NOTICE

All drawings located at the end of the document.

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Modified Proposed Action Memorandum Passive Seep Interception and Treatment Operable Unit 7

Revision 1

Rocky Mountain Remediation Services, L.L.C.

March 1996

ADMIN RECORD
A-OU07-000466

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EXECUTIVE SUMMARY

This revised Seep Interception and Treatment Proposed Action Memorandum presents the U S Department of Energy's accelerated action to address the seep flowing from the Present Landfill into the East Landfill Pond, at Operable Unit No 7 at the Rocky Flats Environmental Technology Site The overall objective of the interception system is to eliminate, to the extent practicable, discharge of F039-listed waste contained in the seep water to a surface-water body

Water will be collected at the seep with an intercept system consisting of perforated pipe in a gravel layer The perforated pipe directs seep water to a concrete vault, which acts as a flow and head equalizing basin From the vault, water is directed through a series of filters and carbon-based reactor tanks housed in a steel tank The treated water is discharged directly to the East Landfill Pond East Landfill Pond water will then be discharged to the A-series ponds, as necessary, to maintain the pond at an acceptable level for system operation

Compliance with potential applicable or relevant and appropriate requirements for seep water will be addressed, to the extent necessary, to protect human health and the environment through interception and treatment of the seep to reduce concentrations of volatile and semivolatile organic compounds

The interception system is designed to be compatible with source containment as a presumptive remedy for final closure of the landfill in July 1997

1.0 PURPOSE

This modified Passive Seep Interception and Treatment Proposed Action Memorandum (PAM) presents the U S Department of Energy's (DOE) accelerated action for the interception and treatment of water seeping from the Present Landfill into the East Landfill Pond, Operable Unit (OU) No 7 at the Rocky Flats Environmental Technology Site (RFETS) (see Figure 1-1) This is the second iteration of the first of two response action documents planned for OU 7 The second document, the *Landfill Closure Interim Measure/Interim Remedial Action (IM/IRA) Decision Document*, will focus on landfill closure as defined in the presumptive remedy approach (EPA 1993), and remediation, if necessary, of environmental media outside of the source area to expand the IM/IRA Decision Document to a comprehensive remedial action

The overall objective of the accelerated action is to eliminate, to the extent practicable, discharge of F039-listed waste contained in the seep water to a surface-water body The accelerated action will address potential applicable or relevant and appropriate requirements (ARARs), and achieve protective standards, to the extent necessary, to protect human health and the environment, through interception and treatment of the seep water to reduce contaminant loading to the East Landfill Pond

Environmental Restoration activities at RFETS are pursuant to an Interagency Agreement (IAG) signed by the DOE, RFFO, the U S Environmental Protection Agency (EPA), and the State of Colorado Department of Public Health and Environment (CDPHE) dated January 22, 1991 (DOE 1991)

2.0 BACKGROUND AND DESCRIPTION

The location and mission of RFETS, location and history of remedial actions at OU 7, characteristics of the seep, and other actions to date are described in the following sections

2.1 ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

The RFETS is located at the foot of the Rocky Mountains in northern Jefferson County, Colorado The site is approximately 16 miles northwest of Denver in Sections 1 through 4 and 9 through 15 of Township 2 south, Range 70 west It is near the suburban communities of Westminster, Broomfield, and Arvada The site covers approximately 6,550 acres, of which, approximately 400 acres were used for industrial activities

Since 1952, the primary mission of RFETS has been the production of components for nuclear weapons In 1989, many of the production functions at the plant were suspended In January 1992, the decision was made to suspend plutonium parts production The site is currently in transition from a weapons production site to a materials management, environmental restoration, and waste management site

More detailed site background information is presented in the OU 7 Final Work Plan Technical Memorandum (OU 7 Final Work Plan) (DOE 1994a)

2.2 OU 7 SITE DESCRIPTION

OU 7 is located north of the industrial area at the western end of No Name Gulch For the purpose of selecting remedial actions, OU 7 is divided into the following areas

- Present Landfill (Individual Hazardous Substance Site [IHSS] 114)
- Inactive Hazardous Waste Storage Area (IHSS 203)
- East Landfill Pond
- Spray evaporation areas adjacent to the East Landfill Pond (IHSS 167 2 and IHSS 167 3)

Each of these areas is shown in Figure 2-1 and described in detail in the OU 7 Final Work Plan (DOE 1994a)

The seep addressed in this report is located near the base of the east face of the 27-acre Present Landfill (IHSS 114) Operation of the landfill was initiated in 1968 to provide disposal of nonradioactive solid wastes and will continue until the landfill is closed in 1997 In 1973, tritium

was detected in water seeping from the landfill In response, monitoring of waste for radionuclides was initiated prior to burial to prevent further disposal of radioactive material, and interim response measures were developed to control the generation and migration of the landfill leachate Locations of the landfill structures (surface-water diversion ditch, subsurface drainage control, and slurry walls) constructed as interim response measures are shown in Figure 2-1 and described in detail in the OU 7 Final Work Plan (DOE 1994a)

Although records indicate that some hazardous waste was disposed at the landfill, hazardous waste disposal was discontinued in 1986

2.3 CHARACTERISTICS OF THE SEEP AT SW097

The existing leachate interception system, which is part of the subsurface drainage control system at the landfill, is only partially effective Between 1977 and 1981, portions of the leachate interception system were buried during landfill expansion Although the intercept trench is effective in keeping leachate within the northern, southern, and western limits of the landfill, there is a seep along the eastern boundary of the landfill just above the pond

Surface-water sampling station SW097 is located where the water seeps from the landfill into the pond The physical area of the seepage face is believed to vary over the course of the year Based on visual observations, the maximum seep width is estimated at 8 ft

Historical data presented in Table 2-1 were used to estimate an average flow rate at the seep Specific information on the method of measurement and the relationship to storm events for most of these data are not available Thus, disregarding measurements believed to be erroneous, the average flow at the seep is estimated to be 3 61 gallons per minute (gpm) The water surfacing at the seep (SW097) comprises surface water and groundwater mixed with leachate from the waste A waste determination of the seep was made based on historical data detailing wastes disposed in the landfill

According to the 1986 Waste Stream Identification Characterization (Rockwell International 1986) report, multiple waste streams believed to contain Resource Conservation and Recovery Act (RCRA) listed hazardous wastes were disposed in the Present Sanitary Landfill prior to 1986 From a RCRA perspective, the surface water/groundwater containing F039 hazardous waste constituents is a "contained-in" waste This waste must be handled as a RCRA-regulated hazardous waste, with the EPA waste code F039, when the seep water is actively managed

Chemicals in the seep that exhibit concentrations above background include total and dissolved metals, radionuclides, volatile organic compounds (VOCs), and semivolatile organic compounds

Table 2-2 Comparison of Contaminant Concentration to ARAR/TBC Standards

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean Result	ARAR/TBC	Units
METALS[1]									
ALUMINUM	10 - 30000	16/19	29	26900	BLANK	BLANK	2929	[illegible]	µG/L
ANTIMONY	0 05 - 60	4/18	14	60 4	BLANK	A	20	300	µG/L
ARSENIC	0 7 - 10	8/16	1 4	3	B	BLANK	3	5	µG/L
BARIUM	0 02 - 50000	19/19	297	1550	BLANK	BLANK	645	1000	µG/L
BERYLLIUM	0 2 - 5	2/18	0 2	1 4	BLANK	JA	1	4	µG/L
CADMIUM	[illegible]	3/16	[illegible]	[illegible]	BLANK	BLANK	[illegible]	TVS [illegible]	µG/L
CHROMIUM	2 4 - 27 5	7/18	2	29 6	BLANK	BLANK	9	50	µG/L
COBALT	0 02 - 50	10/18	2 7	19 1	B	BLANK	11	50	µG/L
COPPER	2 4 - 25	8/18	2	94 9	BLANK	BLANK	12	TVS (16)	µG/L
LEAD	0 8 - 2000	14/18	1 5	11	BLANK	V	5	TVS (6 46)	µG/L
IRON	[illegible]	[illegible]	[illegible]	[illegible]	BLANK	[illegible]	[illegible]	[illegible]	µG/L
LITHIUM	2 - 2000	15/19	34	107	BLANK	V	48	2500	µG/L
MANGANESE	[illegible]	19/19	1320	2490	BLANK	BLANK	[illegible]	[illegible]	µG/L
MERCURY	0 02 - 0 2	1/18	0 1	0 28	BLANK	BLANK	0 1	10	µG/L
MOLYBDENUM	5 7 - 200	6/18	4	28 5	B	BLANK	21		µG/L
NICKEL	0 02 - 40	5/18	5	31	BLANK	V	12	125	µG/L
SELENIUM	1 1 - 5	2/18	1 1	7	W	BLANK	2	17	µG/L
SILVER	2 6 - 25	8/18	2 7	16 7	BLANK	BLANK	5	50	µG/L
STRONTIUM	3 5 - 10000	17/19	814	1370	BLANK	BLANK	920		µG/L
TIN	10 - 200	8/18	11	243	BLANK	BLANK	48	8000	µG/L
VANADIUM	3 2 - 10000	12/19	3 1	211	BLANK	BLANK	25	100	µG/L
ZINC	[illegible]	19/19	[illegible]	[illegible]	BLANK	BLANK	[illegible]	[illegible]	µG/L
PESTICIDES									
alpha-BHC	0 05 - 0 28	1/3	0	0	I	BLANK	0 06		µG/L
RADIONUCLIDES									
AMERICIUM-241	0 - 0 013	16/16	-0 000404	0 02121	BLANK	V	0 007	30	pCi/L
CESIUM-137	0 47 - 1	14/14	-0 21	0 6057	J	BLANK	0 15	3000	pCi/L
PLUTONIUM-238	0 01 - 0 01	2/2	-0 000465	0 00222	J	A	0 00088	30	pCi/L
PLUTONIUM-239	0 003 - 0 003	1/1	0 009	0 009	BLANK	BLANK	0 009	30	pCi/L
PLUTONIUM-239/240	0 - 0 013	16/16	0 001	0 01606	BLANK	A	0 007	30	pCi/L
RADIUM-226	0 03 - 0 03	1/1	0 58	0 58	BLANK	A	0 58	100	pCi/L
STRONTIUM-89,90	-0 21 - 1	9/9	0 66	4 06	BLANK	V	1 35	60	pCi/L
STRONTIUM 90	0 2 - 0 59	3/3	0 5442	1 1	BLANK	BLANK	0 7		pCi/L
TRITIUM	155 - 450	19/19	185 4	1500	BLANK	A	393	1000	pCi/L
URANIUM-233,-234	0 1 - 0 6	12/12	-0 0238	4 2	B	A	0 8	500	pCi/L
URANIUM-235	0 - 0 6	12/12	-0 012	0 084	J	A	0 03	600	pCi/L
URANIUM-238	0 086 - 0 6	12/12	0 03914	3 76	BLANK	A	1	600	pCi/L
SEMIVOLATILE ORGANICS									
2,4-DIMETHYLPHENOL	10 - 10	1/5	3	3	J	A	5	36	µG/L

Table 2-2 (Continued)

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean Result	ARAR/TBC	Units
PHOSPHORUS	50 00 - 1000	9/9	95 00	1380	BLANK	BLANK	1387		µG/L
SILICA	400 0 - 2000	3/3	7400	43000	BLANK	BLANK	19567		µG/L
SILICON	7 3 - 2000	13/13	7060	44000	BLANK	BLANK	13547		µG/L
SOLIDS, NONVOLATILE SUSPENDE	5000 - 5000	6/6	10000	199000	BLANK	BLANK	83167		µG/L
SULFATE	200 0 - 25000	5/14	200 0	29600	BLANK	V	5084	250000	µG/L
TOTAL DISSOLVED SOLIDS	10000 - 10000	15/15	470000	870000	BLANK	BLANK	729333		µG/L
TOTAL ORGANIC CARBON	1000 - 1000	3/3	19000	24500	BLANK	V	20833		µG/L
TOTAL SUSPENDED SOLIDS	4000 - 5000	12/12	10000	250000	BLANK	BLANK	144667		µG/L

Shaded analytes indicate mean result exceeds ARAR
All analytes are total analytes unless otherwise noted
Analytes with zero detections are not reported
For non-detects, one-half the detection limit is used in calculating the mean result
[1] Total recoverable concentration reported
[2] Not listed in 40 CFR 302 4 or 6 CCR 1007-3, Part 261 - Appendix VII and therefore are not required to be addressed under a CERCLA Remedial Action
[3] For tetrachloroethene, the maximum detection equals the ARAR the mean exceeds the ARAR because one-half detection limit for non-detects exceeds the ARAR
[4] For vinyl acetate, one detection out of nineteen causes mean to exceed ARAR, suggests that one detection is outlier and should be discarded

Data Qualifiers
BLANK = data qualifier field in database is blank
B = for inorganics, reported value is < CRDL but > IDL (estimated value)
B = for organics, analyte is also detected in blank,
for common lab contaminants include as detection if blank result > 10 times detection limit
for all other organics include if blank result > 5 times detection limit
B = for radionuclides, constituent also detected in blank whose concentration was > minimum detectable activity
I = organics, interference with target peak (estimated value)
J = for organics, MS data indicate presence of compound but below detection limit (estimated value)
U = for inorganics and organics analyte analyzed but not detected at the quantitation limit.

Data Validation Codes
BLANK = data validation field in database is blank
A = acceptable result.
JA = acceptable result (for estimated value)
V = valid result.
TVS = table value standard, hardness dependent, 5 CCR 1002-8

3.0 ACCELERATED ACTION

A description of the accelerated action and accompanying waste management considerations, consistency with long-term actions, and ARARs are discussed in this section

3 1 DESCRIPTION

The seep interception system, shown in Figure 3-1, will consist of a temporary seep interception and treatment system This system is not intended to collect all flows from the landfill that enter the pond, rather, the system is designed for an average flow situation, and some seepage may bypass or overflow the interception system during unusual flow periods

The area in the vicinity of the seep will be excavated to an approximate depth of 2–5 ft (to the weathered bedrock) and the concrete vault, drain rock, and collection pipe will be emplaced The collection pipe will be backfilled with drain rock to direct the seep flow to the concrete vault, which in turn acts as a flow and head equalizing basin From the concrete vault, a 3-in solid PVC double-contained pipe, offset at 45 degrees, will direct the intercepted seep to a series of filters and carbon-based reactor tanks housed in a steel tank The discharge pipe is 2-in solid PVC and treated water is discharged from the steel tank directly into the pond through an outfall pipe Figure 3-2 shows the passive collection and treatment system

Water from the pond will be discharged to the A-series ponds, as necessary, to maintain the pond at an acceptable level The outlet to the East Landfill Pond is at approximately 5,919 5 ft above sea level To accommodate system operation, the pond will be kept at 5,919 ft or lower, which is a storage volume of approximately 23 acre-feet

A temporary diversion dike consisting of hay bales, liner material, and riprap will be placed upstream of the seep to prevent surface-water runoff and sediments from entering the seep interception system (Figure 3-3)

The following assumptions are incorporated into the development of the PAM

- Drainage of the pond, as necessary, to accommodate the site preparation phase of construction of the passive seep interception and treatment system
- Design flows are 3 6 gpm average and 6 7 gpm maximum

3 2 DESIGN

The Title II (95%) design for the OU 7 seep interception system includes detailed drawings and technical specifications of the temporary seep interception and treatment system

3.3 WASTE MANAGEMENT CONSIDERATIONS

The estimated 500 yd^3 of material (soil, debris, and other residues of the landfill) excavated during construction will be disposed at the Present Landfill Although minimal dewatering will be required as part of this action, any water from dewatering during construction will be pumped to the East Landfill Pond All expired carbon-based and filtering media will be appropriately disposed after a waste determination is made Periods of noninterception and nontreatment will occur during maintanance activities

3.4 CONSISTENCY WITH LONG-TERM ACTIONS

The components of this alternative are low cost and/or can be removed easily prior to capping for reuse during the IM/IRA

3.5 POTENTIAL ARARs/TBCs

ARARs/TBCs for OU 7 are discussed in detail in *Potential Applicable or Relevant and Appropriate Requirements for Operable Unit No 7* (EG&G 1994b) and a summary of pertinent ARARs/TBCs information is presented in Appendix A The ARARs presented in Appendix A are those considered applicable or relevant and appropriate as of the original approval date of this Proposed Action Memorandum (June 27, 1996)

Chemical-Specific ARARs

Chemical-specific ARARs set concentration limits for specific pollutants EPA guidance directs that cleanup actions presume that groundwater be considered a potential source of drinking water unless site-specific factors indicate otherwise Therefore, federal and state chemical-specific water standards have been listed as potential ARARs for OU 7 They include the following.

- Safe Drinking Water Act maximum contaminant levels (MCLs)
- RCRA groundwater protection standards
- Colorado Water Quality Control Act surface-water standards (general and segment-specific)

4.0 ENVIRONMENTAL IMPACTS

The potential environmental impacts of the accelerated action are discussed in the following sections

4 1 AIR QUALITY

There are two possible air quality impacts as a result of the accelerated action (1) potential VOC releases during interception and treatment of the seep water, and (2) fugitive dusts as a result of excavation and construction activities The passive seep interception and treatment system will have minimal impact on air quality Emissions would be controlled during construction by use of appropriate dust suppression methods as specified in the technical specifications of the Title II design package

4.2 WATER QUALITY

The accelerated action will reduce the contaminant loading to the East Landfill Pond The seep is believed to be the source of the radionuclides, metals, VOCs, and SVOCs present in East Landfill Pond sediments (DOE 1994a) In addition, collected waters will be treated to meet ARAR/TBC standards, to the extent necessary to protect human health and the environment Although construction activities may temporarily increase erosion, the stormwater diversion dike is designed to minimize erosion at the interception system

4 3 TERRESTRIAL IMPACTS

Plant and animal life may be negatively impacted by the accelerated action As discussed in Section 3 5, wetlands have been identified along the shoreline of the East Landfill Pond Approximately 75 ft^2 of wetlands will be impacted by the accelerated action However, replacement of damaged wetlands will be addressed under the Landfill Closure IM/IRA Decision Document, resulting in no net impact

OU 7 has been identified as potential habitat for the Preble's Meadow Jumping Mouse, which is a candidate for listing However, neither RFETS nor OU 7 has been identified as critical habitat for any regulated species (DOE 1994a)

Prior to construction of the seep interception system, DOE will ensure the protection of plant and wildlife species of concern by evaluating proposed field activities using procedure 1-DO6-ERP-END 03, "Identification and Protection of Threatened, Endangered, and Special-Concern Species "

5.0 PROJECT SCHEDULE

The Passive Seep Interception and Treatment System will be implemented within six months of approval of this Revised Proposed Action Memorandum in accordance with Section I B 10 b of the IAG

The Revised Proposed Action Memorandum was approved by the Colorado Department of Public Health and Environment, with concurrence of EPA, on June 27, 1995 The approval letter is included as Appendix B

6.0 REFERENCES

U S Army Corps of Engineers, Omaha District, (COE), 1994, *Wetlands Mapping and Resource Study*, August

U S Department of Energy (DOE), 1991, *Federal Facility Agreement and Consent Order* (Interagency Agreement U S DOE, U S EPA, and CDPHE), January

DOE, 1994a, *Final Work Plan Technical Memorandum for Operable Unit No 7, Rocky Flats Plant, Golden, Colorado*, September

DOE, 1994b, Olinger, S J , DOE, to T G Hedahl, EG&G, Personal Communication, Subject "Guidance on the Application of Floodplains Regulations to Rocky Flats Plant," May 3

EG&G, 1994b, *Potential Applicable or Relevant and Appropriate Requirements for Operable Unit No 7 - Present Landfill (IHSS 114) and Inactive Hazardous Waste Storage Area (IHSS 203)*

Environmental Protection Agency (EPA), 1993, *Presumptive Remedy for CERCLA Municipal Landfill Sites*, EPA/540/F-93/035, September

Rockwell International, 1986, *Waste Stream Identifcation Characterization, Rocky Flats Plant, Areas 1–4*, W O 2029-13-04-0001

Appendix A

Potential ARARS/TBC

Potential Contaminant of Concern	ARAR/TBC	Units	Citation
Metals (no dissolved data available)			
Aluminum	0 087	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 1 11), Aquatic-Chronic
Antimony	0 3	mg/L	Practical Quantitation Limit, 40 CFR Part 264 Appendix IX
Arsenic	0 05	mg/L	SDWA MCL (40 CFR 141 11 [b])
Barium	1	mg/L	RCRA MCL (40 CFR 264 94), Table 1
Beryllium	0 004	mg/L	Segment 4 & 5 Standard (Standard is 1-day average)
Cadmium	TVS	mg/L	Segment 4 & 5 Standard
Chromium	0 05	mg/L	RCRA MCL (40 CFR 264 94)
Cobalt	0 05	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 11), Agricultural
Copper	TVS	mg/L	Segment 4 & 5 Standard
Lead	TVS	mg/L	Segment 4 & 5 Standard
Lithium	2 5	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 11), Agricultural
Iron	1	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 1 11) Aquatic Chronic
Manganese	0 05	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 1 11), Domestic Water Supply
Mercury	0 01	mg/L	Segment 4 & 5 Standard
Molybdenum			
Nickel	0 125	mg/L	Segment 4 & 5 Standard
Selenium	0 017	mg/L	Colorado Water Quality Standards (5 CCR 1002-8,3 1 11), Aquatic-Chronic
Silver	0 05	mg/L	RCRA MCL (40 CFR 264 94)
Strontium			
Tin	8	mg/L	Practical Quantitation Limit, 40 CFR, Part 264, Appendix IX
Vanadium	0 1	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 11), Agricultural
Zinc	2	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 11), Agricultural
Radionuclides			
Americium-241	30	pCi/L	DOE Order 5400 5, Derived Concentration Guide
Cesium 137	3000	pCi/L	DOE Order 5400 5, Derived Concentration Guide
Plutonium 238	30	pCi/L	DOE Order 5400 5, Derived Concentration Guide
Plutonium 239	30	pCi/L	DOE Order 5400 5, Derived Concentration Guide
Plutonium 239, 240	30	pCi/L	DOE Order 5400 5, Derived Concentration Guide
Radium 226	100	pCi/L	DOE Order 5400 5, Derived Concentration Guide
Strontium 89,90	60	pCi/L	Segment 4 & 5 Standard
Strontium 90			
Tritium	1000	pCi/L	DOE Order 5400 5, Derived Concentration Guide
Uranium 233,234	500	pCi/L	DOE Order 5400 5, Derived Concentration Guide

Chemical Contaminant of Concern	ARAR/TBC	Units	Citation
Chloroethane	0 0057	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 1 11), Drinking Water and Fish
Ethylbenzene	0 057	mg/L	Treatment Standards for Hazardous Wastes (40 CFR 268 40)
Methylene Chloride	0 0057	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 1 11), Human Health, Drinking Water and Fish
[illegible]			
Tetrachloroethene	0 001	mg/L	SDWA MCL (40 CFR 141 61)
Toluene	1	mg/L	SDWA MCL (40 CFR 141 61)
Total Xylenes	10	mg/L	SDWA MCL (40 CFR 141 61)
Trichloroethene	0 0027	mg/L	Colorado Water Quality Standards (5 CCR 1002-8, 3 1 11), Human Health, Drinking Water and Fish
Vinyl Acetate	0 005	mg/L	Practical Quantitation Limit, 40 CFR 264 Appendix IX
Vinyl Chloride	0 002	mg/L	SDWA MCL (40 CFR 141 61)
Semivolatile Organic Compounds			
2,4-Dimethylphenol[2]	0 036	mg/L	Treatment Standards for Hazardous Wastes (40 CFR 268 40)
2-Methylnaphthalene	0 01	mg/L	Practical Quantitation Limit, 40 CFR 264, Appendix IX
[illegible]			
Acenapthene	0 52	mg/L	Colorado Water Quality Standards (5 CCR 1002-8,3 1 11), Aquatic-Chronic
Bis(2-ethylhexyl)phthalate	0 01	mg/L	Practical Quantitation Limit, 40 CFR 264, Appendix IX
[illegible]			
Diethyl phthalate	0 2	mg/L	Treatment Standards for Hazardous Wastes (40 CFR 268 40)
Fluorene	0 01	mg/L	Practical Quantitation Limit (5 CCR 1002-8, 6 9 2)
Napthalene	0 01	mg/L	Practical Quantitation Limit (5 CCR 1002-8, 6 9 2)
Phenanthrene	0 01	mg/L	Practical Quantitation Limit (5 CCR 1002-8, 6 9 2)
Pesticides			
[illegible]			

[1] Metals for aquatic life are stated as dissolved unless otherwise specified Metals for agricultural and domestic use are stated as total recoverable unless otherwise specified

[2] Not listed in 40 CFR 302 4 or 6 CCR 1007-3, Part 261 – Appendix VII and, therefore, are not required to be addressed under a CERCLA Remedial Action

Shaded areas mean no ARAR found

TVS = table value standard, hardness-dependent from 5 CCR 1002-8

Appendix B

PAM Approval

STATE OF COLORADO

Roy Romer, Governor
Patti Shwayder, Acting Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION

4300 Cherry Creek Dr S
Denver, Colorado 80222 1530
Phone (303) 692-3300
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Colorado Department
of Public Health
and Environment

June 27, 1995

Steve Slaten
IAG Project Coordinator-ER
Department of Energy
Rocky Flats Office
P.O. Box 928
Golden CO 80402-0928

RE: Modified OU 7 Passive Seep Collection and Treatment PAM

Dear Mr Slaten:

The Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (the Division) and the Environmental Protection Agency (EPA) have reviewed DOE's draft Modified Seep Collection and Treatment PAM for OU 7 The Division, as lead agency and with the concurrence of EPA, approves this document. The objectives of the original PAM are satisfied by this revised PAM which proposes methods which are more consistent with landfill closure Therefore, an additional public comment period will not be necessary

The milestone "Begin Seep Collection" scheduled for August 16, 1995 in the original PAM is annulled Construction must, however, proceed so that the seep collection system is operational within six months of this approval date.

If you have any questions regarding these matters, please contact Carl Spreng at 692-3358

Sincerely,

Joe Schieffelin
Rocky Flats Unit Leader
Hazardous Waste Control Program

cc: Peg Witherill, DOE
Laurie Peterson-Wright, EG&G
Martin Hestmark, EPA
Bill Fraser, EPA
Laura Perrault, AGO
Steve Tarlton, RFPU

Tim Rehder

Re Minor Modification to the Modified Proposed Action Memorandum for the Passive Seep Interception and Treatment Operable Unit 7, Revision 1, March 1996

Dear Tim,

The U S Department of Energy/Rocky Flats Field Office (DOE-RFFO) requests a minor modification to the Proposed Action Memorandum for the Passive Seep Interception and Treatment Operable Unit 7, Revision 1, March 1996 (See ¶25as , of the Rocky Flats Cleanup Agreement) Granulated activated carbon (GAC) is presently used to treat the volatile organic compounds that are present in the seep at levels slightly above stream standards DOE is proposing to substitute passive air stripping for the GAC The passive air stripping is better suited to treating the volatile constituents of concern The minor modification is supported by recent water sampling that was performed to evaluate the treatment system A minor modification is appropriate because the change in operation of the treatment system will not cause the system to exceed an effluent limit (id)

DOE has included three documents in support of this modification request The First attachment, entitled *Evaluation of Water Treatment Activities at OU7*, documents the results of the *Plan for Evaluating Water Treatment Activities at OU7* The approved plan was dated May 28, 1997

The second attachment is entitled the *Revised Present Landfill Passive Seep Interception and Treatment System Design Change - Modification to the Proposed Action Memorandum* This attachment describes the proposed change to the design of the of the PSITS

The third attachment is entitled the *Revised Present Landfill Passive Seep Interception and Treatment System Operational Framework - Modification to the Proposed Action Memorandum* (Revised Operational Framework) The Revised Operational Framework is intended to supersede the existing PAM and the existing Operational Framework In this way the PSITS Operator will have a single document that provides a clear and complete understanding of the active compliance obligations

We look forward to discussing your thoughts on the proposed modification I will be calling to schedule a meeting If you have questions or comments please do not hesitate to call at

cc Carl Spreng

ATTACHMENT 1

Evaluation of Water Treatment Activities at OU7

Objectives

The first objective was to evaluate the current volatile organic compound (VOC) and semivolatile organic compound (SVOC) contaminant levels in the influent to the treatment system The second objective was to evaluate the carbon changeout frequency required to meet the concentration limits (applicable or relevant and appropriate requirements, or "ARARs") applicable to the discharge

Conclusion

Two constituents, benzene and vinyl chloride, were detected in the influent at levels slightly above the current stream standards-based ARARs for the OU7 Passive Seep Interception and Treatment System (PSITS)

Installation of new GAD will be required on a monthly basis to consistently attain ARARs The frequency of GAC changeout is due to the fact that neither of these constituents are amenable to treatment using granular activated carbon The two constituents in question are better suited to air stripping

Background

The PSITS is a passive treatment system which utilizes GAC to reduce the concentration of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) in the seep that originally emanated from the toe of the Present Landfill The PSITS is comprised of

- a seep intercept system
- a settling basin to remove suspended solids (the settling basin also serves to reduce metals loading)
- a bag filtration system consisting of two 25 micron bag filters operated in parallel to remove residual suspended solids
- two 55-gallon drums of GAC piped in series

The PSITS consists of perforated pipe laid in a gravel bed Seep water collects in the perforated pipe and is piped to a pre-cast concrete basin

which allows suspended solids to settle and serves to equalize the head on the system The settling basin was equipped with a bypass line which allows the influent, or a portion thereof, to bypass the treatment system during routine maintenance or when the flow rate of the seep water is greater than the maximum system design flow rate A pipe discharges from the settling basin into to bag filters which remove particles greater than 25 microns from the influent

After filtration, the seep water flows through two 55-gallon drums of GAC The GAC removes select VOCs and SVOCs The GAC drums are located in the below-ground carbon steel tank which serves as a secondary containment for the system When two GAC drums are in use they are operated in series in lead and polish positions When breakthrough occurs from the lead drum, the polish drum is moved to the lead position and a new GAC drum is placed in the polish position The effluent from the polish position (i e the treatment system effluent) is discharged by gravity to the East Landfill Pond

Current Operations

With one exception, the PSITS is currently operated in accordance with the Operational Framework and associated Sampling and Analysis Plan (PSITS SAP) submitted by DOE to EPA and CDPHE on November 25, 1996 The Operational Framework was intended to clarify and document issues associated with the management and operation of the PSITS The one exception is that GAC is currently being changed out on a monthly basis The monthly changeout is based upon the results of this evaluation The monthly changeout will continue until this PAM modification is approved

Summary of the Technical Approach to the Evaluation

Sampling and analysis for VOCs and SVOCs was performed in accordance with the (PSITS SAP) Two new 55-gallon drums of GAC were put on line, in series Samples were taken from four locations- in the influent to the treatment system, after the lead GAC unit, in the treatment system effluent after the polish unit, and in the landfill pond

Each location was sampled after one week, one month, and two months After the two month sampling event, the lead GAC was taken off line and the polish GAC was moved into the lead position A fresh drum of GAC was then placed in the polish position That type of rotation reflected the ongoing management practice When the two month rotation was

completed, each location was again sampled after one week, one month and two months

The exact day of sampling was not critical As a result, sampling was coordinated with other maintenance activities Regardless, the sampling schedules for the two study cycles were approximately equivalent An additional sampling was performed on the second cycle to confirm the data obtained from the last scheduled sampling event (the 126th day) VOCs and SVOCs were analyzed by gas chromatography/mass spectrophotometry in accordance with SW-846 methods 8260 and 8270, respectively

The actual time line for the sampling was as follows

Event	Event Cycle	Sample Date	Required Analyses
Install two new GAC drums	Day 0	08/04/97	None
Check System	Day 9	08/13/97	VOC, SVOC,TB*
Check System	Day 35	09/08/97	VOC, SVOC
Check System	Day 65	10/08/97	VOC, SVOC
Start second cycle	Day 65	10/08/97	None
Check System	Day 72	10/15/97	VOC, SVOC
Check System	Day 98	11/10/97	VOC, SVOC
Check System	Day 126	12/08/97	VOC, SVOC
Verify previous data	N/A	01/15/98	VOC SVOC

*Trip Blank for VOC

Data Presentation

The results of the sampling are presented in the four following figures The figures present only the analytes detected by EPA Methods 8260 and 8270 In addition, all exceedance of RFCA Action Levels (stream standards-based ARARs) are highlighted and the total mass of contaminants over the five month evaluation period is summed

Three types of additional data are presented in Appendix 1, 2 and 3 Appendix 1 includes both the samples taken as part of the evaluation (ie 8/13/97 - 1/15/98), and other recent samples in the RFETS Soil and Water Database that are relevant to the evaluation In addition, the data

Figure 1
OU7 SW00396 Landfill Treatment System Influent

Volatiles (ug/L)	RFCA Action Level	Concentration 13-Aug-97	8-Sep-97	8-Oct-97	15-Oct-97	10-Nov-97	8-Dec-97	15-Jan-98	Total Mass (g) 8/97 through 1/98	
1,1-Dichloroethane	1000	4 00	3 90	5 40	4 81		5 60	6 90	13 19	
1,2-Dichlorobenzene	620			0 44			0 47	0 54	0 61	
1,4-Dichlorobenzene	75			0 56			0 66	0 65	0 79	
Acetone					8 47				2 29	
Benzene	1	1 20	1 10	1 50			1 70	2 10	3 52	
Chlorobenzene	100			0 29				0 54	0 33	
Chloroethane		13 00	12 00	15 00		15 00	18 00	16 00	42 05	
cis-1,2-Dichloroethene	70						0 42	0 52	0 46	
Ethylbenzene	680	6 20	6 30	9 70	8 32	12 00	9 40	12 00	28 25	
Napthalene	620	13 00	12 00	30 00	22 90	16 00	37 00	41 00	74 26	
Toluene	1000			1 30	1 35		1 40	1 10	1 95	
Trichloroethene	2 7			0 55			0 70	0 91	0 93	
Vinyl chloride	2	1 70		2 20	1 84		2 50		3 28	
Xylene (total)	10000	13 00	14 00	3 00	1 47	3 60	3 20	2 80	20 79	
									Total Volatiles	192 72
SemiVolatiles										
Acenaphthene	520	1 10		2 10			4 00	4 90	5 51	
bis (2-Ethylhexyl)Phthalate	10		1 60				3 00	1 30	3 03	
Butylbenzylphthalate	300									
Di-n-Butylphthalate	10									
Diethylphthalate	23000									
Ethylbenzene	680			5 90					1 60	
Fluorene	1300			1 80			2 80	3 00	3 33	
Naphthalene	620	1 80	1 30	12 00	6 28		16 00		14 75	
Phenanthrene	10			2 80			4 20	4 00	4 78	
Phenol	2560									
									Total SemiVolatiles	32 98
Average Monthly Flow (gal/min)		3 20	3 40	3 20	3 20	3 10	3 00	2 80		
Average Monthly Flow (l/min)		12 11	12 87	12 11	12 11	11 73	11 36	10 60		

NOTE ONLY ANALYTES DETECTED BY EPA METHODS 8260 AND 8270 WHICH HAVE RFCA LEVELS ARE LISTED
NOTE RFCA ACTION LEVEL EXCEEDANCES ARE SHADED
NOTE NO VALUES SHOWN INDICATE BELOW DETECTION LIMIT

Figure 2
OU7 SW00296 Landfill Treatment Lead GAC Effluent

Volatiles (ug/L)	RFCA Action Level	Concentration 13-Aug-97	8-Sep-97	8-Oct-97	GAC CHANGE 15-Oct-97	10-Nov-97	8-Dec-97	15-Jan-98
1,1-Dichloroethane	1000		2 70	4 40	2 99	5 00	6 80	7 70
1,2-Dichlorobenzene	620						0 46	
1,4-Dichlorobenzene	75						0 60	
Acetone					6 25			
Benzene	1			0 59			**1.90**	**1.10**
Chlorobenzene	100							
Chloroethane		4 40	9 60	16 00		17 00	18 00	19 00
cis-1,2-Dichloroethene	70						0 50	0 38
Ethylbenzene	680			1 40			11 00	3 70
Napthalene	620		1 40	1 00			36 00	1 10
Toluene	1000			0 23			1 50	0 58
Trichloroethene	2 7						0 87	0 43
Vinyl chloride	2			**2.20**			**2.80**	**3 00**
Xylene (total)	10000			1 20			3 70	0 76
SemiVolatiles								
Acenaphthene	520						4 10	
bis (2-Ethylhexyl)Phthalate	10						3 70	
Butylbenzylphthalate	300							
Di-n-Butylphthalate	10							
Diethylphthalate	23000							
Ethylbenzene	680							
Fluorene	1300							
Naphthalene	620						19 00	
Phenanthrene	10						4 60	
Phenol	2560							
Average Monthly Flow (gal/min)		3 20	3 40	3 20	3 20	3 10	3 00	2 80
Average Monthly Flow (l/min)		12 11	12 87	12 11	12 11	11 73	11 36	10 60

NOTE ONLY ANALYTES DETECTED BY EPA METHODS 8260 AND 8270 WHICH HAVE RFCA LEVELS ARE LISTED
NOTE RFCA ACTION LEVEL EXCEEDANCES ARE SHADED
NOTE NO VALUES SHOWN INDICATE BELOW DETECTION LIMIT

Figure 3
OU7 SW00196 Landfill Treatment System Effluent

Volatiles (ug/L)	RFCA Action Level	Concentration 13-Aug-97	8-Sep-97	8-Oct-97	GAC CHANGE	15-Oct-97	10-Nov-97	8-Dec-97	15-Jan-98	Total Mass (g) 8/97 through 1/98	
1,1-Dichloroethane	1000			2 00				3 50	5 60	4 96	
1,2-Dichlorobenzene	620									0 00	
1,4-Dichlorobenzene	75									0 00	
Acetone						5 76				1 56	
Benzene	1									0 00	
Chlorobenzene	100									0 00	
Chloroethane			11 00	16 00				18 00	17 00	27 61	
cis-1,2-Dichloroethene	70									0 00	
Ethylbenzene	680									0 00	
Napthalene	620			14 00						3 78	
Toluene	1000									0 00	
Trichloroethene	2 7									0 00	
Vinyl chloride	2			**2.40**				**2 80**		2 07	
Xylene (total)	10000									0 00	
										Total Volatiles	39 98
SemiVolatiles											
Acenaphthene	520									0 00	
bis (2-Ethylhexyl)Phthalate	10							3 70		1 88	
Butylbenzylphthalate	300									0 00	
Di-n-Butylphthalate	10		1 40						3 20	2 29	
Diethylphthalate	23000									0 00	
Ethylbenzene	680									0 00	
Fluorene	1300									0 00	
Naphthalene	620									0 00	
Phenanthrene	10									0 00	
Phenol	2560									0 00	
										Total SemiVolatiles	4 17
Average Monthly Flow (gal/min)		3 20	3 40	3 20		3 20	3 10	3 00	2 80		
Average Monthly Flow (l/min)		12 11	12 87	12 11		12 11	11 73	11 36	10 60		

NOTE ONLY ANALYTES DETECTED BY EPA METHODS 8260 AND 8270 WHICH HAVE RFCA LEVELS ARE LISTED
NOTE RFCA ACTION LEVEL EXCEEDANCES ARE SHADED
NOTE NO VALUES SHOWN INDICATE BELOW DETECTION LIMIT

Figure 4
OU7 SW098 Landfill Pond

Volatiles (ug/L)	RFCA Action Level	Concentration 13-Aug-97	8-Sep-97	8-Oct-97	GAC CHANGE	15-Oct-97	10-Nov-97	8-Dec-97	15-Jan-98
1,1-Dichloroethane	1000								
1,2-Dichlorobenzene	620								
1,4-Dichlorobenzene	75								
Acetone									
Benzene	1								
Chlorobenzene	100								
Chloroethane									
cis-1,2-Dichloroethene	70								
Ethylbenzene	680								
Napthalene	620			1 50			1 50		
Toluene	1000								
Trichloroethene	2 7								
Vinyl chloride	2								
Xylene (total)	10000								
SemiVolatiles									
Acenaphthene	520								
bis (2-Ethylhexyl)Phthalate	10								
Butylbenzylphthalate	300								
Di-n-Butylphthalate	10								
Diethylphthalate	23000								
Ethylbenzene	680								
Fluorene	1300								
Naphthalene	620								
Phenanthrene	10								
Phenol	2560								
Average Monthly Flow (gal/min)		3 20	3 40	3 20		3 20	3 10	3 00	2 80
Average Monthly Flow (l/min)		12 11	12 87	12 11		12 11	11 73	11 36	10 60

NOTE ONLY ANALYTES DETECTED BY EPA METHODS 8260 AND 8270 WHICH HAVE RFCA LEVELS ARE LISTED
NOTE RFCA ACTION LEVEL EXCEEDANCES ARE SHADED
NOTE NO VALUES SHOWN INDICATE BELOW DETECTION LIMIT

in Appendix 1 also includes all tentatively identified compounds detected during the evaluation

Appendix 2 contains data tables from the *Modified Proposed Action Memorandum Passive Seep Interception and Treatment Operable Unit 7 Revision 1*, March 1996 These data tables have been included for comparison to the new data collected for this evaluation It should be noted that the older data compares very well

Appendix 3 contains data tables from the *Draft Phase 1 IM/IRA Decision Document and Closure Plan for Operable Unit 7 Present Landfill*, March 1996 These data tables have been included for comparison to the new data collected for this evaluation It should be noted that the older data compares very well

Discussion of Results

Influent Quality

Two VOC constituents are present in the influent at concentrations slightly above the stream standards-based ARARs The mass of contamination above stream standards, on a yearly basis, is less than 10 grams It should also be noted that none of the other VOC or SVOC constituents detected approached the ARAR values (See Figure 1)

Although not a focus of the investigation, it is important to recognize that the maximum metal concentrations detected in the seep (see Appendix 2) are consistent with the reported background values for seeps at RFETS (See Appendix 4)

Carbon Changeout Frequency

Figure 2 shows that vinyl chloride and benzene break through the lead GAC at four to eight weeks In fact, at eight weeks, vinyl chloride had broken through both the lead and the polish GAC units and was present in the effluent at levels exceeding ARARs (See Figure 3) To be confident that ARARs are attained, carbon changeout should be conducted monthly

This conclusion is supported in the literature The chart in Appendix 5 illustrates the relative effectiveness of different treatment technologies for specific organic constituents

Landfill Pond Water Quality

Figure 4 is consistent with the results tabulated in Appendix 3 Only very limited contamination has been detected None of the VOC or SVOC constituents approach the stream standards-based ARARs

Appendix 1

Recent Passive Seep Interception Treatment System Data in RFETS Soil and Water Database

Treatment System Influent

Sampling History at OU7

Volatile Organics	5/29/96	7/16/96	9/13/96	10/30/96	11/20/97	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
(1 methyl 1 propenyl) (E)benzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	3 4	ND	ND	ND	ND
1 1 Dichloroethane	ND	9	ND	NT	ND	1	NT	NT	4 2	4	3 9	5 4	4 81	5 6	3 5	5 6
1 1 Dichloroethene	2	ND	ND	NT	ND	1 7	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
1 2 3 4 tetrahydro-1 methylnaphthalen	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 6	ND	ND	ND	ND
1 2 4 Trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	0 95	ND	1 8	1 93	2 2	ND	ND
1 2 Dichlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 44	ND	ND	ND	ND
1 3 5 Trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 31	ND	ND	ND	ND
1 4 Dichlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 56	ND	ND	ND	ND
1-ethly 2 3-dimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 8	ND	ND	ND	ND
1 Ethyle 2 methylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	ND	ND	ND
1 Methyl 3 (1 methyethyl)benzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	ND	ND	ND
1 Methylethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1	ND	ND	ND	ND
2 3-dihydro-1 2-dimethyl 1H Indene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	4 5	ND	ND	ND	ND
2 3 Dihydroindene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	2 2	ND	ND	ND	ND
2 butanone	4	2	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-ethenyl 1 3 4 trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	ND	ND	ND
4 isopropyltolune	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 65	ND	ND	ND	ND
4 Methylethylbenzene 2 oxethanone	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	ND	ND	ND
Acetone	22	ND	ND	NT	ND	0 67	NT	NT	ND	ND	ND	ND	8 47	ND	ND	ND
Benzene	0 3	ND	ND	NT	ND	ND	NT	NT	0 33	1 2	1 1	1 5	ND	1 8	ND	ND
Chlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 29	ND	ND	ND	ND
Chlorodiflouromethane	41	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	23	23	NT	20	4 7	NT	NT	19	13	12	2 2	ND	15	18	17
Chloroflouromethane	25	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	31	ND	ND
Dichlorodifluoromethane	ND	2	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorofluoromethane	9	ND	ND	NT	ND	ND	NT	NT	ND	1 5	ND	ND	1 46	ND	5 78	8 4
Dichlorofluoromethane	ND	ND	ND	NT	ND	ND	NT	NT	ND	3 8	9 1	11	ND	7 2	ND	ND
Ethylbenzene	0 2	2	ND	NT	ND	ND	NT	NT	0 58	6 2	6 3	9 7	8 32	12	ND	ND
Hexane	0 7	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	1 4	ND	ND
Methylene Chloride	2	1	ND	NT	0 8	ND	NT	NT	0 45	ND	ND	ND	3 31	ND	ND	ND
n Butylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 27	ND	ND	ND	ND
n Propylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 31	ND	ND	ND	ND
Napththalene	ND	ND	ND	NT	ND	ND	NT	NT	ND	13	12	30	22 9	16	ND	ND
Toluene	0 2	ND	ND	NT	0 9	ND	NT	NT	ND	ND	ND	1 3	1 35	1 3	ND	ND
Trichloroethene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 55	ND	ND	ND	ND
Vinyl Chloride	ND	5	2	NT	2	ND	NT	NT	ND	1 7	ND	1 84	1 84	ND	2 8	ND
Xylene (Total)	2	ND	ND	NT	ND	0 25	NT	NT	ND	13	14	3	1 47	3 6	ND	ND

ND=Sample Below Detection Limit
NT=Not Sampled

Treatment System Influent

Sampling History at OU7

SemiVolatiles	5/29/96	7/16/96	9/13/96	10/30/96	11/20/97	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1 Methylnaphthalene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2(3H) Benzothalazone	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2 4 Imidazolidinedione 1 (hydrox	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5 9	ND	ND
2-bitoxyethanol	66	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2 Fluoro-1 propene	ND	NT	NT	NT	ND	ND	NT	NT	ND	6 6	ND	ND	ND	ND	ND	ND
2 Methylnaphthalene	2	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2 Methyloxy 3 methybutane	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2 Proenoicacid 2 methyl ethylene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	5 9	ND	ND	ND	ND
3 3-dimethyl 1 Butene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	8 6	ND	ND	ND	ND
3 phenyl 5(4H) isoxalone	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4 4 (1 methylethylidene)bisphenol	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4 4 (Methylethylidene)Biphenol	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4-isothiazolecarboxamide	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Alpha alpha 4 trimethycyclohexane	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Benzocycloheptatriene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Benzoicacid	28	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
bis(2 Ethylhexy)Phthalate	5	NT	NT	NT	ND	4 9	NT	NT	ND	ND	ND	ND	ND	ND	3 7	ND
Butylbenzophthalate	4	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Di n buthylphthalate	6	NT	NT	NT	ND	ND	NT	NT	ND	ND	1 4	ND	ND	ND	ND	3 2
Dibenzofuran	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	3	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Hydroxy MethylesterAcetic acid	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Napthalene	2	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	5	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Triethyleste phosphoric Acid	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Triethylphosphate	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND

ND=Sample Below Detection Limit
NT=Not Sampled

SW00196 Treatment System Effluent

Sampling History at OU7
Location SW00196 Landfill Treatment System Effluent

Volatile Organics	5/29/96	7/16/96	9/13/96	10/30/96	11/20/97	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
(1-methyl-1 propenyl) (E)benzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	3 4	ND	ND	ND	ND
1 1 Dichloroethane	ND	9	ND	NT	ND	1	NT	NT	4 2	4	3 9	5 4	4 81	5 6	3 5	5 8
1 1 Dichloroethene	2	ND	ND	NT	ND	1 7	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
1 2 3 4-tetrahydro 1 methylnaphthalen	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 6	ND	ND	ND	ND
1 2 4 Trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	0 95	ND	1 8	1 93	2 2	ND	ND
1 2 Dichlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 44	ND	ND	ND	ND
1 3 5 Trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 31	ND	ND	ND	ND
1 4 Dichlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 56	ND	ND	ND	ND
1-ethly 2 3-dimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 8	ND	ND	ND	ND
1 Ethyle 2 methylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	ND	ND	ND
1 Methyl 3-(1 methyethyl)benzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	ND	ND	ND
1 Methylethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1	ND	ND	ND	ND
2 3-dihydro-1 2-dimethyl 1H Indene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	4 5	ND	ND	ND	ND
2 3 Dihydroindene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	2 2	ND	ND	ND	ND
2 butanone	4	2	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-ethenyl 1 3 4 trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	ND	ND	ND
4 isopropyltolune	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 65	ND	ND	ND	ND
4-Methylethylbenzene 2-oxethanone	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	ND	ND	ND
Acetone	22	ND	ND	NT	ND	0 67	NT	NT	ND	ND	ND	ND	8 47	ND	ND	ND
Benzene	0 3	ND	ND	NT	ND	ND	NT	NT	0 33	1 2	1 1	1 5	ND	1 8	ND	ND
Chlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 29	ND	ND	ND	ND
Chlorodiflouromethane	41	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	23	23	NT	20	4 7	NT	NT	19	13	12	2 2	ND	15	18	17
Chloroflouromethane	25	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	31	ND	ND
Dichlorodifluoromethane	ND	2	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorofluoromethane	9	ND	ND	NT	ND	ND	NT	NT	ND	1 5	ND	ND	1 48	ND	5 78	8 4
Dichlorofluoromethane	ND	ND	ND	NT	ND	ND	NT	NT	ND	3 8	9 1	11	ND	7 2	ND	ND
Ethylbenzene	0 2	2	ND	NT	ND	ND	NT	NT	0 58	6 2	6 3	9 7	8 32	12	ND	ND
Hexane	0 7	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1 1	ND	1 4	ND	ND
Methylene Chloride	2	1	ND	NT	0 8	ND	NT	NT	0 45	ND	ND	ND	3 31	ND	ND	ND
n Butylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 27	ND	ND	ND	ND
n Propylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 31	ND	ND	ND	ND
Napththalene	ND	ND	ND	NT	ND	ND	NT	NT	ND	13	12	30	22 9	16	ND	ND
Toluene	0 2	ND	ND	NT	0 9	ND	NT	NT	ND	ND	ND	1 3	1 35	1 3	ND	ND
Trichloroethene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0 55	ND	ND	ND	ND
Vinyl Chloride	ND	5	2	NT	2	ND	NT	NT	ND	1 7	ND	1 84	1 84	ND	2 8	ND
Xylene (Total)	2	ND	ND	NT	ND	0 25	NT	NT	ND	13	14	3	1 47	3 6	ND	ND

ND=Sample Below Detection Limit
NT=Not Sampled

SW00196 Treatment System Effluent

Sampling History at OU7
Location SW00196 Landfill Treatment System Effluent

SemiVolatiles	5/29/96	7/16/96	9/13/96	10/30/96	11/20/97	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1 Methylnaphthalene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2(3H) Benzothalazone	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2 4 Imidazolidinedione 1 (hydrox	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2 bitoxyethanol	66	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	5 9	ND	ND
2 Fluoro-1 propene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2 Methylnaphthalene	2	NT	NT	NT	ND	ND	NT	NT	ND	6 6	ND	ND	ND	ND	ND	ND
2 Methyloxy 3 methybutane	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2 Proenoicacid 2 methyl ethylene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
3 3 dimethyl 1 Butene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	5 9	ND	ND	ND	ND
3 phenyl 5(4H) isoxalone	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	8 6	ND	ND	ND	ND
4 4 (1 methylethylidene)bisphenol	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4 4 (Methylethylidene)Biphenol	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4 isothiazolecarboxamide	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Alpha alpha 4 trimethycyclohexane	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Benzocycloheptatriene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Benzoicacid	28	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
bis(2 Ethylhexy)Phthalate	5	NT	NT	NT	ND	4 9	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzophthalate	4	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	3 7	ND
Di n-buthylphthalate	6	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	1 4	ND	ND	ND	ND	3 2
Diethylphthalate	3	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Hydroxy MethylesterAcetic acid	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Napthalene	2	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	5	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Triethyleste phosphoric Acid	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Triethylphosphate	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND

ND=Sample Below Detection Limit
NT=Not Sampled

SW00296 Lead GAC Effluent

Sampling History at OU7
Location SW00296 Landfill Treatment Lead GAC Effluent

Volatile Organics	5/29/96	7/16/96	9/13/96	10/30/96	11/20/96	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1 1 Dichloroethane	NT	NT	5	6	5	5 5	5	4	NT	ND	2 7	4 4	2 99	5	6 8	7 7
1 2 4-Trimethylbenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	2 2	ND
1 2 Dichlorobenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0 48	ND
1 4-Dichlorobenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0 6	ND
2 Butanone	NT	NT	ND	4	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND
Acetone	NT	NT	ND	5	ND	1 8	ND	ND	NT	ND	ND	ND	6 25	ND	ND	ND
Benzene	NT	NT	ND	ND	0 8	0 24	ND	ND	NT	ND	ND	0 59	ND	ND	1 9	1 1
Carbon disulfide	NT	NT	ND	ND	ND	0 2	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NT	NT	22	25	21	24	30	36	NT	4 4	9 6	16	ND	17	18	19
Chloroflouromethane	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	32	ND	ND
cis 1 2 Dichloroethene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0 5	0 38
Dichlorofluoromethane	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	6 5	ND	ND	7 8	4 49	7 3
Ethylbenzene	NT	NT	ND	5	3	0 69	ND	ND	NT	ND	ND	ND	ND	ND	11	3 7
Isopropylbenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	1 2	0 32
Methylene Chloride	NT	NT	ND	1	0 7	1 1	ND	ND	NT	ND	ND	ND	1 69	ND	0 38	ND
n Propylbenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0 71	ND
Napththalene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	1 4	1	ND	ND	36	1 1
Toluene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	0 23	ND	ND	1 5	0 58
Trichloroethene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0 87	0 43
Vinyl Chloride	NT	NT	3	3	2	3 2	2	3	NT	ND	ND	2 2	2 8	ND	ND	3
Xylene (Total)	NT	NT	ND	2	ND	ND	ND	ND	NT	ND	ND	1 2	ND	ND	3 7	0 76

SemiVolatiles	5/29/96	7/16/96	9/13/96	10/30/96	11/20/96	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1 8 Naphtalic anhydride	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	4 9	ND	ND
2 Methylnaphthalene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	2 7	ND
Acenaphthene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	4 1	ND
Alpha alpha cyclohexanemethanol	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	4 2	ND	ND
bis(2 Ethylhexy)Phthalate	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	3 7	ND
Butyl glycolate	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	5 9	ND	ND	ND	ND
Fluorene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	3	ND
Napthalene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	19	ND
Phenanthrene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	4 5	ND	ND	ND	ND
Triethyl esterphosphoric acid	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	5 8	ND	ND	ND	ND
Triethylphosphate	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	7 4	ND	ND
Di-n butyl phthalate	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	6 2	ND	ND	ND	2 5

ND=Sample Below Detection Limit
NT=Not Sampled

SW098 Landfill Pond

Sampling History at OU7
Location SW098 Landfill Pond

Volatile Organics	5/29/96	7/16/96	9/13/96	10/30/96	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1 2-Dichloropropane	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND	ND	0 48	ND	ND
Acetone	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND	ND	3 9	4	ND
Methylene Chloride	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND	ND	ND	1	ND
Napththalene	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	1 5	ND	1 5	ND	ND

SemiVolatiles	5/29/96	7/16/96	9/13/96	10/30/96	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
bis(2-Ethylhexy)Phthalate	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND	ND	1 1	4	ND

ND=Sample Below Detection Limit
NT=Not Sampled

Appendix 2

Data Tables from the *Modified Proposed Action Memorandum Passive Seep Interception and Treatment Operable Unit 7*, March 1996

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean Result	ARAR/TBC	Units
METALS[1]									
ALUMINUM	10 - 30000	15/19	[illegible]	[illegible]	BLANK	BLANK	2628	[illegible]	µG/L
ANTIMONY	0 05 - 60	4/18	14	60 4	BLANK	A	20	300	µG/L
ARSENIC	0 7 - 10	8/16	1 4	3	B	BLANK	3	5	µG/L
BARIUM	0 02 - 50000	19/19	297	1550	BLANK	BLANK	645	1000	µG/L
BERYLLIUM	0 2 - 5	2/18	0 2	1 4	BLANK	JA	1	4	µG/L
CADMIUM	0 1 - 5	[illegible]	[illegible]	[illegible]	BLANK	BLANK	[illegible]	TVS (16)	µG/L
CHROMIUM	2 4 - 27 5	7/18	2	29 6	BLANK	BLANK	9	50	µG/L
COBALT	0 02 - 50	10/18	2 7	19 1	B	BLANK	11	50	µG/L
COPPER	2 4 - 25	8/18	2	94 9	BLANK	BLANK	12	TVS (16)	µG/L
LEAD	0 8 - 2000	14/18	1 5	11	BLANK	V	5	TVS (6 46)	µG/L
IRON	47 - 30000	[illegible]	[illegible]	[illegible]	BLANK	V	[illegible]	[illegible]	µG/L
LITHIUM	2 - 2000	15/19	34	107	BLANK	V	48	2500	µG/L
MANGANESE	[illegible]	[illegible]	[illegible]	[illegible]	BLANK	BLANK	[illegible]	[illegible]	µG/L
MERCURY	0 02 - 0 2	1/18	0 1	0 28	BLANK	BLANK	0 1	10	µG/L
MOLYBDENUM	5 7 - 200	6/18	4	28 5	B	BLANK	21		µG/L
NICKEL	0 02 - 40	5/18	5	31	BLANK	V	12	125	µG/L
SELENIUM	1 1 - 5	2/18	1 1	7	W	BLANK	2	17	µG/L
SILVER	2 6 - 25	8/18	2 7	16 7	BLANK	BLANK	5	50	µG/L
STRONTIUM	3 5 - 10000	17/19	814	1370	BLANK	BLANK	920		µG/L
TIN	10 - 200	8/18	11	243	BLANK	BLANK	48	8000	µG/L
VANADIUM	3 2 - 10000	12/19	3 1	211	BLANK	BLANK	25	100	µG/L
ZINC	8 - 10000	[illegible]	[illegible]	[illegible]	BLANK	BLANK	[illegible]	[illegible]	µG/L
PESTICIDES									
alpha-BHC	0 05 - 0 28	1/3	0	0	I	BLANK	0 06		µG/L
RADIONUCLIDES									
AMERICIUM-241	0 - 0 013	16/16	-0 000404	0 02121	BLANK	V	0 007	30	pCi/L
CESIUM 137	0 47 - 1	14/14	-0 21	0 6057	J	BLANK	0 15	3000	pCi/L
PLUTONIUM-238	0 01 - 0 01	2/2	-0 000465	0 00222	J	A	0 00088	30	pCi/L
PLUTONIUM 239	0 003 - 0 003	1/1	0 009	0 009	BLANK	BLANK	0 009	30	pCi/L
PLUTONIUM-239/240	0 - 0 013	16/16	0 001	0 01606	BLANK	A	0 007	30	pCi/L
RADIUM-226	0 03 - 0 03	1/1	0 58	0 58	BLANK	A	0 58	100	pCi/L
STRONTIUM-89,90	0 21 - 1	9/9	0 66	4 06	BLANK	V	1 35	60	pCi/L
STRONTIUM 90	0 2 - 0,59	3/3	0 5442	1 1	BLANK	BLANK	0 7		pCi/L
TRITIUM	155 - 450	19/19	185 4	1500	BLANK	A	393	1000	pCi/L
URANIUM-233, 234	0 1 - 0 6	12/12	-0 0238	4 2	B	A	0 8	500	pCi/L
URANIUM-235	0 - 0 6	12/12	-0 012	0 084	J	A	0 03	600	pCi/L
URANIUM-238	0 086 - 0 6	12/12	0 03914	3 76	BLANK	A	1	600	pCi/L
SEMIVOLATILE ORGANICS									
2,4-DIMETHYLPHENOL	10 - 10	1/5	3	3	J	A	5	36	µG/L

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean Result	ARAR/TBC	Units
2 METHYLNAPHTHALENE	10 - 10	5/5	12	23	BLANK	V	16	?	µG/L
4 METHYLPHENOL	10 - 10	3/5	2	4	J	BLANK	4	?	µG/L
ACENAPHTHENE	10 10	5/5	2	3	J	A	3	520	µG/L
BIS(2 ETHYLHEXYL)PHTHALATE	10 12	1/5	2	2	J	A	5	10	µG/L
DIBENZOFURAN	10 10	5/5	1	2	J	A	1	?	µG/L
DIETHYL PHTHALATE	10 - 10	4/5	1	3	J	A	3	200	µG/L
FLUORENE	10 - 10	5/5	2	3	J	A	2	10	µG/L
NAPHTHALENE	10 10	5/5	14	22	BLANK	V	18	10	µG/L
PHENANTHRENE	10 - 10	5/5	4	5	J	A	4	10	µG/L
VOLATILE ORGANICS									
1,1 DICHLOROETHANE	5 - 5	17/20	2	10	BLANK	V	6	59	µG/L
1,2 DICHLOROETHENE	5 - 5	10/20	2	14	BLANK	V	4	70	µG/L
2 BUTANONE	10 - 10	6/19	6	76	BLANK	V	12	280	µG/L
2 HEXANONE	10 10	1/20	1	10	BLANK	V	5	50	µG/L
4 METHYL 2 PENTANONE	10 - 10	5/20	10	87	J	A	11	140	µG/L
ACETONE	10 - 10	10/20	10	220	BLANK	A	34	280	µG/L
BENZENE	15 5	1/20	1	2	J	BLANK	2	1	µG/L
CARBON DISULFIDE	5 5	1/20	5	6	BLANK	BLANK	3		µG/L
CHLOROETHANE	10 10	15/20	10	57	BLANK	V	22	190	µG/L
CHLOROMETHANE	10 10	2/20	4	7	J	A	5	5 7	µG/L
ETHYLBENZENE	5 - 5	19/20	1	18	BLANK	BLANK	13	57	µG/L
METHYLENE CHLORIDE	5 5	5/20	3	190	B	BLANK	34	57	µG/L
o-XYLENE	5 - 5	3/4	5	8	BLANK	BLANK	6		µG/L
TETRACHLOROETHENE	5 5	2/20	1	1	J	BLANK	2	1	µG/L
TOLUENE	5 - 5	19/20	5	88	BLANK	BLANK	38	1000	µG/L
TOTAL XYLENES	5 - 5	19/20	1	25	J	A	14	10000	µG/L
TRICHLOROETHENE	5 - 5	11/20	1	4	J	BLANK	2	2 7	µG/L
VINYL ACETATE	10 10	1/19	10	10	BLANK	BLANK	7	9	µG/L
VINYL CHLORIDE	10 10	5/20	3	11	BLANK	V	5	2	µG/L
WATER QUALITY PARAMETERS									
BICARBONATE AS CACO3	1000 10000	15/15	554000	705000	BLANK	V	595800		µG/L
CARBONATE AS CACO3	1000 - 10000	2/9	0	0	BLANK	BLANK	3889		µG/L
CHLORIDE	100 0 - 50000	14/14	1800	66300	BLANK	V	53650		µG/L
CYANIDE	10 - 20	1/14	1 5	36 8	BLANK	BLANK	9	200	µG/L
DISSOLVED ORGANIC CARBON	1000 - 1000	4/4	14000	27000	BLANK	JA	18750		µG/L
FLUORIDE	100 0 - 200 0	12/12	390 0	540 0	BLANK	V	469 2	2000	µG/L
NITRATE/NITRITE	20 00 - 200 0	6/10	20 00	870 0	BLANK	V	263	10000	µG/L
NITRITE	20 00 - 20 00	6/9	20 00	63 00	BLANK	V	30 33	500	µG/L
OIL AND GREASE	200 0 - 11100 0	4/12	800 0	42100	BLANK	V	7013		µG/L
ORTHOPHOSPHATE	10 00 200 0	3/10	50 00	150 0	BLANK	BLANK	60 9		µG/L
pH		5/5	6 8	7 3	BLANK	BLANK	7		PH

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean Result	ARAR/TBC	Units
PHOSPHORUS	50 00 1000	9/9	95 00	1380	BLANK	BLANK	387		µG/L
SILICA	400 0 - 2000	3/3	7400	43000	BLANK	BLANK	19567		µG/L
SILICON	7 3 2000	13/13	7060	44000	BLANK	BLANK	13547		µG/L
SOLIDS, NONVOLATILE SUSPENDE	5000 - 5000	6/6	10000	199000	BLANK	BLANK	83167		µG/L
SULFATE	200 0 25000	5/14	200 0	29600	BLANK	V	5084	250000	µG/L
TOTAL DISSOLVED SOLIDS	10000 - 10000	15/15	470000	870000	BLANK	BLANK	729333		µG/L
TOTAL ORGANIC CARBON	1000 - 1000	3/3	19000	24500	BLANK	V	20833		µG/L
TOTAL SUSPENDED SOLIDS	4000 - 5000	12/12	10000	250000	BLANK	BLANK	144667		µG/L

Shaded analytes indicate mean result exceeds ARAR
All analytes are total analytes unless otherwise noted
Analytes with zero detections are not reported
For non detects one half the detection limit is used in calculating the mean result
[1] Total recoverable concentration reported
[2] Not listed in 40 CFR 302 4 or 6 CCR 1007 3 Part 261 Appendix VII and therefore are not required to be addressed under a CERCLA Remedial Action
[3] For tetrachloroethene the maximum detection equals the ARAR the mean exceeds the ARAR because one-half detection limit for non detects exceeds the ARAR
[4] For vinyl acetate one detection out of nineteen causes mean to exceed ARAR suggests that one detection is outlier and should be discarded

Data Qualifiers
BLANK = data qualifier field in database is blank
B = for inorganics reported value is < CRDL but > IDL (estimated value)
B = for organics analyte is also detected in blank
for common lab contaminants include as detection if blank result > 10 times detection limit
for all other organics include if blank result > 5 times detection limit
B = for radionuclides constituent also detected in blank whose concentration was > minimum detectable activity
I = organics interference with target peak (estimated value)
J = for organics MS data indicate presence of compound but below detection limit (estimated value)
U = for inorganics and organics analyte analyzed but not detected at the quantitation limit

Data Validation Codes
BLANK = data validation field in database is blank
A = acceptable result
JA = acceptable result (for estimated value)
V = valid result
TVS = table value standard hardness dependent 5 CCR 1002-8

Appendix 3

Data Tables from the *Draft Phase 1 IM/IRA Decision Document and Closure Plan for Operable Unit 7, Present Landfill*, March 1996

Table 2-3
Analytes Detected in Surface Water in the East Landfill Pond (SW098)

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean	Background Screening Concentration	Units	PCOC
Metals										
Aluminum	20 200	10/15	30	190	—	V	56	39 000	µg/L	
Arsenic	0 7 10	5/14	0 9	2 2	—	V	1	3 500	µg/L	
Barium	1 3 200	15/15	16	250	—	V	170	64 000	µg/L	2
Beryllium	0 5 5	1/15	0 5	0 7	—	JA	1	1 700	µg/L	
Cadmium	2 4 5	1/15	1	2 1	—	JA	2	1 800	µg/L	
Calcium	14 3 - 5,000	15/15	3,200	55,000	—	V	39,000	57,000	µg/L	2 3
Cesium	100 1 000	1/16	33	50	—	V	180	480 000	µg/L	
Chromium	2 4 10	1/15	2	3 2	—	JA	3	3 300	µg/L	
Copper	2 1 25	4/15	2	16	—	JA	4	8 300	µg/L	
Iron	4 3 100	15/15	16	1,200	—	V	490	17 000	µg/L	
Lead	0 8 3	5/14	0 9	5 3	—	JA	2	1 500	µg/L	
Lithium	2 100	14/14	7 7	110	—	—	77	36 000	µg/L	2
Magnesium	30 - 5,000	15/15	4,300	45,800	—	V	37,000	1,200,000	µg/L	2,3
Manganese	1 15	14/15	2 5	430	—	V	100	3 000	µg/L	2
Mercury	0 2	2/15	0 2	0 54	—	V	0 1	59	µg/L	
Molybdenum	5 7 200	1/14	3	13	B	—	6	33 000	µg/L	2
Nickel	3 9 40	8/15	6 3	17	—	V	8	13,000	µg/L	2
Potassium	95 - 5,000	15/15	1,400	11,000	—	V	8,400	1,600,000	µg/L	2 3
Silver	2 5 10	1/15	2	2 9	—	V	2	3,000	µg/L	
Sodium	21 - 5,000	15/15	20,000	190,000	—	V	160,000	39,000	µg/L	1,2,3
Strontium	2 3 200	14/14	45	600	—	V	460	240,000	µg/L	2
Thallium	1 2 - 10	1/14	1	7 4	—	JA	1	6,500	µg/L	
Tin	10 - 200	3/14	10	26	B	—	12	34 000	µg/L	
Vanadium	2 50	1/15	2	5 6	B	—	2	17 000	µg/L	

Table 2-3
Analytes Detected in Surface Water in the East Landfill Pond (SW098)

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean	Background UTL or Concentration	Units	PCOC
Zinc	1 8 20	12/15	4	26	—	V	10	3 700	µg/L	
Radionuclides										
Americium 241	0 0 19	11/11	0 00057	0 031	U	A	0 007	0 03	pCi/L	1
Cesium 137	0 58 - 1 2	6/6	-0 17	-0 044	J	A	-0 11	2 1	pCi/L	
Gross alpha	2 - 8,7	6/6	-0,67	5	U	V	1	29	pCi/L	2,6
Gross beta	2 6 - 6 8	6/6	7 9	16	—	V	11	31	pCi/L	2,6
Plutonium 239	0 14 0 03	3/3	0	0 005	U	A	0 002	—	pCi/L	
Plutonium 239/240	0 0 01	9/9	-0 00036	0 023	—	A	0 004	0 03	pCi/L	
Radium 226	0 21	1/1	0 23	0 23	—	V	0 23	17	pCi/L	
Strontium 89/90	0 23 1	5/5	0 66	1,9	—	A	1 4	4 9	pCi/L	2
Strontium-90	0 36 - 0 58	5/5	0,7084	1 208	—	V	1 02	—	pCi/L	
Tritium	160 460	13/13	86	260	J	V	160	730	pCi/L	2
Uranium 233/234	0 0 23	5/5	0,76	1,6	—	A	1,1	2 2	pCi/L	2
Uranium 235	0 0 26	5/5	0 036	0 3	—	A	0 2	0 3	pCi/L	1,2
Uranium 238	0 094 0 263	5/5	0,70	2	—	A	1 2	1 8	pCi/L	1,2
Semivolatile Organic Compounds										
Bis(2 ethylhexyl)phthalate	9 11	1/7	1	1	J	A	5	8	µg/L	4
Di n butyl phthalate	9 - 11	1/7	1	1	J	A	5	—	µg/L	4
Volatile Organic Compounds										
Methylene chloride	5	2/15	4	8	B	—	3	21	µg/L	4
Indicator Parameters										
Bicarbonate as $CaCO_3$	1 000 10 000	14/14	213,000	489,000	—	V	390 000	—	µg/L	
Carbonate	10,000	1/4	10,000	15,300	—	V	7,600	—	µg/L	
Carbonate as $CaCO_3$	1,000 10,000	7/10	10,000	77,000	—	V	33 000	—	µg/L	
Chloride	200 - 25 000	14/14	140,000	180,000	—	—	160,000	64 000	µg/L	1 2
Dissolved organic carbon	1 000 2,000	6/6	22,000	32,000	—	V	27,000	—	µg/L	

Table 2-3
Analytes Detected in Surface Water in the East Landfill Pond (SW098)

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean	Background UTL Concentration	Units	PCOC
Fluoride	100 - 200	13/13	590	890	—	—	770	—	µg/L	
Nitrate	100	1/3	100	200	—	JA	100	—	µg/L	
Nitrate/nitrite	20 100	6/11	40	320	—	JA	93	3,100	µg/L	
Oil and grease	200 7,100	1/10	500	500	—	—	2 500	—	µg/L	
Orthophosphate	10 50	1/10	40	40	—	—	27	—	µg/L	
pH	—	4/4	8.2	8.3	—	—	8.2	—	pH	
Phosphorus	50	2/9	50	76	—	V	35	—	µg/L	
Silica	400	1/1	3,100	3,100	—	—	3,100	—	µg/L	
Silicon	7 3 100	13/13	300	3,700	—	V	2,300	16 000	µg/L	
Solids nonvolatile suspended	5 000	2/6	5,000	12,000	—	V	5,000	—	µg/L	
Sulfate	500 - 10,000	14/14	7,000	26,000	—	V	16 000	41 000	µg/L	
Total dissolved solids	10,000	14/14	570,000	810 000	—	V	730,000	—	µg/L	
Total organic carbon	1 000 2,000	6/6	26,000	51 000	—	—	34,000	—	µg/L	
Total suspended solids	4 000 - 5 000	1/9	4,000	12,000	—	—	3 500	—	µg/L	

Notes

All analytes are total analytes unless otherwise noted
For non detects one half the detection limit is used in calculating the mean result

1 Analyte determined to be PCOC by hot measurement test
2 Analyte determined to be PCOC by inferential statistics test(s)
3 Analyte not considered a PCOC because it is a nutrient or is not considered a contaminant
4 All detected organic analytes are considered PCOCs unless eliminated by professional judgment
5 Analyte not considered a PCOC because of infrequent detection and/or detection in blanks or background samples
6 Analyte not considered a PCOC because it is not a measure of a single contaminant
Analyte removed from consideration as PCOC

Data Qualifiers

—	data qualifier or validation field in database is blank
B	for inorganics reported value is < CRDL but > IDL (estimated value)
B	for organics analyte is also detected in blank for common lab contaminants include as detection if blank result > 10 times detection limit for all other organics include if blank result > 5 times detection limit
J	for inorganics value > IDL but control sample analysis not within control limits (estimated value)
J	for organics data indicate presence of compound but below detection limit (estimated value)
U	for inorganics and organics analyte analyzed but not detected at the quantitation limit

Data Validation Codes

—	data qualifier field in database is blank
A	acceptable result
JA	acceptable result (for estimated value)
V	valid result

Definitions

CRDL	contract required detection limit
IDL	instrument detection limit
PCOC	potential contaminant of concern
$UTL_{99/99}$	upper tolerance limit of the 99th percentile at the 99 percent confidence level

Appendix 4

Seep/spring Water Background Concentrations for Metals from the *Background Geochemical Characterization Report*, September 1993

BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT

ROCKY FLATS PLANT
GOLDEN, COLORADO

September 30, 1993

Prepared for:
U.S. Department of Energy
Rocky Flats Plant
Golden, Colorado 80401

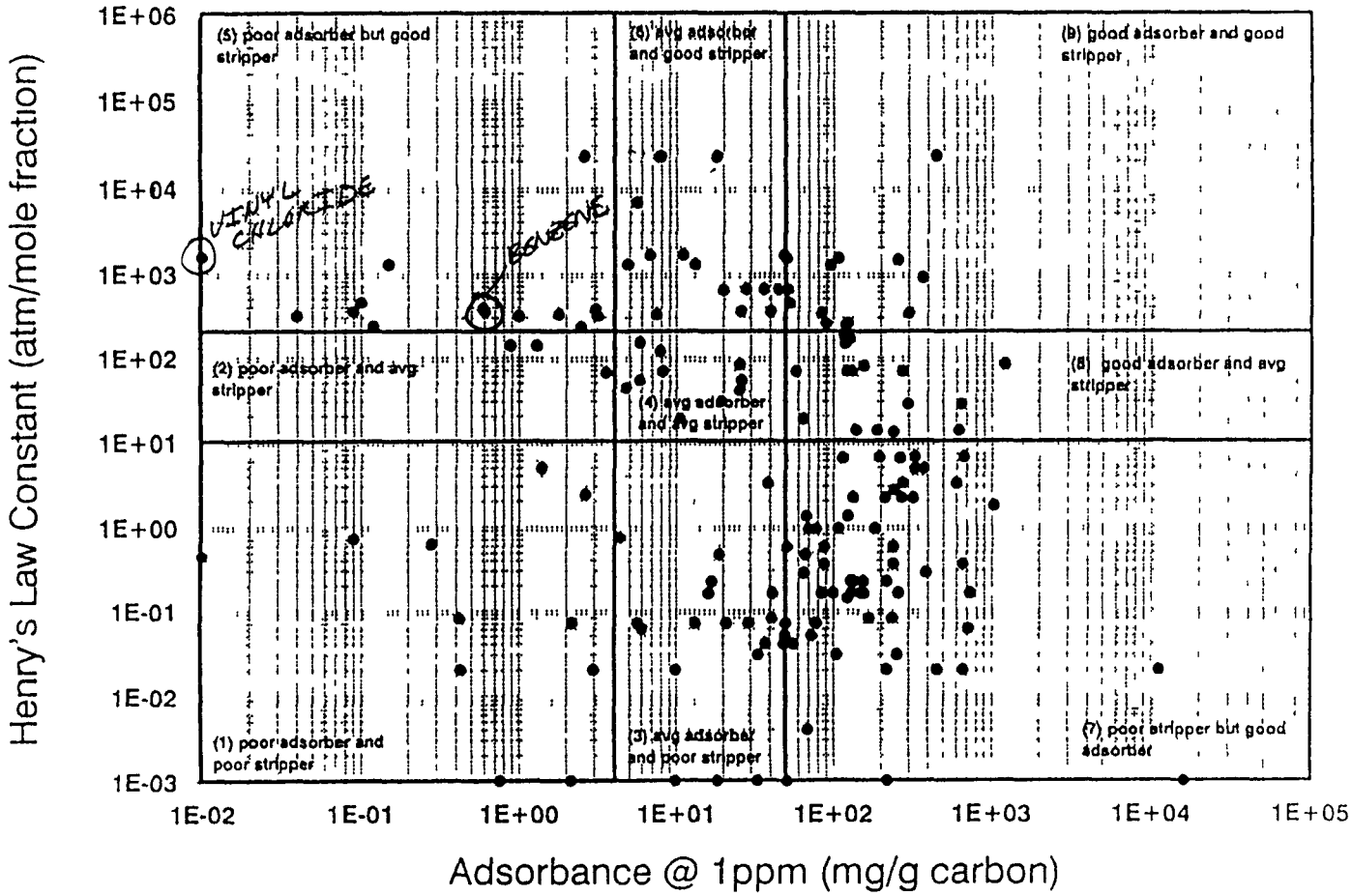
Prepared by:
EG&G Rocky Flats, Inc.
P.O. Box 464
Golden, Colorado 80402

Table C-23. Seep/spring water UTLs for total metals

UPPER TOLERANCE LIMITS (SITE-WIDE)						
SEEP / SPRING WATER, TOTAL METALS						
ANALYTE	SAMPLE SIZE, N	PERCENT DETECTS	MEAN	STANDARD DEVIATION	99 / 99 UTL	UNITS
ALUMINUM	48	83.33	18,115 18	47 149.24	166,871 02	UG/L
ANTIMONY	34	32.35	46.68	108.89	411.91	UG/L
ARSENIC	44	59 09	69 77	192.06	675.73	UG/L
BARIUM	44	75 00	913.39	1 692.11	6,252.00	UG/L
BERYLLIUM	38	34.21	2.81	3 37	13.86	UG/L
CADMIUM	33	30 30	9 08	17.25	67.29	UG/L
CALCIUM	53	90 57	94,329 72	128 636.27	500 177 15	UG/L
CESIUM	33	24.24	419 98	449 37	1 936 79	UG/L
CHROMIUM	40	40 00	23.69	49 27	183.74	UG/L
COBALT	35	34 29	43 39	90 97	346.73	UG/L
COPPER	44	52.27	43 89	99 94	359.20	UG/L
CYANIDE	5	40 00	5 95	7 48	72.83	UG/L
IRON	51	88.24	175 074 71	518 671 63	1 811 483 71	UG/L
LEAD	45	66 67	91 14	207.26	745 05	UG/L
LITHIUM	35	48 57	29 43	26 57	118 02	UG/L
MAGNESIUM	50	80 00	10 370 60	7 644 36	34 488 56	UG/L
MANGANESE	51	80 39	1 798 04	5 027 04	17 658 34	UG/L
MOLYBDENUM	33	27 27	33 46	39 12	165 51	UG/L
NICKEL	35	37 14	50 68	116 39	438 78	UG/L
POTASSIUM	41	48 78	3 386 23	3 069 81	13 071 50	UG/L
SELENIUM	36	38 89	3 31	3 72	15 64	UG/L
SILICON	11	100 00	8 408 18	3 027 84	23 029 71	UG/L
SILVER	32	31 25	10 05	25 69	97 35	UG/L
SODIUM	53	88 68	12 005 80	5 016 89	27 834 09	UG/L
STRONTIUM	42	61 90	506 16	476 35	2,009 06	UG/L
TIN	35	37 14	94 03	190 89	730 54	UG/L
VANADIUM	41	51 22	117 09	280 76	1 002 88	UG/L
ZINC	50	82 00	195 22	431 42	1 556 36	UG/L

Appendix 5

Treatment Effectiveness



Notes For contaminants that neither strip nor adsorb a minimum value was used
Some contaminants appear more than once

Figure 3 2
Air Stripping / Activated Carbon Matrix

Figure 3 2 - Continued

REGION	COMPOUND	k (mg/g carbon)	H (atm/mole fraction)	REGION	COMPOUND	k (mg/g carbon)	H (atm/mole fraction)	REGION	COMPOUND	k (mg/g carbon)	H (atm/mole fraction)
8	ACENAPHTHENE	140 00	13 39	5	DICHLOROETHYLENE,1,1	0 15	1270 00	8	NAPHTHALENE	123 00	68 27
8	ACENAPHTHENE	190 00	13 39	6	DICHLOROETHYLENE,1,1	4 91	1270 00	8	NAPHTHALENE	132 00	68 27
6	ACENAPHTHENE	626 00	13 39	5	DICHLOROETHYLENE,1 2 TRANS-	3 05	370 70	6	NAPHTHALENE	277 00	68 27
7	ACENAPHTHYLENE	115 00	6 33	2	DICHLOROMETHANE	0 68	137 60	4	NAPTHALENE	8 18	68 27
7	ACENAPHTHYLENE	266 00	6 33	7	DICHLOROPHENOL,2,4-	85 16	0 16	7	NITROBENZENE	68 00	1 32
1	ACETONE	2 65	2 38	3	DICHLOROPHENOL,2,4-	16 20	0 16	7	NITROBENZENE	124 89	1 32
1	ACRYLONITRILE	1 40	4 89	3	DICHLOROPHENOL,2 4-	41 40	0 16	7	O-CRESOL	50 07	0 05
8	ALDRIN	299 60	27 56	7	DICHLOROPHENOL,2,4-	131 00	0 16	9	P-XYLENE	85 00	336 90
8	ALDRIN	651 00	27 56	7	DICHLOROPHENOL,2 4	157 00	0 16	8	PCB 1221	242 00	12 87
7	ANTHRACENE	330 00	4 78	4	DICHLOROPROPANE,1,2	5 66	148 60	7	PENTACHLOROPHENOL	100 00	0 16
7	ANTHRACENE	376 00	4 78	3	DIELDRIN	38 90	3 24	7	PENTACHLOROPHENOL	150 00	0 16
5	BENZENE	0 04	309 00	7	DIELDRIN	277 66	3 24	7	PENTACHLOROPHENOL	290 00	0 16
5	BENZENE	1 00	309 00	7	DIELDRIN	606 00	3 24	7	PENTACHLOROPHENOL	736 57	0 16
5	BENZENE	3 18	309 00	7	DIMETHYLPHENOL,2,4	78 00	0 94	7	PHENANTHRENE	135 00	2 18
3	BENZO(a)PYRENE	33 60	0 03	7	DIMETHYLPHENOL,2,4-	108 00	0 94	7	PHENANTHRENE	215 00	2 18
1	BENZOIC ACID	0 76	0 00	7	DIMETHYLPHENOL,2,4-	70 00	0 94	7	PHENANTHRENE	273 00	2 18
7	BENZOIC ACID	51 00	0 00	7	DIMETHYLPHENOL,2,4-	184 00	0 94	1	PHENOL	2 17	0 07
7	BHC gamma LINDANE	256 00	0 03	3	DINITRO-O-CRESOL,4,6-	41 00	0 08	3	PHENOL	13 30	0 07
1	BIS(2 CHLOROETHYL)ETHER	0 09	0 72	7	DINITRO-O-CRESOL,4,6-	237 00	0 08	3	PHENOL	21 00	0 07
7	BIS(2-ETHYLHEXYL)PHTHALATE	11300 00	0 02	1	DINITRO-o-CRESOL,4,6-	0 42	0 08	3	PHENOL	29 00	0 07
4	BROMOFORM	19 60	29 56	7	DINITRO-o-CRESOL,4,6-	169 00	0 08	3	PHENOL	49 80	0 07
6	CARBON TETRACHLORIDE	6 80	1634 00	3	DINITROPHENOL,2,4-	9 87	0 00	3	PHENOL	50 00	0 07
6	CARBON TETRACHLORIDE	11 10	1634 00	3	DINITROPHENOL,2,4-	18 40	0 00	7	PHENOL	77 40	0 07
6	CARBON TETRACHLORIDE	49 03	1634 00	3	DINITROPHENOL,2,4-	33 00	0 00	7	PHENOL	78 10	0 07
7	CHLORDANE	245 00	2 66	1	DIOXANE,1,4-	1 73	0 00	2	PHENOL PH 11 3	5 66	0 07
7	CHLORO-m-CRESOL p-	124 00	0 14	7	DIPHENYLHYDRAZINE,1,2-	16000 00	0 00	3	PROPYLPHENOL,4-	19 00	0 47
9	CHLOROBENZENE	91 00	252 10	7	DIPHENYLHYDRAZINE,1,2-	16000 00	0 00	7	PROPYLPHENOL,4-	67 20	0 47
9	CHLOROBENZENE	125 40	252 10	7	ENDRIN	456 50	0 02	7	PYRENE	65 80	0 28
4	CHLORODIBROMOMETHANE	4 80	43 50	7	ENDRIN	666 00	0 02	7	PYRENE	389 00	0 28
5	CHLOROETHANE	0 59	384 40	1	ETHANOL	0 01	0 45	8	STYRENE	120 00	146 30
5	CHLOROFORM	2 60	22520 00	5	ETHYLBENZENE	0 10	446 80	8	TETRACHLOROETHANE 1 1,2 2	64 96	18 34
6	CHLOROFORM	7 80	22520 00	9	ETHYLBENZENE	53 00	446 80	4	TETRACHLOROETHANE,1,1 2 2	10 80	18 40
6	CHLOROFORM	8 04	22520 00	7	FLUORANTHENE	88 10	0 36	9	TETRACHLOROETHYLENE	50 80	1492 00
6	CHLOROFORM	18 20	22520 00	7	FLUORANTHENE	242 00	0 36	9	TETRACHLOROETHYLENE	108 17	1492 00
7	CHLOROPHENOL 2	51 00	0 57	7	FLUORANTHENE	664 00	0 36	5	TOLUENE	0 09	353 10
7	CHLOROPHENOL 2	88 00	0 57	7	FLUORENE	196 00	6 50	5	TOLUENE	0 81	353 10
7	CHLOROPHENOL,2	240 00	0 57	7	FLUORENE	330 00	6 50	6	TOLUENE	26 10	353 10
2	CHRYSENE	8 07	0 06	7	FLUORENE	674 00	6 50	6	TOLUENE	40 20	353 10
7	CHRYSENE	716 00	0 06	4	HEPTACHLOR	25 84	82 22	8	TRICHLOROBENZENE,1 2,4	157 00	78 89
7	CRESOL 2	73 40	0 05	8	HEPTACHLOR	1220 00	82 22	4	TRICHLOROETHANE	25 55	41 00
3	CRESOL 3-	37 50	0 04	7	HEPTACHLOR EPOXIDE	1040 00	1 76	5	TRICHLOROETHANE,1,1,1	2 48	226 67
7	CRESOL,3-	58 00	0 04	9	HEXACHLOROBENZENE	450 00	22890 00	4	TRICHLOROETHANE,1,1,2-	5 81	53 37
1	CRESOL,4-	2 98	0 02	9	HEXACHLOROBUTADIENE	258 00	1422 22	4	TRICHLOROETHANE,1,1,2	26 20	53 37
3	CRESOL,4	9 97	0 02	9	HEXACHLOROCYCLOPENTADIENE	370 00	888.89	6	TRICHLOROETHYLENE	28 00	648 20
7	DDT p p	322 00	2 18	9	HEXACHLOROETHANE	96 50	1243 00	6	TRICHLOROETHYLENE	35 30	648 20
1	DI BUTYL PHTHALATE	0 43	0 02	1	HYDROXYBENZOIC ACID,4-	2 14	0 00	6	TRICHLOROETHYLENE	45 00	648 20
7	DI n-BUTYL PHTHALATE	220 00	0 02	1	ISOPROPANOL	0 28	0 62	9	TRICHLOROETHYLENE	51 62	648 20
7	DIBENZO(a,h)ANTHRACENE	89 30	0 00	7	LINDANE	106 02	0 03	6	TRICHLOROMONOFLUOROMETHANE	5 60	6765 00
8	DICHLOROBENZENE,1,2	129 00	183 90	3	M-CRESOL	48 87	0 04	3	TRICHLOROPHENOL 2,4,6-	16 95	0 22
8	DICHLOROBENZENE,1,3-	118 00	180 10	6	MERCURY	20 00	633 33	7	TRICHLOROPHENOL 2 4 6-	130 10	0 22
9	DICHLOROBENZENE,1,4-	121 00	240 50	3	METHOXYPHENOL,4	4 38	0 74	7	TRICHLOROPHENOL 2,4 6-	219 00	0 22
4	DICHLOROBROMOMETHANE	7 90	117 78	2	METHYLENE CHLORIDE	1 30	137 60	7	TRICHLOROPHENOL,2 4 6-	137 00	0 22
6	DICHLOROETHANE,1 1,1	7 51	326 20	4	METHYLTERBUTYLETHER (MTBE)	4 30	16 3	7	TRICHLOROPHENOL,2,4 6-	155 00	0 22
5	DICHLOROETHANE,1,1	1 79	326 20	1	N-NITROSODIMETHYLAMINE (NDMA)	0 01	0 00	5	VINYL CHLORIDE	0 01	1544 44
2	DICHLOROETHANE 1 2	3 57	65 44	7	N-NITROSODIPHENYLAMINE	220 00	0 00	5	XYLENE o-	0 12	232 50
6	DICHLOROETHYLENE 1,1	13 25	1270 00	8	NAPHTHALENE	58 00	68 27	9	XYLENE p-	303 00	336 90

Sources EPA RREL Treatability Database and Chemical Engineering (November 1 1)

ATTACHMENT 2

Revised Present Landfill Passive Seep Interception and Treatment System Design Change for a Modification to the Proposed Action Memorandum

Background

During discussions between the Colorado Department of Public Health and Environment, the Department of Energy, Kaiser-Hill, Rocky Mountain Remediation Services, and the Environmental Protection Agency, it has been determined that the Granular Activated Carbon (GAC) treatment system currently being utilized at the OU7 Landfill is ineffective for the volatile organic compounds identified in the seep at levels exceeding steam standards-based ARARs Therefore, an alternative method of passive treatment (aeration) is appropriate The following proposal outlines this simplified method

1) Discharge line - The current bypass line is the preferred discharge line due to several factors The current bypass line has a conveniently located discharge point which can be freeze protected and has proper elevation The bypass line will be covered with a minimum of six inches of dirt in order to protect the line from freezing In contrast, the current configuration would require an extension of the pipe which could not be easily freeze protected because it would extend vertically to achieve the proper elevation

2) Splash pad - A large tile of flagstone will be positioned approximately twelve inches below the discharge line to obtain a splashing effect and significant surface contact area The flagstone will be angled one inch per foot (approximately eight degrees) to ensure the water flows down to additional tiers of flagstone and does not bypass them

3) Flagstone tiers - Three (possibly four) tiers of flagstone (splash pad is first tier) will be positioned in a manner that allows flow across the surface (angled at one inch per foot) of each flagstone with the water then spilling over onto the next flagstone The anticipated drop between tiers

of flagstone will be approximately six inches

4) Gravel layer - A single layer of two inch thick gravel would be would be place in the first six feet of the stream flow The layer of gravel will allow for additional surface contact and serve to slightly agitate the discharge to assist in removing residual volatile organic compounds, if any exist

5) Installation - The proposed method above utilizes readily available and inexpensive materials The new system could be completed within two weeks of written approval In addition, material and labor costs could be expected to be minimal

6) Decommissioning - The current system will be decommissioned by closing valves to the system The drums of GAC will be removed from the current process system within two weeks of the startup of the new system The two weeks will be utilized to ensure that no problems exist that would immediately require the restart of the original system The carbon will then be packaged as waste and the original process equipment will be left in place until the system has proven reliable over a period of six months

7) Maintenance - The system will be inspected weekly and any maintenance will be performed on an as needed basis

ATTACHMENT 3

Revised Present Landfill Passive Seep Interception and Treatment System Operational Framework for a Modification to the Proposed Action Memorandum

Purpose

The Modified Proposed Action Memorandum for Passive Seep Interception and Treatment (the PAM), dated March, 1996, stated that

> "(t)he overall objective of the interception system is to eliminate, to the extent practicable, discharge of F039-listed waste contained in the seep water to a surface-water body"

In addition the PAM requires that

> "(c)ompliance with potential applicable or relevant and appropriate requirements for seep water will be addressed, to the extent necessary, to protect human health and the environment through interception and treatment of the seep to reduce concentrations of volatile and semivolatile organic compounds"

Consistent with that statement of objective, this Operational Framework is intended to summarize operational practices and to improve compliance and auditability The operational framework will

- present specific performance objectives (ie chemical-specific ARARs)
- clarify sampling requirements
- document inspection practices
- document conditions for bypass and associated notification
- address project reporting

Performance Objectives

The original PAM (July, 1995) and revision 1 (March 1996) contain lists of potential ARARs and TBCs It is necessary to refine the ARARs so that specific performance objects are identified in a manner that is consistent with RFCA

The Table 1 presents the performance objectives for the system The constituents included in the table are those volatile and semivolatile constituents identified in the seep for which RFCA Table 1 Surface Water Action Level & Standards are available for Segment 4a & 4b

Metals are not being included as part of the performance objectives This is appropriate for two reasons First, volatile and semivolatile contaminants are the only leachate constituents treated in the system Second, metals have extremely high background concentrations in RFETs groundwater When these reasons are combined, surface water quality standards for metals are not relevant or appropriate as measures of system performance

Sampling Requirements

Complete detail on sampling requirements is provided in the Passive Seep Interception and Treatment System Sampling and Analysis Plan (PSITS SAP) The PSITS SAP is being prepared and will be submitted for review and approval The PSITS SAP provides information on sampling approach, procedures, data quality objectives, data management and evaluation of analytical results

Samples will be collected in two locations First, raw water samples will be collected at the influent to the treatment system in the settling tank Second, the performance of the PSITS will be measured where the leachate exits the six foot gravel bed Samples for total metals, VOCs, SVOCs and radionuclides will be collected monthly for one year and semi-annually thereafter

Inspection

Weekly inspections will be conducted during start-up and optimization A less intensive inspection schedule will be implemented once a competent, steady-state operation can be maintained Once implemented, specific conditions (ie storm events) will trigger additional inspection

TABLE 1
Passive Seep Interception and Treatment System Performance Objectives

Constituent	RFCA Segment 4a & 4b Standards, ug/l
VOLATILES	
1,1-Dichloroethane	1000*
1,2-Dichlorobenzene	620
1,4-Dichlorobenzene	75
Benzene	1
Chlorobenzene	100
Chloromethane	5 7
cis-1,2-Dichloroethene	70
Ethylbenzene	680
Methylene Chloride	5 0
Tetrachloroethene	0 8 (PQL=1)
Toluene	1,000
Trichloroethene	2 7
Vinyl Chloride	2
Xylenes (total)	10,000
SEMI-VOLATILES	
2,4-Dimethylphenol	540
Acenapthene	520
bis(2-ethylhexyl)phthalate	1 8 (PQL = 6)
Butyl benzyl phthalate	3,000
Diethyl phthalate	23,000
Di-n-butyl phthalate	2 7 (PQL = 10)
Fluorene	1300
Napthalene	620
Phenanthrene	0 0028 (PQL = 10)
Phenol	2,560

*No Segment 4a/4b value available This is the Segment 5 value

Bypass

Consistent with the prior verbal agreement, bypass is allowed during periods of high flow from the seep and during maintenance activities EPA will be verbally notified in instances where bypass continues longer than 72 hours Other shorter periods of by-pass will be included in the quarterly operational report

Reporting

Operational status and sample data will be documented and incorporated in the Quarterly Report for the Consolidated Water Treatment Facility In addition, when the results from twelve monthly sampling results are available, the data will be tabulated and submitted in a letter report Based upon the twelve monthly sampling events, it will be determined whether or not the modified system is attaining ARARs to the maximum extent practicable

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Ethylbenzene	680
Methylene Chloride	5 0
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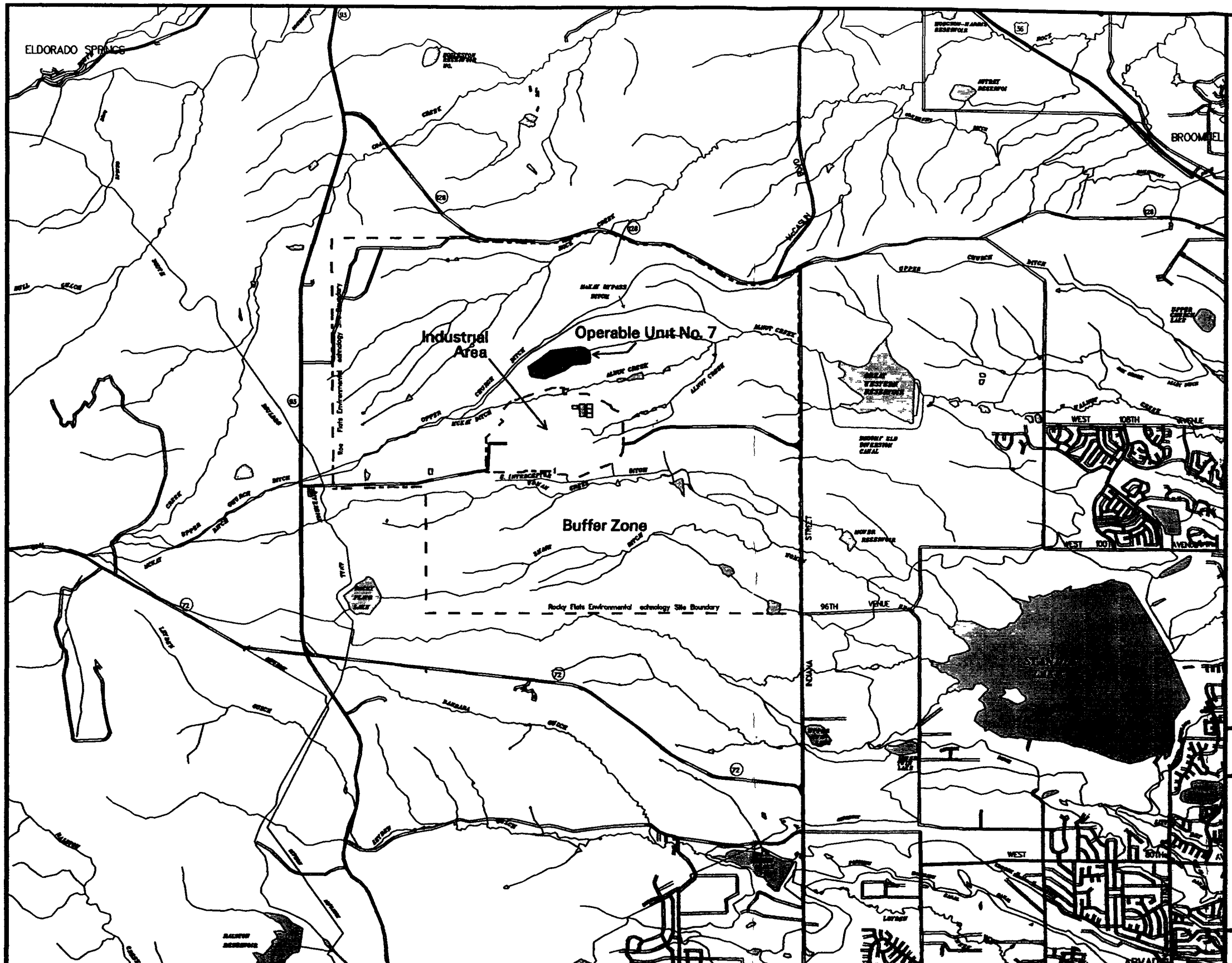


EXPLANATION

- Streams
- Rocky Flats Environmental Technology Site Boundary
- Primary Roads
- Secondary Roads
- Light-Duty Roads
- OU 7

N

0 Miles 1 2

0 Feet 4500 9000

Scale 1 inch = 4500 feet

U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site, Golden, Colorado

Location of Operable Unit No 7

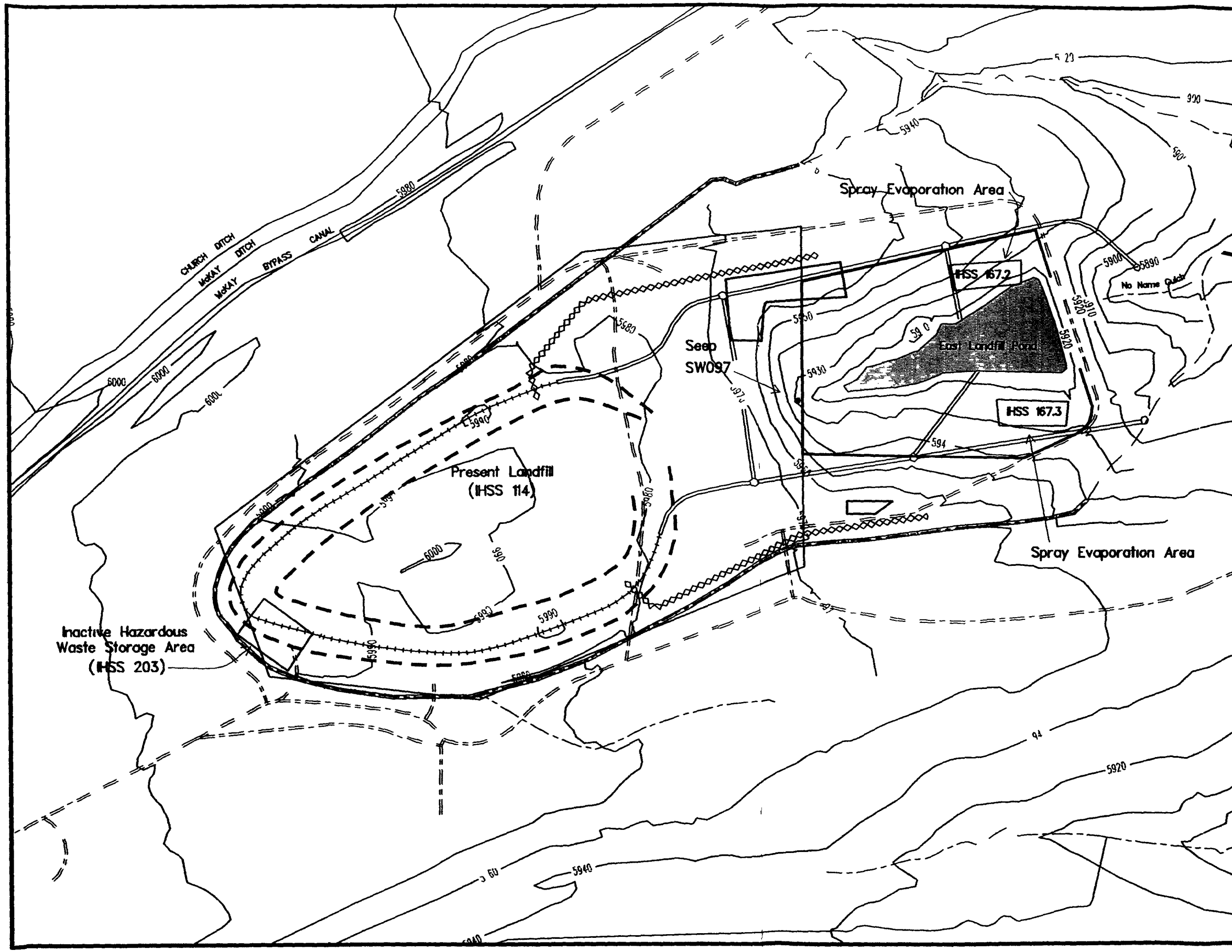
Proposed Action Memorandum

Operable Unit No. 7

December 1995

Figure 1-1

12/13/95 VICINITY.AML



EXPLANATION

- OU 7 IHSS Boundary
- Spray Evaporation Area
- Ditch and Drainage Feature
- Intermittent Stream
- Dirt Road
- Existing Surface-Water Diversion Ditch
- Existing Slurry Wall
- Groundwater Intercept System
  - (perforated)
  - (non-perforated)
- Leachate Collection System
- Approximate Extent of Asbestos Disposal

N

0 Feet 250 500

Topographic Contour Interval - 20 Feet

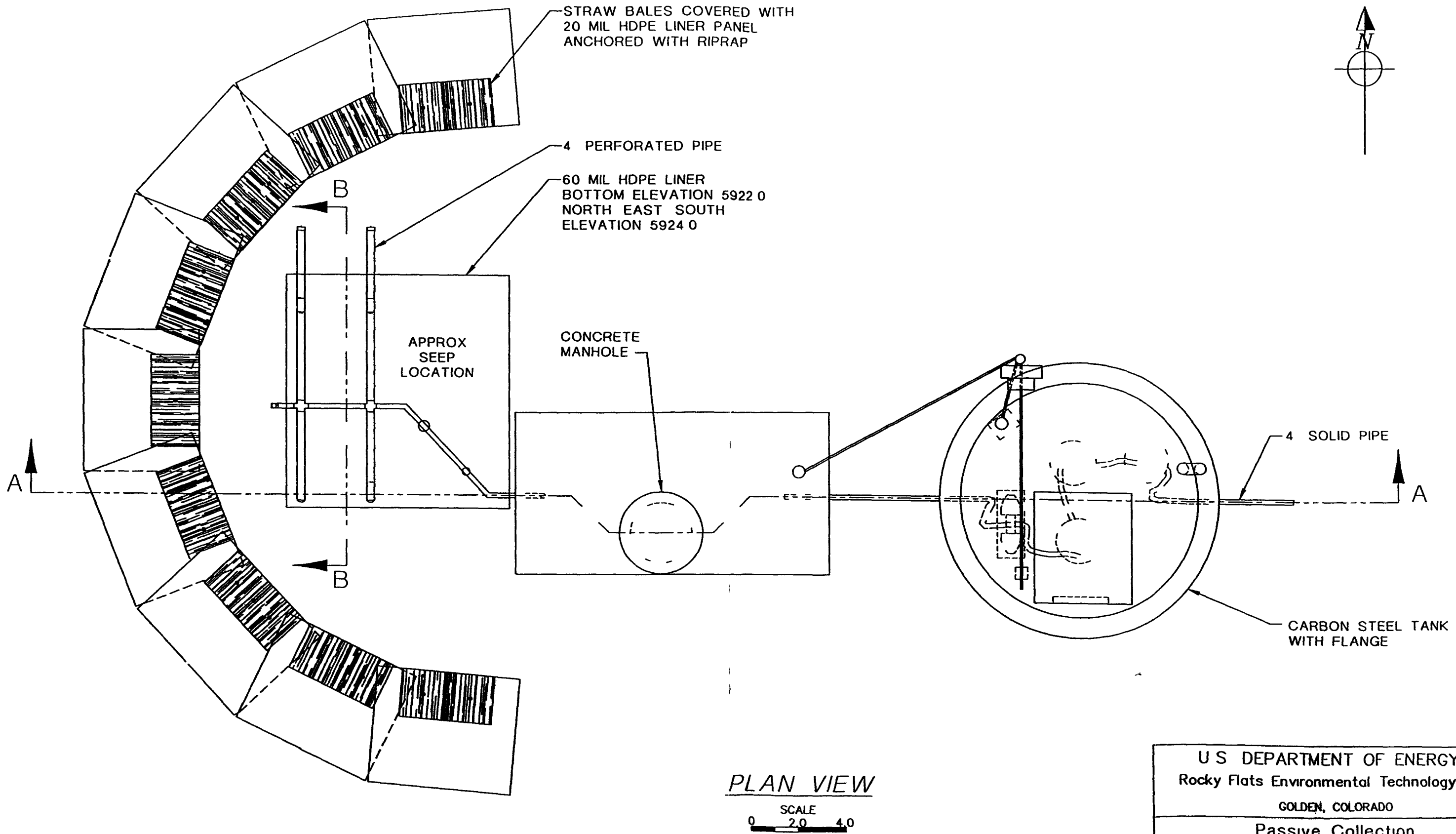
U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site, Golden, Colorado

Remedial Action Areas and Engineering Controls

Proposed Action Memorandum — Operable Unit No. 7

December 1995 — Figure 2-1

12/13/95 SITEPLAN2.MAP



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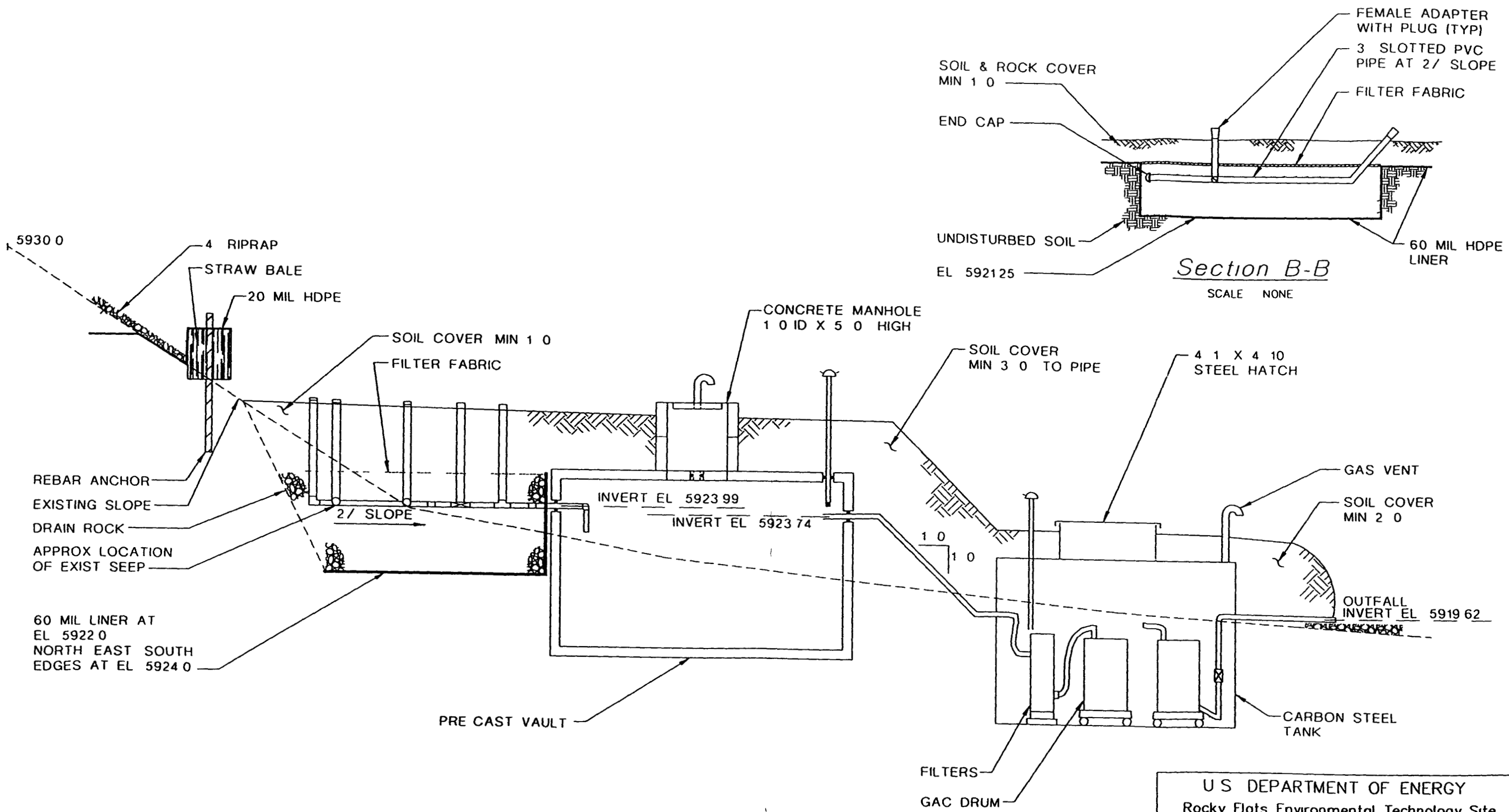
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

Passive Collection
and Treatment System
Plan View

Proposed Action Memorandum | Operable Unit No. 7

December 1995 | Figure 3



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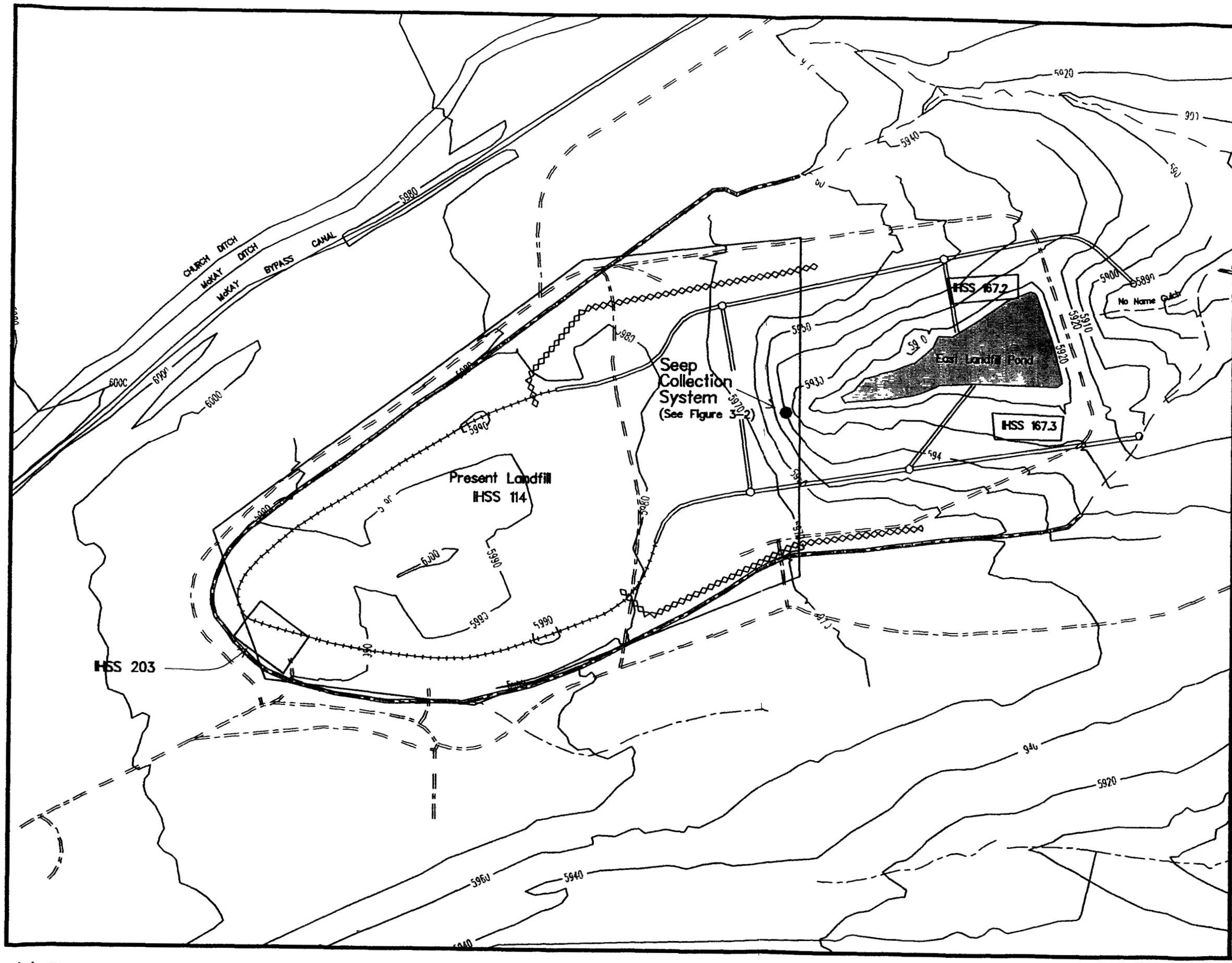
Rocky Flats Environmental Technology Site
GOLDEN COLORADO

Passive Collection and Treatment System
Cross Sections

Proposed Act o Memorandum | Operable Unit No 7

December 1995 | Figure 3-3



EXPLANATION

- OU 7 IHSS Boundary
- Ditch and Drainage Feature
- Intermittent Stream
- Dirt Road
- Existing Surface-Water Diversion Ditch
- Existing Slurry Wall
- Perforated Subsurface Drainage Control System
- Non-perforated Subsurface Drainage Control System
- Seep Collection System

N

0 Feet 250 500

Topographic Contour Interval - 20 Feet

U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site, Golden, Colorado

Seep Collection Facility Plan View

Proposed Action Memorandum

Operable Unit No. 7

December 1995

Figure 3-1

12/13/95 SEEPFACLMAP