QUARTERLY REPORT
FOR THE
ROCKY FLATS GROUNDWATER PLUME
TREATMENT SYSTEMS

January through March 2001

March 31, 2001

1/24

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ACRONYM LIST

CAD/ROD	Corrective Action Decision/Record of Decision
CDPHE	Colorado Department of Public Health and Environment
CWTF	Consolidated Water Treatment Facility
DOE	Department of Energy
EPA	Environmental Protection Agency
gpm	gallons per minute
GAC	granular activated carbon
ITS	Interceptor Trench System
FY	Fiscal Year
HRC™	Hydrogen Release Compound™
msl	mean sea level
mg/l	milligrams per liter
OU	Operable Unit
pCi/l	picoCuries per liter
PU&D	Property Utilization and Disposal
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
SCFA	DOE Subsurface Contaminant Focus Area
SITE	Superfund Innovative Technology Evaluation
SVOCs	semivolatile organic compounds
ug/l	micrograms per liter
VOCs	volatile organic compounds

1.0 INTRODUCTION

This quarterly report describes the activities and provides the available performance monitoring data for the five groundwater collection and treatment systems at the Rocky Flats Environmental Technology Site (RFETS) from January through March 2001 Data are included from the previous quarter that were not available for the last quarterly report

Three of the groundwater collection and treatment systems are reactive barriers designed to protect surface water These were installed for the Mound Site Plume, the East Trenches Plume and the Solar Ponds Plume The systems were installed near the distal ends of the associated plumes to intercept groundwater before it enters surface water These systems are effective in low flow, low permeability regimes

Two other groundwater collection and treatment systems are currently operating at the Site These are the Operable Unit (OU) 1 – 881 Hillside system and the OU7 – Present Landfill Seep collection system This report provides information on the performance for the five systems

The project status of a treatability study ongoing at the Property Utilization and Disposal (PU&D) Yard Plume to determine if enhanced natural attenuation using Hydrogen Release Compound™ (HRC™) is effective in low-flow groundwater regimes at RFETS is also included in this report

1.1 Site Events

The plume treatment systems continue to be impacted by dry conditions at the Site The average flow rates in site drainages in 2000 were significantly lower than average, and the dry conditions appear to be continuing The historic average flow rate at Woman Creek where it intersects Indiana Street is 0 46 cubic feet per second (cfs) However, in 2000, the average flow rate was an order of magnitude lower at 0 037 cfs (RMRS 2001) Dry conditions are continuing, the total precipitation for January through February 2001 was 0 8 inches compared to the historical mean of 1 03 inches for the same time period

1.2 Planned Changes

Because most of the groundwater plume treatment systems are now sampled semi-annually, this report will now be issued on an annual basis with the next report issued March 2002

2.0 MOUND SITE PLUME TREATMENT SYSTEM

The Mound Site Plume Treatment System uses reactive barrier technology to collect and treat groundwater contaminated with chlorinated organic compounds and low levels of radionuclides derived from the Mound Site area The source was removed as an accelerated action in 1997 The Mound Site Plume System was installed in 1998 to meet the Groundwater Action Level Framework Tier 2 concentrations defined in the Rocky Flats Cleanup Agreement (RFCA) (DOE, 1996) The Mound Site Plume System location is shown on Figure 1

The Mound Site Plume Treatment Project was a cooperative effort between RFETS and the Department of Energy Subsurface Contaminant Focus Area (SCFA), with support from U S Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Program

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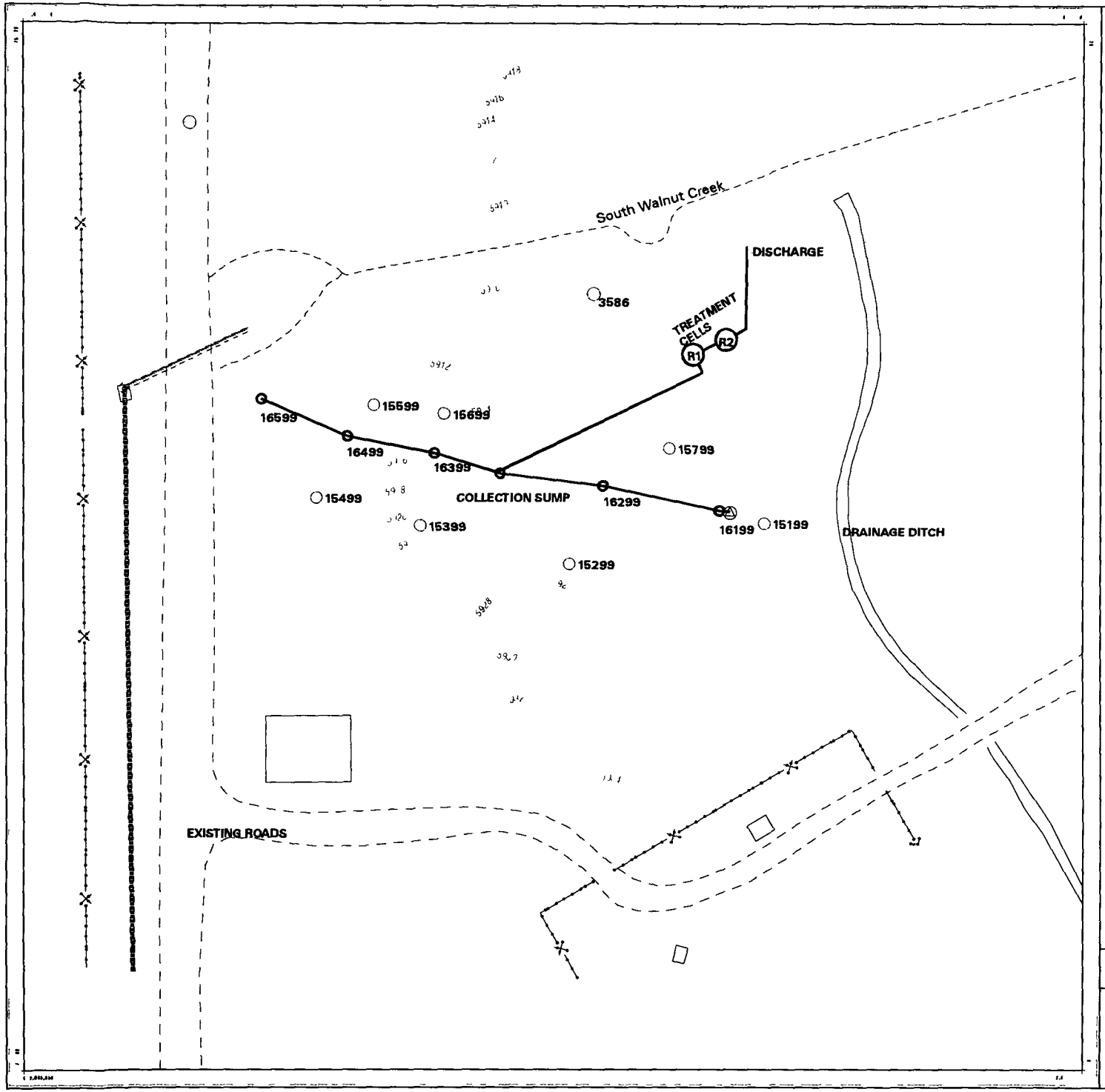

MOUND PLUME TREATMENT SYSTEM LOCATIONS

Figure 1

Rocky Flats Environmental Technology Site

EXPLANATION

Detailed Key

- New Ground Water Well
- Existing Ground Water Well
- New Trench Water Level Monitoring Probes
- New Trench Cleanout
- Contours
- Fences
- 72" Culvert
- Trench System

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams ditches or other drainage features
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES.
Source for all Detailed Key layers except the new groundwater wells is International Technology Corporation (IT) prepared for MSE Technology Applications, Inc in Butte, Montana

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSI, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 800
1 inch represents approximately 67 feet

20 0 40 80ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by
DynCorp
THE ART OF TECHNOLOGY

Prepared for
KAISER HILL

MAP ID 01-0342 March 19, 2001

Original map contents are preserved. Logo and date have changed.

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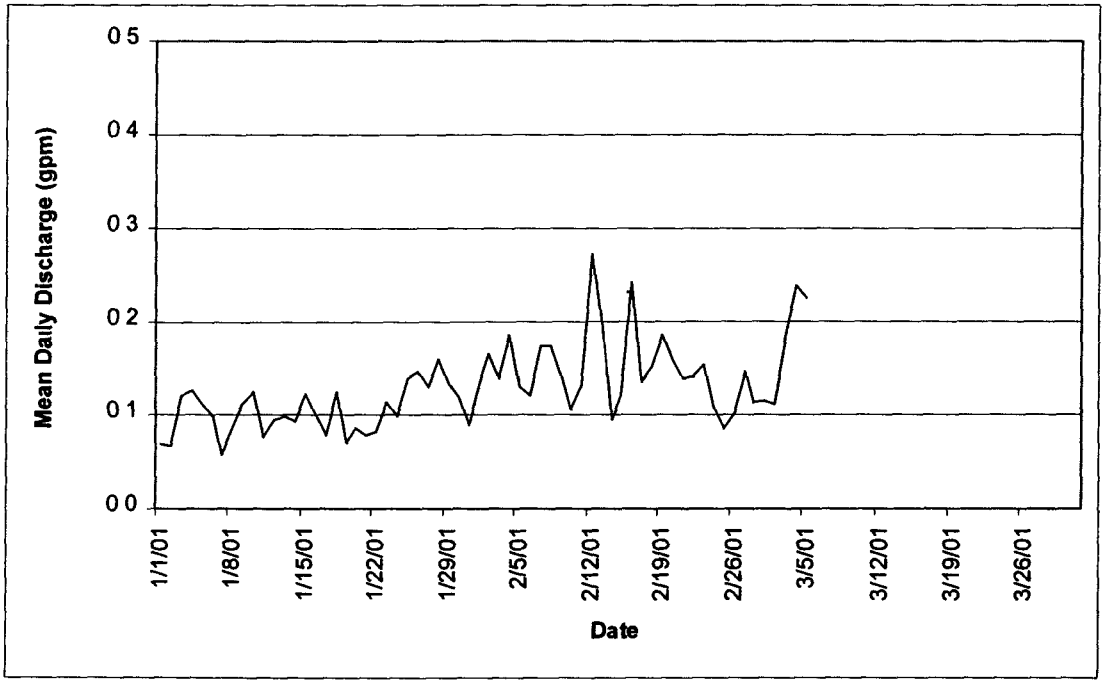
2.1 Project Events

The two treatment cells each contain 4 feet of iron filings as the treatment medium The media surface is raked to minimize crust formation and no crust appears to be forming Site personnel perform quarterly water level monitoring and semi-annual sample collection

2.2 Treatment Effectiveness

Treatment system flow rates and water volume are recorded automatically Flow rates for the period of January through March are shown below on Graph 1 The recorded flow rate ranged from 0 06 to 0 24 gallons per minute (gpm) Since the system's installation, the estimated total volume of groundwater treated as of March 5, 2001 was 673,300 gallons The volume for December 18, 2000 through March 5, 2001 was 13,508 gallons January average flow rate was 0 10 gpm, February average flow rate was 0 15 gpm and March average flow rate was 0 17 gpm

Graph 1 Mound Plume Treatment System Flow Rates, January through March 2001



Water levels within the collection trench are monitored at five piezometers (Figure 1) Water levels at these locations are measured quarterly and are stable Data from this and last quarter are provided in Table 1 Data indicate that the collection system is working as designed Trench piezometers locations were reversed on previous maps and are now correctly identified

Table 1 Mound Plume Collection Trench Piezometer Water Levels (in feet below top of casing)

Piezometer	10/5/00	1/4/01
16199	Dry	dry
16299	12 03	12 02
16399	9 43	9 45
16499	9 17	9 19
16599	12 29	12 29

Water levels are also monitored quarterly at seven locations surrounding the collection trench (three upgradient, three downgradient and one to the east) Locations are shown on Figure 1 and the water levels are shown in Table 2 Water elevation upgradient of the collection trench was approximately 5,917 feet Water elevation downgradient of the collection trench was 9 feet lower at around 5,908 feet, with piezometers 15599 and 15799 dry

Well 3586 is part of the integrated monitoring program and also monitors the Mound Plume System This well is located downgradient of the Mound Plume System as shown on Figure 1 Well 3586 is monitored monthly and the water levels for this quarter are provided in Table 2 Water levels at this location have remained stable for this quarter

Table 2 Mound Plume System Water Elevations (in elevation above sea level)

Piezometers	10/5/00	1/4/01
15199	5918	5917
15299	5916	5915
15399	5918	5917
15499	5919	5918
15599	dry	dry
15699	5907	5908
15799	5911	dry

Downgradient Well			
	1/4/01	2/6/01	3/6/01
3586	5902 2	5902 4	5902 3

2.2.1 Treatment System Monitoring

System sampling continues to verify the performance of the treatment system As specified in the Mound Site Plume Decision Document (DOE 1997a), for fiscal year 2001 samples will consist of semiannual sampling of the influent and effluent Samples were last collected on October 25, 2000 and the results were reported in the previous Quarterly Report Sample results received to date and documented in previous reports indicate that the treatment system is operating more efficiently than designed with most of the volatile organic compounds (VOCs) and radionuclides removed within the first two feet of reactive iron The next sampling event is scheduled for the third quarter of FY01 (April - June 2001)

2.2.2 Downgradient Water Quality

As specified in the Mound Plume Decision Document (DOE 1997a), analytical data are collected on a semi-annual basis at downgradient wells 15599, 15699, 15799 and 3586 to determine the impact of the treatment system on downgradient water quality (Figure 1) Previously, data were collected on a quarterly basis

The latest sampling event was October 25, 2000 Well 15599 is always dry and no analytical results were obtained During the October sampling event, neither well 15699 nor well 15799 had sufficient water to sample Analytical results from last year are provided below in Table 3 The next sampling event is scheduled for the third quarter of FY01 (April - June 2001)

Table 3 Downgradient Well Analytical Results (in ug/l unless otherwise noted)

	15699				15799		3586					RFCA Tier 2 ALF
Analyte Date	11/99	1/00	5/00	8/00	11/99	6/00	10/99	1/00	5/00	7/00	10/00	
1,1,1-Trichloroethane	29 J	16 J	20J	19J	ND	ND	1 J	0 7 J	1 J	2	0 84	200
1,1-Dichloroethane	28 J	22J	26J	23J	ND	ND	38	36	30	33	29 4	3650
1,1-Dichloroethene	120	68J	94	79J	ND	ND	ND	ND	ND	ND	ND	7
Cis-1,2-Dichloroethene	410	280	260	310	ND	ND	7	3	3	2	6 7	70
Methylene Chloride	ND	73JB	720B	330B	ND	0 2 JB	4 JB	0 2 JB	0 2JB	0 2JB	0 34JB	5
Tetrachloroethene	910	780	930	910	0 8 J	0 9 J	ND	ND	ND	ND	ND	5
Trichloroethene	1900 E	1300	1700	1800	0 2 J	0 2 J	0 5 J	0 3 J	0 2 J	0 2 J	0 3 J	5
Vinyl Chloride	ND	ND	ND	ND	ND	ND	56	22	17	16	19 2	2
Uranium-233,234 (pCi/l)	13 35	11 9	9 12	10 2	-	-	3 35	2 63	2 60	2 53	2	1 06
Uranium-235 (pCi/l)	0 27 J	ND	ND	0 4 J	-	-	ND	0 07 J	ND	ND	0 051J	1 01
Uranium-238 (pCi/l)	9 68	10 78	7 57	8 64	-	-	2 19	1 98	1 57	1 74	1 5	0 768

B Present in the laboratory blank (possible lab contamination)
E Exceeded calibration range of instrument
J Detected at concentrations less than the RDL or PQL and greater than the method detection limit
ND Not detected at the detection limit for this analysis
- Insufficient water present for radiological analyses

The high concentrations seen in well 15699 are the result of the well's location within the major preferential flow path for the Mound Site Plume and along the trend of the highest plume concentrations as determined by the pre-remedial investigation (DOE 1997a) The well is in the downgradient portion of the contaminant plume below the collection system This part of the plume is termed the "zone of sacrifice", as it will not be treated by the system This part of the plume is expected to dry up because the upgradient source of water has been removed by the collection system While concentrations are expected to decrease over time, as the plume dries up, concentrations may rise because the contamination level may decline slower than the groundwater volume

Analytical results from well 15699 are within the same order of magnitude throughout the year, and are consistent with the pre-remedial investigation results The values observed at this location are much higher than the concentrations seen in the collection trench, primarily because the collection trench collects groundwater from across the plume area, including lower concentration areas

Well 15799 was installed to the east of the collection trench in an area of the plume with much lower concentrations and the analytical data from both the well and the pre-remedial investigation reflect these lower concentrations (DOE 1997a) Water quality at this location and at well 3586, located downgradient of the collection system near South Walnut Creek have remained substantially unchanged over the reporting period (Table 3)

2.3 Conclusions and Planned Changes

The Mound Site Plume Treatment Project is fully operational and treating contaminated groundwater to below specified system performance concentrations Ongoing maintenance, raking the iron media and retrieving flow rate and water level data are the only required activities

While system sampling will continue to verify the performance of the treatment system, on October 1, 2000, the sampling frequency changed to semiannual sampling of the influent and effluent, as specified in the Mound Site Plume Decision Document (DOE 1997a)

3.0 EAST TRENCHES PLUME TREATMENT SYSTEM

The East Trenches Plume Treatment System collects and treats the contaminated groundwater derived from the Trench 3 and Trench 4 area to the Groundwater Action Level Framework Tier 2 level concentrations defined in the RFCA (DOE, 1996) The sources for the contaminated groundwater plume were remediated in 1996 as an accelerated action

Installation of the 1,200-foot collection system and two reactive iron treatment cells was completed in September 1999 The location of the system is shown on Figure 2 This system requires little maintenance and provides long-term protection of surface water by collecting and treating the contaminated groundwater before it reaches South Walnut Creek

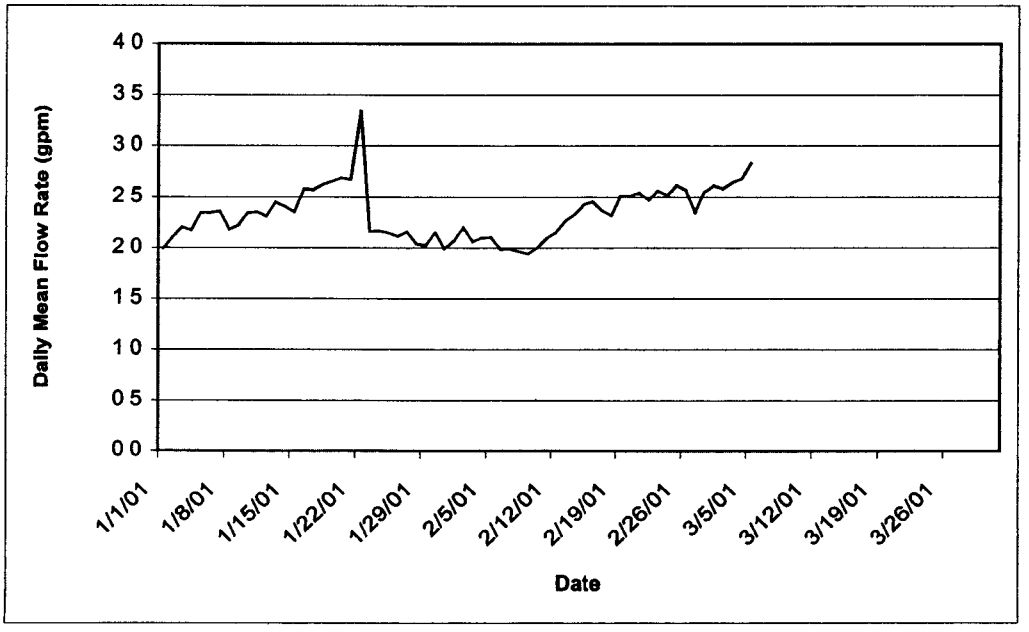
3.1 Project Events

The iron media in the two treatment cells is raked weekly to minimize crust formation Site personnel performed system maintenance, water level monitoring and sample collection

3.2 Treatment Effectiveness

Treatment system flow rates for the period of January through March are shown on Graph 2 The recorded flow rate from the treatment system averaged approximately 2 3 gpm The spike is a result of increased flow when the iron media was raked on January 22nd Total volume of groundwater treated by the system as of March 5th was approximately 3 million gallons with 256,059 gallons of groundwater treated for December 18, 2000 through March 5, 2001

Graph 2 East Trenches Plume Treatment System Flow Rates January through March 2001



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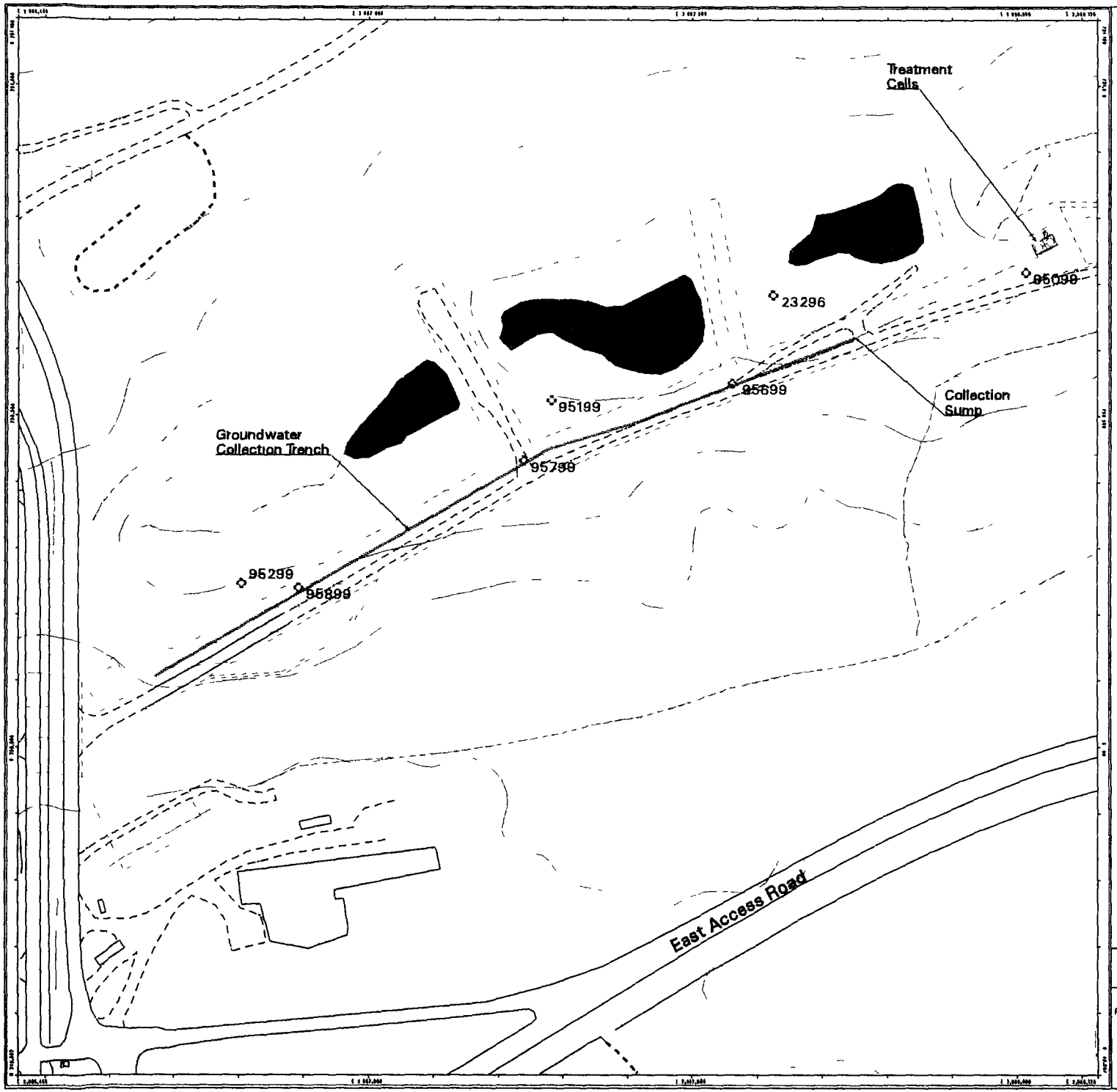

Figure 2
East Trenches Plume Treatment System Locations

EXPLANATION

- Surface Water Drainage
- Collection Trench
- Monitoring Well

Standard Map Features

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

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial flyover data collected by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1/95
Topography (contours) were derived from digital elevation model (DEM) data by Mac Ian Knudsen (MK) using ERDAS Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at 10 meter resolution. DEM post-processing performed by MK Winter 1997.

Scale = 1 : 2580
1 inch represents 215 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum NAD27

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Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared for:
KAISER-HILL

MAP ID: 01-0348east_trench.aml
March 07, 2001

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Water levels within the collection trench were measured monthly at three piezometers Water levels at the wells downgradient of the collection trench were also measured monthly Locations are shown on Figure 2 and monitoring results presented in Table 4 The water levels in the collection trench piezometers for this time period fluctuated about 0 5 foot at piezometers 95799 and 95899 and remained dry at 95699 Water levels in the downgradient wells also remained relatively constant

Table 4 East Trenches Plume Piezometer and Well Water Levels (elevation above mean sea level (msl))

Trench Piezometers				Groundwater Wells			
	1/3/01	2/5/01	3/5/01		1/3/01	2/5/01	3/5/01
95699 (East)	Dry	Dry	Dry	95099	5849	5849 3	5849 2
95799	5877	5877	5876 7	95199	5871	5870 3	5870 1
95899	5889	5888 5	5888 5	95299	Dry	Dry	Dry
				23296	5852	5852 5	5852 5

The water elevations within the collection trench demonstrate the steep gradient towards the east Consistent with previous quarters, water was not observed at piezometer 95699 at the eastern end of the collection trench This indicates that groundwater in this part of the collection trench drains immediately to the collection sump

The water elevation at the downgradient wells remains consistent over this and previous quarters These water elevations are consistent with previous measurements and combined with the water volumes collected, indicate that the collection trench is working as designed

3.2.1 Treatment System Monitoring

In October 2000, the monthly sampling frequency was reduced to semiannual sampling as specified in the East Trenches Plume Decision Document (DOE 1999a) Samples are now collected on a semiannual basis at the influent and effluent of the treatment cells Samples were last collected on October 25, 2000 and the results were reported in the previous Quarterly Report The next samples are scheduled for collection in the third quarter of fiscal year 2001 (April – June 2001) Sample results received to date and documented in previous reports indicate that the treatment system is operating as designed

Methylene chloride has consistently been noted in the effluent samples from the East Trenches Plume treatment system in previous quarters Concentrations observed were less than 10 times the reporting limit but greater than 10 times the associated laboratory blank concentration The Site's Analytical Services Division believes that the methylene chloride is probably a result of laboratory contamination

3.2.2 Downgradient Water Quality

As above, samples are now collected on a semi-annual basis at downgradient wells 95099, 95199, 95299 and 23296 to determine the impact of the treatment system on downgradient water quality (Figure 2) Previously, data were collected on a quarterly basis

The downgradient wells are located within the cut-off downgradient portion of the plume that was not intended to be treated, the zone of sacrifice Well 95299 is dry and no analytical results were

obtained Analytical results from the remaining wells are provided below in Table 5 The latest sampling event was October 30, 2000 The next sampling event is scheduled for the third quarter of FY01 (April – June 2001)

Table 5 Downgradient Well Analytical Results (in ug/l)

Well	Date	Carbon Tetrachloride	Chloroform	Cis-1,2-Dichloroethene	Methylene Chloride	Tetrachloro-ethene	Trichloro-ethene
23296	10/28/99	3J	8J	170	3JB	10J	280
	2/15/00	37J	51J	71J	30JB	36J	960
	3/10/00	40J	41J	53	120B	28J	780
	4/17/00	14J	21J	55	48B	19J	450
	7/18/00	3J	6J	120	14JB	15J	390
	10/30/00	5 7	12 5	80 4	0 41	9	288
95099	10/26/99	0 2J	0 4J	ND	0 1JB	ND	ND
	3/16/00	0 1J	0 3J	ND	0 2 JB	ND	0 1J
	5/19/00	0 2J	0 3J	ND	0 3JB	ND	ND
	7/17/00	0 3J	0 2J	ND	0 1JB	ND	ND
	10/25/00	ND	ND	ND	0 25 JB	ND	ND
95199	10/25/99	ND	0 3J	1J	0 3 JB	1J	38
	3/16/00	ND	0 3J	3	1 JB	2J	69E
	5/19/00	ND	ND	2J	5 JB	2J	54
	7/17/00	ND	ND	2J	4 JB	2J	61
	10/25/00	ND	ND	1 8	0 27 JB	1 8	52 3
RFCA Tier 2 ALF		5	100	70	5	5	5

B = Present in the laboratory blank (possible lab contamination)
E = Exceeded calibration range of instrument
J = Detected at concentrations below the detection limit for this analysis
ND = Not detected at the detection limit for this analysis

Wells 23296 and 95199 show VOC concentrations consistently higher than the RFCA Tier 2 Action Levels (Table 5), although much lower than the concentrations seen at the treatment cells These downgradient wells are located within the cut-off downgradient portion of the plume that was not intended to be treated, the so-called "zone of sacrifice"

Well 23296 is located near South Walnut Creek where the East Trenches Plume exits to surface water Higher VOC concentrations observed at this well were an early indication that a remedial action should be considered for this plume Trichloroethene is the primary contaminant observed, with concentrations ranging between 280 ug/l in October 1999 to 960 ug/l in February 2000 Concentrations declined throughout the year from the February high value to the October lowest values These data indicate a seasonal fluctuation in concentrations

Well 95199 exhibits a similar pattern as well 23296 with the highest concentrations of trichloroethene observed in March 2000 and the lowest concentration in October 1999 However, the range of contaminant levels is much smaller

The apparent seasonality may be a result of precipitation, with wet weather resulting in lower concentrations Little rainfall was observed in February, with wetter weather from mid March (immediately following sampling) through July Because infiltration is a major source of plume recharge, the rainfall apparently caused a decrease in sample concentrations Almost 2 inches of rain fell on July 16, 2000 Samples were collected from wells 23296 and 95199 immediately afterward While concentrations in 23296 are much lower, indicating probable dilution by precipitation, the concentration in well 95199 did not decrease substantially This may indicate

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that the heavy precipitation may have run off and did not infiltrate as much on the hillside where well 95199 is located

Well 95099 is located east of the collection system and outside of the East Trenches Plume It was installed to monitor the effectiveness of the system in limiting plume migration to the east Water quality at this location has remained unchanged over the reporting period as shown in Table 5

3.3 Conclusions and Planned Changes

The East Trenches Plume Treatment System is fully operational and treating contaminated groundwater to below the specified system performance requirements Ongoing maintenance, raking the iron filings, and retrieving flow rate and water level data, are the only required activities The top foot of media in each reactor is expected to be replaced next quarter with a mixture of 90% pea gravel and 10% iron to minimize crust formation

While system sampling continues to verify the performance of the treatment system, on October 1, 2000, the sampling frequency changed to semiannual sampling of the influent and effluent, as described in the East Trenches Plume Decision Document (DOE 1999a)

4.0 SOLAR PONDS PLUME TREATMENT SYSTEM

The Solar Ponds Plume is a groundwater plume containing low-levels of nitrate and uranium, generally attributed to the storage and evaporation of radioactive and hazardous liquid wastes in the Solar Evaporation Ponds These ponds were drained and the sludge removed by 1995 Six interceptor trenches were installed in 1971 to de-water the hillside north and downgradient of the ponds The original six trenches were abandoned in place and the Interceptor Trench System (ITS) was installed in 1981 The ITS was replaced with the installation of a 1,100-foot long collection system and passive treatment cell containing iron and wood chips Installation was completed in September 1999 and the components of the system are shown on Figure 3 This system intercepts the water previously collected by the now defunct ITS

The Solar Ponds Plume system is different from the flow-through systems installed for the Mound Plume and East Trenches Plume As originally designed, the treatment cell was to be located near North Walnut Creek Water was expected to be intercepted and flow by gravity to the treatment cell without detention in the collection trench Because the Preble's Meadow Jumping Mouse (a Federally Listed Threatened Species) is present at the optimal location of a flow-through treatment cell, the treatment cell was located immediately adjacent to the collection trench, not 400 feet downgradient as was originally planned As a result, the collection trench for this system must hold approximately 11 feet of groundwater to develop sufficient hydraulic head for the groundwater to flow into the treatment cell

The maintenance requirements for the wood chip/iron media consist of water level monitoring and sample collection Based on information from other, similar systems, the media does not require raking or other maintenance It is expected that media replacement will be required 10 years after installation

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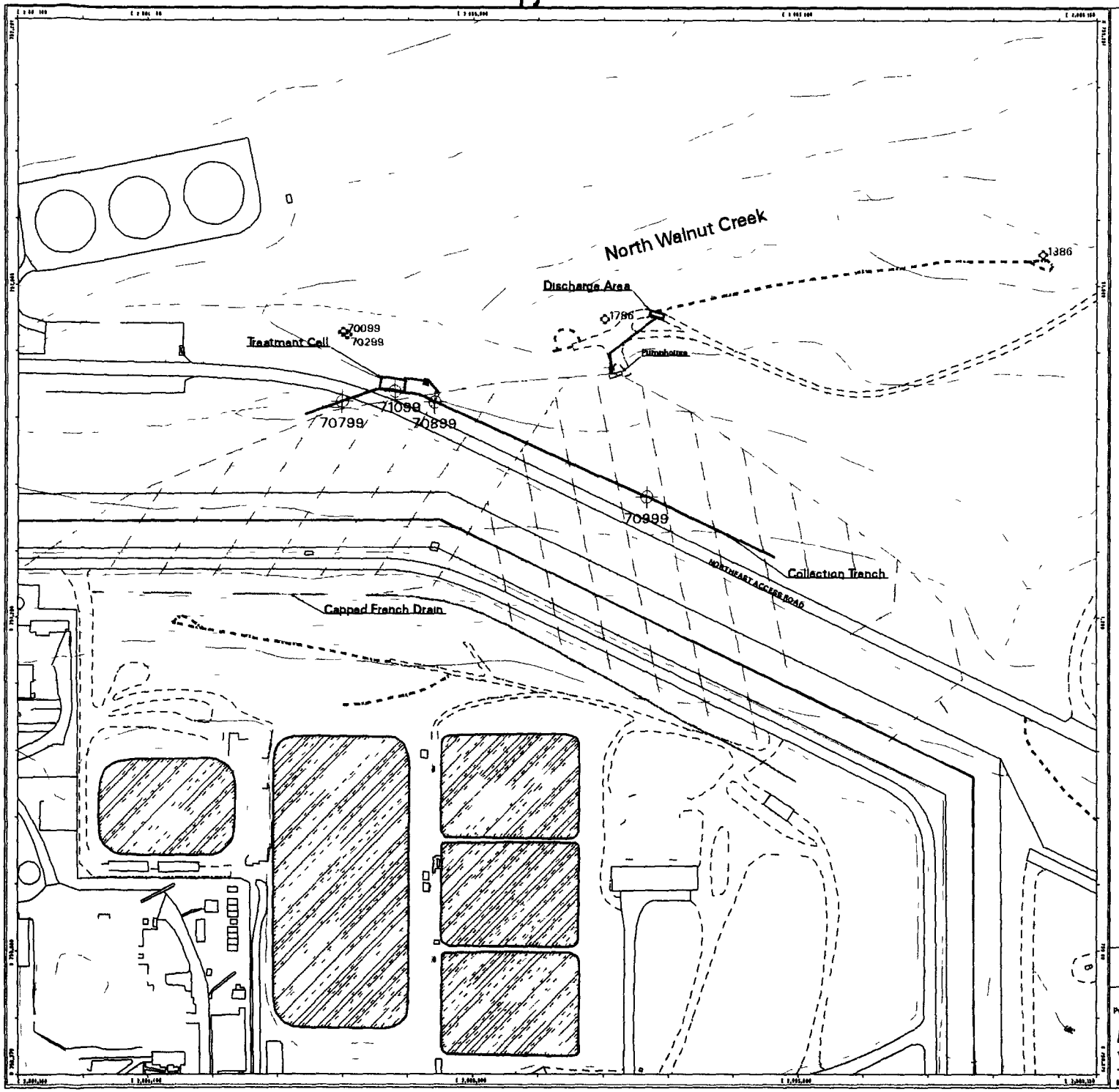

Figure 3
Solar Ponds Plume Treatment System Locations

EXPLANATION

- IT6
- In Trench Piezometer Location
- Monitoring Well

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams ditches or other drainage features
- Fences and other barriers
- Contour (5 Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES.
Buildings, fences, hydrography, roads and other structures from 1994 aerial flyover data compiled by EG&G RSL Las Vegas. Digitized from the orthophotograph.

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1 inch represents approximately 257 feet

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Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER HILL

MAP ID: 01-0345/solar_pond.aml

March 27, 2001

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4.1 Project Events

The Solar Ponds Plume system is currently collecting groundwater containing nitrate and uranium from the Solar Ponds Plume However, some untreated groundwater is also reaching surface water resulting in higher nitrate and uranium levels in North Walnut Creek than were observed prior to system installation As stated in the Solar Ponds Plume Decision Document, nitrate concentrations at SW093, upstream of the Solar Ponds Plume, generally range from 1 to 2 mg/l and uranium activities (all isotopes combined) range from approximately 4 to 6 pCi/l (1999b)

Performance monitoring data shows that the surface water continues to be well below applicable standards of 10 pCi/l uranium and 100 mg/l nitrate as specified in the Solar Ponds Plume Decision Document (DOE 199b) The 100 mg/l nitrate standard is a temporary modification of the underlying stream standard for nitrate (10 mg/l) in North Walnut Creek (DOE 1999b) In November 2000, the Colorado Water Quality Control Commission conducted the triennial review of water quality standards in the South Platte River basin, which includes stream segments on Rocky Flats The Commission voted to retain the temporary modifications and the expiration date of 2009

System performance continues to be evaluated through monitoring water levels in the collection trench, collecting samples at additional locations and at increased sampling frequency

4.2 Treatment Effectiveness

Treatment system flow and volume of water are measured and recorded automatically The flow volumes for the period January through March 2001 ranged from 0 to 4 5 gallons per day (Graph 3) As of March 5, 2001, the total water volume treated since system installation is 64,030 gallons Of this volume, 31 gallons were treated from December 20, 2000 to March 5, 2001 The results from this reporting period show intermittent flow into the treatment cell Flow through the treatment cell is closely associated with precipitation events Water levels within the collection trench are monitored monthly at the locations shown on Figure 3 Water levels for the last two quarters are provided in Table 6

Graph 3 Solar Ponds Plume Treatment System Flow Volume, January through March 2001

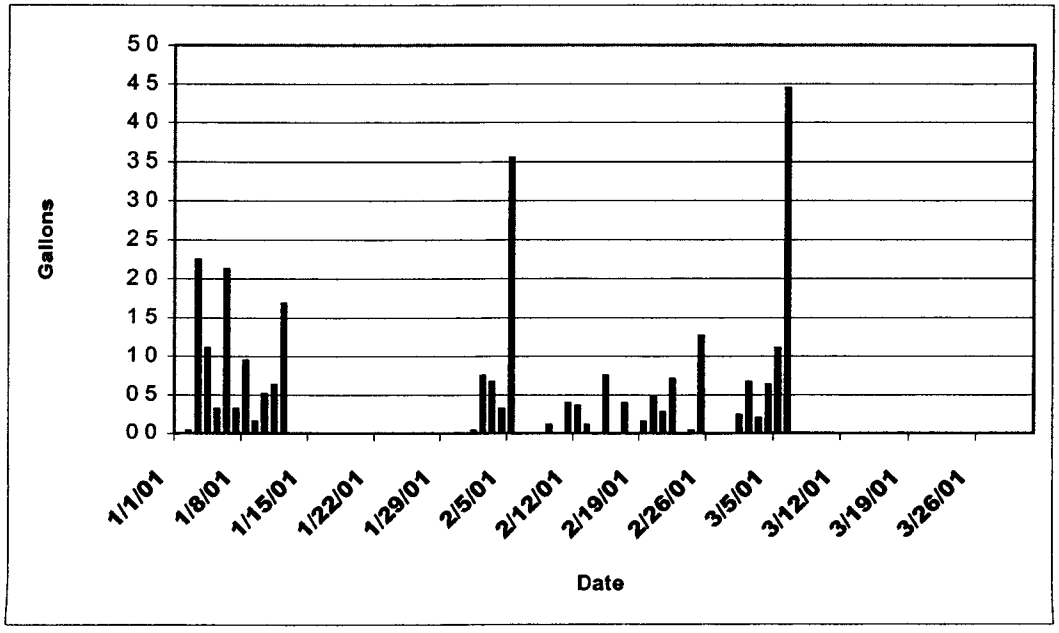

Table 6 Solar Ponds Plume Collection Trench Piezometer Water Levels (feet below casing)

Piezometer	10/3/00	11/1/00	12/4/00	1/3/01	2/5/01	3/5/01
70799	15 18	15 61	18 95	Dry	NM	Dry
70899	16 91	17 3	Dry	Dry	Dry	18 11
70999	20 73	21 06	Dry	Dry	Dry	Dry
71099	17 29	17 68	20 91	21 24	21 06	18 49

NM – not measured

Downgradient wells are monitored monthly, the last two quarters of data are provided in Table 7 Water levels in colluvial well (70099) fluctuate from 5875 to 5878 feet above msl The bedrock well (70299) shows a constant water level of approximately 5877 feet above msl Water levels in well 1786, located within the discharge gallery, remains constant at 5864 feet above msl Water levels in well 1386 fluctuate from 5832 to 5837 feet above msl and are probably influenced by the water flow in nearby North Walnut Creek

Table 7 Depth to Groundwater in Solar Ponds System Wells (in elevation above msl)

Well	10/3/00	11/1/00	12/4/00	1/3/01	2/5/01	3/5/01
70099	5878	5875	5876	5877	5875	5875
70299	5877	5876	5877	5877	5877	5877
1386	5832	5833	5836	5837	5837	5837
1786	5864	5864	5864	5864	5864	5864

4.2.1 Treatment System Monitoring

Monthly samples are collected from the treatment system influent, effluent and discharge gallery (Figure 3) Available nitrate and uranium concentrations are provided in Table 8

Table 8 Solar Ponds Plume Treatment System Analytical Results

	SPP Influent		SPP Effluent		SPP Discharge Gallery	
Collection date	Nitrate in mg/l	Total Uranium in pCi/l	Nitrate in mg/l	Total Uranium in pCi/l	Nitrate in mg/l	Total Uranium in pCi/l
28-Oct-99	130	20 93	-	-	-	-
30-Nov-99	140	20 59	-	-	-	-
28/30-Dec-99	170	23 53	-	-	280	37 44
27-Jan-00	160	27 63	-	-	-	-
29-Feb-00	140	24 66	-	-	-	-
24/27-Mar-00	48	28 3	<0 05	-	240	45 2
25-Apr-00	140	24 99	<0 05*	0 96	283*	34 96*
22-May-00	115	23 05	<0 05 to 0 1*	0 24*	188*	-
29-Jun-00	130	21 72	-	-	294*	28 84
18-Jul-00	140	19 67	<0 05 to 1 1*	0 233	217*	26 17
17-Aug-00	130	26 03	16	0 061	246*	36 91
25-Sep-00	140	24 51	<0 05*	0 03	203*	19 62
Oct-00	110	25 46	<0 05	0 02	200	23 95
30-Nov-00	130	23 27	-	-	200	35 47
27-Dec-00	150	24 68	-	-	220	33 38
30-Jan-01	140	25 06	-	-	130	25 66
26-Feb-01	150	26 44	-	-	140	24 51

*average value for month
- not sampled

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One sample was collect this quarter on March 19, 2001 Low flow from the treatment cell precluded collecting other effluent samples Sample results from the March 19th event have not been received, but will be reported in the next Plumes Report However, when previously sampled, the effluent concentrations are much lower than predicted This is most likely a result of the increased residence time due to low flow rates

Prior to December 2000, the discharge gallery contaminant concentrations were significantly higher than the concentrations observed in the collection trench However, the discharge gallery is located within the zone-of-sacrifice for this plume, the pre-existing downgradient part of the plume that has nitrate concentrations consistently above 500 mg/l The discharge gallery therefore drains an area with historic high concentrations, and this downgradient part of the plume contributes to the higher nitrate and uranium concentrations at the discharge gallery

However, the nitrate and uranium values observed at the discharge gallery sharply declined in January and February At this time, the influent and discharge gallery samples analytical data are the same Because of the low precipitation during this time period, these concentrations most likely indicate that the contribution from the downgradient portion of the plume has declined and it may no longer be contributing significant contamination to the discharge gallery

4.2.2 Downgradient Water Quality

GS13 and Pond A-3 are monitored monthly to verify that nitrate concentrations at both locations are below the temporary stream standard of 100 mg/l The nitrate and uranium concentrations are provided in Table 9 Average monthly values are included for GS13 and Pond A-3

Table 9 Downgradient Water Quality

	GS 13		Pond A-3
Collection date	Nitrate in mg/l	Total Uranium in pCi/l	Nitrate in mg/l
October 99*	17 9	5 59	1 14
November 99*	24 11	6 41	5 04
December 99*	23 67	7 99	8 37
January 00*	32	6 75	14 13
February 00*	26 6	7 57	13 2
March 00*	16 65	5 15	9 26
April 00*	18 65	5 59	8 33
May 00*	13 18	7 1	4 88
June 00*	15 12	3 27	1 11
July 00*	6 5	3 23	1 51
August 00*	24 26	4 13	1 12
September 00*	22 8	3 77	1 23
October 00*	21	5 49	2 48
30-Nov-00	22	9 18	7 1
27-Dec-00	33	9 81	8 8
30-Jan-01	20	9 15	7 9
26-Feb-01	18	8 85	11
Standards	100	10	100

* Average monthly concentrations

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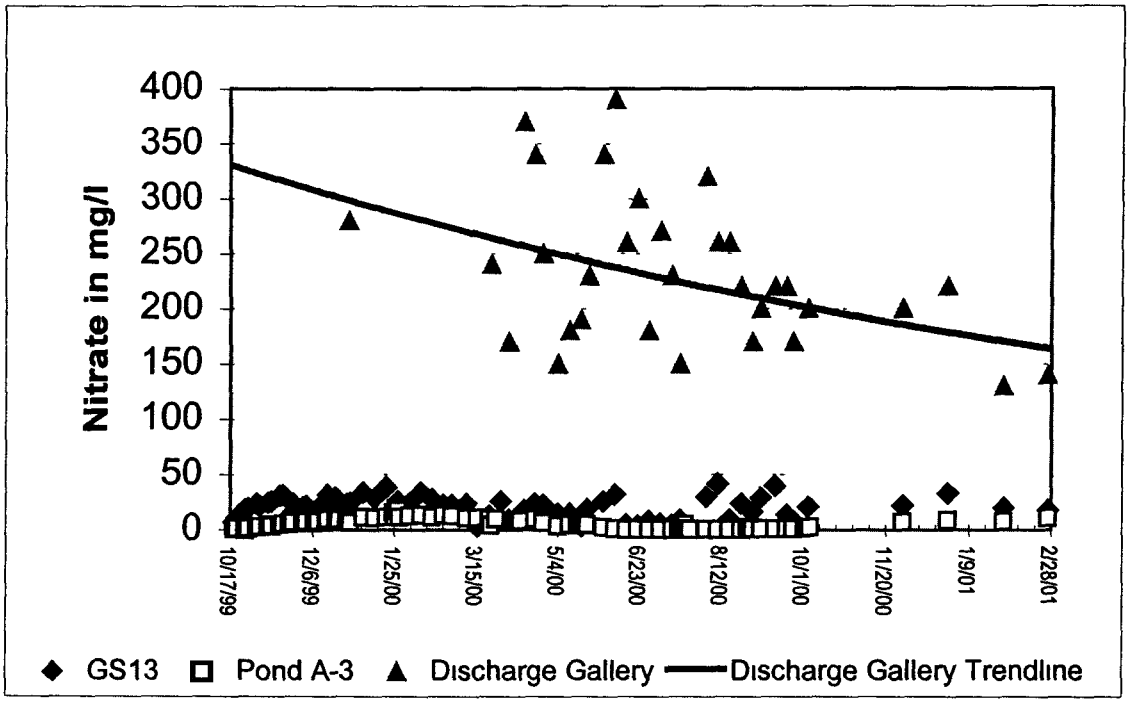
Graph 4 below displays all available nitrate data since installation of the Solar Ponds Plume system along with concentrations observed at the discharge gallery The graph also shows the discharge gallery nitrate concentration trend

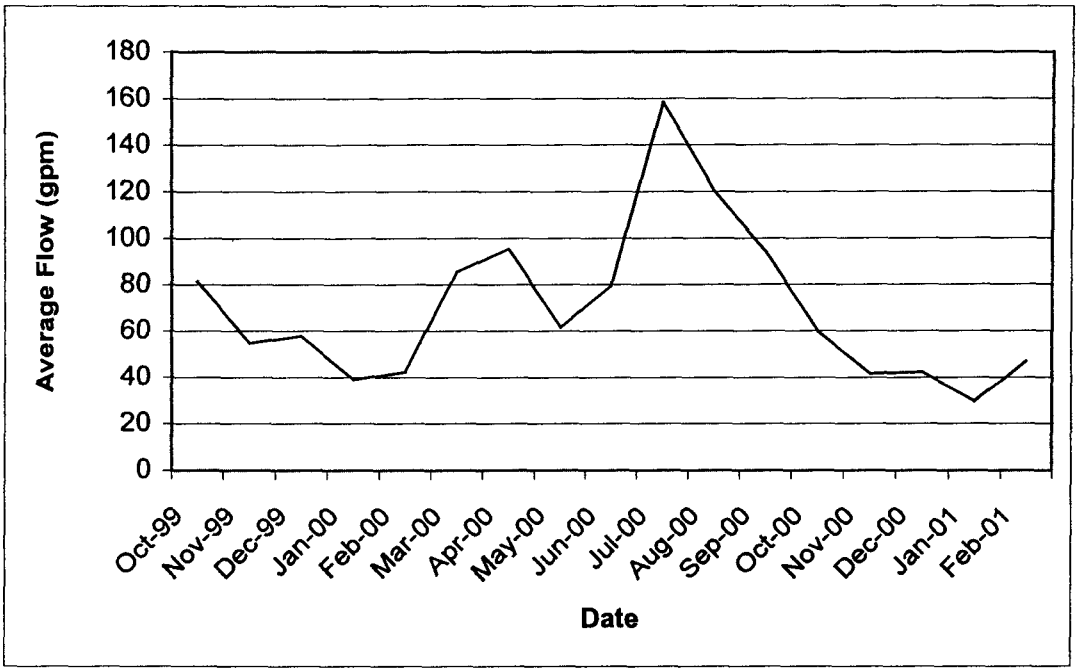
Graph 4 Nitrate Concentrations at the Solar Ponds Plume Treatment System



GS13 is the performance monitoring location for the Solar Ponds Plume System (DOE 199b) and is located in North Walnut Creek immediately downgradient of the Solar Ponds Plume Nitrate concentrations measured at GS13 rose after the Solar Ponds Plume groundwater system was installed in 1999 The nitrate concentrations are generally below 40 mg/l but fluctuate depending upon precipitation and other factors For this quarter, average nitrate concentration was 23 mg/l

At Pond A-3, located downstream of GS13, nitrate concentrations have been steadily declining since March 2000 and are now generally below 10 mg/l Higher concentrations (11 mg/l) this reporting period are related to the lower than normal flow rates in North Walnut Creek Graph 5 displays the average monthly flow rates for the same time January 2001 shows the lowest flow rate of the reporting period, with an average 29 6 gpm compared to 40 gpm in January 2000

Graph 5 Average Flow Rate in North Walnut Creek



Even with below normal precipitation, as evidenced by the below normal flow rates, the discharge gallery nitrate concentrations and uranium activities for January and February 2001 are well below the normal concentrations for this location (Table 8) The discharge gallery and the influent concentrations for January and February are similar indicating that the downgradient plume, the zone of sacrifice, is no longer contributing significant contamination to the discharge gallery Continued monitoring will assist with determining the cause of the decline

Phytoremediation and higher flow rates in North Walnut Creek may account for the lower nitrate concentrations observed during June and July Water leaving the discharge gallery flows along an abandoned dirt road that now is reclaimed by volunteer vegetation As expected, standing water at the discharge gallery supports rushes and cattails while the saturated soils support foxtail grass and barnyard grass Wetland plants in general are known to have relatively high nitrate uptake rates Seasonal die-back of the vegetation, combined with decreased flow in North Walnut Creek, caused nitrate levels to increase slightly (5 to 10 mg/l) at GS13

The Pond A-4 Outfall (GS11) is a RFCA Point-of-Compliance for uranium Samples are collected during Pond A-4 discharge events and contained uranium activities of approximately 3 to 4 pCi/l, well below the surface water standard of 10 pCi/l The sample data are within the range of historical uranium activities for this location The most recent Pond A-4 discharge was from November 13th through November 27, 2000 and uranium data from the composites collected are provided below in Table 10

Table 10 Recent Uranium Activities at the Pond A-4 Point-of-Compliance

	11/13/00 - 11/18/00	11/18/00 - 11/27/00
Uranium 233,234	0 57 +/- 0 05 pCi/l	0 62 +/- 0 05 pCi/l
Uranium 235	0 01 +/- 0 008 pCi/l	0 03 +/- 0 01 pCi/l
Uranium 238	0 59 +/- 0 05 pCi/l	0 58 +/- 0 05 pCi/l
Total Uranium	1 17 pCi/l	1 23 pCi/l

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Analytical samples are collected quarterly where possible from the two downgradient wells and data are provided in Table 11 The bedrock well (70299) consistently contains sufficient water for sampling while the adjacent colluvial well (70099) does not The bedrock contact is lower at the bedrock well, possibly indicating a preferential groundwater flow path Fractured claystone is present in the bedrock well and these fractures apparently contain more water than the colluvium in this area The nitrate concentrations are lower than anticipated in both wells The uranium activity in the colluvial well (70099) is higher than the upgradient part of the Solar Ponds Plume (DOE 199b) and elsewhere in the collection and treatment system (Table 8) The uranium activity at 70099 is also much higher than in the adjacent bedrock well This order of magnitude difference probably indicates that this well intersects naturally occurring uranium-rich cobbles or other native material

Table 11 Solar Ponds Plume Downgradient Well Analytical Results

Well	Date	Nitrate/Nitrite (mg/l)	Uranium-233,-234 (pCi/l)	Uranium-235 (pCi/l)	Uranium-238 (pCi/l)	Total Uranium (pCi/l)
70099	6/6/00	0 87	117	5 04	84 6	206 64
	10/26/00	2 2	79	2	58	139
70299	8/24/99	2 1	5 17	0 18	2 98	8 33
	10/26/99	0 1	11 17	0 55	10 70	22 42
	6/2/00	0 05	5 46	0 32	3 85	9 63
	10/26/00	0 05	7 8	0 16	5 3	13 26
	1/22/01	0 25	9 01	0 22	5 98	15 21
1786	5/11/99	410	33 79	1 13	27 40	62 32
	5/4/00	560	41 7	1 56	29	72 26
	11/8/00	630	36	1 1	26	63 1
	1/23/01	570	36 7	1 3	26 9	64 9
1386	5/18/99	0 06	6 68	0 31	5 79	12 78
	5/4/00	0 05	8 65	0 33	7 47	16 45
	10/26/00	0 23	8 7	0 83	7 3	16 33
	1/23/01	0 1	9 91	0 58	7 96	18 45

Well 1786 is located adjacent to the discharge gallery within the zone-of sacrifice for the Solar Ponds Plume, the downgradient part that was not intended to be treated The high concentrations present at this location confirm that the Solar Ponds Plume extended to North Walnut Creek prior to installation of the Solar Ponds Plume System Well 1386 is near GS13 and is located outside of the plume extent

4.3 Conclusions and Planned Changes

The treatment cell appears to be performing as designed even though water levels in the collection trench continue to fluctuate rather than holding constant at 11 feet Fluctuating water levels indicate that water is bypassing the treatment system Water quality in North Walnut Creek continued to be well below applicable standards for nitrate and uranium even with bypass of the treatment system

Water levels within the collection trench and nearby wells will continue to be monitored on a monthly basis Monitoring will continue at GS13, Pond A-3, and the treatment system influent, effluent and discharge gallery to measure system performance and the impact to surface water

Results for this reporting period reinforce the seasonal effects experienced in system performance, with normal treatment during fall and winter and treatment augmented by phytoremediation during the spring and summer At this time, the Site plans to continue to monitor the system through fiscal year 2001 to document seasonal impacts and to determine if other actions are required to continue to meet surface water standards

5.0 OU 1 – 881 HILLSIDE GROUNDWATER COLLECTION AND TREATMENT SYSTEM

The Operable Unit 1 (OU1) - 881 Hillside groundwater collection and treatment system was installed in 1992 and consisted of a 1,435 foot long French Drain and a separate upgradient Collection Well The Collection Well collects VOC contaminated groundwater from within the plume Trichloroethene is the primary contaminant

The French Drain was installed to prevent potential downgradient contaminant migration Collected water was treated in the Consolidated Water Treatment Facility (CWTF) Because groundwater collected by the French Drain was consistently below RFCA Tier 2 Action Levels, the OU1 Corrective Action Decision (CAD)/Record of Decision (ROD) (DOE 1997b) included decommissioning the French Drain The French Drain was decommissioned in 2000 and will no longer be reported

Based on the declining concentrations of VOCs in the plume, the OU1 CAD/ROD Modification was signed in February 2001 (DOE 2001) and includes one year continued extraction and treatment of groundwater from the Collection Well Then the Collection Well will be used to monitor the plume

Currently, water from the Collection Well is pumped into a portable trailer, then transported to the CWTF for treatment The total water volume treated from the Collection Well was 5,830 gallons for the period January through March 16, 2001 Water volumes extracted from the Collection Well were 1,010 gallons in January, 780 gallons in February and 4,040 gallons in March through March 16th

5.1 Project Events and Effectiveness

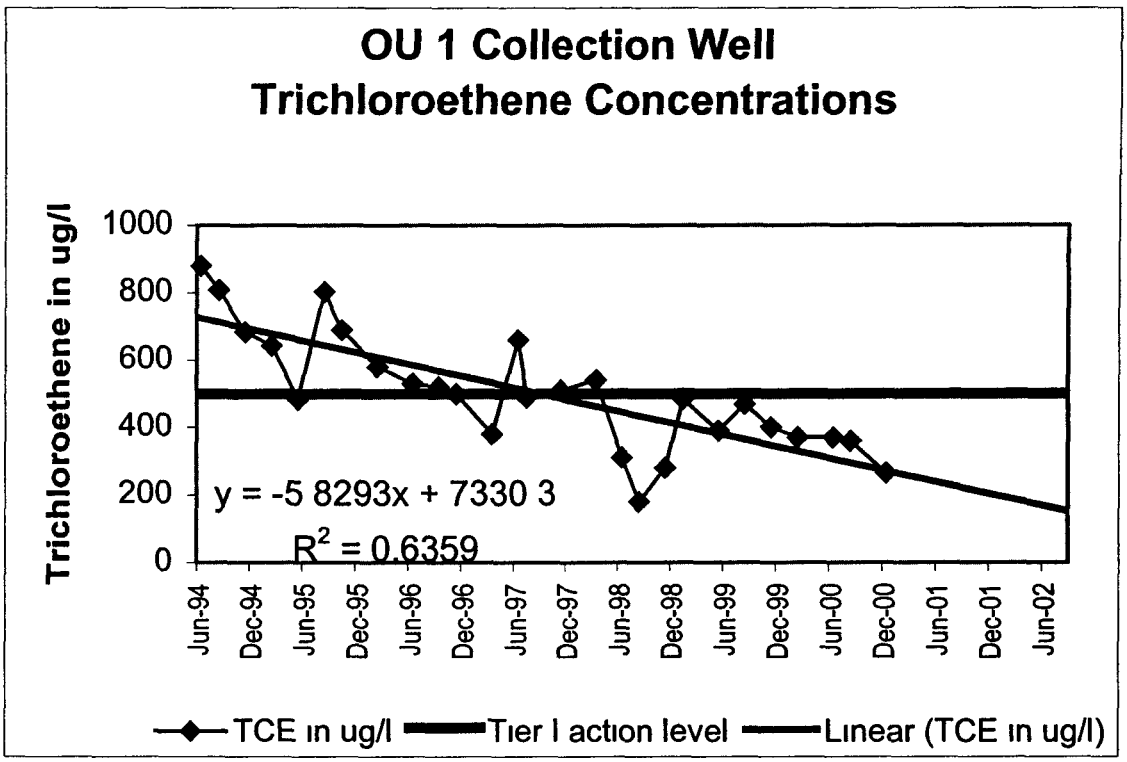
The Collection Well is sampled quarterly and was last sampled March 13, 2001 Results will be reported in the next Plumes Report VOC analytes above detection limits from the December 18, 2000 sampling are reported below in Table 12 Graph 6 demonstrates the trichloroethene concentrations over time This graph is the updated version of the graph in the OU1 CAD/ROD Modification (DOE 2001)

Table 12 Analytical Results for the December 18, 2000 Sampling Event

Analyte	Concentration (ug/l)	RFCA Groundwater Tier 2 Action Levels (ug/l)
Trichloroethene	264	5
Tetrachloroethene	26 9	5
1,1-Dichloroethene	9 5	7
Carbon Tetrachloride	9 4	5
1,1,1-Trichloroethane	1 9 J	200

J – Estimated concentration below the RDL or PQL and above the Method Detection Limit

Graph 6 OU1 Collection Well Tricholoroethene Concentrations



5.2 Planned Changes

There are no changes planned for the next reporting period

6.0 OU 7 – PRESENT LANDFILL SEEP COLLECTION SYSTEM

Groundwater contaminated with low concentrations of VOCs and semi-volatile organic compounds (SVOCs) discharges at a seep in the area of the Present Landfill (OU7) The main contaminants that periodically occur above performance objectives (RFCA Action Levels) are vinyl chloride and benzene

A passive seep interception and treatment system operated between May 1996 and October 1998 The system used granular activated carbon (GAC) to reduce the contaminant concentrations before discharging water to the Landfill Pond However, the GAC did not effectively remove the all contaminants and required monthly change-out to maintain the appropriate operating efficiency

The treatment system was modified in October 1998 to treat the seep water by passive aeration The new system minimizes waste generation and is more effective in removing vinyl chloride The new system results in some treatment of the SVOCs although the passive aeration treatment system is primarily designed to treat VOCs

In the passive aeration treatment system, the water is collected in a settling basin, flows through pre-existing piping to a set of stepped flagstones, and then flows over a 6-foot long bed of gravel

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before discharging into the Landfill Pond Flow is measured at the point of discharge Water quality samples are collected from the settling basin (SW00396) and from the discharge area (SW00196) The OU7 passive aeration treatment has operated since October 26, 1998 and the results were reported in *Evaluation of OU7 Aeration Treatment System,* November 1998-October 1999 (Kaiser-Hill, 2000)

6.1 Volume of Water Treated

This quarter, 56,191 gallons of water were treated in January, 45,075 gallons in February and a projected total of 53,600 gallons in March The total water volume treated this quarter is estimated at 154,900 gallons

6.2 Treatment Effectiveness

VOC samples are collected semi-annually and were last collected on December 4th Benzene was the only VOC detected, with a validated concentration of 2 ug/l The RFCA surface water standard for Segment 4 is 1 ug/l Because the validated value for benzene exceeded the RFCA Surface Water Standard, as stated in the OU7 Seep SAP (DOE 2001), a sample was collected on March 13, 2001 Sample results will be reported in the next Plumes Report

However, the water discharging from the OU7 Seep system meets most surface water action levels As stated in the RFCA Action Level Framework, the Segment 5 stream standard for benzene is 3 ug/l, and the Segment 4 stream standard is 1 ug/l While the Landfill Pond is located in Segment 4, water from the pond is transferred about once a year to the A-series ponds in Segment 5 Benzene is not an analyte of interest at either the A-4 or the Walnut and Indiana Street Points of Compliance

6.3 Planned Changes

Sampling requirement are based on the Evaluation Report (Kaiser Hill 2000) and on the Final Sampling and Analysis Plan (DOE 2001) that was transmitted to Colorado Department of Public Health and Environment (CDPHE) and Environmental Protection Agency (EPA) in March 2001 The Sampling and Analysis Plan incorporates CDPHE and EPA comments, and states that if validated results show an exceedance for two consecutive sampling events, then samples will be collected monthly for VOCs until the performance objective for benzene is attained for two consecutive months

In the event that the validated benzene concentration from the March 2001 sample also exceeds the RFCA Surface Water Standard, monthly VOC sampling will begin and continue until two consecutive monthly sampling events show no exceedance Otherwise, the sampling frequency will return to a semi-annual basis

7.0 PU&D Yard Plume Treatability Study

A plume of VOC contaminated groundwater is derived from a contaminant source in the PU&D Yard at RFETS Investigation results indicate that subsurface VOC contamination is present in only a few locations and that the primary contaminant is tetrachloroethene (Kaiser-Hill 2001)

A treatability study is in progress to evaluate the effectiveness of HRC™ for enhancing natural attenuation of the VOCs in the groundwater and soil at the PU&D Yard Plume HRC™ is a proprietary, environmentally safe, food quality, polylactate ester formulated for slow release of lactic acid upon hydration The HRC™ is expected to stimulate rapid degradation of chlorinated VOCs found in groundwater and soil at this location The HRC™ is expected to be a one-time application According to the manufacturer (Regenesis), the material is expected to stimulate contaminant degradation for approximately one year

The product has been used at other sites to stimulate rapid degradation of chlorinated VOC contaminants in groundwater and soil This study will evaluate the effectiveness of HRC™ in the low flow groundwater regimes common at RFETS (Kaiser-Hill 2001) This project is a cooperative effort between RFETS and the DOE SCFA and funding is provided by DOE SCFA

The study is taking place in the most highly contaminated portion of the PU&D Yard Plume immediately adjacent to the source area An additional monitoring well was installed in January 2001 and a baseline sample was collected Then, 16 material insertion points were used to place over 800 pounds of HRC™ into the subsurface These material insertion points are located within the area immediately surrounding borehole 17497 Insertion of the HRC™ was completed on March 1, 2001 The subsurface conditions will be allowed to stabilize over the next two months, then samples will be collected to monitor the effectiveness of enhanced natural attenuation process starting around May 1, 2001

8.0 REFERENCES

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