

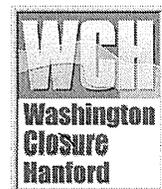
River Corridor Closure Contract

Annual Report for Gravity Collection Lysimeter Monitoring Plan- ERDF Cells 5 and 6, CY 2008

August 2009

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor



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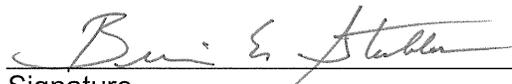
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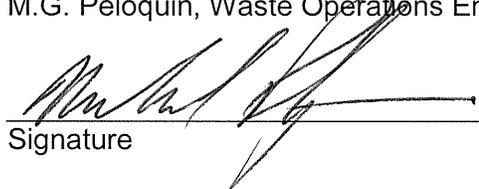


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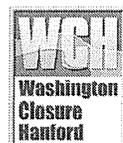


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ACRONYMS

BHI	Bechtel Hanford, Inc.
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
COCs	contaminants of concern
CY	calendar year
DOE-RL	Department of Energy Richland Operations Office
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
GPP	groundwater protection plan
HDPE	high-density polyethylene
MS/MSD	Matrix spike/matrix spike duplicate
QA/QC	quality assurance/quality control
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
ROD	Record of Decision
WCH	Washington Closure Hanford, LLC

metric conversion chart

Into Metric Units			Out of Metric Units		
<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>	<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>
Length			Length		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			Area		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			Mass (weight)		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			Volume		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			Radioactivity		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

1.0 INTRODUCTION

The Environmental Restoration Disposal Facility (ERDF) is a Hanford Site low-level mixed waste disposal facility that was brought into service in July 1996. The ERDF landfill is authorized under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The landfill was designed to meet the *Resource Conservation and Recovery Act of 1976* (RCRA) minimum technology requirements; however, the ERDF is not permitted as a RCRA facility. Wastes disposed at ERDF contain elevated levels of radionuclides and/or hazardous constituents originating from the 100, 200, and 300 Area waste sites and facilities.

Baseline sampling and analytical data obtained from monitoring wells and the ERDF leachate collection system were used to determine contaminants of concern (COCs) and background conditions for long-term monitoring as described in the *Groundwater Protection Plan for the Environmental Restoration Disposal Facility* (ERDF GPP) (WCH 2008a) and to meet the requirements of the ERDF Record of Decision (EPA 1995) and ERDF Amended ROD (EPA 1999). Based on about 10 years of ERDF monitoring activities and statistical evaluations of the data, the ERDF GPP (WCH 2008a) was revised and the new *Environmental Restoration Disposal Facility Lysimeter Monitoring and Sampling Plan* (WCH 2009) was implemented. ERDF lysimeter sampling and analytical baseline data is based upon the same COCs as the ERDF leachate system (WCH 2008b).

1.1 PURPOSE AND OBJECTIVES

The purpose of this annual monitoring report is to evaluate the conditions and identify trends to develop Hanford site-specific data on the performance of the lysimeter systems related to the vadose zone monitoring and potential future use of lysimeter systems. The objectives of this report are as follows:

- Assess data from routine ERDF lysimeter sampling to determine if COCs concentrations over time may be attributed to ERDF operations
- Describe and evaluate the sample data, identify changes or trends in the data, and incorporate a summary of the results.
- Create an initial characterization and establish a baseline to determine if the routine analyte list of indicator parameters is adequate.
- Determine a baseline and describe the changes in the volume of liquid in the lysimeter.

Appendix A shows analytical results for lysimeter samples collected from cells 5 and 6 from CY 2005 and CY 2008.

2.0 BACKGROUND

2.1 GENERAL DESCRIPTION

The ERDF site is located between the 200 East and 200 West Areas of the Hanford Site (Figure 2-1). This location was selected for the ERDF over other possible locations, in part because of the depth to groundwater in this area, its location above pre-existing groundwater plumes, the relatively flat topography in this area, and the compatibility of this location with stakeholder recommendations.

The ERDF landfill is authorized under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)*. The landfill was designed to meet the *Resource Conservation and Recovery Act of 1976 (RCRA)* minimum technology requirements; however, the ERDF is not permitted as a RCRA facility. Wastes disposed at ERDF contain elevated levels of radionuclides and hazardous constituents originating from the 100, 200, and 300 Area waste sites.

2.2 ENVIRONMENTAL RESTORATION DISPOSAL FACILITY

ERDF was designed as a series of side-by-side cells that measure 21.3 m (70 ft) in depth, 152.4 m by 152.4 m (500 ft) wide at the base, with a wall slope of 3:1 to measure over 304 m (1,000 ft) wide at the surface. There are currently six waste cells associated with the ERDF site. Initially, Cells 1 and 2, Cells 3 and 4 (2000), construction Cells 5 and 6 (2004) and the last two cells, 7 and 8, were approved in 2009. Construction of super cells 9 and 10 (cells 9, 10, 11 and 12) are in the beginning stages of construction and full construction is expected to commence in 2010.

Each of the ERDF cells was constructed with a double-liner system for the purpose of collecting liquids, or leachate, which may travel through the waste materials stored at the disposal site. These liquids are typically generated from natural precipitation, moisture within the waste matrix, and the application of dust control water that percolates downward through the disposed waste materials and collects on the surface of the lining material. The primary or upper liners and the secondary or lower liners each are designed to deliver leachate to sump areas. Sumps for the upper liners are independent from the sumps associated with the lower liners. The upper and lower sumps at each of the cells are routinely pumped down, and the leachate is stored in holding tanks prior to transfer to the Effluent Treatment Facility (ETF).

The lysimeters are constructed below the landfill liners and are located underneath the leachate collection sumps in cells 5, 6, 7, and 8.

2.2.1 Lysimeter System

The gravity collection lysimeters (basin lysimeters) were constructed in response to the *Study of Vadose Zone Monitoring at the Hanford Site, Task 1, Use in New Cells at the Environmental Restoration Disposal Facility* (DOE-RL 2003). This study was performed by Fluor Hanford for the U.S. Department of Energy, Richland Operations Office. The purpose of the study was to report on the status of vadose zone monitoring and to recommend measures that could be taken at the Hanford Site to further develop the technology of vadose zone monitoring.

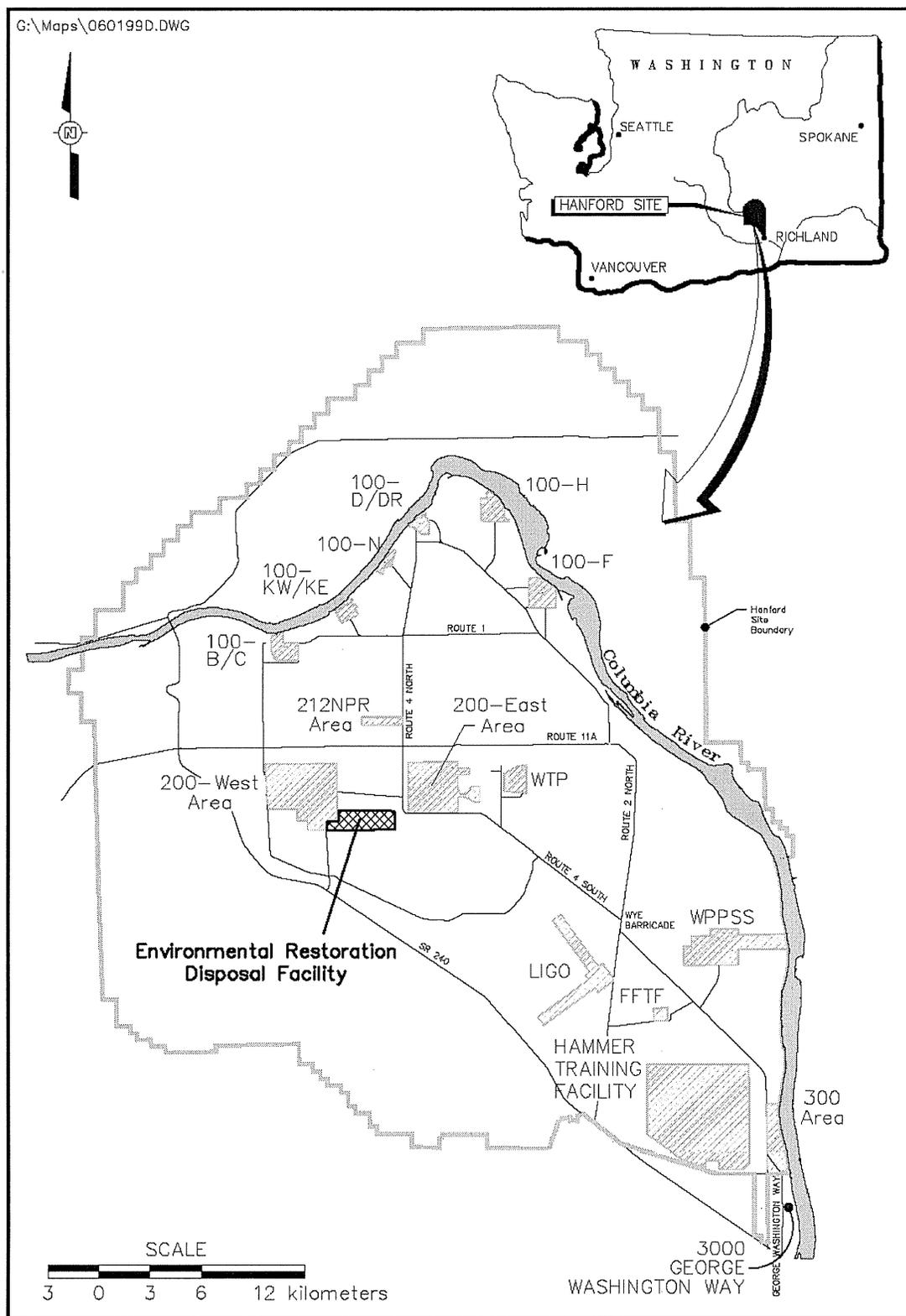
Background

The lysimeter design selected from the study for installation under the ERDF cells was a basin lysimeter (figure 2). These are constructed by excavating a sloping recession within the cell sub-grade beneath the composite liner system and installing an approximate 4,100-ft² liner into the area. A 6-in.-diameter perforated pipe section is laid atop the lysimeter liner and connected to 6-in.-diameter high-density polyethylene (HDPE) piping that is installed to the upper edge of the cell area.

This type of lysimeter is not configured to detect small increases in liquid accumulation. A thick-walled, 6-in.-diameter pipe is laid flat on the bottom of a collection area of approximately 546 ft² increasing to 4,100 ft² at the top of the lysimeter. The lysimeter has an approximate capacity to contain 48,000 gal within the available pore space of the gravel.

The vadose zone monitoring activities described herein are expected to continue until after the final landfill cap is installed and the annual quantity of leachate collected in the secondary leachate collection and removal system is shown to be insignificant (i.e., less than the amount needed to activate the removal pumps).

Figure 2-1. Location of the Environmental Restoration Disposal Facility.



3.0 LYSIMETER MONITORING & SAMPLING

The lysimeter monitoring program is described in *Environmental Restoration Disposal Facility Lysimeter Monitoring and Sampling Plan* (WCH 2009). This section provides an overview of these monitoring requirements.

3.1 LYSIMETER MONITORING

The lysimeters will be visually inspected and dewatered semi-annually until it can be demonstrated that the lysimeters have been successfully de-watered. Once dewatering has been completed, the lysimeters should be visually inspected annually in accordance with the *Environmental Restoration Disposal Facility Lysimeter Monitoring and Sampling Plan* (WCH 2009). The visual inspection will look at the structural integrity of pipe interior, depth to obstructions, depth to water, evaluation of pump use, and general observations.

3.1.1 Camera Inspection and Dewatering

Visual inspection of the lysimeters associated with cells 5 and 6 initially occurred in June 2008. The lysimeter associated with ERDF cell 5 was again inspected twice in October 2008 and once in December 2008, inspections were associated with a dewatering event and sampling event, respectively. The lysimeter associated with ERDF cell 6 was also inspected in December 2008, associated with a sampling event, but was not observed in October 2008 due to an equipment failure during the dewatering of ERDF cell 5 lysimeter. Both lysimeters were visually structurally sound without any obstructions within the visual portion of the pipe. Both lysimeters had some silt settlement within the water layer that clouded out the camera when disturbed. Prior to the visual disturbance associated with the silt the liquid associated with the lysimeters appeared transparent with minimal suspended particles. Both liquid surfaces had no apparent sheen and only had a very minor amount of unidentifiable floating particles. The lysimeter associated with cell 5 had some loose sand particles that fell down the lysimeter when disturbed by the camera. This loose sand may be a result of wind blown material that had deposited just inside the cap and could not be completely removed prior to the camera inspection and sampling event in June 2008, the relevance of this material will be discussed later in the report.

Baseline water levels of the lysimeters were established in June 2008. Depth to water measurements was achieved by using a distance counter associated with the inspection camera. ERDF cell 5 had an initial depth to water of 308 feet and cell 6 had an initial depth to water of 314 feet.

Prior to a dewatering activity in October 2008 the depth to water in cell 5 was measured at 291 feet, a 17 foot increase of water within the lysimeter pipe. A total of 2770 gallons of water was removed from the cell 5 lysimeter before an equipment failure halted the dewatering activity. A post-dewatering visual inspection showed a depth to water distance of 320 feet. In December 2008 the pre-sampling visual inspection of cell 5 lysimeter indicated a depth to water measurement of 343 feet, a decrease in water level of 23 feet from the October 2008 visual inspection, with no dewatering activity occurring between October 2008 and December 2008. ERDF Cell 5 lysimeter had a total water level decline of 35 feet from June 2008 to December 2008.

Analytical Results and Field Data

Depth to water levels in the ERDF cell 6 lysimeter also decreased, with the December 2008 depth to water measurement at 345 feet, a change in 31 feet with no dewatering activities occurring in the cell 6 lysimeter. With such limited data an accurate estimate of the lysimeters water level baseline, total water within the lysimeters, and response to dewatering activities cannot realistically be discussed. Further video inspections and dewatering of lysimeters is planned as a routine activity during CY 2009 to provide further data on the lysimeters and will be available in the CY 2009 annual report.

Cell 5 Lysimeter			Cell 6 Lysimeter	
Date	Gallons		Date	Gallons
January 2006	1651		Dec 2005	2302
June 2006	1890		July 2006	273
October 2008	2770			
	6311	Total		2575

The lysimeters initially underwent dewatering activities in late CY 2005 and CY 2006. The cell 6 lysimeter had 2302 gallons removed in December 2005 and 273 gallons of water removed in July 2006. To date the cell 6 lysimeter has had a total of 2575 gallons removed from it. Dewatering of cell 6 was not performed in October 2008 due to a pump failure. The cell 5 lysimeter was dewatered in January 2006 (1651 gallons removed), June 2006 (1890 gallons removed) and October 2008 (2770 gallons removed). To date the cell 5 lysimeter has had a total of 6311 gallons removed from it. No dewatering activities occurred in CY 2007.

3.2 LYSIMETER SAMPLING

The lysimeters are now on a schedule to be sampled semi-annually in conjunction with the leachate system sampling (WCH 2009). Analytical results will be used to establish a baseline to indicate the conditions in the vadose zone, characterization to ensure proper management of liquids, and monitoring for any trends in the data.

The vadose zone monitoring activities are expected to continue until after the final landfill cap is installed and the annual quantity of leachate collected in the secondary leachate collection and removal system is shown to be insignificant (i.e., less than the amount needed to activate the removal pumps).

The lysimeters were initially sampled in August 2005 in accordance with *Gravity Collection Lysimeter Monitoring Plan ERDF Cells 5 and 6* (BHI 2005). Initial lysimeter samples were analyzed for Chloride, Gross Alpha, Technetium 99 and Gross Beta. In CY 2008 the *Environmental Restoration Disposal Facility Lysimeter Monitoring and Sampling Plan* (WCH 2009) was under development and it was determined that the contaminants of concern (COCs) for the sampling of the lysimeters should be consistent with the COCs for the routine leachate sampling at ERDF as described in the *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan* (WCH 2008b).

The purpose of this initial characterization is to establish a baseline and determine if the routine analyte list of indicator parameters is adequate.

Analytical Results and Field Data

Table 3-1. List of Baseline Lysimeter Analytes by Analytical Method.

Analyte	Method ^a	Practical Quantitation Limit	Accuracy ^b (%)	Precision ^b (%)
Arsenic	6010B	15 µg/L	±25	±25
Barium	6010B	10 µg/L	±25	±25
Calcium	6010B	20 µg/L	±25	±25
Chromium	6010B	10 µg/L	±25	±25
Lead	6010B	9 µg/L	±25	±25
Potassium	6010B	3,000 µg/L	±25	±25
Selenium	6010B	15 µg/L	±25	±25
Silicon	6010B	500 µg/L	±25	±25
Sodium	6010B	500 µg/L	±25	±25
Thallium	6010B	15 µg/L	±25	±25
Tin	6010B	100 µg/L	±25	±25
Vanadium	6010B	10 µg/L	±25	±25
Zinc	6010B	10 µg/L	±25	±25
Carbon tetrachloride	8260B	1 µg/L	±25	±25
Trichloroethylene	8260B	1 µg/L	±25	±25
Bromide	300.0A ^d	200 µg/L	±25	±25
Chloride	300.0A ^d	30,000 µg/L	±20	±25
Fluoride	300.0A ^d	500 µg/L	±20	±25
Nitrogen (in nitrite/nitrate)	353.2	1000 µg/L	±20	±25
Sulfate	300.0A ^d	250,000 µg/L	±20	±25
Phosphate	300.0A ^d	500 µg/L	±20	±25
Total dissolved solids	2540C	10,000 µg/L	±20	NA
Total suspended solids	2540D	8000 µg/L	±20	NA
Total organic halides	9020B	30 µg/L	±20	NA
Carbon-14	^e	200 pCi/L	±20	±25
Iodine-129	^e	5 pCi/L	±20	±25
Technetium-99	^e	10 pCi/L	±20	±25
Radium	903.1 ^f	1 pCi/L	±20	±25
Total uranium	^e	0.1 µg/L	±20	±25
Gross alpha	900.0 ^f	3 pCi/L	±20	±25
Gross beta	900.0 ^f	4 pCi/L	±20	±25
Alkalinity	2320B	5,000 µg/L	±20	±25
pH	^g	NA	NA	NA
Specific conductance	^g	25 µS/cm	±20	NA

Analytical Results and Field Data

Table 3-1. List of Baseline Lysimeter Analytes by Analytical Method.

Analyte	Method ^a	Practical Quantitation Limit	Accuracy ^b (%)	Precision ^b (%)
---------	---------------------	------------------------------	---------------------------	----------------------------

^a Method number indicated is from *Test Method for Evaluating Solid Wastes: Physical Chemical Methods* (SW-846) (EPA 1986), unless otherwise specified.

^b Accuracy is expressed as percent recovery; precision is expressed as a percent relative difference.

^c Method specified is from *Methods for Chemical Analysis of Water and Wastes* (Kopp and McKee 1983).

^d Method specified is from *Determination of Inorganic Anions in Aqueous and Solids Samples by Ion Chromatography* (Lindahl 1984), and is a modification of EPA Method 300.0.

^e Industry standard method, laboratory-specific, based on acceptance by Washington Closure Hanford.

^f Method specified is from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1989).

^g Parameter will be measured in the field.

NA = not available, or not applicable

NTU = nephelometric turbidity units

3.2.1 General Approach to Evaluating Results

Lysimeter samples were analyzed in accordance with the requirements of U.S. Environmental Protection Agency SW-846 (EPA 1986), industry standard, or laboratory-specific test methods as presented in Table 3-1. The following data selection and evaluation criteria were applied:

- Quality assurance/quality control (QA/QC) data were evaluated for the purpose of identifying potential collection or analytical problems. However, unless a problem with the data was identified during this review, the results of or a discussion regarding the quality assurance/quality control data were not included in this report.
- All data qualifiers were recorded.
- If the relative percent difference between values reported for main and duplicate samples was greater than 20%, the samples were flagged in the data spreadsheet and the data evaluated to determine their applicability.
- Data acceptance based on a less than 20% relative percent difference criterion was relaxed for analytical results reported at or near the method detection limit (e.g., typically within five times the detection limit). This allows for an expected increased analytical error when values are close to the detection limit.

4.0 ANALYTICAL RESULTS AND FIELD DATA

Analytical results for lysimeter samples collected during CY 2008 are discussed in the following subsections.

Analytical Results and Field Data

4.1 SUMMARY OF LYSIMETER ANALYSIS

Data associated with leachate sampling conducted from CY 2005 through CY 2008 are presented in Appendix A, Table A-1. Analytical results from CY 2008 sampling events are presented in Table 4-1. Only analytical results that were reported as significant detects (>1 ppb) or that were reported as nondetected values but which are on the routine COCs list are included in this report.

Table 4-1. 2008 Lysimeter Analytical Results.

Analyte	Lysimeter Cell 5 July 2008	Lysimeter Cell 5 Dec 2008	Lysimeter Cell 5 Dec 2008	Lysimeter Cell 6 July 2008	Lysimeter Cell 6 July 2008	Lysimeter Cell 6 Dec 2008	Units
Arsenic	5.8	4.9BM	5.2B	9.4	10.7	12B	ug/L
Barium	185	160	150	79.2	78.9	84	ug/L
Calcium	344000	370000	370000	243000	245000	260000	ug/L
Chromium	7.3	8.6B	9.1B	174	175	170	ug/L
Lead	3U	6.5BM	5.7B	3U	3U	2.6U	ug/L
Potassium	22100	23000	22000	21500	21800	23000	ug/l
Selenium	6U	4.9UM	5.6B	12	6U	9B	ug/L
Silicon	24300	29000N	28000	20800	21300	24000	ug/L
Sodium	156000	150000	150000	177000	178000	210000	ug/L
Thallium	6U	4.9UM	4.9U	6U	6U	4.9U	ug/L
Tin	6U	5.8U	5.8U	6U	6U	5.8U	ug/L
Vanadium	26.7	28	28	114	115	120	ug/L
Zinc	70.5	42	46	34.3	29.6	14	ug/L
Carbon tetrachloride	5U	0.19U	0.19U	5U	5U	0.19U	ug/L
Trichloroethylene	5U	0.16U	0.16U	5U	5U	0.16U	ug/L
Bromide	12500UD	110UN	110U	12500UD	12500UD	240	ug/L
Chloride	64600D	56000DN	56000D	82500D	83300D	90000D	ug/L
Fluoride	12500UD	270B	290B	12500UD	12500UD	170B	ug/L
Nitrogen (in nitrite/nitrate)	40500D	45000D	44000D	37500D	38600D	38000D	ug/L
Sulfate	1310000D	1200000D	1200000D	711000D	719000D	870000D	ug/L
Phosphate	12500UD	190UN	190U	12500UD	12500UD	190U	ug/L
Total dissolved solids	2310000	2100000	2100000	1630000	1640000	1600000	ug/L
Total suspended solids	129000	140000D	270000D	5000U	6000	16000	ug/L
Total organic halides	40.5D	38M	36	37.5D	38.6D	37	ug/L
Carbon-14	-9.94U	21.9U	2.04U	-15.7U	19.1U	18U	pCi/L
Iodine-129	-0.404U	-3.58U	-2.19U	0.288U	-0.12U	-2.86U	pCi/L
Technetium-99	0.666U	1.79U	1.34U	1.4U	1.66U	1.24U	pCi/L
Radium	0.8	0.551	0.57	0.03U	0.057U	0.086U	pCi/L
Total uranium	47.3	24.4	21.3	0.253	0.328	0.088	pCi/L
Gross alpha	36.3	30.5	45.7	-4.38U	5.33	-3.28U	pCi/L

Analytical Results and Field Data

Table 4-1. 2008 Lysimeter Analytical Results.

Analyte	Lysimeter Cell 5 July 2008	Lysimeter Cell 5 Dec 2008	Lysimeter Cell 5 Dec 2008	Lysimeter Cell 6 July 2008	Lysimeter Cell 6 July 2008	Lysimeter Cell 6 Dec 2008	Units
Gross beta	31.6	28	30.9	20.3	22.9	25.7	pCi/L
Alkalinity	171000	170000	170000	52600	52600	48000	ug/L
pH	7.7	8	7.9	9.8	9.8	10	pH
Specific conductance	2540	2400	2400	2010	1990	2000	uS/cm

U = Result is nondetected.

D = Result reported from secondary dilution.

M = Sample duplicate precision not met.

B = Organics: Method blanks contamination, Inorganics: Value is an estimate.

N = MS/MSD recovery outside control limits.

The data presented in Table 4-1 is intended to provide a baseline for future comparison and trending. Lysimeter samples contained detectable concentrations of common metals, anions and radionuclides. The following is a brief description of those constituents for which concentrations/activities contained inconsistencies when compared with the other lysimeter.

- **Sulfate.** Soluble salts, such as, sulfate were the primary constituents present within the lysimeter liquid and can be directly correlated to the levels of the primary constituents found within the ad-mix material used to construct the cells as shown in Appendix 1.
- **Total Dissolved Solids.** TDS appeared to be elevated but appeared stable in both lysimeters.
- **Total Suspended Solids.** TSS concentrations appeared to be elevated in both lysimeters.
- **Uranium.** Uranium levels within cell 5 lysimeter appeared to be elevated and appeared to be decreasing in concentration, while cell 6 had very low detectable levels.
- **Gross Alpha.** Gross alpha activity concentrations in cell 5 lysimeter appear elevated when compared to cell 6 lysimeter.
- **Gross Beta.** Gross beta activity, appears to be within a consistent range within both lysimeters.
- **pH.** Both cells appeared to have stable pH levels although pH levels in cell 6 lysimeter are higher in units than cell 5 lysimeter.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the CY 2008 analytical results, an evaluation of lysimeter monitoring data, a review of the water-level measurement data, and a comparison of lysimeter data versus leachate and admix analytical results the following conclusions and recommendations are presented.

The source of the liquid within the lysimeters is from the vadose zone located beneath the ERDF cell liner and is made up of compaction moisture from the admix layer located immediately above the lysimeter, construction water, consolidation water and condensation water. The absence of Technetium-99 within the lysimeter liquid is a very good indicator that the leachate collection system located above the lysimeters is not leaking liquid into the lysimeters. This is based on Tc-99's high solubility and ease of mobility through soils when soluble and that there are no detectable levels of Tc-99 within the lysimeter liquid. Additional supporting evidence is the high sulfate concentration in the lysimeter liquid in comparison to the leachate, indicating there is no effective dilution of the lysimeter liquid.

Soluble salts were the primary constituents present within the lysimeters and can be directly correlated to the levels of the primary constituents found within the ad-mix material used to construct the cells as shown in Appendix 1.

The elevated levels of Uranium and gross alpha in the lysimeter associated with ERDF cell 5 appear to be a result of gross contamination resulting from wind blown material that settled under the Lysimeter's well cap. This wind blown material was observed and slightly disturbed during the June 2008 visual inspection where some of the material fell into the lysimeter causing the introduction of radionuclide material to the lysimeter's collection basin. This material was observed traveling down the lysimeter during the review of the inspection camera's recorded video. Analytical results from the ERDF air monitoring data in 2008 exhibit an increased amount of airborne radionuclide material that may have settled within the lysimeter cap during windy conditions. Further evidence of gross contamination from windborne material is that the liquid within the lysimeters have been filtered through fine grained soils and geo-textiles covering the lysimeter. This in addition to the higher levels of suspended solids within the lysimeter associated with cell 5 verse the lysimeter associated with cell 6 are indicative of gross contamination.

Bi-annual monitoring of the lysimeter systems will continue in CY 2009 and until the leachate system produces an insignificant amount of liquid. CY 2009 will see the introduction of the lysimeters associated with ERDF cells 7 and 8 into the monitoring plan as well as the continued monitoring of the existing lysimeters associated with ERDF cells 5 and 6. A significant dewatering evolution of all lysimeters is scheduled for CY 2009 with the goal to eventually reduce the amount of free liquid within the lysimeters to a minimum. Visual inspections of the lysimeters will also occur prior to and following all dewatering events and prior to all scheduled sampling to occur during CY 2009.

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APPENDIX A
LYSIMETER SAMPLING SUMMARY, 2006 & 2008

Appendix A – Lysimeter Sampling Results Summary, 2006 & 2008

Table A-1. Summary of Lysimeter Sampling Results, 2005 & 2008 (2 Pages).

Constituent	8/24/05 Cell 5	8/24/05 Cell 5	7/9/08 Cell 5	12/31/08 Cell 5	12/31/08 Cell 5	8/24/05 Cell 6	8/24/05 Cell 6	7/9/08 Cell 6	7/9/08 Cell 6	12/31/08 Cell 6	UNITS	AdMix Cell 5&6	UNITS
Arsenic			5.8	4.9BM	5.2B			9.4	10.7	12B	ug/L	3000	ug/kg
Barium			185	160	150			79.2	78.9	84	ug/L	87000	ug/kg
Calcium			344000	370000	370000			243000	245000	260000	ug/L	5800000	ug/kg
Chromium			7.3	8.6B	9.1B			174	175	170	ug/L	6700	ug/kg
Lead			3U	6.5BM	5.7			3U	3U	2.6U	ug/L	5900	ug/kg
Potassium			22100	23000	22000			21500	21800	23000	ug/L	1200000	ug/kg
Selenium			6U	4.9UM	5.6B			12	6U	9B	ug/L	1000U	ug/kg
Silicon			24300	29000N	28000			20800	21300	24000	ug/L	250000	ug/kg
Sodium			156000	150000	150000			177000	178000	210000	ug/L	1700000	ug/kg
Thallium			6U	4.9UM	4.9U			6U	6U	4.9U	ug/L	780U	ug/kg
Tin			6U	5.8U	5.8U			6U	6U	5.8U	ug/L	1100	ug/kg
Vanadium			26.7	28	28			114	115	120	ug/L	40000	ug/kg
Zinc			70.5	42	46			34.3	29.6	14	ug/L	35000	ug/kg
Carbon tetrachloride			5U	0.19U	0.19U			5U	5U	0.19U	ug/L	0.76U	ug/kg
Trichloroethene			5U	0.16U	0.16U			5U	5U	0.16U	ug/L	0.28U	ug/kg
Bromide			12500UD	110UN	110U			12500UD	12500UD	240	ug/L	470U	ug/kg
Chloride	23800	30600	64600D	56000DN	56000D	62800	79000	82500D	83300D	90000D	ug/L	18000M	ug/kg
Fluoride			12500UD	270B	290B			12500UD	12500UD	170B	ug/L	1800BM	ug/kg
Nitrogen (nitrite/nitrate)			40500D	45000D	44000D			37500D	38600D	38000D	ug/L	21000	ug/kg
Sulfate			1310000D	1200000D	1200000D			711000D	719000D	870000D	ug/L	1300000D	ug/kg
Phosphate			12500UD	190UN	190U			12500UD	12500UD	190U	ug/L	600U	ug/kg
TDS			2310000	2100000	2100000			1630000	1640000	1600000	ug/L	N/A	pH
TSS			129000	140000D	270000D			5000U	6000	16000	ug/L	N/A	ug/kg
TOX			46.3	38M	36			30.3	22.1	37	ug/L	25000U	ug/kg
Carbon-14			-9.94U	21.9U	2.04U			-15.7U	19.1U	18U	pCi/L	-0.477U	pCi/g
Iodine-129			-0.404U	-3.58U	-2.19U			0.288U	-0.12U	-2.86U	pCi/L	0.00194U	ug/kg
Technetium-99	0.230U	-0.629U	0.666U	1.79U	1.34U	-0.617U	-3.33U	1.4U	1.66U	1.24U	pCi/L	-0.0262U	pCi/g
Radium			0.8	0.551	0.57			0.03U	0.057U	0.086U	pCi/L	N/A	pCi/g
Uranium (Total)			47.3	24.4	21.3			0.253	0.328	0.088	ug/L	0.00181	pCi/g
Gross alpha	0.262U	-0.345U	36.3	30.5	45.7	0.361U	-0.908U	-4.38U	5.33	-3.28U	pCi/L	4.05U	ug/kg
Gross beta	15.4	15.2	31.6	28	30.9	16.9	16.1	20.3	22.9	25.7	pCi/L	22.9	pCi/g
Alkalinity			171000	170000	170000			52600	52600	48000	ug/L	N/A	ug/kg

Appendix A – Lysimeter Sampling Results Summary, 2006 & 2008

Table A-1. Summary of Lysimeter Sampling Results, 2005 & 2008 (2 Pages).

Constituent	8/24/05 Cell 5	8/24/05 Cell 5	7/9/08 Cell 5	12/31/08 Cell 5	12/31/08 Cell 5	8/24/05 Cell 6	8/24/05 Cell 6	7/9/08 Cell 6	7/9/08 Cell 6	12/31/08 Cell 6	UNITS	AdMix Cell 5&6	UNITS
pH			7.7	8	7.9			9.8	9.8	10	pH	9.4	pH
Specific Conductance			2540	2400	2400			2010	1990	2000	uS/cm	N/A	uS/cm

U = Result is nondetected.
 D = Result reported from secondary dilution.
 M = Sample duplicate precision not met.
 B = Organics: Method blanks contamination, Inorganics: Value is an estimate.
 N = MS/MSD recovery outside control limits.

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