Data Validation Package

July 2009
Groundwater Sampling at the Lakeview, Oregon, Disposal Site

October 2009

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Sampling Event Summary

Site: Lakeview, Oregon, Disposal Site

Sampling Period: July 10–11, 2009

Groundwater monitoring at the Lakeview, Oregon, Disposal Site is performed every 5 years to demonstrate that the disposal cell is not leaching contaminants, as specified in the 1994 *Long-Term Surveillance Plan for the Collins Ranch Disposal Site, Lakeview, Oregon* (now known as the U.S. Department of Energy Lakeview Uranium Mill Tailings Disposal Site Lakeview, Oregon).

Sampling and analysis were conducted as specified in *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PLN/S04351, continually updated). One duplicate sample was collected from location 0608. Water levels were measured at each sampled well and in seven additional wells.

Arsenic, cadmium, and uranium concentrations are monitored in the uppermost aquifer to evaluate disposal cell performance. The concentrations of these analytes were below the Uranium Mill Tailings Remedial Action groundwater standards established in 40 CFR 192.02. There is no indication of any degradation of groundwater in the vicinity of the site.

Ann M. Houska — 10/23/09

Ann Houska
Site Lead, S.M. Stoller

Date

Lakeview, Oregon, Disposal Site Sample Location Map

Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Lakeview, Oregon, Disposal Site	**Date(s) of Water Sampling**	July 10-11, 2009
Date(s) of Verification	September 9, 2009	**Name of Verifier**	Steve Donivan

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures?	Yes	
List other documents, SOPs, instructions.		Work Order Letter dated June 4, 2009.
2. Were the sampling locations specified in the planning documents sampled?	No	Wells 0602, 0603, 0604, and 0605 were not sampled because they were dry.
3. Was a pre-trip calibration conducted as specified in the above-named documents?	Yes	Pre-trip calibration was performed on July 6, 2009.
4. Was an operational check of the field equipment conducted daily?	Yes	
Did the operational checks meet criteria?	Yes	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Was the category of the well documented?	Yes	
7. Were the following conditions met when purging a Category I well:		
Was one pump/tubing volume purged prior to sampling?	Yes	
Did the water level stabilize prior to sampling?	Yes	
Did pH, specific conductance, and turbidity measurements stabilize prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	
If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	

Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	NA	All sampled wells were Category I.
Was one pump/tubing volume removed prior to sampling?		
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate sample was collected at location 0608.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	NA	All wells were sampled with either a peristaltic pump and dedicated tubing or a dedicated bladder pump.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were QC samples assigned a fictitious site identification number?	Yes	Location ID 2793 was used for the duplicate sample.
Was the true identity of the samples recorded on the Quality Assurance Sample Log or in the Field Data Collection System (FDCS) report?	Yes	
13. Were samples collected in the containers specified?	Yes	
14. Were samples filtered and preserved as specified?	Yes	
15. Were the number and types of samples collected as specified?	Yes	
16. Were chain of custody records completed and was sample custody maintained?	Yes	
17. Are field data sheets signed and dated by both team members (hardcopies) or are dates present for the “Date Signed” fields (FDCS)?	Yes	
18. Was all other pertinent information documented on the field data sheets?	Yes	
19. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
20. Were water levels measured at the locations specified in the planning documents?	Yes	

Laboratory Performance Assessment

General Information

Report Number (RIN): 09062422
Sample Event: July 10-11, 2009
Site(s): Lakeview, Oregon, Disposal Site
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Work Order No.: 0907125
Analysis: Metals and Wet Chemistry
Validator: Steve Donivan
Review Date: September 9, 2009

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325, continually updated), "Standard Practice for Validation of Laboratory Data," GT-9(P). The procedure was applied at Level 3, Data Validation. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1 Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Chloride, Cl	MIS-A-039	SW-846 9056	SW-846 9056
Metals: As, Cd, U	LMM-02	SW-846 3005A	SW-846 6020A
Metals: Ca, Fe, K, Mg, Mn, Na, Si	LMM-01	SW-846 3005A	SW-846 6010B
Sulfate, SO_4	MIS-A-044	SW-846 9056	SW-846 9056
Total Dissolved Solids, TDS	WCH-A-033	EPA 160.1	EPA 160.1

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received six water samples on July 14, 2009, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed on the form and that signatures and dates were present indicating sample relinquishment and receipt. The sample submittal documents including the COC form, and the sample tickets had no errors or omissions. A copy of the air waybill label was included with the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact at a temperature of 1.2 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses, and all samples were analyzed within the applicable holding times.

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte	Flag	Reason
0907125-1	0515	Manganese	U	Less than 5 times the method blank
0907125-2	0606	Manganese	U	Less than 5 times the method blank
0907125-3	0607	Manganese	U	Less than 5 times the method blank
0907125-4	0608	Manganese	U	Less than 5 times the method blank
0907125-6	0608 Duplicate	Manganese	U	Less than 5 times the method blank

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods.

Method SW-846 9056, Chloride, Sulfate

Calibration for sulfate was performed using five calibration standards on June 30, 2009. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the method detection limit (MDL). Initial calibration and calibration check standards were prepared from independent sources. Initial and continuing calibration verification checks were made at the required frequency resulting in four verification checks. All calibration checks met the laboratory's acceptance criteria.

Method SW-846 6020A, Metals

Calibration was performed for arsenic on July 17, 2009, and for cadmium and uranium on July 21, 2009. The initial calibration was performed using seven calibration standards resulting in a calibration curve with a correlation coefficient (r^2) value greater than 0.995. The absolute value of the curve intercept was less than 3 times the MDL. Calibration and laboratory spike standards were prepared from independent sources. Initial and continuing calibration verification checks were made at the required frequency resulting in nine verification checks. All initial and continuing calibration verification results were within the acceptance range. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curves near the practical quantitation limit. All check results were within the acceptance range. The mass calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure. Internal standard recoveries were stable and within acceptance ranges.

Method SW-846 6010B, Metals

Calibration was performed for manganese on July 20, 2009. The initial calibrations were performed using one standard and a blank. Calibration and laboratory spike standards were prepared from independent sources. Initial and continuing calibration verification checks were made at the required frequency resulting in nine verification checks. All initial and continuing calibration verification results were within the acceptance range. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curves near the practical quantitation limit. All check results were within the acceptance range.

Method EPA 160.1, TDS

There are no calibration requirements associated with the determination of total dissolved solids.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. All method blank and initial and continuing calibration blank results were below the practical quantitation limits for all analytes. In cases where blank concentration exceeds the instrument detection limit, the associated sample results are qualified with a "U" flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Inductively Coupled Plasma (ICP) Interference Check Sample (ICS) Analysis

ICP interference check samples ICSA and ICSAB were analyzed at the required frequency to verify the instrumental interelement and background correction factors. All check sample results met the acceptance criteria.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike concentration. The spike recoveries met the recovery and precision criteria for all analytes evaluated.

Laboratory Replicate Analysis

The relative percent difference values for the laboratory replicate sample results for all analytes were less than twenty percent, indicating acceptable laboratory precision.

Laboratory Control Samples (LCS)

LCS were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. The LCS results were acceptable for all analysis.

Metals Serial Dilution

Serial dilutions were performed during the metals analysis to monitor physical or chemical interferences that may exist in the sample matrix. Serial dilutions were prepared and analyzed for manganese and uranium. The acceptance criteria were met for both analytes.

Detection Limits/Dilutions

Samples were diluted in a consistent and acceptable manner when required. The samples were diluted prior to analysis of uranium to reduce interferences. The required detection limits were achieved for both analytes.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable (EDD) File

The EDD file arrived on July 23, 2009. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 09062422 **Lab Code:** PAR **Validator:** Steve Donivan **Validation Date:** 9/9/2009

Project: Lakeview Disposal Site **Analysis Type:** ☑ Metals ☑ General Chem ☐ Rad ☐ Organics

# of Samples: 6 **Matrix:** WATER **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☐ Field/Trip Blanks	
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 09062422 **Lab Code:** PAR **Date Due:** 8/11/2009

Matrix: Water **Site Code:** LKV02 **Date Completed:** 7/27/2009

Analyte	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
		Int.	R^2	ICV	CCV	ICB	CCB								
ARSENIC	07/17/2009	0.0000	1.0000	OK	OK	OK	OK	OK	101.0	93.0	103.0	3.0	98.0	8.0	102.0
CADMIUM	07/21/2009	0.0000	1.0000	OK	OK	OK	OK	OK	100.0	98.0	99.0	2.0	95.0		91.0
CALCIUM	07/20/2009			OK	OK	OK	OK	OK	101.0	100.0	101.0	1.0	104.0	4.0	105.0
IRON	07/20/2009			OK	OK	OK	OK	OK	98.0	95.0	95.0	0.0	102.0		98.0
MAGNESIUM	07/20/2009			OK	OK	OK	OK	OK	101.0	100.0	101.0	1.0	104.0	4.0	104.0
MANGANESE	07/20/2009			OK	OK	OK	OK	OK	97.0	96.0	96.0	0.0	94.0		103.0
POTASSIUM	07/20/2009			OK	OK	OK	OK	OK	95.0	99.0	99.0	0.0			84.0
SILICON	07/20/2009			OK	OK	OK	OK	OK	96.0	76.0	78.0	0.0	91.0	5.0	99.0
SODIUM	07/20/2009			OK	OK	OK	OK	OK	95.0	99.0	99.0	0.0		6.0	88.0
URANIUM	07/21/2009	0.0000	1.0000	OK	OK	OK	OK	OK	100.0	101.0	102.0	1.0	109.0	5.0	103.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 09062422 **Lab Code:** PAR **Date Due:** 8/11/2009

Matrix: Water **Site Code:** LKV02 **Date Completed:** 7/27/2009

Analyte	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB						
CHLORIDE	07/14/2009	0.000	1.0000	OK	OK	OK	OK	OK	98.00	102.0	104.0	1.00	
SULFATE	07/14/2009	0.000	1.0000	OK	OK	OK	OK	OK	99.00	106.0	103.0	2.00	
TOTAL DISSOLVED SOLIDS	07/15/2009							OK	96.00			2.00	

Sampling Quality Control Assessment

The following information summarizes and assesses quality control for this sampling event.

Sampling Protocol

Sample results for all monitor wells met the Category I low-flow sampling criteria and were qualified with an "F" flag in the database, indicating the wells were purged and sampled using the low-flow sampling method.

Equipment Blank Assessment

An equipment blank was not required because all wells were sampled with either a peristaltic pump and dedicated tubing or a dedicated bladder pump.

Field Duplicate Assessment

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. A duplicate sample was collected from location 0608. The duplicate results met the U.S. Environmental Protection Agency recommended laboratory duplicate criteria of less than 20 percent relative difference for results that are greater than 5 times the practical quantitation limit demonstrating acceptable precision.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 09062422 **Lab Code:** PAR **Project:** Lakeview Disposal Site **Validation Date:** 9/9/2009

Duplicate: 2793 **Sample:** 0608

Analyte	Sample Result	Sample Flag	Sample Error	Duplicate Result	Duplicate Flag	Duplicate Error	RPD	RER	Units
ARSENIC	4.8			4.7			2.11		UG/L
CADMIUM	0.032	U		0.032	U				UG/L
CALCIUM	27000			27000			0		UG/L
CHLORIDE	4.2			4.3			2.35		MG/L
IRON	34	B		36	B		5.71		UG/L
MAGNESIUM	5500			5600			1.80		UG/L
MANGANESE	1.8	B		1.9	B		5.41		UG/L
POTASSIUM	3700			3700			0		UG/L
Silica	59000			59000			0		UG/L
SILICON	27000			28000			3.64		UG/L
SODIUM	8100			8100			0		UG/L
SULFATE	4.4			4.5			2.25		MG/L
TOTAL DISSOLVED SOLIDS	170			170			0		MG/L
URANIUM	0.45			0.44			2.25		UG/L

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the SEEPro database reports are defined on the last page of each report. All data in this package are considered validated and available for use.

Laboratory Coordinator: Steve Donivan — Date: 10-12-2009

Data Validation Lead: Steve Donivan — Date: 10-12-2009

Attachment 1
Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists the new data that fall outside the historical data range. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

The chloride result from well 0515 and the calcium, magnesium, and total dissolved solids results from well 0606 were identified as potential outliers. The concentrations of these parameters in these wells has shown an upward trend and the data for this event are acceptable as qualified.

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Data Validation Outliers Report - No Field Parameters
Laboratory: PAR
RIN: 09062422
Comparison: All Historical Data
Report Date: 9/9/2009

Site Code	Location Code	Sample Date	Analyte	Current Result	Current Qualifiers Lab	Current Qualifiers Data	Historical Maximum Result	Historical Maximum Qualifiers Lab	Historical Maximum Qualifiers Data	Historical Minimum Result	Historical Minimum Qualifiers Lab	Historical Minimum Qualifiers Data	Number of Data Points N	Number of Data Points N Below Detect	Normally Distributed	Statistical Outlier
LKV02	0515	07/11/2009	CADMIUM	0.000032	U		0.001	U		0.00013	B	F	10	8	No	No
LKV02	0515	07/11/2009	CHLORIDE	4.1			3.43			1	U		10	1	Yes	Yes
LKV02	0515	07/11/2009	POTASSIUM	4.3			5.8			4.4			10	0	Yes	No
LKV02	0606	07/10/2009	CALCIUM	49			42		F	29.5			10	0	Yes	Yes
LKV02	0606	07/10/2009	CHLORIDE	27			6		F	1	U		10	1	No	Yes
LKV02	0606	07/10/2009	MAGNESIUM	11			9.1		F	6.58			10	0	Yes	Yes
LKV02	0606	07/10/2009	SULFATE	38			12			3			10	0	No	Yes
LKV02	0606	07/10/2009	TOTAL DISSOLVED SOLIDS	280			210		F	164	H		10	0	Yes	Yes
LKV02	0607	07/10/2009	POTASSIUM	3.7			5		F	3.9			11	0	Yes	No
LKV02	0607	07/10/2009	SODIUM	9.5			12.9			10			11	0	Yes	No
LKV02	0608	07/10/2009	CHLORIDE	4.2			1.4			1	U	F	11	1	No	Yes
LKV02	0609	07/10/2009	CHLORIDE	0.86			1.51			0.9		F	12	1	Yes	No
LKV02	0609	07/10/2009	IRON	0.094	B		0.05			0.0059	U		12	11	No	Yes
LKV02	0609	07/10/2009	POTASSIUM	3.1			4.5		F	3.3			12	0	Yes	No
LKV02	0609	07/10/2009	SILICA	59			72		F	59.9			12	0	Yes	No
LKV02	0609	07/10/2009	SODIUM	6.7			9.35			7.21			12	0	No	No

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

*	Replicate analysis not within control limits.
>	Result above upper detection limit.
A	TIC is a suspected aldol-condensation product.
B	Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
C	Pesticide result confirmed by GC-MS.
D	Analyte determined in diluted sample.
E	Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
H	Holding time expired, value suspect.
I	Increased detection limit due to required dilution.
J	Estimated
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
P	> 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
U	Analytical result below detection limit.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X,Y,Z	Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

F	Low flow sampling method used.	G	Possible grout contamination, pH > 9.	J	Estimated value.
L	Less than 3 bore volumes purged prior to sampling.	Q	Qualitative result due to sampling technique.	R	Unusable result.
U	Parameter analyzed for but was not detected.	X	Location is undefined.		

STATISTICAL TESTS:

The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test
Outliers are identified using Dixon's Test when there are 25 or fewer data points.
Outliers are identified using Rosner's Test when there are 26 or more data points.
See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

Attachment 2
Data Presentation

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Groundwater Quality Data

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Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 9/29/2009
Location: 0515 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (As CaCO3)	mg/L	07/11/2009	N001	18.47	-	23.47	107		F	#		
Arsenic	mg/L	07/11/2009	N001	18.47	-	23.47	0.0097		F	#	0.00001	
Cadmium	mg/L	07/11/2009	N001	18.47	-	23.47	0.000032	U	F	#	0.000032	
Calcium	mg/L	07/11/2009	N001	18.47	-	23.47	38		F	#	0.0031	
Chloride	mg/L	07/11/2009	N001	18.47	-	23.47	4.1		F	#	0.2	
Iron	mg/L	07/11/2009	N001	18.47	-	23.47	0.0097	B	F	#	0.0013	
Magnesium	mg/L	07/11/2009	N001	18.47	-	23.47	8.4		F	#	0.0075	
Manganese	mg/L	07/11/2009	N001	18.47	-	23.47	0.0013	B	UF	#	0.00012	
Oxidation Reduction Potential	mV	07/11/2009	N001	18.47	-	23.47	209.6		F	#		
pH	s.u.	07/11/2009	N001	18.47	-	23.47	7.08		F	#		
Potassium	mg/L	07/11/2009	N001	18.47	-	23.47	4.3		F	#	0.11	
Silica	mg/L	07/11/2009	N001	18.47	-	23.47	64		F	#	0.0094	
Silicon	mg/L	07/11/2009	N001	18.47	-	23.47	30		F	#	0.0044	
Sodium	mg/L	07/11/2009	N001	18.47	-	23.47	10		F	#	0.0047	
Specific Conductance	umhos /cm	07/11/2009	N001	18.47	-	23.47	280		F	#		
Sulfate	mg/L	07/11/2009	N001	18.47	-	23.47	15		F	#	0.5	
Temperature	C	07/11/2009	N001	18.47	-	23.47	11.53		F	#		
Total Dissolved Solids	mg/L	07/11/2009	N001	18.47	-	23.47	230		F	#	20	
Turbidity	NTU	07/11/2009	N001	18.47	-	23.47	1.34		F	#		
Uranium	mg/L	07/11/2009	N001	18.47	-	23.47	0.00038		F	#	0.0000045	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 9/29/2009
Location: 0606 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (As CaCO3)	mg/L	07/10/2009	N001	136	-	146	111		F	#		
Arsenic	mg/L	07/10/2009	N001	136	-	146	0.012		F	#	0.00001	
Cadmium	mg/L	07/10/2009	N001	136	-	146	0.000032	U	F	#	0.000032	
Calcium	mg/L	07/10/2009	N001	136	-	146	49		F	#	0.0031	
Chloride	mg/L	07/10/2009	N001	136	-	146	27		F	#	1	
Iron	mg/L	07/10/2009	N001	136	-	146	0.0077	B	F	#	0.0013	
Magnesium	mg/L	07/10/2009	N001	136	-	146	11		F	#	0.0075	
Manganese	mg/L	07/10/2009	N001	136	-	146	0.0012	B	UF	#	0.00012	
Oxidation Reduction Potential	mV	07/10/2009	N001	136	-	146	254.9		F	#		
pH	s.u.	07/10/2009	N001	136	-	146	7.98		F	#		
Potassium	mg/L	07/10/2009	N001	136	-	146	4.6		F	#	0.11	
Silica	mg/L	07/10/2009	N001	136	-	146	54		F	#	0.0094	
Silicon	mg/L	07/10/2009	N001	136	-	146	25		F	#	0.0044	
Sodium	mg/L	07/10/2009	N001	136	-	146	11		F	#	0.0047	
Specific Conductance	umhos /cm	07/10/2009	N001	136	-	146	364		F	#		
Sulfate	mg/L	07/10/2009	N001	136	-	146	38		F	#	0.5	
Temperature	C	07/10/2009	N001	136	-	146	12.46		F	#		
Total Dissolved Solids	mg/L	07/10/2009	N001	136	-	146	280		F	#	20	
Turbidity	NTU	07/10/2009	N001	136	-	146	1.35		F	#		
Uranium	mg/L	07/10/2009	N001	136	-	146	0.00095		F	#	0.0000045	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 9/29/2009
Location: 0607 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (As CaCO3)	mg/L	07/10/2009	N001	148	-	158	120		F	#		
Arsenic	mg/L	07/10/2009	N001	148	-	158	0.0073		F	#	0.00001	
Cadmium	mg/L	07/10/2009	N001	148	-	158	0.000032	U	F	#	0.000032	
Calcium	mg/L	07/10/2009	N001	148	-	158	30		F	#	0.0031	
Chloride	mg/L	07/10/2009	N001	148	-	158	1.7		F	#	0.2	
Iron	mg/L	07/10/2009	N001	148	-	158	0.024	B	F	#	0.0013	
Magnesium	mg/L	07/10/2009	N001	148	-	158	6.6		F	#	0.0075	
Manganese	mg/L	07/10/2009	N001	148	-	158	0.0012	B	UF	#	0.00012	
Oxidation Reduction Potential	mV	07/10/2009	N001	148	-	158	305		F	#		
pH	s.u.	07/10/2009	N001	148	-	158	8.07		F	#		
Potassium	mg/L	07/10/2009	N001	148	-	158	3.7		F	#	0.11	
Silica	mg/L	07/10/2009	N001	148	-	158	56		F	#	0.0094	
Silicon	mg/L	07/10/2009	N001	148	-	158	26		F	#	0.0044	
Sodium	mg/L	07/10/2009	N001	148	-	158	9.5		F	#	0.0047	
Specific Conductance	umhos /cm	07/10/2009	N001	148	-	158	223		F	#		
Sulfate	mg/L	07/10/2009	N001	148	-	158	2.6		F	#	0.5	
Temperature	C	07/10/2009	N001	148	-	158	12.34		F	#		
Total Dissolved Solids	mg/L	07/10/2009	N001	148	-	158	180		F	#	20	
Turbidity	NTU	07/10/2009	N001	148	-	158	1.36		F	#		
Uranium	mg/L	07/10/2009	N001	148	-	158	0.00078		F	#	0.0000045	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 9/29/2009
Location: 0608 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (As CaCO3)	mg/L	07/10/2009	N001	158.21	-	168.21	108		F	#		
Arsenic	mg/L	07/10/2009	N001	158.21	-	168.21	0.0048		F	#	0.00001	
Arsenic	mg/L	07/10/2009	N002	158.21	-	168.21	0.0047		F	#	0.00001	
Cadmium	mg/L	07/10/2009	N001	158.21	-	168.21	0.000032	U	F	#	0.000032	
Cadmium	mg/L	07/10/2009	N002	158.21	-	168.21	0.000032	U	F	#	0.000032	
Calcium	mg/L	07/10/2009	N001	158.21	-	168.21	27		F	#	0.0031	
Calcium	mg/L	07/10/2009	N002	158.21	-	168.21	27		F	#	0.0031	
Chloride	mg/L	07/10/2009	N001	158.21	-	168.21	4.2		F	#	0.2	
Chloride	mg/L	07/10/2009	N002	158.21	-	168.21	4.3		F	#	0.2	
Iron	mg/L	07/10/2009	N001	158.21	-	168.21	0.034	B	F	#	0.0013	
Iron	mg/L	07/10/2009	N002	158.21	-	168.21	0.036	B	F	#	0.0013	
Magnesium	mg/L	07/10/2009	N001	158.21	-	168.21	5.5		F	#	0.0075	
Magnesium	mg/L	07/10/2009	N002	158.21	-	168.21	5.6		F	#	0.0075	
Manganese	mg/L	07/10/2009	N001	158.21	-	168.21	0.0018	B	UF	#	0.00012	
Manganese	mg/L	07/10/2009	N002	158.21	-	168.21	0.0019	B	UF	#	0.00012	
Oxidation Reduction Potential	mV	07/10/2009	N001	158.21	-	168.21	362.7		F	#		
pH	s.u.	07/10/2009	N001	158.21	-	168.21	8.12		F	#		
Potassium	mg/L	07/10/2009	N001	158.21	-	168.21	3.7		F	#	0.11	
Potassium	mg/L	07/10/2009	N002	158.21	-	168.21	3.7		F	#	0.11	
Silica	mg/L	07/10/2009	N001	158.21	-	168.21	59		F	#	0.0094	
Silica	mg/L	07/10/2009	N002	158.21	-	168.21	59		F	#	0.0094	
Silicon	mg/L	07/10/2009	N001	158.21	-	168.21	27		F	#	0.0044	
Silicon	mg/L	07/10/2009	N002	158.21	-	168.21	28		F	#	0.0044	
Sodium	mg/L	07/10/2009	N001	158.21	-	168.21	8.1		F	#	0.0047	
Sodium	mg/L	07/10/2009	N002	158.21	-	168.21	8.1		F	#	0.0047	
Specific Conductance	umhos /cm	07/10/2009	N001	158.21	-	168.21	200		F	#		
Sulfate	mg/L	07/10/2009	N001	158.21	-	168.21	4.4		F	#	0.5	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 9/29/2009
Location: 0608 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Sulfate	mg/L	07/10/2009	N002	158.21	-	168.21	4.5		F	#	0.5	
Temperature	C	07/10/2009	N001	158.21	-	168.21	11.91		F	#		
Total Dissolved Solids	mg/L	07/10/2009	N001	158.21	-	168.21	170		F	#	20	
Total Dissolved Solids	mg/L	07/10/2009	N002	158.21	-	168.21	170		F	#	20	
Turbidity	NTU	07/10/2009	N001	158.21	-	168.21	1.72		F	#		
Uranium	mg/L	07/10/2009	N001	158.21	-	168.21	0.00045		F	#	0.0000045	
Uranium	mg/L	07/10/2009	N002	158.21	-	168.21	0.00044		F	#	0.0000045	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 9/29/2009
Location: 0609 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (As CaCO3)	mg/L	07/10/2009	N001	144.65	-	154.65	53		F	#		
Arsenic	mg/L	07/10/2009	N001	144.65	-	154.65	0.00064		F	#	0.00001	
Cadmium	mg/L	07/10/2009	N001	144.65	-	154.65	0.000032	U	F	#	0.000032	
Calcium	mg/L	07/10/2009	N001	144.65	-	154.65	13		F	#	0.0031	
Chloride	mg/L	07/10/2009	N001	144.65	-	154.65	0.86		F	#	0.2	
Iron	mg/L	07/10/2009	N001	144.65	-	154.65	0.094	B	F	#	0.0013	
Magnesium	mg/L	07/10/2009	N001	144.65	-	154.65	4.5		F	#	0.0075	
Manganese	mg/L	07/10/2009	N001	144.65	-	154.65	0.0038	B	F	#	0.00012	
Oxidation Reduction Potential	mV	07/10/2009	N001	144.65	-	154.65	246.3		F	#		
pH	s.u.	07/10/2009	N001	144.65	-	154.65	7.68		F	#		
Potassium	mg/L	07/10/2009	N001	144.65	-	154.65	3.1		F	#	0.11	
Silica	mg/L	07/10/2009	N001	144.65	-	154.65	59		F	#	0.0094	
Silicon	mg/L	07/10/2009	N001	144.65	-	154.65	27		F	#	0.0044	
Sodium	mg/L	07/10/2009	N001	144.65	-	154.65	6.7		F	#	0.0047	
Specific Conductance	umhos /cm	07/10/2009	N001	144.65	-	154.65	130		F	#		
Sulfate	mg/L	07/10/2009	N001	144.65	-	154.65	0.75		F	#	0.5	
Temperature	C	07/10/2009	N001	144.65	-	154.65	12.97		F	#		
Total Dissolved Solids	mg/L	07/10/2009	N001	144.65	-	154.65	130		F	#	20	
Turbidity	NTU	07/10/2009	N001	144.65	-	154.65	2.58		F	#		
Uranium	mg/L	07/10/2009	N001	144.65	-	154.65	0.00013		F	#	0.0000045	

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:
- * Replicate analysis not within control limits.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.

E	Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
H	Holding time expired, value suspect.
I	Increased detection limit due to required dilution.
J	Estimated
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
P	> 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
U	Analytical result below detection limit.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X,Y,Z	Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

F	Low flow sampling method used.	G	Possible grout contamination, pH > 9.	J	Estimated value.
L	Less than 3 bore volumes purged prior to sampling.	Q	Qualitative result due to sampling technique.	R	Unusable result.
U	Parameter analyzed for but was not detected.	X	Location is undefined.		

QA QUALIFIER:

#	Validated according to quality assurance guidelines.

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Static Water Level Data

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STATIC WATER LEVELS (USEE700) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 9/29/2009

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Measurement Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0513	N	4891.97	07/11/2009	09:16:00	19.42	4872.55	
0514	N	4888.08	07/11/2009	09:17:00	7.14	4880.94	
0515	N	4875.81	07/11/2009	08:50:49	12.9	4862.91	
0516	N	4894.37	07/11/2009	09:18:00	8.84	4885.53	
0520	C	4942.03	07/11/2009	09:55:00	91.46	4850.57	
0521	D	4931.85	07/11/2009	10:00:00	91.91	4839.94	
0522	D	4910.04	07/11/2009	09:55:00	75.76	4834.28	
0523	D	4893.73	07/11/2009	09:56:00	56.98	4836.75	
0602	D	4965.02	07/10/2009	15:41:00			D
0603	D	4968.9	07/10/2009	16:14:00			D
0604	D	4962.82	07/10/2009	16:21:00			D
0605	D	4955.58	07/10/2009	16:55:00			D
0606	D	4955.56	07/10/2009	17:40:57	104.89	4850.67	
0607	D	4963.2	07/10/2009	16:45:02	112.91	4850.29	
0608	D	4968.7	07/10/2009	16:10:21	118.62	4850.08	
0609	D	4965.56	07/10/2009	15:20:56	114.01	4851.55	

FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWN GRADIENT F OFF SITE
N UNKNOWN O ON SITE U UPGRADIENT

WATER LEVEL FLAGS: D Dry F FLOWING

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Time-Concentration Graphs

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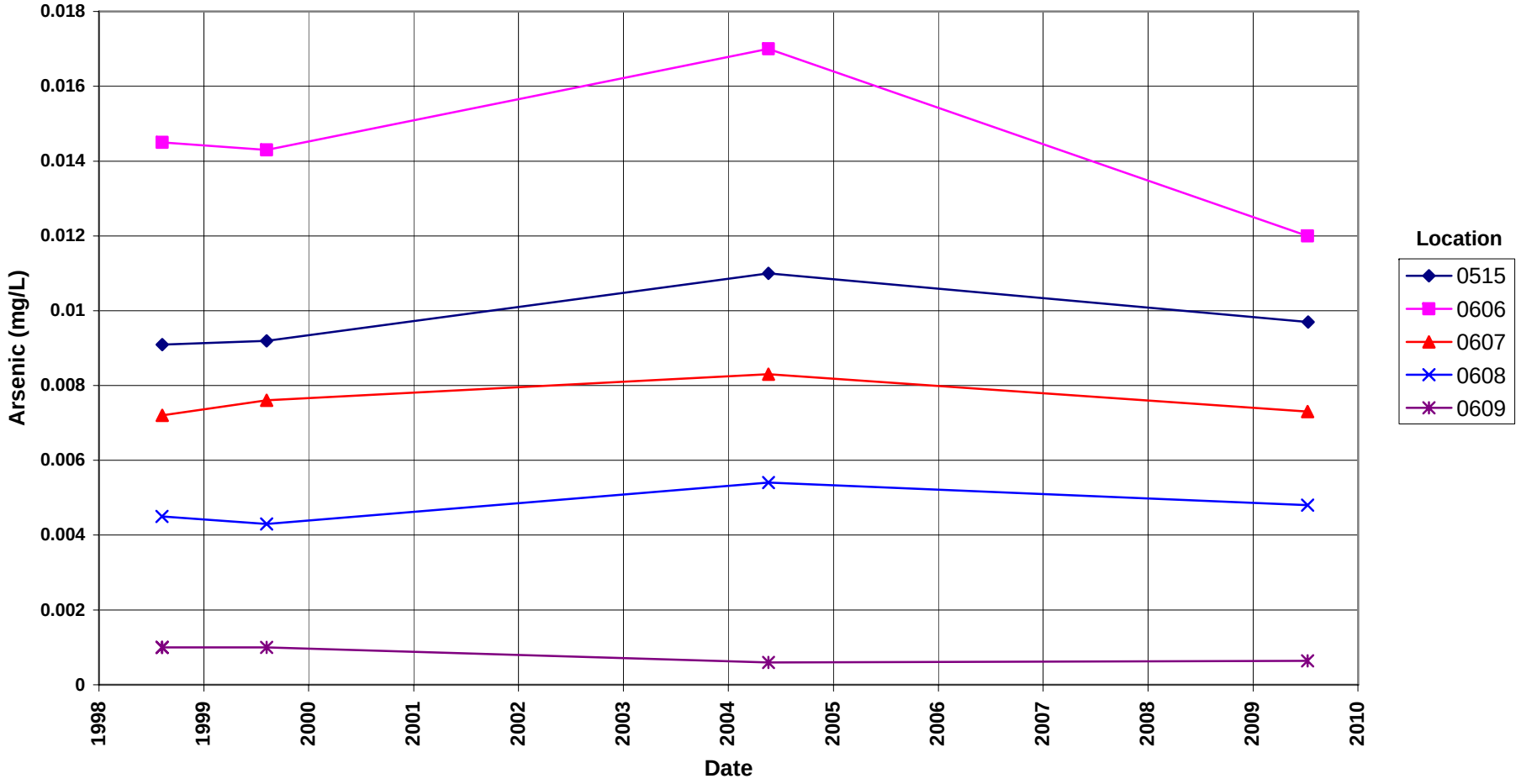
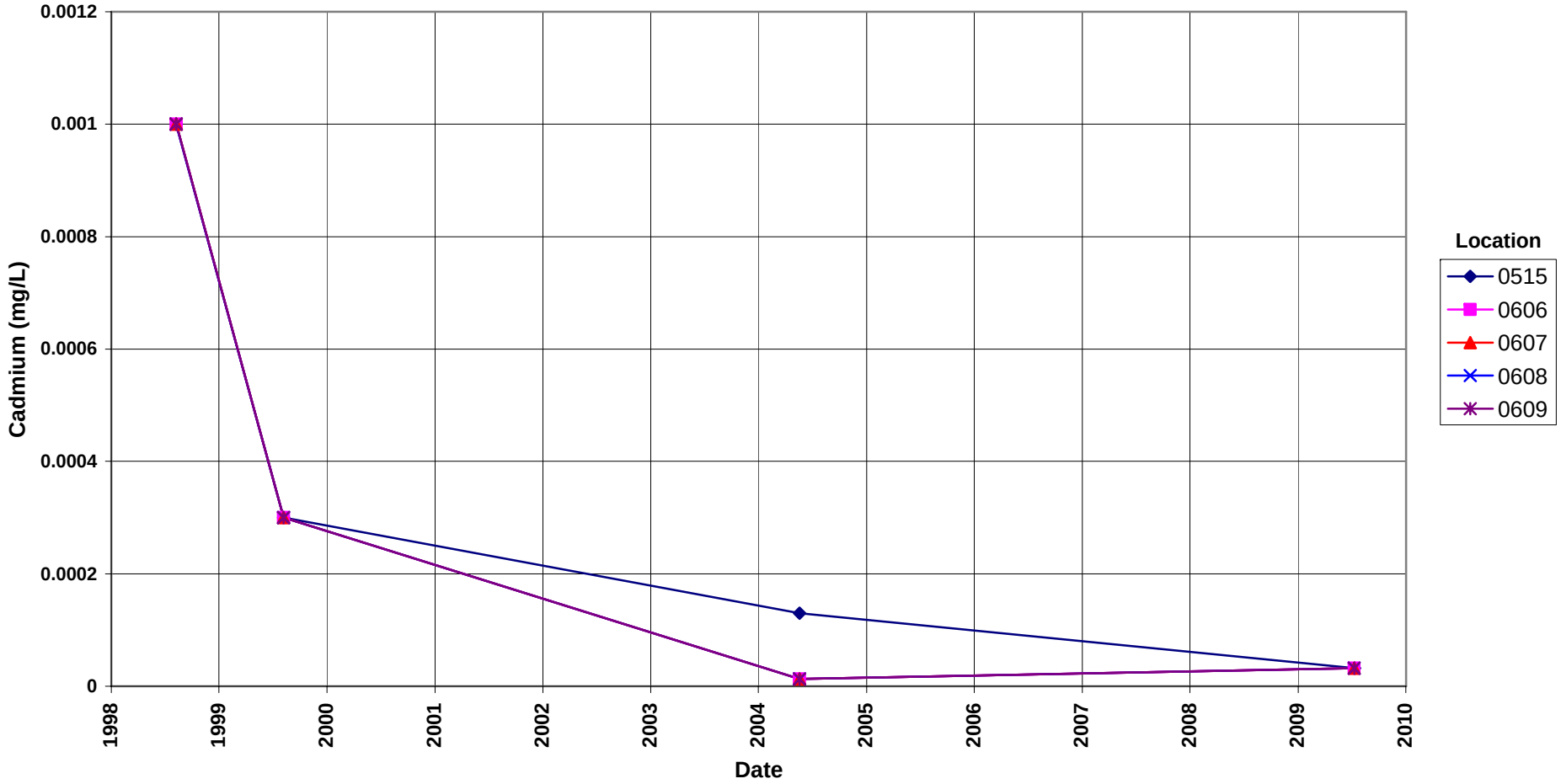
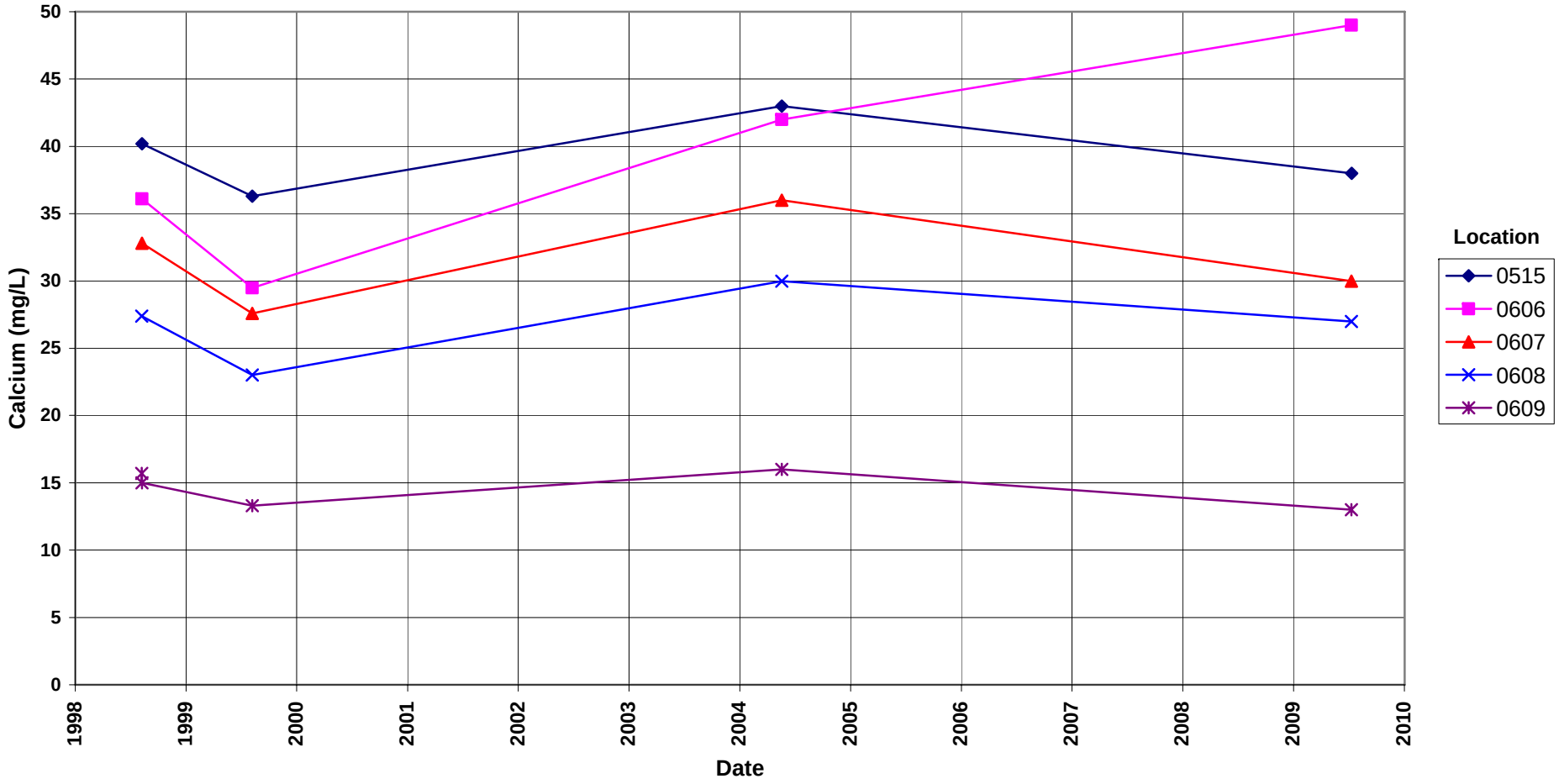
Lakeview Disposal Site
Arsenic Concentration
40 CFR 192.02 Maximum Contaminant Level (MCL) = 0.05 mg/L

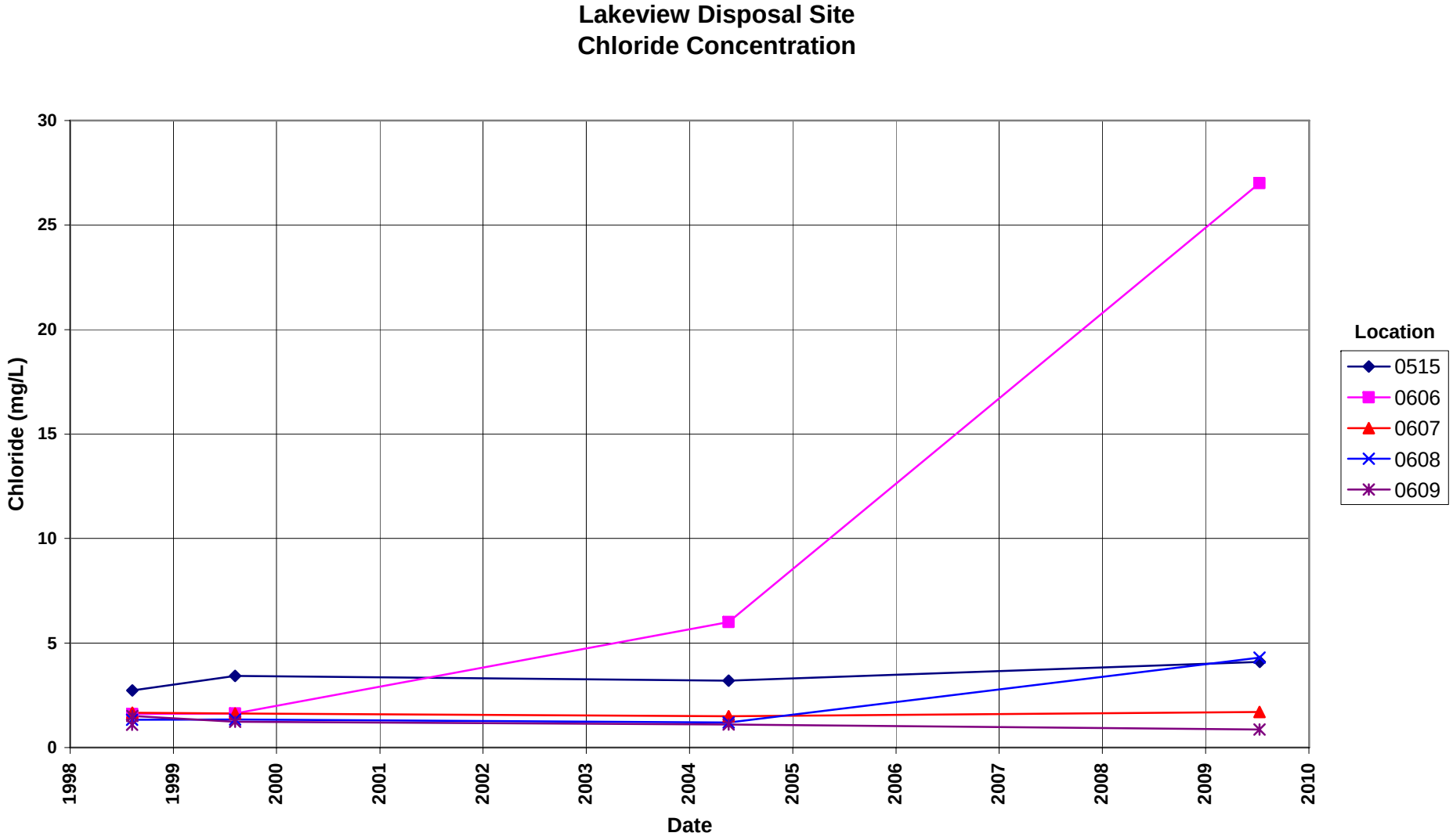


Lakeview Disposal Site
Cadmium Concentration
40 CFR 192.02 Maximum Contaminant Level (MCL) = 0.01 mg/L

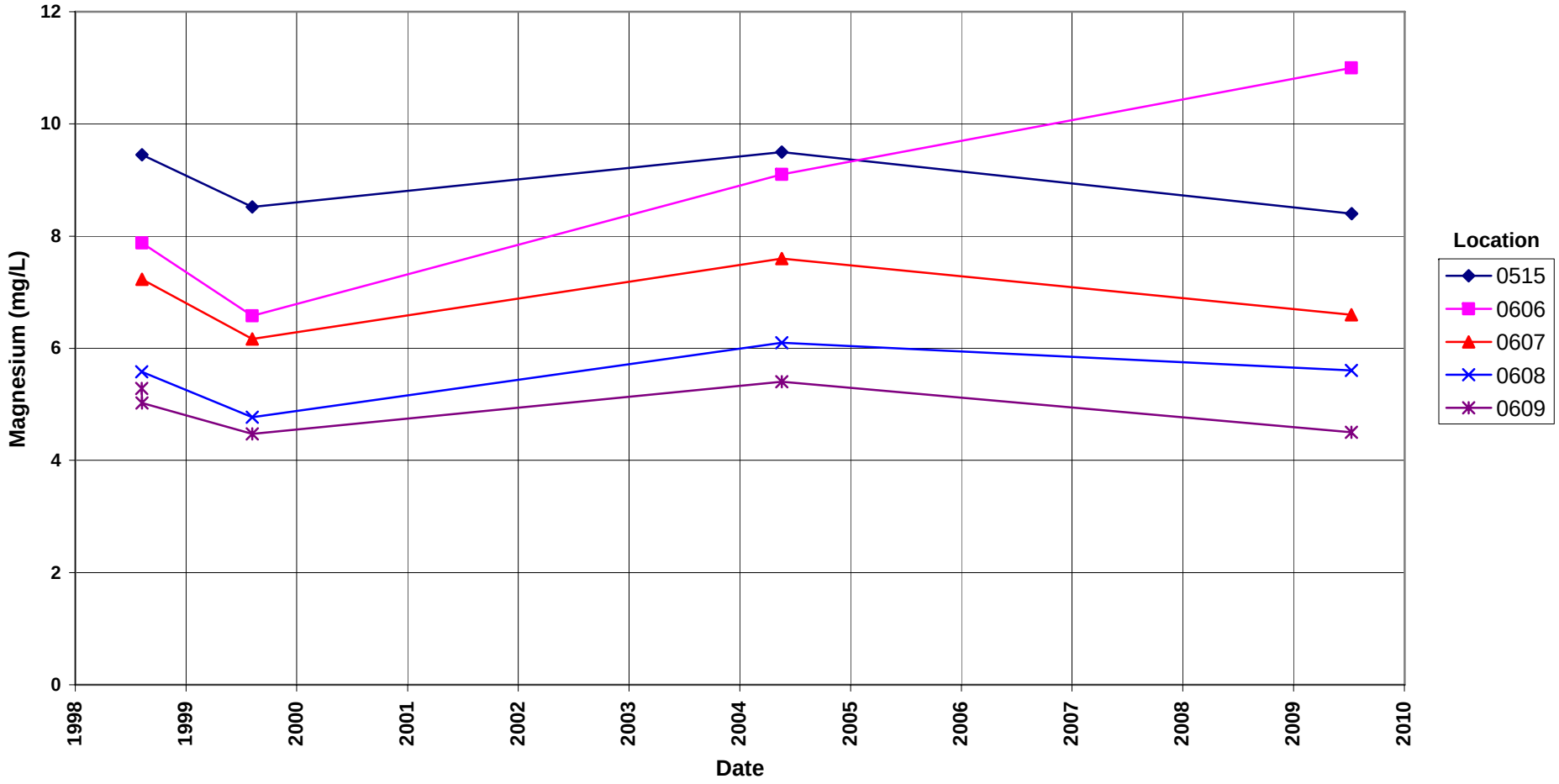


Lakeview Disposal Site
Calcium Concentration

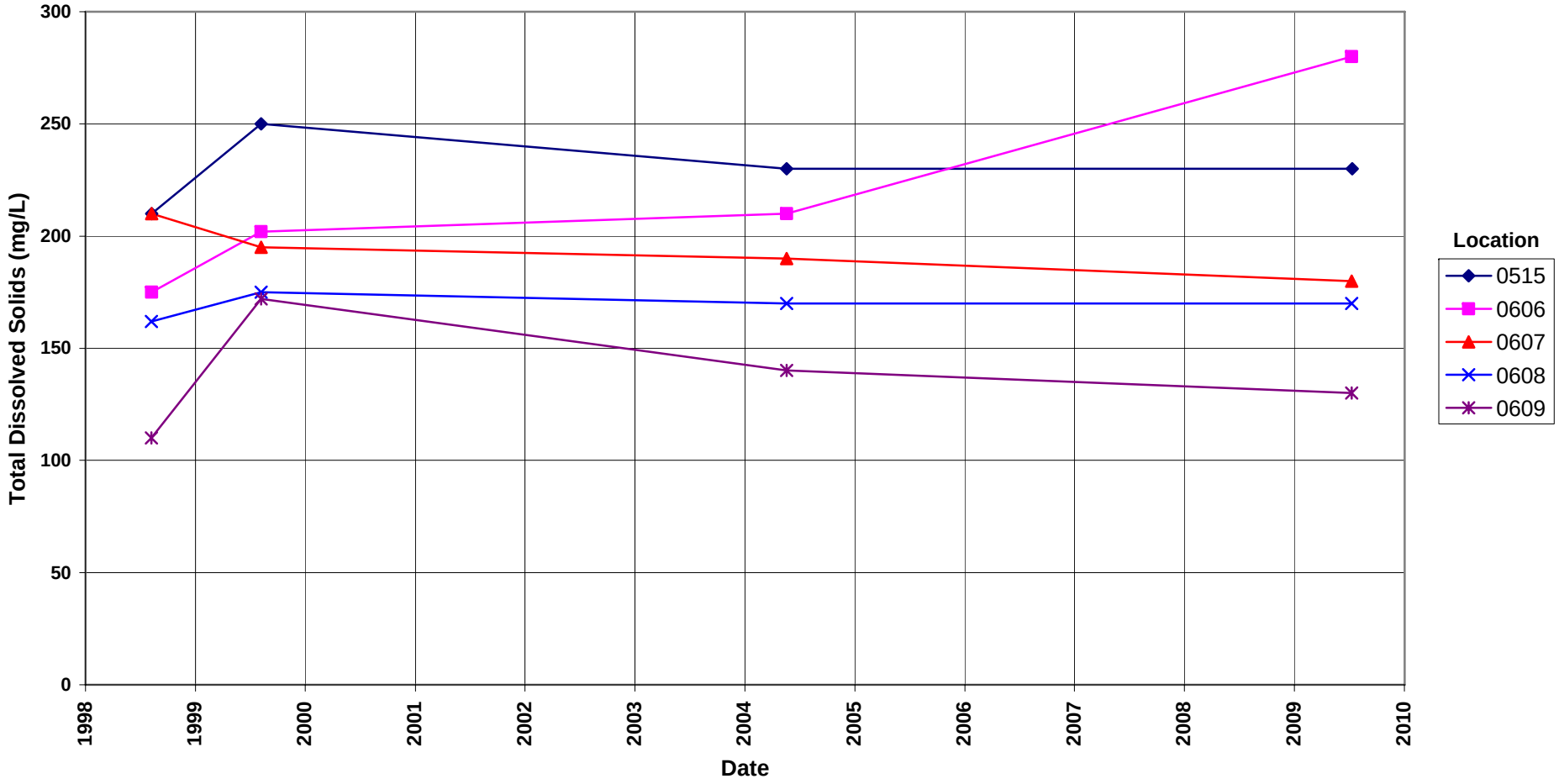



Lakeview Disposal Site
Chloride Concentration
Chloride (mg/L)
30
25
20
15
10
5
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Date
Location
0515
0606
0607
0608
0609

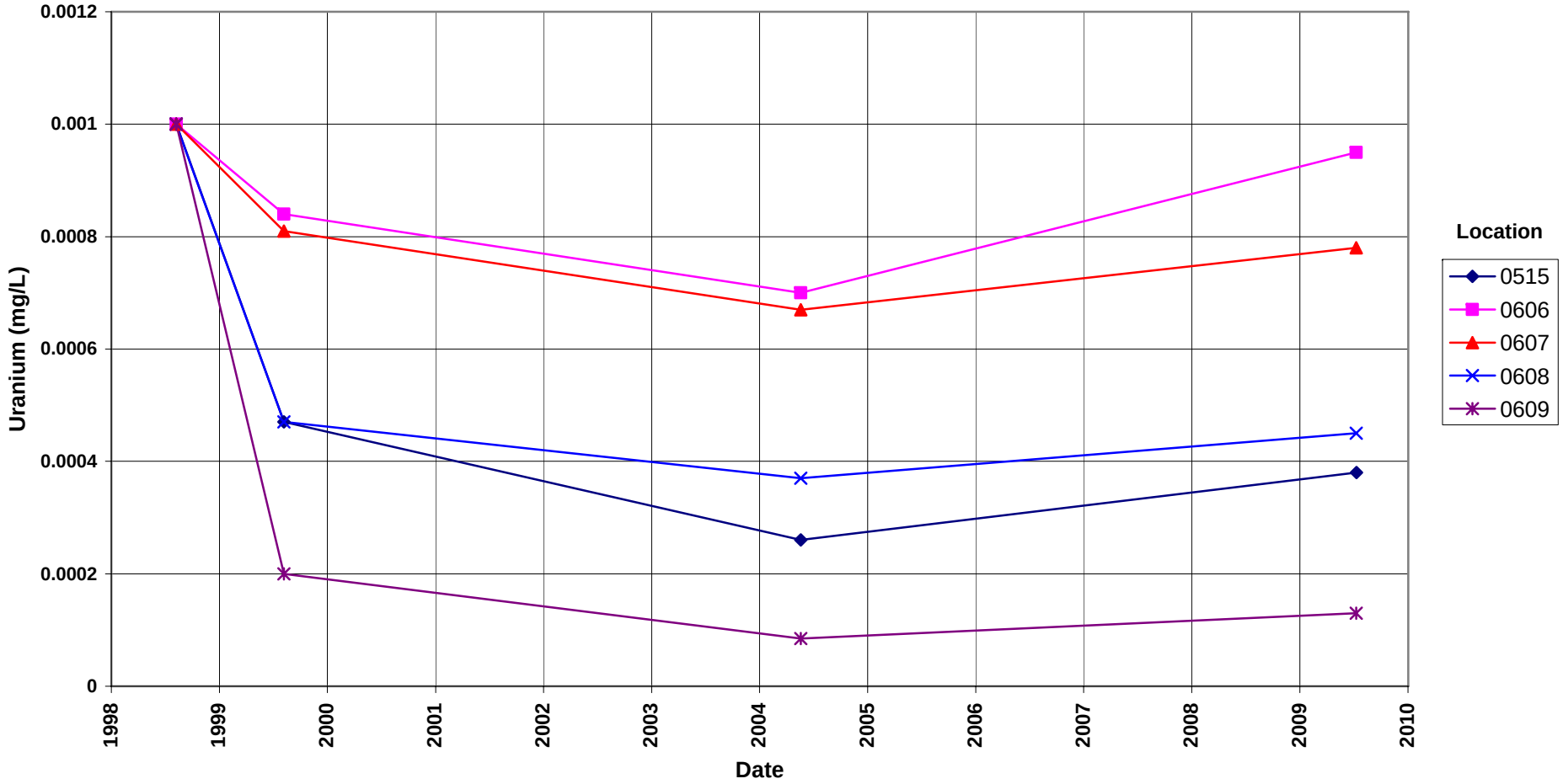
Lakeview Disposal Site
Magnesium Concentration



Lakeview Disposal Site
Total Dissolved Solids Concentration



Lakeview Disposal Site
Uranium Concentration
40 CFR 192.02 Maximum Contaminant Level (MCL) = 0.044 mg/L



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Attachment 3
Sampling and Analysis Work Order

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Task Order LM00-501
Control Number 09-0656

June 4, 2009

U.S. Department of Energy
Office of Legacy Management
ATTN: Jalena Dayvault
Site Manager
2597 B ¾ Road
Grand Junction, CO 81503

SUBJECT: Contract No. DE-AM01-07LM00060, Stoller
July 2009 Environmental Sampling at Lakeview, Oregon

REFERENCE: Task Order LM-501-02-109-402, Lakeview, OR, Disposal Site

Dear Ms. Dayvault:

The purpose of this letter is to inform you of the upcoming sampling event at Lakeview, OR. Enclosed are the maps and tables specifying sample locations and analytes for groundwater monitoring at the Lakeview Disposal and Processing Sites. Water quality data will be collected at the Disposal Site as part of the routine environmental sampling currently scheduled to begin the week of July 6, 2009. Water quality data also will be collected for uranium analysis at the two well locations that were inadvertently missed during the May 2008 Processing Site groundwater monitoring event.

The following lists show the monitor wells (with zone of completion) scheduled to be sampled during this event.

Monitor Wells*
LKV01 Processing Site
509 Sp 540 Al

LKV02 Disposal Site
515 Sp 603 Al 605 Al 606 Cl 607 Al 608 Al 609 Cl
602 Al 604 Al

*NOTE: Al = alluvium; Cl = Lean Clays, Sandy Clays, or Gravelly Clays; Sp = Sand or Gravelly Sand, Poorly Graded

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*. Additionally, although not typically done, water-level measurements will be collected at seven wells associated with the Disposal Site to obtain

hydrogeological information. These wells include: 513, 514, 516, 520, 521, 522, and 523. No water quality samples will be collected from these wells.

Access agreements are being reviewed and are expected to be complete by the beginning of fieldwork.

Please call me at (970) 248-6579 if you have any questions.

Sincerely,

Ann Houska
Site Lead

AH/lcg/lb

Enclosures (4)

cc: (electronic)
Cheri Bahrke, Stoller
Steve Donivan, Stoller
Bev Gallagher, Stoller
Lauren Goodknight, Stoller
Ann Houska, Stoller
EDD Delivery
rc-grand.junction

Constituent Sampling Breakdown

Site	Lakeview				
Analyte	Groundwater		Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	5				
Field Measurements					
Alkalinity	X				
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements	***Disposal Site***	***Processing Site***			
Aluminum					
Ammonia as N (NH3-N)					
Arsenic	X		0.0001	SW-846 6020	LMM-02
Cadmium	X		0.001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SW-846 9056	WCH-A-039
Gross Alpha					
Gross Beta					
Iron	X		0.05	SW-846 6020	LMM-02
Lead					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese	X		0.005	SW-846 6010	LMM-01
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium	X		1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium					
Silica	X		0.1	SW-846 6010	LMM-01
Sodium	X		1	SW-846 6010	LMM-01
Strontium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Total Organic Carbon					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	13	1			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

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Attachment 4
Trip Report

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Stoller established 1959
Grand Junction Office

Memorandum

DATE: July 21, 2009

TO: Ann Houska

FROM: Gretchen Baer

SUBJECT: Trip Report

Site: Lakeview, Oregon, Disposal and Processing Sites

Dates of Sampling Event: July 10-11, 2009

Team Members: Gretchen Baer and David Atkinson

Number of Locations Sampled: At the Disposal Site (LKV02), five monitor wells were sampled for total dissolved solids, chloride, sulfate, arsenic, cadmium, calcium, iron, magnesium, manganese, potassium, silica, sodium, and uranium. Water levels at seven wells were also measured. At the Processing Site (LKV01), two monitor wells were sampled for uranium.

Locations Not Sampled/Reason: Wells 0602, 0603, 0604, and 0605 were not sampled because they were dry.

Location Specific Information:

Location IDs	Site	Comments
0509	LKV01	Well pad is undermined by several inches and the casing is loose. This does not yet appear to negatively affect the water or the ability to sample. This condition was also observed at the nearby well **0510**, which was not scheduled for sampling.
0540	LKV01	Turbidity criteria were not met in this Cat I well. Sample was filtered.
0602, 0603, 0604, 0605	LKV02	Dry at 110 ft, 112 ft, 102 ft, and 102 ft, respectively.
0606	LKV02	Installed a dedicated 2-ft PVC pump on 7/10/09. Intake = 143 ft. Returned ~4 hours later to sample.
0609	LKV02	A small brass fitting was inadvertently dropped into the well during sampling.

Quality Control Sample Cross Reference: The following are the false identifications assigned to the quality control samples.

False ID	Ticket Number	True ID	Sample Type	Associated Matrix
2793	HHU 960	0608	Disposal Site Duplicate	Groundwater
2613	HHU 970	0509	Processing Site Duplicate	Groundwater

Report Identification Number (RIN) Assigned: Disposal Site samples were assigned to RIN 09062422 and Processing Site samples were assigned to RIN 09062426.

Sample Shipment: Samples were shipped overnight by FedEx to ALS Laboratory Group, Fort Collins, Colorado, from Grand Junction on July 13, 2009.

Water Level Measurements: Water levels were collected in all sampled wells and in seven additional wells at the Disposal Site (0513, 0514, 0516, 0520, 0521, 0522, and 0523).

Well Inspection Summary: Inspections were conducted at all sampled wells. All wells were in good condition, with the exception that wells 0509 and 0510 have well pads that are undermined, as noted above in Location Specific Information.

Field Variance: All times recorded during this event, including those for all water levels, are MDT.

Equipment: All wells were sampled using the low-flow procedure with either a peristaltic pump and dedicated tubing or a dedicated bladder pump. Water level measurements were recorded on the hand-held PDA at the seven water-level-only locations.

Institutional Controls

Fences, Gates, Locks: The gates used to access the disposal cell were kept closed and locked during and after sampling. At the landowner's gate, the 3359 key worked on a lock; the combination 3-2-5-9 also opened another of the locks.
Signs: OK
Trespassing/Site Disturbances: None observed.

Site Issues: Cell phone service (Verizon) was available at the site.

Disposal Cell/Drainage Structure Integrity: No issues observed.
Vegetation/Noxious Weed Concerns: None observed.
Maintenance Requirements: None observed.
Safety Issues: None.

Access Issues: In previous sampling events, access to the two Processing Site wells was impeded by water in the ditches; all ditches were dry for this event. Samplers contacted the landowner at the Disposal Site (Mr. Byers, 541-260-0458) to let him know when sampling would be concluded.

Corrective Action Required/Taken: None.

Notes for Future Sampling Events:

- Small-diameter tubing (used to push out stagnant water above ground level) should be left at the Disposal Site bladder pump wells.
- A bailer should be available in case wells 0602, 0603, 0604, or 0605 have water.

(GRB/lcg)

cc: (electronic)
Jalena Dayvault, DOE
Cheri Bahrke, Stoller
Steve Donivan, Stoller
EDD Delivery

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