

Data Validation Package

**August 2016
Groundwater Sampling at the
Grand Junction, Colorado,
Disposal Site**

February 2017



U.S. DEPARTMENT OF
ENERGY

Legacy
Management

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Contents

Sampling Event Summary	1
Data Assessment Summary.....	3
Water Sampling Field Activities Verification Checklist	5
Laboratory Performance Assessment	7
Sampling Quality Control Assessment	17
Certification	19
Grand Junction, Colorado, Disposal Site Planned Sample Locations	25

Attachment 1—Sampling and Analysis Work Order

Attachment 2—Trip Report

Attachment 3—Data Presentation

Groundwater Quality Data
Static Water Level Data
Hydrograph
Time-Concentration Graphs

Attachment 4—Assessment of Anomalous Data

Potential Outliers Report

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Sampling Event Summary

Site: Grand Junction, Colorado, Disposal Site

Sampling Period: August 4, 2016

The 1998 *Interim Long-Term Surveillance Plan for the Cheney Disposal Site Near Grand Junction, Colorado*, requires annual monitoring to assess the performance of the disposal cell. Monitoring wells 0731, 0732, and 0733 were sampled as specified in the plan. Planned monitoring locations are shown in Attachment 1, Sampling and Analysis Work Order.

Sampling and analyses were conducted in accordance with *Sampling and Analysis Plan for the U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351, continually updated)*.

The water level was measured at each sampled well. See Attachment 2, Trip Report for additional details. The water level in well 0733, located in the disposal cell, is lower than water levels in adjacent wells 0731 and 0732, indicating a hydraulic gradient toward the disposal cell. The hydrograph (Attachment 3) shows stable water levels in well 0733 over the past several years.

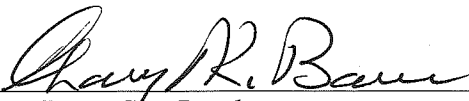
Results from this sampling event were generally consistent with results from the past as shown in the attached concentration-versus-time graphs. There have been no large changes in contaminant concentration observed over the last several years with the following exception. The uranium concentration in well 0733 has been trending upward since 2003. Higher uranium concentrations are expected in this well because it is located in the disposal cell. The selenium concentrations observed in wells 0731 and 0732 are elevated when compared to the disposal cell well 0733. Wells 0731 and 0732 are completed at the alluvium/Mancos contact; here, elevated selenium concentrations are expected due to contributions from the Mancos shale. An assessment of anomalous data is included in Attachment 4.

Wells with sample concentrations that exceeded U.S. Environmental Protection Agency (EPA) groundwater standards (40 CFR 192) are listed in Table 1.

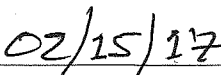
Table 1. Grand Junction Disposal Site Wells where EPA Standards were Exceeded in August 2016

Analyte	Standard ^a	Location	Concentration
Nitrate + Nitrite as Nitrogen	10	0731	37
		0732	37
Selenium	0.01	0731	0.54
		0732	0.37
Uranium	0.044	0731	0.045
		0733	0.19

^a Standards are listed in 40 CFR 192.02 Table 1 to subpart A; units are in milligrams per liter (mg/L).



Gary Baur, Site Lead
Navarro Research and Engineering, Inc.



Date

Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Grand Junction, Colorado, Disposal Site	Date(s) of Water Sampling	August 4, 2016
Date(s) of Verification	January 6, 2017	Name of Verifier	Stephen Donovan

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures? List any Program Directives or other documents, SOPs, instructions.	Yes	Work Order letter dated July 7, 2016.
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Were field equipment calibrations conducted as specified in the above-named documents?	Yes	Calibrations were performed on August 3, 2016.
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	Yes	Yes
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Were wells categorized correctly?	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 meet criteria prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	

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 wells met Category I criteria.
Was one pump/tubing volume removed prior to sampling?	NA	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate sample was collected from well 0732.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	Dedicated equipment was used for all sample collection.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were the true identities of the QC samples documented?	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. Was all pertinent information documented on the field data sheets?	Yes	
18. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
19. Were water levels measured at the locations specified in the planning documents?	Yes	

Laboratory Performance Assessment

General Information

Task ID: GRJ03.1-16080001
Sample Event: August 4, 2016
Site(s): Grand Junction, Colorado, Disposal Site
Laboratory: ALS Laboratory Group
Work Order No.: 1608114
Analysis: Metals, Organics, and Wet Chemistry
Validator: Stephen Donivan
Review Date: January 6, 2017

This validation was performed according to the “Standard Practice for Validation of Environmental Data” found in Appendix A of the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, <https://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites>). The procedure was applied at Level 3, Data Validation.

This validation includes the evaluation of data quality indicators (DQIs) associated with the data. DQIs are the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of the data. Indicators of data quality include the analysis of laboratory control samples to assess accuracy; duplicates and replicates to assess precision; and interference check samples to assess bias (see Figures 1–4, Data Validation Worksheets). The DQIs comparability, completeness, and sensitivity are also evaluated in the sections to follow.

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 2.

Table 2. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Metals: Mo, Se, U, V	LMM-02	SW-846 3005A	SW-846 6020A
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2
Polychlorinated Biphenyls (PCBs)	PEP-A-006	SW-846 3520C, 3665A	SW-846 8082
Sulfate	MIS-A-044	SW-846 9056	SW-846 9056
Total Dissolved Solids (TDS)	WCH-A-033	EPA 160.1	EPA 160.1

Data Qualifier Summary

Analytical results were qualified as listed in Table 3. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 3. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1608114-1	0731	TDS	J	Laboratory replicate result

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received four water samples on August 5, 2016, accompanied by Chain of Custody (COC) forms. The receiving documentation included copies of the air bills. The COC forms were checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced coolers at 3.8 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

A method detection limit (MDL) is defined in 40 CFR 136 as the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDLs reported by the laboratory were compared to the required MDLs to assess the sensitivity of the analyses and were in compliance with contractual requirements.

The practical quantitation limit (PQL) for an analyte, defined as 5 times the MDL, is the lowest concentration that can be quantitatively measured, and is used when evaluating laboratory method performance in the sections below.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification (ICV) demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification (CCV) demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method EPA 160.1, TDS

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

Method EPA 353.2, Nitrate + Nitrite as N

Calibrations for nitrate + nitrite as N were performed using seven calibration standards on August 7, 2016. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All calibration check results were within the acceptance criteria.

Method SW-846 6020A, Mo, Se, U, V

Calibrations for molybdenum, selenium, uranium, and vanadium were performed on August 10, 2016, using four calibration standards. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

Method SW-846 8082, PCBs

The initial calibrations for PCBs were performed using seven calibration standards on May 17, 2016. Calibration curves were established using linear regression. Linear regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All calibration checks met the acceptance criteria for all analytes on both gas chromatography columns. PCBs were not detected in any field sample.

Method SW-846 9056, Sulfate

Calibrations were performed using seven calibration standards on August 5, 2016. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

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.

Metals and Wet Chemistry

All method blank and calibration blank results associated with the samples were below the PQL for all analytes with the exception of CCB7 for sulfate. The samples bracketed by this CCB contained more than 10 times the concentration of sulfate that was detected in the CCB. In cases where a blank concentration exceeds the MDL, 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.

Organics

The method blank results were below the MDLs for all target compounds.

Inductively Coupled Plasma Interference Check Sample Analysis

Interference check samples are analyzed to verify the instrumental interelement and background correction factors and assess any bias due to interelement interferences. Interference check samples were analyzed at the required frequency with all results meeting the acceptance criteria.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of an analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The spike recoveries met the acceptance criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for replicate results that are greater than 5 times the PQL should be less than 20%. For results that are less than 5 times the PQL, the range should be no greater than the PQL. All replicate results met these criteria with the exception of the TDS result for sample 0731. The associated sample TDS result is qualified with a “J” flag as an estimated value.

Laboratory Control Samples

Laboratory control samples (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 analyses.

Metals Serial Dilution

Serial dilutions were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. Serial dilution data are evaluated when the concentration of the undiluted sample is greater than 50 times the MDL. All serial dilution data evaluated met the acceptance criteria.

PCB Surrogate Recoveries

Laboratory performance for individual samples is established by monitoring the recovery of surrogate spikes. The PCB surrogate recoveries were within the acceptance ranges for all samples.

Completeness

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

Chromatography Peak Integration

The integration of analyte peaks was reviewed for all PCB and sulfate data. All peak integrations were satisfactory.

Electronic Data Deliverable (EDD) File

The EDD file arrived on September 15, 2016. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared 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.

General Data Validation Report

Page 1 of 1

Task Code: GRJ03.1-16080001

Lab Code: PAR **Validator:** Stephen Donovan

Validation Date: 01-06-2017

Project: Grand Junction Disposal Site Monitoring

Samples: 4

Analysis Type: General Chemistry Metals Organics Radiochemistry

Chain of Custody

Sample

Present: OK Signed: OK Dated: OK

Integrity: OK Preservation OK Temperature: OK

Check

Summary

Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Duplicates:	There was 1 duplicate evaluated.

Figure 1. General Validation Worksheet

Metals Data Validation Worksheet													Page 1 of 2
Project: Grand Junction Disposal Site Monitoring			Task Code: GRJ03.1-16080001			Lab Code: PAR			06-Jan-2017				
Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Molybdenum	SW-846 6020	08-10-2016	LCS	98.00		80	120		20				
Molybdenum	SW-846 6020	08-10-2016	MB							99		108	MB result < MDL
Molybdenum	SW-846 6020	08-10-2016	MS	112.00		75	125		20				
Molybdenum	SW-846 6020	08-10-2016	MSD		110.00	75	125	2	20				
Molybdenum	SW-846 6020	08-10-2016	R						20				
Selenium	SW-846 6020	08-10-2016	LCS	101.00		80	120		20				
Selenium	SW-846 6020	08-10-2016	MB							95	1	115	MB result < MDL
Selenium	SW-846 6020	08-10-2016	MS	140.00		75	125		20				Sample concentration > than 4 times the spike
Selenium	SW-846 6020	08-10-2016	MSD		144.00	75	125	1	20				Sample concentration > than 4 times the spike
Selenium	SW-846 6020	08-10-2016	R					3	20				
Uranium	SW-846 6020	08-10-2016	LCS	103.00		80	120		20				

QC Types: LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

QC Checks: CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

Figure 2. Metals Validation Worksheet

Metals Data Validation Worksheet													Page 2 of 2
Project: Grand Junction Disposal Site Monitoring			Task Code: GRJ03.1-16080001				Lab Code: PAR			06-Jan-2017			
Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Uranium	SW-846 6020	08-10-2016	MB							93	2	80	MB result < MDL
Uranium	SW-846 6020	08-10-2016	MS	142.00		75	125	20					Sample concentration > than 4 times the spike
Uranium	SW-846 6020	08-10-2016	MSD		141.00	75	125	0	20				Sample concentration > than 4 times the spike
Uranium	SW-846 6020	08-10-2016	R					5	20				
Vanadium	SW-846 6020	08-10-2016	LCS	98.00		80	120		20				
Vanadium	SW-846 6020	08-10-2016	MB							91		112	MB result < MDL
Vanadium	SW-846 6020	08-10-2016	MS	113.00		75	125		20				
Vanadium	SW-846 6020	08-10-2016	MSD		112.00	75	125	1	20				
Vanadium	SW-846 6020	08-10-2016	R						20				

QC Types: LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

QC Checks: CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

Figure 2 (continued). Metals Validation Worksheet

Organics Data Validation Summary

Page 1 of 1

06-Jan-2017

Project: Grand Junction Disposal Site Monitoring

Task Code: GRJ03.1-
16080001

Lab Code: PAR

Surrogate Recovery:	All surrogate recoveries were within the laboratory acceptance limits.
LCS/LCSD Performance:	All LCS/LCSD results were within the laboratory acceptance limits.
MS/MSD Performance:	All MS/MSD results were within the laboratory acceptance limits.
Method Blank Performance:	All method blanks were below the MDL.

Figure 3. Organics Validation Worksheet

Wet Chemistry Data Validation Worksheet

Page 1 of 1

Project: Grand Junction Disposal Site
Monitoring

Task Code: GRJ03.1-16080001

Lab Code: PAR

06-Jan-2017

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comments
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-07-2016	LCS	94.00		90	110		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-07-2016	LCSD	94.00	94.00	90	110	0	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-07-2016	MB							MB result < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-07-2016	MS	107.00		75	125		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-07-2016	MSD		100.00	75	125	2	20	
Sulfate	SW-846 9056	08-15-2016	LCS	104.00		90	110		15	
Sulfate	SW-846 9056	08-15-2016	LCSD	104.00	104.00	90	110	1	15	
Sulfate	SW-846 9056	08-15-2016	MB							MB result < MDL
Total Dissolved Solids	EPA 160.1	08-09-2016	LCS	96.00		85	115		5	
Total Dissolved Solids	EPA 160.1	08-09-2016	LCSD	99.00	99.00	85	115	3	5	
Total Dissolved Solids	EPA 160.1	08-09-2016	MB							MB result < MDL
Total Dissolved Solids	EPA 160.1	08-09-2016	R					13	5	

QC Types: LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

QC Checks: RPD: Relative Percent Difference

Figure 4. Wet Chemistry Validation Worksheet

Sampling Quality Control Assessment

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

Sampling Protocol

Sample results for all monitoring 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 samples were collected using dedicated equipment.

Field Duplicate Analysis

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 0732. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20%. For results that are less than 5 times the PQL, the range should be no greater than the PQL. As shown in Figure 5, the duplicate results met the criteria demonstrating acceptable overall precision.

Validation Report: Field Duplicates

Project: Grand Junction Disposal Site Monitoring **Task Code:** GRJ03.1-16080001 **Lab Code:** PAR

Analyte	Duplicate: GRJ03.1-16080001-004				Sample: GRJ03.1-16080001-002 0732				RPD	RER	Units
	Result	Qualifiers	Uncert.	Dilution	Result	Qualifiers	Uncert.	Dilution			
Aroclor - 1016	0.53	U		1	0.54	U		1			ug/L
Aroclor - 1221	0.53	U		1	0.54	U		1			ug/L
Aroclor - 1232	0.53	U		1	0.54	U		1			ug/L
Aroclor - 1242	0.53	U		1	0.54	U		1			ug/L
Aroclor - 1248	0.53	U		1	0.54	U		1			ug/L
Aroclor - 1254	0.53	U		1	0.54	U		1			ug/L
Aroclor - 1260	0.53	U		1	0.54	U		1			ug/L
Molybdenum	0.0018	J		10	0.0019	J		10	5.4		mg/L
Nitrate + Nitrite as Nitrogen	37			50	37			50	0		mg/L
Selenium	0.39			10	0.37			10	5.3		mg/L
Sulfate	5100			100	5100			100	0		mg/L
Total Dissolved Solids	8800			1	8400			1	4.7		mg/L
Uranium	0.034			10	0.034			10	0		mg/L
Vanadium	0.00065	J		10	0.0006	J		10			mg/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Figure 5. Field Duplicates Worksheet

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the environmental 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: Steph Donovan 2-2-2017
Stephen Donovan Date

Data Validation Lead: Steph Donovan 2-2-2017
Stephen Donovan Date

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Attachment 1

Sampling and Analysis Work Order

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July 7, 2016

Task Assignment 103
Control Number 16-0737

U.S. Department of Energy
Office of Legacy Management
ATTN: William Dam
Site Manager
2597 Legacy Way
Grand Junction, CO 81503

SUBJECT: Contract No. DE-LM0000421, Navarro Research & Engineering, Inc. (Navarro)
Task Assignment 103 LTS&M-UMTRCA TI & TII Sites, D&D Sites, Other
Sites, and Other
August 2016 Environmental Sampling at the Grand Junction, Colorado,
Disposal Site

REFERENCE: Task Assignment 103, 1-103-1-02-106, Grand Junction, Colorado, Disposal Site

Dear Mr. Dam:

The purpose of this letter is to inform you of the upcoming sampling event at Grand Junction, Colorado. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Grand Junction disposal site. Water quality data will be collected at this site as part of the routine environmental sampling currently scheduled to begin the week of August 1, 2016.

The following list shows the monitoring wells (along with associated zone of completion) scheduled for sampling during this event.

MONITORING WELLS

0731 A1 0732 A1 0733 T1

*NOTE: A1 = Alluvium; T1 = Tailings

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*.

William Dam
Control Number 16-0737
Page 2

Please contact me at (970) 248-6391 if you have any questions.

Sincerely,



Gary K. Baur
LMS Site Lead

GKB/lcg/csa

Enclosures

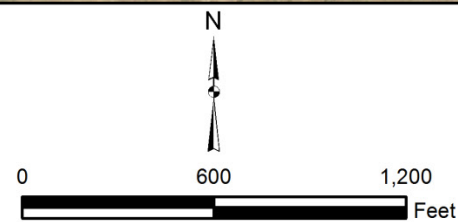
cc: (electronic)

Christina Pennal, DOE
Gary Baur, Navarro
Jeff Carman, Navarro
Beverly Cook, Navarro
Steve Donovan, Navarro
Lauren Goodknight, Navarro
Sam Marutzky, Navarro
Diana Osborne, Navarro
EDD Delivery
rc-grand.junction
File: GRJ 400.02



LEGEND

- WELL TO BE SAMPLED
- ⋯ SITE BOUNDARY



U.S. DEPARTMENT OF ENERGY OFFICE OF LEGACY MANAGEMENT	Work Performed by Navarro Research & Engineering, Inc. Under DOE Contract Number DE-LM0000421
Planned Sample Locations Grand Junction, CO, Disposal Site August 2016	
DATE PREPARED: June 23, 2016	FILE NAME: S1442600_11x17

\\L\Mess\Env\Projects\EBMLTS\111\0001\16\003\S1442600_11x17.mxd smithw 06/23/2016 7:51:22 AM

Grand Junction, Colorado, Disposal Site Planned Sample Locations

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**Sampling Frequencies for Locations at
Grand Junction Disposal Site, Colorado**

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
731			X			Download data logger
732			X			Download data logger
733			X			Download data logger

Sampling conducted in August

Constituent Sampling Breakdown

Site	Site		Required Detection Limit (mg/L)	Analytical Method	Line Item Code
	Groundwater	Surface Water			
Analyte					
Approx. No. Samples/yr	3	0			
Field Measurements					
Alkalinity	X				
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum	X		0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
PCBs	X		0.0005	SW-846 8082	PEP-A-006
Potassium					
Radium-226					
Radium-228					
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica					
Sodium					
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		0.0001	SW-846 6020	LMM-02
Vanadium	X		0.0003	SW-846 6020	LMM-02
Zinc					
Total No. of Analytes	8	0			

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

Attachment 2

Trip Report

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To: Gary Baur, Navarro
 From: David Atkinson, Navarro
 Date: November 17, 2016
 CC: William Dam, DOE
 Steve Donovan, Navarro
 EDD Delivery
 Re: Sampling Trip Report

Site: Grand Junction Disposal Site

Dates of Event: August 4, 2016

Team Members: David Atkinson, Jennifer Graham, Navarro

Number of Locations Sampled: Groundwater samples were collected at monitoring wells 0731, 0732, and 0733. One duplicate sample was collected.

Locations Not Sampled/Reason: None.

Location Specific Information: RCT S. Ficklin (Navarro) was present during the sampling of well 0733 for rad control. W. Dam (DOE), P. Reimus (LANL), G. Baur (Navarro), and M. Birrenbach and M. Martinez (Navarro QA Team) observed sampling at well 0733. In addition, W. Dam and G. Baur observed sampling at well 0732.

Quality Control Sample Cross Reference: The following is the false identification assigned to the quality control sample.

False ID	Sample ID	True ID	Sample Type	Associated Matrix	Laboratory
2978	GRJ03.1-16080001-004	0732	Duplicate	Groundwater	ALS

Task Code Assigned: All samples were assigned to Task Code GRJ03.1-16080001. Field data sheets can be found in <\\crow\sms\GRJ03.1-16080001\FieldData>.

Sample Shipment: Samples were shipped from Grand Junction to ALS Laboratory Group in Fort Collins, Colorado, via FedEx priority overnight on Thursday, August 4, 2016.

Water Level Measurements: Water levels were measured in all sampled wells prior to sampling.

Well Inspection Summary: All wells appeared in good condition, a well lock was replaced at well 0733.

Sampling Method: Samples were collected according to the *Sampling and Analysis Plan (SAP) for the U. S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351, continually updated)*.

Data Logger Summary: Data loggers were downloaded at wells 0733 and 0732. The data logger at well 0731 could not be downloaded due to a problem with the transducer cable connection.

Field Variance: None.

Equipment: Wells were sampled using dedicated bladder pumps and tubing. Field data was collected using EDGE version 6.4.2.

Stakeholder/Regulatory/DOE: Nothing to note.

Institutional Controls:

Fences, Gates, and Locks: Samplers closed and locked all gates upon leaving the site.

Signs: N/A

Trespassing/Site Disturbances: None observed.

Safety Issues: None.

Access Issues: None.

General Information: Nothing to note.

Immediate Actions Taken: None.

Future Actions Required or Suggested: None.

Attachment 3

Data Presentation

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Groundwater Quality Data

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Groundwater Quality Data by Location For Site GRJ03, Grand Junction Disposal Site

Location: 0731

Report Date: 01/06/2017

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Alkalinity	mg/L	08/04/2016	F	N	238				F	Y
Aroclor - 1016	ug/L	08/04/2016	F	N	0.3		0.3	U	F	Y
Aroclor - 1221	ug/L	08/04/2016	F	N	0.3		0.3	U	F	Y
Aroclor - 1232	ug/L	08/04/2016	F	N	0.3		0.3	U	F	Y
Aroclor - 1242	ug/L	08/04/2016	F	N	0.3		0.3	U	F	Y
Aroclor - 1248	ug/L	08/04/2016	F	N	0.3		0.3	U	F	Y
Aroclor - 1254	ug/L	08/04/2016	F	N	0.3		0.3	U	F	Y
Aroclor - 1260	ug/L	08/04/2016	F	N	0.3		0.3	U	F	Y
Dissolved Oxygen	mg/L	08/04/2016	F	N	7.14				F	Y
Molybdenum	mg/L	08/04/2016	F	T	0.0025		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	08/04/2016	F	N	37		0.15		F	Y
Oxidation Reduction Potential	mV	08/04/2016	F	N	174.3				F	Y
pH	s.u.	08/04/2016	F	N	7.20				F	Y
Specific Conductivity	umhos/cm	08/04/2016	F	N	7945				F	Y
Selenium	mg/L	08/04/2016	F	T	0.54		0.00066		F	Y
Sulfate	mg/L	08/04/2016	F	N	5000		30		F	Y
Temperature	C	08/04/2016	F	N	15.38				F	Y

Groundwater Quality Data by Location For Site GRJ03, Grand Junction Disposal Site**Location: 0731**

Report Date: 01/06/2017

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Total Dissolved Solids	mg/L	08/04/2016	F	N	7200		20		FJ	Y
Turbidity	NTU	08/04/2016	F	N	1.95				F	Y
Uranium	mg/L	08/04/2016	F	T	0.045		0.000012		F	Y
Vanadium	mg/L	08/04/2016	F	T	0.00082		0.00058	J	F	Y

Groundwater Quality Data by Location For Site GRJ03, Grand Junction Disposal Site**Location: 0732**

Report Date: 01/06/2017

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Alkalinity	mg/L	08/04/2016	F	N	192				F	Y
Aroclor - 1016	ug/L	08/04/2016	D	N	0.32		0.32	U	F	Y
Aroclor - 1016	ug/L	08/04/2016	F	N	0.32		0.32	U	F	Y
Aroclor - 1221	ug/L	08/04/2016	D	N	0.32		0.32	U	F	Y
Aroclor - 1221	ug/L	08/04/2016	F	N	0.32		0.32	U	F	Y
Aroclor - 1232	ug/L	08/04/2016	D	N	0.32		0.32	U	F	Y
Aroclor - 1232	ug/L	08/04/2016	F	N	0.32		0.32	U	F	Y
Aroclor - 1242	ug/L	08/04/2016	D	N	0.32		0.32	U	F	Y
Aroclor - 1242	ug/L	08/04/2016	F	N	0.32		0.32	U	F	Y
Aroclor - 1248	ug/L	08/04/2016	D	N	0.32		0.32	U	F	Y
Aroclor - 1248	ug/L	08/04/2016	F	N	0.32		0.32	U	F	Y
Aroclor - 1254	ug/L	08/04/2016	D	N	0.32		0.32	U	F	Y
Aroclor - 1254	ug/L	08/04/2016	F	N	0.32		0.32	U	F	Y
Aroclor - 1260	ug/L	08/04/2016	D	N	0.32		0.32	U	F	Y
Aroclor - 1260	ug/L	08/04/2016	F	N	0.32		0.32	U	F	Y
Dissolved Oxygen	mg/L	08/04/2016	F	N	5.02				F	Y
Molybdenum	mg/L	08/04/2016	D	T	0.0018		0.00032	J	F	Y
Molybdenum	mg/L	08/04/2016	F	T	0.0019		0.00032	J	F	Y

Groundwater Quality Data by Location For Site GRJ03, Grand Junction Disposal Site

Location: 0732

Report Date: 01/06/2017

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Nitrate + Nitrite as Nitrogen	mg/L	08/04/2016	D	N	37		0.15		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	08/04/2016	F	N	37		0.15		F	Y
Oxidation Reduction Potential	mV	08/04/2016	F	N	182.9				F	Y
pH	s.u.	08/04/2016	F	N	7.18				F	Y
Specific Conductivity	umhos/cm	08/04/2016	F	N	9650				F	Y
Selenium	mg/L	08/04/2016	D	T	0.39		0.00066		F	Y
Selenium	mg/L	08/04/2016	F	T	0.37		0.00066		F	Y
Sulfate	mg/L	08/04/2016	D	N	5100		30		F	Y
Sulfate	mg/L	08/04/2016	F	N	5100		30		F	Y
Temperature	C	08/04/2016	F	N	14.61				F	Y
Total Dissolved Solids	mg/L	08/04/2016	D	N	8800		20		F	Y
Total Dissolved Solids	mg/L	08/04/2016	F	N	8400		20		F	Y
Turbidity	NTU	08/04/2016	F	N	2.99				F	Y
Uranium	mg/L	08/04/2016	D	T	0.034		0.000012		F	Y
Uranium	mg/L	08/04/2016	F	T	0.034		0.000012		F	Y
Vanadium	mg/L	08/04/2016	D	T	0.00065		0.00058	J	F	Y
Vanadium	mg/L	08/04/2016	F	T	0.0006		0.00058	J	F	Y

Groundwater Quality Data by Location For Site GRJ03, Grand Junction Disposal Site

Location: 0733 Within cell footprint.

Report Date: 01/06/2017

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Alkalinity	mg/L	08/04/2016	F	N	499				F	Y
Aroclor - 1016	ug/L	08/04/2016	F	N	0.33		0.33	U	F	Y
Aroclor - 1221	ug/L	08/04/2016	F	N	0.33		0.33	U	F	Y
Aroclor - 1232	ug/L	08/04/2016	F	N	0.33		0.33	U	F	Y
Aroclor - 1242	ug/L	08/04/2016	F	N	0.33		0.33	U	F	Y
Aroclor - 1248	ug/L	08/04/2016	F	N	0.33		0.33	U	F	Y
Aroclor - 1254	ug/L	08/04/2016	F	N	0.33		0.33	U	F	Y
Aroclor - 1260	ug/L	08/04/2016	F	N	0.33		0.33	U	F	Y
Dissolved Oxygen	mg/L	08/04/2016	F	N	4.62				F	Y
Molybdenum	mg/L	08/04/2016	F	T	0.0015		0.00032	J	F	Y
Nitrate + Nitrite as Nitrogen	mg/L	08/04/2016	F	N	1.3		0.003		F	Y
Oxidation Reduction Potential	mV	08/04/2016	F	N	190.7				F	Y
pH	s.u.	08/04/2016	F	N	6.73				F	Y
Specific Conductivity	umhos/cm	08/04/2016	F	N	12447				F	Y
Selenium	mg/L	08/04/2016	F	T	0.0035		0.00066		F	Y
Sulfate	mg/L	08/04/2016	F	N	7600		60		F	Y
Temperature	C	08/04/2016	F	N	16.06				F	Y

Groundwater Quality Data by Location For Site GRJ03, Grand Junction Disposal Site

Location: 0733 Within cell footprint.

Report Date: 01/06/2017

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Total Dissolved Solids	mg/L	08/04/2016	F	N	13000		20		F	Y
Turbidity	NTU	08/04/2016	F	N	3.24				F	Y
Uranium	mg/L	08/04/2016	F	T	0.19		0.000012		F	Y
Vanadium	mg/L	08/04/2016	F	T	0.0006		0.00058	J	F	Y

SAMPLE TYPE: D = Duplicate E = Equipment Blank F = Field Sample FB = Field Blank TB = Trip Blank

FRACTION: D = Dissolved N = NA T = Total

MDC / MDL: MDC = Radiochemical minimum detectable concentration MDL = Non-radiochemical minimum detection limit

LAB QUALIFIERS (details can be found in laboratory report):

- * = One or more quality control criteria failed (e.g., laboratory control sample, surrogate spike, or calibration verification recovery).
- B = Blank contamination. The reported result is associated with a contaminated blank.
- D = Result is from the analysis of a diluted sample.
- H = Holding time was exceeded.
- J = The reported result is an estimated value (e.g., matrix interference was observed or the analyte was detected at a concentration outside the quantitation range).
- U = Analytical result is below the MDC or MDL.
- Z = Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

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

QA QUALIFIER: Yes = Validated, acceptable as qualified.

Static Water Level Data

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Static Water Levels For Site GRJ03, Grand Junction Disposal Site

Measurement Date Between : 08/04/2016 and 08/04/2016

Report Date: 01/06/2017

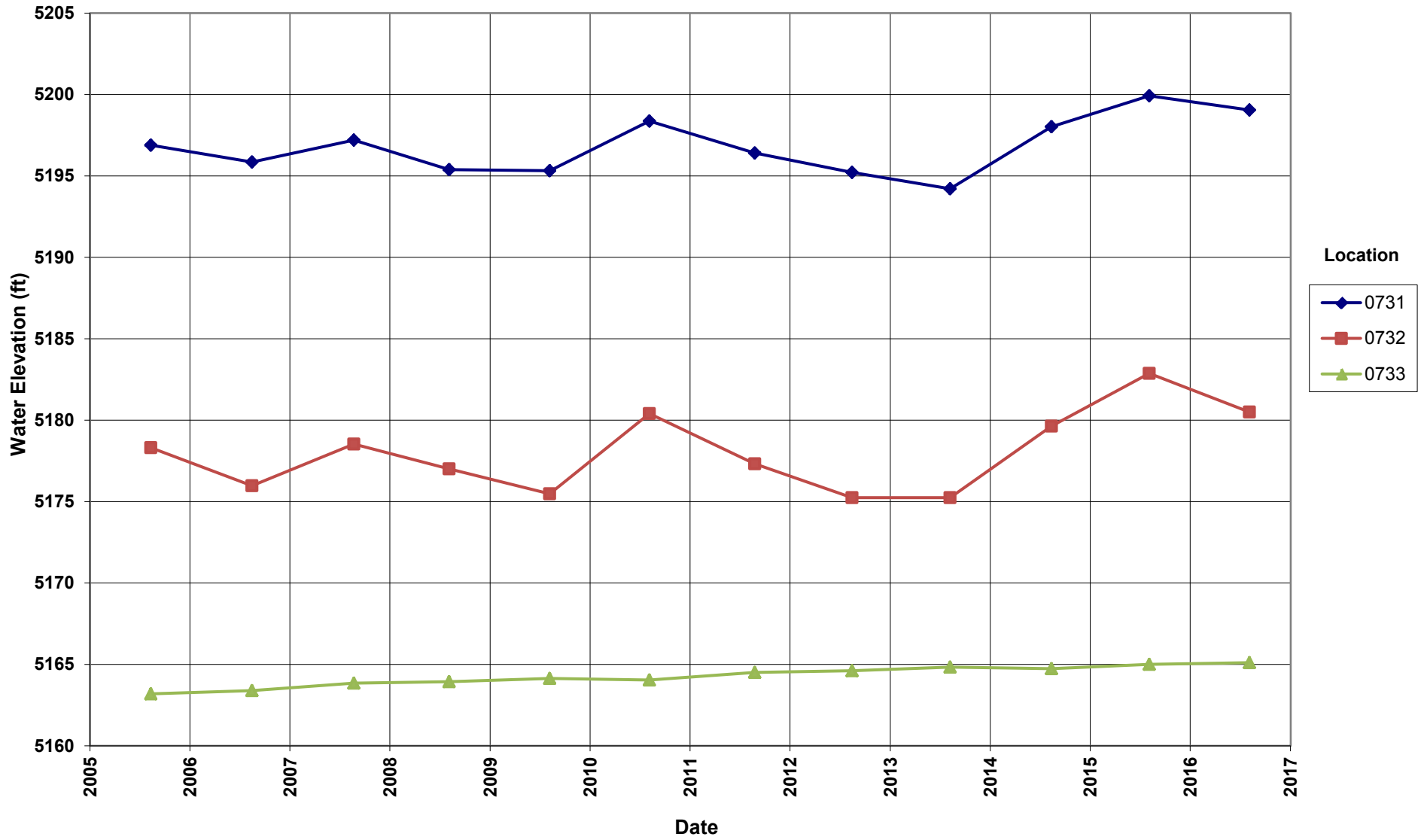
Location Code	Measurement Date	Top of Casing Elevation	Water Elevation	Water Level Depth	Units	Dry (y/n)
0731	08/04/2016	5218.52	5199.05	19.47	ft	
0732	08/04/2016	5202.5	5180.5	22	ft	
0733	08/04/2016	5232.84	5165.11	67.73	ft	

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Hydrograph

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Grand Junction Disposal Site Hydrograph



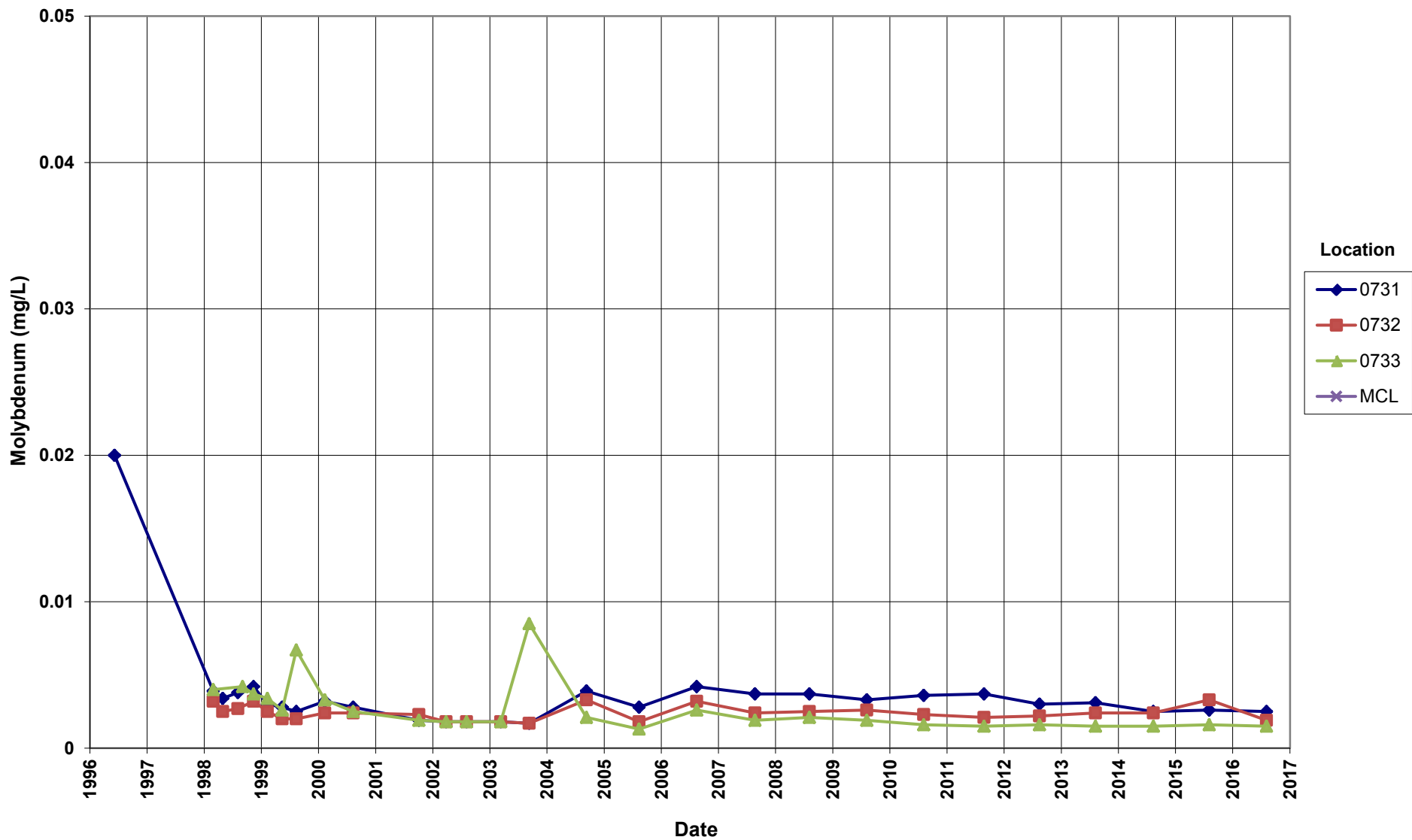
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Time-Concentration Graphs

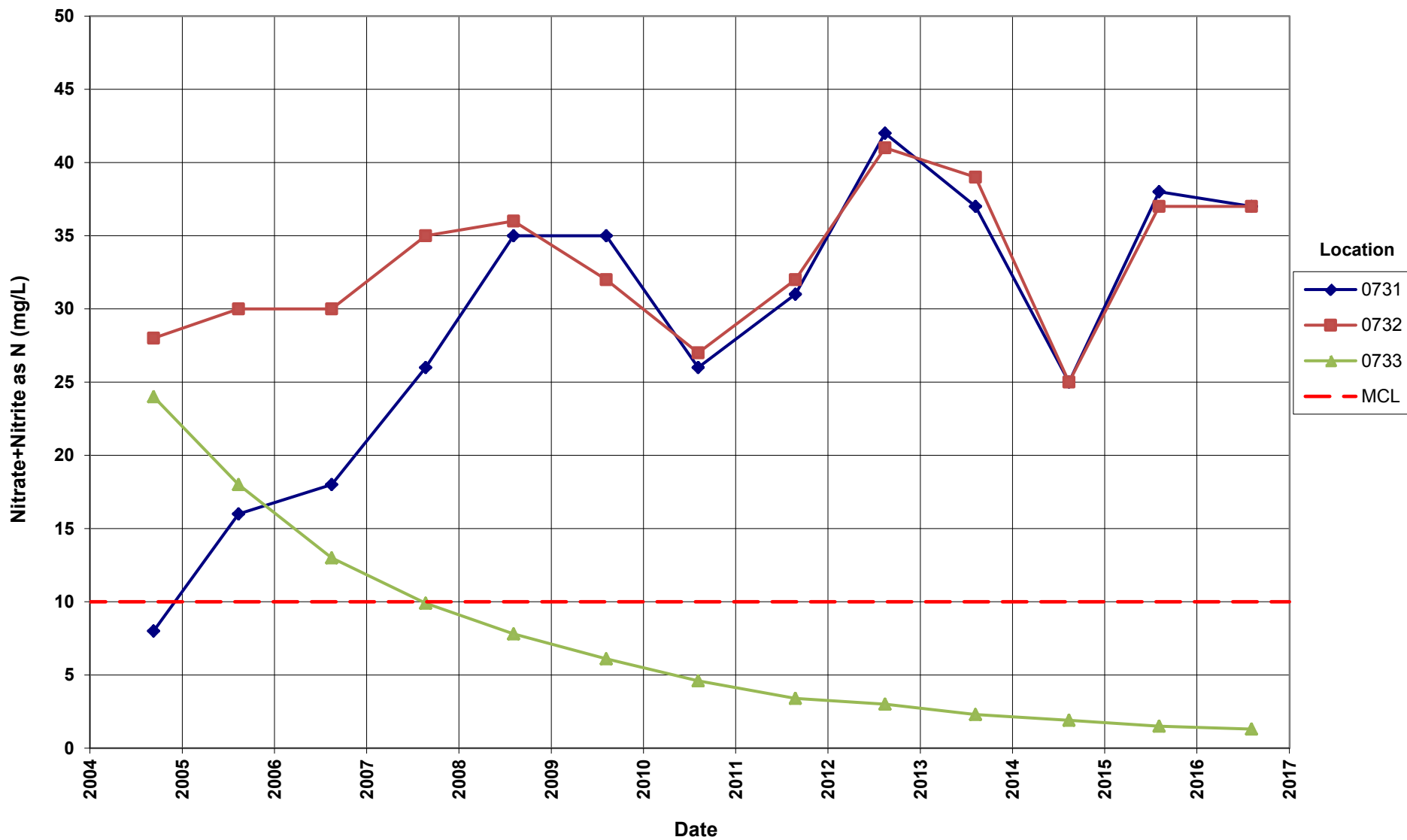
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Grand Junction Disposal Site Molybdenum Concentration

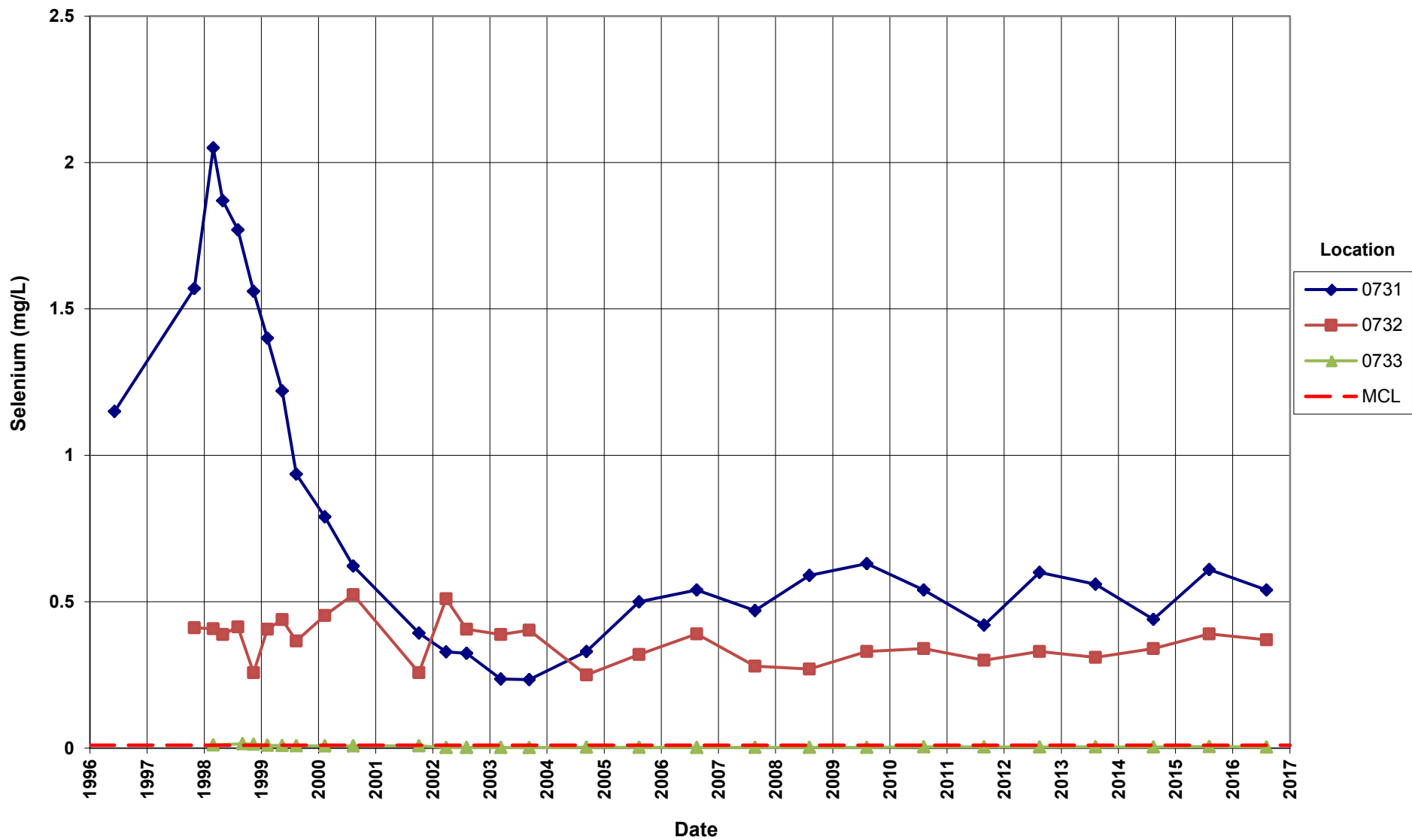
Maximum Concentration Limit (MCL) = 0.1 mg/L



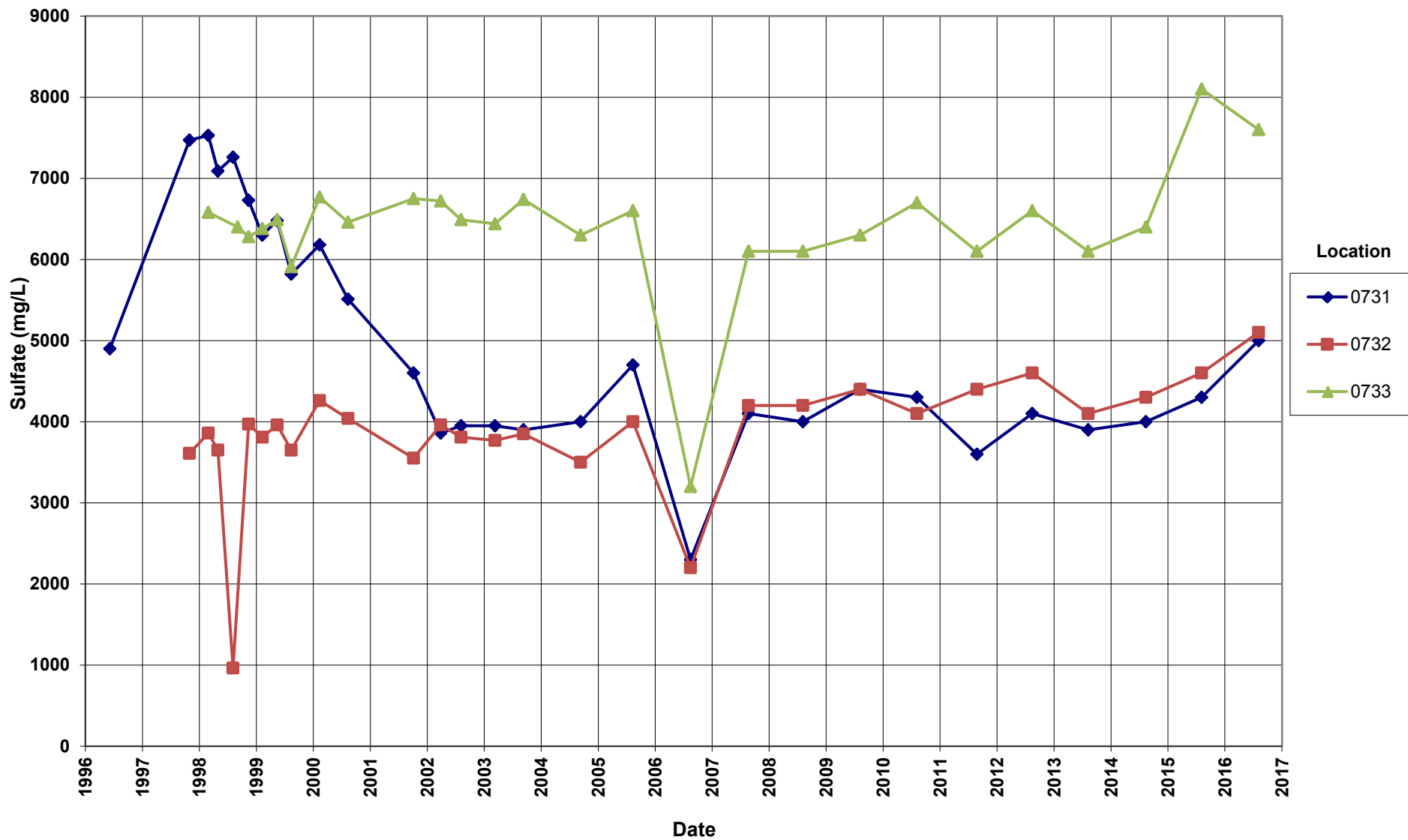
Grand Junction Disposal Site
Nitrate+Nitrite as N Concentration
Maximum Concentration Limit (MCL) = 10 mg/L



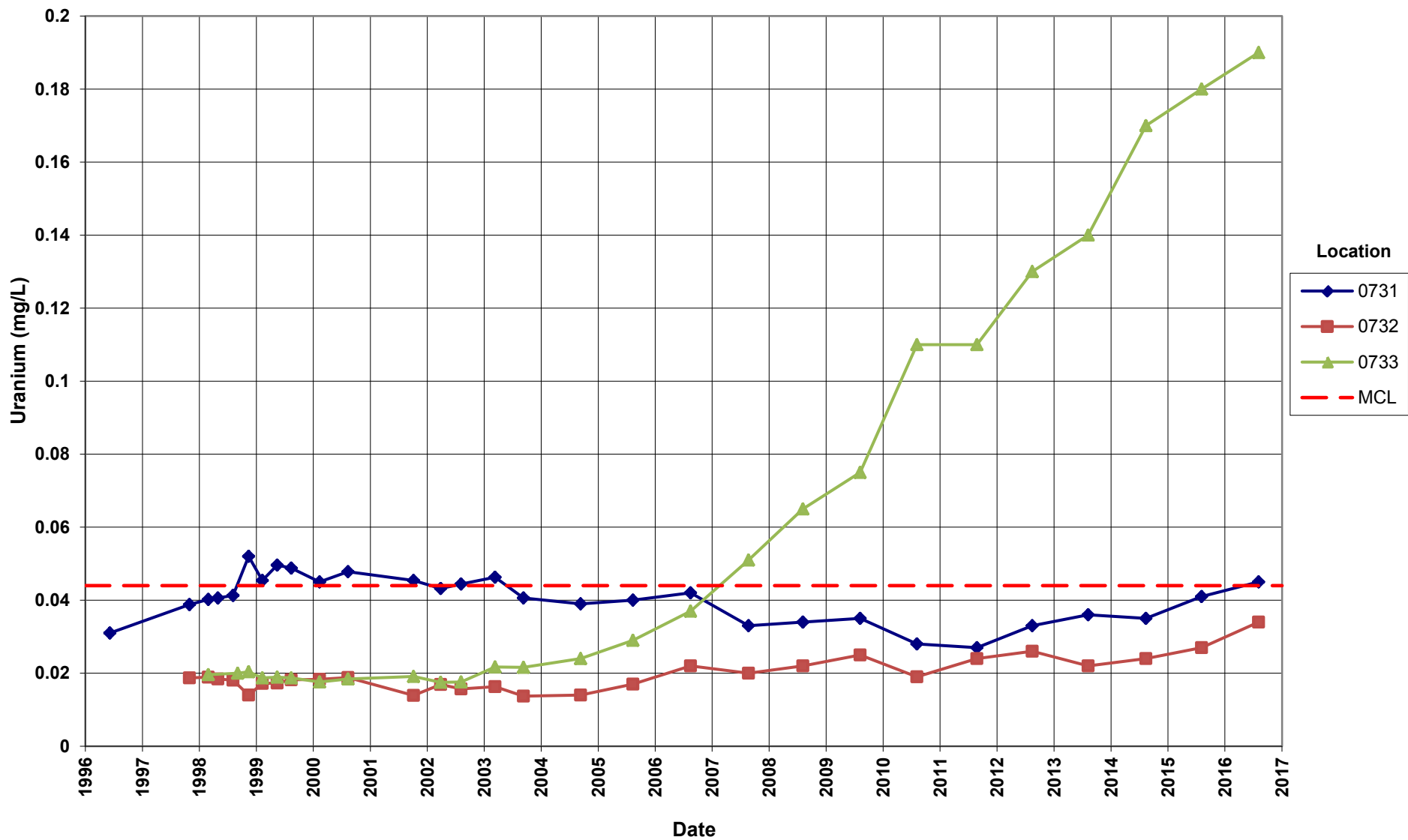
Grand Junction Disposal Site
Selenium Concentration
Maximum Concentration Limit (MCL) = 0.01 mg/L



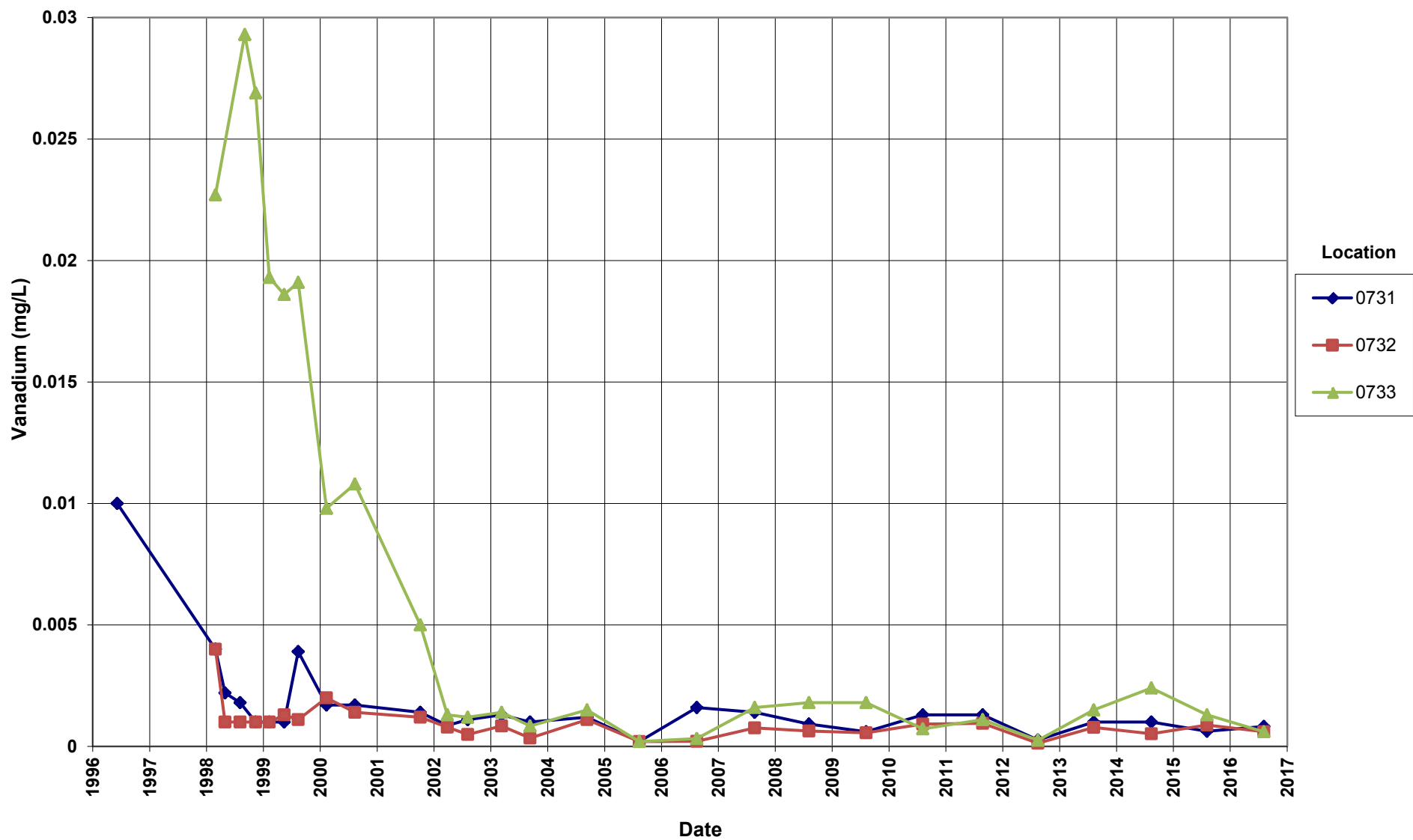
Grand Junction Disposal Site Sulfate Concentration



**Grand Junction Disposal Site
Uranium Concentration**
Maximum Concentration Limit = 0.044 mg/L



Grand Junction Disposal Site Vanadium Concentration



Attachment 4

Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (<https://www.epa.gov/land-research/proucl-software>). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

No values from this sampling event were identified as potential outliers. The data for this task are acceptable as qualified.

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