CHPRC - REVIEW COMMENT RECORD (RCR)

1. Date	2. Review No.
03/28/2018	
3. Project No.	Page 1 of 1

5. Document Number(s)/Title(s)	6. Program/Project/Building Number	7. Reviewer	8. Organization/Group	9. Location/Phone
VSR18-007		Scot Fitzgerald	Sample Management and Reporting	MO277/373-7495

17. Comment Submittal Approval

03/28/2018 (Date)

Scot Fitzgerald (Organization Manager (optional) (print and sign))

10. Agreement With Indicated Comment Disposition(s)

Date

Reviewer/Point of Contact (print and sign)

Author/Originator (print and sign)

11. CLOSED

4/2/18 (Date)

Reviewer/Point of Contact (print and sign)

Scot Fitzgerald (Author/Originator (print and sign))

12. Item	13a. Comments	13b. Basis	13c. Recommendation	14. Reviewer Concurrence Required (Y or N)	15. Disposition (provide justification if NOT accepted)	16. Status
1.	On Page 24 in the semivoa surrogate section multiple surrogate failures are discussed however the surrogate accuracy requirement is the limit established by the laboratory. Per the laboratory limits listed on page 38 there are no surrogate failures.		Correct Narrative and checklist. No flagging is affected.	Y		Closed

CHPRC - REVIEW COMMENT RECORD (RCR)

1. Date	2. Review No.
3/27/2018	
3. Project No.	Page 1 of 1

5. Document Number(s)/Title(s)	6. Program/Project/Building Number	7. Reviewer	8. Organization/Group	9. Location/Phone
VSR18-007		Jadie Kaas	SGRP QA	MO2216 / 376-2949

17. Comment Submittal Approval

Jadie Kaas

3/27/2018 (Date) Jadie Kaas (Organization Manager (optional) (print and sign))

10. Agreement With Indicated Comment Disposition(s)

Reviewer/Point of Contact (print and sign)

Date

Author/Originator (print and sign)

11. CLOSED

3/27/2018 (Date)

Jadie Kaas

Jadie Kaas (Author/Originator (print and sign))

12. Item	13a. Comments	13b. Basis	13c. Recommendation	14. Reviewer Concurrence Required (Y or N)	15. Disposition (provide justification if **NOT accepted**)	16. Status
1	No issues noted					closed

ANALYTICAL QUALITY ASSOCIATES, INC.

PO Box 21987
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Data Validation Report for CH2M Hill
Plateau Remediation Company

VSR18-007
Project ERDF Leachate

Chemical and Radiochemical Validation - Level D

Validation Performed By: Eyda Hergenreder **Date:** 03-15-2018

Eyda Hergenreder

Technical Review By: Ellen McEntee **Date:** 03-19-2018

Ellen McEntee

Quality Review By: Mary A. Donivan **Date:** 04-02-2018

Mary Donivan
Quality Assurance Manager

TABLE OF CONTENTS

Date: 15 March 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: ERDF Leachate
Subject: Volatile Organics - Sample Data Group (SDG) DN0202

INTRODUCTION

This memorandum presents the results of data validation for SDG DN0202 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3D9H4	09/06/17	Water	D	8260B
B3D9H3	09/06/17	Water	D	8260B
B3D9H7	09/06/17	Water	D	8260B

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (SAP). Appendices 1 through 4 provide the following information as indicated below:

Appendix 1. Glossary of Data Reporting Qualifiers
Appendix 2. Summary of Data Qualification
Appendix 3. Data Validation Supporting Documentation
Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirements for volatile organics are analysis within 14 days of sample collection. Sample preservation requires chilling to <6 degrees Celsius and acid preservation with hydrochloric or sulfuric acid to pH <2.

The samples were analyzed within the prescribed holding time and properly preserved.

- **Instrument Performance Check**

Instrument performance checks are performed to ensure adequate mass resolution, identification and sensitivity of the GC/MS system.

All instrument performance checks were met.

- **Initial and Continuing Calibration**

Instrument calibration is established to ensure the instrument is capable of producing acceptable qualitative and quantitative results.

Initial Instrument Calibration

All initial instrument calibration acceptance criteria were met.

Continuing Calibration Verification

All continuing calibration verification acceptance criteria were met.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

No trip blank sample was submitted for validation.

Field Blanks

All field transfer blank results were acceptable.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing surrogate results, matrix spike sample results, and laboratory control sample results. According to the SAP, the surrogate, matrix spike and laboratory control sample accuracy limits are ones specified by the analytical laboratory.

Surrogates

All surrogate recoveries were acceptable.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

All MS/MSD recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limit is specified by the analytical laboratory.

MS/MSD Samples

All MS/MSD relative percent difference values were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

- **Internal Standards**

Internal standard performance criteria ensure that GC/MS sensitivity and response are stable during each analysis. Internal standards are added to all samples, including QC samples, prior to analysis.

All internal standard area counts and retention times were met.

- **Target Compound Identification and Quantitation**

Criteria for compound identification have been established to minimize the number of erroneous compound identifications. Reported results are verified that results are within the calibration range and correctly quantitated. The TICs must be qualitatively identified via a search of spectral libraries.

Target Compound Identification and Qualification

All compound identification criteria were met.

Tentatively Identified Compounds (TIC)

All TIC identifications were met.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG DN0202 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

None found.

REFERENCES

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

WCH-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.

- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.

- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.

- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.

- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.

- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2

Summary of Data Qualification

Volatile Organics Data Qualification Summary			
SDG: DN0202	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
VOC	N/A	None	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix A - Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	C	(D)	E
PROJECT: ERDF Leachate			DATA PACKAGE: VSR18-007		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica		DATE: 03/15/2018	
			SDG: DN0202		
ANALYSES PERFORMED					
SW-846 8260 X		SW-846 8260 (TCLP)	SW-846 8270		SW-846 8270 (TCLP)
SAMPLES/MATRIX Water					
SDG DN0202 - B3D9H4, B3D9H3, B3D9H7					

1. **DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

Technical verification documentation present?	(Yes) No N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

2. INSTRUMENT TUNING AND CALIBRATION (Levels D and E)

GC/MS tuning/performance check acceptable?	(Yes) No N/A
Initial calibrations acceptable?	(Yes) No N/A
Continuing calibrations acceptable?	(Yes) No N/A
Standards traceable?	(Yes) No N/A
Standards expired?	Yes (No) N/A
Calculation check acceptable?	(Yes) No N/A

Comments:

3. BLANKS (Levels B, C, D, and E)

Calibration blanks analyzed? (Levels D, E)	Yes No (N/A)
Calibration blank results acceptable? (Levels D, E)	Yes No (N/A)
Laboratory blanks analyzed?	(Yes) No N/A
Laboratory blank results acceptable?	(Yes) No N/A
Field/trip blanks analyzed? (Levels C, D, E)	(Yes) No N/A
Field/trip blank results acceptable? (Levels C, D, E)	(Yes) No N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

4. ACCURACY (Levels C, D, and E)

Surrogates/system monitoring compounds analyzed?	(Yes) No N/A
Surrogate/system monitoring compound recoveries acceptable?	(Yes) No N/A
Surrogates traceable? (Levels D, E)	(Yes) No N/A
Surrogates expired? (Levels D, E)	Yes (No) N/A
MS/MSD samples analyzed?	(Yes) No N/A
MS/MSD results acceptable?	(Yes) No N/A
MS/MSD standards NIST traceable? (Levels D, E)	(Yes) No N/A
MS/MSD standards? (Levels D, E)	Yes (No) N/A
LCS/BSS samples analyzed?	(Yes) No N/A
LCS/BSS results acceptable?	(Yes) No N/A
Standards traceable? (Levels D, E)	(Yes) No N/A
Standards expired? (Levels D, E)	Yes (No) N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A
Performance audit sample(s) analyzed?	Yes (No) N/A
Performance audit sample results acceptable?	Yes No (N/A)

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

5. PRECISION (Levels C, D, and E)

MS/MSD samples analyzed?	(Yes) No N/A
MS/MSD RPD values acceptable?	(Yes) No N/A
MS/MSD standards NIST traceable? (Levels D, E)	(Yes) No N/A
MS/MSD standards expired? (Levels D, E)	Yes (No) N/A
LCS/LCSD duplicates run due to insufficient sample material?	Yes (No) N/A
Field duplicate RPD values acceptable?	(Yes) No N/A
Field split RPD values acceptable?	Yes No (N/A)
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

6. SYSTEM PERFORMANCE (Levels D and E)

Internal standards analyzed?	(Yes) No N/A
Internal standard areas acceptable?	(Yes) No N/A
Internal standard retention times acceptable?	(Yes) No N/A
Standards traceable?	(Yes) No N/A
Standards expired?	Yes (No) N/A
Transcription/calculation errors?	Yes (No) N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

7. HOLDING TIMES (all levels)

Samples properly preserved?	(Yes) No N/A
Sample holding times acceptable?	(Yes) No N/A

Comments:

8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)

Compound identification acceptable? (Levels D, E)	(Yes) No N/A
Compound quantitation acceptable? (Levels D, E)	(Yes) No N/A
Results reported for all requested analyses?	(Yes) No N/A
Results supported in the raw data? (Levels D, E)	(Yes) No N/A
Samples properly prepared? (Levels D, E)	(Yes) No N/A
Laboratory properly identified and coded all TIC? (Levels D, E)	(Yes) No N/A
Detection limits meet RDL?	(Yes) No N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

9. SAMPLE CLEANUP (Levels D and E)

GPC cleanup performed?	Yes (No) N/A
GPC check performed?	Yes (No) N/A
GPC check recoveries acceptable?	Yes No (N/A)
GPC calibration performed?	Yes (No) N/A
GPC calibration check performed?	Yes No (N/A)
GPC calibration check retention times acceptable?	Yes No (N/A)
Check/calibration materials traceable?	Yes No (N/A)
Check/calibration materials Expired?	Yes No (N/A)
Analytical batch QC given similar cleanup?	Yes No (N/A)
Transcription/Calculation Errors?	Yes (No) N/A

Comments (attach additional sheets as necessary):

Appendix 4

Additional Documentation Requested By Client

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 280-100923-1
SDG: DN0202

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
Lab Sample ID	Client Sample ID	12DCE (70-130)	BFB (70-130)	DBFM (70-130)	TOL (70-130)
280-100923-1	B3D9H4	115	107	108	116
280-100923-2	B3D9H3	118	117	107	113
280-100923-3	B3D9H7	116	113	107	115
280-100923-3 MS	B3D9H7	113	104	105	108
280-100923-3 MSD	B3D9H7	113	105	104	109
LCS 280-387770/4	Lab Control Sample	98	92	92	97
MB 280-387770/6	Method Blank	113	113	106	114

Surrogate Legend

12DCE = 1,2-Dichloroethane-d4 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane (Surr)
TOL = Toluene-d8 (Surr)

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)					
Lab Sample ID	Client Sample ID	FBP (48-130)	2FP (41-130)	TBP (42-130)	NBZ (42-130)	PHL (45-130)	TPH (20-130)
280-100923-2	B3D9H3	72	71	76	71	73	58
280-100923-2 MS	B3D9H3	70	67	82	70	68	58
280-100923-2 MSD	B3D9H3	74	74	79	76	75	49
280-100923-3	B3D9H7	72	68	82	69	73	51
LCS 280-388530/2-A	Lab Control Sample	81	80	88	82	83	86
LCSD 280-388530/3-A	Lab Control Sample Dup	79	78	84	80	79	82
MB 280-388530/1-A	Method Blank	78	75	75	77	76	83

Surrogate Legend

FBP = 2-Fluorobiphenyl (Surr)
2FP = 2-Fluorophenol (Surr)
TBP = 2,4,6-Tribromophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
PHL = Phenol-d5 (Surr)
TPH = Terphenyl-d14 (Surr)

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 280-387770/6
Matrix: Water
Analysis Batch: 387770

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbon tetrachloride	0.19	U	1.0	0.19	ug/L			09/15/17 08:34	1
Trichloroethene	0.16	U	1.0	0.16	ug/L			09/15/17 08:34	1

Tentatively Identified Compound	*MB Est. Result*	*MB Qualifier*	*Unit*	*D*	*RT*	*CAS No.*	*Prepared*	*Analyzed*	*Dil Fac*
Methylene Chloride	*0.442*	*J*	*ug/L*		*5.71*	*75-09-2*		*09/15/17 08:34*	*1*
Cyclotetrasiloxane, octamethyl-	*12.3*	*N J*	*ug/L*		*10.56*	*556-67-2*		*09/15/17 08:34*	*1*
Unknown	*1.95*	*N*	*ug/L*		*12.08*			*09/15/17 08:34*	*1*

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*113*		*70 - 130*		*09/15/17 08:34*	*1*
4-Bromofluorobenzene (Surr)	*113*		*70 - 130*		*09/15/17 08:34*	*1*
Dibromofluoromethane (Surr)	*106*		*70 - 130*		*09/15/17 08:34*	*1*
Toluene-d8 (Surr)	*114*		*70 - 130*		*09/15/17 08:34*	*1*

Lab Sample ID: LCS 280-387770/4
Matrix: Water
Analysis Batch: 387770

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Carbon tetrachloride	5.00	4.37		ug/L		87	65 - 135
Trichloroethene	5.00	4.11		ug/L		82	65 - 135

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*98*		*70 - 130*
4-Bromofluorobenzene (Surr)	*92*		*70 - 130*
Dibromofluoromethane (Surr)	*92*		*70 - 130*
Toluene-d8 (Surr)	*97*		*70 - 130*

Lab Sample ID: 280-100923-3 MS
Matrix: Water
Analysis Batch: 387770

Client Sample ID: B3D9H7
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Carbon tetrachloride	0.19	U	5.00	4.99		ug/L		100	65 - 135
Trichloroethene	0.16	U	5.00	4.52		ug/L		90	65 - 135

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*113*		*70 - 130*
4-Bromofluorobenzene (Surr)	*104*		*70 - 130*
Dibromofluoromethane (Surr)	*105*		*70 - 130*
Toluene-d8 (Surr)	*108*		*70 - 130*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 280-100923-3 MSD
Matrix: Water
Analysis Batch: 387770

Client Sample ID: B3D9H7
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Carbon tetrachloride	0.19	U	5.00	5.16		ug/L		103	65 - 135	3	21
Trichloroethene	0.16	U	5.00	4.58		ug/L		92	65 - 135	1	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*113*		*70 - 130*
4-Bromofluorobenzene (Surr)	*105*		*70 - 130*
Dibromofluoromethane (Surr)	*104*		*70 - 130*
Toluene-d8 (Surr)	*109*		*70 - 130*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 280-388530/1-A
Matrix: Water
Analysis Batch: 389001

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 388530

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Diphenylhydrazine	0.23	U	10	0.23	ug/L		09/22/17 08:12	09/26/17 17:30	1

Tentatively Identified Compound	*MB Est. Result*	*MB Qualifier*	*Unit*	*D*	*RT*	*CAS No.*	*Prepared*	*Analyzed*	*Dil Fac*
Tentatively Identified Compound	*None*		*ug/L*				*09/22/17 08:12*	*09/26/17 17:30*	*1*

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*78*		*48 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
2-Fluorophenol (Surr)	*75*		*41 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
2,4,6-Tribromophenol (Surr)	*75*		*42 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
Nitrobenzene-d5 (Surr)	*77*		*42 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
Phenol-d5 (Surr)	*76*		*45 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
Terphenyl-d14 (Surr)	*83*		*20 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*

Lab Sample ID: LCS 280-388530/2-A
Matrix: Water
Analysis Batch: 389001

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 388530

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
1,2-Diphenylhydrazine			80.9	65.4		ug/L		81	55 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*81*		*48 - 130*
2-Fluorophenol (Surr)	*80*		*41 - 130*
2,4,6-Tribromophenol (Surr)	*88*		*42 - 130*
Nitrobenzene-d5 (Surr)	*82*		*42 - 130*
Phenol-d5 (Surr)	*83*		*45 - 130*
Terphenyl-d14 (Surr)	*86*		*20 - 130*

Date: 15 March 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: ERDF Leachate
Subject: Semivolatile Organics - Sample Data Group (SDG) DN0202

INTRODUCTION

This memorandum presents the results of data validation for SDG DN0202 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3D9H3	9/06/17	Water	D	8270D
B3D9H7	9/06/17	Water	D	8270D

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (SAP). Appendices 1 through 4 provide the following information as indicated below:

Appendix 1. Glossary of Data Reporting Qualifiers
Appendix 2. Summary of Data Qualification
Appendix 3. Data Validation Supporting Documentation
Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirements for semivolatile organics in water are extraction within 7 days of sample collection and analysis within 40 days of sample extraction. Sample preservation requires chilling to <6 degrees Celsius.

The samples were properly preserved and originally extracted and analyzed within the prescribed holding times; however due to QC failure samples were re-extracted.

Samples B3D9H3 and B3D9H7 were re-extracted 16 days after sample collection due to failed surrogate recoveries for the LCS with the original extract. The sample results were non-detects and should be qualified as unusable and flagged "UR."

- **Instrument Performance Check**

Instrument performance checks are performed to ensure adequate mass resolution, identification and sensitivity of the GC/MS system.

All instrument performance checks were met.

- **Initial and Continuing Calibration**

Instrument calibration is established to ensure the instrument is capable of producing acceptable qualitative and quantitative results.

Initial Instrument Calibration

All initial instrument calibration acceptance criteria were met.

Continuing Calibration Verification

All continuing calibration verification acceptance criteria were met.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

The laboratory blank result was acceptable.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing surrogate results, matrix spike sample results and laboratory control sample results. According to the SAP, the surrogate, laboratory control sample accuracy limit and the matrix spike sample accuracy limits are ones established by the analytical laboratory.

Surrogates

All surrogate recoveries were acceptable.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

All MS/MSD recoveries were acceptable.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limit is specified by the analytical laboratory.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

- **Internal Standards**

Internal standard performance criteria ensure that GC/MS sensitivity and response are stable during each analysis. Internal standards are added to all samples, including QC samples, prior to analysis.

All internal standard area counts and retention times were met.

- **Target Compound Identification and Quantitation**

Criteria for compound identification have been established to minimize the number of erroneous compound identifications. Reported results are verified that results are within the calibration range and correctly quantitated. The TICs must be qualitatively identified via a search of spectral libraries.

Target Compound Identification and Qualification

All compound identification criteria were met.

Tentatively Identified Compounds (TIC)

All TIC identifications were met.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG DN0202 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 0%.

MAJOR DEFICIENCIES

A major deficiency leading to qualification of 1,2-diphenylhydrazine results for samples B3D9H3 and B3D9H7 as unusable were due to holding time infraction.

MINOR DEFICIENCIES

None found.

REFERENCES

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

WCH-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.

- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.

- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.

- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.

- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.

- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2

Summary of Data Qualification

Semivolatile Organics Data Qualification Summary			
SDG: DN0202	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
1,2-diphenylhydrazine	UR	B3D9H3, B3D9H7	Extracted beyond 2X the holding time

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix A - Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	C	(D)	E
PROJECT: ERDF Leachate			DATA PACKAGE: VSR18-007		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica		DATE: 03/15/2018	
			SDG: DN0202		
ANALYSES PERFORMED					
SW-846 8260		SW-846 8260 (TCLP)	SW-846 8270 X		SW-846 8270 (TCLP)
SAMPLES/MATRIX Water					
DN0202: B3D9H3, B3D9H7					

1. **DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

Technical verification documentation present?	(Yes) No N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

2. INSTRUMENT TUNING AND CALIBRATION (Levels D and E)

GC/MS tuning/performance check acceptable?	(Yes) No N/A
Initial calibrations acceptable?	(Yes) No N/A
Continuing calibrations acceptable?	(Yes) No N/A
Standards traceable?	(Yes) No N/A
Standards expired?	Yes (No) N/A
Calculation check acceptable?	(Yes) No N/A

Comments:

3. BLANKS (Levels B, C, D, and E)

Calibration blanks analyzed? (Levels D, E)	Yes No (N/A)
Calibration blank results acceptable? (Levels D, E)	Yes No (N/A)
Laboratory blanks analyzed?	(Yes) No N/A
Laboratory blank results acceptable?	(Yes) No N/A
Field/trip blanks analyzed? (Levels C, D, E)	Yes (No) N/A
Field/trip blank results acceptable? (Levels C, D, E)	Yes No (N/A)
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

4. ACCURACY (Levels C, D, and E)

Surrogates/system monitoring compounds analyzed?	(Yes) No N/A
Surrogate/system monitoring compound recoveries acceptable?	(Yes) No N/A
Surrogates traceable? (Levels D, E)	(Yes) No N/A
Surrogates expired? (Levels D, E)	Yes (No) N/A
MS/MSD samples analyzed?	(Yes) No N/A
MS/MSD results acceptable?	(Yes) No N/A
MS/MSD standards NIST traceable? (Levels D, E)	(Yes) No N/A
MS/MSD standards? (Levels D, E)	Yes (No) N/A
LCS/BSS samples analyzed?	(Yes) No N/A
LCS/BSS results acceptable?	(Yes) No N/A
Standards traceable? (Levels D, E)	(Yes) No N/A
Standards expired? (Levels D, E)	Yes (No) N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A
Performance audit sample(s) analyzed?	Yes (No) N/A
Performance audit sample results acceptable?	Yes No (N/A)

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

5. PRECISION (Levels C, D, and E)

MS/MSD samples analyzed?	(Yes) No N/A
MS/MSD RPD values acceptable?	(Yes) No N/A
MS/MSD standards NIST traceable? (Levels D, E)	(Yes) No N/A
MS/MSD standards expired? (Levels D, E)	Yes (No) N/A
LCS/LCSD duplicates run due to insufficient sample material?	(Yes) No N/A
Field duplicate RPD values acceptable?	(Yes) No N/A
Field split RPD values acceptable?	Yes No (N/A)
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

6. SYSTEM PERFORMANCE (Levels D and E)

Internal standards analyzed?	(Yes) No N/A
Internal standard areas acceptable?	(Yes) No N/A
Internal standard retention times acceptable?	(Yes) No N/A
Standards traceable?	(Yes) No N/A
Standards expired?	Yes (No) N/A
Transcription/calculation errors?	Yes (No) N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

7. HOLDING TIMES (all levels)

Samples properly preserved?	(Yes) No N/A
Sample holding times acceptable?	Yes (No) N/A

Comments:

Samples extracted 16 days after collection

8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)

Compound identification acceptable? (Levels D, E)	(Yes) No N/A
Compound quantitation acceptable? (Levels D, E)	(Yes) No N/A
Results reported for all requested analyses?	(Yes) No N/A
Results supported in the raw data? (Levels D, E)	(Yes) No N/A
Samples properly prepared? (Levels D, E)	(Yes) No N/A
Laboratory properly identified and coded all TIC? (Levels D, E)	(Yes) No N/A
Detection limits meet RDL?	(Yes) No N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

9. SAMPLE CLEANUP (Levels D and E)

GPC cleanup performed?	Yes (No) N/A
GPC check performed?	Yes No (N/A)
GPC check recoveries acceptable?	Yes No (N/A)
GPC calibration performed?	Yes No (N/A)
GPC calibration check performed?	Yes No (N/A)
GPC calibration check retention times acceptable?	Yes No (N/A)
Check/calibration materials traceable?	Yes No (N/A)
Check/calibration materials Expired?	Yes No (N/A)
Analytical batch QC given similar cleanup?	Yes No (N/A)
Transcription/Calculation Errors?	Yes (No) N/A

Comments (attach additional sheets as necessary):

Appendix 4

Additional Documentation Requested By Client

Surrogate Summary

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 280-100923-1
SDG: DN0202

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		12DCE	BFB	DBFM	TOL
Lab Sample ID	Client Sample ID	(70-130)	(70-130)	(70-130)	(70-130)
280-100923-1	B3D9H4	115	107	108	116
280-100923-2	B3D9H3	118	117	107	113
280-100923-3	B3D9H7	116	113	107	115
280-100923-3 MS	B3D9H7	113	104	105	108
280-100923-3 MSD	B3D9H7	113	105	104	109
LCS 280-387770/4	Lab Control Sample	98	92	92	97
MB 280-387770/6	Method Blank	113	113	106	114

Surrogate Legend

12DCE = 1,2-Dichloroethane-d4 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane (Surr)
TOL = Toluene-d8 (Surr)

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)					
		FBP	2FP	TBP	NBZ	PHL	TPH
Lab Sample ID	Client Sample ID	(48-130)	(41-130)	(42-130)	(42-130)	(45-130)	(20-130)
280-100923-2	B3D9H3	72	71	76	71	73	58
280-100923-2 MS	B3D9H3	70	67	82	70	68	58
280-100923-2 MSD	B3D9H3	74	74	79	76	75	49
280-100923-3	B3D9H7	72	68	82	69	73	51
LCS 280-388530/2-A	Lab Control Sample	81	80	88	82	83	86
LCSD 280-388530/3-A	Lab Control Sample Dup	79	78	84	80	79	82
MB 280-388530/1-A	Method Blank	78	75	75	77	76	83

Surrogate Legend

FBP = 2-Fluorobiphenyl (Surr)
2FP = 2-Fluorophenol (Surr)
TBP = 2,4,6-Tribromophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
PHL = Phenol-d5 (Surr)
TPH = Terphenyl-d14 (Surr)

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 280-100923-3 MSD — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387770

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Carbon tetrachloride	0.19	U	5.00	5.16		ug/L		103	65 - 135	3	21
Trichloroethene	0.16	U	5.00	4.58		ug/L		92	65 - 135	1	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*113*		*70 - 130*
4-Bromofluorobenzene (Surr)	*105*		*70 - 130*
Dibromofluoromethane (Surr)	*104*		*70 - 130*
Toluene-d8 (Surr)	*109*		*70 - 130*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 280-388530/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 389001 — **Prep Batch: 388530**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Diphenylhydrazine	0.23	U	10	0.23	ug/L		09/22/17 08:12	09/26/17 17:30	1

Tentatively Identified Compound	*MB Est. Result*	*MB Qualifier*	*Unit*	*D*	*RT*	*CAS No.*	*Prepared*	*Analyzed*	*Dil Fac*
Tentatively Identified Compound	*None*		*ug/L*				*09/22/17 08:12*	*09/26/17 17:30*	*1*

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*78*		*48 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
2-Fluorophenol (Surr)	*75*		*41 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
2,4,6-Tribromophenol (Surr)	*75*		*42 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
Nitrobenzene-d5 (Surr)	*77*		*42 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
Phenol-d5 (Surr)	*76*		*45 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*
Terphenyl-d14 (Surr)	*83*		*20 - 130*	*09/22/17 08:12*	*09/26/17 17:30*	*1*

Lab Sample ID: LCS 280-388530/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 389001 — **Prep Batch: 388530**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
1,2-Diphenylhydrazine			80.9	65.4		ug/L		81	55 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*81*		*48 - 130*
2-Fluorophenol (Surr)	*80*		*41 - 130*
2,4,6-Tribromophenol (Surr)	*88*		*42 - 130*
Nitrobenzene-d5 (Surr)	*82*		*42 - 130*
Phenol-d5 (Surr)	*83*		*45 - 130*
Terphenyl-d14 (Surr)	*86*		*20 - 130*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 280-388530/3-A
Matrix: Water
Analysis Batch: 389001

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 388530

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2-Diphenylhydrazine			80.9	65.1		ug/L		80	55 - 130	0	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*79*		*48 - 130*
2-Fluorophenol (Surr)	*78*		*41 - 130*
2,4,6-Tribromophenol (Surr)	*84*		*42 - 130*
Nitrobenzene-d5 (Surr)	*80*		*42 - 130*
Phenol-d5 (Surr)	*79*		*45 - 130*
Terphenyl-d14 (Surr)	*82*		*20 - 130*

Lab Sample ID: 280-100923-2 MS
Matrix: Water
Analysis Batch: 389001

Client Sample ID: B3D9H3
Prep Type: Total/NA
Prep Batch: 388530

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2-Diphenylhydrazine	0.23	U Z	82.3	66.1		ug/L		80	55 - 120

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*70*		*48 - 130*
2-Fluorophenol (Surr)	*67*		*41 - 130*
2,4,6-Tribromophenol (Surr)	*82*		*42 - 130*
Nitrobenzene-d5 (Surr)	*70*		*42 - 130*
Phenol-d5 (Surr)	*68*		*45 - 130*
Terphenyl-d14 (Surr)	*58*		*20 - 130*

Lab Sample ID: 280-100923-2 MSD
Matrix: Water
Analysis Batch: 389001

Client Sample ID: B3D9H3
Prep Type: Total/NA
Prep Batch: 388530

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2-Diphenylhydrazine	0.23	U Z	81.0	63.8		ug/L		79	55 - 120	4	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*74*		*48 - 130*
2-Fluorophenol (Surr)	*74*		*41 - 130*
2,4,6-Tribromophenol (Surr)	*79*		*42 - 130*
Nitrobenzene-d5 (Surr)	*76*		*42 - 130*
Phenol-d5 (Surr)	*75*		*45 - 130*
Terphenyl-d14 (Surr)	*49*		*20 - 130*

Date: 15 March 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: ERDF Leachate
Subject: Inorganics - Sample Data Group (SDG) DN0202

INTRODUCTION

This memorandum presents the results of data validation for SDG DN0202 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3D9H3	09/06/17	Water	D	6010D, 6020B
B3D9H7	09/06/17	Water	D	6010D, 6020B

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (SAP). Appendices 1 through 4 provide the following information as indicated below:

Appendix 1. Glossary of Data Reporting Qualifiers
Appendix 2. Summary of Data Qualification
Appendix 3. Data Validation Supporting Documentation
Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirement for ICP metals are analysis within 180 days of sample collection. Sample preservation requires acid preservation with nitric acid to pH <2.

The samples were analyzed within the prescribed holding times and properly preserved.

- **Initial and Continuing Calibration**

Compliance requirements for satisfactory instrument calibration are established to assure that the instruments are capable of producing acceptable qualitative and quantitative data for target analytes. The ICP-MS tune serves as an initial demonstration of instrument stability and precision. The instrument should be successfully calibrated each time the instrument is set up. Immediately following the calibration and after every ten samples the calibration must be verified by analyzing a calibration verifications standard. The control limits for the ICV and CCVs are 90% to 110%.

ICP-MS tune

All instrument tune requirements were met.

Instrument Calibration

All initial calibration criteria were met. It should be noted that the correlation coefficients and y-intercepts for both methods were not reported; however according to the data review checklist all calibration criteria were met. In addition, it should be noted that for method 6010D two replicate exposures were analyzed instead of the required minimum three exposures. Data should not be qualified as a result.

Initial and Continuing Calibration Verification (ICV/CCVs)

All calibration verification acceptance criteria were met.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis. The initial calibration blank (ICB) and the continuing calibration blanks (CCBs) are analyzed at the beginning of each analytical batch and after every 10 samples to verify the instrument baseline is at zero and free of contamination.

Calibration Blanks (ICBs/CCBs)

All calibration blank results were acceptable with the following exceptions.

The calibration blank result for Tl was negative with an absolute value > the method detection limit (MDL) but ≤ the practical quantitation limit (PQL). The Tl sample results were non-detects and based on professional judgment should be qualified as estimates and flagged "UJ."

The calibration blank results for U were negative with absolute values > the PQL. The U sample results were detects >10X the PQL and should not be qualified as a result.

Laboratory Blanks

All laboratory blank results were acceptable with the following exceptions.

The method blank result for Ba was a detect > the MDL but ≤ the PQL. The Ba sample results were detects ≥20X the blank value and should not be qualified.

The method blank result for U was negative with an absolute value > the MDL but ≤ the PQL. The U sample results were detects >10X the PQL and should not be qualified as a result.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and ICP-AES interference check sample results. According to the SAP, the matrix spike sample accuracy limits are 75% to 125% and the laboratory control sample accuracy limits are 80% to 120% as specified by the DV procedure. The interference check sample limits are ones specified by the DV procedure.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

All MS/MSD recoveries were acceptable. It should be noted that the parent sample results for Ca, Cr and U were detects >4X the spike concentration. Data should not be qualified as a result.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

ICP Interference Check Samples (ICSs)

All ICS results met QC acceptance criteria with the following exception. The ICS A result for Cr was a detect > the MDL but ≤ the PQL. The Ca results for both samples were equivalent to the ICS level; however the Cr sample results were detects > 100X the ICS A value and based on professional judgment data should not be qualified as a result.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results, field split sample results and ICP serial dilution results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are ≤20% as specified by the DV procedure.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

Serial Dilution Samples

All serial dilution results met QC acceptance criteria.

- **ICP-MS Internal Standards**

The analysis of ICP-MS internal standards is used to determine the existence and magnitude of instrument drift and physical interferences. The criteria for evaluation of internal standard results apply to all samples (including QC) analyzed during the analytical run, beginning with the calibration.

All internal standards results met QC acceptance criteria.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDG DN0202 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

A minor deficiency leading to qualification of Tl result for samples B3D9H3 and B3D9H7 was due to a negative laboratory blank value.

REFERENCES

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

WCH-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.

- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.

- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.

- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.

- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.

- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2

Summary of Data Qualification

Inorganic Data Qualification Summary			
SDG: DN0202	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
Tl	UJ	B3D9H3, B3D9H7	Negative calibration blank value

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	C	(D)	E
PROJECT: ERDF Leachate			DATA PACKAGE: VSR18-007		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica		DATE: 03/15/2018	
			SDG: DN0202		
ANALYSES PERFORMED					
SW-846/ICP X	SW-846/GFAA	SW-846/Hg	SW-846 Cyanide	SW-846/ICPMS X	
SAMPLES/MATRIX Water					
SDG DN0202: B3D9H3, B3D9H7					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	(Yes) No N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

2. **INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)**

Initial calibrations performed on all instruments?	(Yes) No N/A
Initial calibrations acceptable?	(Yes) No N/A
ICP interference checks acceptable?	Yes (No) N/A
ICV and CCV checks performed on all instruments?	(Yes) No N/A
ICV and CCV checks acceptable?	(Yes) No N/A
Standards traceable?	(Yes) No N/A
Standards expired?	Yes (No) N/A
Calculation check acceptable?	(Yes) No N/A

Comments:

Linear regressions for calibration were not reported,
two exposures were performed for samples and standards.

ICSA: Cr 1.45 ug/L;

3. **BLANKS (Levels B, C, D, and E)**

ICB and CCB checks performed for all applicable analyses? (Levels D, E)	(Yes) No N/A
ICB and CCB results acceptable? (Levels D, E)	Yes (No) N/A
Laboratory blanks analyzed?	(Yes) No N/A
Laboratory blank results acceptable?	Yes (No) N/A
Field blanks analyzed? (Levels C, D, E)	Yes (No) N/A
Field blank results acceptable? (Levels C, D, E)	Yes No (N/A)
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Laboratory blank - Ba 0.415 ug/L, U -0.282 ug/L

CCB: before samples U -0.282 ug/L, Tl -0.062 ug/L; after samples U -0.282 ug/L

Appendix A - (Cont.) Chemical Data Validation Checklist

4. **ACCURACY (Levels C, D, and E)**

MS/MSD samples analyzed?	(Yes) No N/A
MS/MSD results acceptable?	(Yes) No N/A
MS/MSD standards NIST traceable? (Levels D, E)	(Yes) No N/A
MS/MSD standards expired? (Levels D, E)	Yes (No) N/A
LCS/BSS samples analyzed?	(Yes) No N/A
LCS/BSS results acceptable?	(Yes) No N/A
Standards traceable? (Levels D, E)	(Yes) No N/A
Standards expired? (Levels D, E)	Yes (No) N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A
Performance audit sample(s) analyzed?	Yes (No) N/A
Performance audit sample results acceptable?	Yes No (N/A)

Comments:

Parent result for Ca, Cr and U >4X spike concentration

Appendix A - (Cont.) Chemical Data Validation Checklist

5. **PRECISION (Levels C, D, and E)**

Duplicate RPD values acceptable?	(Yes) No N/A
Duplicate results acceptable?	(Yes) No N/A
MS/MSD standards NIST traceable? (Levels D, E)	(Yes) No N/A
MS/MSD standards expired? (Levels D, E)	Yes (No) N/A
LCS/LCSD duplicates run due to insufficient sample material?	Yes (No) N/A
Field duplicate RPD values acceptable?	(Yes) No N/A
Field split RPD values acceptable?	Yes No (N/A)
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

6. **ICP QUALITY CONTROL (Levels D and E)**

ICP serial dilution samples analyzed?	(Yes) No N/A
ICP serial dilution %D values acceptable?	(Yes) No N/A
ICP post digestion spike required?	Yes (No) N/A
ICP post digestion spike values acceptable?	Yes No (N/A)
Standards traceable?	(Yes) No N/A
Standards expired?	Yes (No) N/A
Transcription/calculation errors?	Yes (No) N/A

Comments:

7. **HOLDING TIMES (all levels)**

Samples properly preserved?	(Yes) No N/A
Sample holding times acceptable?	(Yes) No N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

8. **RESULT QUANTITATION AND DETECTION LIMITS (all levels)**

Results reported for all requested analyses?	(Yes) No N/A
Results supported in the raw data? (Levels D, E)	(Yes) No N/A
Samples properly prepared? (Levels D, E)	(Yes) No N/A
Detection limits meet RDL?	(Yes) No N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments (attach additional sheets as necessary):

Appendix 4

Additional Documentation Requested By Client

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 280-387078/1-A
Matrix: Water
Analysis Batch: 387617
Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387078

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	34.5	U	200	34.5	ug/L		09/13/17 07:34	09/13/17 17:07	1
Potassium	237	U	3000	237	ug/L		09/13/17 07:34	09/13/17 17:07	1
Silicon	34.7	U	500	34.7	ug/L		09/13/17 07:34	09/13/17 17:07	1
Sodium	117	U	1000	117	ug/L		09/13/17 07:34	09/13/17 17:07	1

Lab Sample ID: LCS 280-387078/2-A
Matrix: Water
Analysis Batch: 387617
Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 387078

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	50000	50950		ug/L		102	80 - 120
Potassium	50000	52510		ug/L		105	80 - 120
Silicon	10000	10440		ug/L		104	80 - 120
Sodium	50000	54000		ug/L		108	80 - 120

Lab Sample ID: 280-100923-3 MS
Matrix: Water
Analysis Batch: 387617
Client Sample ID: B3D9H7
Prep Type: Total/NA
Prep Batch: 387078

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	294000		50000	340300	X	ug/L		93	75 - 125
Potassium	19300		50000	71450		ug/L		104	75 - 125
Silicon	20800		10000	30830		ug/L		100	75 - 125
Sodium	195000		50000	245800		ug/L		102	75 - 125

Lab Sample ID: 280-100923-3 MSD
Matrix: Water
Analysis Batch: 387617
Client Sample ID: B3D9H7
Prep Type: Total/NA
Prep Batch: 387078

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Calcium	294000		50000	338800	X	ug/L		90	75 - 125	0	20
Potassium	19300		50000	71220		ug/L		104	75 - 125	0	20
Silicon	20800		10000	30780		ug/L		100	75 - 125	0	20
Sodium	195000		50000	244600		ug/L		99	75 - 125	0	20

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 280-387080/1-A
Matrix: Water
Analysis Batch: 387601
Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387080

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.33	U	5.0	0.33	ug/L		09/13/17 07:34	09/13/17 20:21	1
Barium	0.415	B	1.0	0.29	ug/L		09/13/17 07:34	09/13/17 20:21	1
Beryllium	0.080	U	1.0	0.080	ug/L		09/13/17 07:34	09/13/17 20:21	1
Chromium	0.50	U	2.0	0.50	ug/L		09/13/17 07:34	09/13/17 20:21	1
Lead	0.18	U	1.0	0.18	ug/L		09/13/17 07:34	09/13/17 20:21	1
Selenium	0.70	U	5.0	0.70	ug/L		09/13/17 07:34	09/13/17 20:21	1
Thallium	0.050	U	1.0	0.050	ug/L		09/13/17 07:34	09/13/17 20:21	1

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 280-387080/1-A
Matrix: Water
Analysis Batch: 387601
Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387080

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tin	0.77	U	10.0	0.77	ug/L		09/13/17 07:34	09/13/17 20:21	1
Uranium	0.050	U	1.0	0.050	ug/L		09/13/17 07:34	09/13/17 20:21	1
Vanadium	0.50	U	5.0	0.50	ug/L		09/13/17 07:34	09/13/17 20:21	1
Zinc	2.0	U	10.0	2.0	ug/L		09/13/17 07:34	09/13/17 20:21	1
Tungsten	0.20	U	5.0	0.20	ug/L		09/13/17 07:34	09/13/17 20:21	1

Lab Sample ID: LCS 280-387080/2-A
Matrix: Water
Analysis Batch: 387601
Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 387080

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	40.0	38.34		ug/L		96	80 - 120
Barium	40.0	41.32		ug/L		103	80 - 120
Beryllium	40.0	40.07		ug/L		100	80 - 120
Chromium	40.0	39.88		ug/L		100	80 - 120
Lead	40.0	38.27		ug/L		96	80 - 120
Selenium	40.0	39.41		ug/L		99	80 - 120
Thallium	40.0	40.02		ug/L		100	80 - 120
Tin	40.0	37.96		ug/L		95	80 - 120
Uranium	40.0	35.91		ug/L		90	80 - 120
Vanadium	40.0	40.44		ug/L		101	80 - 120
Zinc	40.0	42.45		ug/L		106	80 - 120
Tungsten	40.0	37.03		ug/L		93	80 - 120

Lab Sample ID: 280-100923-3 MS
Matrix: Water
Analysis Batch: 387601
Client Sample ID: B3D9H7
Prep Type: Total/NA
Prep Batch: 387080

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	5.3		40.0	45.79		ug/L		101	75 - 125
Barium	90.6		40.0	127.2		ug/L		92	75 - 125
Beryllium	0.080	U	40.0	43.74		ug/L		109	75 - 125
Chromium	177		40.0	211.8	X	ug/L		86	75 - 125
Lead	0.18	U	40.0	40.29		ug/L		101	75 - 125
Selenium	1.6	B	40.0	43.77		ug/L		106	75 - 125
Thallium	0.050	U	40.0	42.80		ug/L		107	75 - 125
Tin	0.77	U	40.0	40.05		ug/L		100	75 - 125
Uranium	1060		40.0	998.1	X	ug/L		-147	75 - 125
Vanadium	15.8		40.0	58.16		ug/L		106	75 - 125
Zinc	2.0	U	40.0	43.50		ug/L		109	75 - 125
Tungsten	0.20	U	40.0	39.27		ug/L		98	75 - 125

Lab Sample ID: 280-100923-3 MSD
Matrix: Water
Analysis Batch: 387601
Client Sample ID: B3D9H7
Prep Type: Total/NA
Prep Batch: 387080

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	5.3		40.0	45.39		ug/L		100	75 - 125	1	20
Barium	90.6		40.0	134.1		ug/L		109	75 - 125	5	20

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 280-100923-3 MSD — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387601 — **Prep Batch: 387080**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Beryllium	0.080	U	40.0	39.73		ug/L		99	75 - 125	10	20
Chromium	177		40.0	218.7	X	ug/L		104	75 - 125	3	20
Lead	0.18	U	40.0	40.80		ug/L		102	75 - 125	1	20
Selenium	1.6	B	40.0	42.79		ug/L		103	75 - 125	2	20
Thallium	0.050	U	40.0	42.29		ug/L		106	75 - 125	1	20
Tin	0.77	U	40.0	40.55		ug/L		101	75 - 125	1	20
Uranium	1060		40.0	1021	X	ug/L		-90	75 - 125	2	20
Vanadium	15.8		40.0	58.67		ug/L		107	75 - 125	1	20
Zinc	2.0	U	40.0	40.94		ug/L		102	75 - 125	6	20
Tungsten	0.20	U	40.0	38.76		ug/L		97	75 - 125	1	30

Method: 350.1 - Nitrogen, Ammonia

Lab Sample ID: MB 280-387267/61 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia as N	22.0	U	100	22.0	ug/L			09/11/17 21:35	1

Lab Sample ID: LCS 280-387267/59 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia as N	2500	2519		ug/L		101	80 - 120

Lab Sample ID: LCSD 280-387267/60 — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ammonia as N	2500	2497		ug/L		100	80 - 120	1	20

Lab Sample ID: 280-100923-3 MS — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia as N	22.0	U	1000	1042		ug/L		104	75 - 125

Lab Sample ID: 280-100923-3 MSD — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ammonia as N	22.0	U	1000	1046		ug/L		105	75 - 125	0	20

Date: 15 March 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: ERDF Leachate
Subject: General Chemistry - Sample Data Groups (SDGs) DN0202 and WC2279

INTRODUCTION

This memorandum presents the results of data validation for SDGs DN0202 and WC2279 prepared by TestAmerica Laboratories, Inc.. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3D9H3	09/06/17	Water	D	350.1, 353.2, 410.4, 9020B, 9040C, 9050A, SM2320B, SM2540C, SM2540D
B3D9H7	09/06/17	Water	D	350.1, 353.2, 410.4, 9020B, 9040C, 9050A, SM2320B, SM2540C, SM2540D
B3D9H1	09/06/17	Water	D	300.0, 7196A
B3D9H5	09/06/17	Water	D	300.0, 7196A

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (SAP). Appendices 1 through 4 provide the following information as indicated below:

Appendix 1. Glossary of Data Reporting Qualifiers
Appendix 2. Summary of Data Qualification
Appendix 3. Data Validation Supporting Documentation
Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirements are as follows:

- All anions except nitrate, nitrite, and orthophosphate – analysis within 28 days of sample collection
- Nitrate, nitrite, and orthophosphate – analysis within 48 hours of sample collection
- Alkalinity – analysis within 14 days of sample collection

- Ammonia, chemical oxygen demand (COD), conductivity, nitrate/nitrite and total organic halides (TOX) – analysis within 28 days of sample collection
- Hexavalent chromium – analysis within 24 hours of sample collection
- pH – analysis as soon as possible (24 hours is a reasonable holding time)
- Total dissolved solids (TDS) and total suspended solids (TSS) – analysis within 7 days of sample collection

Sample preservation for the above analyses requires chilling to <6 degrees Celsius. In addition, ammonia, nitrate/nitrite and TOX are brought to pH<2 with sulfuric acid.

The samples were analyzed within the prescribed holding times and properly preserved with the following exceptions.

For SDG WC2779, the temperature for samples B3D9H1 and B3D9H5 was 18.1 degrees Celsius upon receipt at the laboratory. The samples were received within 8 hours of sample collection; therefore based on professional judgment, data should not be qualified as a result.

For SDG DN0202, samples B3D9H3 and B3D9H7 were analyzed for pH six days after sample collection. Based on professional judgment the pH results should be qualified as estimates and flagged "J."

- **Initial and Continuing Calibration**

Compliance requirements for satisfactory instrument calibration are established to assure that the instruments are capable of producing acceptable qualitative and quantitative data for target analytes. The instrument should be successfully calibrated each time the instrument is set up. Immediately following the calibration and after every ten samples the calibration must be verified by analyzing a calibration verifications standard. The control limits for the ICV and CCVs are 85% to 115%.

Initial calibration

All instrument calibrations met QC acceptance criteria.

Initial and Continuing Calibration Verifications (ICV/CCVs)

All calibration verification acceptance criteria were met with the following exceptions.

SDG DN0202 – More than 10 samples were analyzed between acceptable CCVs for ammonia, nitrate/nitrite, pH and alkalinity. All CCVs were within the acceptance limit, and based on professional judgment, data should not be qualified.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis. The initial calibration blank (ICB) and the

continuing calibration blanks (CCBs) are analyzed at the beginning of each analytical batch and after every 10 samples to verify the instrument baseline is at zero and free of contamination.

Calibration Blanks (ICBs/CCBs)

All calibration blank results were within the acceptance limit with the following exception.

For SDG DN0202, the calibration blank result for alkalinity was a detect > the method detection limit (MDL) but ≤ the practical quantitation limit (PQL). The alkalinity results for samples B3D9H3 and B3D9H7 were significantly > the PQL and data should not be qualified as a result.

Laboratory Blanks

All laboratory blank results were acceptable with the following exception.

For SDG DN0202, the alkalinity laboratory blank result was > the MDL but ≤ the PQL. The alkalinity results for samples B3D9H3 and B3D9H7 were detects ≥20X the blank value and should not be qualified as a result.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results and laboratory control sample results. According to the SAP, the matrix spike sample accuracy limits are 75% to 125% and the laboratory control sample accuracy limits 80% to 120% as specified by the DV procedure.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

All MS/MSD recoveries were acceptable with the following exception.

For SDG DN0202, the MS and MSD recoveries for TOX were <30%. The TOX results for samples B3D9H3 and B3D9H7 were detects and should be qualified as estimates and flagged "J-."

Laboratory Control Samples/Laboratory Sample Duplicate (LCS/LCSD)

All LCS/LCSD recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, laboratory duplicate sample results, LCS/LCSD results, field duplicate sample results and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are ≤20% as specified by the DV procedure.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

Laboratory Duplicate Samples

All laboratory duplicate results were acceptable.

LCS/LCSD Samples

All LCS/LCSD RPD values were acceptable.

Field Duplicate Samples

For SDG DN0202, field duplicate sample B3D9H7 and its associated sample B3K9H3 had an alkalinity RPD >20%.

Field Split Samples

No field splits were submitted for validation.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDLs with the exception of TOX and specific conductance.

- **Completeness**

SDGs DN0202 and WC2279 were submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Minor deficiencies leading to qualification of pH and TOX for samples B3D9H3 and B3D9H7 were due to holding time infraction and very low matrix spike recoveries.

REFERENCES

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

WCH-173, Rev. 0, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.

- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.

- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.

- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.

- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.

- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2

Summary of Data Qualification

General Chemistry Data Qualification Summary			
SDGs:DN0202, WC2279	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
pH	J	B3D9H3, B3D9H7	Analysis beyond the holding time
TOX	J-	B3D9H3, B3D9H7	Very low matrix spike recoveries

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	C	(D)	E
PROJECT: ERDF Leachate			DATA PACKAGE: VSR18-007		
VALIDATOR: Eyda Hergenreder		LAB: TestAmerica		DATE: 03/15/2018	
			SDG: DN0202, WC2279		

ANALYSES PERFORMED					
Anions/IC X	TOC	TOX X	TPH-418.1	Oil and Grease	Alkalinity X
Ammonia X	BOD/COD	Chloride	Chromium-VI X	pH X	NO_3/NO_2 X
Sulfate	TDS X	TKN	Phosphate	COD X	Specific Conductance X
TSS X					

SAMPLES/MATRIX Water
SDG DN0202 - B3D9H3, B3D9H7
SDG WC2279 - B3D9H1, B3D9H5

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	(Yes) No N/A

Comments:

Appendix A - (Cont.) Chemical Data Validation Checklist

2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations performed on all instruments?	(Yes) No N/A
Initial calibrations acceptable?	(Yes) No N/A
ICV and CCV checks performed on all instruments?	(Yes) No N/A
ICV and CCV checks acceptable?	(Yes) No N/A
Standards traceable?	(Yes) No N/A
Standards expired?	Yes (No) N/A
Calculation check acceptable?	(Yes) No N/A

Comments:

SDG DN0202 - More than 10 samples were analyzed between CCVs for ammonia, nitrate, pH, Alk

3. BLANKS (Levels B, C, D, and E)

ICB and CCB checks performed for all applicable analyses? (Levels D, E)	(Yes) No N/A
ICB and CCB results acceptable? (Levels D, E)	Yes (No) N/A
Laboratory blanks analyzed?	(Yes) No N/A
Laboratory blank results acceptable?	Yes (No) N/A
Field blanks analyzed? (Levels C, D, E)	Yes (No) N/A
Field blank results acceptable? (Levels C, D, E)	Yes No (N/A)
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

SDG DN0202 - Alkalinity - CCB 2630 mg/L; MB 3520 ug/L

Appendix A - (Cont.) Chemical Data Validation Checklist

4. ACCURACY (Levels C, D, and E)

Spike samples analyzed?	(Yes) No N/A
Spike recoveries acceptable?	Yes (No) N/A
Spike standards NIST traceable? (Levels D, E)	(Yes) No N/A
Spike standards expired? (Levels D, E)	Yes (No) N/A
LCS/BSS samples analyzed?	(Yes) No N/A
LCS/BSS results acceptable?	(Yes) No N/A
Standards traceable? (Levels D, E)	(Yes) No N/A
Standards expired? (Levels D, E)	Yes (No) N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A
Performance audit sample(s) analyzed?	Yes (No) N/A
Performance audit sample results acceptable?	Yes No (N/A)

Comments:

SDG DN0202 - TOX MS 18%/MSD 21%

Appendix A - (Cont.) Chemical Data Validation Checklist

5. PRECISION (Levels C, D, and E)

Duplicate RPD values acceptable?	(Yes) No N/A
Duplicate results acceptable?	(Yes) No N/A
MS/MSD standards NIST traceable? (Levels D, E)	(Yes) No N/A
MS/MSD standards expired? (Levels D, E)	Yes (No) N/A
LCS/LCSD duplicates run due to insufficient sample material?	(Yes) No N/A
Field duplicate RPD values acceptable?	Yes (No) N/A
Field split RPD values acceptable?	Yes No (N/A)
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

SDG DN0202: Alkalinity sample B3D9H3/field duplicate B3D9H7 RPD 43%

6. HOLDING TIMES (all levels)

Samples properly preserved?	Yes (No) N/A
Sample holding times acceptable?	Yes (No) N/A

Comments:

SDG WC2779 - sample temperature was 18.1 upon receipt at laboratory

SDG DN0202 - samples B3D9H3 and B3D9H7 analyzed 6 days after sample collection for pH

Appendix A - (Cont.) Chemical Data Validation Checklist

7. RESULT QUANTITATION AND DETECTION LIMITS (all levels)

Results reported for all requested analyses?	(Yes) No N/A
Results supported in the raw data? (Levels D, E)	(Yes) No N/A
Samples properly prepared? (Levels D, E)	(Yes) No N/A
Detection limits meet RDL?	Yes (No) N/A
Transcription/calculation errors? (Levels D, E)	Yes (No) N/A

Comments (attach additional sheets as necessary):

SDG DN0202 - MDL>RL for TOX and Spec. Cond.

Appendix 4

Additional Documentation Requested By Client

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 280-100923-3 MSD — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387601 — **Prep Batch: 387080**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Beryllium	0.080	U	40.0	39.73		ug/L		99	75 - 125	10	20
Chromium	177		40.0	218.7	X	ug/L		104	75 - 125	3	20
Lead	0.18	U	40.0	40.80		ug/L		102	75 - 125	1	20
Selenium	1.6	B	40.0	42.79		ug/L		103	75 - 125	2	20
Thallium	0.050	U	40.0	42.29		ug/L		106	75 - 125	1	20
Tin	0.77	U	40.0	40.55		ug/L		101	75 - 125	1	20
Uranium	1060		40.0	1021	X	ug/L		-90	75 - 125	2	20
Vanadium	15.8		40.0	58.67		ug/L		107	75 - 125	1	20
Zinc	2.0	U	40.0	40.94		ug/L		102	75 - 125	6	20
Tungsten	0.20	U	40.0	38.76		ug/L		97	75 - 125	1	30

Method: 350.1 - Nitrogen, Ammonia

Lab Sample ID: MB 280-387267/61 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia as N	22.0	U	100	22.0	ug/L			09/11/17 21:35	1

Lab Sample ID: LCS 280-387267/59 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia as N	2500	2519		ug/L		101	80 - 120

Lab Sample ID: LCSD 280-387267/60 — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ammonia as N	2500	2497		ug/L		100	80 - 120	1	20

Lab Sample ID: 280-100923-3 MS — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia as N	22.0	U	1000	1042		ug/L		104	75 - 125

Lab Sample ID: 280-100923-3 MSD — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387267

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ammonia as N	22.0	U	1000	1046		ug/L		105	75 - 125	0	20

Method: 353.2 - Nitrogen, Nitrate-Nitrite

Lab Sample ID: MB 280-388639/22
Matrix: Water
Analysis Batch: 388639
Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	19.0	U	100	19.0	ug/L			09/21/17 22:05	1

Lab Sample ID: LCS 280-388639/21
Matrix: Water
Analysis Batch: 388639
Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate Nitrite as N	5000	4597		ug/L		92	80 - 120

Lab Sample ID: 280-100923-3 MS
Matrix: Water
Analysis Batch: 388639
Client Sample ID: B3D9H7
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate Nitrite as N	57300	D	40000	93560	D	ug/L		91	75 - 125

Lab Sample ID: 280-100923-3 MSD
Matrix: Water
Analysis Batch: 388639
Client Sample ID: B3D9H7
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate Nitrite as N	57300	D	40000	93770	D	ug/L		91	75 - 125	0	20

Method: 410.4 - COD

Lab Sample ID: MB 280-388769/5
Matrix: Water
Analysis Batch: 388769
Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chemical Oxygen Demand	4060	U	20000	4060	ug/L			09/25/17 09:57	1

Lab Sample ID: LCS 280-388769/3
Matrix: Water
Analysis Batch: 388769
Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chemical Oxygen Demand	100000	100300		ug/L		100	80 - 120

Lab Sample ID: LCSD 280-388769/4
Matrix: Water
Analysis Batch: 388769
Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chemical Oxygen Demand	100000	101300		ug/L		101	80 - 120	1	20

Method: 410.4 - COD (Continued)

Lab Sample ID: 280-100923-3 MS — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 388769

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chemical Oxygen Demand	21100		50000	75150		ug/L		108	75 - 125		

Lab Sample ID: 280-100923-3 MSD — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 388769

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chemical Oxygen Demand	21100		50000	69920		ug/L		98	75 - 125	7	20

Method: 9020B - Organic Halides, Total (TOX)

Lab Sample ID: MB 280-387512/2 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387512

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Halogens - Dup	7.7	U	30.0	7.7	ug/L			09/13/17 09:40	1

Lab Sample ID: LCS 280-387512/4 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387512

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Halogens - Dup	100	100.5		ug/L		101	80 - 120		

Lab Sample ID: 280-100923-3 MS — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387512

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Halogens - Dup	82.7	B N D	500	172.5	N D	ug/L		18	75 - 125		

Lab Sample ID: 280-100923-3 MSD — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387512

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Halogens - Dup	82.7	B N D	500	188.6	N D	ug/L		21	75 - 125	9	23

Method: 9040C - pH

Lab Sample ID: LCS 280-387418/4 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387418

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH	7.00	7.030		SU		100	99 - 101		

Method: 9040C - pH (Continued)

Lab Sample ID: 280-100923-3 DU — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387418

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	8.07			8.070		SU				0	5

Method: 9050A - Specific Conductance

Lab Sample ID: MB 280-387108/5 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387108

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	2.00	U	2.00	2.00	umhos/cm			09/09/17 13:27	1

Lab Sample ID: LCS 280-387108/3 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387108

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Specific Conductance			1410	1375		umhos/cm		98	90 - 110		

Lab Sample ID: LCSD 280-387108/4 — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387108

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Specific Conductance			1410	1371		umhos/cm		97	90 - 110	0	10

Lab Sample ID: 280-100923-3 DU — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387108

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Specific Conductance	2130			2119		umhos/cm				0.5	10

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 280-387419/5 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387419

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	3520	B	5000	1070	ug/L			09/12/17 15:56	1

Lab Sample ID: LCS 280-387419/4 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387419

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity as CaCO3			200000	194500		ug/L		97	80 - 120		

Method: SM 2320B - Alkalinity (Continued)

Lab Sample ID: 280-100923-3 DU — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387419

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Alkalinity as CaCO3	209000		225600		ug/L		7	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 280-387192/1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387192

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	4700	U	10000	4700	ug/L			09/11/17 11:19	1

Lab Sample ID: LCS 280-387192/2 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387192

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	500000	491000		ug/L		98	80 - 120

Lab Sample ID: 280-100923-3 DU — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387192

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	1970000		1989000		ug/L		1	20

Method: SM 2540D - Solids, Total Suspended (TSS)

Lab Sample ID: MB 280-387146/1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387146

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	1100	U	4000	1100	ug/L			09/11/17 07:31	1

Lab Sample ID: LCS 280-387146/2 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387146

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Suspended Solids	100000	94000		ug/L		94	80 - 120

Lab Sample ID: 280-100923-3 DU — **Client Sample ID: B3D9H7**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 387146

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Suspended Solids	1100	U	1100	U	ug/L		NC	20

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 300-5975-1
SDG: WC2279

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 300-9063/41
Matrix: Water
Analysis Batch: 9063

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.014	U	0.028	0.014	mg/L			09/07/17 04:47	1
Nitrite as N	0.019	U	0.038	0.019	mg/L			09/07/17 04:47	1
Orthophosphate as P	0.041	U	0.082	0.041	mg/L			09/07/17 04:47	1

Lab Sample ID: MB 300-9063/5
Matrix: Water
Analysis Batch: 9063

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.014	U	0.028	0.014	mg/L			09/06/17 19:44	1
Nitrite as N	0.019	U	0.038	0.019	mg/L			09/06/17 19:44	1
Orthophosphate as P	0.041	U	0.082	0.041	mg/L			09/06/17 19:44	1

Lab Sample ID: LCS 300-9063/42
Matrix: Water
Analysis Batch: 9063

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	2.26	2.27		mg/L		100	80 - 120
Nitrite as N	3.04	3.07		mg/L		101	80 - 120
Orthophosphate as P	6.53	6.55		mg/L		100	80 - 120

Lab Sample ID: LCS 300-9063/6
Matrix: Water
Analysis Batch: 9063

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	2.26	2.25		mg/L		100	80 - 120
Nitrite as N	3.04	3.02		mg/L		99	80 - 120
Orthophosphate as P	6.53	6.46		mg/L		99	80 - 120

Lab Sample ID: 300-5974-A-18 MS
Matrix: Water
Analysis Batch: 9063

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	5.7	D	1.13	6.89	D	mg/L		107	75 - 125
Nitrite as N	0.095	U D	1.52	1.37	D	mg/L		90	75 - 125
Orthophosphate as P	0.21	U D	3.26	2.83	D	mg/L		87	75 - 125

Lab Sample ID: 300-5974-A-18 DU
Matrix: Water
Analysis Batch: 9063

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Nitrate as N	5.7	D	5.63	D	mg/L		1	20
Nitrite as N	0.095	U D	0.095	U D	mg/L		NC	20
Orthophosphate as P	0.21	U D	0.21	U D	mg/L		NC	20

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 300-5975-1
SDG: WC2279

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: MB 300-9064/41
Matrix: Water
Analysis Batch: 9064

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	0.10	U	0.20	0.10	mg/L			09/07/17 04:47	1
Fluoride	0.025	U	0.050	0.025	mg/L			09/07/17 04:47	1
Sulfate	0.13	U	0.25	0.13	mg/L			09/07/17 04:47	1
Bromide	0.063	U	0.13	0.063	mg/L			09/07/17 04:47	1

Lab Sample ID: MB 300-9064/5
Matrix: Water
Analysis Batch: 9064

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	0.10	U	0.20	0.10	mg/L			09/06/17 19:44	1
Fluoride	0.025	U	0.050	0.025	mg/L			09/06/17 19:44	1
Sulfate	0.13	U	0.25	0.13	mg/L			09/06/17 19:44	1
Bromide	0.063	U	0.13	0.063	mg/L			09/06/17 19:44	1

Lab Sample ID: LCS 300-9064/42
Matrix: Water
Analysis Batch: 9064

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	16.0	15.9		mg/L		99	80 - 120
Fluoride	4.00	3.98		mg/L		99	80 - 120
Sulfate	20.0	19.9		mg/L		99	80 - 120
Bromide	10.0	10.0		mg/L		100	80 - 120

Lab Sample ID: LCS 300-9064/6
Matrix: Water
Analysis Batch: 9064

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	16.0	15.7		mg/L		98	80 - 120
Fluoride	4.00	3.93		mg/L		98	80 - 120
Sulfate	20.0	19.6		mg/L		98	80 - 120
Bromide	10.0	9.95		mg/L		99	80 - 120

Lab Sample ID: 300-5974-A-18 MS
Matrix: Water
Analysis Batch: 9064

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	11	D	8.00	18.9	D	mg/L		100	75 - 125
Fluoride	0.27	D	2.00	2.07	D	mg/L		90	75 - 125
Sulfate	56	D	10.0	65.1	D	mg/L		94	75 - 125
Bromide	0.31	U D	5.00	4.57	D	mg/L		91	75 - 125

QC Sample Results

Client: CH2M Hill Plateau Remediation Company
Project/Site: FRC16-03

TestAmerica Job ID: 300-5975-1
SDG: WC2279

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 300-5974-A-18 DU
Matrix: Water
Analysis Batch: 9064

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Chloride	11	D	10.8	D	mg/L		1	20
Fluoride	0.27	D	0.271	D	mg/L		0.2	20
Sulfate	56	D	55.2	D	mg/L		0.8	20
Bromide	0.31	U D	0.31	U D	mg/L		NC	20

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 300-9070/3
Matrix: Water
Analysis Batch: 9070

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	0.0015	U	0.0040	0.0015	mg/L			09/06/17 16:31	1

Lab Sample ID: LCS 300-9070/4
Matrix: Water
Analysis Batch: 9070

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cr (VI)	0.250	0.253		mg/L		101	80 - 120

Lab Sample ID: 300-5972-A-1 MS
Matrix: Water
Analysis Batch: 9070

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cr (VI)	0.0067		0.0501	0.0592		mg/L		105	75 - 125

Lab Sample ID: 300-5972-A-1 DU
Matrix: Water
Analysis Batch: 9070

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Cr (VI)	0.0067		0.00630		mg/L		6	20

Date: 15 March 2018
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: ERDF Leachate
Subject: Radiochemical - Sample Data Group (SDG) GEL432331

INTRODUCTION

This memorandum presents the results of data validation for SDG GEL432331 prepared by GEL Laboratories LLC. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B3D9H2	09/06/17	Water	D	Gross alpha/beta, Tc-99, Gamma, Tritium, I-129, Total Alpha Radium, T-Strontium & C-14
B3D9H6	09/06/17	Water	D	Gross alpha/beta, Tc-99, Gamma, Tritium, I-129, Total Alpha Radium, T-Strontium & C-14

Data validation was conducted in accordance with the CHPRC validation statement of work and the Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan, WCH-173, Rev. 2 (SAP). Appendices 1 through 4 provide the following information as indicated below:

Appendix 1. Glossary of Data Reporting Qualifiers
Appendix 2. Summary of Data Qualification
Appendix 3. Data Validation Supporting Documentation
Appendix 4. Additional Documentation Requested by Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analysis is 180 days. Sample preservation for water samples for all analyses except tritium, C-14 and I-129 requires acid preservation with nitric acid to pH <2.

The samples were analyzed within the prescribed holding time and properly preserved.

- **Initial and Continuing Instrument Calibration**

The objective of instrument calibration is to ensure that detectors used for sample analysis are initially capable of producing qualitative results and that the calibration was maintained throughout the time period in which samples are analyzed.

Initial Calibration

All counting system used for sample analyses were efficiently calibrated.

Continuing Calibration

All continuing calibration checks were performed and met QC acceptance criteria.

Background Counts

All background count results met QC acceptance criteria.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and chemical recovery factors. Chemical recovery factors are determined through use of a carrier or tracer and provide assessment of the chemical separation process that is affected by the laboratory procedure, sample matrix, and/or interference. Chemical recovery factors are used to correct sample concentration, uncertainty, and MDC results. According to the SAP, the limits

used for the laboratory control sample, matrix spikes, carrier and tracer recoveries are ones specified by the DV procedure.

Matrix Spike (MS) Samples

All MS recoveries were acceptable. It should be noted that the parent sample result for tritium was >4X the spike concentration. Data should not be qualified as a result.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

Carrier/Tracer Recovery Factors

All carrier/tracer recovery factors were acceptable.

- **Precision**

Precision is evaluated by reviewing laboratory duplicate, field duplicate, and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are ones specified by the DV procedure. When sample results are <5X the MDC, the range between the primary and duplicate sample results must be ≤ the MDC of the primary sample.

Laboratory Duplicate Samples

All laboratory duplicate results were acceptable.

Field Duplicate Samples

All field duplicate results were acceptable.

Field Split Samples

No field splits were submitted for validation.

- **Detection Limits**

Reported MDCs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDCs were below the CRDLs with the following exceptions. The MDCs for gross alpha, gross beta, I-129 and Tc-99 for sample B3D9H2 and gross alpha, gross beta, Am-241, I-129 and Tc-99 for sample B3D9H6 were > the CRDL.

- **Completeness**

SDG GEL432331 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

None found.

REFERENCES

GRP-GD-002, Rev. 2, Change 0, *Data Validation for Radiochemical Analyses*, September 2016.

WCH-173, Rev. 2, *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan*, November 2015.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** ─ The constituent was analyzed for and was not detected. The data should be considered usable for decision-making purposes.

- **UJ** ─ The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the MDC. The data should be considered usable for decision-making purposes.

- **J** ─ Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J+** ─ Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **J-** ─ Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.

- **UR** ─ Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

- **R** ─ Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2

Summary of Data Qualification

Radiochemical Data Qualification Summary			
SDGs: GEL432331	Reviewer: AQA	Project: ERDF Leachate	Page 1 of 1
Analyte(s)	**Qualifier**	**Samples Affected**	**Reason**
Radiochemical	None	N/A	N/A

Comments: None

Appendix 3

Data Validation Supporting Documentation

Appendix B - Radiochemical Data Validation Checklist

Validation Level:	A	B	C	(D)	E

Project: ERDF Leachate		Data Package: VSR18-007
Validator: Eyda Hergenreder	Lab: GEL	Date: 03/15/2018
		SDG: GEL432331

Analyses Performed					
X Gross Alpha/Beta	☐ Strontium-90	X Technetium-99	☐ Alpha Spectroscopy	X Gamma Spectroscopy	X Tritium
☐ Total Uranium	☐ Radium-22	X I-129	X Total Alpha Radium	X Total Strontium	X C-14

Samples/Matrix Water

SDG GEL432331 - B3D9H2, B3D9H6

1. Completeness and Case Narrative	☐ N/A
Technical verification forms present?	(Yes) No N/A

Comments:

2. Initial Calibration (Levels D, E)	☐ N/A
Instruments/detectors calibrated?	(Yes) No N/A
Initial calibration acceptable?	(Yes) No N/A
Standards NIST traceable?	(Yes) No N/A
Standards expired?	Yes (No) N/A
Calculation check acceptable?	(Yes) No N/A

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

3. Continuing Calibration (Levels D, E)	☐ N/A
Calibration checked within required frequency?	(Yes) No N/A
Calibration check acceptable?	(Yes) No N/A
Calibration check standards traceable?	(Yes) No N/A
Calibration check standards expired?	Yes (No) N/A
Calculation check acceptable?	(Yes) No N/A

Comments:

4. Background Counts (Levels D, E)	☐ N/A
Background counts checked within required frequency?	(Yes) No N/A
Background counts acceptable?	(Yes) No N/A
Calculation check acceptable?	(Yes) No N/A

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

5. Blanks (Levels B, C, D, E)	☐ N/A
Method blank analyzed within required frequency?	(Yes) No N/A
Method blank results acceptable?	(Yes) No N/A
Analytes detected in method blank?	Yes (No) N/A
Field blank(s) analyzed?	Yes (No) N/A
Field blank results acceptable?	Yes No (N/A)
Analytes detected in field blank(s)?	Yes No (N/A)
Transcription/Calculation Errors? (Levels D, E)	Yes (No) N/A

Comments:

6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E)	☐ N/A
LCS /BSS analyzed within required frequency?	(Yes) No N/A
LCS/BSS recoveries acceptable?	(Yes) No N/A
LCS/BSS traceable? (Levels D,E)	(Yes) No N/A
LCS/BSS expired? (Levels D,E)	Yes (No) N/A
LCS/BSS levels correct? (Levels D,E)	(Yes) No N/A
Transcription/Calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

7. Chemical Carrier Recovery (Levels C, D, E)	☐ N/A
Chemical carrier added?	(Yes) No N/A
Chemical recovery acceptable?	(Yes) No N/A
Chemical carrier traceable? (Levels D, E)	(Yes) No N/A
Chemical carrier expired? (Levels D, E)	Yes (No) N/A
Transcription/Calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

8. Tracer Recovery (Levels C, D, E)	☐ N/A
Tracer added?	(Yes) No N/A
Tracer recovery acceptable?	(Yes) No N/A
Tracer traceable? (Levels D, E)	(Yes) No N/A
Tracer expired? (Levels D, E)	Yes (No) N/A
Transcription/Calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

9. Matrix Spikes (Levels C, D, E)	☐ N/A
Matrix spike analyzed?	(Yes) No N/A
Spike recoveries acceptable?	(Yes) No N/A
Spike source traceable? (Levels D, E)	(Yes) No N/A
Spike source expired? (Levels D, E)	Yes (No) N/A
Transcription/Calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Parent result for tritium >4X spike concentration

10. Duplicates (Levels C, D, E)	☐ N/A
Duplicates analyzed at required frequency?	(Yes) No N/A
RPD values acceptable?	(Yes) No N/A
Transcription/Calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

Appendix B - (Cont.) Radiochemical Data Validation Checklist

11. Field QC Samples (Levels C, D, E)	☐ N/A
Field duplicate sample(s) analyzed?	(Yes) No N/A
Field duplicate RPD values acceptable?	(Yes) No N/A
Field split sample(s) analyzed?	Yes (No) N/A
Field split RPD values acceptable?	Yes No (N/A)
Performance audit sample(s) analyzed?	Yes (No) N/A
Performance audit sample results acceptable?	Yes No (N/A)

Comments:

12. Holding Times (All levels)	☐ N/A
Are sample holding times acceptable?	(Yes) No N/A

Comments:

13. Results and MDCs (All Levels)	☐ N/A
Results reported for all required sample analyses?	(Yes) No N/A
Results supported in raw data?(Levels D, E)	(Yes) No N/A
Results acceptable? (Levels D, E)	(Yes) No N/A
MDC's meet required reporting limits?	Yes (No) N/A
Transcription/Calculation errors? (Levels D, E)	Yes (No) N/A

Comments:

MDC > RL

sample B3D9H2, alpha, beta, I-129, Tc-99

sample B3D9H6, alpha, beta, Am-241, I-129, Tc-99

Appendix 4

Additional Documentation Requested By Client

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: October 4, 2017

Client : **CH2MHill Plateau Remediation Company**
MSIN R3-50 CHPRC
PO Box 1600
Richland, Washington **99352**

Contact: **Mr. Scot Fitzgerald**

Workorder: **432331**

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
Rad Gamma Spec									
Batch 1700608									
QC1203874924 MB									
Americium-241			U	-3.51	pCi/L			MXR1	09/21/1711:29
	Uncert:			+/-11.0					
	TPU:			+/-11.1					
Cesium-137			U	3.69	pCi/L				
	Uncert:			+/-3.91					
	TPU:			+/-4.25					
Cobalt-60			U	-0.898	pCi/L				
	Uncert:			+/-3.64					
	TPU:			+/-3.67					
Europium-152			U	0.668	pCi/L				
	Uncert:			+/-9.82					
	TPU:			+/-9.82					
Europium-154			U	3.90	pCi/L				
	Uncert:			+/-11.4					
	TPU:			+/-11.6					
Europium-155			U	-5.03	pCi/L				
	Uncert:			+/-11.4					
	TPU:			+/-11.6					
QC1203874925 432331001 DUP									
Americium-241	U	2.03	U	17.7	pCi/L				09/21/1713:59
	Uncert:	+/-7.99		+/-35.2		RPD:	0	N/A	
	TPU:	+/-8.04		+/-36.2		RER:	0.828	(0-2)	
Cesium-137	U	-1.9	U	2.16	pCi/L				
	Uncert:	+/-5.97		+/-4.05		RPD:	0	N/A	
	TPU:	+/-6.04		+/-4.17		RER:	1.08	(0-2)	
Cobalt-60	U	2.38	U	4.05	pCi/L				
	Uncert:	+/-6.61		+/-4.26		RPD:	0	N/A	
	TPU:	+/-6.70		+/-4.65		RER:	0.4	(0-2)	
Europium-152	U	-9.48	U	-1.59	pCi/L				
	Uncert:	+/-13.2		+/-12.0		RPD:	0	N/A	
	TPU:	+/-13.9		+/-12.0		RER:	0.841	(0-2)	
Europium-154	U	-3.22	U	4.91	pCi/L				
	Uncert:	+/-15.4		+/-7.30		RPD:	0	N/A	
	TPU:	+/-15.5		+/-7.64		RER:	0.923	(0-2)	
Europium-155	U	11.9	U	-3.67	pCi/L				
	Uncert:	+/-12.1		+/-14.9		RPD:	0	N/A	
	TPU:	+/-13.3		+/-15.0		RER:	1.52	(0-2)	
QC1203874926 LCS									
Americium-241	1.10E+05			1.19E+05	pCi/L	REC:	108	(80%-120%)	09/21/1713:59
	Uncert:			+/-2610					
	TPU:			+/-12300					
Cesium-137	41800			43500	pCi/L	REC:	104	(80%-120%)	
	Uncert:			+/-854					
	TPU:			+/-3750					

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 432331

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria		Range	Analyst	Date Time
Rad Gamma Spec										
Batch 1700608										
Cobalt-60	36800			38200	pCi/L	REC:	104	(80%-120%)		
Uncert:				+/-954						
TPU:				+/-3740						
Europium-152			U	208	pCi/L					
Uncert:				+/-360						
TPU:				+/-373						
Europium-154			U	199	pCi/L					
Uncert:				+/-269						
TPU:				+/-284						
Europium-155			U	-221	pCi/L					
Uncert:				+/-337						
TPU:				+/-352						
Batch 1701068										
QC1203876140 MB										
Iodine-129			U	0.330	pCi/L				MJH1	10/02/1709:17
Uncert:				+/-1.02						
TPU:				+/-1.03						
QC1203876141 432331001 DUP										
Iodine-129	U	-1.01	U	-0.0656	pCi/L					10/02/1709:18
Uncert:		+/-2.19		+/-1.79		RPD:	0	N/A		
TPU:		+/-2.24		+/-1.79		RER:	0.649	(0-2)		
QC1203876142 432331001 MS										
Iodine-129	139 U	-1.01		131	pCi/L	REC:	94	(75%-125%)		10/02/1709:40
Uncert:		+/-2.19		+/-14.7						
TPU:		+/-2.24		+/-19.8						
QC1203876143 LCS										
Iodine-129	139			142	pCi/L	REC:	102	(80%-120%)		10/02/1709:47
Uncert:				+/-14.8						
TPU:				+/-20.6						
Rad Gas Flow										
Batch 1701402										
QC1203876967 MB										
Total Strontium			U	0.561	pCi/L				LXB3	09/22/1714:30
Uncert:				+/-0.770						
TPU:				+/-0.781						
**Strontium Carrier	7.85			8.10	mg	REC:	103	(40%-110%)		
QC1203876968 432331002 DUP										
Total Strontium		10.2		11.5	pCi/L					09/22/1714:31
Uncert:		+/-1.40		+/-1.64		RPD:	12	(0%-20%)		
TPU:		+/-2.79		+/-3.12		RER:	0.595	(0-2)		
**Strontium Carrier	7.85	7.80		8.20	mg	REC:	104	(40%-110%)		
QC1203876969 LCS										
Total Strontium	79.3			70.8	pCi/L	REC:	89	(80%-120%)		09/22/1714:31
Uncert:				+/-4.06						
TPU:				+/-16.8						
**Strontium Carrier	7.85			7.60	mg	REC:	97	(40%-110%)		
Batch 1701444										
QC1203877118 MB										
Total Alpha Radium			U	-0.0682	pCi/L				JXC9	09/19/1714:42

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 432331

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
Rad Gas Flow									
Batch 1701444									
Uncert:				+/-0.447					
TPU:				+/-0.447					
**Barium Carrier	27.3			25.9	mg	REC: 95	(40%-110%)		
QC1203877119 432331002 DUP									
Total Alpha Radium		U 0.428	U	0.199	pCi/L				09/19/1714:42
Uncert:		+/-0.591		+/-0.545		RPD: 0	N/A		
TPU:		+/-0.597		+/-0.548		RER: 0.552	(0-2)		
**Barium Carrier	27.3	26.7		26.3	mg	REC: 96	(40%-110%)		
QC1203877120 LCS									
Total Alpha Radium	555			480	pCi/L	REC: 87	(80%-120%)		09/19/1714:42
Uncert:				+/-14.5					
TPU:				+/-82.8					
**Barium Carrier	27.3			26.9	mg	REC: 99	(40%-110%)		
Batch 1704590									
QC1203884595 MB									
Alpha			U	1.84	pCi/L			BXG2	09/28/1715:45
Uncert:				+/-1.53					
TPU:				+/-1.56					
Beta			U	3.15	pCi/L				
Uncert:				+/-2.83					
TPU:				+/-2.88					
QC1203884596 432331001 DUP									
Alpha		703		645	pCi/L				09/28/1715:45
Uncert:		+/-25.5		+/-24.2		RPD: 9	(0%-20%)		
TPU:		+/-118		+/-108		RER: 0.708	(0-2)		
Beta		376		372	pCi/L				
Uncert:		+/-8.95		+/-8.78		RPD: 1	(0%-20%)		
TPU:		+/-62.8		+/-61.4		RER: 0.102	(0-2)		
QC1203884597 432331001 MS									
Alpha	1210	703		1970	pCi/L	REC: 105	(75%-125%)		09/28/1715:18
Uncert:		+/-25.5		+/-182					
TPU:		+/-118		+/-370					
Beta	4750	376		5150	pCi/L	REC: 101	(75%-125%)		
Uncert:		+/-8.95		+/-178					
TPU:		+/-62.8		+/-879					
QC1203884598 432331001 MSD									
Alpha	1210	703		1720	pCi/L	REC: 84	(75%-125%)		09/28/1715:19
Uncert:		+/-25.5		+/-165		RPD: 14	(0%-20%)		
TPU:		+/-118		+/-334		RER: 1.01	(0-2)		
Beta	4750	376		5490	pCi/L	REC: 108	(75%-125%)		
Uncert:		+/-8.95		+/-183		RPD: 6	(0%-20%)		
TPU:		+/-62.8		+/-914		RER: 0.526	(0-2)		
QC1203884599 LCS									
Alpha	302			296	pCi/L	REC: 98	(80%-120%)		09/28/1715:19
Uncert:				+/-28.1					
TPU:				+/-56.9					
Beta	1190			1250	pCi/L	REC: 105	(80%-120%)		
Uncert:				+/-42.6					
TPU:				+/-207					
Rad Liquid Scintillation									

QC Summary

Workorder: 432331

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
Rad Liquid Scintillation									
Batch 1699684									
QC1203872478 MB									
Carbon-14			U	11.4	pCi/L			BXM4	09/27/1710:31
Uncert:				+/-19.4					
TPU:				+/-19.5					
QC1203872479 432331001 DUP									
Carbon-14	U	24.7	U	20.6	pCi/L				09/28/1711:02
Uncert:		+/-20.7		+/-20.5		RPD: 0	N/A		
TPU:		+/-21.2		+/-20.8		RER: 0.27	(0-2)		
QC1203872480 432331001 MS									
Carbon-14	1500 U	24.7		1560	pCi/L	REC: 104	(75%-125%)		09/27/1711:04
Uncert:		+/-20.7		+/-81.7					
TPU:		+/-21.2		+/-302					
QC1203872481 LCS									
Carbon-14	750			701	pCi/L	REC: 93	(80%-120%)		09/27/1711:20
Uncert:				+/-39.1					
TPU:				+/-136					
Batch 1699719									
QC1203872581 MB									
Tritium			U	42.3	pCi/L			BXM4	09/20/1723:16
Uncert:				+/-206					
TPU:				+/-206					
QC1203872582 432331001 DUP									
Tritium		45300		49000	pCi/L				09/21/1700:07
Uncert:		+/-979		+/-1030		RPD: 8	(0%-20%)		
TPU:		+/-8810		+/-9530		RER: 0.562	(0-2)		
QC1203872583 432331001 MS									
Tritium	2210	45300		28000	pCi/L	REC: N/A			09/21/1700:59
Uncert:		+/-979		+/-1420					
TPU:		+/-8810		+/-5600					
QC1203872584 LCS									
Tritium	2210			2100	pCi/L	REC: 95	(80%-120%)		09/21/1701:15
Uncert:				+/-474					
TPU:				+/-624					
Batch 1704603									
QC1203884648 MB									
Technetium-99			U	-37.9	pCi/L			CXS7	10/03/1709:57
Uncert:				+/-25.5					
TPU:				+/-25.5					
**Technetium-99m Tracer	38200			31300	CPM	REC: 82	(30%-105%)		
QC1203884649 432331001 DUP									
Technetium-99		132		148	pCi/L				10/03/1711:21
Uncert:		+/-28.0		+/-28.7		RPD: 11	(0% - 100%)		
TPU:		+/-31.7		+/-33.0		RER: 0.663	(0-2)		
**Technetium-99m Tracer	38200	33000		31900	CPM	REC: 84	(30%-105%)		
QC1203884650 LCS									
Technetium-99	1720			1610	pCi/L	REC: 94	(80%-120%)		10/03/1712:46
Uncert:				+/-50.3					
TPU:				+/-186					
**Technetium-99m Tracer	38200			29000	CPM	REC: 76	(30%-105%)		

Notes: