

Data Validation Report
Remedial Investigation at RVAAP-66 Facility Wide Groundwater
Semi-Annual & Quarterly Sampling Event for December 2017

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract Number: W9133L-14-D-0008
Task Order Number: 0003

Laboratory SDG 280-104320-1

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CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

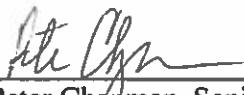
TEC-WESTON Joint Venture has completed this Data Validation Report. Data validation was performed by the Validator and Secondary QC Review was performed by a Senior Chemist. Signatures indicate the report is approved for release.



Erica Fisher, Validator, TEC-WESTON JV

1/30/2018

Date



Peter Chapman, Senior Chemist, TEC-WESTON JV

1/30/2018

Date

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INTRODUCTION

This report summarizes the results of the **EPA Stage 2B** data validation performed on groundwater samples and quality control (QC) sample data for the Remedial Investigation for RVAAP-66, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio. Results are reported in laboratory sample delivery group (SDG) **280-104320-1**.

TestAmerica, Inc., Denver, Colorado performed the analyses listed in the table below:

Parameters	Analytical Method	Laboratory Location
Volatile Organic Compounds (VOCs)	8260B	Denver, CO
Semivolatile Organic Compounds (SVOCs)	8270D	Denver, CO
Polycyclic Aromatic Hydrocarbons (PAHs)	8270D SIM	Denver, CO
Organochlorine Pesticides	8081B	Denver, CO
Polychlorinated Biphenyls (PCBs)	8082A	Denver, CO
Explosives	8330B	Denver, CO
Nitroguanidine	8330 Modified	Sacramento, CA
Metals	6010C/6020A/7470A	Denver, CO
Perchlorate	6860	Denver, CO
Alkalinity	2320B	Denver, CO
Total Cyanide	9012B	Denver, CO
Nitrocellulose	WS-WC-0050	Sacramento, CA
Sulfide	9034	Denver, CO
Chloride, Sulfate, Nitrate, Nitrite	9056A	Denver, CO

The data were reviewed using guidance and quality control criteria documented in the *Draft Remedial Investigation Work Plan for Groundwater and Environmental Services for RVAAP-66 Facility-Wide Groundwater, Appendix A: Sampling Analysis Plan, A.2: Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio Attachment A Data Validation Evaluation Sheets (January 2016)* which are based on the *Department of Defense Quality Systems Manual (DoD QSM), Version 5.0; USEPA National Functional Guidelines for Organic Data Review (EPA 2014); and USEPA National Functional Guidelines for Inorganic Data Review (EPA 2014)*, the analytical methods, and professional judgment.

During data validation, qualifiers are assigned to assist in proper data interpretation. If values are estimated, data may be used for site evaluation purposes but reasons for data qualification should be taken into consideration when interpreting sample concentrations. Data that have been rejected (R)

should not be used for any purpose. Results with no qualifiers meet all data quality goals as outlined in the UFP-QAPP.

The data was reviewed and validated by calculating Relative Percent Difference (RPD) between spiked sample values according to the *USEPA National Functional Guidelines for Organic Data Review (EPA 2014)* and *USEPA National Functional Guidelines for Inorganic Data Review (EPA 2014)*. Therefore, the RPDs were calculated using the percent recovery values as stated in the above referenced USEPA documents. SW-846 Methods were utilized for this project and they recommend using the actual spiked sample values to calculate RPD values. However, the laboratory used varying spike amounts due to sample aliquot and percent moisture differences which lead to variations in the spike amounts making it very difficult to compare the spiked sample values. These differences would have created poor precision results for the spiked sample values that were not necessarily indicative of the data quality. The use of comparing spike recovery values in this case was a much better indicator of analytical precision.

The following samples were validated:

Sample ID	Laboratory ID	Sample Date	Matrix	QC Sample	VOCs	SVOCs (phthalates)	SVOCs (nitroamines, phthalates)	SVOCs (full list)	PAHs	Pesticides	PCBs	Explosives	Nitroguanidine	Perchlorate	Metals	Total Cyanide	Alkalinity	Nitrocellulose
TB-120517	280-104320-1	12/05/17	Groundwater	Trip Blank	✓													
LL10mw-005-120417-GW	280-104320-2	12/04/17	Groundwater		✓			✓	✓						✓			
FWGmw-023-120417-GW	280-104320-3	12/04/17	Groundwater		✓			✓	✓	✓	✓	✓	✓		✓	✓		✓
BKGmw-017-120417-GW	280-104320-4	12/04/17	Groundwater												✓		✓	
BKGmw-017-120417-GF	280-104320-5	12/04/17	Groundwater												✓			
FWGmw-019-120517-GW	280-104320-6	12/05/17	Groundwater		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
FWGmw-019-D-120517-GW	280-104320-7	12/05/17	Groundwater	Field Duplicate	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BKGmw-024-120517-GW	280-104320-8	12/05/17	Groundwater		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FWGmw-022-120517-GW	280-104320-9	12/05/17	Groundwater	MS/MSD	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
LL10mw-003-120517-GW	280-104320-10	12/05/17	Groundwater		✓													
FWGmw-002-120517-GW	280-104320-11	12/05/17	Groundwater															✓
BKGmw-021-120517-GW	280-104320-12	12/05/17	Groundwater												✓		✓	
SCFmw-006-120517-GW	280-104320-13	12/05/17	Groundwater												✓		✓	
WBGmw-020-120517-GW	280-104320-14	12/05/17	Groundwater		✓								✓			✓		
WBGmw-021-120517-GW	280-104320-15	12/05/17	Groundwater		✓								✓			✓		
FWGmw-004-120517-GW	280-104320-16	12/05/17	Groundwater		✓								✓			✓		
WBGmw-009-120517-GW	280-104320-17	12/05/17	Groundwater		✓								✓			✓		
WBGmw-006-120517-GW	280-104320-18	12/05/17	Groundwater		✓								✓			✓		
FWGmw-013-120517-GW	280-104320-19	12/05/17	Groundwater														✓	
DA2mw-115-120517-GW	280-104320-20	12/05/17	Groundwater		✓								✓			✓	✓	
DETmw-003-120517-GW	280-104320-21	12/05/17	Groundwater		✓				✓	✓	✓	✓	✓		✓	✓		
BKGmw-018-120517-GW	280-104320-22	12/05/17	Groundwater												✓			✓
BKGmw-006-120517-GW	280-104320-23	12/05/17	Groundwater												✓		✓	
BKGmw-015-120517-GW	280-104320-24	12/05/17	Groundwater												✓		✓	
LL10mw-003-120517-GW	280-104320-25	12/05/17	Groundwater				✓								✓			
CPBmw-009-120517-GW	280-104320-26	12/05/17	Groundwater														✓	

Some samples were analyzed for natural attenuation parameters. Natural attenuation parameters are reported, but not validated in accordance with the QAPP.

DATA VALIDATION REPORT

1.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative. All requested target analytes were reported for each sample.

1.2 SAMPLE RECEIPT

The samples were received by the laboratory on December 6, 2017; the samples were received in good condition, under chain-of-custody, and custody seals intact. With the exception of those discussed below, all samples were properly preserved and cooler temperatures were less than 6°C.

Nitroguanidine and nitrocellulose analyses were performed by TestAmerica Sacramento.

One of the three hydrochloride (HCl) preserve vials received for sample FWGmw-019-120517-GW was received broken and had to be disposed by the laboratory. Sufficient intact sample volume remained to facilitate VOC analysis.

The HCl preserve vials for the requested VOC analysis for samples FWGmw-023-120417-GW, FWGmw-019-120517-GW, FWGmw-019-D-120517-GW, BKGmw-024-120517-GW and FWGmw-022-120517-GW (including both the MS and MSD) were received with a headspace bubble greater than 6 mm diameter. The laboratory noted this in the sample receipt, proceeded with the analysis and notes in the case narrative that the analytical results may be biased low. This is further discussed in Section 1.4.1.

The laboratory received one 250 ml unpreserved amber glass bottle with no container label, which was packed with three other 250 ml unpreserved amber glass bottles with sample label DETmw-003-120517-GW. As all other samples were accounted for, the unlabeled bottle was logged as DETmw-003-120517-GW in view of its packing arrangement.

One unpreserved 125 ml plastic unpreserved bottle of sample FWGmw-023-120417-GW was received by the laboratory requesting perchlorate analysis, which was not requested on the chain of custody. The laboratory logged the sample for perchlorate analysis per information on the container label.

1.3 DEFINITIONS

Detection limit (DL): The smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration with 99% confidence. At the DL, the false positive rate is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific matrix with a specific method with 99% confidence.

Limit of detection (LOD): The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. At the LOD, the false negative rate is 1%. An LOD may be used as the lowest concentration for reliably reporting a non-detect of a specific analyte in a specific matrix with a specific method with 99% confidence.

Limits of Quantitation (LOQ): The smallest concentration that produces a quantitative result with known and recorded precision and bias. For DoD/DOE projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range.

The following validation flags and reason codes were applied:

Validation Flag	Reason Code	Description
U	B	Non-detection; blank detection.
UJ	S	Estimated non-detection; surrogate outlier.
J	S	Estimated detection; surrogate outlier.
UJ	L	Estimated non-detection; LCS/LCSD percent recovery or RPD exceedance.
UJ	IC	Estimated detection; initial calibration criteria not met.
J	CC	Estimated detection; continuing calibration criteria not met.
UJ	CC	Estimated non-detection; continuing calibration criteria not met.
UJ	Q	Estimated non-detection; based on reviewers professional judgement, result is qualified.
J	Q	Estimated detection; based on reviewers professional judgement, result is qualified.
J	P	Estimated detection; post digestion spike percent recovery exceedance.
UJ	M	Estimated non-detection; MS/MSD percent recovery or RPD exceedance.
UJ	H	Estimated non-detection; holding time exceedance.

1.4 TECHNICAL DATA VALIDATION

1.4.1 Volatile Organic Compounds by Method 8260B

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Holding times
- Method blanks
- MS/MSD recoveries and RPDs
- LODs and LOQs
- Instrument tuning
- Internal standard area counts
- Initial calibration
- Initial calibration verification
- Closing calibration verification
- Field duplicate

All analytical or quality parameters requiring further discussion for Method 8260B are described in the sections below.

1.4.1.1 Sample Integrity and Preservation

The sample containers for samples FWGmw-023-120417-GW, FWGmw-019-120517-GW, FWGmw-019-D-120517-GW, BKGmw-024-120517-GW and FWGmw-022-120517-GW (including both the MS and MSD samples) were received with headspace greater than 6 mm in diameter. The laboratory proceeded with the analysis using the sample container with the least amount of headspace. All associated samples are therefore qualified as estimated (UJ Q).

1.4.1.2 Method Blank

Methylene chloride (0.572 µg/L) was detected in the method blank less than the LOQ (5 µg/L). All associated sample results were non-detect; therefore, no qualification was necessary.

1.4.1.3 Trip Blank

Acetone (13 µg/L) was detected in the trip blank (TB-120517) greater than the LOQ (10 µg/L). All associated sample results were non-detect; therefore, no qualification was necessary.

1.4.1.4 LCS/LCSD Recoveries and RPDs

Methylene chloride recovered above the QC limits (74-124%) in the LCS. However, the recovery was within the QC range in the LCSD (115%) and the RPD (10%) was within acceptable limits (20%). Therefore no qualification is necessary.

1.4.2 Semivolatile Organic Compounds by Method 8270D

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Method blanks
- Surrogate recoveries
- LODs and LOQs
- Instrument tuning
- Internal standard area counts
- Initial calibration
- Continuing calibration verification
- Closing calibration verification
- Field duplicates

All analytical or quality parameters requiring further discussion for Method 8270D are described in the sections below.

1.4.2.1 Holding Times

The laboratory noted in the case narrative that sample WBGmw-021-120517-GW was lost due to glassware malfunction during concentration. The sample was re-extracted eight days out of holding time. Sample results for WBGmw-021-120517-GW are therefore qualified estimated (UJ H).

1.4.2.2 LCS/LCSD Recoveries and RPDs

All LCS/LCSD recoveries and RPDs were within control limits with the exception of the exceedances presented in the following table:

Analyte	LCS %R	LCSD %R	%R QC Limits	RPD	RPD Limits
4-Nitrophenol	26	25	59-129	4	20
Benzoic acid	17	14	41-129	20	20
Phenol	22	20	61-120	6	20

%R = percent recovery

Bolded values are outside control limits.

4-Nitrophenol, benzoic acid and phenol all recovered below the acceptable ranges (59-129%, 41-129% and 61-120%, respectively) in both the LCS (26%, 17% and 22%) and LCSD (25%, 14% and 20%), although the RPDs were within acceptable limits. All associated samples are therefore qualified estimated (UJ L).

1.4.2.3 MS/MSD Recoveries and RPDs

One MS/MSD of sample FWGmw-022-120517-GW was analyzed for SCOCs in this SDG. All MS/MSD recoveries and RPDs were within control limits with the exception of those presented in the following table:

Analyte	MS %R	MSD %R	%R QC Limits	RPD	RPD Limits
2,4-Dimethylphenol	62	70	31-124	22	20
3 & 4 Methylphenol	54	62	29-110	23	20
4-Nitrophenol	29	32	59-129	20	20
Benzoic acid	27	30	41-129	19	20
Benzyl alcohol	56	63	31-112	21	20
N-Nitrosodi-n-propylamine	74	83	49-119	21	20
Phenol	26	27	61-120	10	20

%R = percent recovery

Bolded values are outside control limits.

The MS/MSD RPDs for 2,4-dimethylphenol (22%), 3 & 4 methylphenol (23%), benzyl alcohol (21%) and N-nitrosodi-n-propylamine (21%) exceeded the acceptable limit of 20%. However, the MS and MSD recoveries were all within the acceptable ranges, therefore no qualification was necessary.

4-Nitrophenol, benzoic acid and phenol all recovered below the acceptable ranges (59-129%, 41-129% and 61-120%, respectively) in both the MS (29%, 27% and 26%) and MSD (32%, 30% and 27%), although the RPDs were within acceptable limits. The associated parent sample (FWGmw-022-120517-GW) is therefore qualified estimated (UJ M).

1.4.2.4 Initial Calibration Verification

The hexachlorocyclopentadiene percent difference (%D) was outside QC limits ($\pm 20\%$) in initial calibration verification 280-398290/11 (-100%). All associated sample results are qualified estimated (UJ IC).

1.4.3 Polycyclic Aromatic Hydrocarbons by Method 8270D SIM

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Holding times
- LCS/LCSD recoveries and RPDs
- MS/MSD recoveries and RPDs
- LODs and LOQs

- Instrument tuning
- Internal standard area counts
- Initial calibration
- Initial calibration verification
- Closing calibration verification
- Field duplicates

All analytical or quality parameters requiring further discussion for Method 8270D SIM are described in the sections below.

1.4.3.1 Sample Preparation

The laboratory noted in the case narrative that an incorrect spike was accidentally used for PAH analysis (SIM Surrogate (for 3510C) instead of SIM LVI Surrogate (for 3510C_LVI). The laboratory report that the LVI surrogate only differs from the 1L surrogate as a dilution, which was accounted for in the analysis. Therefore, no data qualifiers have been assigned for this error.

1.4.3.2 Method Blank

Benzo(a)anthracene (0.0106 µg/L), chrysene (0.00509 µg/L), fluoranthene (0.0138 µg/L), phenanthrene (0.0110 µg/L) and pyrene (0.0105 µg/L) were detected in the method blank below the LOQ (all 0.10 µg/L). Benzo(a)anthracene, chrysene, fluoranthene, phenanthrene and pyrene were detected in all associated sample results at concentrations less than the LOQ and are therefore qualified non-detect at the LOQ due to blank contamination (U B).

1.4.3.3 Surrogate Recoveries

Surrogate nitrobenzene-d5 recovered below the QC limits (55-111%) for samples LL10mw-005-120417-GW (54%) and FWGmw-023-120417-GW (54%). All associated results are qualified estimated (J/UJ S), with the exception of fluoranthene, phenanthrene and pyrene in sample FWGmw-023-120417-GW. Per Section 1.4.3.1, these analytes are qualified non-detect at the LOQ due to blank contamination (U B) and therefore no further qualification is applied.

1.4.4 Organochlorine Pesticides by Method 8081B

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Surrogate recoveries
- Method blank
- LCS/LCSD recoveries and RPDs
- MS/MSD recoveries and RPDs

- Initial calibration
- Initial calibration verification
- Internal standards
- Endrin/DDT breakdown check
- Second column confirmation
- Field duplicate

All analytical or quality parameters requiring further discussion for Method 8081B are described in the sections below.

1.4.4.1 *Holding Times*

The laboratory noted in the case narrative that sample FWGmw-022-120517-GW (and the associated MS/MSD samples) were lost during concentration which necessitated re-extraction. The primary and MS/MSD samples were re-extracted out of holding time. Re-extraction did not exceed 14 days post holding time, therefore the sample results for primary sample FWGmw-022-120517-GW are qualified estimated (UJ H).

1.4.4.2 *LODs/LOQs*

The laboratory reported in the case narrative that sample FWGmw-022-120517-GW was concentrated to a final volume of 1 ml rather than the method required volume of 5 ml due to the sample matrix. A dilution was performed on all extracts in order to compensate for the incorrect final volume and the reporting limits (RLs) are elevated proportionately. As the laboratory adjusted the LODs and LOQs appropriately, no further qualification is considered necessary.

1.4.4.3 *Continuing Calibration Verification*

The 4,4'-DDT %D (26.2%) in continuing calibration verification CCVIS 280-399720/8 exceeded the acceptable QC limit (20%). Associated sample DETmw-003-120517-GW is therefore qualified estimated (UJ CC) for 4,4'-DDT.

The 4,4'-DDT %D (27.8%) in continuing calibration verification CCVIS 280-399869/8 exceeded the acceptable QC limit (20%). Associated sample FWGmw-022-120517-GW is therefore qualified estimated (UJ CC) for 4,4'-DDT.

The Methoxychlor %D (21%) in continuing calibration verification CCVIS 280-399869/19 exceeded the acceptable QC limit (20%). Associated sample FWGmw-022-120517-GW is therefore qualified estimated (UJ CC) for methoxychlor.

The laboratory reported in the case narrative that all results were reported from the column that was in control.

1.4.5 Polychlorinated Biphenyls by Method 8082A

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Holding times
- LODs and LOQs
- Surrogate recoveries
- Method blank
- LCS recoveries
- MS/MSD recoveries and RPDs
- Initial calibration
- Initial calibration verification
- Continuing calibration verification
- Internal standards
- Second column confirmation
- Field duplicates

No analytical or quality parameters requiring further discussion for Method 8082A were identified.

1.4.6 Explosives by Method 8330B

The following parameters were evaluated and met the required criteria. No validation flags were assigned:

- Holding times
- Initial calibration
- Initial calibration verification
- LODs and LOQs

All analytical or quality parameters requiring further discussion for Method 8330B are described in the sections below.

1.4.6.1 Sample Preparation

Samples WBGmw-020-120517-GW, WBGmw-021-120517-GW, DA2mw-115-120517-GW and DETmw-003-120517-GW were filtered prior to analysis to reduce matrix interferences.

A portion of sample FWGmw-023-120417-GW was used for analysis as the sample container used for the final analysis was not the appropriate size. The original, correct size container was consumed during initial method execution, however, a rework was needed for the method due to LCS/LCSD failures and a 500 ml aliquot from a 1L amber container was extracted for analysis. As such, the solvent rinse of the sample bottle was not performed. No data qualifiers are considered necessary.

Due to significant quality control issues with the surrogate recoveries and LCS/LCSD samples, the laboratory noted in the case narrative that it was decided to re-extract and re-analyze all samples for Method 8330B. Similarly poor surrogate recoveries and LCS/LCSD recoveries were observed in the second set of data and the laboratory chose to report both sets of results.

1.4.6.2 Method Blanks

Although no analytes were detected in the method blanks, it should be noted that the surrogate 1,2-dinitrobenzene recovered below control limits (83-119%) in the method blanks, therefore biasing the results low.

1.4.6.3 Surrogate Recoveries

Surrogate 1,2-dinitrobenzene recovered below control limits (83-119%) in samples FWGmw-023-120417-GW (78%), FWGmw-019-120517-GW (58%), BKGmw-024-120517-GW (81%), FWGmw-004-120517-GW (65%), WBGmw-009-120517-GW (66%) and DETmw-003-120517-GW (79%). The laboratory noted in the case narrative that the samples were re-extracted, however, the reported surrogates on the re-extracted results were similar to the first. All associated results are qualified estimated (J/UJ S).

1.4.6.4 LCS/LCSD Recoveries and RPDs

All LCS/LCSD recoveries and RPDs were within control limits with the exception of the exceedances presented in the following table:

LCS/LCSD Pair	Analyte	LCS %R	LCSD %R	%R QC Limits	RPD	RPD Limits	Assigned Flags
LCS 280-398109/2-A / LCSD 280-398109/2-A	1,3-Dinitrobenzene	81	64	78-120	23	20	J/UJ L
	2,4,6-Trinitrotoluene	77	67	71-123	13	20	None
	2,4-Dinitrotoluene	79	63	78-120	22	20	J/UJ L
	2,6-Dinitrobenzene	75	63	77-127	17	20	J/UJ L
	2-Amino-4,6-dinitrotoluene	67	53	79-120	23	20	J/UJ L
	2-Nitrotoluene	71	52	70-127	30	20	J/UJ L
	3-Nitrotoluene	70	53	73-125	27	20	J/UJ L
	4-Amino-2,6-dinitrotoluene	63	50	76-125	22	20	J/UJ L
	4-Nitrotoluene	72	55	71-127	26	20	J/UJ L
	HMX	103	74	65-135	32	20	None

	Nitrobenzene	79	57	65-134	32	20	J/UJ L
LCS 280-398450/2-A/LCSD 280-398450/2-A	1,3,5-Trinitrobenzene	67	97	73-125	36	20	J/UJ L
	1,3-Dinitrobenzene	56	92	78-120	49	20	J/UJ L
	2,4,6-Trinitrotoluene	62	84	71-123	31	20	J/UJ L
	2,4-Dinitrotoluene	60	93	78-120	44	20	J/UJ L
	2,6-Dinitrotoluene	59	89	77-127	40	20	J/UJ L
	2-Amino-4,6-dinitrotoluene	56	86	79-120	42	20	J/UJ L
	2-Nitrotoluene	50	90	70-127	58	20	J/UJ L
	3-Nitrotoluene	49	90	73-125	59	20	J/UJ L
	4-Amino-2,6-dinitrotoluene	58	86	76-125	38	20	J/UJ L
	4-Nitrotoluene	49	93	71-127	62	20	J/UJ L
	HMX	70	88	65-135	23	20	J/UJ L
	Nitrobenzene	50	95	65-134	62	20	J/UJ L
	Nitroglycerin	73	96	74-127	27	20	J/UJ L
	RDX	68	93	68-130	30	20	None

%R = percent recovery

Bolded values are outside control limits.

All associated samples with analytes shown in the table that have both LCS/LCSD recoveries below their applicable QC limits or either the LCS or LCSD and the RPD outside acceptable limits are qualified estimated (J/UJ L).

LCS/LCSDs associated with the second data set reported after re-extraction have not been considered or validated as the results were similar to the first. Refer to Section 1.4.6.1 for further detail.

1.4.6.5 Matrix Spike/Matrix Spike Duplicate

An MS/MSD was performed on sample FWGmw-022-120517-GW. All MS/MSD recoveries and RPDs were within control limits with the exception of the exceedances presented in the following table:

Parent Sample	Analyte	MS %R	MSD %R	%R QC Limits	RPD	RPD Limits	Assigned Flags
FWGmw-022-120517-GW	1,3,5-Trinitrobenzene	79	71	73-125	7	20	None
	1,3-Dinitrobenzene	73	64	78-120	9	20	UJ M
	2,4,6-Trinitrotoluene	74	69	71-123	3	20	None
	2,4-Dinitrotoluene	71	63	78-120	8	20	UJ M
	2,6-Dinitrotoluene	71	65	77-127	5	20	UJ M

2-Amino-4,6-dinitrotoluene	60	54	79-120	6	20	UJ M
2-Nitrotoluene	61	53	70-127	11	20	UJ M
3-Nitrotoluene	80	50	73-125	42	20	UJ M
4-Amino-2,6-dinitrotoluene	58	52	76-125	6	20	UJ M
4-Nitrotoluene	63	51	71-127	17	20	UJ M
Nitrobenzene	66	55	65-134	14	20	UJ M

%R = percent recovery

Bolded values are outside control limits.

The MS and MSD recoveries were below control limits for 1,3-dinitrobenzene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 4-amino-2,6-dinitrotoluene, 4-nitrotoluene, nitrobenzene. The results for these analytes in the associated parent sample are qualified as estimated (UJ M).

The MSD recovery and RPD was below control limits for 3-nitrotoluene. The associated parent sample results are qualified as estimated (UJ M).

The MSD recoveries were below control limits for 1,3,5-trinitrobenzene and 2,4,6-trinitrotoluene. The MS recoveries and RPDs were within control limits for these analytes, therefore no qualification is necessary.

1.4.6.6 Second Column Confirmation

All RPD of the first and second column confirmations were below the acceptance criterion of 40% for all samples and analytes with the exception of HMX in sample WBGmw-006-120517-GW. The RPD between the two columns for HMX in sample WBGmw-006-120517-GW was 53.9%. Therefore the associated HMX result for the sample are qualified (J Q).

1.4.7 Nitroguanidine by Method 8330

The following parameters were evaluated and met the required criteria. No validation flags were assigned:

- Holding times
- Method blank
- LCS recoveries
- MS/MSD recovery and RPD
- Initial calibration
- Initial calibration verification
- Continuing calibration verification
- LODs and LOQs
- Field duplicates

No analytical or quality parameters required further discussion for Method 8330.

1.4.8 Perchlorate by Method 6860

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Holding times
- LODs and LOQs
- LCS recoveries
- Method blank
- Initial calibration verification
- Initial calibration blank
- Continuing calibration verification
- Continuing calibration blank
- Detection limit check
- Interference check standards
- Field duplicates

No analytical or quality parameters required further discussion for Method 6860.

1.4.9 Total Metals by Method 6010C/6020A/7470A

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Holding times
- LODs and LOQs
- LCS/LCSD recoveries and RPDs
- Serial dilution
- Contract required detection limit standard
- Instrument tuning
- Interference check solutions

All analytical or quality issues requiring further discussion for Methods 6010C, 6020A, and/or 7470A are described in the sections below.

1.4.9.1 Method Blanks

Several analytes were detected in the method blank. The following table presents the method blank detections:

Method Blank	Associated Samples	Analyte	Blank Detection ($\mu\text{g/L}$)	LOQ ($\mu\text{g/L}$)	Assigned Flags	Samples Qualified
MB 280-399546/1-A	BKGmw-017-120417-GF	Sodium	165	5000	None	None
MB 280-397836/1-A	LL10mw-005-120417-GW FWGmw-023-120417-GW BKGmw-017-120417-GW	Calcium	0.297	1000	None	None

	FWGmw-019-120517-GW FWGmw-019-D-120517-GW BKGmw-024-120517-GW FWGmw-022-120517-GW BKGmw-021-120517-GW SCFmw-006-120517-GW WBGmw-020-120517-GW WBGmw-021-120517-GW FWGmw-004-120517-GW WBGmw-009-120517-GW WBGmw-006-120517-GW DA2mw-115-120517-GW DETmw-003-120517-GW BKGmw-018-120517-GW BKGmw-006-120517-GW BKGmw-015-120517-GW LL10mw-003-120517-GW					
		Iron	0.338	100	U B	LL10mw-005-120417-GW WBGmw-009-120517-GW BKGmw-018-120517-GW LL10mw-003-120517-GW
		Magnesium	21.7	500	None	None
MB 280-397837/1-A	LL10mw-005-120417-GW FWGmw-023-120417-GW BKGmw-017-120417-GW FWGmw-019-120517-GW FWGmw-019-D-120517-GW BKGmw-024-120517-GW FWGmw-022-120517-GW BKGmw-021-120517-GW SCFmw-006-120517-GW WBGmw-020-120517-GW WBGmw-021-120517-GW FWGmw-004-120517-GW WBGmw-006-120517-GW BKGmw-018-120517-GW BKGmw-006-120517-GW BKGmw-015-120517-GW LL10mw-003-120517-GW	Manganese	0.310	3.5	U B	BKGmw-021-120517-GW BKGmw-015-120517-GW LL10mw-003-120517-GW
		Lead	0.197	3	U B	BKGmw-017-120417-GW BKGmw-024-120517-GW FWGmw-022-120517-GW SCFmw-006-120517-GW WBGmw-020-120517-GW WBGmw-021-120517-GW FWGmw-004-120517-GW WBGmw-006-120517-GW BKGmw-018-120517-GW BKGmw-006-120517-GW
MB 280-399550/1-A	BKGmw-017-120417-GF	Beryllium	0.0990	1	None	None
		Lead	0.348	3	None	None

Detections less than the LOQ in associated samples are qualified as not detected at the LOQ (U B).

1.4.9.2 Continuing Calibration Blanks

Calcium (101 µg/L) and sodium (181 µg/L) were detected in continuing calibration blank CCB 280-400298/39 below their respective LOQs (1000 µg/L and 5000 µg/L). Sodium (120 µg/L) was also detected in CCB 280-4002988/53 below the LOQ. Calcium and sodium were both detected above the LOQ in associated sample BKGmw-017-120417-GF, therefore no qualification is necessary.

Lead (0.287 µg/L) was detected in CCB 280-400304/77 below the LOQ (3 µg/L). Lead was detected below the LOQ in associated samples WBGmw-006-120517-GW, BKGmw-018-120517-GW and BKGmw-006-120517-GW, which are already qualified non-detect at the LOQ (U B) due to method blank contamination, therefore no additional qualification is necessary. All other associated samples were non-detect for lead, therefore no qualification is necessary.

1.4.9.3 Initial/Continuing Calibrations Verifications

Barium (79%) recovered above control limits (80-120%) in the low-level initial calibration verification ICVL 280-400436/5. All associated barium detections were qualified as estimated (UJ/J CC).

Arsenic (79%), chromium (74%) and cobalt (77%) recovered below control limits in the low-level continuing calibration verification CCVL 280-399975/72. All associated arsenic, chromium and cobalt detections were qualified as estimated (UJ/J CC).

Chromium (75%) and cobalt (73%) recovered below control limits in the low-level continuing calibration verification CCVL 280-399975/84. All associated chromium and cobalt detections were qualified as estimated (UJ/J CC).

1.4.9.4 Matrix Spike/Matrix Spike Duplicates

An MS/MSD was performed on sample FWGmw-022-120517-GW. Manganese (166%) recovered above control limits (87-115%) in the MSD. The MS recovery (89%) and RPD (9%) were within control limits; therefore, no qualification was necessary.

1.4.9.5 Post Digestion Spike

A PDS was performed on sample FWGmw-022-120517-GW. Calcium (78%) recovered below control limits (80-120%) in the PDS. The calcium result in the parent sample was qualified as estimated (J P). Beryllium (129%) and manganese (143%) recovered above the control limits (80-120%). Beryllium was not detected in the primary sample, therefore no qualification is necessary. Manganese was detected in the parent sample and is therefore qualified estimated (J P).

1.4.9.6 Field Duplicates

One field duplicate sample (FWGmw-019-D-120517-GW) was analyzed for metals as part of this SDG. For detections less than 5x the LOQ, the difference in values was compared to \pm the LOQ. For detections greater than 5x the LOQ, the relative percent difference was calculated and compared to the RPD limit. The following table shows the detections in the parent and duplicate sample:

Primary/ Duplicate Sample ID	Analyte	Primary Sample Result ($\mu\text{g/L}$)	Field Duplicate Result ($\mu\text{g/L}$)	LOQ ($\mu\text{g/L}$)	Absolute Diff. ($\mu\text{g/L}$)	RPD (%)	RPD Limit (%)¹
FWGmw- 019-120517- GW / FWGmw- 019-D- 120517-GW	Calcium	89000	93000	1000	N/A	4	40
	Iron	560	570	100	N/A	2	40
	Magnesium	29000	30000	500	N/A	3	40
	Potassium	2200 (J)	2200 (J)	3000	0	N/A	\pm LOQ
	Sodium	15000	16000	5000	1000	N/A	\pm LOQ
	Antimony	0.97 (J)	0.67 (J)	6.0	0.3	N/A	\pm LOQ
	Arsenic	12	13	5	1	N/A	\pm LOQ
	Barium	37	37	3	N/A	0	40

Primary/ Duplicate Sample ID	Analyte	Primary Sample Result ($\mu\text{g/L}$)	Field Duplicate Result ($\mu\text{g/L}$)	LOQ ($\mu\text{g/L}$)	Absolute Diff. ($\mu\text{g/L}$)	RPD (%)	RPD Limit (%)¹
	Cobalt	1.8	1.8	1	0	N/A	\pm LOQ
	Manganese	100	100	3.5	N/A	0	40
	Nickel	6.1	6.8	3	0.7	N/A	\pm LOQ

¹ The RPD limit is 40% for detections greater than 5x the LOQ; \pm the LOQ for detections less than 5x the LOQ.

Bold values exceed the RPD limit.

J Laboratory flag indicating the result is less than the LOQ and is estimated.

N/A Not applicable

All duplicate pair results are within QC limits (40% or \pm LOQ), with the exception of sodium, therefore no qualification is necessary.

1.4.10 Nitrocellulose by Method 353.2

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Holding times
- LODs and LOQs
- LCS recoveries
- MS/MSD recoveries and RPD
- Method blank
- Initial calibration verification
- Continuing calibration verification
- Initial calibration blank
- Continuing calibration blank
- Field duplicates

No analytical or quality parameters required further discussion for Method 353.2.

1.4.11 Total Cyanide by Method 9012B

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Holding times
- LODs and LOQs
- LCS recoveries
- Method blanks
- MS/MSD sample recovery and RPD
- Initial calibration verification

- Continuing calibration verification
- Initial calibration blank
- Continuing calibration blank
- Low and high level control sample recoveries
- Field duplicates

No analytical or quality issues requiring further discussion were identified for Methods 9012B.

1.4.12 Alkalinity by Method 2320B

The following parameters were evaluated and met the required criteria. No validation flags were assigned based on the following:

- Holding times
- LODs and LOQs
- LCS recoveries
- Field duplicates
- Initial calibration verification
- Continuing calibration verification
- Low and high level control sample recoveries
- Field duplicates

All analytical or quality issues requiring further discussion for Methods 2320B are described in the sections below.

1.4.12.1 Method Blanks

Alkalinity (2.96 mg/L) was detected in one method blank at a concentration below the LOQ (5.0 mg/L). Alkalinity was detected at a concentration above the LOQ in all associated samples; therefore, no qualification was necessary.

1.4.12.2 Continuing Calibration Blanks

Alkalinity was detected in two continuing calibration blanks (1.72 mg/L and 2.23 mg/L) bracketing the samples below the LOQ (5 mg/L). Alkalinity was detected at a concentration above the LOQ in the associated sample; therefore, no qualification is necessary.

DATA VALIDATION TABLE

SDG	Field Sample ID	Lab Sample ID	Matrix	Parameter	CAS Number	Units	Result	Lab Flag	DV Flag	Detection	LOQ	LOD	MDL	AnalyticMethod	Reason Code
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	4-Nitrophenol	100-02-7	µg/L	4.0	u q	uj	n	50	4.0	1.0	SVOCs	L
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Benzoic acid	65-85-0	µg/L	16	u q	uj	n	81	16	5.7	SVOCs	L
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Phenol	108-95-2	µg/L	2.0	u q	uj	n	10	2.0	0.56	SVOCs	L
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Hexachlorocyclopentadiene	77-47-4	µg/L	25	u	uj	n	50	25	6.6	SVOCs	IC
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Benzo[a]anthracene	56-55-3	µg/L	0.0095	j	u	n	0.10	0.012	0.0042	PAHs	B
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Chrysene	218-01-9	µg/L	0.0047	j	u	n	0.10	0.012	0.0033	PAHs	B
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Fluoranthene	206-44-0	µg/L	0.013	j	u	n	0.10	0.012	0.0048	PAHs	B
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Naphthalene	91-20-3	µg/L	0.021	j q	j	y	0.10	0.012	0.0080	PAHs	S
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Phenanthrene	85-01-8	µg/L	0.011	j	u	n	0.10	0.020	0.0093	PAHs	B
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Pyrene	129-00-0	µg/L	0.0098	j	u	n	0.10	0.020	0.0061	PAHs	B
280-104320-1	LL10mw-005-120417-GW	280-104320-2	Ground Water	Iron	7439-89-6	µg/L	33	j	u	n	100	85	22	Metals	B
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,1,1-Trichloroethane	71-55-6	µg/L	0.40	u	uj	n	1.0	0.40	0.16	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,1,2,2-Tetrachloroethane	79-34-5	µg/L	0.80	u	uj	n	1.0	0.80	0.20	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,1,2-Trichloroethane	79-00-5	µg/L	0.80	u	uj	n	1.0	0.80	0.32	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,1-Dichloroethane	75-34-3	µg/L	0.80	u	uj	n	1.0	0.80	0.16	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,1-Dichloroethene	75-35-4	µg/L	0.80	u	uj	n	1.0	0.80	0.14	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,2-Dibromoethane	106-93-4	µg/L	0.40	u	uj	n	1.0	0.40	0.18	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,2-Dichloroethane	107-06-2	µg/L	0.40	u	uj	n	1.0	0.40	0.13	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,2-Dichloroethene, Total	540-59-0	µg/L	0.20	u	uj	n	1.0	0.20	0.15	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	1,2-Dichloropropane	78-87-5	µg/L	0.40	u	uj	n	1.0	0.40	0.13	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	2-Butanone (MEK)	78-93-3	µg/L	4.0	u	uj	n	6.0	4.0	1.8	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	2-Hexanone	591-78-6	µg/L	4.0	u	uj	n	5.0	4.0	1.4	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	4-Methyl-2-pentanone (MIBK)	108-10-1	µg/L	3.2	u	uj	n	5.0	3.2	1.0	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Acetone	67-64-1	µg/L	6.4	u	uj	n	10	6.4	1.9	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Benzene	71-43-2	µg/L	0.40	u	uj	n	1.0	0.40	0.16	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Bromochloromethane	74-97-5	µg/L	0.20	u	uj	n	1.0	0.20	0.10	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Bromodichloromethane	75-27-4	µg/L	0.40	u	uj	n	1.0	0.40	0.17	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Bromoform	75-25-2	µg/L	0.40	u	uj	n	1.0	0.40	0.19	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Bromomethane	74-83-9	µg/L	0.80	u	uj	n	2.0	0.80	0.21	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Carbon disulfide	75-15-0	µg/L	1.6	u	uj	n	2.0	1.6	0.45	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Carbon tetrachloride	56-23-5	µg/L	0.40	u	uj	n	2.0	0.40	0.19	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Chlorobenzene	108-90-7	µg/L	0.40	u	uj	n	1.0	0.40	0.17	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Chloroethane	75-00-3	µg/L	1.6	u	uj	n	2.0	1.6	0.41	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Chloroform	67-66-3	µg/L	0.40	u	uj	n	1.0	0.40	0.16	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Chloromethane	74-87-3	µg/L	0.80	u	uj	n	2.0	0.80	0.30	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	cis-1,3-Dichloropropene	10061-01-5	µg/L	0.40	u	uj	n	1.0	0.40	0.16	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Dibromochloromethane	124-48-1	µg/L	0.40	u	uj	n	1.0	0.40	0.17	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Ethylbenzene	100-41-4	µg/L	0.40	u	uj	n	1.0	0.40	0.16	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Methylene Chloride	75-09-2	µg/L	0.80	u q	uj	n	5.0	0.80	0.32	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Styrene	100-42-5	µg/L	0.40	u	uj	n	1.0	0.40	0.17	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Tetrachloroethene	127-18-4	µg/L	0.40	u	uj	n	1.0	0.40	0.20	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	Toluene	108-88-3	µg/L	0.40	u	uj	n	1.0	0.40	0.17	VOCs	Q
280-104320-1	FWGmw-023-120417-GW	280-104320-3	Ground Water	trans-1,3-Dichloropropene	10061-02-6	µg/L	0.40	u	uj	n	1.0	0.40	0.19	VOCs	Q

280-104320-1	LL10mw-003-120517-GW	280-104320-25	Ground Water	Chromium	7440-47-3	µg/L	1.8	u	uj	n	10	1.8	0.50	Metals	CC
280-104320-1	LL10mw-003-120517-GW	280-104320-25	Ground Water	Cobalt	7440-48-4	µg/L	0.2	u	uj	n	1.0	0.20	0.054	Metals	CC
280-104320-1	LL10mw-003-120517-GW	280-104320-25	Ground Water	Iron	7439-89-6	µg/L	63	j	u	n	100	85	22	Metals	B
280-104320-1	LL10mw-003-120517-GW	280-104320-25	Ground Water	Manganese	7439-96-5	µg/L	0.92	j	u	n	3.5	0.95	0.31	Metals	B