DATA VALIDATION REPORT

Early May 2017 Groundwater Sampling Event
Four Corners Power Plant, Arizona Public Service
Farmington, New Mexico

Prepared by:

Amec Foster Wheeler Environment & Infrastructure, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034-1917
(602) 733-6000

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ACRONYMS

%	percent
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
APS	Arizona Public Service
CCR	coal combustion residual
CLP	Contract Laboratory Program
COC	chain of custody
EPA	United States Environmental Protection Agency
ID	identification
LCS	laboratory control sample
LCSD	laboratory control sample
MCL	maximum contaminant level
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
QC	quality control
RL	reporting limit
RPD	relative percent difference
SAP	sampling and analysis plan
SDG	sample delivery group
SM	Standard Method
SU	standard units (pH)
TestAmerica	TestAmerica Laboratories, Inc.
TDS	total dissolved solids

DATA VALIDATION REPORT
Four Corners Power Plant, Arizona Public Service
Farmington, New Mexico

1.0 INTRODUCTION

Arizona Public Service (APS) collected 21 water samples, including two field duplicates, between May 1st and 3rd, 2017, from the Four Corners Power Plant, located in Farmington, New Mexico. APS submitted the samples to TestAmerica Laboratories, Inc. (TestAmerica) in Phoenix, Arizona, and TestAmerica in Irvine, California. The samples were assigned to sample delivery groups (SDGs) J82216-1, J82216-2, J82219-1, and J82221-1. TestAmerica analyzed the samples for total metals and mercury by United States Environmental Protection Agency (EPA) Methods 200.7, 200.8, and 245.1; anions by EPA Method 300.0; total dissolved solids (TDS) by Standard Method (SM) 2540C; and pH by SM 4500B. TestAmerica subcontracted the samples to Radiation Safety Engineering, Inc., where they were analyzed for radium 226/228 using GammaRay HPGE. A list of these samples by field sample identification (ID), sample collection date, and the laboratory sample IDs is presented in Table 1.

2.0 DATA VALIDATION METHODOLOGY

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) performed an EPA Stage 2A validation on these samples, which is equivalent to a Level I data evaluation as defined in the project sampling and analysis plan (SAP). The Stage 2A validation includes review of the quality control (QC) results in the laboratory's analytical report and does not include review or validation of the raw analytical data. This data validation has been performed in general accordance with:

- AECOM, Inc., 2015. Final Sampling and Analysis Plan Coal Combustion Residual (CCR) Groundwater Monitoring, Four Corners Power Plant, Arizona Public Service, Farmington, New Mexico, December 2015.
- EPA, 2004. SW 846 Test Methods for Evaluating Solid Wastes, Update IIIB.
- EPA, 2014. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Superfund Data Review, EPA-540 R 013 001.

The CLP guidelines were written specifically for the CLP, and have been modified for the purposes of this data review where they differ from method-specific QC requirements.

The laboratory's certified analytical report and supporting documentation were reviewed to assess the following:

- Data package and electronic data deliverable completeness;
- Chain of custody (COC) compliance;
- Holding time compliance;
- Presence or absence of laboratory contamination as demonstrated by laboratory blanks;
- Accuracy and bias as demonstrated by recovery of laboratory control sample (LCS) and matrix spike (MS) samples;
- Analytical precision as relative percent difference (RPD) of analyte concentration between laboratory duplicates, LCS/LCS duplicates (LCSDs), or MSs/MS duplicates (MSDs);
- Insofar as possible, the degree of conformance to method requirements and good laboratory practices.

In general, it is important to recognize that no analytical data are guaranteed to be correct, even if all QC audits are passed. Strict QC serves to increase confidence in data, but any reported value may potentially contain error.

3.0 EXPLANATION OF DATA QUALITY INDICATORS

Summary explanations of the specific data quality indicators reviewed during data validation are presented below.

3.1 LABORATORY CONTROL SAMPLE RECOVERIES

LCSs are aliquots of analyte free matrices that are spiked with the analytes of interest for an analytical method, or a representative subset of those analytes. The spiked matrix is then processed through the same analytical procedures as the samples they accompany. LCS recovery is an indication of a laboratory’s ability to successfully perform an analytical method in an interference free matrix.

3.2 MATRIX SPIKE RECOVERIES

MSs and MSDs are prepared by adding known amounts of the analytes of interest for an analytical method, or a representative subset of those analytes, to an aliquot of sample. The spiked sample is then processed through the same extraction, concentration, cleanup, and analytical procedures as the unspiked samples in an analytical batch.

MS recovery and precision are an indication of a laboratory's ability to successfully recover an analyte in the matrix of a specific sample or closely related sample matrices. It is important not to apply MS results for any specific sample to other samples without understanding how the sample matrices are related.

3.3 BLANK CONCENTRATIONS

Blank samples are aliquots of analyte free matrix that are used as negative controls to verify that the sample collection, storage, preparation, and analysis system does not produce false positive results.

Laboratory blanks are processed by the laboratory using exactly the same procedures as the field samples. Target analytes should not be found in laboratory blanks.

When target analytes are detected in blanks, analyte concentrations in associated samples less than five times the concentration detected in the blank will be U qualified as being not detected.

3.4 LABORATORY DUPLICATES

Laboratory duplicate analysis verifies acceptable method precision by the laboratory at the time of preparation and analysis and/or sampling precision at the time of collection.

4.0 DEFINITIONS OF QUALIFIERS THAT MAY BE ADDED DURING DATA VALIDATION

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

R The sample result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

5.0 QUALIFICATION REASON CODES

The following reason codes were applied to the data during data validation:

EX There are multiple data points available for the same parameter. Amec Foster Wheeler chose to exclude this data point in favor of a point that better meets project-specified QC criteria.

HT Holding time exceeded.

NR There are multiple results for the same analysis and the result should be considered not reportable.

DL The result was greater than the minimum detection limit (MDL) but below the reporting limit (RL)

HM Matrix spike recovery was high

MB The same analyte was detected in the sample and in the associated laboratory blank and the concentration detected in the sample was less than five times the concentration detected in the blank.

6.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION

The samples were received at the laboratories under proper COC, intact, properly preserved, and at temperatures less than the SAP-specified maximum of 6 degrees Celsius.

7.0 SPECIFIC DATA VALIDATION FINDINGS

Results from these samples may be considered usable with the limitations and exceptions described in Sections 7.1 through 8.0.

7.1 METALS BY EPA METHODS 200.7, 200.8, AND 245.1

Total metals and mercury results generated by TestAmerica may be considered usable with the limitations described in Sections 7.1.1 through 7.1.6.

7.1.1 Holding Times

All samples were analyzed for metals within the SAP-specified holding time of 28 days for mercury and 180 days for the additional metals.

7.1.2 Laboratory Blanks

Target analytes were not detected in the laboratory blanks associated with the analysis of these samples with the following exceptions.

- Barium and lead were detected at concentrations of 0.00539 mg/L and 0.000569 mg/L, respectively, in the laboratory blank associated with the analysis of samples FC-CCR-FD01-5117, FC-CCR-FD02-5217, FC-CCR-MW8-5317, FC-CCR-MW49A-5317, FC-CCR-MW60-5317, FC-CCR-MW61-5317, FC-CCR-MW62-5117, FC-CCR-MW63-5217, FC-CCR-MW64-5217, FC-CCR-MW65-5117, FC-CCR-MW66-5117, FC-CCR-MW67-5217, FC-CCR-MW68-5217, FC-CCR-MW69-5217, FC-CCR-MW70-5117, FC-CCR-MW71-5217, FC-CCR-MW72-5217, FC-CCR-MW73-5217, and FC-CCR-MW75-5317. TestAmerica re-digested and reanalyzed all samples that had barium and/or lead results affected by the blank detections and no data were qualified based on these blank detections.
- Barium and lead were detected at concentrations of 0.00528 mg/L and 0.000572 mg/L, respectively, in the laboratory blank associated with the second analysis of samples FC-CCR-MW66-5117, FC-CCR-MW67-5217, FC-CCR-MW68-5217, FC-CCR-MW69-5217, FC-CCR-MW70-5117, FC-CCR-MW71-5217, FC-CCR-MW72-5217, FC-CCR-MW73-5217, FC-CCR-MW74-5217, and FC-CCR-MW75-5317. Lead results associated with these analyses were not reported and TestAmerica re-digested and reanalyzed all samples that had barium results affected by the blank detections, so no data were qualified based on these blank detections.

7.1.3 Laboratory Control Sample Accuracy and Precision

LCS and LCSD recoveries were within the SAP-specified 80 to 120 percent (%) limits and RPDs between the LCS and LCSD results were less than the laboratory-specified maximum of 20%.

7.1.4 Matrix Spikes/Matrix Spike Duplicates

TestAmerica performed MS and MSD analyses on project sample FC-CCR-MW8-5317 for antimony, arsenic, barium, cadmium, chromium, cobalt, lead, molybdenum, selenium, and thallium; FC-CCR-MW68-5217 for boron, calcium, magnesium, potassium, and sodium; and FC-CCR-MW7-5317 for mercury. MS/MSD recoveries were within laboratory-specified limits, and RPDs between MS and MSD results were less than the laboratory-specified maximum of 20%, with the following exceptions:

- Calcium (-13%, -19%), boron (-685%, -443%), magnesium (-477%, -205%), and sodium (-135%, -49%) recoveries were low in the MS and MSD performed on sample FC-CCR-MW68-5217 from SDG J82216-1. However, the concentrations of the analytes in the native unspiked sample were greater than four times the spike concentrations and based on CLP validation guidelines it is not possible to evaluate data usability for these analytes based on MS/MSD recoveries.
- Selenium recoveries were high in the two MS (150%, 135%) and two MSDs (151%, 135%) performed on sample FC-CCR-MW8-5317 from SDG J82219-1. Amec Foster Wheeler J qualified the detected selenium results from this sample due to potential high analytical bias. (J-HM)

MS and MSD analyses for other metals were performed on batch samples not related to this project. It is not possible to evaluate data usability based on the MS/MSD performance of unrelated samples.

7.1.5 Analytical Sensitivity

Amec Foster Wheeler compared RLs for antimony, arsenic, barium, beryllium, cadmium, chromium, selenium, thallium, lead and mercury against applicable MCLs to confirm that the RLs were sufficiently low to meet the MCLs. Non-detect results were reported to RLs less than the applicable MCLs. Boron, calcium, cobalt, lithium, magnesium, molybdenum, potassium, and sodium are not EPA-regulated analytes in groundwater and it is not possible to evaluate the RLs for these analytes against the National Primary Drinking Water Regulation MCLs.

7.1.6 Data Reporting and Analytical Procedures

There were no data reporting or analytical issues with the data groups associated with this validation.

7.2 ANIONS BY EPA METHOD 300.0

Fluoride, chloride, and sulfate results generated by TestAmerica may be considered usable with the limitations described in Sections 7.2.1 through 7.2.7.

7.2.1 Holding Times

Samples were analyzed for anions within the SAP-specified holding time of 28 days, with the following exceptions:

- Samples FC-CCR-FD01-5117, FC-CCR-FD02-5217, FC-CCR-MW7-5317, FC-CCR-MW8-5317, FC-CCR-MW49A-5317, FC-CCR-MW60-5317, FC-CCR-MW61-5317,

FC-CCR-MW62-5117, FC-CCR-MW63-5217, FC-CCR-MW64-5217, FC-CCR-MW65-5117, FC-CCR-MW66-5117, FC-CCR-MW67-5217, FC-CCR-MW68-5217, FC-CCR-MW69-5217, FC-CCR-MW70-5117, FC-CCR-MW71-5217, FC-CCR-MW72-5217, FC-CCR-MW73-5217, FC-CCR-MW74-5219, and FC-CCR-MW75-5317 were initially analyzed for fluoride within 28 days of sampling, but the samples were reanalyzed between 7 and 9 days past holding at APS's request because RLs were too high in the original analyses to meet project-specified sensitivity criteria (see Section 7.2.6). Amec Foster Wheeler J qualified the detected fluoride results from the reanalysis of these samples because of the missed hold time. (J-HT)

7.2.2 Laboratory Blanks

Fluoride, chloride, and sulfate were not detected in the laboratory blanks associated with the analysis of these samples.

7.2.3 Laboratory Control Samples

LCS and LCSD recoveries were within the laboratory-specified 90 to 110% limits and RPDs between the LCS and LCSD results were less than the laboratory-specified maximum values.

7.2.4 Matrix Spikes/Matrix Spike Duplicates

TestAmerica performed MS and MSD analyses on samples FC-CCR-MW62-5117 for chloride and fluoride; and FC-CCR-FD01-5117, FC-CCR-MW49A-5317, FC-CCR-MW66-5117, and FC-CCR-MW75-5317 for fluoride. Recoveries were within the laboratory-specified 80 to 120% limits, and RPDs between MS and MSD results were less than 20%.

According to the laboratory's case narrative, the MS and MSDs for two of the analytical batches associated with samples evaluated in this report could not be evaluated for accuracy and precision due to high sulfate concentrations in the unspiked native sample. There was no further discussion or indication whether the spiked samples were project-specific samples or unrelated batch samples. No data were qualified based on this issue.

7.2.5 Laboratory Duplicates

TestAmerica did not perform duplicate analyses of any of the samples covered in this report.

7.2.6 Analytical Sensitivity

Amec Foster Wheeler compared RLs for fluoride against the MCL of 4 mg/L and RLs for chloride and sulfate against the secondary MCLs of 250 mg/L to assess whether the RLs were sufficiently low to evaluate compliance with the MCLs.

TestAmerica Phoenix subcontracted the anion analyses to TestAmerica Irvine. TestAmerica Irvine does not routinely analyze samples with high chloride and sulfate concentrations and the samples were analyzed at dilutions that resulted in non-detected fluoride results with concentrations greater than the MCL of 4.0 mg/L.

At APS's request, TestAmerica Irvine reanalyzed selected samples from SDG J22816-1 for fluoride and reported results in SDG J22816-2. In some instances, estimated concentrations greater than the method detection limit but less than the reporting limit were detected; however most of the results were again reported as not detected above a reported sample quantitation limit that was greater than the MCL. Following receipt of SDG J22816-2 fluoride results, APS directed TestAmerica Phoenix to reanalyze all samples for fluoride to achieve RLs less than the MCL of 4.0 mg/L; the second reanalysis event occurred outside of holding time (see Section 7.2.1). Fluoride either was detected in the reanalyses, or was not detected with RLs less than 4.0 mg/L.

Since data from multiple runs were available for these samples, Amec Foster Wheeler identified the best results based on meeting project-specific sensitivity goals in Table 2A. This analysis was based entirely on which results required the least amount of qualification and did not consider consistency with past data.

7.2.7 Data Reporting and Analytical Procedures

TestAmerica reported up to five sets of fluoride results for the samples collected in May 2017. Amec FW calculated the relative standard deviations (RSDs) between redundant fluoride results and RSDs were less than 20% or else differences between the results were less than the average RL. Fluoride detections for the May 2017 dataset are summarized in Table 2A.

Amec Foster Wheeler chose to reject non-detected fluoride results from the multiple analyses when there either were detections in one of the other analyses of the same sample or there was a result that was not detected with a lower RL. These rejections do not affect completeness or overall data usability. (R-NR)

Amec Foster Wheeler's recommendations for the best fluoride data set based on either meeting project-specified sensitivity goals or data requiring the least qualification and therefore best data quality are specified by bolded results in Table 2A. The project management team is not required to follow these recommendations, but should fully evaluate the data against project data quality objectives and historical data when reporting these fluoride results.

TestAmerica qualified results that were between the method detection limit and the reporting limit as estimated results, and Amec Foster Wheeler maintained those qualifiers. (J-DL)

7.3 TOTAL DISSOLVED SOLIDS BY SM 2540C

TDS results generated by TestAmerica may be considered fully usable without qualification.

7.3.1 Holding Times

All samples were analyzed for TDS within the SAP-specified holding time of 7 days.

7.3.2 Laboratory Blanks

TDS was not detected in the laboratory blanks at concentrations above the reporting limit.

7.3.3 Laboratory Control Sample Accuracy and Precision

LCS and LCSD recoveries were within the laboratory-specified 90 to 110% limits and RPDs between the LCS and LCSD results were less than the laboratory-specified maximum of 10%.

7.3.4 Laboratory Duplicates

TestAmerica did not perform duplicate analysis on any of the samples from these SDGs.

7.3.5 Data Reporting and Analytical Procedures

There were no data reporting of analytical issues with the data groups associated with this validation.

7.4 PH BY SM 4500B

pH results generated by TestAmerica may be considered usable with the limitations described in Sections 7.4.1 through 7.4.4.

7.4.1 Holding Times

All samples were analyzed for pH after the method-specified 15 minute hold time had passed. Amec Foster Wheeler J qualified the pH results from these samples because of the missed holding time. (J-HT)

7.4.2 Laboratory Control Sample Accuracy

LCS recovery was within the laboratory-specified 98.5 to 101.5% limits.

7.4.3 Laboratory Duplicates

TestAmerica did not perform duplicate analyses on any of the samples from these SDGs.

7.4.4 Data Reporting and Analytical Procedures

There were no data anomalies associated with the pH analysis of these samples.

7.5 RADIOCHEMICAL ANALYSES

It was not possible to evaluate data usability for the radiochemical analyses due to a lack of reported laboratory QC.

7.5.1 Analytical Sensitivity

Amec Foster Wheeler compared RLs for total radium analysis against the MCL to confirm that the RLs were sufficiently low to meet the MCL. Non-detect results were reported to RLs less than the applicable MCL.

8.0 FIELD DUPLICATES

APS collected samples FC-CCR-FD01-5117 and FC-CCR-FD02-5217 as field duplicates of samples FC-CCR-MW65-5117 and FC-CCR-MW64-5217, respectively. Target analyte detections are summarized in Table 2B. Precision values were less than the SAP-specified maximum of 20%, or the differences between the detected concentrations were less than the RLs.

9.0 SUMMARY AND CONCLUSIONS

The data generated are usable and of acceptable quality with the addition of qualifiers presented in Table 3. Qualifier definitions are summarized in Section 4.0, reason codes are summarized in Section 5.0, and qualified data are summarized below.

- Amec Foster Wheeler J or UJ qualified 75 records as being estimated concentrations because of hold time exceedances, results above the upper calibration limit, high matrix spike recoveries, or results between the MDL and RL.
- Amec Foster Wheeler rejected 23 records. There were results from multiple runs available for the same samples, and Amec Foster Wheeler rejected results that did not meet project specific sensitivity goals. The rejections do not affect the overall data completeness.

REFERENCES

AECOM, 2015. Sampling and Analysis Plan CCR Groundwater Monitoring Four Corners Power Plant Arizona Public Service, Farmington, New Mexico, December 2015.

EPA, 2014. EPA CLP National Functional Guidelines for Inorganic Superfund Data Review, EPA-540 R 013 001.

EPA, 2004. SW 846 Test Methods for Evaluating Solid Wastes, Update IIIB.

LIMITATIONS

This report was prepared exclusively for Arizona Public Service by Amec Foster Wheeler Environment & Infrastructure, Inc. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in Amec Foster Wheeler services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This data validation report is intended to be used by Arizona Public Service, Four Corners Power Plant site only, subject to the terms and conditions of its contract with Amec Foster Wheeler. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

TABLES

TABLE 1
Field Samples Submitted to Test America Laboratories, Inc.
Four Corners Power Plant, Arizona Public Service
Farmington, New Mexico

Field Sample ID	Collection Date	Test America Sample ID	Notes
FC-CCR-MW7-5317	5/3/2017	550-82216-1	
FC-CCR-MW8-5317	5/3/2017	550-82216-2	
FC-CCR-MW49A-5317	5/3/2017	550-82216-3	
FC-CCR-MW60-5317	5/3/2017	550-82216-4	
FC-CCR-MW61-5317	5/3/2017	550-82216-5	
FC-CCR-MW62-5117	5/1/2017	550-82216-6	
FC-CCR-MW63-5217	5/2/2017	550-82216-7	
FC-CCR-MW64-5217	5/2/2017	550-82216-8	
FC-CCR-FD02-5217	5/2/2017	550-82216-9	Field Duplicate of FC-CCR-MW64-5217
FC-CCR-MW65-5117	5/1/2017	550-82216-10	
FC-CCR-FD01-5117	5/1/2017	550-82216-11	Field Duplicate of FC-CCR-MW65-5217
FC-CCR-MW66-5117	5/1/2017	550-82216-12	
FC-CCR-MW67-5217	5/2/2017	550-82216-13	
FC-CCR-MW68-5217	5/2/2017	550-82216-14	
FC-CCR-MW69-5217	5/2/2017	550-82216-15	
FC-CCR-MW70-5117	5/1/2017	550-82216-16	
FC-CCR-MW71-5217	5/2/2017	550-82216-17	
FC-CCR-MW72-5217	5/2/2017	550-82216-18	
FC-CCR-MW73-5217	5/2/2017	550-82216-19	
FC-CCR-MW74-5217	5/2/2017	550-82216-20	
FC-CCR-MW75-5317	5/3/2017	550-82216-21	
FC-CCR-MW7-5317	5/3/2017	550-82219-1	
FC-CCR-MW8-5317	5/3/2017	550-82219-2	
FC-CCR-MW49A-5317	5/3/2017	550-82219-3	
FC-CCR-MW60-5317	5/3/2017	550-82219-4	
FC-CCR-MW61-5317	5/3/2017	550-82219-5	
FC-CCR-MW62-5117	5/1/2017	550-82219-6	
FC-CCR-MW63-5217	5/2/2017	550-82219-7	
FC-CCR-MW64-5217	5/2/2017	550-82219-8	
FC-CCR-FD02-5217	5/2/2017	550-82219-9	Field Duplicate of FC-CCR-MW64-5217
FC-CCR-MW65-5117	5/1/2017	550-82219-10	
FC-CCR-FD01-5117	5/1/2017	550-82219-11	Field Duplicate of FC-CCR-MW65-5217
FC-CCR-MW66-5117	5/1/2017	550-82219-12	
FC-CCR-MW67-5217	5/2/2017	550-82219-13	
FC-CCR-MW68-5217	5/2/2017	550-82219-14	
FC-CCR-MW69-5217	5/2/2017	550-82219-15	
FC-CCR-MW70-5117	5/1/2017	550-82219-16	
FC-CCR-MW71-5217	5/2/2017	550-82219-17	
FC-CCR-MW72-5217	5/2/2017	550-82219-18	
FC-CCR-MW73-5217	5/2/2017	550-82219-19	
FC-CCR-MW74-5217	5/2/2017	550-82219-20	
FC-CCR-MW75-5317	5/3/2017	550-82219-21	

Notes:
ID = identification

TABLE 2A
Redundant Fluoride Results
Four Corners Power Plant, Arizona Public Service
Farmington, New Mexico

Sample	Average RL	J82216-1 Analytical Result [1]	J82216-2 Analytical Result [1]	J82216-1 Rev(1) Analytical Result [2]	J82219-1 Analytical Result [1]	J82219-1 Rev(1) Analytical Result [2]	RSD	Notes
FC-CCR-MW7-5317	6.3	10 U	10 U	**0.80 U**	**5.1 J**	0.35 J	NC	± RL
FC-CCR-MW8-5317	6.8	10 U	**6.2 J**	2.0 U	**5.3 J**	1.1 J	NC	± RL
FC-CCR-MW49A-5317	16	25 U	25 U	**2.0 U**	25 U	**0.79 J**	NC	± RL
FC-CCR-MW60-5317	5.4	**10**		6.9	**10**	6.9	21%	± RL
FC-CCR-MW61-5317	3.2	5.0 U	**3.3 J**	1.2	**2.8 J**	1.2	NC	± RL
FC-CCR-MW62-5117	3.2	5.0 U	**3.8 J**	1.3	**3.3 J**	1.3	NC	± RL
FC-CCR-MW63-5217	1.5	**2.7**		1.7	**2.5**	1.7	24%	± RL
FC-CCR-MW64-5217	0.45	**1.4**		1.4	**1.3**	1.4	3.6%	
FC-CCR-FD02-5217	0.45	**1.4**		1.4	**1.3**	1.5	5.8%	
FC-CCR-MW65-5117	0.45	**1.7**		1.9	**1.6**	1.9	8.5%	
FC-CCR-FD01-5117	0.45	**1.7**		1.9	**1.6**	1.8	7.4%	
FC-CCR-MW66-5117	9.8	**30**		24	**32**	24	15%	
FC-CCR-MW67-5217	9.8	**26**		22	**28**	37	22%	± RL
FC-CCR-MW68-5217	8.5	**14**		10	**18 J**	10	29%	± RL
FC-CCR-MW69-5217	9.8	**22**		18	**24 J**	18	15%	
FC-CCR-MW70-5117	4.3	5.0 U	**4.3 J**	1.6	10 U	**1.7**	NC	± RL
FC-CCR-MW71-5217	9.8	10 U	10 U	**2.0 U**	25 U	**0.44 J**	NC	± RL
FC-CCR-MW72-5217	9.8	10 U	10 U	**2.0 U**	25 U	**0.32 J**	NC	± RL
FC-CCR-MW73-5217	6.3	10 U	10 U	**0.80 U**	10 U	**0.20 J**	NC	± RL
FC-CCR-MW74-5217	12	25 U	25 U	**1.9**	25 U	**1.9**	NC	± RL
FC-CCR-MW75-5317	4.8	10 U		**2.0 U**	**2.8 J**	1.4 J	NC	± RL

Notes:

mg/L = milligrams per liter
RL = reporting limit
NC = not calculable
RSD = relative standard deviation

Bold results either meet project-specified sensitivity goals or require the least qualification and therefore the best data quality.

[1] Analysis performed by TestAmerica, Irvine within the EPA-recommended maximum hold time of 28 days.

[2] Analysis performed by TestAmerica, Phoenix, between 7 and 9 days past the maximum recommended hold time.

Methods:

EPA 300.0 = Ions

Qualifier and Reason Code Definitions:

± RL = the difference ebtween analyte concentrations is less than the RL.
J = The analyte was positively identified; the associated numerical value is approximate.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

TABLE 2B
Field Duplicate Detections
Four Corners Power Plant, Arizona Public Service
Farmington, New Mexico

Method	Analyte	RL	Primary Sample Result	Field Duplicate Result	RPD	Notes
Samples FC-CCR-MW65-5117 and FC-CCR-FD01-5117						
300.0	Chloride	25 mg/L	58	59	1.7%	
	Fluoride	0.50 mg/L	1.7	1.7	0.0%	
	Fluoride	0.50 mg/L	1.6	1.6	0.0%	
	Sulfate	25 mg/L	500	510	2.0%	
200.7 Rev 4.4	Boron	0.050 mg/L	0.79	0.81	2.5%	
	Calcium	2.0 mg/L	110	120	8.7%	
	Magnesium	2.0 mg/L	59	61	3.3%	
	Potassium	0.50 mg/L	3.7	3.7	0.0%	
	Sodium	0.50 mg/L	160	170	6.1%	
200.8 LL	Cobalt	0.00050 mg/L	0.0011	0.0011	0.0%	
	Molybdenum	0.00050 mg/L	0.0083	0.0083	0.0%	
SM 2540C	Total Dissolved Solids	20 mg/L	1,100	1,100	0.0%	
SM 4500 H+ B	pH	0.1 SU	7.7	7.7	0.0%	
Samples FC-CCR-MW64-5217 and FC-CCR-FD02-5217						
300.0	Chloride	5.0 mg/L	44	51	15%	
	Fluoride	0.50 mg/L	1.4	1.4	0.0%	
	Fluoride	0.50 mg/L	1.3	1.3	0.0%	
	Sulfate	25 mg/L	340	350	2.9%	
200.7 Rev 4.4	Boron	0.05 mg/L	0.55	0.57	3.6%	
	Calcium	2.0 mg/L	86	87	1.2%	
	Magnesium	2.0 mg/L	35	35	0.0%	
	Potassium	0.50 mg/L	5.6	5.7	1.8%	
	Sodium	0.50 mg/L	120	120	0.0%	
200.8 LL	Cobalt	0.00050 mg/L	0.0011	0.0011	0.0%	
	Molybdenum	0.00050 mg/L	0.0045	0.0044	2.2%	
	Thallium	0.00010 mg/L	0.00011	0.00011	0.0%	
SM 2540C	Total Dissolved Solids	20 mg/L	780	780	0.0%	
SM 4500 H+ B	pH	0.1 SU	7.9	7.9	0.0%	
GammaRay HPGE	Radium 226	0.4 pCi/L	0.7	0.4 U	NC	± RL
	Total Radium	0.6 pCi/L	0.7	0.6 U	NC	± RL

Notes:
SU=standard units (for pH)
mg/L = milligrams per liter
RL = reporting limit
RPD = relative percent difference

Methods:
EPA 300.0 = Ions
EPA 200.7 = Metals
EPA 200.8 = Low Level Metals
SM2540C = Total Dissolved Solids
SM4500 = pH

Qualifier Definitions:
J = The analyte was positively identified; the associated numerical value is approximate.

Reason Codes:
FD = High field duplicate RPD. Potential analytical or sampling imprecision.

TABLE 3
Qualifiers Added During Data Validation
Four Corners Power Plant, Arizona Public Service
Farmington, New Mexico

Sample IDs	Methods	SDG	Analytes	Concentrations	Qualifiers and Reason Codes
FC-CCR-FD01-5117	SM 4500 H+ B	J82216-1	pH	7.7 SU	J HT
FC-CCR-FD01-5117	200.8	J82219-1	barium	0.017 mg/L	U MB
FC-CCR-FD01-5117	300.0	J82216-1 Rev(1)	fluoride	1.9 mg/L	J HT
FC-CCR-FD01-5117	300.0	J82219-1 Rev(1)	fluoride	1.8 mg/L	J HT
FC-CCR-FD02-5217	SM 4500 H+ B	J82216-1	pH	7.9 SU	J HT
FC-CCR-FD02-5217	200.8	J82219-1	barium	0.026 mg/L	U MB
FC-CCR-FD02-5217	300.0	J82216-1 Rev(1)	fluoride	1.4 mg/L	J HT
FC-CCR-FD02-5217	300.0	J82219-1 Rev(1)	fluoride	1.5 mg/L	J HT
FC-CCR-MW49A-5317	SM 4500 H+ B	J82216-1	pH	7.5 SU	J HT
FC-CCR-MW49A-5317	300.0	J82216-1 Rev(1)	fluoride	2.0 mg/L	UJ HT
FC-CCR-MW49A-5317	200.8	J82219-1	barium	0.022 mg/L	U MB
FC-CCR-MW49A-5317	300.0	J82219-1 Rev(1)	fluoride	0.79 mg/L	J HT, DL
FC-CCR-MW49A-5317	300.0	J82219-1	fluoride	25 mg/L	R NR
FC-CCR-MW49A-5317	300.0	J82216-1	fluoride	25 mg/L	R NR
FC-CCR-MW49A-5317	300.0	J82216-2	fluoride	25 mg/L	R NR
FC-CCR-MW60-5317	SM 4500 H+ B	J82216-1	pH	7.7 SU	J HT
FC-CCR-MW60-5317	200.8	J82219-1	barium	0.017 mg/L	U MB
FC-CCR-MW60-5317	300.0	J82216-1 Rev(1)	fluoride	6.9 mg/L	J HT
FC-CCR-MW60-5317	300.0	J82219-1 Rev(1)	fluoride	6.9 mg/L	J HT
FC-CCR-MW61-5317	SM 4500 H+ B	J82216-1	pH	8.6 SU	J HT
FC-CCR-MW61-5317	300.0	J82216-2	fluoride	3.3 mg/L	J DL
FC-CCR-MW61-5317	200.8	J82219-1	barium	0.014 mg/L	U MB
FC-CCR-MW61-5317	200.8	J82219-1	lead	0.00082 mg/L	U MB
FC-CCR-MW61-5317	300.0	J82219-1	fluoride	2.8 mg/L	J DL
FC-CCR-MW61-5317	300.0	J82216-1	fluoride	5.0 mg/L	R NR
FC-CCR-MW61-5317	300.0	J82216-1 Rev(1)	fluoride	1.2 mg/L	J HT
FC-CCR-MW61-5317	300.0	J82219-1 Rev(1)	fluoride	1.2 mg/L	J HT
FC-CCR-MW62-5117	SM 4500 H+ B	J82216-1	pH	7.2 SU	J HT
FC-CCR-MW62-5117	300.0	J82216-2	fluoride	3.8 mg/L	J DL
FC-CCR-MW62-5117	200.8	J82219-1	barium	0.021 mg/L	U MB
FC-CCR-MW62-5117	300.0	J82219-1	fluoride	3.3 mg/L	J DL
FC-CCR-MW62-5117	300.0	J82216-1	fluoride	5.0 mg/L	R NR
FC-CCR-MW62-5117	300.0	J82216-1 Rev(1)	fluoride	1.3 mg/L	J HT
FC-CCR-MW62-5117	300.0	J82219-1 Rev(1)	fluoride	1.3 mg/L	J HT
FC-CCR-MW63-5217	SM 4500 H+ B	J82216-1	pH	7.3 SU	J HT
FC-CCR-MW63-5217	200.8	J82219-1	barium	0.017 mg/L	U MB
FC-CCR-MW63-5217	300.0	J82216-1 Rev(1)	fluoride	1.7 mg/L	J HT
FC-CCR-MW63-5217	300.0	J82219-1 Rev(1)	fluoride	1.7 mg/L	J HT
FC-CCR-MW64-5217	SM 4500 H+ B	J82216-1	pH	7.9 SU	J HT
FC-CCR-MW64-5217	200.8	J82219-1	barium	0.026 mg/L	U MB
FC-CCR-MW64-5217	300.0	J82216-1 Rev(1)	fluoride	1.4 mg/L	J HT
FC-CCR-MW64-5217	300.0	J82219-1 Rev(1)	fluoride	1.4 mg/L	J HT
FC-CCR-MW65-5117	SM 4500 H+ B	J82216-1	pH	7.7 SU	J HT
FC-CCR-MW65-5117	200.8	J82219-1	barium	0.017 mg/L	U MB
FC-CCR-MW65-5117	300.0	J82216-1 Rev(1)	fluoride	1.9 mg/L	J HT
FC-CCR-MW65-5117	300.0	J82219-1 Rev(1)	fluoride	1.9 mg/L	J HT
FC-CCR-MW66-5117	SM 4500 H+ B	J82216-1	pH	7.4 SU	J HT

TABLE 3
Qualifiers Added During Data Validation
Four Corners Power Plant, Arizona Public Service
Farmington, New Mexico

Sample IDs	Methods	SDG	Analytes	Concentrations	Qualifiers and Reason Codes
FC-CCR-MW66-5117	200.8	J82219-1	barium	0.02 mg/L	U MB
FC-CCR-MW66-5117	300.0	J82216-1 Rev(1)	fluoride	24 mg/L	J HT
FC-CCR-MW66-5117	300.0	J82219-1 Rev(1)	fluoride	24 mg/L	J HT
FC-CCR-MW67-5217	SM 4500 H+ B	J82216-1	pH	7.3 SU	J HT
FC-CCR-MW67-5217	200.8	J82219-1	barium	0.019 mg/L	U MB
FC-CCR-MW67-5217	300.0	J82216-1 Rev(1)	fluoride	22 mg/L	J HT
FC-CCR-MW67-5217	300.0	J82219-1 Rev(1)	fluoride	37 mg/L	J HT
FC-CCR-MW68-5217	SM 4500 H+ B	J82216-1	pH	7.3 SU	J HT
FC-CCR-MW68-5217	200.8	J82219-1	barium	0.0068 mg/L	U MB
FC-CCR-MW68-5217	300.0	J82219-1	fluoride	18 mg/L	J DL
FC-CCR-MW68-5217	300.0	J82216-1 Rev(1)	fluoride	10 mg/L	J HT
FC-CCR-MW68-5217	300.0	J82219-1 Rev(1)	fluoride	10 mg/L	J HT
FC-CCR-MW69-5217	SM 4500 H+ B	J82216-1	pH	7.5 SU	J HT
FC-CCR-MW69-5217	200.8	J82219-1	barium	0.015 mg/L	U MB
FC-CCR-MW69-5217	300.0	J82219-1	fluoride	24 mg/L	J DL
FC-CCR-MW69-5217	300.0	J82216-1 Rev(1)	fluoride	18 mg/L	J HT
FC-CCR-MW69-5217	300.0	J82219-1 Rev(1)	fluoride	18 mg/L	J HT
FC-CCR-MW70-5117	SM 4500 H+ B	J82216-1	pH	7.2 SU	J HT
FC-CCR-MW70-5117	300.0	J82216-2	fluoride	4.3 mg/L	J DL
FC-CCR-MW70-5117	200.8	J82219-1	barium	0.0097 mg/L	U MB
FC-CCR-MW70-5117	300.0	J82216-1	fluoride	5.0 mg/L	R NR
FC-CCR-MW70-5117	300.0	J82219-1	fluoride	10 mg/L	R NR
FC-CCR-MW70-5117	300.0	J82216-1 Rev(1)	fluoride	1.6 mg/L	J HT
FC-CCR-MW70-5117	300.0	J82219-1 Rev(1)	fluoride	1.7 mg/L	J HT
FC-CCR-MW71-5217	300.0	J82216-1	fluoride	10 mg/L	R NR
FC-CCR-MW71-5217	SM 4500 H+ B	J82216-1	pH	7.3 SU	J HT
FC-CCR-MW71-5217	300.0	J82216-1 Rev(1)	fluoride	2.0 mg/L	UJ HT
FC-CCR-MW71-5217	200.8	J82219-1	barium	0.0087 mg/L	U MB
FC-CCR-MW71-5217	300.0	J82219-1 Rev(1)	fluoride	0.44 mg/L	J HT, DL
FC-CCR-MW71-5217	300.0	J82216-2	fluoride	10 mg/L	R NR
FC-CCR-MW71-5217	300.0	J82219-1	fluoride	25 mg/L	R NR
FC-CCR-MW72-5217	300.0	J82216-1	fluoride	10 mg/L	R NR
FC-CCR-MW72-5217	SM 4500 H+ B	J82216-1	pH	7.3 SU	J HT
FC-CCR-MW72-5217	300.0	J82216-1 Rev(1)	fluoride	2.0 mg/L	UJ HT
FC-CCR-MW72-5217	200.8	J82219-1	barium	0.0079 mg/L	U MB
FC-CCR-MW72-5217	300.0	J82219-1 Rev(1)	fluoride	0.32 mg/L	J HT, DL
FC-CCR-MW72-5217	300.0	J82219-1	fluoride	25 mg/L	R NR
FC-CCR-MW72-5217	300.0	J82216-2	fluoride	10 mg/L	R NR
FC-CCR-MW73-5217	300.0	J82216-1	fluoride	10 mg/L	R NR
FC-CCR-MW73-5217	SM 4500 H+ B	J82216-1	pH	7.2 SU	J HT
FC-CCR-MW73-5217	300.0	J82216-1 Rev(1)	fluoride	0.80 mg/L	UJ HT
FC-CCR-MW73-5217	200.8	J82219-1	barium	0.026 mg/L	U MB
FC-CCR-MW73-5217	300.0	J82219-1 Rev(1)	fluoride	0.20 mg/L	J HT, DL
FC-CCR-MW73-5217	300.0	J82216-2	fluoride	10 mg/L	R NR
FC-CCR-MW73-5217	300.0	J82219-1	fluoride	10 mg/L	R NR
FC-CCR-MW74-5217	300.0	J82216-1	fluoride	25 mg/L	R NR
FC-CCR-MW74-5217	SM 4500 H+ B	J82216-1	pH	8 SU	J HT

TABLE 3
Qualifiers Added During Data Validation
Four Corners Power Plant, Arizona Public Service
Farmington, New Mexico

Sample IDs	Methods	SDG	Analytes	Concentrations	Qualifiers and Reason Codes
FC-CCR-MW74-5217	200.8	J82219-1	barium	0.018 mg/L	U MB
FC-CCR-MW74-5217	300.0	J82216-1 Rev(1)	fluoride	1.9 mg/L	J HT
FC-CCR-MW74-5217	300.0	J82219-1 Rev(1)	fluoride	1.9 mg/L	J HT
FC-CCR-MW74-5217	300.0	J82216-2	fluoride	25 mg/L	R NR
FC-CCR-MW74-5217	300.0	J82219-1	fluoride	25 mg/L	R NR
FC-CCR-MW7-5317	300.0	J82216-1	fluoride	10 mg/L	R NR
FC-CCR-MW7-5317	SM 4500 H+ B	J82216-1	pH	7.4 SU	J HT
FC-CCR-MW7-5317	300.0	J82219-1	fluoride	5.1 mg/L	J DL
FC-CCR-MW7-5317	300.0	J82216-1 Rev(1)	fluoride	0.80 mg/L	J HT, DL
FC-CCR-MW7-5317	300.0	J82216-2	fluoride	10 mg/L	R NR
FC-CCR-MW7-5317	300.0	J82219-1 Rev(1)	fluoride	0.35 mg/L	J HT, DL
FC-CCR-MW75-5217	300.0	J82216-1	fluoride	10 mg/L	R NR
FC-CCR-MW75-5317	SM 4500 H+ B	J82216-1	pH	8.3 SU	J HT
FC-CCR-MW75-5317	300.0	J82216-1 Rev(1)	fluoride	2.0 mg/L	UJ HT
FC-CCR-MW75-5317	300.0	J82219-1	fluoride	2.8 mg/L	J DL
FC-CCR-MW75-5317	300.0	J82219-1 Rev(1)	fluoride	1.4 mg/L	J HT, DL
FC-CCR-MW8-5317	300.0	J82216-1	fluoride	10 mg/L	R NR
FC-CCR-MW8-5317	SM 4500 H+ B	J82216-1	pH	7.3 SU	J HT
FC-CCR-MW8-5317	300.0	J82216-1 Rev(1)	fluoride	2.0 mg/L	UJ HT
FC-CCR-MW8-5317	300.0	J82216-2	fluoride	6.2 mg/L	J DL
FC-CCR-MW8-5317	200.8	J82219-1	barium	0.012 mg/L	U MB
FC-CCR-MW8-5317	200.8	J82219-1	selenium	0.0015 mg/L	J HM
FC-CCR-MW8-5317	300.0	J82219-1	fluoride	5.3 mg/L	J DL
FC-CCR-MW8-5317	300.0	J82219-1 Rev(1)	fluoride	1.1 mg/L	J HT, DL

Methods:
EPA 300.0 = Ions
EPA 200.7 = Metals
EPA 200.8 = Low Level Metals
SM2540C = Total Dissolved Solids
SM4500 = pH

Qualifier Definitions:
J = The analyte was positively identified; the associated numerical value is approximate.
U = The analyte was not detected above the RL.
R = There are multiple results for the same analyte and this result is considered not reportable.
UJ = The analyte was not detected above the RL. However, the RL is approximate.

Reason Codes:
DL=analyte detected between the minimum detection limit (MDL) and the reporting limit (RL)
HM=high matrix spike recovery
HT = Holding time exceeded
MB = detection in laboratory blank
NR = There are multiple results for the same analysis and the result should be considered not reportable.