TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
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TestAmerica Job ID: 240-58654-2
Client Project/Site: FCPP - CCR APS Four Corners

For:
AECOM Technical Services Inc.
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Attn: Dan Sola

Authorized for release by:
1/13/2016 9:42:58 AM

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Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Qualifiers

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 240-58654-2

Laboratory: TestAmerica Canton

Narrative

CASE NARRATIVE

Client: AECOM Technical Services Inc.

Project: FCPP - CCR APS Four Corners

Report Number: 240-58654-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

The 903.0 Radium-226, the 904.0 Radium-228 and the Ra226_Ra228 Combined Radium-226 and Radium-228 analyses were performed at the TestAmerica St. Louis laboratory.

TestAmerica Canton attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT
The samples were received on 12/4/2015 9:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.5º C.

RADIUM-226
Samples FC-CCR-MW8-120115 (240-58654-1), FC-CCR-MW12R-120115 (240-58654-2), FC-CCR-MW43-120115 (240-58654-3), FC-CCR-MW49A-120115 (240-58654-4) and FC-CCR-MW50-120115 (240-58654-5) were analyzed for Radium-226 in accordance with EPA Method 903.0. The samples were prepared on 12/07/2015 and analyzed on 12/30/2015.

Radium-226 Prep Batch 160-225856: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: FC-CCR-MW8-120115 (240-58654-1), FC-CCR-MW12R-120115 (240-58654-2), FC-CCR-MW43-120115 (240-58654-3), FC-CCR-MW49A-120115 (240-58654-4) and FC-CCR-MW50-120115 (240-58654-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead. Lot 240-58654 was prepared at a reduced aliquot due to limited sample volume available.

Radium-226 Prep Batch 160-225856: The following samples were prepared at a reduced aliquot due to cloudiness and a sulfur smell: FC-CCR-MW8-120115 (240-58654-1), FC-CCR-MW12R-120115 (240-58654-2), FC-CCR-MW43-120115 (240-58654-3), FC-CCR-MW49A-120115 (240-58654-4) and FC-CCR-MW50-120115 (240-58654-5).

Job ID: 240-58654-2 (Continued)

Laboratory: TestAmerica Canton (Continued)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-228
Samples FC-CCR-MW8-120115 (240-58654-1), FC-CCR-MW12R-120115 (240-58654-2), FC-CCR-MW43-120115 (240-58654-3), FC-CCR-MW49A-120115 (240-58654-4) and FC-CCR-MW50-120115 (240-58654-5) were analyzed for Radium-228 in accordance with EPA Method 904.0. The samples were prepared on 12/07/2015 and analyzed on 12/14/2015.

Radium-228 Prep Batch 160-225862:The radium-228 detection goal was not met for the following samples due to the reduced sample volume attributed to the presence of matrix interferences (see prep NCM 74290): FC-CCR-MW8-120115 (240-58654-1), FC-CCR-MW12R-120115 (240-58654-2) and FC-CCR-MW50-120115 (240-58654-5). Analytical results are reported with the detection limit achieved.

Radium-228 Prep Batch 160-225862: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: FC-CCR-MW8-120115 (240-58654-1), FC-CCR-MW12R-120115 (240-58654-2), FC-CCR-MW43-120115 (240-58654-3), FC-CCR-MW49A-120115 (240-58654-4) and FC-CCR-MW50-120115 (240-58654-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead. Lot 240-58654 was prepared at a reduced aliquot due to limited sample volume available.

Radium-228 Prep Batch 160-225862: The following samples were prepared at a reduced aliquot due to cloudiness and a sulfur smell: FC-CCR-MW8-120115 (240-58654-1), FC-CCR-MW12R-120115 (240-58654-2), FC-CCR-MW43-120115 (240-58654-3), FC-CCR-MW49A-120115 (240-58654-4) and FC-CCR-MW50-120115 (240-58654-5).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

COMBINED RADIUM 226 AND RADIUM 228
Samples FC-CCR-MW8-120115 (240-58654-1), FC-CCR-MW12R-120115 (240-58654-2), FC-CCR-MW43-120115 (240-58654-3), FC-CCR-MW49A-120115 (240-58654-4) and FC-CCR-MW50-120115 (240-58654-5) were analyzed for Combined Radium 226 and Radium 228 in accordance with Ra226_Ra228. The samples were analyzed on 01/12/2016.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-58654-1	FC-CCR-MW8-120115	Water	12/01/15 09:50	12/04/15 09:45
240-58654-2	FC-CCR-MW12R-120115	Water	12/01/15 10:20	12/04/15 09:45
240-58654-3	FC-CCR-MW43-120115	Water	12/01/15 11:35	12/04/15 09:45
240-58654-4	FC-CCR-MW49A-120115	Water	12/01/15 10:45	12/04/15 09:45
240-58654-5	FC-CCR-MW50-120115	Water	12/01/15 11:15	12/04/15 09:45

Client Sample Results

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Client Sample ID: FC-CCR-MW8-120115

Lab Sample ID: 240-58654-1

Date Collected: 12/01/15 09:50
Matrix: Water
Date Received: 12/04/15 09:45

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.78		0.354	0.433	1.00	0.220	pCi/L	12/07/15 14:52	12/30/15 13:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*64.1*		*40 - 110*	*12/07/15 14:52*	*12/30/15 13:12*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.88	G	0.821	0.839	1.00	1.18	pCi/L	12/07/15 15:26	12/14/15 12:58	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*64.1*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:58*	*1*
Y Carrier	*81.1*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:58*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	4.66		0.894	0.944	5.00	1.18	pCi/L		01/12/16 10:27	1

Client Sample Results

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Client Sample ID: FC-CCR-MW12R-120115

Lab Sample ID: 240-58654-2
Date Collected: 12/01/15 10:20
Matrix: Water
Date Received: 12/04/15 09:45

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	6.20		0.770	0.951	1.00	0.368	pCi/L	12/07/15 14:52	12/30/15 13:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*53.4*		*40 - 110*	*12/07/15 14:52*	*12/30/15 13:12*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	9.76	G	2.32	2.48	1.00	2.77	pCi/L	12/07/15 15:26	12/14/15 12:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*55.1*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:59*	*1*
Y Carrier	*77.0*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:59*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	16.0		2.44	2.66	5.00	2.77	pCi/L		01/12/16 10:27	1

Client Sample Results

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Client Sample ID: FC-CCR-MW43-120115

Lab Sample ID: 240-58654-3
Date Collected: 12/01/15 11:35
Matrix: Water
Date Received: 12/04/15 09:45

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.81		0.288	0.330	1.00	0.217	pCi/L	12/07/15 14:52	12/30/15 13:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*65.0*		*40 - 110*	*12/07/15 14:52*	*12/30/15 13:12*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.73		0.740	0.782	1.00	0.910	pCi/L	12/07/15 15:26	12/14/15 12:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*65.0*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:59*	*1*
Y Carrier	*93.8*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:59*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	4.54		0.794	0.849	5.00	0.910	pCi/L		01/12/16 10:27	1

Client Sample Results

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Client Sample ID: FC-CCR-MW49A-120115

Lab Sample ID: 240-58654-4

Date Collected: 12/01/15 10:45
Matrix: Water
Date Received: 12/04/15 09:45

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.528		0.162	0.169	1.00	0.177	pCi/L	12/07/15 14:52	12/30/15 13:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.4*		*40 - 110*	*12/07/15 14:52*	*12/30/15 13:13*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.34		0.578	0.592	1.00	0.819	pCi/L	12/07/15 15:26	12/14/15 12:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.4*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:59*	*1*
Y Carrier	*87.1*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:59*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.87		0.601	0.615	5.00	0.819	pCi/L		01/12/16 10:27	1

Client Sample Results

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Client Sample ID: FC-CCR-MW50-120115

Lab Sample ID: 240-58654-5

Date Collected: 12/01/15 11:15
Matrix: Water
Date Received: 12/04/15 09:45

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	6.69		0.759	0.969	1.00	0.482	pCi/L	12/07/15 14:52	12/30/15 13:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*67.9*		*40 - 110*	*12/07/15 14:52*	*12/30/15 13:13*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	17.3	G	2.29	2.78	1.00	2.05	pCi/L	12/07/15 15:26	12/14/15 12:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*67.9*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:59*	*1*
Y Carrier	*84.5*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:59*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	23.9		2.41	2.95	5.00	2.05	pCi/L		01/12/16 10:27	1

Tracer/Carrier Summary

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Method: 903.0 - Radium-226 (GFPC)

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

		Percent Yield (Acceptance Limits)						
Lab Sample ID	Client Sample ID	Ba (40-110)						
240-58654-1	FC-CCR-MW8-120115	64.1						
240-58654-2	FC-CCR-MW12R-120115	53.4						
240-58654-3	FC-CCR-MW43-120115	65.0						
240-58654-4	FC-CCR-MW49A-120115	78.4						
240-58654-5	FC-CCR-MW50-120115	67.9						
LCS 160-225856/2-A	Lab Control Sample	78.4						
LCSD 160-225856/3-A	Lab Control Sample Dup	76.4						
MB 160-225856/1-A	Method Blank	82.2						

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

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

		Percent Yield (Acceptance Limits)						
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)					
240-58654-1	FC-CCR-MW8-120115	64.1	81.1					
240-58654-2	FC-CCR-MW12R-120115	55.1	77.0					
240-58654-3	FC-CCR-MW43-120115	65.0	93.8					
240-58654-4	FC-CCR-MW49A-120115	78.4	87.1					
240-58654-5	FC-CCR-MW50-120115	67.9	84.5					
LCS 160-225862/2-A	Lab Control Sample	78.4	90.1					
LCSD 160-225862/3-A	Lab Control Sample Dup	76.4	86.7					
MB 160-225862/1-A	Method Blank	82.2	90.5					

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

QC Sample Results

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-225856/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 230078 — **Prep Batch: 225856**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.04441	U	0.0409	0.0411	1.00	0.0630	pCi/L	12/07/15 14:52	12/30/15 13:10	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.2*		*40 - 110*	*12/07/15 14:52*	*12/30/15 13:10*	*1*

Lab Sample ID: LCS 160-225856/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 230078 — **Prep Batch: 225856**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.2	12.63		1.22	1.00	0.0623	pCi/L	113	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*78.4*		*40 - 110*

Lab Sample ID: LCSD 160-225856/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 230078 — **Prep Batch: 225856**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226			11.2	13.08		1.27	1.00	0.0756	pCi/L	117	68 - 137	0.18	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*76.4*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-225862/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 227093 — **Prep Batch: 225862**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.1020	U	0.229	0.229	1.00	0.392	pCi/L	12/07/15 15:26	12/14/15 12:57	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.2*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:57*	*1*
Y Carrier	*90.5*		*40 - 110*	*12/07/15 15:26*	*12/14/15 12:57*	*1*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-225862/2-A
Matrix: Water
Analysis Batch: 227093

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 225862

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			3.19	2.987		0.520	1.00	0.429	pCi/L	94	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*78.4*		*40 - 110*
Y Carrier	*90.1*		*40 - 110*

Lab Sample ID: LCSD 160-225862/3-A
Matrix: Water
Analysis Batch: 227093

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 225862

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			3.19	3.128		0.544	1.00	0.438	pCi/L	98	56 - 140	0.13	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*76.4*		*40 - 110*
Y Carrier	*86.7*		*40 - 110*

QC Association Summary

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Rad

Prep Batch: 225856

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-58654-1	FC-CCR-MW8-120115	Total/NA	Water	PrecSep-21	
240-58654-2	FC-CCR-MW12R-120115	Total/NA	Water	PrecSep-21	
240-58654-3	FC-CCR-MW43-120115	Total/NA	Water	PrecSep-21	
240-58654-4	FC-CCR-MW49A-120115	Total/NA	Water	PrecSep-21	
240-58654-5	FC-CCR-MW50-120115	Total/NA	Water	PrecSep-21	
LCS 160-225856/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-225856/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	
MB 160-225856/1-A	Method Blank	Total/NA	Water	PrecSep-21	

Prep Batch: 225862

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-58654-1	FC-CCR-MW8-120115	Total/NA	Water	PrecSep_0	
240-58654-2	FC-CCR-MW12R-120115	Total/NA	Water	PrecSep_0	
240-58654-3	FC-CCR-MW43-120115	Total/NA	Water	PrecSep_0	
240-58654-4	FC-CCR-MW49A-120115	Total/NA	Water	PrecSep_0	
240-58654-5	FC-CCR-MW50-120115	Total/NA	Water	PrecSep_0	
LCS 160-225862/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-225862/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	
MB 160-225862/1-A	Method Blank	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Client Sample ID: FC-CCR-MW8-120115 — Lab Sample ID: 240-58654-1

Date Collected: 12/01/15 09:50 — **Matrix: Water**
Date Received: 12/04/15 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			225856	12/07/15 14:52	MMS	TAL SL
Total/NA	Analysis	903.0		1	230078	12/30/15 13:12	SMP	TAL SL
Total/NA	Prep	PrecSep_0			225862	12/07/15 15:26	MMS	TAL SL
Total/NA	Analysis	904.0		1	227093	12/14/15 12:58	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	231797	01/12/16 10:27	TJR	TAL SL

Client Sample ID: FC-CCR-MW12R-120115 — Lab Sample ID: 240-58654-2

Date Collected: 12/01/15 10:20 — **Matrix: Water**
Date Received: 12/04/15 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			225856	12/07/15 14:52	MMS	TAL SL
Total/NA	Analysis	903.0		1	230078	12/30/15 13:12	SMP	TAL SL
Total/NA	Prep	PrecSep_0			225862	12/07/15 15:26	MMS	TAL SL
Total/NA	Analysis	904.0		1	227093	12/14/15 12:59	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	231797	01/12/16 10:27	TJR	TAL SL

Client Sample ID: FC-CCR-MW43-120115 — Lab Sample ID: 240-58654-3

Date Collected: 12/01/15 11:35 — **Matrix: Water**
Date Received: 12/04/15 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			225856	12/07/15 14:52	MMS	TAL SL
Total/NA	Analysis	903.0		1	230078	12/30/15 13:12	SMP	TAL SL
Total/NA	Prep	PrecSep_0			225862	12/07/15 15:26	MMS	TAL SL
Total/NA	Analysis	904.0		1	227093	12/14/15 12:59	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	231797	01/12/16 10:27	TJR	TAL SL

Client Sample ID: FC-CCR-MW49A-120115 — Lab Sample ID: 240-58654-4

Date Collected: 12/01/15 10:45 — **Matrix: Water**
Date Received: 12/04/15 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			225856	12/07/15 14:52	MMS	TAL SL
Total/NA	Analysis	903.0		1	230078	12/30/15 13:13	SMP	TAL SL
Total/NA	Prep	PrecSep_0			225862	12/07/15 15:26	MMS	TAL SL
Total/NA	Analysis	904.0		1	227093	12/14/15 12:59	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	231797	01/12/16 10:27	TJR	TAL SL

Lab Chronicle

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Client Sample ID: FC-CCR-MW50-120115

Lab Sample ID: 240-58654-5

Date Collected: 12/01/15 11:15

Matrix: Water

Date Received: 12/04/15 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			225856	12/07/15 14:52	MMS	TAL SL
Total/NA	Analysis	903.0		1	230078	12/30/15 13:13	SMP	TAL SL
Total/NA	Prep	PrecSep_0			225862	12/07/15 15:26	MMS	TAL SL
Total/NA	Analysis	904.0		1	227093	12/14/15 12:59	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	231797	01/12/16 10:27	TJR	TAL SL

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Certification Summary

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Laboratory: TestAmerica Canton

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
California	NELAP	9	01144CA	06-30-14 *
California	State Program	9	2927	04-30-17
Connecticut	State Program	1	PH-0590	12-31-17
Illinois	NELAP	5	200004	07-31-16
Kansas	NELAP	7	E-10336	01-31-16 *
Kentucky (UST)	State Program	4	58	02-26-16 *
Kentucky (WW)	State Program	4	98016	12-31-15 *
L-A-B	DoD ELAP		L2315	07-18-16
Minnesota	NELAP	5	039-999-348	12-31-16
Nevada	State Program	9	OH-000482008A	07-31-16
New Jersey	NELAP	2	OH001	06-30-16
New York	NELAP	2	10975	03-31-16 *
Ohio VAP	State Program	5	CL0024	09-14-17
Oregon	NELAP	10	4062	02-23-16 *
Pennsylvania	NELAP	3	68-00340	08-31-16
Texas	NELAP	6	T104704517-15-5	08-31-16
USDA	Federal		P330-13-00319	11-26-16
Virginia	NELAP	3	460175	09-14-16
Washington	State Program	10	C971	01-12-16 *
West Virginia DEP	State Program	3	210	12-31-15 *
Wisconsin	State Program	5	999518190	08-31-16

Laboratory: TestAmerica St. Louis

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska	State Program	10	MO00054	06-30-16
California	ELAP	9	2886	03-31-16
Connecticut	State Program	1	PH-0241	03-31-17
Florida	NELAP	4	E87689	06-30-16
Illinois	NELAP	5	003757	11-30-16
Iowa	State Program	7	373	12-01-16
Kansas	NELAP	7	E-10236	01-31-16 *
Kentucky (DW)	State Program	4	90125	12-31-15 *
L-A-B	DoD ELAP		L2305	04-10-16 *
Louisiana	NELAP	6	04080	06-30-16
Louisiana (DW)	NELAP	6	LA160008	12-31-16
Maryland	State Program	3	310	09-30-16
Missouri	State Program	7	780	06-30-16
Nevada	State Program	9	MO000542016-1	07-31-16
New Jersey	NELAP	2	MO002	06-30-16
New York	NELAP	2	11616	03-31-16 *
North Dakota	State Program	8	R207	06-30-16
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-16
Pennsylvania	NELAP	3	68-00540	02-28-16 *
South Carolina	State Program	4	85002001	06-30-16
Texas	NELAP	6	T104704193-15-9	07-31-16
USDA	Federal		P330-07-00122	01-09-17
Utah	NELAP	8	MO000542015-7	07-31-16

* Certification renewal pending - certification considered valid.

Certification Summary

Client: AECOM Technical Services Inc.
Project/Site: FCPP - CCR APS Four Corners

TestAmerica Job ID: 240-58654-2

Laboratory: TestAmerica St. Louis (Continued)

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Virginia	NELAP	3	460230	06-14-16
Washington	State Program	10	C592	08-30-16
West Virginia DEP	State Program	3	381	08-31-16

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

1 2 3 4 5 6 7 8 9 10 11 12 13

CHAIN OF CUSTODY
AND
RECEIVING DOCUMENTS

240-58654 Chain of Custody

4101 Shuffel Street, N.W. North Canton, OH 44720 tel 330.497.9396 fax 330.497.0772 www.testamericainc.com

America Phoenix
E. Cotton Center Blvd.
189
nix, AZ 85040
one: 602.437.3340 Fax:

1.4/C1.5

Chain of Custody Record

097472

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact		Project Manager: Dan Sola	Site Contact:	Date: 12/1/15	COC No: 097472
Company Name: AECOM		Tel/Fax:	Lab Contact: Becki Strart	Carrier: Fed Ex	1 of 1 COCs
Address: 7720 N. 16th St. #100		Analysis Turnaround Time			Sampler:
City/State/Zip: Phoenix, AZ, 85331		☒ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone: 612-244-8599		TAT if different from Below _____			Walk-in Client:
Fax:		☒ 2 weeks			Lab Sampling:
Project Name: FCPP- CCR		☐ 1 week			
Site: APS Four Corners		☐ 2 days			Job / SDG No.:
P O #		☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	200.8	245.1	353.2	2320B, 2450C, 300	903.1	904	Sample Specific Notes:
FC-CCR-MW8-120115	12/1/15	950	G	W	4	N		X	X	X	X			
FC-CCR-MW12R-120115	12/1/15	1020	G	W	4	N		X	X	X	X			
FC-CCR-MW43-120115	12/1/15	1135	G	W	4	N		X	X	X	X			
FC-CCR-MW49A-120115	12/1/15	1045	G	W	4	N		X	X	X	X			
FC-CCR-MW50-120115	12/1/15	1115	G	W	4	N		X	X	X	X			
~~FC-CCR~~ QS														

Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4=HNO3, 5=NaOH, 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☒ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:
~~ONE CO~~ 3.8°C

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: _____ Corr'd: _____ | Therm ID No.: _____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
	AECOM	12/2/15 2:00pm	Louie Bateman	T-America	12/3/15 11:20
Relinquished by: Louie Bateman	Company: T-America	Date/Time: 12/3/15 12:35	Received by:	Company: TA-PHX LAB	Date/Time: 12-03-15 15:15
Relinquished by: FEDEX	Company: TA PHX LAB	Date/Time: 12-03-15	Received in Laboratory by:	Company: TA	Date/Time: 12/4/15 945

TestAmerica Canton Sample Receipt Form/Narrative **Login # : 58604**
Canton Facility

Client AECOM Site Name _____ Cooler unpacked by: Alex

Cooler Received on 12/4/15 Opened on 12/4/15

FedEx: 1st Grd Exp UPS FAS Stetson Client Drop Off TestAmerica Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # _____ Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt
   - IR GUN# 53 (CF +0.1 °C) Observed Cooler Temp. 1.4 °C Corrected Cooler Temp. 1.5 °C
   - IR GUN# 48 (CF -0.3 °C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C
   - ~~IR GUN# 5 (CF +0.4 °C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C~~
   - IR GUN# 8 (CF -0.5 °C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

☐ See Multiple Cooler Form

2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
   - -Were custody seals on the outside of the cooler(s) signed & dated? Yes No NA
   - -Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
7. Did all bottles arrive in good condition (Unbroken)? Yes No
8. Could all bottle labels be reconciled with the COC? Yes No
9. Were correct bottle(s) used for the test(s) indicated? Yes No
10. Sufficient quantity received to perform indicated analyses? Yes No
11. Were sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# **HC559158**
12. Were VOAs on the COC? Yes No
13. Were air bubbles >6 mm in any VOA vials? Yes No NA
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes No
15. Was a LL Hg or Me Hg trip blank present? _____ Yes No

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

14. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES

Samples processed by:

15. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.

Sample(s) _____ were received in a broken container.

~~Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)~~

16. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.

Time preserved: _____ Preservative(s) added/Lot number(s): _____.

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
FC-CCR-MW8-120115	240-58654-A-1	Plastic 250ml - with Sulfuric Acid	<2		
FC-CCR-MW8-120115	240-58654-C-1	Plastic 500ml - with Nitric Acid	<2		
FC-CCR-MW8-120115	240-58654-D-1	Plastic 1 liter - Nitric Acid	<2		
FC-CCR-MW12R-120115	240-58654-A-2	Plastic 250ml - with Sulfuric Acid	<2		
FC-CCR-MW12R-120115	240-58654-C-2	Plastic 500ml - with Nitric Acid	<2		
FC-CCR-MW12R-120115	240-58654-D-2	Plastic 1 liter - Nitric Acid	<2		
FC-CCR-MW43-120115	240-58654-A-3	Plastic 250ml - with Sulfuric Acid	<2		
FC-CCR-MW43-120115	240-58654-C-3	Plastic 500ml - with Nitric Acid	<2		
FC-CCR-MW43-120115	240-58654-D-3	Plastic 1 liter - Nitric Acid	<2		
FC-CCR-MW49A-120115	240-58654-A-4	Plastic 250ml - with Sulfuric Acid	<2		
FC-CCR-MW49A-120115	240-58654-C-4	Plastic 500ml - with Nitric Acid	<2		
FC-CCR-MW49A-120115	240-58654-D-4	Plastic 1 liter - Nitric Acid	<2		
FC-CCR-MW50-120115	240-58654-A-5	Plastic 250ml - with Sulfuric Acid	<2		
FC-CCR-MW50-120115	240-58654-C-5	Plastic 500ml - with Nitric Acid	<2		
FC-CCR-MW50-120115	240-58654-D-5	Plastic 1 liter - Nitric Acid	<2		