

October 31, 2019

Information Technology Unit
Los Angeles Regional Water Quality Control Board
320 West 4th Street, Suite 200
Los Angeles, California 90013

Subject: Update to Fourth Quarter 2018 NPDES Discharge Monitoring Report
Compliance File CI-6027 and NPDES No. CA0001309
Santa Susana Field Laboratory
Ventura County, California

The Boeing Company (Boeing) hereby submits this update to the Discharge Monitoring Report (DMR) for the Santa Susana Field Laboratory (Santa Susana Site) for the period of October 1 through December 31, 2018 (Fourth Quarter 2018). This DMR Update was prepared in support of the National Pollutant Discharge Elimination System Permit No. CA0001309 (NPDES Permit) issued by the Los Angeles California Regional Water Quality Control Board (Regional Board) in 2015.

Two exceedances of gross alpha were detected in December 2018, correlated to high levels of suspended solids, so Boeing requested additional non-permit-required radionuclide analysis of those samples. However, due to the time required by the analytical laboratory for these additional analyses, results were not available until after the February 15, 2019 submittal of the Fourth Quarter 2018 DMR. These additional data are presented in Table 1.

Hard copies of this Update to the Fourth Quarter 2018 DMR are available to the public at the California State University Northridge Oviatt Library, the Simi Valley Public Library, and the Platt Branch of the Los Angeles Public Library.

An electronic version of this DMR is located at:

<http://www.boeing.com/principles/environment/santa-susana/monitoring-reports.page>

Gross Alpha for Outfalls 002 and 008

Outfall 002

On December 7, 2018, a stormwater sample was collected from Outfall 002. Gross alpha was reported at 22.3 +/- 5.45 picocuries per liter [pCi/L], above the Daily Maximum Benchmark Limit of 15 pCi/L. Per the NPDES Permit, if gross alpha is greater than 15 pCi/L, additional calculations and analysis must be made: total uranium analysis must be performed, total uranium results must be less than 20 pCi/L, gross alpha minus total uranium must be compared to the Benchmark of 15 pCi/L, and the average of gross alpha results for the calendar year must also be compared to the Daily Maximum Benchmark of 15 pCi/L. Total uranium analysis was performed, and the result was 1.25 +/- 1.30 pCi/L. Gross alpha minus total uranium was calculated to be 21.05 +/- 5.60 pCi/L which exceeds the Daily Maximum Benchmark Limit of 15 pCi/L. The only other discharge event for Outfall 002 was on March 23, 2018. Averaging the December and March data gives an annual average of

11.70 +/- 2.95 pCi/L, which is below the Daily Maximum Benchmark Limit.

Boeing tested the December 7, 2018 sample from Outfall 002 at an independent, State-certified laboratory for an additional twelve naturally occurring and three man-made alpha emitting radionuclides. That isotopic analysis confirmed that only naturally-occurring radioactive material (NORM) was detected. No anthropogenic (man-made) alpha emitting radionuclides were detected in the sample, demonstrating that residual radiological soil contamination from historic site operations at SSFL did not impact stormwater due to the Woolsey Fire (Table 1).

Outfall 008

On December 7, 2018, a stormwater sample was collected from Outfall 008. Gross alpha was reported at 14.8 +/- 3.81 pCi/L, which could be slightly above the Benchmark Limit of 15 pCi/L if you take into account the error range provided by the laboratory. As stated above, if gross alpha is greater than 15 pCi/L, additional calculations and analysis must be made: total uranium analysis must be performed, total uranium results must be less than 20 pCi/L, gross alpha minus total uranium must be compared to the Benchmark of 15 pCi/L, and the average of gross alpha results for the calendar year must also be compared to the Daily Maximum Benchmark of 15 pCi/L. Total uranium analysis was performed and the results were 1.33 +/- 0.884 pCi/L. Gross alpha minus total uranium was calculated to be 13.47 +/- 3.91 pCi/L which is indeterminate¹ compared to the Daily Maximum Benchmark Limit of 15 pCi/L. As Outfall 008 only flowed during the Fourth Quarter 2018, the annual average was also indeterminate.

Boeing tested the December 7, 2018 sample from Outfall 008 at an independent, State-certified laboratory for an additional thirteen naturally-occurring and four man-made alpha emitting radionuclides. That isotopic analysis confirmed that only naturally-occurring radioactive material (NORM) was detected. No anthropogenic (man-made) alpha emitting radionuclides were detected in the sample, demonstrating that residual radiological soil contamination from historic site operations at SSFL did not impact stormwater due to the Woolsey Fire (Table 1).

The Stormwater Expert Panel is evaluating the data contained in this report and will include the results of their analysis in the 2019 Annual Report.

FACILITY CONTACT

If there are any questions regarding this report or its enclosures, you may contact Mr. Jeffrey Wokurka of Boeing at (818) 466-8800.

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted.

Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge

¹ An indeterminate result is defined by the NPDES Permit when the Daily Maximum Benchmark Limit lies within the +/- 1.96 σ error range of the mean analysis result. In this case, 15 pCi/L lies within the range 13.47 - 3.91 = 9.56 pCi/L and 13.47 + 3.91 = 17.38 pCi/L.

and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on the 31st of October 2019 at The Boeing Company, Seal Beach, CA Site.

Sincerely,



Kim O'Rourke
Remediation Program Manager
Environment, Health & Safety

Enclosures:

Table 1 – Extended Radiochemistry, Fourth Quarter 2018
Analytical Report – J226830-5
Analytical Report – J226838-4

c: Los Angeles Regional Water Quality Control Board; Attn: Ms. Cassandra Owens
California Department of Toxic Substances Control; Attn: Mr. Mark Malinowski
California State University Northridge Oviatt Library
Simi Valley Public Library
Los Angeles Public Library, Platt Branch

TABLES

EXTENDED RADIOCHEMISTRY

FOURTH QUARTER 2018
THE BOEING COMPANY
SANTA SUSANA FIELD LABORATORY
NPDES PERMIT CA0001309

October 1 through December 31, 2018

ANALYTE	UNITS	PERMIT LIMIT DAILY MAX	OUTFALL 002			OUTFALL 008		
			12/07/2018 10:05 (Composite)			12/07/2018 11:05 (Composite)		
			RESULT	MDA	LABORATORY/ VALIDATION QUALIFIER	RESULT	MDA	LABORATORY/ VALIDATION QUALIFIER
MAN-MADE RADIOCHEMISTRY RESULTS								
Americium-241	pCi/L	-/-	0.275 +/-0.456	0.813	U*	0.109 +/-0.356	0.768	U*
Plutonium-238	pCi/L	-/-	0.207 +/-0.540	1.07	U*	0.156 +/-0.481	0.998	U*
Plutonium-239/240	pCi/L	-/-	0.321 +/-0.398	0.519	U*	0.113 +/-0.227	0.340	U*
NATURALLY OCCURRING RADIOCHEMISTRY RESULTS BY GAMMA SPECTROSCOPY								
Actinium-227	pCi/L	-/-	39.2 +/-79.5	98.6	U*	6.72 +/-67.0	95.1	U*
Bismuth-211	pCi/L	-/-	39.2 +/-79.5	98.6	U*	6.72 +/-67.0	95.1	U*
Bismuth-212	pCi/L	-/-	49.4 +/-85.3	144	U*	16.0 +/-95.6	169	U*
Cesium-137	pCi/L	-/-	-4.04 +/-11.4	19.4	U*	-3.40 +/-12.5	15.6	U*
Polonium-210	pCi/L	-/-	1.27 +/-0.479	0.500	*	2.36 +/-0.789	0.833	*
Protactinium-231	pCi/L	-/-	0.000 +/-46.3	685	U*	79.1 +/-178	403	U*
Radium-223	pCi/L	-/-	39.2 +/-79.5	98.6	U*	6.72 +/-67.0	95.1	U*
Radium-224	pCi/L	-/-	-15.9 +/-14.2	35.5	U*	24.3 +/-13.0	14.8	*
Thorium-227	pCi/L	-/-	39.2 +/-79.5	98.6	U*	6.72 +/-67.0	95.1	U*
NATURALLY OCCURRING RADIOCHEMISTRY RESULTS BY ALPHA SPECTROSCOPY								
Thorium-228	pCi/L	-/-	1.82 +/-1.48	1.79	*	1.17 +/-0.905	1.13	*
Thorium-230	pCi/L	-/-	1.24 +/-1.27	1.63	U*	2.17 +/-1.13	0.930	*
Thorium-232	pCi/L	-/-	0.767 +/-0.916	1.29	U*	1.24 +/-0.806	0.692	*

NOTES:

-92.9 +/-200 = A negative radiochemical analytical result indicates the count rate of the sample was less than the background condition. Radiological results are presented as activity plus or minus total uncertainty.

-/- = No NPDES permit limit established for daily maximum or monthly

* = Result not validated

MDA = Minimum Detectable Activity

pCi/L = picoCuries per liter

U = Result not detected

LABORATORY REPORTS

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Irvine

17461 Derian Ave

Suite 100

Irvine, CA 92614-5817

Tel: (949)261-1022

TestAmerica Job ID: 440-226838-4

Client Project/Site: Quarterly Outfall 002 Comp

For:

Haley & Aldrich, Inc.

400 E Van Buren St.

Suite 545

Phoenix, Arizona 85004

Attn: Katherine Miller



Authorized for release by:

3/26/2019 7:27:16 PM

Urvashi Patel, Manager of Project Management

(949)261-1022

urvashi.patel@testamericainc.com

LINKS

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www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

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

I certify under penalty of perjury that the information contained in this report and all attachments was produced in accordance with the indicated methods and laboratory standard operating procedures, except as noted, and are complete and accurate to the best of my knowledge and belief. Subcontract laboratory reports that are attached have been evaluated for completeness and quality control acceptability.



Urvashi Patel
Manager of Project Management
3/26/2019 7:27:16 PM



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Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-226838-1	Outfall002_20181207_Comp	Water	12/07/18 10:05	12/07/18 21:05

1

2

3

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Case Narrative

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Job ID: 440-226838-4

Laboratory: TestAmerica Irvine

Narrative

**Job Narrative
440-226838-4**

Comments

No additional comments.

Receipt

The samples were received on 12/7/2018 9:05 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.6° C and 2.9° C.

RAD

Method(s) 901.1: Gamma Prep Batch 160-417097

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417097/2-A), (MB 160-417097/1-A), (440-226830-I-1-J) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch 160-417097

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417097/2-A), (MB 160-417097/1-A), (440-226830-I-1-J) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch 160-417097

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from Reported to Analyte

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Po-216	Pb-212
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417097/2-A), (MB 160-417097/1-A), (440-226830-I-1-J) and (440-226830-I-1-K

Case Narrative

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Job ID: 440-226838-4 (Continued)

Laboratory: TestAmerica Irvine (Continued)

DU)

Method(s) 901.1: Gamma Prep Batch: 160-417097

The cesium-137 MDC (21.2 pCi/L) for the method blank (MB) is above the requested limit of 20 pCi/L. Cesium-137 activity was not observed in the MB above the MDC or RL. The MDC for the associated samples is less than the requested limit. The data have been reported with the MDC achieved. (MB 160-417097/1-A).

Method(s) A-01-R: Americium Prep Batch: 160-417049

Manual Integrations and adjustments to ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

(LCSD 160-417049/3-A).

Method(s) A-01-R: Americium Prep Batch: 160-417049

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417049/2-A), (LCSD 160-417049/3-A) and (MB 160-417049/1-A)

Method(s) A-01-R: Americium Prep Batch: 160-417049

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417049/2-A), (LCSD 160-417049/3-A) and (MB 160-417049/1-A)

Method(s) A-01-R: Polonium Prep Batch: 160-418940

The following samples have a tracer recoveries below the 30% QC limit: MB 160-418940/1-A (29.0%), LCS 160-418940/2-A (24.5%), 440-226830-I-1-N (21.7%), 440-226830-I-1-O DU (21.7%), 440-226838-P-1-O (28.3%), 440-229259-J-1-J (19.7%). In addition, the Po-210 MDC is above the detection goal (0.300 pCi/L) which can be attributed to the lower tracer recovery. The samples were counted for the maximum count time of 960 minutes and achieved >400 tracer counts in the tracer peaks (which leads to 10% count uncertainty at 2 sigma), the resolution of < 100 keV is met for all peaks (there are no indications of spectral interferences), and the activity in the sample is above the MDC. The data have been qualified and reported with this narrative.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-418940/2-A), (MB 160-418940/1-A), (440-226830-I-1-N) and (440-226830-I-1-O DU)

Method(s) A-01-R: Polonium Prep Batch: 160-418940

The Po-210 detection goal (0.300 pCi/L) was not met for the following samples due to low tracer recovery and reduced aliquots (see prep non-conformance memo: 160-162593): Outfall002_20181207_Comp (440-226838-1), (MB 160-418940/1-A), (440-226830-I-1-N) and (440-226830-I-1-O DU). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Polonium Prep Batch: 160-418940

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-418940/2-A), (MB 160-418940/1-A), (440-226830-I-1-N) and (440-226830-I-1-O

Case Narrative

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Job ID: 440-226838-4 (Continued)

Laboratory: TestAmerica Irvine (Continued)

DU)

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

The Pu-238 detection goal (1.00 pCi/L) was not met for the following samples due to the reduced aliquot required from the presence of matrix interferences (see prep non-conformance memo: 160-161634): Outfall002_20181207_Comp (440-226838-1) and (MB 160-417063/1-A). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417063/2-A), (LCSD 160-417063/3-A) and (MB 160-417063/1-A)

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417063/2-A), (LCSD 160-417063/3-A) and (MB 160-417063/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Manual Integrations and adjustments to ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

(LCS 160-417064/2-A).

Method(s) A-01-R: Thorium Prep Batch: 160-417064

The detection goals were not met for the following samples due to the reduced aliquot required from the presence of matrix interferences (see prep non-conformance memo: 160-161635): Outfall002_20181207_Comp (440-226838-1). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Thorium Prep Batch: 160-417064

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk).

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall002_20181207_Comp (440-226838-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Case Narrative

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Job ID: 440-226838-4 (Continued)

Laboratory: TestAmerica Irvine (Continued)

Method(s) Digest/Cu Plate: polonium-210 prep 160-417309: The following sample could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: Outfall002_20181207_Comp (440-226838-1). The sample was dark-brown, murky, and contained a fair amount of undissolved sediment along the bottom of the container. Although sample was shaken well prior to sub-sampling there is no guarantee that sediments were evenly dispersed.

Method(s) Digest/Cu Plate: polonium-210 prep 160-417309: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Due to apparent matrix samples underwent atypical separations prior to auto-plating per SOP No. ST-RC-0210.

Outfall002_20181207_Comp (440-226838-1)

Method(s) Digest/Cu Plate: Polonium-210 prep batch 160-418940: The following sample could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: Outfall002_20181207_Comp (440-226838-1). The samples were dark-brown, murky, and contained a fair amount of undissolved sediment along the bottom of the container. Although sample was shaken well prior to sub-sampling there is no guarantee that sediments were evenly dispersed.

Method(s) Digest/Cu Plate: Polonium-210 prep batch 160-418940: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Due to apparent matrix samples underwent atypical separations prior to purification via extraction chromatography and preparation for counting by alpha spectroscopy. The samples were also prepared at a reduced aliquot to lower potential matrix interference.

Outfall002_20181207_Comp (440-226838-1)

Method(s) ExtChrom: Americium Prep Batch 160-417049:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall002_20181207_Comp (440-226838-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method(s) ExtChrom: Plutonium Prep Batch 160-417063:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall002_20181207_Comp (440-226838-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method(s) ExtChrom: Thorium Prep Batch 160-417064:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall002_20181207_Comp (440-226838-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

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

Client Sample Results

Client: Haley & Aldrich, Inc.
 Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Client Sample ID: Outfall002_20181207_Comp

Lab Sample ID: 440-226838-1

Date Collected: 12/07/18 10:05

Matrix: Water

Date Received: 12/07/18 21:05

Method: 901.1 - Cesium 137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium-227	39.2	U	79.4	79.5		98.6	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Cesium-137	-4.04	U	11.4	11.4	20.0	19.4	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Bismuth-211	39.2	U	79.4	79.5		98.6	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Bismuth-212	49.4	U	85.2	85.3		144	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Thorium-227	39.2	U	79.4	79.5		98.6	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Radium-223	39.2	U	79.4	79.5		98.6	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Radium-224	-15.9	U	14.1	14.2		35.5	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Protactinium-231	0.000	U	46.3	46.3		685	pCi/L	02/27/19 22:08	03/01/19 17:10	1

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Americium-241	0.275	U	0.455	0.456	1.00	0.813	pCi/L	02/27/19 12:01	03/07/19 22:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Americium-243	85.1		30 - 110					02/27/19 12:01	03/07/19 22:45	1

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Plutonium-238	0.207	U G	0.539	0.540	1.00	1.07	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Plutonium-239/240	0.321	U	0.398	0.398	1.00	0.519	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Pu-242 (T)	79.9		30 - 110					02/27/19 13:31	03/06/19 21:52	1

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Polonium-210	1.27	G	0.467	0.479	0.300	0.500	pCi/L	03/12/19 12:19	03/15/19 20:28	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Polonium-209	28.3	X	30 - 110					03/12/19 12:19	03/15/19 20:28	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	1.82	G	1.47	1.48	1.00	1.79	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-230	1.24	U G	1.27	1.27	1.00	1.63	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-232	0.767	U G	0.914	0.916	1.00	1.29	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	45.4		30 - 110					02/27/19 13:33	03/07/19 22:42	1

TestAmerica Irvine

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Method	Method Description	Protocol	Laboratory
901.1	Cesium 137 & Other Gamma Emitters (GS)	EPA	TAL SL
A-01-R	Isotopic Curium and/or Americium 241 (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Plutonium and Neptunium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Polonium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
Digest/Cu Plate	Preparation, Digestion & Copper Plating	TAL-STL	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-0	Fill Geometry, No In-Growth	None	TAL SL

Protocol References:

- DOE = U.S. Department of Energy
- EPA = US Environmental Protection Agency
- None = None
- 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

Lab Chronicle

Client: Haley & Aldrich, Inc.
 Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Client Sample ID: Outfall002_20181207_Comp

Lab Sample ID: 440-226838-1

Date Collected: 12/07/18 10:05

Matrix: Water

Date Received: 12/07/18 21:05

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Fill_Geo-0			1000 mL	1.0 mL	417097	02/27/19 22:08	MPT	TAL SL
Total/NA	Analysis	901.1		1			417372	03/01/19 17:10	KLS	TAL SL
Total/NA	Prep	ExtChrom			100.08 mL	1.0 mL	417063	02/27/19 13:31	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418008	03/06/19 21:52	ALS	TAL SL
Total/NA	Prep	ExtChrom			100.08 mL	1.0 mL	417064	02/27/19 13:33	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418286	03/07/19 22:42	ALS	TAL SL
Total/NA	Prep	ExtChrom			100.08 mL	1.0 mL	417049	02/27/19 12:01	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418293	03/07/19 22:45	ALS	TAL SL
Total/NA	Prep	Digest/Cu Plate			199.97 mL	1.0 g	418940	03/12/19 12:19	PJM	TAL SL
Total/NA	Analysis	A-01-R		1			419522	03/15/19 20:28	ALS	TAL SL

Laboratory References:

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



QC Sample Results

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Method: 901.1 - Cesium 137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-417097/1-A
Matrix: Water
Analysis Batch: 417503

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417097

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Cesium-137	6.536	U G	12.5	12.5	20.0	21.2	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Bismuth-211	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Bismuth-212	-76.06	U	128	128		274	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Thorium-227	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Radium-223	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Radium-224	-11.20	U	20.1	20.2		40.9	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Protactinium-231	0.0000	U	57.8	57.8		1010	pCi/L	02/27/19 22:08	03/01/19 17:09	1

Lab Sample ID: LCS 160-417097/2-A
Matrix: Water
Analysis Batch: 417372

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 417097

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	136000	124300		14400		399	pCi/L	91	90 - 111
Cesium-137	44900	44730		4480	20.0	110	pCi/L	100	90 - 111
Cobalt-60	30400	29420		2910		61.0	pCi/L	97	89 - 110

Lab Sample ID: 440-226830-I-1-K DU
Matrix: Water
Analysis Batch: 417504

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 417097

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium-227	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Cesium-137	-3.40	U	4.351	U	9.55	20.0	16.4	pCi/L	0.35	1
Bismuth-211	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Bismuth-212	16.0	U	2.412	U	95.6		177	pCi/L	0.07	1
Thorium-227	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Radium-223	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Radium-224	24.3		-2.018	U	17.0		29.4	pCi/L	0.88	1
Protactinium-231	79.1	U	72.45	U	225		521	pCi/L	0.02	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-417064/1-A
Matrix: Water
Analysis Batch: 418283

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417064

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.1787	U	0.434	0.434	1.00	0.812	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-230	0.5403	U	0.666	0.668	1.00	0.916	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-232	0.04384	U	0.243	0.243	1.00	0.653	pCi/L	02/27/19 13:33	03/07/19 22:42	1

TestAmerica Irvine

QC Sample Results

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: MB 160-417064/1-A
Matrix: Water
Analysis Batch: 418283

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417064

Tracer	MB %Yield	MB Qualifier	Limits
Thorium-229	99.9		30 - 110

Prepared	Analyzed	Dil Fac
02/27/19 13:33	03/07/19 22:42	1

Lab Sample ID: LCS 160-417064/2-A
Matrix: Water
Analysis Batch: 418284

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 417064

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Thorium-230	40.1	38.67		5.18	1.00	0.779	pCi/L	96	81 - 125

Tracer	LCS %Yield	LCS Qualifier	Limits
Thorium-229	103		30 - 110

Lab Sample ID: LCSD 160-417064/3-A
Matrix: Water
Analysis Batch: 418285

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 417064

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230	40.1	43.40		5.64	1.00	0.788	pCi/L	108	81 - 125	0.44	1

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Thorium-229	104		30 - 110

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

Lab Sample ID: MB 160-418940/1-A
Matrix: Water
Analysis Batch: 419517

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 418940

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Polonium-210	0.1963	U G	0.207	0.208	0.300	0.313	pCi/L	03/12/19 12:19	03/15/19 20:28	1

Tracer	MB %Yield	MB Qualifier	Limits
Polonium-209	29.0	X	30 - 110

Prepared	Analyzed	Dil Fac
03/12/19 12:19	03/15/19 20:28	1

Lab Sample ID: LCS 160-418940/2-A
Matrix: Water
Analysis Batch: 419518

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 418940

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Polonium-210	43.1	41.20		4.31	0.300	0.747	pCi/L	96	79 - 124

TestAmerica Irvine

QC Sample Results

Client: Haley & Aldrich, Inc.
 Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-418940/2-A
Matrix: Water
Analysis Batch: 419518

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 418940

Tracer	LCS		Limits
	%Yield	Qualifier	
Polonium-209	24.5	X	30 - 110

Lab Sample ID: 440-226830-I-1-O DU
Matrix: Water
Analysis Batch: 419520

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 418940

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
	Polonium-210	2.36	G	2.125	G	0.828	0.300	0.955	pCi/L	0.15

Tracer	DU		Limits
	%Yield	Qualifier	
Polonium-209	21.7	X	30 - 110

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

Lab Sample ID: MB 160-417049/1-A
Matrix: Water
Analysis Batch: 418290

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417049

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Americium-241	0.1270	U	0.413	0.413	1.00	0.893	pCi/L	02/27/19 12:01	03/07/19 22:44

Tracer	MB		Limits	Prepared	Analyzed	Dil Fac
	%Yield	Qualifier				
Americium-243	96.2		30 - 110	02/27/19 12:01	03/07/19 22:44	1

Lab Sample ID: LCS 160-417049/2-A
Matrix: Water
Analysis Batch: 418291

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 417049

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
		Americium-241	37.2	37.97		5.76	1.00	0.787	pCi/L

Tracer	LCS		Limits
	%Yield	Qualifier	
Americium-24	90.4		30 - 110

Lab Sample ID: LCSD 160-417049/3-A
Matrix: Water
Analysis Batch: 418292

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 417049

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
		Americium-241	37.2	37.58		5.63	1.00	0.808	pCi/L	101	80 - 116

TestAmerica Irvine

QC Sample Results

Client: Haley & Aldrich, Inc.
 Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-417049/3-A
Matrix: Water
Analysis Batch: 418292

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 417049

Tracer	LCS D %Yield	LCS D Qualifier	Limits
Americium-241	94.8		30 - 110

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Lab Sample ID: MB 160-417063/1-A
Matrix: Water
Analysis Batch: 418005

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417063

Analyte	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Plutonium-238	0.3914	U G	0.627	0.628	1.00	1.11	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Plutonium-239/240	0.07682	U	0.254	0.254	1.00	0.639	pCi/L	02/27/19 13:31	03/06/19 21:52	1

Tracer	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Pu-242 (T)	74.3		30 - 110	02/27/19 13:31	03/06/19 21:52	1

Lab Sample ID: LCS 160-417063/2-A
Matrix: Water
Analysis Batch: 418006

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 417063

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									%Rec	Limits
Plutonium-238	53.0	52.34		6.37	1.00	0.909	pCi/L	99	79 - 115	
Plutonium-239/240	52.8	52.02		6.33	1.00	0.574	pCi/L	98	85 - 120	

Tracer	LCS %Yield	LCS Qualifier	Limits
Pu-242 (T)	89.9		30 - 110

Lab Sample ID: LCSD 160-417063/3-A
Matrix: Water
Analysis Batch: 418007

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 417063

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									%Rec	Limits	RER	Limit
Plutonium-238	53.0	47.71		5.88	1.00	0.921	pCi/L	90	79 - 115	0.38	1	
Plutonium-239/240	52.8	50.05		6.08	1.00	0.547	pCi/L	95	85 - 120	0.16	1	

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Pu-242 (T)	93.3		30 - 110

QC Association Summary

Client: Haley & Aldrich, Inc.
 Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Rad

Prep Batch: 417049

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417049/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417049/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCSD 160-417049/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

Prep Batch: 417063

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417063/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417063/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCSD 160-417063/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

Prep Batch: 417064

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417064/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417064/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCSD 160-417064/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

Prep Batch: 417097

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	Fill_Geo-0	
MB 160-417097/1-A	Method Blank	Total/NA	Water	Fill_Geo-0	
LCS 160-417097/2-A	Lab Control Sample	Total/NA	Water	Fill_Geo-0	
440-226830-I-1-K DU	Duplicate	Total/NA	Water	Fill_Geo-0	

Prep Batch: 418940

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	Digest/Cu Plate	
MB 160-418940/1-A	Method Blank	Total/NA	Water	Digest/Cu Plate	
LCS 160-418940/2-A	Lab Control Sample	Total/NA	Water	Digest/Cu Plate	
440-226830-I-1-O DU	Duplicate	Total/NA	Water	Digest/Cu Plate	

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
X	Tracer is outside acceptance limits.
G	The Sample MDC is greater than the requested RL.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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)

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Laboratory: TestAmerica Irvine

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	CA ELAP 2706	06-30-19

Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD / DOE		L2305	04-06-22
Arizona	State Program	9	AZ0813	12-08-19
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19 *
Florida	NELAP	4	E87689	06-30-19
Hawaii	State Program	9	NA	06-30-19
Illinois	NELAP	5	200023	11-30-19
Iowa	State Program	7	373	12-01-20
Kansas	NELAP	7	E-10236	10-31-19
Kentucky (DW)	State Program	4	KY90125	12-31-19
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA011	12-31-19
Maryland	State Program	3	310	09-30-19
Michigan	State Program	5	9005	06-30-19
Missouri	State Program	7	780	06-30-19
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19 *
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-19
Pennsylvania	NELAP	3	68-00540	02-28-19 *
South Carolina	State Program	4	85002001	06-30-19
Texas	NELAP	6	T104704193-18-13	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542018-10	07-31-19
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-19
West Virginia DEP	State Program	3	381	08-31-19

* Accreditation/Certification renewal pending - accreditation/certification considered valid.



440-226838 Chain of Custody

Client Name/Address:
 Haley & Aldrich
 5333 Mission Center Rd Suite 300
 San Diego, CA 92108

Test America Contact: Urvashi Patel
 17481 Derian Ave Suite #100
 Irvine CA 92614
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Project:
 Boeing-SSFL NPDES
 Permit 2018
 Quarterly Outfall [001, 002, 011, 018]
 Outfall 002
 Comp

Project Manager: Katherine Miller
 520.289.8606, 520.904.6944 (cell)

Field Manager: Mark Dominick
 978.234.5033, 818.599.0702 (cell)

Test America's services under the CoC shall be performed in accordance with the TSCa within Blanket Service Agreement 2015-18, TestAmerica by and between Haley & Aldrich, Inc., its subsidiaries and affiliates, and TestAmerica Laboratories Inc

Sampler: Mark Smith
No.1

Sample Description	Sample ID	Sampling Date/Time	Sample Matrix	Container Type	# of Cont	Preservative	Bottle #	MS/MSD	Total Recoverable Metals: (E200) Cu, Pb, Cd, Se	TCD (and all congeners) (E1613B)	BOD5 (20 degrees C) (E405.1 (SM5210B, BODCalc))	Surfactants (MBAS) (SM5540C/E425.1)	Cl-, SO4, Nitrate-N, Nitrite-N, NO3+NO2-N, Perchlorate (E300)	Turbidity, TDS (SM2540C/E180.1)	TSS (160.2 (SM2540D))	Ammonia-N (350.2)	alpha-BHC (E608)	2,4,6-TCP, 2,4-Dinitrofluorene, Bis(2-ethylhexyl)phthalate, NDMA, PCP (SVOCs E825)	Total Recoverable Metals, Mercury (E245.1)	Total Recoverable Metals (E200) Fe, Mn	Comments			
Outfall002_20181207_Comp	WM	12/7/2018	WM	500 mL Poly	1	HNO3	90	No	X											X	Outfall 001 analyze for Fe and Mn Outfalls 002 and 011 analyze for Fe only			
	WM		WM	1 L Glass Amber	2	None	110	No	X															
	WM		WM	1L Poly	1	None	115	No		X														
	WM		WM	500 mL Poly	2	None	120	No			X													
	WM		WM	500 mL Poly	2	None	130	No				X												
	WM		WM	500 mL Poly	1	None	150	No					X											
	WM		WM	500 mL Poly	1	H2SO4	160	No						X										
	WM		WM	1 L Glass Amber	2	None	170	No										X						
	WM		WM	1 L Glass Amber	2	None	180	No											X					
	WM		WM	1L Poly	1	None	185	No												X				
Outfall002_20181207_Comp_Extra	WM		WM	1000 mL Glass Amber	1	HNO3	315	No																
	WM		WM	1 L Glass Amber	2	None	440	No																
	WM		WM	500 mL Poly	2	None	450	No																
	WM		WM	500 mL Poly	2	None	450	No																
	WM		WM	1 L Glass Amber	2	None	470	No																
	WM		WM	1 L Glass Amber	2	None	480	No																

Relinquished By: Mark Dominick Date/Time: 12-7-18/14:35 Company: Haley & Aldrich

Relinquished By: Janier Vega Date/Time: 12-7-18 9:05 Company: Janier Vega

Relinquished By: TA IRV Date/Time: 12/18 2105 Company: Janier Vega

Received By: Janier Vega Date/Time: 12-7-18 14:35 Company: Janier Vega

Received By: TA IRV Date/Time: 12/18 2105 Company: Janier Vega

Turn-around time (Check): 24 Hour 48 Hour 72 Hour 10 Day X Normal

Sample Integrity (Check): Intact On Ice

Store samples for 6 months Data Requirements (Check): No Level IV All Level IV X

04/0.6 22/29 1294

CHAIN OF CUSTODY FORM

Test America

<p>Client Name/Address: Haley & Aldrich 5333 Mission Center Rd Suite 300 San Diego, CA 92108</p>		<p>Project: Boeing-SSFL NPDES Permit 2018 Quarry Outfall [001, 002, 011, 018] Outfall 002 Comp</p>		<p>Project Manager: Katherine Miller 520.285.8606, 520.904.6944 (cell)</p>		<p>Field Manager: Mark Dominick 978.234.5033, 818.599.0702 (cell)</p>		<p>Sample Matrix</p>		<p>Preservative</p>		<p>MSMSD</p>		<p>Comments</p>	
<p>Test America Contact: Urvashi Patel Irvine CA 92614 Tel 949-260-3269 Cell 949-333-9055</p>		<p>Test America's services under this CoC shall be performed in accordance with the T&Cs within Blanket Service Agreement 2015-16, electronically by and between Haley & Aldrich, Inc., its subsidiaries and affiliates, and TestAmerica Laboratories, Inc.</p>		<p>Sample ID</p>		<p>Sampling Date/Time</p>		<p>Container Type</p>		<p># of Cont</p>		<p>Bottle #</p>		<p>Filter and preserve with 24hrs of receipt at lab at CF001,002,011, or 018</p>	
<p>Outfall 002</p>		<p>Outfall002_20181207_Comp_F</p>		<p>12/7/2018 11:05</p>		<p>1L Glass Amber</p>		<p>2</p>		<p>250</p>		<p>Chlordane, DDE, DDT, Heptachlor PCBs, toxaphene at OF001,002,011, or 018.</p>			
<p>Outfall 002</p>		<p>Outfall002_20181207_Comp</p>		<p>12/7/2018 11:05</p>		<p>borosilicate vials</p>		<p>1</p>		<p>320</p>		<p>Sample receiving DO NOT OPEN BAG. Bag to be opened in Mercury Prep using clean procedures.</p>			
<p>Outfall 002</p>		<p>Outfall002_20181207_Comp</p>		<p>12/7/2018 11:05</p>		<p>500 mL Poly</p>		<p>1</p>		<p>220</p>		<p>Unfiltered and unpreserved analysis. Separate RAD onto another worksheet. Analyze duplicate, not MS/MSD.</p>			
<p>Outfall 002</p>		<p>Outfall002_20181207_Comp</p>		<p>12/7/2018 11:05</p>		<p>2.5 Gal Cube</p>		<p>1</p>		<p>230</p>		<p>Only test if first or second rain events of the year.</p>			
<p>Outfall 002</p>		<p>Outfall002_20181207_Comp</p>		<p>12/7/2018 11:05</p>		<p>1 Gal Cube</p>		<p>1</p>		<p>235</p>		<p>Unfiltered and unpreserved analysis. Separate RAD onto another worksheet. Analyze duplicate, not MS/MSD.</p>			

<p>Relinquished By: <i>Mark Dominick</i></p>	<p>Received By: <i>Javier Vega</i></p>	<p>Date/Time: 12-7-18 14:35</p>	<p>Date/Time: 12-7-18 14:35</p>
<p>Relinquished By: <i>Javier Vega</i></p>	<p>Received By: <i>Victor</i></p>	<p>Date/Time: 12-7-18 16:50</p>	<p>Date/Time: 12-7-18 16:50</p>
<p>Relinquished By: <i>Javier Vega</i></p>	<p>Received By: <i>Javier Vega</i></p>	<p>Date/Time: 12-7-18 9:05</p>	<p>Date/Time: 12-7-18 9:05</p>



Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 440-226838-4

Login Number: 226838

List Source: TestAmerica Irvine

List Number: 1

Creator: Soderblom, Tim

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	Not present
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 440-226838-4

Login Number: 226838

List Number: 3

Creator: Hellm, Michael

List Source: TestAmerica St. Louis

List Creation: 12/20/18 12:36 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	19.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tracer/Carrier Summary

Client: Haley & Aldrich, Inc.
Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Americium-241 (30-110)
440-226838-1	Outfall002_20181207_Comp	85.1
LCS 160-417049/2-A	Lab Control Sample	90.4
LCSD 160-417049/3-A	Lab Control Sample Dup	94.8
MB 160-417049/1-A	Method Blank	96.2

Tracer/Carrier Legend

Americium-243 = Americium-243

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Pu-242 (T) (30-110)
440-226838-1	Outfall002_20181207_Comp	79.9
LCS 160-417063/2-A	Lab Control Sample	89.9
LCSD 160-417063/3-A	Lab Control Sample Dup	93.3
MB 160-417063/1-A	Method Blank	74.3

Tracer/Carrier Legend

Pu-242 (T) = Pu-242 (T)

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Polonium-210 (30-110)
440-226830-I-1-O DU	Duplicate	21.7 X
440-226838-1	Outfall002_20181207_Comp	28.3 X
LCS 160-418940/2-A	Lab Control Sample	24.5 X
MB 160-418940/1-A	Method Blank	29.0 X

Tracer/Carrier Legend

Polonium-209 = Polonium-209

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Thorium-232 (30-110)
440-226838-1	Outfall002_20181207_Comp	45.4
LCS 160-417064/2-A	Lab Control Sample	103
LCSD 160-417064/3-A	Lab Control Sample Dup	104
MB 160-417064/1-A	Method Blank	99.9

Tracer/Carrier Legend

Thorium-229 = Thorium-229

Patel, Urvashi

From: Miller, Katherine <KMiller@haleyaldrich.com>
Sent: Monday, February 18, 2019 12:53 PM
To: Patel, Urvashi
Subject: RE: Gross alpha

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Red Category

-External Email-

We need these test for OF002 and OF008 from Dec.

OF002 - Qtrly	440-226838
OF008 - Annual	440-226830

Man-made radionuclides to be analyzed by alpha spectroscopy

Pu-239/240
Pu-238
Am-241

Naturally occurring radionuclides to be analyzed by alpha spectroscopy

Th-232
Th-230
Th-228

Naturally occurring radionuclides to be analyzed by gamma spectroscopy

Po-210
Po-214
Po-218
Pa-231
Ac-227
Th-227
Ra-223

Po-215
Bi-211
Ra-224
Po-216
Bi-212
Po-212

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Miller, Katherine
Sent: Thursday, January 24, 2019 11:41 AM
To: 'Patel, Urvashi' <Urvashi.Patel@testamericainc.com>
Subject: RE: Gross alpha

No rad tests needed.

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Patel, Urvashi <Urvashi.Patel@testamericainc.com>
Sent: Wednesday, January 23, 2019 11:07 AM
To: Miller, Katherine <KMiller@haleyaldrich.com>
Subject: RE: Gross alpha

Katherine- please let me know if you'd like to add the analysis and I'll add them to both jobs.

Thanks,
Urvashi

URVASHI PATEL
Manager of Project Management

Test America
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Ave, Suite #100
Irvine, CA 92614
TEL 949-261-1022 | FAX 949-260-3297
DIRECT 949-260-3269
CELL 949-333-9055

www.testamericainc.com

From: Franks, Mike
Sent: Wednesday, January 23, 2019 9:50 AM
To: 'Miller, Katherine'
Cc: Patel, Urvashi
Subject: RE: Gross alpha

The recount can be done in a few days. Just scheduling the analysis time.

The isotopic thorium can be done in 10 business days.

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]
Sent: Wednesday, January 23, 2019 11:44 AM
To: Franks, Mike
Cc: Patel, Urvashi
Subject: RE: Gross alpha

-External Email-

How long would recount and isotopic thorium take?

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Franks, Mike <Mike.Franks@testamericainc.com>
Sent: Wednesday, January 23, 2019 10:28 AM
To: Miller, Katherine <KMiller@haleyaldrich.com>
Cc: Patel, Urvashi <Urvashi.Patel@testamericainc.com>
Subject: FW: Gross alpha
Importance: High

Hi Katherine,

Our technical director review the gamma spec 901.1 data for jobs 440-226838 & 440-226830. The Np-237 result we discussed is most likely caused by interference from x-ray junk around that energy line.

He concurs that isotopic thorium is the logical additional analysis. We can also recount the Gross Alpha/Beta planchete

Thanks.

Mike

MIKE FRANKS
Client Relations Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

13715 Rider Trail North
Earth City, MO 63045
Tel 314.298.8566 | Fax 314.298.8757
www.testamericainc.com

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]
Sent: Wednesday, January 23, 2019 8:51 AM

To: Patel, Urvashi
Subject: RE: Gross alpha

-External Email-

I need the lab to call me asap

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Patel, Urvashi <Urvashi.Patel@testamericainc.com>
Sent: Tuesday, January 22, 2019 6:00 PM
To: Miller, Katherine <KMiller@haleyaldrich.com>
Subject: RE: Gross alpha

Mike got back to me today but will give you a call tomorrow to discuss:
We can perform additional analysis. Uranium, thorium, and radium are the predominant naturally occurring alpha emitters. I can contact the client tomorrow.

Mike Franks is his full name.

Thanks,
Urvashi

URVASHI PATEL
Manager of Project Management

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Irvine, CA 92614
TEL 949-261-1022 | FAX 949-260-3297
DIRECT 949-260-3269
CELL 949-333-9055

www.testamericainc.com

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]
Sent: Tuesday, January 22, 2019 4:38 PM
To: Patel, Urvashi
Subject: RE: Gross alpha

-External Email-

We are hoping for a super fast TAT on the answer and if possible, the results.

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Patel, Urvashi <Urvashi.Patel@testamericainc.com>
Sent: Tuesday, January 22, 2019 5:36 PM
To: Miller, Katherine <KMiller@haleyaldrich.com>
Subject: RE: Gross alpha

Ok- checking with our Rad experts to see if this is possible.

Thanks,
Urvashi

URVASHI PATEL
Manager of Project Management

Test America
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Irvine, CA 92614
TEL 949-261-1022 | FAX 949-260-3297
DIRECT 949-260-3269
CELL 949-333-9055

www.testamericainc.com

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]
Sent: Tuesday, January 22, 2019 4:30 PM
To: Patel, Urvashi
Subject: Re: Gross alpha

-External Email-

Determining if it is naturally occurring

Sent from my iPhone

On Jan 22, 2019, at 5:25 PM, Patel, Urvashi <Urvashi.Patel@testamericainc.com> wrote:

Hi Katherine
Is there something specific you're looking for in the water? I've not heard of speciating water from Gross Alpha but I'll ask the team and get back to you.

Thanks,
Urvashi

URVASHI PATEL

Manager of Project Management

Test America
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Ave, Suite #100
Irvine, CA 92614
TEL 949-261-1022 | FAX 949-260-3297
DIRECT 949-260-3269
CELL 949-333-9055

www.testamericainc.com

-----Original Message-----

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]

Sent: Tuesday, January 22, 2019 4:22 PM

To: Patel, Urvashi

Subject: Gross alpha

-External Email-

Urvashi,
Can we speciate water for the gross alpha?

Sent from my iPhone

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Irvine

17461 Derian Ave

Suite 100

Irvine, CA 92614-5817

Tel: (949)261-1022

TestAmerica Job ID: 440-226830-5

Client Project/Site: Annual Outfall 008 Comp

For:

Haley & Aldrich, Inc.

400 E Van Buren St.

Suite 545

Phoenix, Arizona 85004

Attn: Katherine Miller



Authorized for release by:

3/26/2019 6:25:35 PM

Urvashi Patel, Manager of Project Management

(949)261-1022

urvashi.patel@testamericainc.com

LINKS

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results through
TotalAccess

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Visit us at:
www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

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

I certify under penalty of perjury that the information contained in this report and all attachments was produced in accordance with the indicated methods and laboratory standard operating procedures, except as noted, and are complete and accurate to the best of my knowledge and belief. Subcontract laboratory reports that are attached have been evaluated for completeness and quality control acceptability.



Urvashi Patel
Manager of Project Management
3/26/2019 6:25:35 PM



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Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-226830-1	Outfall008_20181207_Comp	Water	12/07/18 11:05	12/07/18 21:05

1

2

3

4

5

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7

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15

Case Narrative

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Job ID: 440-226830-5

Laboratory: TestAmerica Irvine

Narrative

**Job Narrative
440-226830-5**

Comments

No additional comments.

Receipt

The samples were received on 12/7/2018 9:05 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 2.3° C and 3.5° C.

Receipt Exceptions

The reference method requires samples to be preserved to a pH <2. The following samples was received with insufficient preservation at a pH of 7: Outfall008_20181207_Comp (440-226830-1). The samples were preserved with 10mL of nitric acid reagent #1598157, at 16:00 on 12/11/18, to reach the appropriate pH of 2 in the laboratory.

RAD

Method(s) 901.1: Gamma Prep Batch 160-417097

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417097/2-A), (MB 160-417097/1-A) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch 160-417097

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417097/2-A), (MB 160-417097/1-A) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch 160-417097

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from Reported to Analyte

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Po-216	Pb-212
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211

Case Narrative

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Job ID: 440-226830-5 (Continued)

Laboratory: TestAmerica Irvine (Continued)

Th-227 Pb-211
Bi-214 Ra-226
Outfall008_20181207_Comp (440-226830-1), (LCS 160-417097/2-A), (MB 160-417097/1-A) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch: 160-417097

The cesium-137 MDC (21.2 pCi/L) for the method blank (MB) is above the requested limit of 20 pCi/L. Cesium-137 activity was not observed in the MB above the MDC or RL. The MDC for the associated samples is less than the requested limit. The data have been reported with the MDC achieved. (MB 160-417097/1-A).

Method(s) A-01-R: Americium Prep Batch: 160-417049

Manual Integrations and adjustments to ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

(LCSD 160-417049/3-A).

Method(s) A-01-R: Americium Prep Batch: 160-417049

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417049/2-A), (LCSD 160-417049/3-A) and (MB 160-417049/1-A)

Method(s) A-01-R: Americium Prep Batch: 160-417049

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417049/2-A), (LCSD 160-417049/3-A) and (MB 160-417049/1-A)

Method(s) A-01-R: Polonium Prep Batch: 160-418940

The following samples have a tracer recoveries below the 30% QC limit: MB 160-418940/1-A (29.0%), LCS 160-418940/2-A (24.5%), 440-226830-I-1-N (21.7%), 440-226830-I-1-O DU (21.7%), 440-226838-P-1-O (28.3%), 440-229259-J-1-J (19.7%). In addition, the Po-210 MDC is above the detection goal (0.300 pCi/L) which can be attributed to the lower tracer recovery. The samples were counted for the maximum count time of 960 minutes and achieved >400 tracer counts in the tracer peaks (which leads to 10% count uncertainty at 2 sigma), the resolution of < 100 keV is met for all peaks (there are no indications of spectral interferences), and the activity in the sample is above the MDC. The data have been qualified and reported with this narrative.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-418940/2-A), (MB 160-418940/1-A) and (440-226830-I-1-O DU)

Method(s) A-01-R: Polonium Prep Batch: 160-418940

The Po-210 detection goal (0.300 pCi/L) was not met for the following samples due to low tracer recovery and reduced aliquots (see prep non-conformance memo: 160-162593): Outfall008_20181207_Comp (440-226830-1), (MB 160-418940/1-A) and (440-226830-I-1-O DU). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Polonium Prep Batch: 160-418940

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Case Narrative

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Job ID: 440-226830-5 (Continued)

Laboratory: TestAmerica Irvine (Continued)

Outfall008_20181207_Comp (440-226830-1), (LCS 160-418940/2-A), (MB 160-418940/1-A) and (440-226830-I-1-O DU)

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

The Pu-238 detection goal (1.00 pCi/L) was not met for the following samples due to the reduced aliquot required from the presence of matrix interferences (see prep non-conformance memo: 160-161634): (MB 160-417063/1-A). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417063/2-A), (LCSD 160-417063/3-A) and (MB 160-417063/1-A)

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417063/2-A), (LCSD 160-417063/3-A) and (MB 160-417063/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Manual Integrations and adjustments to ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

(LCS 160-417064/2-A).

Method(s) A-01-R: Thorium Prep Batch: 160-417064

The detection goals were not met for the following samples due to the reduced aliquot required from the presence of matrix interferences (see prep non-conformance memo: 160-161635): Outfall008_20181207_Comp (440-226830-1). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Thorium Prep Batch: 160-417064

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk).

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall008_20181207_Comp (440-226830-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Case Narrative

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Job ID: 440-226830-5 (Continued)

Laboratory: TestAmerica Irvine (Continued)

Method(s) Digest/Cu Plate: polonium-210 prep 160-417309: The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: Outfall008_20181207_Comp (440-226830-1) and (440-226830-I-1 DU). The sample was dark-brown, murky, and contained a fair amount of undissolved sediment along the bottom of the container. Although samples were shaken well prior to sub-sampling there is no guarantee that sediments were evenly dispersed.

Method(s) Digest/Cu Plate: polonium-210 prep 160-417309: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Due to apparent matrix samples underwent atypical separations prior to auto-plating per SOP No. ST-RC-0210.

Outfall008_20181207_Comp (440-226830-1) and (440-226830-I-1 DU)

Method(s) Digest/Cu Plate: Polonium-210 prep batch 160-418940: The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: Outfall008_20181207_Comp (440-226830-1) and (440-226830-I-1 DU). The samples were dark-brown, murky, and contained a fair amount of undissolved sediment along the bottom of the container. Although sample was shaken well prior to sub-sampling there is no guarantee that sediments were evenly dispersed.

Method(s) Digest/Cu Plate: Polonium-210 prep batch 160-418940: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Due to apparent matrix samples underwent atypical separations prior to purification via extraction chromatography and preparation for counting by alpha spectroscopy. The samples were also prepared at a reduced aliquot to lower potential matrix interference.

Outfall008_20181207_Comp (440-226830-1) and (440-226830-I-1 DU)

Method(s) ExtChrom: Americium Prep Batch 160-417049:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall008_20181207_Comp (440-226830-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method(s) ExtChrom: Plutonium Prep Batch 160-417063:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall008_20181207_Comp (440-226830-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method(s) ExtChrom: Thorium Prep Batch 160-417064:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall008_20181207_Comp (440-226830-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

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

Client Sample Results

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Client Sample ID: Outfall008_20181207_Comp

Lab Sample ID: 440-226830-1

Date Collected: 12/07/18 11:05

Matrix: Water

Date Received: 12/07/18 21:05

Method: 901.1 - Cesium 137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	6.72	U	67.0	67.0		95.1	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Cesium-137	-3.40	U	12.4	12.5	20.0	15.6	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Bismuth-211	6.72	U	67.0	67.0		95.1	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Bismuth-212	16.0	U	95.6	95.6		169	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Thorium-227	6.72	U	67.0	67.0		95.1	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Radium-223	6.72	U	67.0	67.0		95.1	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Radium-224	24.3		12.7	13.0		14.8	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Protactinium-231	79.1	U	178	178		403	pCi/L	02/27/19 22:08	03/04/19 15:04	1

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Americium-241	0.109	U	0.355	0.356	1.00	0.768	pCi/L	02/27/19 12:01	03/07/19 22:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Americium-243	97.2		30 - 110					02/27/19 12:01	03/07/19 22:45	1

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.156	U	0.480	0.481	1.00	0.998	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Plutonium-239/240	0.113	U	0.227	0.227	1.00	0.340	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Pu-242 (T)	88.5		30 - 110					02/27/19 13:31	03/06/19 21:52	1

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Polonium-210	2.36	G	0.763	0.789	0.300	0.833	pCi/L	03/12/19 12:19	03/15/19 20:28	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Polonium-209	21.7	X	30 - 110					03/12/19 12:19	03/15/19 20:28	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	1.17	G	0.899	0.905	1.00	1.13	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-230	2.17		1.12	1.13	1.00	0.930	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-232	1.24		0.800	0.806	1.00	0.692	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	93.9		30 - 110					02/27/19 13:33	03/07/19 22:42	1

TestAmerica Irvine

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Method	Method Description	Protocol	Laboratory
901.1	Cesium 137 & Other Gamma Emitters (GS)	EPA	TAL SL
A-01-R	Isotopic Curium and/or Americium 241 (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Plutonium and Neptunium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Polonium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
Digest/Cu Plate	Preparation, Digestion & Copper Plating	TAL-STL	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-0	Fill Geometry, No In-Growth	None	TAL SL

Protocol References:

- DOE = U.S. Department of Energy
- EPA = US Environmental Protection Agency
- None = None
- 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

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Client Sample ID: Outfall008_20181207_Comp

Lab Sample ID: 440-226830-1

Date Collected: 12/07/18 11:05

Matrix: Water

Date Received: 12/07/18 21:05

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Fill_Geo-0			1000 mL	1.0 mL	417097	02/27/19 22:08	MPT	TAL SL
Total/NA	Analysis	901.1		1			417532	03/04/19 15:04	CDR	TAL SL
Total/NA	Prep	ExtChrom			100.04 mL	1.0 mL	417063	02/27/19 13:31	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418009	03/06/19 21:52	ALS	TAL SL
Total/NA	Prep	ExtChrom			100.04 mL	1.0 mL	417064	02/27/19 13:33	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418287	03/07/19 22:42	ALS	TAL SL
Total/NA	Prep	ExtChrom			100.04 mL	1.0 mL	417049	02/27/19 12:01	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418294	03/07/19 22:45	ALS	TAL SL
Total/NA	Prep	Digest/Cu Plate			199.97 mL	1.0 g	418940	03/12/19 12:19	PJM	TAL SL
Total/NA	Analysis	A-01-R		1			419530	03/15/19 20:28	ALS	TAL SL

Laboratory References:

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



QC Sample Results

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Method: 901.1 - Cesium 137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-417097/1-A
Matrix: Water
Analysis Batch: 417503

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417097

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium-227	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Cesium-137	6.536	U G	12.5	12.5	20.0	21.2	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Bismuth-211	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Bismuth-212	-76.06	U	128	128		274	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Thorium-227	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Radium-223	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Radium-224	-11.20	U	20.1	20.2		40.9	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Protactinium-231	0.0000	U	57.8	57.8		1010	pCi/L	02/27/19 22:08	03/01/19 17:09	1

Lab Sample ID: LCS 160-417097/2-A
Matrix: Water
Analysis Batch: 417372

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 417097

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium-241	136000	124300		14400		399	pCi/L	91	90 - 111
Cesium-137	44900	44730		4480	20.0	110	pCi/L	100	90 - 111
Cobalt-60	30400	29420		2910		61.0	pCi/L	97	89 - 110

Lab Sample ID: 440-226830-1 DU
Matrix: Water
Analysis Batch: 417504

Client Sample ID: Outfall008_20181207_Comp
Prep Type: Total/NA
Prep Batch: 417097

Analyte	Sample Sample		DU DU		Total	RL	MDC	Unit	RER	RER
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					Limit
Actinium-227	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Cesium-137	-3.40	U	4.351	U	9.55	20.0	16.4	pCi/L	0.35	1
Bismuth-211	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Bismuth-212	16.0	U	2.412	U	95.6		177	pCi/L	0.07	1
Thorium-227	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Radium-223	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Radium-224	24.3		-2.018	U	17.0		29.4	pCi/L	0.88	1
Protactinium-231	79.1	U	72.45	U	225		521	pCi/L	0.02	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-417064/1-A
Matrix: Water
Analysis Batch: 418283

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417064

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	0.1787	U	0.434	0.434	1.00	0.812	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-230	0.5403	U	0.666	0.668	1.00	0.916	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-232	0.04384	U	0.243	0.243	1.00	0.653	pCi/L	02/27/19 13:33	03/07/19 22:42	1

TestAmerica Irvine

QC Sample Results

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: MB 160-417064/1-A
Matrix: Water
Analysis Batch: 418283

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417064

Tracer	MB %Yield	MB Qualifier	Limits
Thorium-229	99.9		30 - 110

Prepared	Analyzed	Dil Fac
02/27/19 13:33	03/07/19 22:42	1

Lab Sample ID: LCS 160-417064/2-A
Matrix: Water
Analysis Batch: 418284

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 417064

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Thorium-230	40.1	38.67		5.18	1.00	0.779	pCi/L	96	81 - 125

Tracer	LCS %Yield	LCS Qualifier	Limits
Thorium-229	103		30 - 110

Lab Sample ID: LCSD 160-417064/3-A
Matrix: Water
Analysis Batch: 418285

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 417064

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230	40.1	43.40		5.64	1.00	0.788	pCi/L	108	81 - 125	0.44	1

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Thorium-229	104		30 - 110

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

Lab Sample ID: MB 160-418940/1-A
Matrix: Water
Analysis Batch: 419517

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 418940

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Polonium-210	0.1963	U G	0.207	0.208	0.300	0.313	pCi/L	03/12/19 12:19	03/15/19 20:28	1

Tracer	MB %Yield	MB Qualifier	Limits
Polonium-209	29.0	X	30 - 110

Prepared	Analyzed	Dil Fac
03/12/19 12:19	03/15/19 20:28	1

Lab Sample ID: LCS 160-418940/2-A
Matrix: Water
Analysis Batch: 419518

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 418940

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Polonium-210	43.1	41.20		4.31	0.300	0.747	pCi/L	96	79 - 124

TestAmerica Irvine

QC Sample Results

Client: Haley & Aldrich, Inc.
 Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-418940/2-A
Matrix: Water
Analysis Batch: 419518

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 418940

Tracer	LCS %Yield	LCS Qualifier	Limits
Polonium-209	24.5	X	30 - 110

Lab Sample ID: 440-226830-1 DU
Matrix: Water
Analysis Batch: 419520

Client Sample ID: Outfall008_20181207_Comp
Prep Type: Total/NA
Prep Batch: 418940

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Polonium-210	2.36	G	2.125	G	0.828	0.300	0.955	pCi/L	0.15	1

Tracer	DU %Yield	DU Qualifier	Limits
Polonium-209	21.7	X	30 - 110

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

Lab Sample ID: MB 160-417049/1-A
Matrix: Water
Analysis Batch: 418290

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417049

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Americium-241	0.1270	U	0.413	0.413	1.00	0.893	pCi/L	02/27/19 12:01	03/07/19 22:44	1

Tracer	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Americium-243	96.2		30 - 110	02/27/19 12:01	03/07/19 22:44	1

Lab Sample ID: LCS 160-417049/2-A
Matrix: Water
Analysis Batch: 418291

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 417049

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	37.2	37.97		5.76	1.00	0.787	pCi/L	102	80 - 116

Tracer	LCS %Yield	LCS Qualifier	Limits
Americium-24	90.4		30 - 110

Lab Sample ID: LCSD 160-417049/3-A
Matrix: Water
Analysis Batch: 418292

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 417049

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Americium-241	37.2	37.58		5.63	1.00	0.808	pCi/L	101	80 - 116	0.03	1

TestAmerica Irvine

QC Sample Results

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-417049/3-A
Matrix: Water
Analysis Batch: 418292

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 417049

Tracer	LCS D %Yield	LCS D Qualifier	Limits
Americium-241	94.8		30 - 110

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Lab Sample ID: MB 160-417063/1-A
Matrix: Water
Analysis Batch: 418005

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 417063

Analyte	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Plutonium-238	0.3914	U G	0.627	0.628	1.00	1.11	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Plutonium-239/240	0.07682	U	0.254	0.254	1.00	0.639	pCi/L	02/27/19 13:31	03/06/19 21:52	1

Tracer	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Pu-242 (T)	74.3		30 - 110	02/27/19 13:31	03/06/19 21:52	1

Lab Sample ID: LCS 160-417063/2-A
Matrix: Water
Analysis Batch: 418006

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 417063

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									Plutonium-238	53.0
Plutonium-239/240	52.8	52.02		6.33	1.00	0.574	pCi/L	98	85 - 120	

Tracer	LCS %Yield	LCS Qualifier	Limits
Pu-242 (T)	89.9		30 - 110

Lab Sample ID: LCSD 160-417063/3-A
Matrix: Water
Analysis Batch: 418007

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 417063

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									Plutonium-238	53.0	47.71	
Plutonium-239/240	52.8	50.05		6.08	1.00	0.547	pCi/L	95	85 - 120	0.16	1	

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Pu-242 (T)	93.3		30 - 110

QC Association Summary

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Rad

Prep Batch: 417049

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226830-1	Outfall008_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417049/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417049/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCS D 160-417049/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

Prep Batch: 417063

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226830-1	Outfall008_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417063/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417063/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCS D 160-417063/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

Prep Batch: 417064

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226830-1	Outfall008_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417064/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417064/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCS D 160-417064/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

Prep Batch: 417097

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226830-1	Outfall008_20181207_Comp	Total/NA	Water	Fill_Geo-0	
MB 160-417097/1-A	Method Blank	Total/NA	Water	Fill_Geo-0	
LCS 160-417097/2-A	Lab Control Sample	Total/NA	Water	Fill_Geo-0	
440-226830-1 DU	Outfall008_20181207_Comp	Total/NA	Water	Fill_Geo-0	

Prep Batch: 418940

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226830-1	Outfall008_20181207_Comp	Total/NA	Water	Digest/Cu Plate	
MB 160-418940/1-A	Method Blank	Total/NA	Water	Digest/Cu Plate	
LCS 160-418940/2-A	Lab Control Sample	Total/NA	Water	Digest/Cu Plate	
440-226830-1 DU	Outfall008_20181207_Comp	Total/NA	Water	Digest/Cu Plate	

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
G	The Sample MDC is greater than the requested RL.
X	Tracer is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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)

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
 Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Laboratory: TestAmerica Irvine

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	CA ELAP 2706	06-30-19

Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD / DOE		L2305	04-06-22
Arizona	State Program	9	AZ0813	12-08-19
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19 *
Florida	NELAP	4	E87689	06-30-19
Hawaii	State Program	9	NA	06-30-19
Illinois	NELAP	5	200023	11-30-19
Iowa	State Program	7	373	12-01-20
Kansas	NELAP	7	E-10236	10-31-19
Kentucky (DW)	State Program	4	KY90125	12-31-19
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA011	12-31-19
Maryland	State Program	3	310	09-30-19
Michigan	State Program	5	9005	06-30-19
Missouri	State Program	7	780	06-30-19
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19 *
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-19
Pennsylvania	NELAP	3	68-00540	02-28-19 *
South Carolina	State Program	4	85002001	06-30-19
Texas	NELAP	6	T104704193-18-13	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542018-10	07-31-19
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-19
West Virginia DEP	State Program	3	381	08-31-19

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

CHAIN OF CUSTODY FORM

Test America

440-226830 Chain of Custody

<p>Client Name/Address: Haley & Aldrich 5333 Mission Center Rd Suite 300 San Diego, CA 92108 Test America Contact Unvashi Patel 17461 Denan Ave Suite #100 Irvine CA 92614 Tel 949-260-3269 Cell 949-333-9055</p>		<p>Project Boeing-SSFL NPDES Permit 2018 Annual Outfall [008] Outfall 008 Comp</p>		<p>Project Manager: Katherine Miller 520 289 8606, 520.904.6944 (cell) Field Manager: Mark Dominick 978 234 5033, 818 599 0702 (cell)</p>		<p>Sample Description</p>		<p>Sample ID</p>		<p>Sampling Date/Time</p>		<p>Sample Matrix</p>		<p>Container Type</p>		<p># of Cont.</p>		<p>Preservative</p>		<p>Bottle #</p>		<p>MSMSD</p>	
<p>Outfall008_20181207_Comp</p>		<p>12/7/2018 / 11:05</p>		<p>WM</p>		<p>500 mL Poly</p>		<p>1</p>		<p>HNO₃</p>		<p>85</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
<p>Outfall008_20181207_Comp_F</p>		<p>12/7/2018 / 11:05</p>		<p>WM</p>		<p>1 L Glass Amber</p>		<p>2</p>		<p>None</p>		<p>110</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
<p>Outfall008_20181207_Comp_Estra</p>		<p>12/7/2018 / 11:05</p>		<p>WM</p>		<p>500 mL Poly</p>		<p>1</p>		<p>None</p>		<p>155</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>500 mL Poly</p>		<p>1</p>		<p>H2SO4</p>		<p>160</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>1L Poly</p>		<p>1</p>		<p>None</p>		<p>185</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>500 mL Poly</p>		<p>1</p>		<p>NaOH</p>		<p>220</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>2.5 Gal Cube</p>		<p>1</p>		<p>None</p>		<p>225</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>1 L Glass Amber</p>		<p>1</p>		<p>None</p>		<p>230</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>1 Gal Cube</p>		<p>1</p>		<p>None</p>		<p>235</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>1 L Glass Amber</p>		<p>2</p>		<p>None</p>		<p>250</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>1 L Glass Amber</p>		<p>1</p>		<p>None</p>		<p>185</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>borosilicate vials</p>		<p>1</p>		<p>None</p>		<p>320</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>1 L Glass Amber</p>		<p>2</p>		<p>None</p>		<p>110</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>500 mL Poly</p>		<p>2</p>		<p>None</p>		<p>125</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			
				<p>WM</p>		<p>1 L Glass Amber</p>		<p>2</p>		<p>None</p>		<p>250</p>		<p>No</p>		<p>No</p>		<p>No</p>		<p>No</p>			

<p>Relinquished By: <i>[Signature]</i> Date/Time: 12-7-18/14:35</p>		<p>Company: <i>[Signature]</i> Date/Time: 12-7-18/14:35</p>		<p>Turn-around time (Check) 24 Hour: <input type="checkbox"/> 72 Hour: <input type="checkbox"/> 10 Day: <input checked="" type="checkbox"/> 48 Hour: <input type="checkbox"/> 5 Day: <input type="checkbox"/> Normal: <input type="checkbox"/></p>	
<p>Relinquished By: <i>[Signature]</i> Date/Time: 12-7-18/16:50</p>		<p>Company: <i>[Signature]</i> Date/Time: 12-7-18/16:50</p>		<p>Sample Integrity (Check) Intact: <input checked="" type="checkbox"/> On Ice: <input checked="" type="checkbox"/></p>	
<p>Relinquished By: <i>[Signature]</i> Date/Time: 12-7-18/9:05</p>		<p>Company: <i>[Signature]</i> Date/Time: 12-7-18/9:05</p>		<p>Data Requirements (Check) No Level IV: <input type="checkbox"/> All Level IV: <input checked="" type="checkbox"/></p>	

1894 2.1/2.3 3.3/3.5

CHAIN OF CUSTODY FORM

Test America

<p>Client Name/Address: Haley & Aldrich 5333 Mission Center Rd Suite 300 San Diego, CA 92108</p>		<p>Project: Boeing-SSFL NPDES Permit 2018 Annual Outfall [008] Outfall 008 Comp</p>		<p>ANALYSIS REQUIRED</p>					
<p>Test America Contact: Urvashi Patel 17461 Derian Ave Suite #100 Irvine CA 92614 Tel 949-260-3269 Cell 949-333-9055</p>		<p>Project Manager: Katherine Miller 520.289.8606, 520.904.6944 (cell) Field Manager: Mark Dominick 978.234.5033, 818.598.0702 (cell)</p>		<p>Priority Pollutants-SVOCs (E625) X Cr (VI), Total (E2186) X Asbestos (EPA100 2) X Chlorpyrifos, Diazinon (E525 2) X</p>					
<p>Sample Description</p>	<p>Sample ID</p>	<p>Sampling Date/Time</p>	<p>Sample Matrix</p>	<p>Container Type</p>	<p># of Cont</p>	<p>Preservative</p>	<p>Bottle #</p>	<p>MS/MSD</p>	<p>Comments</p>
Outfall 008	Outfall008_20181207_Comp	12/7/2018 / 11:05	WM	1 L Glass Amber	2	None	175	No	
			WM	500 mL Poly	1	None	280	No	
			WM	1 L Poly	1	None	270	No	
			WM	1 L Glass Amber	2	HCl	275	No	Only at Outfall 008, 009
	Outfall008_20181207_Comp_Extra	12/7/2018 / 14:05	WM	1 L Glass Amber	1	None	175	No	Extract within 24-hours of sampling
			WM	1 L Glass Amber	2	HCl	275	No	Hold
									Hold

Relinquished By: *Mark Dominick* Date/Time: 12-7-18/14:35 Received By: *Javier Vega* Date/Time: 12-7-18 14:35

Relinquished By: *Javier Vega* Date/Time: 12-7-18 9:05 Received By: *Javier Vega* Date/Time: 12/7/18 21:05

Legend: R = Routine, A = Annual

Turn-around time (Check): 24 Hour: 48 Hour: 72 Hour: 10 Day: Normal

Sample Integrity (Check): Intact: On Ice: Store samples for 6 months: Data Requirements (Check): No Level IV: All Level IV:



Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 440-226830-5

Login Number: 226830

List Number: 1

Creator: Soderblom, Tim

List Source: TestAmerica Irvine

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	Not present
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 440-226830-5

Login Number: 226830

List Number: 2

Creator: Dupart, Lacey S

List Source: TestAmerica St. Louis

List Creation: 12/11/18 03:46 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	19.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tracer/Carrier Summary

Client: Haley & Aldrich, Inc.
Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Americium-241 (30-110)
440-226830-1	Outfall008_20181207_Comp	97.2
LCS 160-417049/2-A	Lab Control Sample	90.4
LCSD 160-417049/3-A	Lab Control Sample Dup	94.8
MB 160-417049/1-A	Method Blank	96.2

Tracer/Carrier Legend

Americium-243 = Americium-243

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Pu-242 (T) (30-110)
440-226830-1	Outfall008_20181207_Comp	88.5
LCS 160-417063/2-A	Lab Control Sample	89.9
LCSD 160-417063/3-A	Lab Control Sample Dup	93.3
MB 160-417063/1-A	Method Blank	74.3

Tracer/Carrier Legend

Pu-242 (T) = Pu-242 (T)

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Polonium-210 (30-110)
440-226830-1	Outfall008_20181207_Comp	21.7 X
440-226830-1 DU	Outfall008_20181207_Comp	21.7 X
LCS 160-418940/2-A	Lab Control Sample	24.5 X
MB 160-418940/1-A	Method Blank	29.0 X

Tracer/Carrier Legend

Polonium-209 = Polonium-209

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Thorium-232 (30-110)
440-226830-1	Outfall008_20181207_Comp	93.9
LCS 160-417064/2-A	Lab Control Sample	103
LCSD 160-417064/3-A	Lab Control Sample Dup	104
MB 160-417064/1-A	Method Blank	99.9

Tracer/Carrier Legend

Thorium-229 = Thorium-229

Patel, Urvashi

From: Miller, Katherine <KMiller@haleyaldrich.com>
Sent: Monday, February 18, 2019 12:53 PM
To: Patel, Urvashi
Subject: RE: Gross alpha

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Red Category

-External Email-

We need these test for OF002 and OF008 from Dec.

OF002 - Qtrly	440-226838
OF008 - Annual	440-226830

Man-made radionuclides to be analyzed by alpha spectroscopy

Pu-239/240
Pu-238
Am-241

Naturally occurring radionuclides to be analyzed by alpha spectroscopy

Th-232
Th-230
Th-228

Naturally occurring radionuclides to be analyzed by gamma spectroscopy

Po-210
Po-214
Po-218
Pa-231
Ac-227
Th-227
Ra-223

Po-215
Bi-211
Ra-224
Po-216
Bi-212
Po-212

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Miller, Katherine
Sent: Thursday, January 24, 2019 11:41 AM
To: 'Patel, Urvashi' <Urvashi.Patel@testamericainc.com>
Subject: RE: Gross alpha

No rad tests needed.

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Patel, Urvashi <Urvashi.Patel@testamericainc.com>
Sent: Wednesday, January 23, 2019 11:07 AM
To: Miller, Katherine <KMiller@haleyaldrich.com>
Subject: RE: Gross alpha

Katherine- please let me know if you'd like to add the analysis and I'll add them to both jobs.

Thanks,
Urvashi

URVASHI PATEL
Manager of Project Management

Test America
THE LEADER IN ENVIRONMENTAL TESTING
17461 Derian Ave, Suite #100
Irvine, CA 92614
TEL 949-261-1022 | FAX 949-260-3297
DIRECT 949-260-3269
CELL 949-333-9055

www.testamericainc.com

From: Franks, Mike
Sent: Wednesday, January 23, 2019 9:50 AM
To: 'Miller, Katherine'
Cc: Patel, Urvashi
Subject: RE: Gross alpha

The recount can be done in a few days. Just scheduling the analysis time.

The isotopic thorium can be done in 10 business days.

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]
Sent: Wednesday, January 23, 2019 11:44 AM
To: Franks, Mike
Cc: Patel, Urvashi
Subject: RE: Gross alpha

-External Email-

How long would recount and isotopic thorium take?

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Franks, Mike <Mike.Franks@testamericainc.com>
Sent: Wednesday, January 23, 2019 10:28 AM
To: Miller, Katherine <KMiller@haleyaldrich.com>
Cc: Patel, Urvashi <Urvashi.Patel@testamericainc.com>
Subject: FW: Gross alpha
Importance: High

Hi Katherine,

Our technical director review the gamma spec 901.1 data for jobs 440-226838 & 440-226830. The Np-237 result we discussed is most likely caused by interference from x-ray junk around that energy line.

He concurs that isotopic thorium is the logical additional analysis. We can also recount the Gross Alpha/Beta planchete

Thanks.

Mike

MIKE FRANKS
Client Relations Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

13715 Rider Trail North
Earth City, MO 63045
Tel 314.298.8566 | Fax 314.298.8757
www.testamericainc.com

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]
Sent: Wednesday, January 23, 2019 8:51 AM

To: Patel, Urvashi
Subject: RE: Gross alpha

-External Email-

I need the lab to call me asap

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Patel, Urvashi <Urvashi.Patel@testamericainc.com>
Sent: Tuesday, January 22, 2019 6:00 PM
To: Miller, Katherine <KMiller@haleyaldrich.com>
Subject: RE: Gross alpha

Mike got back to me today but will give you a call tomorrow to discuss:
We can perform additional analysis. Uranium, thorium, and radium are the predominant naturally occurring alpha emitters. I can contact the client tomorrow.

Mike Franks is his full name.

Thanks,
Urvashi

URVASHI PATEL
Manager of Project Management

Test America
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17461 Derian Ave, Suite #100
Irvine, CA 92614
TEL 949-261-1022 | FAX 949-260-3297
DIRECT 949-260-3269
CELL 949-333-9055

www.testamericainc.com

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]
Sent: Tuesday, January 22, 2019 4:38 PM
To: Patel, Urvashi
Subject: RE: Gross alpha

-External Email-

We are hoping for a super fast TAT on the answer and if possible, the results.

Katherine Miller
HALEY & ALDRICH
Tel: 520.289.8606

From: Patel, Urvashi <Urvashi.Patel@testamericainc.com>
Sent: Tuesday, January 22, 2019 5:36 PM
To: Miller, Katherine <KMiller@haleyaldrich.com>
Subject: RE: Gross alpha

Ok- checking with our Rad experts to see if this is possible.

Thanks,
Urvashi

URVASHI PATEL
Manager of Project Management

Test America
THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Ave, Suite #100
Irvine, CA 92614
TEL 949-261-1022 | FAX 949-260-3297
DIRECT 949-260-3269
CELL 949-333-9055

www.testamericainc.com

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]
Sent: Tuesday, January 22, 2019 4:30 PM
To: Patel, Urvashi
Subject: Re: Gross alpha

-External Email-

Determining if it is naturally occurring

Sent from my iPhone

On Jan 22, 2019, at 5:25 PM, Patel, Urvashi <Urvashi.Patel@testamericainc.com> wrote:

Hi Katherine
Is there something specific you're looking for in the water? I've not heard of speciating water from Gross Alpha but I'll ask the team and get back to you.

Thanks,
Urvashi

URVASHI PATEL

Manager of Project Management

Test America
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-----Original Message-----

From: Miller, Katherine [<mailto:KMiller@haleyaldrich.com>]

Sent: Tuesday, January 22, 2019 4:22 PM

To: Patel, Urvashi

Subject: Gross alpha

-External Email-

Urvashi,
Can we speciate water for the gross alpha?

Sent from my iPhone