

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-16698-2

Client Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

For:

Westinghouse Electric Company LLC
3300 State Road P
Festus, Missouri 63028

Attn: Mr. Martin Swanson



Authorized for release by:
4/22/2016 4:37:05 PM

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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.

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Case Narrative

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Job ID: 160-16698-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Westinghouse Electric Company LLC

Project: HDP RFP-CBA-022 (7 DAY TAT)

Report Number: 160-16698-2

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

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

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

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

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

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

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

RECEIPT

The samples were received on 3/28/2016 11:11 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 20.0° C.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples L08-13-13-T-E-B-00 (160-16698-1), L08-13-14-T-E-B-00 (160-16698-2), L08-13-15-T-E-B-00 (160-16698-3), L08-13-16-T-E-B-00 (160-16698-4) and L08-13-17-T-E-B-00 (160-16698-5) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were leached on 03/28/2016, prepared on 03/31/2016 and analyzed on 04/21/2016.

Preparation Batch 160-243065:

The samples, analyzed by gamma spectroscopy, resulted in an RPD/RER (relative percent difference/replicate error ratio) outside of the acceptance criteria of 40%/1 for protactinium 231. Both the sample and sample duplicates activity are less than the MDC. The data have been qualified and reported. L08-13-13-T-E-B-00 (160-16698-1), L08-13-14-T-E-B-00 (160-16698-2), L08-13-15-T-E-B-00 (160-16698-3), L08-13-16-T-E-B-00 (160-16698-4), L08-13-17-T-E-B-00 (160-16698-5), (LCS 160-243065/2-A), (MB 160-243065/1-A) and

Case Narrative

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Job ID: 160-16698-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

(160-16698-A-1-I DU)

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

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FORM HDP-PR-QA-006-1
CHAIN OF CUSTODY

Instructions: Each time the container is transferred to another organization, a person from each organization should sign the CoC. The Laboratory/End User must verify that the sample is correctly identified before the sample is released for use or analysis and send the completed CoC to HDP.

[illegible]

Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-16698-2

Login Number: 16698

List Source: TestAmerica St. Louis

List Number: 1

Creator: Dedner, Connie L

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.	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	
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.	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 $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
F	Duplicate RPD exceeds the control limit

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, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:
DOE = U.S. Department of Energy

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

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Sample Summary

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-16698-1	L08-13-13-T-E-B-00	Solid	03/24/16 10:20	03/28/16 11:11
160-16698-2	L08-13-14-T-E-B-00	Solid	03/24/16 10:30	03/28/16 11:11
160-16698-3	L08-13-15-T-E-B-00	Solid	03/24/16 10:25	03/28/16 11:11
160-16698-4	L08-13-16-T-E-B-00	Solid	03/24/16 10:35	03/28/16 11:11
160-16698-5	L08-13-17-T-E-B-00	Solid	03/24/16 15:00	03/28/16 11:11

Client Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Client Sample ID: L08-13-13-T-E-B-00

Date Collected: 03/24/16 10:20

Date Received: 03/28/16 11:11

Lab Sample ID: 160-16698-1

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.30		0.132	0.186		0.0772	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Bismuth 212	1.39		0.383	0.409		0.336	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Bismuth 214	1.13		0.102	0.155		0.0585	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Lead 212	1.15		0.0962	0.178		0.0818	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Lead 214	1.30		0.0963	0.166		0.0846	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Potassium 40	22.0		1.22	2.53		0.303	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Protactinium 231	-0.762	U	0.796	0.800		1.30	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Radium 226	1.13		0.102	0.155	1.00	0.0585	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Thorium 232	1.30		0.132	0.186		0.0772	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Thorium 234	1.16		0.544	0.558		0.871	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Uranium 235	0.159	U	0.149	0.150		0.244	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Americium 241	-0.0104	U	2.27	2.27		0.0943	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Protactinium 234m	6.16		3.64	3.69		5.52	pCi/g	03/31/16 12:41	04/21/16 07:07	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.373		0.0454	0.0594		0.0317	pCi/g	03/31/16 12:41	04/21/16 07:07	1

Client Sample ID: L08-13-14-T-E-B-00

Date Collected: 03/24/16 10:30

Date Received: 03/28/16 11:11

Lab Sample ID: 160-16698-2

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.10		0.126	0.169		0.113	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Bismuth 212	1.29		0.373	0.396		0.330	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Bismuth 214	1.19		0.105	0.162		0.0613	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Lead 212	1.02		0.0766	0.153		0.0647	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Lead 214	1.23		0.0922	0.158		0.0775	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Potassium 40	18.2		1.05	2.13		0.202	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Protactinium 231	0.377	U	0.217	0.221		1.17	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Radium 226	1.19		0.105	0.162	1.00	0.0613	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Thorium 232	1.10		0.126	0.169		0.113	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Thorium 234	1.81		0.539	0.571		0.830	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Uranium 235	2.50		0.233	0.345		0.235	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Americium 241	0.0384	U	0.0635	0.0636		0.105	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Protactinium 234m	6.08		3.14	3.20		3.25	pCi/g	03/31/16 12:41	04/21/16 07:08	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.352		0.0447	0.0577		0.0325	pCi/g	03/31/16 12:41	04/21/16 07:08	1

TestAmerica St. Louis

Client Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Client Sample ID: L08-13-15-T-E-B-00

Lab Sample ID: 160-16698-3

Date Collected: 03/24/16 10:25

Matrix: Solid

Date Received: 03/28/16 11:11

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.15		0.160	0.199		0.156	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Bismuth 212	1.11		0.384	0.401		0.372	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Bismuth 214	1.18		0.126	0.176		0.0740	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Lead 212	1.08		0.0832	0.163		0.0739	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Lead 214	1.34		0.118	0.183		0.0776	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Potassium 40	17.2		1.29	2.19		0.242	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Protactinium 231	0.608	U	0.393	0.399		1.27	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Radium 226	1.18		0.126	0.176	1.00	0.0740	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Thorium 232	1.15		0.160	0.199		0.156	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Thorium 234	1.16		0.365	0.385		0.973	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Uranium 235	0.360		0.223	0.226		0.263	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Americium 241	0.0192	U	0.0719	0.0719		0.120	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Protactinium 234m	3.06	U	3.97	3.99		5.86	pCi/g	03/31/16 12:41	04/21/16 07:09	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.363		0.0698	0.0793		0.0582	pCi/g	03/31/16 12:41	04/21/16 07:09	1

Client Sample ID: L08-13-16-T-E-B-00

Lab Sample ID: 160-16698-4

Date Collected: 03/24/16 10:35

Matrix: Solid

Date Received: 03/28/16 11:11

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.05		0.130	0.169		0.131	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Bismuth 212	1.29		0.436	0.456		0.443	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Bismuth 214	1.27		0.123	0.181		0.0742	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Lead 212	1.06		0.0864	0.163		0.0726	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Lead 214	1.35		0.111	0.179		0.0710	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Potassium 40	19.7		1.31	2.40		0.342	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Protactinium 231	0.179	U	0.195	0.195		1.16	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Radium 226	1.27		0.123	0.181	1.00	0.0742	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Thorium 232	1.05		0.130	0.169		0.131	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Thorium 234	0.915	U	0.320	0.334		0.946	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Uranium 235	0.243		0.121	0.124		0.180	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Americium 241	-0.00114	U	0.0633	0.0633		0.107	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Protactinium 234m	0.000	U	2.84	2.84		4.97	pCi/g	03/31/16 12:41	04/21/16 07:47	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.387		0.0527	0.0663		0.0386	pCi/g	03/31/16 12:41	04/21/16 07:47	1

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Client Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Client Sample ID: L08-13-17-T-E-B-00

Lab Sample ID: 160-16698-5

Date Collected: 03/24/16 15:00

Matrix: Solid

Date Received: 03/28/16 11:11

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.27		0.138	0.187		0.0969	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Bismuth 212	1.26		0.311	0.337		0.365	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Bismuth 214	1.26		0.109	0.170		0.0730	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Lead 212	1.10		0.0805	0.164		0.0704	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Lead 214	1.49		0.105	0.188		0.0788	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Potassium 40	20.7		1.10	2.36		0.306	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Protactinium 231	0.201	U	0.466	0.467		0.786	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Radium 226	1.26		0.109	0.170	1.00	0.0730	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Thorium 232	1.27		0.138	0.187		0.0969	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Thorium 234	1.05		0.461	0.474		0.733	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Uranium 235	-0.0621	U	0.143	0.143		0.239	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Americium 241	-0.00896	U	4.18	4.18		0.106	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Protactinium 234m	5.43		2.34	2.40		5.06	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.84		0.658	0.692		0.777	pCi/g	03/31/16 12:41	04/21/16 07:48	1
Tl-208	0.386		0.0579	0.0702		0.0452	pCi/g	03/31/16 12:41	04/21/16 07:48	1

QC Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-243065/1-A

Matrix: Solid

Analysis Batch: 247184

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 243065

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.0008809	U	0.00806	0.00806		0.0723	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Bismuth 212	0.01923	U	0.0986	0.0987		0.183	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Bismuth 214	-0.004447	U	0.0406	0.0406		0.0370	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Lead 212	0.007254	U	0.0104	0.0104		0.0178	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Lead 214	0.006710	U	0.00550	0.00555		0.0310	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Potassium 40	-0.05688	U	2.28	2.28		0.164	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Protactinium 231	0.08744	U	0.164	0.164		0.282	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Radium 226	-0.004447	U	0.0406	0.0406	1.00	0.0370	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Thorium 232	0.0008809	U	0.00806	0.00806		0.0723	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Thorium 234	-0.06181	U	0.295	0.295		0.278	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Uranium 235	0.008807	U	0.0339	0.0339		0.0617	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Americium 241	-0.002268	U	0.0145	0.0145		0.0257	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Protactinium 234m	0.005149	U	0.0500	0.0500		2.29	pCi/g	03/31/16 12:41	04/21/16 07:05	1
Other Detected Radionuclides	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/g	03/31/16 12:41	04/21/16 07:05	1

Lab Sample ID: LCS 160-243065/2-A

Matrix: Solid

Analysis Batch: 247187

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 243065

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	98.42		10.2		0.507	pCi/g	98	87 - 116
Cesium 137	34.0	32.64		3.42		0.150	pCi/g	96	87 - 120
Cobalt 60	31.5	30.45		3.08		0.118	pCi/g	97	87 - 115

Lab Sample ID: 160-16698-1 DU

Matrix: Solid

Analysis Batch: 247184

Client Sample ID: L08-13-13-T-E-B-00

Prep Type: Total/NA

Prep Batch: 243065

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	1.30		1.177		0.201		0.0965	pCi/g	0.33	1
Bismuth 212	1.39		1.181		0.358		0.418	pCi/g	0.27	1
Bismuth 214	1.13		1.172		0.165		0.0651	pCi/g	0.14	1
Lead 212	1.15		1.030		0.156		0.0670	pCi/g	0.37	1
Lead 214	1.30		1.113		0.155		0.0804	pCi/g	0.58	1
Potassium 40	22.0		19.06		2.25		0.285	pCi/g	0.62	1
Protactinium 231	-0.762	U	0.5998	U F	0.265		1.07	pCi/g	1.28	1
Radium 226	1.13		1.172		0.165	1.00	0.0651	pCi/g	0.14	1
Thorium 232	1.30		1.177		0.201		0.0965	pCi/g	0.33	1
Thorium 234	1.16		1.233		0.543		0.835	pCi/g	0.07	1
Uranium 235	0.159	U	-0.04614	U	0.220		0.250	pCi/g	0.55	1
Americium 241	-0.0104	U	0.009895	U	0.0588		0.0989	pCi/g	0.01	1

TestAmerica St. Louis

QC Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-16698-1 DU
Matrix: Solid
Analysis Batch: 247184

Client Sample ID: L08-13-13-T-E-B-00
Prep Type: Total/NA
Prep Batch: 243065

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Protactinium 234m	6.16		2.810	U	2.96		4.84	pCi/g	0.50	1
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Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Tl-208	0.373		0.3134		0.0535		0.0318	pCi/g	0.53	1

QC Association Summary

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16698-2

Rad

Leach Batch: 242446

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16698-1	L08-13-13-T-E-B-00	Total/NA	Solid	Dry and Grind	
160-16698-1 DU	L08-13-13-T-E-B-00	Total/NA	Solid	Dry and Grind	
160-16698-2	L08-13-14-T-E-B-00	Total/NA	Solid	Dry and Grind	
160-16698-3	L08-13-15-T-E-B-00	Total/NA	Solid	Dry and Grind	
160-16698-4	L08-13-16-T-E-B-00	Total/NA	Solid	Dry and Grind	
160-16698-5	L08-13-17-T-E-B-00	Total/NA	Solid	Dry and Grind	

Prep Batch: 243065

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16698-1	L08-13-13-T-E-B-00	Total/NA	Solid	Fill_Geo-21	242446
160-16698-1 DU	L08-13-13-T-E-B-00	Total/NA	Solid	Fill_Geo-21	242446
160-16698-2	L08-13-14-T-E-B-00	Total/NA	Solid	Fill_Geo-21	242446
160-16698-3	L08-13-15-T-E-B-00	Total/NA	Solid	Fill_Geo-21	242446
160-16698-4	L08-13-16-T-E-B-00	Total/NA	Solid	Fill_Geo-21	242446
160-16698-5	L08-13-17-T-E-B-00	Total/NA	Solid	Fill_Geo-21	242446
LCS 160-243065/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-243065/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	