

# 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: 160-3530-2

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

For:

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

Attn: Martin Swanson



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Authorized for release by:  
9/24/2013 5:17:50 AM

Ivan Vania, Project Manager I  
[ivan.vania@testamericainc.com](mailto:ivan.vania@testamericainc.com)

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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: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3530-2

**Job ID: 160-3530-2**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Westinghouse Electric Company LLC**

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

**Report Number: 160-3530-2**

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 08/26/2013; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 20.0 C.

### **RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)**

Samples L050328PUI01 (160-3530-1), L050328PUI02 (160-3530-2), L050328PUI03 (160-3530-3), L050328PUI04 (160-3530-4), L050328PUI05 (160-3530-5), L050328PUI06 (160-3530-6), L050328PUI07 (160-3530-7), L050341PUB00 (160-3530-8) and L050342PUB00 (160-3530-9) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were leached on 08/27/2013, prepared on 08/29/2013 and analyzed on 09/19/2013.

Preparation Batch 69559:

Lead-214 analyzed by gamma spectroscopy was detected above the MDC in the method blank. Variations in Compton backgrounds and statistical analyses allow for small area counts in the ROIs of this nuclide. Other Uranium decay chain products are not present in the blank to support lead-214 identification. The data is reported.

## Case Narrative

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

TestAmerica Job ID: 160-3530-2

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### Job ID: 160-3530-2 (Continued)

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#### Laboratory: TestAmerica St. Louis (Continued)

The RER was outside of the acceptance limits of 1 for protactinium-231. Both the sample and duplicate activity were less than the MDC. (160-3530-9 DU), (LCS 160-69559/2-A), (MB 160-69559/1-A), L050328PUI01 (160-3530-1), L050328PUI02 (160-3530-2), L050328PUI03 (160-3530-3), L050328PUI04 (160-3530-4), L050328PUI05 (160-3530-5), L050328PUI06 (160-3530-6), L050328PUI07 (160-3530-7), L050341PUB00 (160-3530-8), L050342PUB00 (160-3530-9)

No other difficulties were encountered during the Radium 226 analysis. All other quality control parameters were within the acceptance limits.

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Procedure HDP-PR-QA-006, Chain of Custody Revison: 3 Westinghouse Non-Proprietary Class 3		Page 1 of 1
<b>Hematite Decommissioning Project</b>		
FORM HDP-PR-QA-006-1 <b>CHAIN OF CUSTODY</b>		
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.		
<b>Chain of Custody ID No.</b> F-082613-01 <b>Page</b> 1/1		
<b>Project Name:</b> Westinghouse Electric Company		
<b>Contact Person:</b> Gerald Rood		
<b>Phone Number:</b> 314-810-3382		
<b>Sampler Name:</b> Scott Jenkins		
Total Containers		
<b>Laboratory Name:</b> TA-MO		
<b>Laboratory Address:</b> 13715 Rider Trail North		
<b>Phone No.:</b> 314-298-8566		
<b>Laboratory Contact Person:</b> Joe Walker		
<b>Phone No.:</b> 708-870-8453		
<b>Turn Around Time</b> (7 days)		
Rush		
Remarks		
Requested Analysis		
Gamma Spec (21 day ingrow for Ra-226)		
Isotopic Uranium		
Tc-99		
Gamma Spec		
Comp (C) or Grab (G)		
Matrix		
Sample ID	Date	Time
L050328PUI01	8/23/2013	10:30
L050328PUI02	8/23/2013	10:50
L050328PUI03	8/23/2013	11:05
L050328PUI04	8/23/2013	14:10
L050328PUI05	8/23/2013	14:00
L050328PUI06	8/23/2013	14:40
L050328PUI07	8/23/2013	15:00
L050341PUB00	8/23/2013	15:30
L050342PUB00	8/23/2013	15:35
Total 9		
Cooler ID: 0826-03		
Cooler Temperature: Ambient		
Shipper and Number:		
Comments: Please re-analyze the samples after 21-day ingrowth period.		
Verified By:		



## Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-3530-2

**Login Number: 3530**

**List Source: TestAmerica St. Louis**

**List Number: 1**

**Creator: Clarke, Jill C**

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.	False	
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.	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.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

## Definitions/Glossary

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

TestAmerica Job ID: 160-3530-2

### Qualifiers

#### Rad

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
F	Duplicate RPD exceeds the control limit

### Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
▫	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
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: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3530-2

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

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**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





# Sample Summary

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

TestAmerica Job ID: 160-3530-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-3530-1	L050328PUI01	Solid	08/23/13 10:30	08/26/13 18:30
160-3530-2	L050328PUI02	Solid	08/23/13 10:50	08/26/13 18:30
160-3530-3	L050328PUI03	Solid	08/23/13 11:05	08/26/13 18:30
160-3530-4	L050328PUI04	Solid	08/23/13 14:10	08/26/13 18:30
160-3530-5	L050328PUI05	Solid	08/23/13 14:00	08/26/13 18:30
160-3530-6	L050328PUI06	Solid	08/23/13 14:40	08/26/13 18:30
160-3530-7	L050328PUI07	Solid	08/23/13 15:00	08/26/13 18:30
160-3530-8	L050341PUB00	Solid	08/23/13 15:30	08/26/13 18:30
160-3530-9	L050342PUB00	Solid	08/23/13 15:35	08/26/13 18:30

# Client Sample Results

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

TestAmerica Job ID: 160-3530-2

**Client Sample ID: L050328PUI01**

**Lab Sample ID: 160-3530-1**

Date Collected: 08/23/13 10:30

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.17		0.152	0.193		0.111	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Bismuth 212	1.49		0.423	0.451		0.359	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Bismuth 214	1.11		0.107	0.158		0.0667	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Lead 212	1.03		0.0812	0.156		0.0879	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Lead 214	1.34		0.105	0.174		0.0829	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Potassium 40	24.0		1.32	2.79		0.419	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Protactinium 231	0.356	U	0.214	0.217		1.26	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Radium 226	1.11		0.107	0.158	1.00	0.0667	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Thorium 232	1.17		0.152	0.193		0.111	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Thorium 234	3.03		0.968	1.02		1.12	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Uranium 235	0.580		0.156	0.167		0.229	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Americium 241	0.0162	U	0.0723	0.0723		0.121	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Protactinium 234m	4.00	U	3.26	3.29		5.14	pCi/g	08/29/13 12:45	09/19/13 11:33	1

**Client Sample ID: L050328PUI02**

**Lab Sample ID: 160-3530-2**

Date Collected: 08/23/13 10:50

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.19		0.126	0.171		0.113	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Bismuth 212	1.54		0.537	0.558		0.508	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Bismuth 214	1.14		0.129	0.170		0.0871	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Lead 212	1.13		0.0877	0.150		0.0752	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Lead 214	1.28		0.102	0.160		0.0939	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Potassium 40	21.2		1.45	2.52		0.313	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Protactinium 231	0.572	U	0.253	0.259		1.48	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Radium 226	1.14		0.129	0.170	1.00	0.0871	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Thorium 232	1.19		0.126	0.171		0.113	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Thorium 234	2.94		0.482	0.561		1.10	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Uranium 235	0.904		0.217	0.234		0.256	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Americium 241	-0.0303	U	0.114	0.114		0.114	pCi/g	08/29/13 12:45	09/19/13 11:32	1
Protactinium 234m	2.42	U	4.33	4.33		6.81	pCi/g	08/29/13 12:45	09/19/13 11:32	1

**Client Sample ID: L050328PUI03**

**Lab Sample ID: 160-3530-3**

Date Collected: 08/23/13 11:05

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.15		0.166	0.204		0.183	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Bismuth 212	1.61		0.608	0.630		0.516	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Bismuth 214	1.29		0.141	0.194		0.0878	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Lead 212	1.03		0.0871	0.159		0.0802	pCi/g	08/29/13 12:45	09/19/13 11:33	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-3530-2

**Client Sample ID: L050328PU103**

**Lab Sample ID: 160-3530-3**

Date Collected: 08/23/13 11:05

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Lead 214	1.30		0.115	0.178		0.109	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Potassium 40	21.0		1.48	2.62		0.315	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Protactinium 231	-0.695	U	0.923	0.926		1.53	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Radium 226	1.29		0.141	0.194	1.00	0.0878	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Thorium 232	1.15		0.166	0.204		0.183	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Thorium 234	9.23		1.35	1.66		1.40	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Uranium 235	1.31		0.209	0.248		0.267	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Americium 241	0.0887	U	0.0734	0.0740		0.107	pCi/g	08/29/13 12:45	09/19/13 11:33	1
Protactinium 234m	18.5		7.01	7.26		8.11	pCi/g	08/29/13 12:45	09/19/13 11:33	1

**Client Sample ID: L050328PU104**

**Lab Sample ID: 160-3530-4**

Date Collected: 08/23/13 14:10

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.35		0.155	0.207		0.108	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Bismuth 212	1.41		0.553	0.572		0.512	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Bismuth 214	1.22		0.109	0.167		0.0607	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Lead 212	1.14		0.0784	0.167		0.0665	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Lead 214	1.47		0.114	0.191		0.0725	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Potassium 40	22.4		1.32	2.64		0.429	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Protactinium 231	-0.675	U	0.730	0.734		1.20	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Radium 226	1.22		0.109	0.167	1.00	0.0607	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Thorium 232	1.35		0.155	0.207		0.108	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Thorium 234	8.14		1.19	1.47		1.25	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Uranium 235	1.20		0.234	0.264		0.269	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Americium 241	-0.0106	U	0.0709	0.0709		0.119	pCi/g	08/29/13 12:45	09/19/13 11:34	1
Protactinium 234m	10.2		3.72	3.86		3.89	pCi/g	08/29/13 12:45	09/19/13 11:34	1

**Client Sample ID: L050328PU105**

**Lab Sample ID: 160-3530-5**

Date Collected: 08/23/13 14:00

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.16		0.152	0.193		0.130	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Bismuth 212	1.23		0.399	0.419		0.393	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Bismuth 214	1.27		0.130	0.185		0.0898	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Lead 212	1.02		0.0830	0.156		0.0898	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Lead 214	1.46		0.114	0.190		0.0770	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Potassium 40	23.9		1.31	2.78		0.346	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Protactinium 231	0.270	U	0.215	0.217		1.23	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Radium 226	1.27		0.130	0.185	1.00	0.0898	pCi/g	08/29/13 12:45	09/19/13 17:46	1

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# Client Sample Results

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

TestAmerica Job ID: 160-3530-2

**Client Sample ID: L050328PU105**

**Lab Sample ID: 160-3530-5**

Date Collected: 08/23/13 14:00

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Thorium 232	1.16		0.152	0.193		0.130	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Thorium 234	4.74		0.954	1.08		1.08	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Uranium 235	0.568		0.161	0.171		0.236	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Americium 241	0.00521	U	0.0746	0.0746		0.125	pCi/g	08/29/13 12:45	09/19/13 17:46	1
Protactinium 234m	8.50		3.89	3.98		5.78	pCi/g	08/29/13 12:45	09/19/13 17:46	1

**Client Sample ID: L050328PU106**

**Lab Sample ID: 160-3530-6**

Date Collected: 08/23/13 14:40

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.951		0.178	0.203		0.134	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Bismuth 212	1.66		0.427	0.461		0.338	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Bismuth 214	1.22		0.111	0.169		0.0468	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Lead 212	1.14		0.0825	0.169		0.0673	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Lead 214	1.47		0.129	0.200		0.0869	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Potassium 40	21.6		1.41	2.62		0.371	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Protactinium 231	0.211	U	0.196	0.197		1.36	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Radium 226	1.22		0.111	0.169	1.00	0.0468	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Thorium 232	0.951		0.178	0.203		0.134	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Thorium 234	2.83		0.892	0.940		1.07	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Uranium 235	0.483		0.197	0.203		0.240	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Americium 241	0.0180	U	0.0661	0.0662		0.111	pCi/g	08/29/13 12:45	09/19/13 17:47	1
Protactinium 234m	-0.0384	U	4.31	4.31		7.64	pCi/g	08/29/13 12:45	09/19/13 17:47	1

**Client Sample ID: L050328PU107**

**Lab Sample ID: 160-3530-7**

Date Collected: 08/23/13 15:00

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.828		0.176	0.196		0.217	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Bismuth 212	1.08		0.476	0.490		0.667	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Bismuth 214	1.25		0.149	0.198		0.102	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Lead 212	1.09		0.0921	0.169		0.0841	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Lead 214	1.41		0.129	0.195		0.109	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Potassium 40	20.4		1.50	2.57		0.334	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Protactinium 231	0.638	U	0.469	0.474		1.35	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Radium 226	1.25		0.149	0.198	1.00	0.102	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Thorium 232	0.828		0.176	0.196		0.217	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Thorium 234	19.1		1.98	2.81		1.92	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Uranium 235	3.39		0.293	0.452		0.350	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Americium 241	-0.0151	U	0.123	0.123		0.206	pCi/g	08/29/13 12:45	09/19/13 17:48	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-3530-2

**Client Sample ID: L050328PU107**

**Lab Sample ID: 160-3530-7**

Date Collected: 08/23/13 15:00

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Protactinium 234m	22.4		6.02	6.43		4.52	pCi/g	08/29/13 12:45	09/19/13 17:48	1

**Client Sample ID: L050341PUB00**

**Lab Sample ID: 160-3530-8**

Date Collected: 08/23/13 15:30

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	1.12		0.155	0.192		0.145	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Bismuth 212	1.70		0.528	0.556		0.456	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Bismuth 214	1.14		0.152	0.193		0.108	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Lead 212	1.12		0.0905	0.171		0.0840	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Lead 214	1.32		0.126	0.186		0.0988	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Potassium 40	20.0		1.46	2.51		0.196	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Protactinium 231	0.685	U	0.451	0.457		1.16	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Radium 226	1.14		0.152	0.193	1.00	0.108	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Thorium 232	1.12		0.155	0.192		0.145	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Thorium 234	37.0		1.98	4.35		1.88	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Uranium 235	1.97		0.300	0.361		0.381	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Americium 241	0.0223	U	0.126	0.126		0.210	pCi/g	08/29/13 12:45	09/19/13 19:22	1
Protactinium 234m	51.3		7.85	9.41		4.10	pCi/g	08/29/13 12:45	09/19/13 19:22	1

**Client Sample ID: L050342PUB00**

**Lab Sample ID: 160-3530-9**

Date Collected: 08/23/13 15:35

Matrix: Solid

Date Received: 08/26/13 18:30

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	1.21		0.128	0.178		0.102	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Bismuth 212	1.23		0.389	0.409		0.366	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Bismuth 214	1.13		0.106	0.159		0.0649	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Lead 212	1.07		0.0725	0.156		0.0590	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Lead 214	1.24		0.0876	0.156		0.0770	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Potassium 40	19.0		1.20	2.28		0.445	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Protactinium 231	-0.720	U	0.721	0.725		1.18	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Radium 226	1.13		0.106	0.159	1.00	0.0649	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Thorium 232	1.21		0.128	0.178		0.102	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Thorium 234	20.3		1.27	2.48		1.28	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Uranium 235	4.52		0.311	0.555		0.348	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Americium 241	-0.0380	U	0.0997	0.0998		0.166	pCi/g	08/29/13 12:45	09/19/13 17:48	1
Protactinium 234m	23.5		5.14	5.66		4.01	pCi/g	08/29/13 12:45	09/19/13 17:48	1

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-3530-2

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

**Lab Sample ID: MB 160-69559/1-A**  
**Matrix: Solid**  
**Analysis Batch: 73551**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 69559**

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.002868	U	0.0264	0.0264		0.0414	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Bismuth 212	0.02970	U	0.116	0.116		0.223	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Bismuth 214	0.02448	U	0.0281	0.0282		0.0379	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Lead 212	-0.001540	U	0.0188	0.0188		0.0272	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Lead 214	0.05330		0.0197	0.0205		0.0223	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Potassium 40	0.0000	U	0.0946	0.0946		0.512	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Protactinium 231	0.006444	U	0.0219	0.0219		0.424	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Radium 226	0.02448	U	0.0281	0.0282	1.00	0.0379	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Thorium 232	0.002868	U	0.0264	0.0264		0.0414	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Thorium 234	-0.03011	U	0.196	0.196		0.308	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Uranium 235	0.01572	U	0.0399	0.0400		0.0632	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Americium 241	-0.002066	U	0.0132	0.0132		0.0241	pCi/g	08/29/13 12:45	09/19/13 17:41	1
Protactinium 234m	0.2139	U	1.05	1.05		3.73	pCi/g	08/29/13 12:45	09/19/13 17:41	1

**Lab Sample ID: LCS 160-69559/2-A**  
**Matrix: Solid**  
**Analysis Batch: 73561**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 69559**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium 241	97.7	95.55		9.94		0.463	pCi/g	98	87 - 116
Cesium 137	31.6	31.24		3.27		0.111	pCi/g	99	87 - 120
Cobalt 60	24.6	23.66		2.39		0.0693	pCi/g	96	87 - 115

**Lab Sample ID: 160-3530-9 DU**  
**Matrix: Solid**  
**Analysis Batch: 73561**

**Client Sample ID: L050342PUB00**  
**Prep Type: Total/NA**  
**Prep Batch: 69559**

Analyte	Sample		DU DU		Total	RL	MDC	Unit	RER	RER
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					Limit
Actinium 228	1.21		1.066		0.181		0.0903	pCi/g	0.41	1
Bismuth 212	1.23		0.6686		0.381		0.571	pCi/g	0.71	1
Bismuth 214	1.13		1.149		0.164		0.0771	pCi/g	0.05	1
Lead 212	1.07		1.050		0.154		0.0599	pCi/g	0.06	1
Lead 214	1.24		1.284		0.171		0.0764	pCi/g	0.14	1
Potassium 40	19.0		19.79		2.34		0.358	pCi/g	0.18	1
Protactinium 231	-0.720	U	0.4879	U F	0.267		1.19	pCi/g	1.22	1
Radium 226	1.13		1.149		0.164	1.00	0.0771	pCi/g	0.05	1
Thorium 232	1.21		1.066		0.181		0.0903	pCi/g	0.41	1
Thorium 234	20.3		19.77		2.46		1.36	pCi/g	0.12	1
Uranium 235	4.52		4.410		0.542		0.332	pCi/g	0.1	1
Americium 241	-0.0380	U	0.01146	U	0.108		0.179	pCi/g	0.24	1
Protactinium 234m	23.5		25.59		6.57		4.97	pCi/g	0.17	1

# QC Association Summary

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

TestAmerica Job ID: 160-3530-2

## Rad

### Leach Batch: 68914

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3530-1	L050328PUI01	Total/NA	Solid	Dry and Grind	
160-3530-2	L050328PUI02	Total/NA	Solid	Dry and Grind	
160-3530-3	L050328PUI03	Total/NA	Solid	Dry and Grind	
160-3530-4	L050328PUI04	Total/NA	Solid	Dry and Grind	
160-3530-5	L050328PUI05	Total/NA	Solid	Dry and Grind	
160-3530-6	L050328PUI06	Total/NA	Solid	Dry and Grind	
160-3530-7	L050328PUI07	Total/NA	Solid	Dry and Grind	
160-3530-8	L050341PUB00	Total/NA	Solid	Dry and Grind	
160-3530-9	L050342PUB00	Total/NA	Solid	Dry and Grind	
160-3530-9 DU	L050342PUB00	Total/NA	Solid	Dry and Grind	

### Prep Batch: 69559

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3530-1	L050328PUI01	Total/NA	Solid	Fill_Geo-21	68914
160-3530-2	L050328PUI02	Total/NA	Solid	Fill_Geo-21	68914
160-3530-3	L050328PUI03	Total/NA	Solid	Fill_Geo-21	68914
160-3530-4	L050328PUI04	Total/NA	Solid	Fill_Geo-21	68914
160-3530-5	L050328PUI05	Total/NA	Solid	Fill_Geo-21	68914
160-3530-6	L050328PUI06	Total/NA	Solid	Fill_Geo-21	68914
160-3530-7	L050328PUI07	Total/NA	Solid	Fill_Geo-21	68914
160-3530-8	L050341PUB00	Total/NA	Solid	Fill_Geo-21	68914
160-3530-9	L050342PUB00	Total/NA	Solid	Fill_Geo-21	68914
160-3530-9 DU	L050342PUB00	Total/NA	Solid	Fill_Geo-21	68914
LCS 160-69559/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-69559/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	