

# 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: 160-16777-1

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:  
4/11/2016 11:50:58 AM

Ivan Vania, Project Manager II  
(314)298-8566  
[ivan.vania@testamericainc.com](mailto:ivan.vania@testamericainc.com)

### LINKS

Review your project  
results through  
**TotalAccess**

Have a Question?



Visit us at:  
[www.testamericainc.com](http://www.testamericainc.com)

*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.*

1

2

3

4

5

6

7

8

9

10

11

12



# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	5
Receipt Checklists . . . . .	6
Definitions/Glossary . . . . .	7
Method Summary . . . . .	8
Sample Summary . . . . .	9
Client Sample Results . . . . .	10
QC Sample Results . . . . .	14
QC Association Summary . . . . .	17
Tracer Carrier Summary . . . . .	19

# Case Narrative

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

TestAmerica Job ID: 160-16777-1

**Job ID: 160-16777-1**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Westinghouse Electric Company LLC**

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

**Report Number: 160-16777-1**

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 4/4/2016 11:00 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.

### **TECHNETIUM-99 (ICPMS)**

Samples L05-04-23-T-R-B-00 (160-16777-1), L05-04-24-T-S-B-00 (160-16777-2), L05-04-25-T-S-B-00 (160-16777-3) and L05-04-26-T-S-B-00 (160-16777-4) were analyzed for Technetium-99 (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 04/05/2016 and analyzed on 04/07/2016.

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

### **PERCENT SOLIDS**

Samples L05-04-23-T-R-B-00 (160-16777-1), L05-04-24-T-S-B-00 (160-16777-2), L05-04-25-T-S-B-00 (160-16777-3) and L05-04-26-T-S-B-00 (160-16777-4) were analyzed for percent solids in accordance with EPA Method 160.3 MOD. The samples were analyzed on 04/05/2016.

## Case Narrative

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

TestAmerica Job ID: 160-16777-1

---

### Job ID: 160-16777-1 (Continued)

---

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

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

#### **CESIUM-137 & OTHER GAMMA EMITTERS (GS)**

Samples L05-04-23-T-R-B-00 (160-16777-1), L05-04-24-T-S-B-00 (160-16777-2), L05-04-25-T-S-B-00 (160-16777-3) and L05-04-26-T-S-B-00 (160-16777-4) were analyzed for Cesium-137 & Other Gamma Emitters (GS) in accordance with DOE GA-01-R. The samples were leached on 04/04/2016, prepared on 04/06/2016 and analyzed on 04/07/2016.

Preparation Batch 160-244600:

Radium-226 is reported in these samples at the client's request. Radium-226 is reported from the 609.31 keV line of bismuth-214. Because the samples have not had 21-days of ingrowth, the activity for radium-226 is an estimated value and may be biased low. This bias is caused by the disruption of secular equilibrium between radium-226 and bismuth-214 by the loss of radon-222 during sample preparation. The samples are reported with the MDC achieved. L05-04-23-T-R-B-00 (160-16777-1), L05-04-24-T-S-B-00 (160-16777-2), L05-04-25-T-S-B-00 (160-16777-3), L05-04-26-T-S-B-00 (160-16777-4), (LCS 160-244600/2-A), (MB 160-244600/1-A) and (160-16777-A-1-G DU)

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

Hematite Decommissioning Project

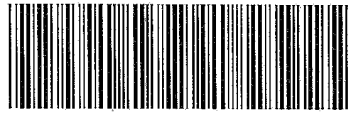
Procedure HDP-PR-QA-006, Chain of Custody

Revision: 4

Westinghouse Non-Proprietary Class 3

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.

<b>Chain of Custody ID No.</b> F-040216-01 <b>Page</b> 1/1				<b>Requested Analysis</b>										<b>Laboratory Name:</b>	
<b>Project Name:</b> Westinghouse Electric Company				Comp (C) or Grab (G)	Gamma Spec	Isotopic Uranium	Tc-99	Gamma Spec (21 day ingrow for Ra-226)	A	A	Total Containers	<b>Laboratory Name:</b> TA-MO			
<b>Contact Person:</b> Clark Evers												<b>Laboratory Address:</b> 13715 Rider Trail North			
<b>Phone Number:</b> 314-810-3336												<b>Phone No.:</b> 314-298-8566			
<b>Sampler Name:</b> Donte Love												<b>Laboratory Contact Person:</b> Ivan Vania			
<b>Turn Around Time</b>				<b>Phone No.:</b> 708-870-8453											
Rush				(7 days)											
Remarks															
<b>Sample ID</b>	<b>Date</b>	<b>Time</b>	<b>Matrix</b>												
L05-04-23-T-R-B-00	4/2/2016	9:15	S	G	X	X	X						1	LSA 05-04 Sidewall Bias	
L05-04-24-T-S-B-00	4/2/2016	8:55	S	G	X	X	X						1	LSA 05-04 Bias	
L05-04-25-T-S-B-00	4/2/2016	9:00	S	G	X	X	X						1	LSA 05-04 Bias	
L05-04-26-T-S-B-00	4/2/2016	9:10	S	G	X	X	X						1	LSA 05-04 Bias	
															
160-16777 Chain of Custody															
<b>Relinquished by:</b> M. DeKeyser		<b>Date/Time:</b> 4-4-16 0900		<b>Received by:</b> R. G. [Signature]		<b>Date/Time:</b> 4-4-16 0900		<b>Total:</b> 4		<b>Cooler Temperature:</b> Ambient					
<b>Company Name:</b> WEC				<b>Company Name:</b> CROSS ROADS				<b>Cooler ID:</b> 0401-02		<b>Shipper and Number:</b>					
<b>Received by:</b>		<b>Date/Time:</b>		<b>Relinquished by:</b>		<b>Date/Time:</b>		<b>Comments:</b> N/A							
<b>Company Name:</b>				<b>Company Name:</b>											
<b>Relinquished by:</b> M. G. [Signature]		<b>Date/Time:</b> 4-4-16 11:00		<b>Received by:</b> D. [Signature]		<b>Date/Time:</b> 4-4-16 1100		<b>Verified By:</b> Thomas Yardy / [Signature]		4-3-16					
<b>Company Name:</b> CROSS ROADS				<b>Company Name:</b> [Signature]											



## Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-16777-1

**Login Number: 16777**

**List Source: TestAmerica St. Louis**

**List Number: 1**

**Creator: Dedner, Connie L**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> 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 <math><6\text{mm}</math> (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: 160-16777-1

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

## Glossary

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

# Method Summary

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

TestAmerica Job ID: 160-16777-1

Method	Method Description	Protocol	Laboratory
6020A	Metals (ICP/MS), Tc-99	SW846	TAL SL
Moisture	Percent Moisture	EPA	TAL SL
6020A	Metals (ICP/MS), Tc-99 in Activity	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

#### Protocol References:

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

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

TestAmerica Job ID: 160-16777-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-16777-1	L05-04-23-T-R-B-00	Solid	04/02/16 09:15	04/04/16 11:00
160-16777-2	L05-04-24-T-S-B-00	Solid	04/02/16 08:55	04/04/16 11:00
160-16777-3	L05-04-25-T-S-B-00	Solid	04/02/16 09:00	04/04/16 11:00
160-16777-4	L05-04-26-T-S-B-00	Solid	04/02/16 09:10	04/04/16 11:00

1

2

3

4

5

6

7

8

9

10

11

12

# Client Sample Results

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

TestAmerica Job ID: 160-16777-1

**Client Sample ID: L05-04-23-T-R-B-00**

**Lab Sample ID: 160-16777-1**

Date Collected: 04/02/16 09:15

Matrix: Solid

Date Received: 04/04/16 11:00

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.11		0.119	0.164		0.109	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Americium 241	-0.0381	U	0.0642	0.0643		0.106	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Bismuth 212	1.23		0.302	0.328		0.264	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Bismuth 214	0.861		0.0979	0.133		0.0709	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Lead 212	1.04		0.0742	0.154		0.0639	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Lead 214	0.939		0.0859	0.130		0.0657	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Potassium 40	19.7		1.09	2.30		0.353	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Protactinium 231	0.303	U	0.171	0.175		1.07	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Radium 226	0.861		0.0979	0.133	1.00	0.0709	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Thorium 234	1.36		0.506	0.525	1.00	0.792	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Uranium 235	0.108	U	0.139	0.139		0.238	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Protactinium 234m	0.243	U	2.68	2.68		4.77	pCi/g	04/06/16 10:38	04/07/16 17:15	1
Thorium 232	1.11		0.119	0.164		0.109	pCi/g	04/06/16 10:38	04/07/16 17:15	1
<b>Other Detected Radionuclides</b>			<b>Count Uncert. (2σ+/-)</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Tl-208	0.367		0.0427	0.0572		0.0293	pCi/g	04/06/16 10:38	04/07/16 17:15	1

**Client Sample ID: L05-04-23-T-R-B-00**

**Lab Sample ID: 160-16777-1**

Date Collected: 04/02/16 09:15

Matrix: Solid

Date Received: 04/04/16 11:00

Percent Solids: 80.4

**Method: 6020A - Metals (ICP/MS), Tc-99**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99		ND	0.000068	0.000020	mg/Kg	☼	04/05/16 02:58	04/07/16 09:43	1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0952	U	0.0747	0.0752	1.36	0.232	pCi/g	04/05/16 02:58	04/07/16 09:43	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	92		30 - 110					04/05/16 02:58	04/07/16 09:43	1

**Client Sample ID: L05-04-24-T-S-B-00**

**Lab Sample ID: 160-16777-2**

Date Collected: 04/02/16 08:55

Matrix: Solid

Date Received: 04/04/16 11:00

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.13		0.127	0.172		0.136	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Americium 241	0.0201	U	0.0443	0.0443		0.0740	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Bismuth 212	1.40		0.515	0.535		0.468	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Bismuth 214	0.774		0.0979	0.127		0.0687	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Lead 212	1.00		0.0793	0.152		0.0682	pCi/g	04/06/16 10:38	04/07/16 17:16	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-16777-1

**Client Sample ID: L05-04-24-T-S-B-00**

**Lab Sample ID: 160-16777-2**

Date Collected: 04/02/16 08:55

Matrix: Solid

Date Received: 04/04/16 11:00

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Lead 214	0.827		0.0864	0.122		0.0600	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Potassium 40	18.3		1.16	2.20		0.232	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Protactinium 231	0.417	U	0.280	0.283		1.04	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Radium 226	0.774		0.0979	0.127	1.00	0.0687	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Thorium 234	0.828		0.262	0.275	1.00	0.745	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Uranium 235	0.0588	U	0.124	0.124		0.215	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Protactinium 234m	1.78	U	3.30	3.31		5.59	pCi/g	04/06/16 10:38	04/07/16 17:16	1
Thorium 232	1.13		0.127	0.172		0.136	pCi/g	04/06/16 10:38	04/07/16 17:16	1
<b>Other Detected</b>			<b>Count</b>	<b>Total</b>						
<b>Radionuclides</b>			<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
	<b>Result</b>	<b>Qualifier</b>	<b>(2σ+/-)</b>	<b>(2σ+/-)</b>						
Tl-208	0.382		0.0504	0.0642		0.0356	pCi/g	04/06/16 10:38	04/07/16 17:16	1

**Client Sample ID: L05-04-24-T-S-B-00**

**Lab Sample ID: 160-16777-2**

Date Collected: 04/02/16 08:55

Matrix: Solid

Date Received: 04/04/16 11:00

Percent Solids: 81.4

**Method: 6020A - Metals (ICP/MS), Tc-99**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99		ND	0.000068	0.000020	mg/Kg	☼	04/05/16 02:58	04/07/16 09:56	1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	0.110	U	0.107	0.107	1.36	0.233	pCi/g	04/05/16 02:58	04/07/16 09:56	1
<b>Carrier</b>			<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	90		30 - 110					04/05/16 02:58	04/07/16 09:56	1

**Client Sample ID: L05-04-25-T-S-B-00**

**Lab Sample ID: 160-16777-3**

Date Collected: 04/02/16 09:00

Matrix: Solid

Date Received: 04/04/16 11:00

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.08		0.118	0.161		0.0961	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Americium 241	0.000549	U	0.0486	0.0486		0.0825	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Bismuth 212	1.32		0.374	0.399		0.342	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Bismuth 214	0.674		0.0876	0.112		0.0704	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Lead 212	1.02		0.0770	0.153		0.0627	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Lead 214	0.845		0.0831	0.121		0.0625	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Potassium 40	19.3		1.15	2.29		0.362	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Protactinium 231	0.448	U	0.249	0.254		0.974	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Radium 226	0.674		0.0876	0.112	1.00	0.0704	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Thorium 234	0.984		0.507	0.517	1.00	0.816	pCi/g	04/06/16 10:38	04/07/16 17:17	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-16777-1

**Client Sample ID: L05-04-25-T-S-B-00**

**Lab Sample ID: 160-16777-3**

Date Collected: 04/02/16 09:00

Matrix: Solid

Date Received: 04/04/16 11:00

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Uranium 235	0.0856	U	0.112	0.112		0.171	pCi/g	04/06/16 10:38	04/07/16 17:17	1
Protactinium 234m	1.94	U	2.79	2.79		4.64	pCi/g	04/06/16 10:38	04/07/16 17:17	1
<b>Thorium 232</b>	<b>1.08</b>		0.118	0.161		0.0961	pCi/g	04/06/16 10:38	04/07/16 17:17	1
<b>Other Detected</b>			<b>Count</b>	<b>Total</b>						
<b>Radionuclides</b>	<b>Result</b>	<b>Qualifier</b>	<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
<i>Pb-210</i>	1.54		0.637	0.663		0.789	pCi/g	04/06/16 10:38	04/07/16 17:17	1
<i>Tl-208</i>	0.299		0.0419	0.0521		0.0324	pCi/g	04/06/16 10:38	04/07/16 17:17	1

**Client Sample ID: L05-04-25-T-S-B-00**

**Lab Sample ID: 160-16777-3**

Date Collected: 04/02/16 09:00

Matrix: Solid

Date Received: 04/04/16 11:00

Percent Solids: 80.1

**Method: 6020A - Metals (ICP/MS), Tc-99**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99		ND	0.000069	0.000021	mg/Kg	☼	04/05/16 02:58	04/07/16 10:01	1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	0.00947	U	0.0401	0.0401	1.38	0.237	pCi/g	04/05/16 02:58	04/07/16 10:01	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	90		30 - 110					04/05/16 02:58	04/07/16 10:01	1

**Client Sample ID: L05-04-26-T-S-B-00**

**Lab Sample ID: 160-16777-4**

Date Collected: 04/02/16 09:10

Matrix: Solid

Date Received: 04/04/16 11:00

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.891</b>		0.129	0.158		0.113	pCi/g	04/06/16 10:38	04/07/16 17:50	1
Americium 241	0.0189	U	0.0539	0.0539		0.0900	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Bismuth 212</b>	<b>1.37</b>		0.376	0.402		0.325	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Bismuth 214</b>	<b>0.773</b>		0.0853	0.117		0.0590	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Lead 212</b>	<b>1.08</b>		0.0727	0.158		0.0543	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Lead 214</b>	<b>0.872</b>		0.0761	0.118		0.0613	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Potassium 40</b>	<b>19.0</b>		1.08	2.23		0.318	pCi/g	04/06/16 10:38	04/07/16 17:50	1
Protactinium 231	0.452	U	0.212	0.218		1.07	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Radium 226</b>	<b>0.773</b>		0.0853	0.117	1.00	0.0590	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Thorium 234</b>	<b>0.761</b>		0.289	0.300	1.00	0.760	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Uranium 235</b>	<b>0.212</b>		0.119	0.121		0.157	pCi/g	04/06/16 10:38	04/07/16 17:50	1
Protactinium 234m	0.599	U	2.75	2.75		4.79	pCi/g	04/06/16 10:38	04/07/16 17:50	1
<b>Thorium 232</b>	<b>0.891</b>		0.129	0.158		0.113	pCi/g	04/06/16 10:38	04/07/16 17:50	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-16777-1

**Client Sample ID: L05-04-26-T-S-B-00**

**Lab Sample ID: 160-16777-4**

Date Collected: 04/02/16 09:10

Matrix: Solid

Date Received: 04/04/16 11:00

Other Detected			Count	Total						
Radionuclides	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.58		0.599	0.627		0.736	pCi/g	04/06/16 10:38	04/07/16 17:50	1
Tl-208	0.314		0.0390	0.0509		0.0286	pCi/g	04/06/16 10:38	04/07/16 17:50	1

**Client Sample ID: L05-04-26-T-S-B-00**

**Lab Sample ID: 160-16777-4**

Date Collected: 04/02/16 09:10

Matrix: Solid

Date Received: 04/04/16 11:00

Percent Solids: 77.2

**Method: 6020A - Metals (ICP/MS), Tc-99**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000071	0.000021	mg/Kg	☼	04/05/16 02:58	04/07/16 10:05	1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0195	U	0.0909	0.0909	1.42	0.244	pCi/g	04/05/16 02:58	04/07/16 10:05	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	91		30 - 110					04/05/16 02:58	04/07/16 10:05	1

# QC Sample Results

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

TestAmerica Job ID: 160-16777-1

## Method: 6020A - Metals (ICP/MS), Tc-99

**Lab Sample ID: MB 160-244121/1-A**  
**Matrix: Solid**  
**Analysis Batch: 244891**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 244121**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000051	0.000015	mg/Kg		04/05/16 02:58	04/07/16 09:35	1

**Lab Sample ID: LCS 160-244121/2-A**  
**Matrix: Solid**  
**Analysis Batch: 244891**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 244121**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Technetium 99	0.00119	0.00118		mg/Kg		99	80 - 120

**Lab Sample ID: 160-16777-1 MS**  
**Matrix: Solid**  
**Analysis Batch: 244891**

**Client Sample ID: L05-04-23-T-R-B-00**  
**Prep Type: Total/NA**  
**Prep Batch: 244121**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Technetium 99	ND		0.00148	0.00150		mg/Kg	☼	102	75 - 125

**Lab Sample ID: 160-16777-1 MSD**  
**Matrix: Solid**  
**Analysis Batch: 244891**

**Client Sample ID: L05-04-23-T-R-B-00**  
**Prep Type: Total/NA**  
**Prep Batch: 244121**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Technetium 99	ND		0.00148	0.00146		mg/Kg	☼	99	75 - 125	3	30

## Method: 6020A - Metals (ICP/MS), Tc-99 in Activity

**Lab Sample ID: MB 160-244121/1-A**  
**Matrix: Solid**  
**Analysis Batch: 244892**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 244121**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.03870	U	0.0746	0.0747	1.03	0.176	pCi/g	04/05/16 02:58	04/07/16 09:35	1
Carrier	MB %Yield	MB Qualifier	Limits							
Re	97		30 - 110							
								Prepared	Analyzed	Dil Fac
								04/05/16 02:58	04/07/16 09:35	1

**Lab Sample ID: LCS 160-244121/2-A**  
**Matrix: Solid**  
**Analysis Batch: 244892**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 244121**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Limits
Technetium 99	20.4	20.16		1.87	1.01	0.173	pCi/g	99	80 - 120
Carrier	LCS %Yield	LCS Qualifier	Limits						
Re	99		30 - 110						

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-16777-1

## Method: 6020A - Metals (ICP/MS), Tc-99 in Activity (Continued)

**Lab Sample ID: 160-16777-1 MS**

**Matrix: Solid**

**Analysis Batch: 244892**

**Client Sample ID: L05-04-23-T-R-B-00**

**Prep Type: Total/NA**

**Prep Batch: 244121**

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Technetium 99	0.0952	U	25.3	25.72		2.45	1.41	0.241	pCi/g	102	75 - 125
<b>Carrier</b>	<b>%Yield</b>	<b>MS Qualifier</b>	<b>Limits</b>								
Re	88		30 - 110								

**Lab Sample ID: 160-16777-1 MSD**

**Matrix: Solid**

**Analysis Batch: 244892**

**Client Sample ID: L05-04-23-T-R-B-00**

**Prep Type: Total/NA**

**Prep Batch: 244121**

Analyte	Sample Result	Sample Qual	Spike Added	MSD Result	MSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Technetium 99	0.0952	U	25.4	25.05		2.43	1.39	0.238	pCi/g	99	75 - 125	0.14	1
<b>Carrier</b>	<b>%Yield</b>	<b>MSD Qualifier</b>	<b>Limits</b>										
Re	90		30 - 110										

## Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-244600/1-A**

**Matrix: Solid**

**Analysis Batch: 244918**

**Client Sample ID: Method Blank**

**Prep Type: Total/NA**

**Prep Batch: 244600**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.009973	U	0.0387	0.0387		0.0740	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Americium 241	-0.001706	U	0.0132	0.0132		0.0242	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Bismuth 212	0.05427	U	0.127	0.127		0.230	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Bismuth 214	-0.006250	U	0.250	0.250		0.0408	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Lead 212	-0.009291	U	2.02	2.02		0.0275	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Lead 214	-0.01484	U	0.0818	0.0818		0.0403	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Potassium 40	-0.06207	U	2.48	2.48		0.243	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Protactinium 231	0.0000	U	0.0606	0.0606		0.351	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Radium 226	-0.006250	U	0.250	0.250	1.00	0.0408	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Thorium 234	0.08676	U	0.0721	0.0727	1.00	0.233	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Uranium 235	-0.01312	U	0.525	0.525		0.0858	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Protactinium 234m	-0.3801	U	15.2	15.2		4.00	pCi/g	04/06/16 10:38	04/07/16 17:19	1
Thorium 232	0.009973	U	0.0387	0.0387		0.0740	pCi/g	04/06/16 10:38	04/07/16 17:19	1
<b>Other Detected Radionuclides</b>	<b>MB Result</b>	<b>MB Qualifier</b>	<b>Count Uncert. (2σ+/-)</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Other Detected Radionuclide	None						pCi/g	04/06/16 10:38	04/07/16 17:19	1

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-16777-1

## Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

**Lab Sample ID: LCS 160-244600/2-A**  
**Matrix: Solid**  
**Analysis Batch: 244920**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 244600**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	103.4		10.8		0.385	pCi/g	103	87 - 116
Cesium 137	34.1	37.96		3.92	0.200	0.161	pCi/g	111	87 - 120
Cobalt 60	31.6	34.34		3.40		0.0840	pCi/g	109	87 - 115

**Lab Sample ID: 160-16777-1 DU**  
**Matrix: Solid**  
**Analysis Batch: 244919**

**Client Sample ID: L05-04-23-T-R-B-00**  
**Prep Type: Total/NA**  
**Prep Batch: 244600**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	1.11		1.163		0.180		0.104	pCi/g	0.15	1
Americium 241	-0.0381	U	0.01722	U	0.0570		0.0955	pCi/g	0.46	1
Bismuth 212	1.23		1.686		0.532		0.409	pCi/g	0.53	1
Bismuth 214	0.861		0.8411		0.133		0.0702	pCi/g	0.08	1
Lead 212	1.04		1.082		0.162		0.0669	pCi/g	0.13	1
Lead 214	0.939		1.045		0.139		0.0593	pCi/g	0.39	1
Potassium 40	19.7		20.69		2.46		0.241	pCi/g	0.20	1
Protactinium 231	0.303	U	0.6265	U	0.278		1.09	pCi/g	0.71	1
Radium 226	0.861		0.8411		0.133	1.00	0.0702	pCi/g	0.08	1
Thorium 234	1.36		0.9928		0.499	1.00	0.778	pCi/g	0.36	1
Uranium 235	0.108	U	0.1567	U	0.113		0.219	pCi/g	0.19	1
Protactinium 234m	0.243	U	2.429	U	3.06		5.81	pCi/g	0.38	1
Thorium 232	1.11		1.163		0.180		0.104	pCi/g	0.15	1
<b>Other Detected Radionuclides</b>	<b>Sample Result</b>	<b>Sample Qual</b>	<b>DU Result</b>	<b>DU Qual</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>RER</b>	<b>RER Limit</b>
Tl-208	0.367		0.3588		0.0610		0.0356	pCi/g	0.07	1



# QC Association Summary

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

TestAmerica Job ID: 160-16777-1

## Metals

### Prep Batch: 244121

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16777-1	L05-04-23-T-R-B-00	Total/NA	Solid	None	
160-16777-1 MS	L05-04-23-T-R-B-00	Total/NA	Solid	None	
160-16777-1 MSD	L05-04-23-T-R-B-00	Total/NA	Solid	None	
160-16777-2	L05-04-24-T-S-B-00	Total/NA	Solid	None	
160-16777-3	L05-04-25-T-S-B-00	Total/NA	Solid	None	
160-16777-4	L05-04-26-T-S-B-00	Total/NA	Solid	None	
LCS 160-244121/2-A	Lab Control Sample	Total/NA	Solid	None	
MB 160-244121/1-A	Method Blank	Total/NA	Solid	None	

### Analysis Batch: 244891

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16777-1	L05-04-23-T-R-B-00	Total/NA	Solid	6020A	244121
160-16777-1 MS	L05-04-23-T-R-B-00	Total/NA	Solid	6020A	244121
160-16777-1 MSD	L05-04-23-T-R-B-00	Total/NA	Solid	6020A	244121
160-16777-2	L05-04-24-T-S-B-00	Total/NA	Solid	6020A	244121
160-16777-3	L05-04-25-T-S-B-00	Total/NA	Solid	6020A	244121
160-16777-4	L05-04-26-T-S-B-00	Total/NA	Solid	6020A	244121
LCS 160-244121/2-A	Lab Control Sample	Total/NA	Solid	6020A	244121
MB 160-244121/1-A	Method Blank	Total/NA	Solid	6020A	244121

## General Chemistry

### Analysis Batch: 244119

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16768-A-1 DU	Duplicate	Total/NA	Solid	Moisture	
160-16777-1	L05-04-23-T-R-B-00	Total/NA	Solid	Moisture	
160-16777-2	L05-04-24-T-S-B-00	Total/NA	Solid	Moisture	
160-16777-3	L05-04-25-T-S-B-00	Total/NA	Solid	Moisture	
160-16777-4	L05-04-26-T-S-B-00	Total/NA	Solid	Moisture	

## Rad

### Leach Batch: 244065

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16777-1	L05-04-23-T-R-B-00	Total/NA	Solid	Dry and Grind	
160-16777-1 DU	L05-04-23-T-R-B-00	Total/NA	Solid	Dry and Grind	
160-16777-2	L05-04-24-T-S-B-00	Total/NA	Solid	Dry and Grind	
160-16777-3	L05-04-25-T-S-B-00	Total/NA	Solid	Dry and Grind	
160-16777-4	L05-04-26-T-S-B-00	Total/NA	Solid	Dry and Grind	

### Prep Batch: 244121

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16777-1	L05-04-23-T-R-B-00	Total/NA	Solid	None	
160-16777-1 MS	L05-04-23-T-R-B-00	Total/NA	Solid	None	
160-16777-1 MSD	L05-04-23-T-R-B-00	Total/NA	Solid	None	
160-16777-2	L05-04-24-T-S-B-00	Total/NA	Solid	None	
160-16777-3	L05-04-25-T-S-B-00	Total/NA	Solid	None	
160-16777-4	L05-04-26-T-S-B-00	Total/NA	Solid	None	
LCS 160-244121/2-A	Lab Control Sample	Total/NA	Solid	None	
MB 160-244121/1-A	Method Blank	Total/NA	Solid	None	

TestAmerica St. Louis

# QC Association Summary

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

TestAmerica Job ID: 160-16777-1

## Rad (Continued)

### Prep Batch: 244600

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16777-1	L05-04-23-T-R-B-00	Total/NA	Solid	Fill_Geo-0	244065
160-16777-1 DU	L05-04-23-T-R-B-00	Total/NA	Solid	Fill_Geo-0	244065
160-16777-2	L05-04-24-T-S-B-00	Total/NA	Solid	Fill_Geo-0	244065
160-16777-3	L05-04-25-T-S-B-00	Total/NA	Solid	Fill_Geo-0	244065
160-16777-4	L05-04-26-T-S-B-00	Total/NA	Solid	Fill_Geo-0	244065
LCS 160-244600/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-0	
MB 160-244600/1-A	Method Blank	Total/NA	Solid	Fill_Geo-0	

# Tracer/Carrier Summary

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

TestAmerica Job ID: 160-16777-1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

**Matrix: Solid**

**Prep Type: Total/NA**

## Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Re (30-110)
160-16777-1	L05-04-23-T-R-B-00	92
160-16777-1 MS	L05-04-23-T-R-B-00	88
160-16777-1 MSD	L05-04-23-T-R-B-00	90
160-16777-2	L05-04-24-T-S-B-00	90
160-16777-3	L05-04-25-T-S-B-00	90
160-16777-4	L05-04-26-T-S-B-00	91
LCS 160-244121/2-A	Lab Control Sample	99
MB 160-244121/1-A	Method Blank	97

### Tracer/Carrier Legend

Re = Re