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: 160-16779-2
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:
4/28/2016 12:42:25 PM

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

Table of Contents

Job ID: 160-16779-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Westinghouse Electric Company LLC

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

Report Number: 160-16779-2

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 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 20.0º C.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples L05-04-14-T-S-S-00 (160-16779-1), L05-04-15-T-R-S-00 (160-16779-2), L05-04-17-T-S-S-00 (160-16779-3), L05-04-18-T-R-S-00 (160-16779-4), L05-04-20-T-S-S-00 (160-16779-5), L05-04-21-T-R-S-00 (160-16779-6), L05-04-22-T-E-S-00 (160-16779-7) and L05-04-22-T-E-Q-00 (160-16779-8) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were leached on 04/04/2016, prepared on 04/06/2016 and analyzed on 04/27/2016.

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	Page 1 of 1
	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.

Chain of Cutody ID No. F-040116-02 **Page** 1/1

Project Name:
Westinghouse Electric Company

Contact Person:
Clark Evers

Phone Number:
314-810-3336

Sampler Name
Mike Dekeyser

Laboratory Name:
TA-MO

Laboratory Address:
13715 Rider Trail North

Phone No.
314-298-8566

Laboratory Contact Person:
Ivan Vania

Phone No.
708-870-8453

Turn Around Time
Rush (7 days)

Sample ID	Date	Time	Matrix	Comp (C) or Grab (G)	Requested Analysis: Gamma Spec	Isotopic Uranium	Tc-99	Gamma Spec (21 day ingrow for Ra-226)						Total Containers	Remarks
L05-04-14-T-S-S-00	4/1/2016	9:10	S	G	X		X	X						1	LSA 05-04
L05-04-15-T-R-S-00	4/1/2016	14:00	S	C	X		X	X						1	LSA 05-04
L05-04-17-T-S-S-00	4/1/2016	9:15	S	G	X		X	X						1	LSA 05-04
L05-04-18-T-R-S-00	4/1/2016	14:55	S	C	X		X	X						1	LSA 05-04
L05-04-20-T-S-S-00	4/1/2016	9:25	S	G	X		X	X						1	LSA 05-04
L05-04-21-T-R-S-00	4/1/2016	9:40	S	C	X		X	X						1	LSA 05-04
L05-04-22-T-E-S-00	4/1/2016	10:10	S	G	X		X	X						1	LSA 05-04
L05-04-22-T-E-Q-00	4/1/2016	10:10	S	G	X		X	X						1	LSA 05-04

160-16779 Chain of Custody

Relinquished by: M. DeKeyser	Date/Time 4-4-16 0900	Received by: KGMF 3815	Date/Time 4-4-16 0900	Total 8	Cooler Temperature: Ambient
Company Name: WEC		Company Name: Cross Roads		Cooler ID: 0401-02	Shipper and Number:
Received by:	Date/Time	Relinquished by:	Date/Time	Comments: N/A	
Company Name:		Company Name:			
Relinquished by: KGMF 3815	Date/Time 4-4-16 11:00	Received by:	Date/Time 4-4-16 1100	Verified By: Thomas Yarbrough 4-3-16	
Company Name: Cross Roads		Company Name: TBS Group			

Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-16779-2

Login Number: 16779
List Number: 1
Creator: Dedner, Connie L

List Source: TestAmerica St. Louis

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

TestAmerica Job ID: 160-16779-2

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: 160-16779-2

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

Sample Summary

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

TestAmerica Job ID: 160-16779-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-16779-1	L05-04-14-T-S-S-00	Solid	04/01/16 09:10	04/04/16 11:00
160-16779-2	L05-04-15-T-R-S-00	Solid	04/01/16 14:00	04/04/16 11:00
160-16779-3	L05-04-17-T-S-S-00	Solid	04/01/16 09:15	04/04/16 11:00
160-16779-4	L05-04-18-T-R-S-00	Solid	04/01/16 14:55	04/04/16 11:00
160-16779-5	L05-04-20-T-S-S-00	Solid	04/01/16 09:25	04/04/16 11:00
160-16779-6	L05-04-21-T-R-S-00	Solid	04/01/16 09:40	04/04/16 11:00
160-16779-7	L05-04-22-T-E-S-00	Solid	04/01/16 10:10	04/04/16 11:00
160-16779-8	L05-04-22-T-E-Q-00	Solid	04/01/16 10:10	04/04/16 11:00

Client Sample ID: L05-04-14-T-S-S-00

Lab Sample ID: 160-16779-1

Date Collected: 04/01/16 09:10

Matrix: Solid

Date Received: 04/04/16 11:00

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	**1.01**		0.104	0.146		0.0834	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Bismuth 212	**1.19**		0.396	0.415		0.342	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Bismuth 214	**0.838**		0.0959	0.130		0.0691	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Lead 212	**0.929**		0.0717	0.140		0.0615	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Lead 214	**0.965**		0.0826	0.130		0.0604	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Potassium 40	**17.6**		1.08	2.10		0.441	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Protactinium 231	0.496	U	0.214	0.221		1.05	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Radium 226	**0.838**		0.0959	0.130	1.00	0.0691	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Thorium 232	**1.01**		0.104	0.146		0.0834	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Thorium 234	0.740	U	0.266	0.277		0.773	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Uranium 235	**0.293**		0.109	0.113		0.176	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Americium 241	-0.000986	U	0.0541	0.0541		0.0914	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Protactinium 234m	2.64	U	2.32	2.34		4.10	pCi/g	04/06/16 10:29	04/27/16 13:40	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Tl-208	*0.273*		*0.0399*	*0.0490*		*0.0326*	*pCi/g*	*04/06/16 10:29*	*04/27/16 13:40*	*1*

Client Sample ID: L05-04-15-T-R-S-00

Lab Sample ID: 160-16779-2

Date Collected: 04/01/16 14:00

Matrix: Solid

Date Received: 04/04/16 11:00

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	**1.14**		0.164	0.201		0.157	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Bismuth 212	**1.46**		0.482	0.505		0.450	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Bismuth 214	**1.16**		0.125	0.174		0.0750	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Lead 212	**1.03**		0.0916	0.162		0.0800	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Lead 214	**1.23**		0.119	0.175		0.0823	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Potassium 40	**19.5**		1.41	2.45		0.402	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Protactinium 231	0.603	U	0.578	0.581		0.910	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Radium 226	**1.16**		0.125	0.174	1.00	0.0750	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Thorium 232	**1.14**		0.164	0.201		0.157	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Thorium 234	0.867	U	0.306	0.319		0.871	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Uranium 235	0.0758	U	0.126	0.126		0.261	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Americium 241	-0.0264	U	0.0729	0.0730		0.122	pCi/g	04/06/16 10:29	04/27/16 13:41	1
Protactinium 234m	2.09	U	3.72	3.72		6.29	pCi/g	04/06/16 10:29	04/27/16 13:41	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Pb-210	*1.63*		*0.647*	*0.675*		*0.816*	*pCi/g*	*04/06/16 10:29*	*04/27/16 13:41*	*1*
Tl-208	*0.384*		*0.0524*	*0.0659*		*0.0360*	*pCi/g*	*04/06/16 10:29*	*04/27/16 13:41*	*1*

Client Sample ID: L05-04-17-T-S-S-00

Lab Sample ID: 160-16779-3

Date Collected: 04/01/16 09:15

Matrix: Solid

Date Received: 04/04/16 11:00

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	**0.228**		0.0633	0.0675		0.0402	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Bismuth 212	**0.350**		0.175	0.179		0.179	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Bismuth 214	**0.320**		0.0494	0.0596		0.0317	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Lead 212	**0.210**		0.0398	0.0482		0.0386	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Lead 214	**0.326**		0.0498	0.0602		0.0371	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Potassium 40	**5.49**		0.576	0.805		0.174	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Protactinium 231	0.171	U	0.161	0.162		0.583	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Radium 226	**0.320**		0.0494	0.0596	1.00	0.0317	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Thorium 232	**0.228**		0.0633	0.0675		0.0402	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Thorium 234	**0.985**		0.315	0.331		0.470	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Uranium 235	**0.339**		0.0967	0.103		0.128	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Americium 241	0.0229	U	0.0320	0.0321		0.0530	pCi/g	04/06/16 10:29	04/27/16 13:40	1
Protactinium 234m	0.138	U	1.32	1.32		2.49	pCi/g	04/06/16 10:29	04/27/16 13:40	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Pb-210	*0.850*		*0.342*	*0.356*		*0.428*	*pCi/g*	*04/06/16 10:29*	*04/27/16 13:40*	*1*
Tl-208	*0.0964*		*0.0243*	*0.0262*		*0.0208*	*pCi/g*	*04/06/16 10:29*	*04/27/16 13:40*	*1*

Client Sample ID: L05-04-18-T-R-S-00

Lab Sample ID: 160-16779-4

Date Collected: 04/01/16 14:55

Matrix: Solid

Date Received: 04/04/16 11:00

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	**0.920**		0.194	0.215		0.156	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Bismuth 212	**1.77**		0.464	0.500		0.349	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Bismuth 214	**0.998**		0.131	0.167		0.0879	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Lead 212	**1.05**		0.103	0.171		0.0904	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Lead 214	**1.31**		0.134	0.191		0.0968	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Potassium 40	**17.4**		1.32	2.21		0.361	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Protactinium 231	0.315	U	0.590	0.591		0.993	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Radium 226	**0.998**		0.131	0.167	1.00	0.0879	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Thorium 232	**0.920**		0.194	0.215		0.156	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Thorium 234	**1.32**		0.593	0.609		0.939	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Uranium 235	-0.0985	U	0.226	0.226		0.272	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Americium 241	0.00134	U	0.0662	0.0662		0.112	pCi/g	04/06/16 10:29	04/27/16 14:14	1
Protactinium 234m	0.689	U	3.77	3.77		6.79	pCi/g	04/06/16 10:29	04/27/16 14:14	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Tl-208	*0.400*		*0.0555*	*0.0692*		*0.0379*	*pCi/g*	*04/06/16 10:29*	*04/27/16 14:14*	*1*

Client Sample ID: L05-04-20-T-S-S-00

Lab Sample ID: 160-16779-5

Date Collected: 04/01/16 09:25

Matrix: Solid

Date Received: 04/04/16 11:00

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	**0.702**		0.101	0.124		0.0751	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Bismuth 212	**0.677**		0.250	0.260		0.215	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Bismuth 214	**0.683**		0.0800	0.107		0.0557	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Lead 212	**0.677**		0.0640	0.109		0.0539	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Lead 214	**0.825**		0.0777	0.116		0.0650	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Potassium 40	**11.3**		0.851	1.43		0.309	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Protactinium 231	0.291	U	0.244	0.246		0.916	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Radium 226	**0.683**		0.0800	0.107	1.00	0.0557	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Thorium 232	**0.702**		0.101	0.124		0.0751	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Thorium 234	**1.22**		0.241	0.272		0.637	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Uranium 235	**0.325**		0.115	0.120		0.178	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Americium 241	0.00866	U	0.0491	0.0491		0.0827	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Protactinium 234m	**4.22**		2.21	2.25		3.88	pCi/g	04/06/16 10:29	04/27/16 14:15	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Tl-208	*0.188*		*0.0377*	*0.0424*		*0.0304*	*pCi/g*	*04/06/16 10:29*	*04/27/16 14:15*	*1*

Client Sample ID: L05-04-21-T-R-S-00

Lab Sample ID: 160-16779-6

Date Collected: 04/01/16 09:40

Matrix: Solid

Date Received: 04/04/16 11:00

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	**1.04**		0.143	0.177		0.118	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Bismuth 212	**0.987**		0.347	0.362		0.470	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Bismuth 214	**0.956**		0.102	0.142		0.0674	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Lead 212	**0.967**		0.0740	0.145		0.0617	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Lead 214	**0.962**		0.0827	0.130		0.0694	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Potassium 40	**16.7**		1.09	2.02		0.283	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Protactinium 231	0.443	U	0.271	0.275		0.997	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Radium 226	**0.956**		0.102	0.142	1.00	0.0674	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Thorium 232	**1.04**		0.143	0.177		0.118	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Thorium 234	**0.883**		0.246	0.263		0.672	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Uranium 235	0.0687	U	0.120	0.120		0.222	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Americium 241	0.00168	U	0.0450	0.0450		0.0764	pCi/g	04/06/16 10:29	04/27/16 14:15	1
Protactinium 234m	0.761	U	2.72	2.72		4.76	pCi/g	04/06/16 10:29	04/27/16 14:15	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Tl-208	*0.302*		*0.0457*	*0.0554*		*0.0349*	*pCi/g*	*04/06/16 10:29*	*04/27/16 14:15*	*1*

Client Sample ID: L05-04-22-T-E-S-00

Lab Sample ID: 160-16779-7

Date Collected: 04/01/16 10:10

Matrix: Solid

Date Received: 04/04/16 11:00

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	**0.882**		0.111	0.143		0.106	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Bismuth 212	**1.34**		0.432	0.454		0.385	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Bismuth 214	**0.846**		0.100	0.133		0.0730	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Lead 212	**0.978**		0.0818	0.151		0.0684	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Lead 214	**0.925**		0.0714	0.120		0.0640	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Potassium 40	**16.7**		1.02	1.99		0.194	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Protactinium 231	0.435	U	0.223	0.228		1.07	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Radium 226	**0.846**		0.100	0.133	1.00	0.0730	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Thorium 232	**0.882**		0.111	0.143		0.106	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Thorium 234	0.705	U	0.267	0.277		0.799	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Uranium 235	0.0487	U	0.144	0.144		0.243	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Americium 241	0.0244	U	0.0577	0.0578		0.0964	pCi/g	04/06/16 10:29	04/27/16 15:23	1
Protactinium 234m	3.19	U	1.99	2.02		4.60	pCi/g	04/06/16 10:29	04/27/16 15:23	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Tl-208	*0.299*		*0.0455*	*0.0551*		*0.0339*	*pCi/g*	*04/06/16 10:29*	*04/27/16 15:23*	*1*

Client Sample ID: L05-04-22-T-E-Q-00

Lab Sample ID: 160-16779-8

Date Collected: 04/01/16 10:10

Matrix: Solid

Date Received: 04/04/16 11:00

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	**0.972**		0.159	0.187		0.113	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Bismuth 212	**1.20**		0.342	0.364		0.296	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Bismuth 214	**0.912**		0.117	0.150		0.0834	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Lead 212	**0.991**		0.0807	0.152		0.0683	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Lead 214	**1.06**		0.0978	0.147		0.0671	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Potassium 40	**16.8**		1.13	2.05		0.220	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Protactinium 231	0.712	U	0.407	0.414		0.872	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Radium 226	**0.912**		0.117	0.150	1.00	0.0834	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Thorium 232	**0.972**		0.159	0.187		0.113	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Thorium 234	0.619	U	0.271	0.278		0.794	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Uranium 235	0.0717	U	0.137	0.137		0.229	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Americium 241	0.0187	U	0.0583	0.0583		0.0976	pCi/g	04/06/16 10:29	04/27/16 15:22	1
Protactinium 234m	**5.68**		3.40	3.45		4.69	pCi/g	04/06/16 10:29	04/27/16 15:22	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Pb-210	*1.62*		*0.626*	*0.654*		*0.777*	*pCi/g*	*04/06/16 10:29*	*04/27/16 15:22*	*1*
Tl-208	*0.356*		*0.0477*	*0.0603*		*0.0347*	*pCi/g*	*04/06/16 10:29*	*04/27/16 15:22*	*1*

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

Lab Sample ID: MB 160-244684/1-A
Matrix: Solid
Analysis Batch: 248012

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 244684

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.01339	U	0.0253	0.0254		0.0444	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Bismuth 212	0.04229	U	0.0748	0.0749		0.130	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Bismuth 214	0.002566	U	0.0200	0.0200		0.0335	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Lead 212	-0.003714	U	0.0263	0.0263		0.0231	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Lead 214	-0.006331	U	0.0470	0.0470		0.0299	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Potassium 40	-0.05688	U	2.28	2.28		0.164	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Protactinium 231	-0.0009372	U	0.155	0.155		0.292	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Radium 226	0.002566	U	0.0200	0.0200	1.00	0.0335	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Thorium 232	0.01339	U	0.0253	0.0254		0.0444	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Thorium 234	0.01415	U	0.0209	0.0209		0.274	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Uranium 235	-0.0001865	U	0.000605	0.000605		0.0593	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Americium 241	0.002849	U	0.0125	0.0125		0.0221	pCi/g	04/06/16 10:29	04/27/16 15:56	1
Protactinium 234m	-0.3414	U	13.7	13.7		2.35	pCi/g	04/06/16 10:29	04/27/16 15:56	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*	*04/06/16 10:29*	*04/27/16 15:56*	*1*

Lab Sample ID: LCS 160-244684/2-A
Matrix: Solid
Analysis Batch: 248014

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 244684

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	101.9		10.6		0.502	pCi/g	101	87 - 116
Cesium 137	34.0	34.06		3.57		0.172	pCi/g	100	87 - 120
Cobalt 60	31.4	31.15		3.15		0.104	pCi/g	99	87 - 115

Lab Sample ID: 160-16778-A-1-G DU
Matrix: Solid
Analysis Batch: 248009

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 244684

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	1.07		1.169		0.195		0.159	pCi/g	0.28	1
Bismuth 212	1.36		1.533		0.531		0.450	pCi/g	0.17	1
Bismuth 214	1.27		1.065		0.177		0.0932	pCi/g	0.58	1
Lead 212	1.07		1.040		0.170		0.0917	pCi/g	0.08	1
Lead 214	1.33		1.299		0.184		0.0866	pCi/g	0.09	1
Potassium 40	18.9		18.49		2.36		0.512	pCi/g	0.08	1
Protactinium 231	0.606	U	0.5927	U	0.254		1.33	pCi/g	0.03	1
Radium 226	1.27		1.065		0.177	1.00	0.0932	pCi/g	0.58	1
Thorium 232	1.07		1.169		0.195		0.159	pCi/g	0.28	1
Thorium 234	1.05		1.105		0.353		0.944	pCi/g	0.08	1
Uranium 235	0.307		0.2470		0.195		0.245	pCi/g	0.17	1
Americium 241	0.0181	U	-0.001279	U	0.0724		0.122	pCi/g	0.15	1

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

TestAmerica Job ID: 160-16779-2

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

Lab Sample ID: 160-16778-A-1-G DU
Matrix: Solid
Analysis Batch: 248009

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 244684

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Protactinium 234m	6.09			1.984	U	3.88		6.59	pCi/g			0.54	1
Other Detected Radionuclides	***Sample Result***	***Sample Qual***		***DU Result***	***DU Qual***	***Total Uncert. (2σ+/-)***	***RL***	***MDC***	***Unit***			***RER***	***RER Limit***
Tl-208	*0.349*			*0.3591*		*0.0683*		*0.0441*	*pCi/g*			*0.08*	*1*

QC Association Summary

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

TestAmerica Job ID: 160-16779-2

Rad

Leach Batch: 244065

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16778-A-1-G DU	Duplicate	Total/NA	Solid	Dry and Grind	
160-16779-1	L05-04-14-T-S-S-00	Total/NA	Solid	Dry and Grind	
160-16779-2	L05-04-15-T-R-S-00	Total/NA	Solid	Dry and Grind	
160-16779-3	L05-04-17-T-S-S-00	Total/NA	Solid	Dry and Grind	
160-16779-4	L05-04-18-T-R-S-00	Total/NA	Solid	Dry and Grind	
160-16779-5	L05-04-20-T-S-S-00	Total/NA	Solid	Dry and Grind	
160-16779-6	L05-04-21-T-R-S-00	Total/NA	Solid	Dry and Grind	
160-16779-7	L05-04-22-T-E-S-00	Total/NA	Solid	Dry and Grind	
160-16779-8	L05-04-22-T-E-Q-00	Total/NA	Solid	Dry and Grind	

Prep Batch: 244684

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16778-A-1-G DU	Duplicate	Total/NA	Solid	Fill_Geo-21	244065
160-16779-1	L05-04-14-T-S-S-00	Total/NA	Solid	Fill_Geo-21	244065
160-16779-2	L05-04-15-T-R-S-00	Total/NA	Solid	Fill_Geo-21	244065
160-16779-3	L05-04-17-T-S-S-00	Total/NA	Solid	Fill_Geo-21	244065
160-16779-4	L05-04-18-T-R-S-00	Total/NA	Solid	Fill_Geo-21	244065
160-16779-5	L05-04-20-T-S-S-00	Total/NA	Solid	Fill_Geo-21	244065
160-16779-6	L05-04-21-T-R-S-00	Total/NA	Solid	Fill_Geo-21	244065
160-16779-7	L05-04-22-T-E-S-00	Total/NA	Solid	Fill_Geo-21	244065
160-16779-8	L05-04-22-T-E-Q-00	Total/NA	Solid	Fill_Geo-21	244065
LCS 160-244684/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-244684/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	