

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: 160-15789-2

Client Project/Site: HDP

For:

Perma-Fix Environmental Services Inc.
2800 Solway Road
Knoxville, Tennessee 37931

Attn: Brian Miller



Authorized for release by:
2/29/2016 1:34:09 PM

Ivan Vania, Project Manager II
(314)298-8566

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: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Job ID: 160-15789-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Perma-Fix Environmental Services Inc.

Project: HDP

Report Number: 160-15789-2

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 1/20/2016 10:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 4 coolers at receipt time were 18.9° C, 18.9° C, 18.9° C and 18.9° C.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples B02-01-01-P-S-S-00 (160-15789-1), B02-01-02-P-R-S-00 (160-15789-2), B02-01-03-P-E-S-00 (160-15789-3), B02-01-04-P-S-S-00 (160-15789-4), B02-01-05-P-R-S-00 (160-15789-5), B02-01-06-P-E-S-00 (160-15789-6), B02-01-07-P-S-S-00 (160-15789-7), B02-01-08-P-R-S-00 (160-15789-8), B02-01-09-P-E-S-00 (160-15789-9), B02-01-10-P-S-S-00 (160-15789-10), B02-01-11-P-R-S-00 (160-15789-11), B02-01-12-P-E-S-00 (160-15789-12), B02-01-13-P-S-S-00 (160-15789-13), B02-01-14-P-R-S-00 (160-15789-14), B02-01-15-P-E-S-00 (160-15789-15), B02-01-16-P-S-S-00 (160-15789-16), B02-01-17-P-R-S-00 (160-15789-17), B02-01-18-P-E-S-00 (160-15789-18), B02-01-19-P-S-S-00 (160-15789-19), B02-01-20-P-R-S-00 (160-15789-20), B02-01-21-P-E-S-00 (160-15789-21), B02-01-22-P-S-S-00 (160-15789-22), B02-01-23-P-R-S-00 (160-15789-23), B02-01-24-P-E-S-00 (160-15789-24), B02-01-02-P-R-Q-00 (160-15789-25) and B02-01-10-P-S-Q-00 (160-15789-26) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were leached on 01/20/2016, prepared on 01/22/2016 and analyzed on 02/20/2016, 02/21/2016 and 02/28/2016.

Case Narrative

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Job ID: 160-15789-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

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

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TestAmerica St. Louis

13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record
TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☒ Other:

Client Contact		Project Manager: Brian Miller		Site Contact: Ellen Jakub		Date: 1/19/2016		COC No: 011916-FSS1											
Perma-Fix Environmental Services		Tel/Fax: (314) 810-3333		Lab Contact: Ivan Vania		Carrier: Courier		1 of 3 COCs											
2800 Solway Road		Analysis Turnaround Time		160-15789 Chain of Custody				Sampler: For Lab Use Only: Walk-in Client: Lab Sampling:											
Knoxville, TN 37931		☒ CALENDAR DAYS ☐ WORKING DAYS																	
(865) 690-0501 Phone		TAT if different from Below _____																	
(865) 539-9868 FAX		☐ 2 weeks ☒ 1 week ☐ 2 days ☐ 1 day																	
Project Name: Hematite Decommissioning Project		Site: Westinghouse Hematite, MO		P O # 832953				Job / SDG No.:											
Sample Identification		Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Gamma Spec Westinghouse Hematite Library	Alpha Spec	ICP/MS (Tc-99)	Gamma Spec (With post-21 day ingrowth)	Sample Specific Notes:						
B02-01-01-P-S-S-00		12/31/15	1150	C	Soil	1	N		X		X	X	Mark Shaffer						
B02-01-02-P-R-S-00		1/4/16	0925	C	Soil	1	N		X		X	X	Mark Shaffer						
B02-01-03-P-E-S-00		1/4/16	0935	C	Soil	1	N		X		X	X	Mark Shaffer						
B02-01-04-P-S-S-00		12/29/15	0925	C	Soil	1	N		X		X	X	Mark Shaffer						
B02-01-05-P-R-S-00		12/29/15	1030	C	Soil	1	N		X		X	X	Jahmai Williams						
B02-01-06-P-E-S-00		12/29/15	1035	C	Soil	1	N		X		X	X	Jahmai Williams						
B02-01-07-P-S-S-00		12/29/15	1100	C	Soil	1	N		X		X	X	Jahmai Williams						
B02-01-08-P-R-S-00		12/29/15	1130	C	Soil	1	N		X		X	X	Jahmai Williams						
B02-01-09-P-E-S-00		12/29/15	1135	C	Soil	1	N		X		X	X	Jahmai Williams						
B02-01-10-P-S-S-00		12/31/15	1045	C	Soil	1	N		X		X	X	Brian Miller						
B02-01-11-P-R-S-00		12/31/15	1115	C	Soil	1	N		X		X	X	Chris Chandler						
B02-01-12-P-E-S-00		12/31/15	1125	C	Soil	1	N		X		X	X	Brian Miller						
Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other None										Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)									
Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.										☒ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months									
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown																			
Special Instructions/QC Requirements & Comments: Potential for Radiological Contamination																			
Custody Seals Intact: ☒ Yes ☐ No					Custody Seal No.:					Cooler Temp. (°C): Obs'd: Cor'd: Therm ID No.:									
Relinquished by: <i>Ellen Jakub</i>					Company: <i>Perma-Fix</i>					Date/Time: <i>8:55 1/20/16</i>					Received by: <i>Gerald Brady</i>				
Relinquished by: <i>Gerald Brady</i>					Company: <i>Crossroads</i>					Date/Time: <i>10:30 1/20/16</i>					Received by: <i>Jeff Clark</i>				
Relinquished by:					Company:					Date/Time:					Received in Laboratory by:				

Hematite Decommissioning Project

Permafix (for Westinghouse) Non-Proprietary Class 3

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

Revision: 3

TestAmerica St. Louis

13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record
TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☒ Other:

TestAmerica Laboratories, Inc.

Client Contact		Project Manager: Brian Miller		Site Contact: Ellen Jakub		Date: 1/19/2016		COC No: 011916-FSS1			
Perma-Fix Environmental Services		Tel/Fax: (314) 810-3333		Lab Contact: Ivan Vania		Carrier: Courier		2 of 3 COCs			
2800 Solway Road		Analysis Turnaround Time		Filtered Sample (Y/N) Gamma Spec Westinghouse Hematite Library Alpha Spec ICP/MS (Tc-99) Gamma Spec (With post-21 day ingrowth)				Sampler: For Lab Use Only: Walk-in Client: Lab Sampling: Job / SDG No.:			
Knoxville, TN 37931		☒ CALENDAR DAYS ☐ WORKING DAYS									
(865) 690-0501 Phone		TAT if different from Below									
(865) 539-9868 FAX		☐ 2 weeks ☒ 1 week ☐ 2 days ☐ 1 day									
Project Name: Hematite Decommissioning Project											
Site: Westinghouse Hematite, MO											
P O # 832953											
Sample Identification		Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sample Specific Notes:				
B02-01-13-P-S-S-00		1/18/16	1005	C	Soil	1	N	X	X	X	Mark Shaffer
B02-01-14-P-R-S-00		1/18/16	1045	C	Soil	1	N	X	X	X	Chris Chandler
B02-01-15-P-E-S-00		1/18/16	1050	C	Soil	1	N	X	X	X	Mark Shaffer
B02-01-16-P-S-S-00		12/29/16	1520	C	Soil	1	N	X	X	X	Mark Shaffer
B02-01-17-P-R-S-00		12/31/15	1020	C	Soil	1	N	X	X	X	Chris Chandler
B02-01-18-P-E-S-00		12/31/15	1030	C	Soil	1	N	X	X	X	Mark Shaffer
B02-01-19-P-S-S-00		1/18/16	1105	C	Soil	1	N	X	X	X	Mark Shaffer
B02-01-20-P-R-S-00		1/18/16	1120	C	Soil	1	N	X	X	X	Chris Chandler
B02-01-21-P-E-S-00		1/18/16	1125	C	Soil	1	N	X	X	X	Mark Shaffer
B02-01-22-P-S-S-00		1/18/16	1315	C	Soil	1	N	X	X	X	Mark Shaffer
B02-01-23-P-R-S-00		1/18/16	1340	C	Soil	1	N	X	X	X	Chris Chandler
B02-01-24-P-E-S-00		1/18/16	1345	C	Soil	1	N	X	X	X	Mark Shaffer
Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other, None											
Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.							Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)				
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown							☒ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months				
Special Instructions/QC Requirements & Comments: Potential for Radiological Contamination											
Custody Seals Intact: ☒ Yes ☐ No		Custody Seal No.:		Cooler Temp. (°C): Obs'd:		Corr'd:		Therm ID No.:			
Relinquished by: <i>Ellen C. Jakub</i>		Company: <i>PERMAFIX</i>		Date/Time: <i>1/20/16 8:55</i>		Received by: <i>Gerald Brady</i>		Company: <i>Crossroads</i>			
Relinquished by: <i>Gerald Brady</i>		Company: <i>Crossroads</i>		Date/Time: <i>1/20/16 10:30</i>		Received by: <i>Joe Clark</i>		Company: <i>TA 572</i>			
Relinquished by:		Company:		Date/Time:		Received in Laboratory by:		Company:			

Hematite Decommissioning Project

Permafix (for Westinghouse) Non-Proprietary Class 3

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

Revision: 3

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Chain of Custody Record

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TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☒ Other:

Client Contact		Project Manager: Brian Miller		Site Contact: Ellen Jakub		Date: 1/19/2016		COC No: 011916-FSS1	
Perma-Fix Environmental Services		Tel/Fax: (314) 810-3333		Lab Contact: Ivan Vania		Carrier: Courier		3 of 3 COCs	
2800 Solway Road		Analysis Turnaround Time		Filtered Sample (Y/N) Perform MS/MSD (Y/N) Gamma Spec Westinghouse Hematite Library Alpha Spec ICP/MS (Tc-99) Gamma Spec (With post-21 day ingrowth)				Sampler:	
Knoxville, TN 37931		☒ CALENDAR DAYS ☐ WORKING DAYS TAT if different from Below _____						For Lab Use Only:	
(865) 690-0501 Phone		☐ 2 weeks ☒ 1 week ☐ 2 days ☐ 1 day						Walk-in Client:	
(865) 539-9868 FAX								Lab Sampling:	
Project Name: Hematite Decommissioning Project								Job / SDG No.:	
Site: Westinghouse Hematite, MO									
P O # 832953									
Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sample Specific Notes:			
B02-01-02-P-R-Q-00	1/4/16	925	C	Soil	1	N	X	X	Mark Shaffer
B02-01-10-P-S-Q-00	12/31/15	1045	C	Soil	1	N	X	X	Brian Miller
N / A									
Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other None									
Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.						Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)			
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown						☒ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months			
Special Instructions/QC Requirements & Comments: Potential for Radiological Contamination									
Custody Seals Intact: ☒ Yes ☐ No		Custody Seal No.:		Cooler Temp. (°C): Obs'd: _____		Con'd: _____		Therm ID No.:	
Relinquished by: <i>ELUEN C. JAKUB</i>		Company: <i>PERMAFIX</i>		Date/Time: <i>1/20/16</i>		Received by: <i>David Brady</i>		Company: <i>Crossroads</i>	
Relinquished by: <i>Gerald Brady</i>		Company: <i>Crossroads</i>		Date/Time: <i>1/20/16 10:30</i>		Received by: <i>Joe Clarke</i>		Company: <i>TA SL</i>	
Relinquished by:		Company:		Date/Time:		Received in Laboratory by:		Company:	

Hematite Decommissioning Project

Permafix (for Westinghouse) Non-Proprietary Class 3

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

Revision: 3

Login Sample Receipt Checklist

Client: Perma-Fix Environmental Services Inc.

Job Number: 160-15789-2

Login Number: 15789

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

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

Definitions/Glossary

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

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

Method Summary

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

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: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-15789-1	B02-01-01-P-S-S-00	Solid	12/31/15 11:50	01/20/16 10:30
160-15789-2	B02-01-02-P-R-S-00	Solid	01/04/16 09:25	01/20/16 10:30
160-15789-3	B02-01-03-P-E-S-00	Solid	01/04/16 09:35	01/20/16 10:30
160-15789-4	B02-01-04-P-S-S-00	Solid	12/29/15 09:25	01/20/16 10:30
160-15789-5	B02-01-05-P-R-S-00	Solid	12/29/15 10:30	01/20/16 10:30
160-15789-6	B02-01-06-P-E-S-00	Solid	12/29/15 10:35	01/20/16 10:30
160-15789-7	B02-01-07-P-S-S-00	Solid	12/29/15 11:00	01/20/16 10:30
160-15789-8	B02-01-08-P-R-S-00	Solid	12/29/15 11:30	01/20/16 10:30
160-15789-9	B02-01-09-P-E-S-00	Solid	12/29/15 11:35	01/20/16 10:30
160-15789-10	B02-01-10-P-S-S-00	Solid	12/31/15 10:45	01/20/16 10:30
160-15789-11	B02-01-11-P-R-S-00	Solid	12/31/15 11:15	01/20/16 10:30
160-15789-12	B02-01-12-P-E-S-00	Solid	12/31/15 11:25	01/20/16 10:30
160-15789-13	B02-01-13-P-S-S-00	Solid	01/18/16 10:05	01/20/16 10:30
160-15789-14	B02-01-14-P-R-S-00	Solid	01/18/16 10:45	01/20/16 10:30
160-15789-15	B02-01-15-P-E-S-00	Solid	01/18/16 10:50	01/20/16 10:30
160-15789-16	B02-01-16-P-S-S-00	Solid	12/29/15 15:20	01/20/16 10:30
160-15789-17	B02-01-17-P-R-S-00	Solid	12/31/15 10:20	01/20/16 10:30
160-15789-18	B02-01-18-P-E-S-00	Solid	12/31/15 10:30	01/20/16 10:30
160-15789-19	B02-01-19-P-S-S-00	Solid	01/18/16 11:05	01/20/16 10:30
160-15789-20	B02-01-20-P-R-S-00	Solid	01/18/16 11:20	01/20/16 10:30
160-15789-21	B02-01-21-P-E-S-00	Solid	01/18/16 11:25	01/20/16 10:30
160-15789-22	B02-01-22-P-S-S-00	Solid	01/18/16 13:15	01/20/16 10:30
160-15789-23	B02-01-23-P-R-S-00	Solid	01/18/16 13:40	01/20/16 10:30
160-15789-24	B02-01-24-P-E-S-00	Solid	01/18/16 13:45	01/20/16 10:30
160-15789-25	B02-01-02-P-R-Q-00	Solid	01/04/16 09:25	01/20/16 10:30
160-15789-26	B02-01-10-P-S-Q-00	Solid	12/31/15 10:45	01/20/16 10:30

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-01-P-S-S-00

Date Collected: 12/31/15 11:50

Date Received: 01/20/16 10:30

Lab Sample ID: 160-15789-1

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.110		0.0309	0.0329		0.0595	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Bismuth 212	0.000	U	0.115	0.115		0.280	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Bismuth 214	0.166		0.0319	0.0362		0.0261	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Lead 212	0.108		0.0210	0.0253		0.0210	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Lead 214	0.174		0.0248	0.0307		0.0287	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Potassium 40	2.49		0.336	0.422		0.176	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Protactinium 231	0.0486	U	0.0495	0.0498		0.361	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Radium 226	0.166		0.0319	0.0362	1.00	0.0261	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Thorium 232	0.110		0.0309	0.0329		0.0595	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Thorium 234	0.125	U	0.0939	0.0948		0.308	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Uranium 235	0.0348	U	0.0441	0.0442		0.0817	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Americium 241	0.00232	U	0.0184	0.0184		0.0317	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Protactinium 234m	0.846	U	0.786	0.791		2.12	pCi/g	01/22/16 09:43	02/28/16 04:40	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.0317		0.0112	0.0116		0.0107	pCi/g	01/22/16 09:43	02/28/16 04:40	1

Client Sample ID: B02-01-02-P-R-S-00

Date Collected: 01/04/16 09:25

Date Received: 01/20/16 10:30

Lab Sample ID: 160-15789-2

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.01		0.102	0.145		0.0960	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Bismuth 212	1.19		0.343	0.364		0.315	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Bismuth 214	1.03		0.0983	0.145		0.0642	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Lead 212	0.959		0.0662	0.141		0.0521	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Lead 214	1.09		0.0787	0.138		0.0605	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Potassium 40	17.7		1.01	2.07		0.322	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Protactinium 231	0.291	U	0.172	0.175		0.983	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Radium 226	1.03		0.0983	0.145	1.00	0.0642	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Thorium 232	1.01		0.102	0.145		0.0960	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Thorium 234	1.32		0.440	0.461		0.682	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Uranium 235	0.0902	U	0.122	0.122		0.214	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Americium 241	0.0113	U	0.0526	0.0526		0.0882	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Protactinium 234m	7.20		2.17	2.29		4.18	pCi/g	01/22/16 09:43	02/20/16 17:41	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.380		0.0405	0.0566		0.0238	pCi/g	01/22/16 09:43	02/20/16 17:41	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-03-P-E-S-00

Lab Sample ID: 160-15789-3

Date Collected: 01/04/16 09:35

Matrix: Solid

Date Received: 01/20/16 10:30

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	1.08		0.133	0.172		0.117	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Bismuth 212	1.50		0.440	0.467		0.375	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Bismuth 214	1.05		0.103	0.150		0.0596	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Lead 212	0.964		0.0815	0.149		0.0706	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Lead 214	1.26		0.0937	0.161		0.0725	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Potassium 40	18.4		1.19	2.23		0.252	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Protactinium 231	0.806	U	0.347	0.358		1.01	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Radium 226	1.05		0.103	0.150	1.00	0.0596	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Thorium 232	1.08		0.133	0.172		0.117	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Thorium 234	0.756	U	0.280	0.291		0.844	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Uranium 235	0.154	U	0.155	0.156		0.222	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Americium 241	0.00198	U	0.0501	0.0501		0.0850	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Protactinium 234m	5.76		3.71	3.76		4.89	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.62		0.626	0.654		0.761	pCi/g	01/22/16 09:43	02/20/16 18:17	1
Tl-208	0.337		0.0510	0.0618		0.0412	pCi/g	01/22/16 09:43	02/20/16 18:17	1

Client Sample ID: B02-01-04-P-S-S-00

Lab Sample ID: 160-15789-4

Date Collected: 12/29/15 09:25

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.0532	U	0.0256	0.0262		0.0621	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Bismuth 212	0.0763	U	0.110	0.110		0.183	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Bismuth 214	0.123		0.0264	0.0293		0.0246	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Lead 212	0.0567		0.0173	0.0188		0.0241	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Lead 214	0.154		0.0280	0.0323		0.0257	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Potassium 40	2.08		0.296	0.362		0.178	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Protactinium 231	0.0211	U	0.0688	0.0688		0.309	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Radium 226	0.123		0.0264	0.0293	1.00	0.0246	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Thorium 232	0.0532	U	0.0256	0.0262		0.0621	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Thorium 234	0.176	U	0.0914	0.0932		0.282	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Uranium 235	0.00962	U	0.0180	0.0181		0.0692	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Americium 241	-0.00608	U	0.645	0.645		0.0331	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Protactinium 234m	0.355	U	0.944	0.945		1.69	pCi/g	01/22/16 09:43	02/20/16 18:18	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.0331		0.0136	0.0140		0.0147	pCi/g	01/22/16 09:43	02/20/16 18:18	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-05-P-R-S-00

Lab Sample ID: 160-15789-5

Date Collected: 12/29/15 10:30

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.820		0.114	0.141		0.113	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Bismuth 212	1.01		0.347	0.362		0.324	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Bismuth 214	0.793		0.0833	0.117		0.0514	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Lead 212	0.716		0.0581	0.109		0.0560	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Lead 214	0.881		0.0708	0.116		0.0590	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Potassium 40	14.1		0.935	1.72		0.202	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Protactinium 231	0.293	U	0.262	0.264		0.912	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Radium 226	0.793		0.0833	0.117	1.00	0.0514	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Thorium 232	0.820		0.114	0.141		0.113	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Thorium 234	0.698		0.501	0.507		0.675	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Uranium 235	0.130	U	0.0761	0.0773		0.133	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Americium 241	-0.0131	U	0.0455	0.0456		0.0764	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Protactinium 234m	1.20	U	2.76	2.77		4.46	pCi/g	01/22/16 09:43	02/20/16 19:06	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.245		0.0398	0.0472		0.0309	pCi/g	01/22/16 09:43	02/20/16 19:06	1

Client Sample ID: B02-01-06-P-E-S-00

Lab Sample ID: 160-15789-6

Date Collected: 12/29/15 10:35

Matrix: Solid

Date Received: 01/20/16 10:30

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	1.23		0.144	0.190		0.125	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Bismuth 212	1.40		0.463	0.484		0.408	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Bismuth 214	1.17		0.0965	0.154		0.0569	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Lead 212	1.06		0.0753	0.157		0.0630	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Lead 214	1.35		0.107	0.177		0.0749	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Potassium 40	19.9		1.09	2.28		0.347	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Protactinium 231	0.357	U	0.239	0.243		1.14	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Radium 226	1.17		0.0965	0.154	1.00	0.0569	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Thorium 232	1.23		0.144	0.190		0.125	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Thorium 234	1.14		0.570	0.582		0.761	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Uranium 235	0.104	U	0.141	0.142		0.234	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Americium 241	0.00814	U	0.0587	0.0587		0.0987	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Protactinium 234m	0.372	U	2.59	2.59		3.68	pCi/g	01/22/16 09:43	02/20/16 19:07	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.321		0.0422	0.0535		0.0355	pCi/g	01/22/16 09:43	02/20/16 19:07	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-07-P-S-S-00

Lab Sample ID: 160-15789-7

Date Collected: 12/29/15 11:00

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.0572		0.0325	0.0330		0.0554	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Bismuth 212	0.0862	U	0.103	0.104		0.168	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Bismuth 214	0.124		0.0300	0.0327		0.0250	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Lead 212	0.0813		0.0196	0.0222		0.0214	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Lead 214	0.137		0.0253	0.0290		0.0280	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Potassium 40	2.70		0.337	0.436		0.137	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Protactinium 231	0.0461	U	0.150	0.150		0.333	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Radium 226	0.124		0.0300	0.0327	1.00	0.0250	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Thorium 232	0.0572		0.0325	0.0330		0.0554	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Thorium 234	0.244	U	0.173	0.175		0.256	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Uranium 235	0.0151	U	0.0315	0.0315		0.0681	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Americium 241	0.000659	U	0.0190	0.0190		0.0329	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Protactinium 234m	0.157	U	1.05	1.05		1.94	pCi/g	01/22/16 09:43	02/20/16 19:12	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.0238		(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.0238		0.0105	0.0108		0.0125	pCi/g	01/22/16 09:43	02/20/16 19:12	1

Client Sample ID: B02-01-08-P-R-S-00

Lab Sample ID: 160-15789-8

Date Collected: 12/29/15 11:30

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.880		0.106	0.139		0.0863	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Bismuth 212	0.967		0.330	0.345		0.310	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Bismuth 214	0.796		0.0985	0.129		0.0706	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Lead 212	0.780		0.0723	0.124		0.0619	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Lead 214	0.909		0.0746	0.120		0.0578	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Potassium 40	14.6		0.991	1.79		0.279	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Protactinium 231	-0.423	U	0.566	0.568		0.935	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Radium 226	0.796		0.0985	0.129	1.00	0.0706	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Thorium 232	0.880		0.106	0.139		0.0863	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Thorium 234	0.710		0.267	0.278		0.688	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Uranium 235	0.0714	U	0.118	0.119		0.198	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Americium 241	0.00903	U	0.0454	0.0454		0.0765	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Protactinium 234m	0.932	U	2.52	2.52		4.36	pCi/g	01/22/16 09:43	02/20/16 20:55	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.285		(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.285		0.0384	0.0485		0.0258	pCi/g	01/22/16 09:43	02/20/16 20:55	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-09-P-E-S-00

Lab Sample ID: 160-15789-9

Date Collected: 12/29/15 11:35

Matrix: Solid

Date Received: 01/20/16 10:30

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		0.155	0.192		0.142	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Bismuth 212	1.84		0.512	0.546		0.436	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Bismuth 214	1.14		0.0994	0.154		0.0625	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Lead 212	1.19		0.0942	0.181		0.0804	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Lead 214	1.40		0.102	0.178		0.0843	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Potassium 40	22.0		1.18	2.51		0.330	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Protactinium 231	0.595	U	0.269	0.277		1.19	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Radium 226	1.14		0.0994	0.154	1.00	0.0625	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Thorium 232	1.14		0.155	0.192		0.142	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Thorium 234	0.860		0.284	0.298		0.854	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Uranium 235	0.0875	U	0.117	0.117		0.250	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Americium 241	0.000362	U	0.0636	0.0636		0.108	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Protactinium 234m	5.24		2.68	2.73		4.65	pCi/g	01/22/16 09:43	02/20/16 19:50	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.408		(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			0.0545	0.0687		0.0422	pCi/g	01/22/16 09:43	02/20/16 19:50	1

Client Sample ID: B02-01-10-P-S-S-00

Lab Sample ID: 160-15789-10

Date Collected: 12/31/15 10:45

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.0694		0.0318	0.0326		0.0447	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Bismuth 212	0.0498	U	0.0920	0.0921		0.158	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Bismuth 214	0.162		0.0368	0.0404		0.0291	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Lead 212	0.0734		0.0195	0.0216		0.0214	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Lead 214	0.140		0.0249	0.0288		0.0286	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Potassium 40	2.30		0.316	0.394		0.142	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Protactinium 231	0.0942	U	0.139	0.139		0.340	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Radium 226	0.162		0.0368	0.0404	1.00	0.0291	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Thorium 232	0.0694		0.0318	0.0326		0.0447	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Thorium 234	0.135	U	0.107	0.108		0.297	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Uranium 235	0.0389	U	0.0432	0.0434		0.0721	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Americium 241	0.00175	U	0.0176	0.0176		0.0304	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Protactinium 234m	0.322	U	1.07	1.07		1.93	pCi/g	01/22/16 09:43	02/20/16 19:51	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.0285		(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			0.0119	0.0122		0.0109	pCi/g	01/22/16 09:43	02/20/16 19:51	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-11-P-R-S-00

Lab Sample ID: 160-15789-11

Date Collected: 12/31/15 11:15

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.979		0.113	0.151		0.123	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Bismuth 212	1.15		0.331	0.352		0.273	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Bismuth 214	1.05		0.106	0.152		0.0679	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Lead 212	0.889		0.0740	0.137		0.0643	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Lead 214	1.20		0.0960	0.157		0.0679	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Potassium 40	15.7		1.07	1.93		0.314	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Protactinium 231	0.561	U	0.339	0.344		0.837	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Radium 226	1.05		0.106	0.152	1.00	0.0679	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Thorium 232	0.979		0.113	0.151		0.123	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Thorium 234	0.756		0.248	0.260		0.725	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Uranium 235	0.0655	U	0.135	0.135		0.225	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Americium 241	0.0275	U	0.0525	0.0526		0.0874	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Protactinium 234m	2.57	U	2.95	2.96		4.80	pCi/g	01/22/16 09:43	02/20/16 21:30	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.320		0.0519	0.0616		0.0394	pCi/g	01/22/16 09:43	02/20/16 21:30	1

Client Sample ID: B02-01-12-P-E-S-00

Lab Sample ID: 160-15789-12

Date Collected: 12/31/15 11:25

Matrix: Solid

Date Received: 01/20/16 10:30

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	1.22		0.136	0.183		0.153	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Bismuth 212	1.64		0.522	0.548		0.452	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Bismuth 214	1.24		0.110	0.168		0.0720	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Lead 212	1.12		0.0829	0.167		0.0720	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Lead 214	1.41		0.106	0.181		0.0751	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Potassium 40	19.9		1.12	2.29		0.329	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Protactinium 231	0.468	U	0.276	0.280		1.24	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Radium 226	1.24		0.110	0.168	1.00	0.0720	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Thorium 232	1.22		0.136	0.183		0.153	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Thorium 234	1.35		0.590	0.607		0.782	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Uranium 235	0.0985	U	0.137	0.137		0.252	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Americium 241	0.0283	U	0.0466	0.0467		0.0779	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Protactinium 234m	2.35	U	2.99	3.00		4.92	pCi/g	01/22/16 09:43	02/20/16 20:56	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.355		0.0452	0.0581		0.0343	pCi/g	01/22/16 09:43	02/20/16 20:56	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-13-P-S-S-00

Lab Sample ID: 160-15789-13

Date Collected: 01/18/16 10:05

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.0934		0.0286	0.0302		0.0548	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Bismuth 212	0.0301	U	0.0902	0.0903		0.161	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Bismuth 214	0.164		0.0310	0.0354		0.0240	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Lead 212	0.0726		0.0192	0.0214		0.0222	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Lead 214	0.193		0.0287	0.0350		0.0205	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Potassium 40	2.54		0.327	0.418		0.138	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Protactinium 231	-0.00646	U	0.189	0.189		0.339	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Radium 226	0.164		0.0310	0.0354	1.00	0.0240	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Thorium 232	0.0934		0.0286	0.0302		0.0548	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Thorium 234	0.195	U	0.166	0.167		0.283	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Uranium 235	0.0179	U	0.0386	0.0386		0.0835	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Americium 241	-0.00487	U	0.0160	0.0160		0.0273	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Protactinium 234m	0.202	U	1.25	1.25		2.09	pCi/g	01/22/16 09:43	02/20/16 20:57	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.0334		0.0118	0.0123		0.00946	pCi/g	01/22/16 09:43	02/20/16 20:57	1

Client Sample ID: B02-01-14-P-R-S-00

Lab Sample ID: 160-15789-14

Date Collected: 01/18/16 10:45

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.996		0.119	0.156		0.103	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Bismuth 212	1.18		0.344	0.365		0.302	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Bismuth 214	0.934		0.0813	0.126		0.0609	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Lead 212	0.907		0.0766	0.140		0.0692	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Lead 214	1.10		0.0776	0.139		0.0642	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Potassium 40	17.9		1.01	2.07		0.347	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Protactinium 231	0.356	U	0.207	0.210		1.04	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Radium 226	0.934		0.0813	0.126	1.00	0.0609	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Thorium 232	0.996		0.119	0.156		0.103	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Thorium 234	1.22		0.473	0.490		0.748	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Uranium 235	0.0293	U	0.122	0.122		0.217	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Americium 241	0.00696	U	0.0572	0.0572		0.0963	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Protactinium 234m	6.60		2.47	2.55		4.80	pCi/g	01/22/16 09:43	02/20/16 21:31	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.362		0.0426	0.0566		0.0307	pCi/g	01/22/16 09:43	02/20/16 21:31	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-15-P-E-S-00

Lab Sample ID: 160-15789-15

Date Collected: 01/18/16 10:50

Matrix: Solid

Date Received: 01/20/16 10:30

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	1.06		0.109	0.153		0.114	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Bismuth 212	1.57		0.412	0.443		0.359	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Bismuth 214	1.10		0.0993	0.151		0.0658	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Lead 212	1.04		0.0706	0.152		0.0573	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Lead 214	1.31		0.0862	0.161		0.0613	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Potassium 40	18.3		1.01	2.13		0.248	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Protactinium 231	-0.527	U	0.617	0.619		1.01	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Radium 226	1.10		0.0993	0.151	1.00	0.0658	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Thorium 232	1.06		0.109	0.153		0.114	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Thorium 234	1.43		0.601	0.620		0.774	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Uranium 235	0.140	U	0.120	0.120		0.209	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Americium 241	0.00951	U	0.0524	0.0524		0.0880	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Protactinium 234m	2.70	U	2.45	2.46		3.89	pCi/g	01/22/16 09:43	02/20/16 21:32	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.340		0.0384	0.0522		0.0242	pCi/g	01/22/16 09:43	02/20/16 21:32	1

Client Sample ID: B02-01-16-P-S-S-00

Lab Sample ID: 160-15789-16

Date Collected: 12/29/15 15:20

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.112		0.0426	0.0441		0.0484	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Bismuth 212	0.0593	U	0.130	0.130		0.226	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Bismuth 214	0.200		0.0382	0.0435		0.0282	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Lead 212	0.107		0.0264	0.0298		0.0290	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Lead 214	0.211		0.0320	0.0388		0.0327	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Potassium 40	4.18		0.483	0.645		0.181	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Protactinium 231	0.00687	U	0.0126	0.0126		0.483	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Radium 226	0.200		0.0382	0.0435	1.00	0.0282	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Thorium 232	0.112		0.0426	0.0441		0.0484	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Thorium 234	0.181	U	0.163	0.164		0.274	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Uranium 235	0.0626	U	0.0505	0.0509		0.0825	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Americium 241	0.0172	U	0.0234	0.0234		0.0319	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Protactinium 234m	1.10	U	0.841	0.848		2.68	pCi/g	01/22/16 09:43	02/20/16 22:12	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.0597		0.0157	0.0168		0.0121	pCi/g	01/22/16 09:43	02/20/16 22:12	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-17-P-R-S-00

Lab Sample ID: 160-15789-17

Date Collected: 12/31/15 10:20

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.611		0.0907	0.109		0.0790	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Bismuth 212	0.811		0.259	0.272		0.225	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Bismuth 214	0.642		0.0702	0.0964		0.0492	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Lead 212	0.583		0.0524	0.0921		0.0446	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Lead 214	0.753		0.0680	0.104		0.0441	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Potassium 40	11.5		0.757	1.38		0.220	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Protactinium 231	0.231	U	0.177	0.179		0.853	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Radium 226	0.642		0.0702	0.0964	1.00	0.0492	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Thorium 232	0.611		0.0907	0.109		0.0790	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Thorium 234	0.884		0.360	0.371		0.568	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Uranium 235	0.113	U	0.0807	0.0815		0.136	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Americium 241	0.00551	U	0.0410	0.0410		0.0694	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Protactinium 234m	0.300	U	1.23	1.23		3.89	pCi/g	01/22/16 09:43	02/20/16 22:13	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.210		(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			0.0355	0.0415		0.0286	pCi/g	01/22/16 09:43	02/20/16 22:13	1

Client Sample ID: B02-01-18-P-E-S-00

Lab Sample ID: 160-15789-18

Date Collected: 12/31/15 10:30

Matrix: Solid

Date Received: 01/20/16 10:30

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	1.06		0.113	0.156		0.0856	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Bismuth 212	1.10		0.362	0.380		0.336	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Bismuth 214	1.05		0.0936	0.144		0.0594	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Lead 212	0.989		0.0701	0.146		0.0580	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Lead 214	1.19		0.0869	0.151		0.0584	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Potassium 40	17.2		1.03	2.04		0.357	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Protactinium 231	0.492	U	0.267	0.272		0.752	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Radium 226	1.05		0.0936	0.144	1.00	0.0594	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Thorium 232	1.06		0.113	0.156		0.0856	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Thorium 234	1.09		0.465	0.479		0.739	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Uranium 235	0.105	U	0.122	0.122		0.205	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Americium 241	-0.0116	U	0.0529	0.0529		0.0887	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Protactinium 234m	1.83	U	2.60	2.60		4.32	pCi/g	01/22/16 09:43	02/20/16 22:16	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.351		(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			0.0419	0.0555		0.0287	pCi/g	01/22/16 09:43	02/20/16 22:16	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-19-P-S-S-00

Lab Sample ID: 160-15789-19

Date Collected: 01/18/16 11:05

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.0910		0.0394	0.0405		0.0406	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Bismuth 212	0.0857	U	0.128	0.128		0.214	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Bismuth 214	0.131		0.0309	0.0337		0.0250	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Lead 212	0.0935		0.0219	0.0250		0.0224	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Lead 214	0.145		0.0275	0.0313		0.0287	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Potassium 40	2.40		0.365	0.440		0.178	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Protactinium 231	0.0543	U	0.0583	0.0586		0.381	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Radium 226	0.131		0.0309	0.0337	1.00	0.0250	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Thorium 232	0.0910		0.0394	0.0405		0.0406	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Thorium 234	0.0829	U	0.105	0.105		0.314	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Uranium 235	0.0371	U	0.0428	0.0430		0.0725	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Americium 241	0.00461	U	0.0177	0.0177		0.0305	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Protactinium 234m	0.672	U	1.18	1.19		2.04	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.0389		(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.0389		0.0112	0.0119		0.00871	pCi/g	01/22/16 09:43	02/21/16 17:22	1

Client Sample ID: B02-01-20-P-R-S-00

Lab Sample ID: 160-15789-20

Date Collected: 01/18/16 11:20

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.980		0.108	0.146		0.0917	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Bismuth 212	0.969		0.336	0.350		0.310	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Bismuth 214	0.840		0.0868	0.123		0.0592	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Lead 212	0.850		0.0769	0.135		0.0681	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Lead 214	0.980		0.0840	0.132		0.0604	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Potassium 40	16.6		0.936	1.92		0.233	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Protactinium 231	0.455	U	0.271	0.275		0.800	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Radium 226	0.840		0.0868	0.123	1.00	0.0592	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Thorium 232	0.980		0.108	0.146		0.0917	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Thorium 234	1.00		0.440	0.453		0.702	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Uranium 235	0.139	U	0.133	0.133		0.170	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Americium 241	0.0231	U	0.0528	0.0529		0.0883	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Protactinium 234m	6.39		2.32	2.41		4.60	pCi/g	01/22/16 09:43	02/21/16 17:22	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.						
TI-208	0.270		(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.270		0.0406	0.0492		0.0336	pCi/g	01/22/16 09:43	02/21/16 17:22	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-21-P-E-S-00

Lab Sample ID: 160-15789-21

Date Collected: 01/18/16 11:25

Matrix: Solid

Date Received: 01/20/16 10:30

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.15		0.141	0.184		0.108	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Bismuth 212	1.31		0.462	0.482		0.462	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Bismuth 214	1.17		0.115	0.167		0.0784	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Lead 212	1.05		0.0873	0.162		0.0786	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Lead 214	1.42		0.105	0.181		0.0816	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Potassium 40	19.4		1.24	2.34		0.331	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Protactinium 231	0.651	U	0.305	0.313		1.17	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Radium 226	1.17		0.115	0.167	1.00	0.0784	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Thorium 232	1.15		0.141	0.184		0.108	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Thorium 234	0.795	U	0.310	0.321		0.810	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Uranium 235	0.0965	U	0.158	0.158		0.241	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Americium 241	0.0132	U	0.0626	0.0626		0.105	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Protactinium 234m	6.04		3.50	3.56		5.43	pCi/g	01/22/16 10:00	02/21/16 18:55	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.370		0.0530	0.0655		0.0420	pCi/g	01/22/16 10:00	02/21/16 18:55	1

Client Sample ID: B02-01-22-P-S-S-00

Lab Sample ID: 160-15789-22

Date Collected: 01/18/16 13:15

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.248		0.0450	0.0516		0.0505	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Bismuth 212	0.313		0.144	0.147		0.139	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Bismuth 214	0.285		0.0417	0.0512		0.0272	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Lead 212	0.238		0.0360	0.0473		0.0343	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Lead 214	0.278		0.0426	0.0514		0.0355	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Potassium 40	5.24		0.472	0.715		0.140	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Protactinium 231	0.133	U	0.0900	0.0912		0.444	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Radium 226	0.285		0.0417	0.0512	1.00	0.0272	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Thorium 232	0.248		0.0450	0.0516		0.0505	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Thorium 234	0.286	U	0.138	0.141		0.376	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Uranium 235	0.0652	U	0.0739	0.0742		0.106	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Americium 241	-0.0116	U	0.0267	0.0268		0.0448	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Protactinium 234m	0.562	U	1.27	1.27		2.21	pCi/g	01/22/16 10:00	02/21/16 18:58	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.0804		0.0176	0.0195		0.0135	pCi/g	01/22/16 10:00	02/21/16 18:58	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-23-P-R-S-00

Lab Sample ID: 160-15789-23

Date Collected: 01/18/16 13:40

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.949		0.129	0.161		0.105	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Bismuth 212	1.36		0.428	0.450		0.387	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Bismuth 214	0.976		0.101	0.143		0.0645	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Lead 212	0.910		0.0752	0.140		0.0649	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Lead 214	1.07		0.0929	0.145		0.0704	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Potassium 40	16.2		1.11	1.99		0.323	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Protactinium 231	0.222	U	0.186	0.188		1.05	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Radium 226	0.976		0.101	0.143	1.00	0.0645	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Thorium 232	0.949		0.129	0.161		0.105	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Thorium 234	1.05		0.462	0.475		0.728	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Uranium 235	0.0392	U	0.0864	0.0865		0.192	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Americium 241	-0.0254	U	0.0505	0.0506		0.0842	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Protactinium 234m	0.508	U	2.68	2.68		4.75	pCi/g	01/22/16 10:00	02/21/16 19:38	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.305		0.0477	0.0573		0.0381	pCi/g	01/22/16 10:00	02/21/16 19:38	1

Client Sample ID: B02-01-24-P-E-S-00

Lab Sample ID: 160-15789-24

Date Collected: 01/18/16 13:45

Matrix: Solid

Date Received: 01/20/16 10:30

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	1.17		0.137	0.181		0.135	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Bismuth 212	1.51		0.376	0.407		0.316	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Bismuth 214	1.25		0.110	0.170		0.0715	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Lead 212	1.15		0.0810	0.170		0.0697	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Lead 214	1.38		0.0957	0.172		0.0661	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Potassium 40	21.0		1.11	2.39		0.309	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Protactinium 231	0.436	U	0.271	0.275		1.17	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Radium 226	1.25		0.110	0.170	1.00	0.0715	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Thorium 232	1.17		0.137	0.181		0.135	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Thorium 234	0.927		0.282	0.298		0.833	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Uranium 235	0.0913	U	0.152	0.152		0.251	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Americium 241	0.00984	U	0.0618	0.0618		0.104	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Protactinium 234m	1.29	U	2.67	2.67		4.54	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.68		0.669	0.697		0.795	pCi/g	01/22/16 10:00	02/21/16 19:41	1
Tl-208	0.414		0.0484	0.0645		0.0348	pCi/g	01/22/16 10:00	02/21/16 19:41	1

TestAmerica St. Louis

Client Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Client Sample ID: B02-01-02-P-R-Q-00

Lab Sample ID: 160-15789-25

Date Collected: 01/04/16 09:25

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.662		0.0971	0.118		0.0750	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Bismuth 212	0.914		0.337	0.350		0.307	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Bismuth 214	0.576		0.0781	0.0984		0.0766	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Lead 212	0.646		0.0609	0.103		0.0509	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Lead 214	0.735		0.0807	0.111		0.0694	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Potassium 40	12.4		0.937	1.58		0.232	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Protactinium 231	0.378	U	0.239	0.243		0.789	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Radium 226	0.576		0.0781	0.0984	1.00	0.0766	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Thorium 232	0.662		0.0971	0.118		0.0750	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Thorium 234	0.967		0.407	0.420		0.635	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Uranium 235	0.103	U	0.0978	0.0984		0.183	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Americium 241	-0.0105	U	0.0447	0.0447		0.0753	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Protactinium 234m	0.587	U	2.28	2.28		4.05	pCi/g	01/22/16 10:00	02/21/16 20:42	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208			0.0348	0.0420		0.0237	pCi/g	01/22/16 10:00	02/21/16 20:42	1

Client Sample ID: B02-01-10-P-S-Q-00

Lab Sample ID: 160-15789-26

Date Collected: 12/31/15 10:45

Matrix: Solid

Date Received: 01/20/16 10:30

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	0.0819		0.0409	0.0417		0.0712	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Bismuth 212	0.000	U	0.119	0.119		0.171	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Bismuth 214	0.229		0.0384	0.0450		0.0280	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Lead 212	0.113		0.0277	0.0313		0.0282	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Lead 214	0.251		0.0377	0.0459		0.0292	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Potassium 40	2.98		0.366	0.473		0.192	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Protactinium 231	0.0740	U	0.141	0.142		0.377	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Radium 226	0.229		0.0384	0.0450	1.00	0.0280	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Thorium 232	0.0819		0.0409	0.0417		0.0712	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Thorium 234	0.126	U	0.131	0.132		0.388	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Uranium 235	0.00477	U	0.0377	0.0377		0.0996	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Americium 241	0.00585	U	0.0192	0.0192		0.0333	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Protactinium 234m	0.389	U	1.15	1.16		2.06	pCi/g	01/22/16 10:00	02/21/16 20:43	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208			0.0122	0.0131		0.0116	pCi/g	01/22/16 10:00	02/21/16 20:43	1

TestAmerica St. Louis

QC Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

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

Lab Sample ID: MB 160-233855/1-A

Matrix: Solid

Analysis Batch: 238329

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 233855

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.008362	U	0.0273	0.0273		0.0503	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Bismuth 212	0.02538	U	0.0787	0.0787		0.146	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Bismuth 214	-0.001605	U	0.0145	0.0145		0.0358	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Lead 212	0.01801	U	0.0142	0.0144		0.0195	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Lead 214	0.001466	U	0.0140	0.0140		0.0286	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Potassium 40	0.01123	U	0.104	0.104		0.230	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Protactinium 231	0.02222	U	0.120	0.120		0.273	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Radium 226	-0.001605	U	0.0145	0.0145	1.00	0.0358	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Thorium 232	0.008362	U	0.0273	0.0273		0.0503	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Thorium 234	0.1551	U	0.151	0.152		0.228	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Uranium 235	0.01459	U	0.0317	0.0317		0.0629	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Americium 241	0.0009052	U	0.0104	0.0104		0.0191	pCi/g	01/22/16 09:43	02/28/16 13:24	1
Protactinium 234m	0.0000	U	0.241	0.241		0.888	pCi/g	01/22/16 09:43	02/28/16 13:24	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	01/22/16 09:43	02/28/16 13:24	1

Lab Sample ID: LCS 160-233855/2-A

Matrix: Solid

Analysis Batch: 238209

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 233855

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	108.3		11.3		0.521	pCi/g	108	87 - 116
Cesium 137	34.2	37.64		3.89		0.151	pCi/g	110	87 - 120
Cobalt 60	32.2	34.54		3.42		0.0892	pCi/g	107	87 - 115

Lab Sample ID: 160-15789-1 DU

Matrix: Solid

Analysis Batch: 238207

Client Sample ID: B02-01-01-P-S-S-00

Prep Type: Total/NA

Prep Batch: 233855

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	0.110		0.1373		0.0373		0.0188	pCi/g	0.39	1
Bismuth 212	0.000	U	0.06204	U	0.0994		0.168	pCi/g	0.29	1
Bismuth 214	0.166		0.1858		0.0387		0.0233	pCi/g	0.27	1
Lead 212	0.108		0.1096		0.0279		0.0235	pCi/g	0.02	1
Lead 214	0.174		0.1756		0.0349		0.0221	pCi/g	0.02	1
Potassium 40	2.49		2.314		0.395		0.140	pCi/g	0.22	1
Protactinium 231	0.0486	U	0.01120	U	0.0371		0.310	pCi/g	0.43	1
Radium 226	0.166		0.1858		0.0387	1.00	0.0233	pCi/g	0.27	1
Thorium 232	0.110		0.1373		0.0373		0.0188	pCi/g	0.39	1
Thorium 234	0.125	U	0.1631	U	0.186		0.280	pCi/g	0.14	1
Uranium 235	0.0348	U	0.02722	U	0.0476		0.0800	pCi/g	0.08	1
Americium 241	0.00232	U	0.01401	U	0.0142		0.0228	pCi/g	0.36	1

TestAmerica St. Louis

QC Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

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

Lab Sample ID: 160-15789-1 DU

Matrix: Solid

Analysis Batch: 238207

Client Sample ID: B02-01-01-P-S-S-00

Prep Type: Total/NA

Prep Batch: 233855

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	Limit
Protactinium 234m	0.846	U	0.4095	U	1.34		2.36	pCi/g	0.21	1
Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	Limit
Tl-208	0.0317		0.04151		0.0121		0.00718	pCi/g	0.41	1

Lab Sample ID: MB 160-233857/1-A

Matrix: Solid

Analysis Batch: 238253

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 233857

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.009008	U	0.0214	0.0214		0.0415	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Bismuth 212	-0.003259	U	0.0929	0.0929		0.182	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Bismuth 214	-0.004284	U	0.0338	0.0338		0.0327	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Lead 212	-0.004135	U	0.0371	0.0371		0.0225	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Lead 214	-0.002823	U	0.0373	0.0373		0.0288	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Potassium 40	-0.07361	U	2.94	2.94		0.189	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Protactinium 231	0.06000	U	0.133	0.133		0.290	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Radium 226	-0.004284	U	0.0338	0.0338	1.00	0.0327	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Thorium 232	0.009008	U	0.0214	0.0214		0.0415	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Thorium 234	0.06818	U	0.104	0.105		0.254	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Uranium 235	0.01278	U	0.0306	0.0306		0.0711	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Americium 241	0.0001111	U	0.0115	0.0115		0.0210	pCi/g	01/22/16 10:00	02/21/16 17:28	1
Protactinium 234m	0.0000	U	0.636	0.636		2.30	pCi/g	01/22/16 10:00	02/21/16 17:28	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	01/22/16 10:00	02/21/16 17:28	1

Lab Sample ID: LCS 160-233857/2-A

Matrix: Solid

Analysis Batch: 238257

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 233857

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	108.5		11.3		0.556	pCi/g	108	87 - 116
Cesium 137	34.2	37.74		3.90		0.147	pCi/g	110	87 - 120
Cobalt 60	32.2	34.90		3.46		0.0960	pCi/g	108	87 - 115

TestAmerica St. Louis

QC Sample Results

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

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

Lab Sample ID: 160-15789-21 DU

Matrix: Solid

Analysis Batch: 238253

Client Sample ID: B02-01-21-P-E-S-00

Prep Type: Total/NA

Prep Batch: 233857

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	1.15		1.130		0.165		0.101	pCi/g	0.07	1
Bismuth 212	1.31		1.666		0.503		0.404	pCi/g	0.36	1
Bismuth 214	1.17		1.221		0.162		0.0535	pCi/g	0.15	1
Lead 212	1.05		1.104		0.164		0.0666	pCi/g	0.16	1
Lead 214	1.42		1.310		0.172		0.0732	pCi/g	0.30	1
Potassium 40	19.4		17.58		2.08		0.277	pCi/g	0.40	1
Protactinium 231	0.651	U	0.4916	U	0.275		0.972	pCi/g	0.27	1
Radium 226	1.17		1.221		0.162	1.00	0.0535	pCi/g	0.15	1
Thorium 232	1.15		1.130		0.165		0.101	pCi/g	0.07	1
Thorium 234	0.795	U	1.204		0.477		0.722	pCi/g	0.51	1
Uranium 235	0.0965	U	0.1314	U	0.137		0.225	pCi/g	0.12	1
Americium 241	0.0132	U	0.03782	U	0.0604		0.0999	pCi/g	0.20	1
Protactinium 234m	6.04		1.016	U	2.54		4.37	pCi/g	0.82	1
Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Tl-208	0.370		0.3927		0.0639		0.0341	pCi/g	0.18	1

QC Association Summary

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Rad

Leach Batch: 233330

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-15789-1	B02-01-01-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-1 DU	B02-01-01-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-2	B02-01-02-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-15789-3	B02-01-03-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-4	B02-01-04-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-5	B02-01-05-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-15789-6	B02-01-06-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-7	B02-01-07-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-8	B02-01-08-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-15789-9	B02-01-09-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-10	B02-01-10-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-11	B02-01-11-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-15789-12	B02-01-12-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-13	B02-01-13-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-14	B02-01-14-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-15789-15	B02-01-15-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-16	B02-01-16-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-17	B02-01-17-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-15789-18	B02-01-18-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-19	B02-01-19-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-20	B02-01-20-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-15789-21	B02-01-21-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-21 DU	B02-01-21-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-22	B02-01-22-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-15789-23	B02-01-23-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-15789-24	B02-01-24-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-15789-25	B02-01-02-P-R-Q-00	Total/NA	Solid	Dry and Grind	
160-15789-26	B02-01-10-P-S-Q-00	Total/NA	Solid	Dry and Grind	

Prep Batch: 233855

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-15789-1	B02-01-01-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-1 DU	B02-01-01-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-2	B02-01-02-P-R-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-3	B02-01-03-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-4	B02-01-04-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-5	B02-01-05-P-R-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-6	B02-01-06-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-7	B02-01-07-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-8	B02-01-08-P-R-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-9	B02-01-09-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-10	B02-01-10-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-11	B02-01-11-P-R-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-12	B02-01-12-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-13	B02-01-13-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-14	B02-01-14-P-R-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-15	B02-01-15-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-16	B02-01-16-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-17	B02-01-17-P-R-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-18	B02-01-18-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-19	B02-01-19-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330

TestAmerica St. Louis

QC Association Summary

Client: Perma-Fix Environmental Services Inc.
Project/Site: HDP

TestAmerica Job ID: 160-15789-2

Rad (Continued)

Prep Batch: 233855 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-15789-20	B02-01-20-P-R-S-00	Total/NA	Solid	Fill_Geo-21	233330
LCS 160-233855/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-233855/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 233857

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-15789-21	B02-01-21-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-21 DU	B02-01-21-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-22	B02-01-22-P-S-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-23	B02-01-23-P-R-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-24	B02-01-24-P-E-S-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-25	B02-01-02-P-R-Q-00	Total/NA	Solid	Fill_Geo-21	233330
160-15789-26	B02-01-10-P-S-Q-00	Total/NA	Solid	Fill_Geo-21	233330
LCS 160-233857/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-233857/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	