

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: 160-14321-1

Client Project/Site: HDP

For:

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

Attn: Brian Miller



Authorized for release by:

10/22/2015 4:27:45 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: 160-14321-1

Job ID: 160-14321-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Perma-Fix Environmental Services Inc.

Project: HDP

Report Number: 160-14321-1

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

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

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

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

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

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

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

RECEIPT

The samples were received on 10/16/2015 11:14 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 20.3° C and 20.3° C.

TECHNETIUM-99 (ICPMS)

Samples L03-02-01-P-S-S-00 (160-14321-1), L03-02-02-P-R-S-00 (160-14321-2), L03-02-04-P-S-S-00 (160-14321-3), L03-02-05-P-R-S-00 (160-14321-4), L03-02-07-P-S-S-00 (160-14321-5), L03-02-08-P-R-S-00 (160-14321-6), L03-02-10-P-S-S-00 (160-14321-7), L03-02-11-P-R-S-00 (160-14321-8), L03-02-13-P-S-S-00 (160-14321-9), L03-02-14-P-R-S-00 (160-14321-10), L03-02-16-P-S-S-00 (160-14321-11), L03-02-17-P-R-S-00 (160-14321-12), L03-02-19-P-S-S-00 (160-14321-13), L03-02-20-P-R-S-00 (160-14321-14), L03-02-22-P-S-S-00 (160-14321-15), L03-02-23-P-R-S-00 (160-14321-16), L03-02-11-P-S-Q-00 (160-14321-17) and L03-02-19-P-R-Q-00 (160-14321-18) were analyzed for Technetium-99 (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 10/19/2015 and analyzed on 10/20/2015.

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

Case Narrative

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

TestAmerica Job ID: 160-14321-1

Job ID: 160-14321-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

PERCENT SOLIDS

Samples L03-02-01-P-S-S-00 (160-14321-1), L03-02-02-P-R-S-00 (160-14321-2), L03-02-04-P-S-S-00 (160-14321-3), L03-02-05-P-R-S-00 (160-14321-4), L03-02-07-P-S-S-00 (160-14321-5), L03-02-08-P-R-S-00 (160-14321-6), L03-02-10-P-S-S-00 (160-14321-7), L03-02-11-P-R-S-00 (160-14321-8), L03-02-13-P-S-S-00 (160-14321-9), L03-02-14-P-R-S-00 (160-14321-10), L03-02-16-P-S-S-00 (160-14321-11), L03-02-17-P-R-S-00 (160-14321-12), L03-02-19-P-S-S-00 (160-14321-13), L03-02-20-P-R-S-00 (160-14321-14), L03-02-22-P-S-S-00 (160-14321-15), L03-02-23-P-R-S-00 (160-14321-16), L03-02-11-P-S-Q-00 (160-14321-17) and L03-02-19-P-R-Q-00 (160-14321-18) were analyzed for percent solids in accordance with EPA Method 160.3 MOD. The samples were analyzed on 10/17/2015.

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

CESIUM-137 & OTHER GAMMA EMITTERS (GS)

Samples L03-02-01-P-S-S-00 (160-14321-1), L03-02-02-P-R-S-00 (160-14321-2), L03-02-04-P-S-S-00 (160-14321-3), L03-02-05-P-R-S-00 (160-14321-4), L03-02-07-P-S-S-00 (160-14321-5), L03-02-08-P-R-S-00 (160-14321-6), L03-02-10-P-S-S-00 (160-14321-7), L03-02-11-P-R-S-00 (160-14321-8), L03-02-13-P-S-S-00 (160-14321-9), L03-02-14-P-R-S-00 (160-14321-10), L03-02-16-P-S-S-00 (160-14321-11), L03-02-17-P-R-S-00 (160-14321-12), L03-02-19-P-S-S-00 (160-14321-13), L03-02-20-P-R-S-00 (160-14321-14), L03-02-22-P-S-S-00 (160-14321-15), L03-02-23-P-R-S-00 (160-14321-16), L03-02-11-P-S-Q-00 (160-14321-17) and L03-02-19-P-R-Q-00 (160-14321-18) were analyzed for Cesium-137 & Other Gamma Emitters (GS) in accordance with DOE GA-01-R. The samples were leached on 10/16/2015, prepared on 10/19/2015 and analyzed on 10/19/2015 and 10/20/2015.

Preparation Batch 160-217089:

Radium-226 is reported in these samples at client request. Radium-226 is reported from the 609.31 keV line of bismuth-214. Because the samples have not had a 21-day ingrowth, the activity for radium-226 is an estimated value and may be biased low. This bias is caused by the disruption of secular equilibrium between radium-226 and bismuth-214 by the loss of radon-222 during sample preparation. L03-02-01-P-S-S-00 (160-14321-1), L03-02-02-P-R-S-00 (160-14321-2), L03-02-04-P-S-S-00 (160-14321-3), L03-02-05-P-R-S-00 (160-14321-4), L03-02-07-P-S-S-00 (160-14321-5), L03-02-08-P-R-S-00 (160-14321-6), L03-02-10-P-S-S-00 (160-14321-7), L03-02-11-P-R-S-00 (160-14321-8), L03-02-13-P-S-S-00 (160-14321-9), L03-02-14-P-R-S-00 (160-14321-10), L03-02-16-P-S-S-00 (160-14321-11), L03-02-17-P-R-S-00 (160-14321-12), L03-02-19-P-S-S-00 (160-14321-13), L03-02-20-P-R-S-00 (160-14321-14), L03-02-22-P-S-S-00 (160-14321-15), L03-02-23-P-R-S-00 (160-14321-16), L03-02-11-P-S-Q-00 (160-14321-17), L03-02-19-P-R-Q-00 (160-14321-18) and (160-14321-A-1-C DU) duplicate of sample L03-02-01-P-S-S-00DU (160-14321-1). Refer to the QC report for details.

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

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: 10/16/2015	COC No: 101615-FSS1
Perma-Fix Environmental Services 2800 Solway Road Knoxville, TN 37931 (865) 690-0501 Phone (865) 539-9868 FAX	Tel/Fax: (314) 810-3333	Lab Contact: Ivan Vanya	Carrier: Courier	1 of 2 COCs
Analysis Turnaround Time ☒ CALENDAR DAYS ☐ WORKING DAYS TAT if different from Below ☐ 2 weeks ☒ 1 week ☐ 2 days ☐ 1 day		Sampler: For Lab Use Only: Walk-in Client: Lab Sampling: Job / SDG No.:		
Project Name: Hematite Decommissioning Project Site: Westinghouse Hematite, MO P O # 832953		Sample Specific Notes:		

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 (CP/MS (Tc-99) (With post-21 day ingrowth)		Sample Specific Notes:
L03-02-01-P-S-S-00	10/14/15	1515	G	Soil	1	N		X	X		Matt Cushman
L03-02-02-P-R-S-00	10/14/15	1600	C	Soil	1	N		X	X		Chris Chandler
L03-02-04-P-S-S-00	10/14/15	1615	G	Soil	1	N		X	X		Matt Cushman
L03-02-05-P-R-S-00	10/14/15	1650	C	Soil	1	N		X	X		Chris Chandler
L03-02-07-P-S-S-00	10/14/15	1705	G	Soil	1	N		X	X		Matt Cushman
L03-02-08-P-R-S-00	10/14/15	1725	C	Soil	1	N		X	X		Chris Chandler
L03-02-10-P-S-S-00	10/15/15	0835	G	Soil	1	N		X	X		Mark Shaffer
L03-02-11-P-R-S-00	10/15/15	0920	C	Soil	1	N		X	X		Chris Chandler
L03-02-13-P-S-S-00	10/15/15	940	G	Soil	1	N		X	X		Mark Shaffer
L03-02-14-P-R-S-00	10/15/15	1020	C	Soil	1	N		X	X		Mark Shaffer
L03-02-16-P-S-S-00	10/15/15	1030	G	Soil	1	N		X	X		Mark Shaffer
L03-02-17-P-R-S-00	10/15/15	1050	C	Soil	1	N		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.

☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

☒ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

Custody Seals Intact: ☒ Yes ☐ No	Custody Seal No.:	Cooler Temp. (°C):	Obs'd:	Cor'd:	Therm ID No.:
Relinquished by: <i>Brian Miller</i>	Company: Perma-Fix	Date/Time: 10-15/0900	Received by: <i>Ellen Jakub</i>	Company: CAOSR Roads	Date/Time: 10-16-15 9:00
Relinquished by:	Company:	Date/Time:	Received by: <i>Ellen Jakub</i>	Company: Westinghouse	Date/Time: 10-16-15 11:14
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Hematite Decommissioning Project | Permafix (for Westinghouse) Non-Proprietary Class 3 | Procedure: HDP-PR-QA-006, Chain of Custody | Revision: 3



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Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

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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: 10/16/2015		COC No: 101615-FSS1	
Perma-Fix Environmental Services		Tel/Fax: (314) 810-3333		Lab Contact: Ivan Vanya		Carrier: Courier		2 of 2 COCs	
2800 Solway Road		Analysis Turnaround Time		Gamma Spec		Gamma Spec		Sampler:	
Knoxville, TN 37931		☒ CALENDAR DAYS ☐ WORKING DAYS		Westinghouse Hematite Library		(With post-21 day ingrowth)		For Lab Use Only:	
Phone (865) 690-0501		TAT if different from below		Alpha Spec		ICP/MS (Tc-99)		Walk-in Client:	
FAX (865) 539-9868		2 weeks ☐		Gamma Spec		Perform MS / MSD (Y / N)		Lab Sampling:	
Project Name: Hematite Decommissioning Project		1 week ☒		Sample Type (C-Comp, G-Grab)		Filtered Sample (Y / N)		Job / SDG No.:	
Site: Westinghouse Hematite, MO		2 days ☐		Sample Date		# of Cont.			
P O # 832953		1 day ☐		Sample Time		Matrix		Sample Specific Notes:	
L03-02-19-P-S-S-00	10/15/15	1110	G	Soil	1	N	X	X	Chris Chandler
L03-02-20-P-R-S-00	10/15/15	1135	C	Soil	1	N	X	X	Mark Shaffer
L03-02-22-P-S-S-00	10/15/15	1200	G	Soil	1	N	X	X	Mark Shaffer
L03-02-23-P-R-S-00	10/15/15	1230	C	Soil	1	N	X	X	Chris Chandler
L03-02-11-P-S-Q-00	10/15/15	920	G	Soil	1	N	X	X	Chris Chandler
L03-02-19-P-R-Q-00	10/15/15	1110	C	Soil	1	N	X	X	Chris Chandler
Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other									
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.									
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown									
Special Instructions/QC Requirements & Comments: Potential for Radiological Contamination									
Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)									
☒ Return to Client ☐ Disposal by Lab ☐ Archive for Months									
Custody Seals Intact: ☒ Yes ☐ No									
Relinquished by: <u>Brian Miller</u> Date/Time: <u>10-16-15 0900</u> Received by: <u>K. Miller</u> Date/Time: <u>10-16-15 0900</u> Company: <u>Perma-Fix</u>									
Relinquished by: <u>Brian Miller</u> Date/Time: <u>10-16-15 1114</u> Received by: <u>Ellen Jakub</u> Date/Time: <u>10-16-15 1114</u> Company: <u>Perma-Fix</u>									
Relinquished by: <u>Brian Miller</u> Date/Time: <u>10-16-15 1114</u> Received by: <u>Ellen Jakub</u> Date/Time: <u>10-16-15 1114</u> Company: <u>Perma-Fix</u>									

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: 160-14321-1

Login Number: 14321

List Number: 1

Creator: Clarke, Jill C

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	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: 160-14321-1

Qualifiers

Rad

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

Glossary

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

Method Summary

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

TestAmerica Job ID: 160-14321-1

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

Protocol References:

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

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

Laboratory References:

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

Sample Summary

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

TestAmerica Job ID: 160-14321-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-14321-1	L03-02-01-P-S-S-00	Solid	10/14/15 15:15	10/16/15 11:14
160-14321-2	L03-02-02-P-R-S-00	Solid	10/14/15 16:00	10/16/15 11:14
160-14321-3	L03-02-04-P-S-S-00	Solid	10/14/15 16:15	10/16/15 11:14
160-14321-4	L03-02-05-P-R-S-00	Solid	10/14/15 16:50	10/16/15 11:14
160-14321-5	L03-02-07-P-S-S-00	Solid	10/14/15 17:05	10/16/15 11:14
160-14321-6	L03-02-08-P-R-S-00	Solid	10/14/15 17:25	10/16/15 11:14
160-14321-7	L03-02-10-P-S-S-00	Solid	10/15/15 08:35	10/16/15 11:14
160-14321-8	L03-02-11-P-R-S-00	Solid	10/15/15 09:20	10/16/15 11:14
160-14321-9	L03-02-13-P-S-S-00	Solid	10/15/15 09:40	10/16/15 11:14
160-14321-10	L03-02-14-P-R-S-00	Solid	10/15/15 10:20	10/16/15 11:14
160-14321-11	L03-02-16-P-S-S-00	Solid	10/15/15 10:30	10/16/15 11:14
160-14321-12	L03-02-17-P-R-S-00	Solid	10/15/15 10:50	10/16/15 11:14
160-14321-13	L03-02-19-P-S-S-00	Solid	10/15/15 11:10	10/16/15 11:14
160-14321-14	L03-02-20-P-R-S-00	Solid	10/15/15 11:35	10/16/15 11:14
160-14321-15	L03-02-22-P-S-S-00	Solid	10/15/15 12:00	10/16/15 11:14
160-14321-16	L03-02-23-P-R-S-00	Solid	10/15/15 12:30	10/16/15 11:14
160-14321-17	L03-02-11-P-S-Q-00	Solid	10/15/15 09:20	10/16/15 11:14
160-14321-18	L03-02-19-P-R-Q-00	Solid	10/15/15 11:10	10/16/15 11:14

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-01-P-S-S-00

Date Collected: 10/14/15 15:15

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-1

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.13		0.148	0.186		0.110	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Americium 241	0.0103	U	0.0600	0.0600		0.101	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Bismuth 212	1.50		0.525	0.547		0.445	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Bismuth 214	0.832		0.0934	0.127		0.0664	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Lead 212	1.05		0.0826	0.159		0.0728	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Lead 214	1.13		0.0906	0.149		0.0624	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Potassium 40	20.9		1.15	2.40		0.287	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Protactinium 234m	0.000	U	2.04	2.04		6.63	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Protactinium 231	0.390	U	0.282	0.285		1.24	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Radium 226	0.832		0.0934	0.127		0.0664	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Thorium 234	1.34		0.497	0.516		0.779	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Uranium 235	0.123	U	0.134	0.134		0.231	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Thorium 232	1.13		0.148	0.186		0.110	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Other Detected Radionuclides										
Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.86		0.715	0.747		0.837	pCi/g	10/19/15 11:09	10/19/15 20:53	1
Tl-208	0.358		0.0504	0.0624		0.0386	pCi/g	10/19/15 11:09	10/19/15 20:53	1

Client Sample ID: L03-02-01-P-S-S-00

Date Collected: 10/14/15 15:15

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-1

Matrix: Solid

Percent Solids: 91.5

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000062	0.000019	mg/Kg	☆	10/19/15 13:03	10/20/15 20:49	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0963	U	0.0296	0.0309	1.23	0.211	pCi/g	10/19/15 13:03	10/20/15 20:49	1
Carrier										
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	89		30 - 110					10/19/15 13:03	10/20/15 20:49	1

Client Sample ID: L03-02-02-P-R-S-00

Date Collected: 10/14/15 16:00

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-2

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.980		0.122	0.158		0.0959	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Americium 241	-0.0125	U	0.0569	0.0569		0.0955	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Bismuth 212	1.35		0.421	0.444		0.363	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Bismuth 214	0.793		0.0862	0.119		0.0565	pCi/g	10/19/15 11:09	10/19/15 20:54	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-02-P-R-S-00

Lab Sample ID: 160-14321-2

Date Collected: 10/14/15 16:00

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Lead 212	1.06		0.0739	0.156		0.0573	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Lead 214	0.906		0.0735	0.119		0.0564	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Potassium 40	17.8		1.05	2.10		0.271	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Protactinium 234m	-0.228	U	10.3	10.3		4.54	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Protactinium 231	0.662	U	0.242	0.253		1.02	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Radium 226	0.793		0.0862	0.119		0.0565	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Thorium 234	1.20		0.496	0.511		0.785	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Uranium 235	0.0573	U	0.136	0.136		0.216	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Thorium 232	0.980		0.122	0.158		0.0959	pCi/g	10/19/15 11:09	10/19/15 20:54	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.335		0.0425	0.0549		0.0336	pCi/g	10/19/15 11:09	10/19/15 20:54	1

Client Sample ID: L03-02-02-P-R-S-00

Lab Sample ID: 160-14321-2

Date Collected: 10/14/15 16:00

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 83.3

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000065	0.000019	mg/Kg	☼	10/19/15 13:03	10/20/15 21:08	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0687	U	0.0320	0.0326	1.29	0.221	pCi/g	10/19/15 13:03	10/20/15 21:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	93		30 - 110					10/19/15 13:03	10/20/15 21:08	1

Client Sample ID: L03-02-04-P-S-S-00

Lab Sample ID: 160-14321-3

Date Collected: 10/14/15 16:15

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.04		0.143	0.178		0.124	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Americium 241	0.0358	U	0.0616	0.0618		0.102	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Bismuth 212	0.982		0.303	0.320		0.281	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Bismuth 214	0.778		0.0846	0.117		0.0590	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Lead 212	0.936		0.0726	0.141		0.0611	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Lead 214	0.929		0.0797	0.125		0.0679	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Potassium 40	17.7		1.08	2.10		0.341	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Protactinium 234m	4.72		2.23	2.28		4.36	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Protactinium 231	0.398	U	0.212	0.217		1.05	pCi/g	10/19/15 11:09	10/19/15 21:23	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-04-P-S-S-00

Lab Sample ID: 160-14321-3

Date Collected: 10/14/15 16:15

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226	0.778		0.0846	0.117		0.0590	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Thorium 234	1.38		0.487	0.508		0.754	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Uranium 235	0.0530	U	0.137	0.137		0.230	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Thorium 232	1.04		0.143	0.178		0.124	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Other Detected Radionuclides										
Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.65		0.700	0.727		0.833	pCi/g	10/19/15 11:09	10/19/15 21:23	1
Tl-208	0.302		0.0459	0.0556		0.0370	pCi/g	10/19/15 11:09	10/19/15 21:23	1

Client Sample ID: L03-02-04-P-S-S-00

Lab Sample ID: 160-14321-3

Date Collected: 10/14/15 16:15

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 88.0

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000064	0.000019	mg/Kg	☼	10/19/15 13:03	10/20/15 21:10	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.105	U	0.0308	0.0323	1.27	0.218	pCi/g	10/19/15 13:03	10/20/15 21:10	1
Carrier										
Re	90		30 - 110					10/19/15 13:03	10/20/15 21:10	1

Client Sample ID: L03-02-05-P-R-S-00

Lab Sample ID: 160-14321-4

Date Collected: 10/14/15 16:50

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.43		0.169	0.222		0.105	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Americium 241	0.00294	U	0.0641	0.0641		0.108	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Bismuth 212	1.33		0.367	0.392		0.484	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Bismuth 214	1.21		0.110	0.166		0.0747	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Lead 212	1.26		0.0904	0.186		0.0810	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Lead 214	1.23		0.101	0.164		0.0724	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Potassium 40	18.4		1.08	2.14		0.343	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Protactinium 234m	0.525	U	2.46	2.46		5.18	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Protactinium 231	0.450	U	0.235	0.240		1.27	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Radium 226	1.21		0.110	0.166		0.0747	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Thorium 234	1.16		0.545	0.558		0.874	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Uranium 235	0.241		0.161	0.163		0.222	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Thorium 232	1.43		0.169	0.222		0.105	pCi/g	10/19/15 11:09	10/19/15 22:16	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-05-P-R-S-00

Lab Sample ID: 160-14321-4

Date Collected: 10/14/15 16:50

Matrix: Solid

Date Received: 10/16/15 11:14

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.12		0.568	0.583		0.772	pCi/g	10/19/15 11:09	10/19/15 22:16	1
Tl-208	0.462		0.0510	0.0697		0.0378	pCi/g	10/19/15 11:09	10/19/15 22:16	1

Client Sample ID: L03-02-05-P-R-S-00

Lab Sample ID: 160-14321-4

Date Collected: 10/14/15 16:50

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 75.0

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000077	0.000023	mg/Kg	☼	10/19/15 13:03	10/20/15 21:13	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0538	U	0.0432	0.0435	1.54	0.264	pCi/g	10/19/15 13:03	10/20/15 21:13	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	87		30 - 110					10/19/15 13:03	10/20/15 21:13	1

Client Sample ID: L03-02-07-P-S-S-00

Lab Sample ID: 160-14321-5

Date Collected: 10/14/15 17:05

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.27		0.136	0.186		0.126	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Americium 241	0.00831	U	0.0603	0.0603		0.102	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Bismuth 212	1.27		0.392	0.413		0.398	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Bismuth 214	0.986		0.102	0.144		0.0682	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Lead 212	1.03		0.101	0.168		0.0933	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Lead 214	1.02		0.0914	0.140		0.0699	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Potassium 40	21.6		1.18	2.48		0.387	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Protactinium 234m	6.94		3.13	3.20		4.38	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Protactinium 231	0.536	U	0.265	0.271		1.21	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Radium 226	0.986		0.102	0.144		0.0682	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Thorium 234	1.10		0.527	0.539		0.845	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Uranium 235	0.0885	U	0.151	0.151		0.250	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Thorium 232	1.27		0.136	0.186		0.126	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.92		0.644	0.683		0.776	pCi/g	10/19/15 11:09	10/19/15 21:27	1
Tl-208	0.404		0.0552	0.0691		0.0417	pCi/g	10/19/15 11:09	10/19/15 21:27	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-07-P-S-S-00

Lab Sample ID: 160-14321-5

Date Collected: 10/14/15 17:05

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 90.4

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000060	0.000018	mg/Kg	☼	10/19/15 13:03	10/20/15 21:15	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0592	U	0.0538	0.0541	1.20	0.206	pCi/g	10/19/15 13:03	10/20/15 21:15	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	92		30 - 110					10/19/15 13:03	10/20/15 21:15	1

Client Sample ID: L03-02-08-P-R-S-00

Lab Sample ID: 160-14321-6

Date Collected: 10/14/15 17:25

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.14		0.118	0.166		0.115	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Americium 241	-0.00202	U	0.0620	0.0620		0.105	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Bismuth 212	1.54		0.460	0.487		0.410	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Bismuth 214	0.844		0.0934	0.128		0.0613	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Lead 212	1.13		0.0835	0.169		0.0670	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Lead 214	0.927		0.0860	0.129		0.0619	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Potassium 40	16.3		1.07	1.98		0.237	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Protactinium 234m	1.79	U	2.89	2.90		4.94	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Protactinium 231	0.674	U	0.295	0.305		1.09	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Radium 226	0.844		0.0934	0.128		0.0613	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Thorium 234	1.41		0.522	0.542		0.816	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Uranium 235	0.111	U	0.116	0.116		0.219	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Thorium 232	1.14		0.118	0.166		0.115	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	0.987		0.545	0.558		0.764	pCi/g	10/19/15 11:09	10/19/15 22:17	1
Tl-208	0.397		0.0513	0.0658		0.0375	pCi/g	10/19/15 11:09	10/19/15 22:17	1

Client Sample ID: L03-02-08-P-R-S-00

Lab Sample ID: 160-14321-6

Date Collected: 10/14/15 17:25

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 72.5

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000076	0.000023	mg/Kg	☼	10/19/15 13:03	10/20/15 21:18	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-08-P-R-S-00

Date Collected: 10/14/15 17:25

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-6

Matrix: Solid

Percent Solids: 72.5

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0544	U	0.0126	0.0136	1.53	0.262	pCi/g	10/19/15 13:03	10/20/15 21:18	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	90		30 - 110					10/19/15 13:03	10/20/15 21:18	1

Client Sample ID: L03-02-10-P-S-S-00

Date Collected: 10/15/15 08:35

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-7

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.15		0.167	0.204		0.152	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Americium 241	-0.0318	U	0.0645	0.0646		0.108	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Bismuth 212	1.27		0.614	0.628		0.569	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Bismuth 214	0.925		0.131	0.163		0.0905	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Lead 212	1.03		0.0889	0.161		0.0717	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Lead 214	0.861		0.105	0.138		0.0816	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Potassium 40	16.7		1.32	2.16		0.290	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Protactinium 234m	1.68	U	3.53	3.53		6.06	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Protactinium 231	0.387	U	0.332	0.334		1.26	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Radium 226	0.925		0.131	0.163		0.0905	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Thorium 234	1.11		0.542	0.554		0.860	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Uranium 235	0.0551	U	0.151	0.151		0.272	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Thorium 232	1.15		0.167	0.204		0.152	pCi/g	10/19/15 11:09	10/19/15 22:13	1
Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.284		0.0537	0.0613		0.0413	pCi/g	10/19/15 11:09	10/19/15 22:13	1

Client Sample ID: L03-02-10-P-S-S-00

Date Collected: 10/15/15 08:35

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-7

Matrix: Solid

Percent Solids: 88.9

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000062	0.000019	mg/Kg	☆	10/19/15 13:03	10/20/15 21:20	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0838	U	0.0264	0.0275	1.24	0.213	pCi/g	10/19/15 13:03	10/20/15 21:20	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	91		30 - 110					10/19/15 13:03	10/20/15 21:20	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-11-P-R-S-00

Lab Sample ID: 160-14321-8

Date Collected: 10/15/15 09:20

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.41		0.174	0.226		0.105	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Americium 241	0.00270	U	0.0690	0.0690		0.117	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Bismuth 212	1.12		0.481	0.494		0.663	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Bismuth 214	0.973		0.136	0.170		0.0877	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Lead 212	1.29		0.112	0.201		0.0953	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Lead 214	0.969		0.108	0.148		0.0800	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Potassium 40	15.8		1.36	2.11		0.323	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Protactinium 234m	4.82	U	3.48	3.51		5.80	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Protactinium 231	0.792	U	0.438	0.447		1.20	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Radium 226	0.973		0.136	0.170		0.0877	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Thorium 234	1.60		0.654	0.675		1.02	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Uranium 235	0.0622	U	0.159	0.160		0.326	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Thorium 232	1.41		0.174	0.226		0.105	pCi/g	10/19/15 11:09	10/19/15 22:45	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208			0.0683	0.0812		0.0509	pCi/g	10/19/15 11:09	10/19/15 22:45	1

Client Sample ID: L03-02-11-P-R-S-00

Lab Sample ID: 160-14321-8

Date Collected: 10/15/15 09:20

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 79.6

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000069	0.000021	mg/Kg	☼	10/19/15 13:03	10/20/15 21:23	1

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

Method 9320 - Metals (ICP-AES), TOC, Inorganic										
Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0344	U	0.0345	0.0346	1.38	0.236	pCi/g	10/19/15 13:03	10/20/15 21:23	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	92		30 - 110					10/19/15 13:03	10/20/15 21:23	1

Client Sample ID: L03-02-13-P-S-S-00

Lab Sample ID: 160-14321-9

Date Collected: 10/15/15 09:40

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.33		0.144	0.197		0.111	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Americium 241	-0.00199	U	0.0909	0.0909		0.106	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Bismuth 212	1.50		0.533	0.554		0.490	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Bismuth 214	0.862		0.0933	0.129		0.0642	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Lead 212	1.28		0.0868	0.188		0.0720	pCi/g	10/19/15 11:09	10/19/15 22:50	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-13-P-S-S-00

Lab Sample ID: 160-14321-9

Date Collected: 10/15/15 09:40

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Lead 214	1.05		0.0967	0.146		0.0768	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Potassium 40	21.9		1.20	2.51		0.383	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Protactinium 234m	3.71	U	2.80	2.83		5.27	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Protactinium 231	0.435	U	0.209	0.214		1.14	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Radium 226	0.862		0.0933	0.129		0.0642	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Thorium 234	1.53		0.748	0.765		0.906	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Uranium 235	0.122	U	0.148	0.148		0.240	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Thorium 232	1.33		0.144	0.197		0.111	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.08		0.688	0.699		0.859	pCi/g	10/19/15 11:09	10/19/15 22:50	1
Tl-208	0.441		0.0526	0.0695		0.0388	pCi/g	10/19/15 11:09	10/19/15 22:50	1

Client Sample ID: L03-02-13-P-S-S-00

Lab Sample ID: 160-14321-9

Date Collected: 10/15/15 09:40

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 83.2

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000066	0.000020	mg/Kg	☼	10/19/15 13:03	10/20/15 21:25	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0479	U	0.0744	0.0745	1.31	0.225	pCi/g	10/19/15 13:03	10/20/15 21:25	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	92		30 - 110					10/19/15 13:03	10/20/15 21:25	1

Client Sample ID: L03-02-14-P-R-S-00

Lab Sample ID: 160-14321-10

Date Collected: 10/15/15 10:20

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.22		0.126	0.177		0.114	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Americium 241	-0.0274	U	0.0616	0.0617		0.103	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Bismuth 212	1.48		0.493	0.516		0.426	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Bismuth 214	0.874		0.0907	0.128		0.0725	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Lead 212	1.16		0.0852	0.173		0.0674	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Lead 214	0.929		0.0995	0.139		0.0748	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Potassium 40	18.4		1.16	2.21		0.357	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Protactinium 234m	1.05	U	2.74	2.74		5.61	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Protactinium 231	0.668	U	0.253	0.264		1.10	pCi/g	10/19/15 11:09	10/19/15 22:51	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-14-P-R-S-00

Lab Sample ID: 160-14321-10

Date Collected: 10/15/15 10:20

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226	0.874		0.0907	0.128		0.0725	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Thorium 234	1.71		0.661	0.684		0.847	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Uranium 235	0.0797	U	0.133	0.133		0.228	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Thorium 232	1.22		0.126	0.177		0.114	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Other Detected Radionuclides										
Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.66		0.644	0.673		0.814	pCi/g	10/19/15 11:09	10/19/15 22:51	1
Tl-208	0.412		0.0523	0.0676		0.0356	pCi/g	10/19/15 11:09	10/19/15 22:51	1

Client Sample ID: L03-02-14-P-R-S-00

Lab Sample ID: 160-14321-10

Date Collected: 10/15/15 10:20

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 84.3

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000064	0.000019	mg/Kg	☼	10/19/15 13:03	10/20/15 21:28	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	-0.00110	U	0.0514	0.0514	1.28	0.219	pCi/g	10/19/15 13:03	10/20/15 21:28	1
Carrier										
Re	93		30 - 110					10/19/15 13:03	10/20/15 21:28	1

Client Sample ID: L03-02-16-P-S-S-00

Lab Sample ID: 160-14321-11

Date Collected: 10/15/15 10:30

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.15		0.153	0.193		0.190	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Americium 241	0.00912	U	0.0759	0.0759		0.128	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Bismuth 212	1.75		0.523	0.554		0.438	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Bismuth 214	1.02		0.132	0.169		0.0850	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Lead 212	1.26		0.106	0.194		0.0877	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Lead 214	1.15		0.112	0.164		0.0814	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Potassium 40	18.6		1.54	2.45		0.582	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Protactinium 234m	1.74	U	4.13	4.13		7.13	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Protactinium 231	0.276	U	0.269	0.271		1.45	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Radium 226	1.02		0.132	0.169		0.0850	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Thorium 234	1.19		0.351	0.373		0.986	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Uranium 235	0.0383	U	0.131	0.131		0.303	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Thorium 232	1.15		0.153	0.193		0.190	pCi/g	10/19/15 11:09	10/19/15 23:30	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-16-P-S-S-00

Lab Sample ID: 160-14321-11

Date Collected: 10/15/15 10:30

Matrix: Solid

Date Received: 10/16/15 11:14

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.41		0.628	0.649		0.865	pCi/g	10/19/15 11:09	10/19/15 23:30	1
Tl-208	0.353		0.0595	0.0699		0.0437	pCi/g	10/19/15 11:09	10/19/15 23:30	1

Client Sample ID: L03-02-16-P-S-S-00

Lab Sample ID: 160-14321-11

Date Collected: 10/15/15 10:30

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 83.9

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000068	0.000021	mg/Kg	☼	10/19/15 13:03	10/20/15 21:42	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0898	U	0.0722	0.0727	1.37	0.234	pCi/g	10/19/15 13:03	10/20/15 21:42	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	87		30 - 110					10/19/15 13:03	10/20/15 21:42	1

Client Sample ID: L03-02-17-P-R-S-00

Lab Sample ID: 160-14321-12

Date Collected: 10/15/15 10:50

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.22		0.144	0.190		0.0713	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Americium 241	0.0253	U	0.0573	0.0574		0.0955	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Bismuth 212	1.23		0.353	0.376		0.299	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Bismuth 214	0.906		0.0933	0.133		0.0680	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Lead 212	1.09		0.0765	0.160		0.0643	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Lead 214	0.956		0.0808	0.128		0.0589	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Potassium 40	17.3		0.993	2.03		0.266	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Protactinium 234m	0.334	U	2.66	2.66		4.65	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Protactinium 231	0.354	U	0.185	0.189		1.00	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Radium 226	0.906		0.0933	0.133		0.0680	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Thorium 234	1.03		0.300	0.318		0.917	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Uranium 235	0.0275	U	0.109	0.109		0.235	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Thorium 232	1.22		0.144	0.190		0.0713	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.15		0.489	0.507		0.667	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Tl-208	0.316		0.0396	0.0514		0.0286	pCi/g	10/19/15 11:09	10/19/15 23:31	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-17-P-R-S-00

Lab Sample ID: 160-14321-12

Date Collected: 10/15/15 10:50

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 79.2

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000068	0.000021	mg/Kg	☼	10/19/15 13:03	10/20/15 21:44	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0614	U	0.0616	0.0618	1.37	0.234	pCi/g	10/19/15 13:03	10/20/15 21:44	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	92		30 - 110					10/19/15 13:03	10/20/15 21:44	1

Client Sample ID: L03-02-19-P-S-S-00

Lab Sample ID: 160-14321-13

Date Collected: 10/15/15 11:10

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.01		0.144	0.177		0.0743	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Americium 241	0.0000185	U	0.0593	0.0593		0.101	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Bismuth 212	1.33		0.413	0.435		0.360	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Bismuth 214	0.922		0.107	0.144		0.0762	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Lead 212	1.06		0.0906	0.164		0.0778	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Lead 214	1.04		0.0924	0.143		0.0691	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Potassium 40	18.6		1.25	2.28		0.155	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Protactinium 234m	3.54	U	2.79	2.81		5.80	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Protactinium 231	0.643	U	0.278	0.287		1.11	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Radium 226	0.922		0.107	0.144		0.0762	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Thorium 234	1.23		0.303	0.329		0.851	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Uranium 235	0.217		0.141	0.142		0.191	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Thorium 232	1.01		0.144	0.177		0.0743	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.46		0.653	0.675		0.844	pCi/g	10/19/15 11:09	10/19/15 23:31	1
Tl-208	0.301		0.0516	0.0603		0.0435	pCi/g	10/19/15 11:09	10/19/15 23:31	1

Client Sample ID: L03-02-19-P-S-S-00

Lab Sample ID: 160-14321-13

Date Collected: 10/15/15 11:10

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 80.9

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000070	0.000021	mg/Kg	☼	10/19/15 13:03	10/20/15 21:47	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-19-P-S-S-00

Date Collected: 10/15/15 11:10

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-13

Matrix: Solid

Percent Solids: 80.9

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.213	U	0.161	0.163	1.40	0.240	pCi/g	10/19/15 13:03	10/20/15 21:47	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	89		30 - 110					10/19/15 13:03	10/20/15 21:47	1

Client Sample ID: L03-02-20-P-R-S-00

Date Collected: 10/15/15 11:35

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-14

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.35		0.129	0.187		0.115	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Americium 241	-0.00289	U	0.114	0.114		0.0991	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Bismuth 212	1.35		0.314	0.343		0.383	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Bismuth 214	0.928		0.0880	0.130		0.0606	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Lead 212	1.27		0.0949	0.191		0.0827	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Lead 214	1.15		0.0791	0.144		0.0673	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Potassium 40	17.7		0.991	2.04		0.329	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Protactinium 234m	6.77		2.78	2.86		4.32	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Protactinium 231	0.434	U	0.225	0.230		1.10	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Radium 226	0.928		0.0880	0.130		0.0606	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Thorium 234	0.949		0.264	0.282		0.774	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Uranium 235	0.0739	U	0.142	0.142		0.240	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Thorium 232	1.35		0.129	0.187		0.115	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	0.885		0.489	0.500		0.668	pCi/g	10/19/15 11:09	10/19/15 23:32	1
Tl-208	0.436		0.0518	0.0685		0.0388	pCi/g	10/19/15 11:09	10/19/15 23:32	1

Client Sample ID: L03-02-20-P-R-S-00

Date Collected: 10/15/15 11:35

Date Received: 10/16/15 11:14

Lab Sample ID: 160-14321-14

Matrix: Solid

Percent Solids: 79.6

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000068	0.000020	mg/Kg	☼	10/19/15 13:03	10/20/15 21:49	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.0409	U	0.0216	0.0219	1.36	0.233	pCi/g	10/19/15 13:03	10/20/15 21:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	92		30 - 110					10/19/15 13:03	10/20/15 21:49	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-22-P-S-S-00

Lab Sample ID: 160-14321-15

Date Collected: 10/15/15 12:00

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.09		0.126	0.168		0.113	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Americium 241	-0.00698	U	0.0603	0.0603		0.102	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Bismuth 212	1.23		0.501	0.517		0.456	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Bismuth 214	0.910		0.103	0.140		0.0640	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Lead 212	1.07		0.0824	0.161		0.0677	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Lead 214	1.10		0.0919	0.146		0.0698	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Potassium 40	20.0		1.22	2.38		0.316	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Protactinium 234m	1.93	U	3.41	3.42		5.82	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Protactinium 231	-0.714	U	0.739	0.743		1.21	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Radium 226	0.910		0.103	0.140		0.0640	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Thorium 234	1.15		0.496	0.511		0.786	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Uranium 235	0.0708	U	0.129	0.129		0.233	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Thorium 232	1.09		0.126	0.168		0.113	pCi/g	10/19/15 11:09	10/19/15 23:33	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208			0.0467	0.0563		0.0373	pCi/g	10/19/15 11:09	10/19/15 23:33	1

Client Sample ID: L03-02-22-P-S-S-00

Lab Sample ID: 160-14321-15

Date Collected: 10/15/15 12:00

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 89.2

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000062	0.000019	mg/Kg	☼	10/19/15 13:03	10/20/15 21:52	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.141	U	0.0421	0.0441	1.24	0.212	pCi/g	10/19/15 13:03	10/20/15 21:52	1
Carrier	%Yield	Qualifier	Limits							
Re	90		30 - 110							
								Prepared	Analyzed	Dil Fac
								10/19/15 13:03	10/20/15 21:52	1

Client Sample ID: L03-02-23-P-R-S-00

Lab Sample ID: 160-14321-16

Date Collected: 10/15/15 12:30

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.24		0.165	0.208		0.140	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Americium 241	-0.0361	U	0.0799	0.0800		0.133	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Bismuth 212	1.51		0.522	0.545		0.490	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Bismuth 214	0.850		0.138	0.164		0.0995	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Lead 212	1.15		0.107	0.183		0.0905	pCi/g	10/19/15 11:09	10/20/15 02:26	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-23-P-R-S-00

Lab Sample ID: 160-14321-16

Date Collected: 10/15/15 12:30

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Lead 214	1.02		0.115	0.156		0.0841	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Potassium 40	19.5		1.50	2.50		0.319	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Protactinium 234m	0.0536	U	0.345	0.345		8.34	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Protactinium 231	-0.694	U	0.949	0.952		1.57	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Radium 226	0.850		0.138	0.164		0.0995	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Thorium 234	1.39		0.588	0.606		0.921	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Uranium 235	0.105	U	0.153	0.154		0.252	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Thorium 232	1.24		0.165	0.208		0.140	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.420		0.0616	0.0754		0.0441	pCi/g	10/19/15 11:09	10/20/15 02:26	1

Client Sample ID: L03-02-23-P-R-S-00

Lab Sample ID: 160-14321-16

Date Collected: 10/15/15 12:30

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 85.4

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000065	0.000019	mg/Kg	☼	10/19/15 13:03	10/20/15 21:54	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.00929	U	0.0306	0.0306	1.29	0.221	pCi/g	10/19/15 13:03	10/20/15 21:54	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	91		30 - 110					10/19/15 13:03	10/20/15 21:54	1

Client Sample ID: L03-02-11-P-S-Q-00

Lab Sample ID: 160-14321-17

Date Collected: 10/15/15 09:20

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.05		0.106	0.151		0.0825	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Americium 241	0.0111	U	0.0566	0.0567		0.0950	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Bismuth 212	0.975		0.296	0.313		0.388	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Bismuth 214	0.832		0.0903	0.125		0.0625	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Lead 212	1.09		0.0765	0.160		0.0633	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Lead 214	0.896		0.0720	0.118		0.0589	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Potassium 40	15.3		0.921	1.82		0.246	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Protactinium 234m	0.630	U	2.53	2.53		4.39	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Protactinium 231	0.213	U	0.452	0.452		0.760	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Radium 226	0.832		0.0903	0.125		0.0625	pCi/g	10/19/15 11:09	10/20/15 02:26	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-11-P-S-Q-00

Lab Sample ID: 160-14321-17

Date Collected: 10/15/15 09:20

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium 234	1.22		0.481	0.498		0.758	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Uranium 235	0.139	U	0.0820	0.0833		0.142	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Thorium 232	1.05		0.106	0.151		0.0825	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Other Detected Radionuclides										
Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.31		0.595	0.615		0.740	pCi/g	10/19/15 11:09	10/20/15 02:26	1
Tl-208	0.360		0.0427	0.0568		0.0328	pCi/g	10/19/15 11:09	10/20/15 02:26	1

Client Sample ID: L03-02-11-P-S-Q-00

Lab Sample ID: 160-14321-17

Date Collected: 10/15/15 09:20

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 82.1

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000068	0.000020	mg/Kg	☼	10/19/15 13:03	10/20/15 21:57	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	-0.00140	U	0.0251	0.0251	1.36	0.233	pCi/g	10/19/15 13:03	10/20/15 21:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	90		30 - 110					10/19/15 13:03	10/20/15 21:57	1

Client Sample ID: L03-02-19-P-R-Q-00

Lab Sample ID: 160-14321-18

Date Collected: 10/15/15 11:10

Matrix: Solid

Date Received: 10/16/15 11:14

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.04		0.141	0.177		0.121	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Americium 241	-0.0215	U	0.0581	0.0581		0.0972	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Bismuth 212	1.29		0.386	0.409		0.378	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Bismuth 214	0.853		0.0941	0.129		0.0641	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Lead 212	1.04		0.0787	0.156		0.0623	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Lead 214	1.02		0.0883	0.138		0.0529	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Potassium 40	19.9		1.20	2.36		0.319	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Protactinium 234m	1.18	U	3.05	3.05		5.32	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Protactinium 231	0.442	U	0.283	0.287		1.01	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Radium 226	0.853		0.0941	0.129		0.0641	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Thorium 234	1.74		0.667	0.691		0.854	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Uranium 235	0.163	U	0.135	0.136		0.235	pCi/g	10/19/15 11:09	10/20/15 02:27	1
Thorium 232	1.04		0.141	0.177		0.121	pCi/g	10/19/15 11:09	10/20/15 02:27	1

TestAmerica St. Louis

Client Sample Results

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

TestAmerica Job ID: 160-14321-1

Client Sample ID: L03-02-19-P-R-Q-00

Lab Sample ID: 160-14321-18

Date Collected: 10/15/15 11:10

Matrix: Solid

Date Received: 10/16/15 11:14

Other Detected Radionuclides		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.365	0.0490	0.0619		0.0366	pCi/g	10/19/15 11:09	10/20/15 02:27	1

Client Sample ID: L03-02-19-P-R-Q-00

Lab Sample ID: 160-14321-18

Date Collected: 10/15/15 11:10

Matrix: Solid

Date Received: 10/16/15 11:14

Percent Solids: 82.8

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000068	0.000021	mg/Kg	☼	10/19/15 13:03	10/20/15 21:59	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.346		0.143	0.146	1.37	0.234	pCi/g	10/19/15 13:03	10/20/15 21:59	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	88		30 - 110					10/19/15 13:03	10/20/15 21:59	1

QC Sample Results

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

TestAmerica Job ID: 160-14321-1

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

Lab Sample ID: MB 160-217107/1-A

Matrix: Solid

Analysis Batch: 217510

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 217107

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000052	0.000016	mg/Kg		10/19/15 13:03	10/20/15 20:44	1

Lab Sample ID: LCS 160-217107/2-A

Matrix: Solid

Analysis Batch: 217510

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 217107

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Technetium 99	0.00123	0.00121		mg/Kg		98	80 - 120

Lab Sample ID: 160-14321-1 MS

Matrix: Solid

Analysis Batch: 217510

Client Sample ID: L03-02-01-P-S-S-00

Prep Type: Total/NA

Prep Batch: 217107

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Technetium 99	ND		0.00135	0.00133		mg/Kg	✱	99	75 - 125

Lab Sample ID: 160-14321-1 MSD

Matrix: Solid

Analysis Batch: 217510

Client Sample ID: L03-02-01-P-S-S-00

Prep Type: Total/NA

Prep Batch: 217107

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Technetium 99	ND		0.00134	0.00134		mg/Kg	✱	100	75 - 125	1	30

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

Lab Sample ID: MB 160-217107/1-A

Matrix: Solid

Analysis Batch: 217511

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 217107

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.03797	U	0.0301	0.0303	1.05	0.179	pCi/g	10/19/15 13:03	10/20/15 20:44	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Re	96		30 - 110	10/19/15 13:03	10/20/15 20:44	1

Lab Sample ID: LCS 160-217107/2-A

Matrix: Solid

Analysis Batch: 217511

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 217107

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Technetium 99	21.1	20.66		2.14	1.07	0.183	pCi/g	98	80 - 120

Carrier	LCS %Yield	LCS Qualifier	Limits
Re	94		30 - 110

TestAmerica St. Louis

QC Sample Results

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

TestAmerica Job ID: 160-14321-1

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

Lab Sample ID: 160-14321-1 MS

Matrix: Solid

Analysis Batch: 217511

Client Sample ID: L03-02-01-P-S-S-00

Prep Type: Total/NA

Prep Batch: 217107

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Technetium 99	0.0963	U	23.0	22.70		2.19	1.26	0.215	pCi/g	99	75 - 125
MS MS											
Carrier	%Yield	Qualifier	Limits								
Re	87		30 - 110								

Lab Sample ID: 160-14321-1 MSD

Matrix: Solid

Analysis Batch: 217511

Client Sample ID: L03-02-01-P-S-S-00

Prep Type: Total/NA

Prep Batch: 217107

Analyte	Sample Result	Sample Qual	Spike Added	MSD Result	MSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Technetium 99	0.0963	U	22.9	22.93		2.20	1.21	0.207	pCi/g	100	75 - 125	0.05	1
MSD MSD													
Carrier	%Yield	Qualifier	Limits										
Re	90		30 - 110										

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

Lab Sample ID: MB 160-217089/1-A

Matrix: Solid

Analysis Batch: 217121

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 217089

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.008209	U	0.0376	0.0376		0.0826	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Americium 241	-0.003752	U	0.0111	0.0111		0.0199	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Bismuth 212	-0.01354	U	0.136	0.136		0.267	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Bismuth 214	0.003643	U	0.0198	0.0198		0.0378	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Lead 212	-0.007692	U	0.115	0.115		0.0305	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Lead 214	0.005879	U	0.0166	0.0166		0.0382	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Potassium 40	-0.06165	U	1.16	1.16		0.351	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Protactinium 234m	-0.3100	U	1.57	1.57		3.01	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Protactinium 231	0.0000	U	0.160	0.160		0.351	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Radium 226	0.003643	U	0.0198	0.0198		0.0378	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Thorium 234	-0.08659	U	0.346	0.346		0.295	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Uranium 235	0.01276	U	0.0396	0.0397		0.0704	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Thorium 232	0.008209	U	0.0376	0.0376		0.0826	pCi/g	10/19/15 11:09	10/19/15 21:22	1
Count Total										
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	10/19/15 11:09	10/19/15 21:22	1

TestAmerica St. Louis

QC Sample Results

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

TestAmerica Job ID: 160-14321-1

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

Lab Sample ID: LCS 160-217089/2-A
Matrix: Solid
Analysis Batch: 217124

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 217089

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	101.8		10.6		0.497	pCi/g	101	87 - 116
Cesium 137	34.4	34.00		3.56	0.200	0.165	pCi/g	99	87 - 120
Cobalt 60	33.6	32.74		3.30		0.127	pCi/g	97	87 - 115

Lab Sample ID: 160-14321-1 DU
Matrix: Solid
Analysis Batch: 217129

Client Sample ID: L03-02-01-P-S-S-00
Prep Type: Total/NA
Prep Batch: 217089

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	1.13		0.9985		0.146		0.0923	pCi/g	0.39	1
Americium 241	0.0103	U	0.001622	U	0.0485		0.0823	pCi/g	0.08	1
Bismuth 212	1.50		1.252		0.487		0.417	pCi/g	0.24	1
Bismuth 214	0.832		0.7270		0.124		0.0738	pCi/g	0.42	1
Lead 212	1.05		1.024		0.155		0.0635	pCi/g	0.07	1
Lead 214	1.13		0.8632	F	0.116		0.0719	pCi/g	1.01	1
Potassium 40	20.9		18.68		2.21		0.296	pCi/g	0.48	1
Protactinium 234m	0.000	U	0.2731	U	0.982		4.54	pCi/g	0.09	1
Protactinium 231	0.390	U	0.4466	U	0.214		1.13	pCi/g	0.11	1
Radium 226	0.832		0.7270		0.124		0.0738	pCi/g	0.42	1
Thorium 234	1.34		0.8552		0.276		0.748	pCi/g	0.61	1
Uranium 235	0.123	U	0.09460	U	0.134		0.205	pCi/g	0.11	1
Thorium 232	1.13		0.9985		0.146		0.0923	pCi/g	0.39	1
Total										
Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Pb-210	1.86		1.475		0.558		0.698	pCi/g	0.29	1
Tl-208	0.358		0.3106		0.0513		0.0289	pCi/g	0.42	1

QC Association Summary

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

TestAmerica Job ID: 160-14321-1

Metals

Prep Batch: 217107

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14321-1	L03-02-01-P-S-S-00	Total/NA	Solid	None	
160-14321-1 MS	L03-02-01-P-S-S-00	Total/NA	Solid	None	
160-14321-1 MSD	L03-02-01-P-S-S-00	Total/NA	Solid	None	
160-14321-2	L03-02-02-P-R-S-00	Total/NA	Solid	None	
160-14321-3	L03-02-04-P-S-S-00	Total/NA	Solid	None	
160-14321-4	L03-02-05-P-R-S-00	Total/NA	Solid	None	
160-14321-5	L03-02-07-P-S-S-00	Total/NA	Solid	None	
160-14321-6	L03-02-08-P-R-S-00	Total/NA	Solid	None	
160-14321-7	L03-02-10-P-S-S-00	Total/NA	Solid	None	
160-14321-8	L03-02-11-P-R-S-00	Total/NA	Solid	None	
160-14321-9	L03-02-13-P-S-S-00	Total/NA	Solid	None	
160-14321-10	L03-02-14-P-R-S-00	Total/NA	Solid	None	
160-14321-11	L03-02-16-P-S-S-00	Total/NA	Solid	None	
160-14321-12	L03-02-17-P-R-S-00	Total/NA	Solid	None	
160-14321-13	L03-02-19-P-S-S-00	Total/NA	Solid	None	
160-14321-14	L03-02-20-P-R-S-00	Total/NA	Solid	None	
160-14321-15	L03-02-22-P-S-S-00	Total/NA	Solid	None	
160-14321-16	L03-02-23-P-R-S-00	Total/NA	Solid	None	
160-14321-17	L03-02-11-P-S-Q-00	Total/NA	Solid	None	
160-14321-18	L03-02-19-P-R-Q-00	Total/NA	Solid	None	
LCS 160-217107/2-A	Lab Control Sample	Total/NA	Solid	None	
MB 160-217107/1-A	Method Blank	Total/NA	Solid	None	

Analysis Batch: 217510

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14321-1	L03-02-01-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-1 MS	L03-02-01-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-1 MSD	L03-02-01-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-2	L03-02-02-P-R-S-00	Total/NA	Solid	6020A	217107
160-14321-3	L03-02-04-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-4	L03-02-05-P-R-S-00	Total/NA	Solid	6020A	217107
160-14321-5	L03-02-07-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-6	L03-02-08-P-R-S-00	Total/NA	Solid	6020A	217107
160-14321-7	L03-02-10-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-8	L03-02-11-P-R-S-00	Total/NA	Solid	6020A	217107
160-14321-9	L03-02-13-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-10	L03-02-14-P-R-S-00	Total/NA	Solid	6020A	217107
160-14321-11	L03-02-16-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-12	L03-02-17-P-R-S-00	Total/NA	Solid	6020A	217107
160-14321-13	L03-02-19-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-14	L03-02-20-P-R-S-00	Total/NA	Solid	6020A	217107
160-14321-15	L03-02-22-P-S-S-00	Total/NA	Solid	6020A	217107
160-14321-16	L03-02-23-P-R-S-00	Total/NA	Solid	6020A	217107
160-14321-17	L03-02-11-P-S-Q-00	Total/NA	Solid	6020A	217107
160-14321-18	L03-02-19-P-R-Q-00	Total/NA	Solid	6020A	217107
LCS 160-217107/2-A	Lab Control Sample	Total/NA	Solid	6020A	217107
MB 160-217107/1-A	Method Blank	Total/NA	Solid	6020A	217107

TestAmerica St. Louis

QC Association Summary

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

TestAmerica Job ID: 160-14321-1

General Chemistry

Analysis Batch: 216830

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14321-1	L03-02-01-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-1 DU	L03-02-01-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-2	L03-02-02-P-R-S-00	Total/NA	Solid	Moisture	
160-14321-3	L03-02-04-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-4	L03-02-05-P-R-S-00	Total/NA	Solid	Moisture	
160-14321-5	L03-02-07-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-6	L03-02-08-P-R-S-00	Total/NA	Solid	Moisture	
160-14321-7	L03-02-10-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-8	L03-02-11-P-R-S-00	Total/NA	Solid	Moisture	
160-14321-9	L03-02-13-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-10	L03-02-14-P-R-S-00	Total/NA	Solid	Moisture	
160-14321-11	L03-02-16-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-12	L03-02-17-P-R-S-00	Total/NA	Solid	Moisture	
160-14321-13	L03-02-19-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-14	L03-02-20-P-R-S-00	Total/NA	Solid	Moisture	
160-14321-15	L03-02-22-P-S-S-00	Total/NA	Solid	Moisture	
160-14321-16	L03-02-23-P-R-S-00	Total/NA	Solid	Moisture	
160-14321-17	L03-02-11-P-S-Q-00	Total/NA	Solid	Moisture	
160-14321-18	L03-02-19-P-R-Q-00	Total/NA	Solid	Moisture	

Rad

Leach Batch: 216801

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14321-1	L03-02-01-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-1 DU	L03-02-01-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-2	L03-02-02-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14321-3	L03-02-04-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-4	L03-02-05-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14321-5	L03-02-07-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-6	L03-02-08-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14321-7	L03-02-10-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-8	L03-02-11-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14321-9	L03-02-13-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-10	L03-02-14-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14321-11	L03-02-16-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-12	L03-02-17-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14321-13	L03-02-19-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-14	L03-02-20-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14321-15	L03-02-22-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14321-16	L03-02-23-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14321-17	L03-02-11-P-S-Q-00	Total/NA	Solid	Dry and Grind	
160-14321-18	L03-02-19-P-R-Q-00	Total/NA	Solid	Dry and Grind	

Prep Batch: 217089

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14321-1	L03-02-01-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-1 DU	L03-02-01-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-2	L03-02-02-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-3	L03-02-04-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801

TestAmerica St. Louis

QC Association Summary

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

TestAmerica Job ID: 160-14321-1

Rad (Continued)

Prep Batch: 217089 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14321-4	L03-02-05-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-5	L03-02-07-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-6	L03-02-08-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-7	L03-02-10-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-8	L03-02-11-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-9	L03-02-13-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-10	L03-02-14-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-11	L03-02-16-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-12	L03-02-17-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-13	L03-02-19-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-14	L03-02-20-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-15	L03-02-22-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-16	L03-02-23-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-17	L03-02-11-P-S-Q-00	Total/NA	Solid	Fill_Geo-0	216801
160-14321-18	L03-02-19-P-R-Q-00	Total/NA	Solid	Fill_Geo-0	216801
LCS 160-217089/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-0	
MB 160-217089/1-A	Method Blank	Total/NA	Solid	Fill_Geo-0	

Prep Batch: 217107

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14321-1	L03-02-01-P-S-S-00	Total/NA	Solid	None	
160-14321-1 MS	L03-02-01-P-S-S-00	Total/NA	Solid	None	
160-14321-1 MSD	L03-02-01-P-S-S-00	Total/NA	Solid	None	
160-14321-2	L03-02-02-P-R-S-00	Total/NA	Solid	None	
160-14321-3	L03-02-04-P-S-S-00	Total/NA	Solid	None	
160-14321-4	L03-02-05-P-R-S-00	Total/NA	Solid	None	
160-14321-5	L03-02-07-P-S-S-00	Total/NA	Solid	None	
160-14321-6	L03-02-08-P-R-S-00	Total/NA	Solid	None	
160-14321-7	L03-02-10-P-S-S-00	Total/NA	Solid	None	
160-14321-8	L03-02-11-P-R-S-00	Total/NA	Solid	None	
160-14321-9	L03-02-13-P-S-S-00	Total/NA	Solid	None	
160-14321-10	L03-02-14-P-R-S-00	Total/NA	Solid	None	
160-14321-11	L03-02-16-P-S-S-00	Total/NA	Solid	None	
160-14321-12	L03-02-17-P-R-S-00	Total/NA	Solid	None	
160-14321-13	L03-02-19-P-S-S-00	Total/NA	Solid	None	
160-14321-14	L03-02-20-P-R-S-00	Total/NA	Solid	None	
160-14321-15	L03-02-22-P-S-S-00	Total/NA	Solid	None	
160-14321-16	L03-02-23-P-R-S-00	Total/NA	Solid	None	
160-14321-17	L03-02-11-P-S-Q-00	Total/NA	Solid	None	
160-14321-18	L03-02-19-P-R-Q-00	Total/NA	Solid	None	
LCS 160-217107/2-A	Lab Control Sample	Total/NA	Solid	None	
MB 160-217107/1-A	Method Blank	Total/NA	Solid	None	

Tracer/Carrier Summary

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

TestAmerica Job ID: 160-14321-1

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

Matrix: Solid

Prep Type: Total/NA

Percent Yield (Acceptance Limits)		
Lab Sample ID	Client Sample ID	Re (30-110)
160-14321-1	L03-02-01-P-S-S-00	89
160-14321-1 MS	L03-02-01-P-S-S-00	87
160-14321-1 MSD	L03-02-01-P-S-S-00	90
160-14321-2	L03-02-02-P-R-S-00	93
160-14321-3	L03-02-04-P-S-S-00	90
160-14321-4	L03-02-05-P-R-S-00	87
160-14321-5	L03-02-07-P-S-S-00	92
160-14321-6	L03-02-08-P-R-S-00	90
160-14321-7	L03-02-10-P-S-S-00	91
160-14321-8	L03-02-11-P-R-S-00	92
160-14321-9	L03-02-13-P-S-S-00	92
160-14321-10	L03-02-14-P-R-S-00	93
160-14321-11	L03-02-16-P-S-S-00	87
160-14321-12	L03-02-17-P-R-S-00	92
160-14321-13	L03-02-19-P-S-S-00	89
160-14321-14	L03-02-20-P-R-S-00	92
160-14321-15	L03-02-22-P-S-S-00	90
160-14321-16	L03-02-23-P-R-S-00	91
160-14321-17	L03-02-11-P-S-Q-00	90
160-14321-18	L03-02-19-P-R-Q-00	88
LCS 160-217107/2-A	Lab Control Sample	94
MB 160-217107/1-A	Method Blank	96

Tracer/Carrier Legend

Re = Re