

# 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: 160-14225-1

Client Project/Site: HDP

For:

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

Attn: Brian Miller

*Rhonda Ridenhower*

Authorized for release by:

10/20/2015 10:58:22 AM

Rhonda Ridenhower, Manager of Project Management  
[rhonda.ridenhower@testamericainc.com](mailto:rhonda.ridenhower@testamericainc.com)

Designee for

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

[ivan.vania@testamericainc.com](mailto:ivan.vania@testamericainc.com)

### LINKS

Review your project  
results through  
**TotalAccess**

Have a Question?



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

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

1

2

3

4

5

6

7

8

9

10

11

12



# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	5
Receipt Checklists . . . . .	7
Definitions/Glossary . . . . .	8
Method Summary . . . . .	9
Sample Summary . . . . .	10
Client Sample Results . . . . .	11
QC Sample Results . . . . .	28
QC Association Summary . . . . .	31
Tracer Carrier Summary . . . . .	34

# Case Narrative

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

TestAmerica Job ID: 160-14225-1

**Job ID: 160-14225-1**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Perma-Fix Environmental Services Inc.**

**Project: HDP**

**Report Number: 160-14225-1**

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 10/12/2015; the samples arrived in good condition, properly preserved. The temperatures of the 3 coolers at receipt time were 20.0° C, 20.0° C and 20.0° C.

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

Samples L03-01-01-P-S-S-00 (160-14225-1), L03-01-02-P-R-S-00 (160-14225-2), L03-01-04-P-S-S-00 (160-14225-3), L03-01-05-P-R-S-00 (160-14225-4), L03-01-07-P-S-S-00 (160-14225-5), L03-01-08-P-R-S-00 (160-14225-6), L03-01-10-P-S-S-00 (160-14225-7), L03-01-11-P-R-S-00 (160-14225-8), L03-01-13-P-S-S-00 (160-14225-9), L03-01-14-P-R-S-00 (160-14225-10), L03-01-16-P-S-S-00 (160-14225-11), L03-01-17-P-R-S-00 (160-14225-12), L03-01-19-P-S-S-00 (160-14225-13), L03-01-20-P-R-S-00 (160-14225-14), L03-01-22-P-S-S-00 (160-14225-15), L03-01-23-P-R-S-00 (160-14225-16), L03-01-01-P-S-Q-00 (160-14225-17), L03-01-05-P-R-Q-00 (160-14225-18) and L03-01-25-P-S-B-00 (160-14225-19) were analyzed for Technetium-99 (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 10/13/2015 and analyzed on 10/15/2015.

The continuing calibration blank (CCB) for analytical batch 160-216733 and 160-216734 contained Technetium above the reporting limit (RL). All reported samples associated with this CCB were either below the reporting limit for this analyte or contained this analyte at a

# Case Narrative

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

TestAmerica Job ID: 160-14225-1

## Job ID: 160-14225-1 (Continued)

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

concentration greater than 10X the value found in the CCB; therefore, re-analysis of samples was not performed. L03-01-02-P-R-S-00 (160-14225-2), L03-01-04-P-S-S-00 (160-14225-3), L03-01-05-P-R-S-00 (160-14225-4), L03-01-07-P-S-S-00 (160-14225-5), L03-01-08-P-R-S-00 (160-14225-6), L03-01-10-P-S-S-00 (160-14225-7), L03-01-11-P-R-S-00 (160-14225-8), L03-01-13-P-S-S-00 (160-14225-9), L03-01-14-P-R-S-00 (160-14225-10), L03-01-16-P-S-S-00 (160-14225-11), L03-01-17-P-R-S-00 (160-14225-12), L03-01-19-P-S-S-00 (160-14225-13), L03-01-20-P-R-S-00 (160-14225-14), L03-01-22-P-S-S-00 (160-14225-15), L03-01-23-P-R-S-00 (160-14225-16), L03-01-01-P-S-Q-00 (160-14225-17), L03-01-05-P-R-Q-00 (160-14225-18) and L03-01-25-P-S-B-00 (160-14225-19)

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

### PERCENT SOLIDS

Samples L03-01-01-P-S-S-00 (160-14225-1), L03-01-02-P-R-S-00 (160-14225-2), L03-01-04-P-S-S-00 (160-14225-3), L03-01-05-P-R-S-00 (160-14225-4), L03-01-07-P-S-S-00 (160-14225-5), L03-01-08-P-R-S-00 (160-14225-6), L03-01-10-P-S-S-00 (160-14225-7), L03-01-11-P-R-S-00 (160-14225-8), L03-01-13-P-S-S-00 (160-14225-9), L03-01-14-P-R-S-00 (160-14225-10), L03-01-16-P-S-S-00 (160-14225-11), L03-01-17-P-R-S-00 (160-14225-12), L03-01-19-P-S-S-00 (160-14225-13), L03-01-20-P-R-S-00 (160-14225-14), L03-01-22-P-S-S-00 (160-14225-15), L03-01-23-P-R-S-00 (160-14225-16), L03-01-01-P-S-Q-00 (160-14225-17), L03-01-05-P-R-Q-00 (160-14225-18) and L03-01-25-P-S-B-00 (160-14225-19) were analyzed for percent solids in accordance with EPA Method 160.3 MOD. The samples were analyzed on 10/15/2015.

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 L03-01-01-P-S-S-00 (160-14225-1), L03-01-02-P-R-S-00 (160-14225-2), L03-01-04-P-S-S-00 (160-14225-3), L03-01-05-P-R-S-00 (160-14225-4), L03-01-07-P-S-S-00 (160-14225-5), L03-01-08-P-R-S-00 (160-14225-6), L03-01-10-P-S-S-00 (160-14225-7), L03-01-11-P-R-S-00 (160-14225-8), L03-01-13-P-S-S-00 (160-14225-9), L03-01-14-P-R-S-00 (160-14225-10), L03-01-16-P-S-S-00 (160-14225-11), L03-01-17-P-R-S-00 (160-14225-12), L03-01-19-P-S-S-00 (160-14225-13), L03-01-20-P-R-S-00 (160-14225-14), L03-01-22-P-S-S-00 (160-14225-15), L03-01-23-P-R-S-00 (160-14225-16), L03-01-01-P-S-Q-00 (160-14225-17), L03-01-05-P-R-Q-00 (160-14225-18) and L03-01-25-P-S-B-00 (160-14225-19) were analyzed for Cesium-137 & Other Gamma Emitters (GS) in accordance with DOE GA-01-R. The samples were dried on 10/13/2015, prepared on 10/15/2015 and analyzed on 10/16/2015.

Radium-226 is reported in these samples at the client's request. Radium-226 is reported from the 609.31 keV line of bismuth-214. Because the samples have not had 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. L03-01-01-P-S-S-00 (160-14225-1), L03-01-02-P-R-S-00 (160-14225-2), L03-01-04-P-S-S-00 (160-14225-3), L03-01-05-P-R-S-00 (160-14225-4), L03-01-07-P-S-S-00 (160-14225-5), L03-01-08-P-R-S-00 (160-14225-6), L03-01-10-P-S-S-00 (160-14225-7), L03-01-11-P-R-S-00 (160-14225-8), L03-01-13-P-S-S-00 (160-14225-9), L03-01-14-P-R-S-00 (160-14225-10), L03-01-16-P-S-S-00 (160-14225-11), L03-01-17-P-R-S-00 (160-14225-12), L03-01-19-P-S-S-00 (160-14225-13), L03-01-20-P-R-S-00 (160-14225-14), L03-01-22-P-S-S-00 (160-14225-15), L03-01-23-P-R-S-00 (160-14225-16), L03-01-01-P-S-Q-00 (160-14225-17), L03-01-05-P-R-Q-00 (160-14225-18), L03-01-25-P-S-B-00 (160-14225-19), (LCS 160-216682/2-A), (MB 160-216682/1-A) and (160-14225-A-1-D DU)

The sample duplicate precision for the following samples were outside control limits for Pa-231, both the sample and duplicate were below the MDC. L03-01-01-P-S-S-00 (160-14225-1).

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 Laboratories, Inc.

Regulatory Program:  DW  NPDES  RCRA  Other:

<b>Client Contact</b> Perma-Fix Environmental Services 2800 Solway Road Knoxville, TN 37931 (865) 690-0501 Phone (865) 539-9868 FAX Project Name: Hematite Decommissioning Project Site: Westinghouse Hematite, MO P O # 832953		<b>Project Manager: Brian Miller</b> Tel/Fax: (314) 810-3333 Analysis Turnaround Time <input checked="" type="checkbox"/> CALENDAR DAYS <input type="checkbox"/> WORKING DAYS TAT if different from Below <input type="checkbox"/> 2 weeks <input checked="" type="checkbox"/> 1 week <input type="checkbox"/> 2 days <input type="checkbox"/> 1 day		<b>Site Contact: Ellen Jakub</b> Date: 10/12/2015 <b>Lab Contact: Ivan Vanya</b> Carrier: Courier		COC No: 101215-FSS1 1 of 2 COCs Sampler: For Lab Use Only: Walk-in Client: Lab Sampling: 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	CP/MS (Tc-99) (With post-21 day ingrowth)	Sample Specific Notes:
L03-01-01-P-S-S-00	10/08/15	1515	G	Soil	1	N		X		X	Mark Shaffer
L03-01-02-P-R-S-00	10/08/15	1530	C	Soil	1	N		X		X	Jahmai Williams
L03-01-04-P-S-S-00	10/08/15	1430	G	Soil	1	N		X		X	Chris Chandler
L03-01-05-P-R-S-00	10/08/15	1445	C	Soil	1	N		X		X	Jahmai Williams
L03-01-07-P-S-S-00	10/08/15	1605	G	Soil	1	N		X		X	Mark Shaffer
L03-01-08-P-R-S-00	10/08/15	1615	C	Soil	1	N		X		X	Jahmai Williams
L03-01-10-P-S-S-00	10/08/15	1340	G	Soil	1	N		X		X	Mark Shaffer
L03-01-11-P-R-S-00	10/08/15	1405	C	Soil	1	N		X		X	Chris Chandler
L03-01-13-P-S-S-00	10/08/15	1115	G	Soil	1	N		X		X	Jahmai Williams
L03-01-14-P-R-S-00	10/08/15	1130	C	Soil	1	N		X		X	Jahmai Williams
L03-01-16-P-S-S-00	10/08/15	1030	G	Soil	1	N		X		X	Jahmai Williams
L03-01-17-P-R-S-00	10/08/15	1105	C	Soil	1	N		X		X	Jahmai Williams



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

Return to Client  Disposal by Lab  Archive for \_\_\_\_\_ Months

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other, None

Possible Hazard Identification: 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

Custody Seal Intact: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Relinquished by: <i>Ellen Jakub</i> Relinquished by: <i>Ellen Vanya</i> Relinquished by:	Company: <i>Perma-Fix</i> Company: <i>Crossroads</i> Company:	Date/Time: 10-12-15/12:15 Date/Time: 10-12-15/14:00 Date/Time:	Received by: <i>Sergiy Ivanov</i> Received by: <i>Ellen Vanya</i> Received in Laboratory by:	Company: <i>Quorchem-Corona</i> Company: <i>TA STJ</i> Company:	Date/Time: 10-12-15/12:45 AM Date/Time: 10-12-15/14:07 Date/Time:
--	---	--	--	---	---

Hematite Decommissioning Project | 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 Laboratories, Inc.

Regulatory Program:  DW  NPDES  RCRA  Other:

<b>Client Contact</b> Perma-Fix Environmental Services 2800 Solway Road Knoxville, TN 37931 Phone (865) 690-0501 FAX (865) 539-9868 Project Name: Hematite Decommissioning Project Site: Westinghouse Hematite, MO P O # 832953		<b>Project Manager:</b> Brian Miller Tel/Fax: (314) 810-3333		<b>Site Contact:</b> Ellen Jakub Date: 10/12/2015		<b>Lab Contact:</b> Ivan Vanya Carrier: Courier		COC No: 101215-FSS1 2 of 2 COCs																							
<b>Analysis Turnaround Time</b> <input checked="" type="checkbox"/> CALENDAR DAYS <input type="checkbox"/> WORKING DAYS TAT if different from Below: _____ <input type="checkbox"/> 2 weeks <input checked="" type="checkbox"/> 1 week <input type="checkbox"/> 2 days <input type="checkbox"/> 1 day		<b>Sample Identification</b> L03-01-19-P-S-S-00 L03-01-20-P-R-S-00 L03-01-22-P-S-S-00 L03-01-23-P-R-S-00 L03-01-01-P-S-Q-00 L03-01-05-P-R-Q-00 L03-01-25-P-S-B-00		<b>Sample Date</b> 10/08/15 10/08/15 10/08/15 10/08/15 10/08/15 10/08/15 10/09/15		<b>Sample Time</b> 1000 1015 0925 0940 1515 1445 1010		<b>Sample Type (C-Comp, G-Grab)</b> G C G C C G G		<b>Matrix</b> Soil Soil Soil Soil Soil Soil Soil		<b>Filtered Sample (Y/N)</b> N N N N N N N		<b>Perform MS/MSD (Y/N)</b> X X X X X X X		<b>Westinghouse Hematite Library</b> X X X X X X X		<b>Alpha Spec</b> X X X X X X X		<b>ICP/MS (Tc-99)</b> X X X X X X X		<b>Gamma Spec (With post-21 day ingrowth)</b> X X X X X X X									
<b>Sample Specific Notes:</b> Matt Cushman Jahmai Williams Mark Shaffer Chrts Chandler Mark Shaffer Jahmai Williams Jahmai Williams		<b>Sampler:</b> For Lab Use Only: Walk-in Client: _____ Lab Sampling: _____ Job / SDG No.: _____		<b>Preservation Used:</b> 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other, None		<b>Possible Hazard Identification:</b> 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.		<input checked="" type="checkbox"/> Return to Client <input type="checkbox"/> Disposal by Lab <input type="checkbox"/> Archive for _____ Months		<b>Special Instructions/QC Requirements &amp; Comments: Potential for Radiological Contamination</b>		<b>Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)</b>		<b>Received by:</b> Company: Perma-Fix Date/Time: 10-12-15 12:45 PM Received by: <i>George Warford</i> Date/Time: 10-13-15 14:27 Received in Laboratory by: <i>Ellen Jakub</i>		<b>Company:</b> Perma-Fix <b>Company:</b> Crossroads <b>Company:</b>		<b>Received by:</b> <i>George Warford</i> <b>Company:</b> <i>Perma-Fix</i> <b>Received by:</b> <i>Ellen Jakub</i> <b>Company:</b> <i>TAOR</i>		<b>Received by:</b> <i>George Warford</i> <b>Company:</b> <i>Perma-Fix</i> <b>Received by:</b> <i>Ellen Jakub</i> <b>Company:</b> <i>TAOR</i>											
<b>Client Contact</b> Perma-Fix Environmental Services 2800 Solway Road Knoxville, TN 37931 Phone (865) 690-0501 FAX (865) 539-9868 Project Name: Hematite Decommissioning Project Site: Westinghouse Hematite, MO P O # 832953		<b>Project Manager:</b> Brian Miller Tel/Fax: (314) 810-3333		<b>Site Contact:</b> Ellen Jakub Date: 10/12/2015		<b>Lab Contact:</b> Ivan Vanya Carrier: Courier		COC No: 101215-FSS1 2 of 2 COCs		<b>Sample Specific Notes:</b> Matt Cushman Jahmai Williams Mark Shaffer Chrts Chandler Mark Shaffer Jahmai Williams Jahmai Williams		<b>Sampler:</b> For Lab Use Only: Walk-in Client: _____ Lab Sampling: _____ Job / SDG No.: _____		<b>Preservation Used:</b> 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other, None		<b>Possible Hazard Identification:</b> 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.		<input checked="" type="checkbox"/> Return to Client <input type="checkbox"/> Disposal by Lab <input type="checkbox"/> Archive for _____ Months		<b>Special Instructions/QC Requirements &amp; Comments: Potential for Radiological Contamination</b>		<b>Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)</b>		<b>Received by:</b> Company: Perma-Fix Date/Time: 10-12-15 12:45 PM Received by: <i>George Warford</i> Date/Time: 10-13-15 14:27 Received in Laboratory by: <i>Ellen Jakub</i>		<b>Company:</b> Perma-Fix <b>Company:</b> Crossroads <b>Company:</b>		<b>Received by:</b> <i>George Warford</i> <b>Company:</b> <i>Perma-Fix</i> <b>Received by:</b> <i>Ellen Jakub</i> <b>Company:</b> <i>TAOR</i>		<b>Received by:</b> <i>George Warford</i> <b>Company:</b> <i>Perma-Fix</i> <b>Received by:</b> <i>Ellen Jakub</i> <b>Company:</b> <i>TAOR</i>	



# Login Sample Receipt Checklist

Client: Perma-Fix Environmental Services Inc.

Job Number: 160-14225-1

**Login Number: 14225**

**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.	N/A	
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.	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: 160-14225-1

## Qualifiers

### Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.

### 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: 160-14225-1

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: 160-14225-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-14225-1	L03-01-01-P-S-S-00	Solid	10/08/15 15:15	10/12/15 14:27
160-14225-2	L03-01-02-P-R-S-00	Solid	10/08/15 15:30	10/12/15 14:27
160-14225-3	L03-01-04-P-S-S-00	Solid	10/08/15 14:30	10/12/15 14:27
160-14225-4	L03-01-05-P-R-S-00	Solid	10/08/15 14:45	10/12/15 14:27
160-14225-5	L03-01-07-P-S-S-00	Solid	10/08/15 16:05	10/12/15 14:27
160-14225-6	L03-01-08-P-R-S-00	Solid	10/08/15 16:15	10/12/15 14:27
160-14225-7	L03-01-10-P-S-S-00	Solid	10/08/15 13:40	10/12/15 14:27
160-14225-8	L03-01-11-P-R-S-00	Solid	10/08/15 14:05	10/12/15 14:27
160-14225-9	L03-01-13-P-S-S-00	Solid	10/08/15 11:15	10/12/15 14:27
160-14225-10	L03-01-14-P-R-S-00	Solid	10/08/15 11:30	10/12/15 14:27
160-14225-11	L03-01-16-P-S-S-00	Solid	10/08/15 10:30	10/12/15 14:27
160-14225-12	L03-01-17-P-R-S-00	Solid	10/08/15 11:05	10/12/15 14:27
160-14225-13	L03-01-19-P-S-S-00	Solid	10/08/15 10:00	10/12/15 14:27
160-14225-14	L03-01-20-P-R-S-00	Solid	10/08/15 10:15	10/12/15 14:27
160-14225-15	L03-01-22-P-S-S-00	Solid	10/08/15 09:25	10/12/15 14:27
160-14225-16	L03-01-23-P-R-S-00	Solid	10/08/15 09:40	10/12/15 14:27
160-14225-17	L03-01-01-P-S-Q-00	Solid	10/08/15 15:15	10/12/15 14:27
160-14225-18	L03-01-05-P-R-Q-00	Solid	10/08/15 14:45	10/12/15 14:27
160-14225-19	L03-01-25-P-S-B-00	Solid	10/09/15 10:10	10/12/15 14:27

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

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

**Lab Sample ID: 160-14225-1**

Date Collected: 10/08/15 15:15

Matrix: Solid

Date Received: 10/12/15 14:27

**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		0.131	0.172		0.127	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Americium 241	-0.0150	U	0.0604	0.0605		0.101	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Bismuth 212	1.04		0.430	0.443		0.439	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Bismuth 214	0.917		0.102	0.139		0.0679	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Lead 212	1.03		0.0815	0.156		0.0664	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Lead 214	0.959		0.0881	0.133		0.0756	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Potassium 40	17.9		1.22	2.21		0.274	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Protactinium 234m	1.72	U	3.17	3.18		5.39	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Protactinium 231	0.599	U	0.321	0.328		1.00	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Radium 226	0.917		0.102	0.139		0.0679	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Thorium 234	0.848		0.274	0.288		0.758	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Uranium 235	0.0718	U	0.105	0.105		0.175	pCi/g	10/15/15 14:20	10/16/15 23:15	1
Thorium 232	1.09		0.131	0.172		0.127	pCi/g	10/15/15 14:20	10/16/15 23:15	1
<b>Other Detected Radionuclides</b>			<b>Count Uncert. (2σ+/-)</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Tl-208	0.338		0.0490	0.0603		0.0370	pCi/g	10/15/15 14:20	10/16/15 23:15	1

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

**Lab Sample ID: 160-14225-1**

Date Collected: 10/08/15 15:15

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 87.9

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	0.000062	J	0.000098	0.000029	mg/Kg	☼	10/13/15 16:21	10/15/15 17:51	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	1.07		2.56	2.56	1.96	0.335	pCi/g	10/13/15 16:21	10/15/15 17:51	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	58		30 - 110					10/13/15 16:21	10/15/15 17:51	1

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

**Lab Sample ID: 160-14225-2**

Date Collected: 10/08/15 15:30

Matrix: Solid

Date Received: 10/12/15 14:27

**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		0.0984	0.145		0.0704	pCi/g	10/15/15 14:20	10/16/15 18:22	1
Americium 241	-0.0157	U	0.0549	0.0549		0.0918	pCi/g	10/15/15 14:20	10/16/15 18:22	1
Bismuth 212	1.24		0.367	0.389		0.332	pCi/g	10/15/15 14:20	10/16/15 18:22	1
Bismuth 214	0.884		0.0928	0.131		0.0656	pCi/g	10/15/15 14:20	10/16/15 18:22	1
Lead 212	1.03		0.0667	0.149		0.0500	pCi/g	10/15/15 14:20	10/16/15 18:22	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

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

**Lab Sample ID: 160-14225-2**

Date Collected: 10/08/15 15:30

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Lead 214</b>	<b>0.991</b>		0.0764	0.128		0.0553	pCi/g	10/15/15 14:20	10/16/15 18:22	1
<b>Potassium 40</b>	<b>15.1</b>		0.947	1.81		0.308	pCi/g	10/15/15 14:20	10/16/15 18:22	1
Protactinium 234m	0.776	U	2.46	2.46		4.31	pCi/g	10/15/15 14:20	10/16/15 18:22	1
Protactinium 231	0.377	U	0.176	0.181		0.995	pCi/g	10/15/15 14:20	10/16/15 18:22	1
<b>Radium 226</b>	<b>0.884</b>		0.0928	0.131		0.0656	pCi/g	10/15/15 14:20	10/16/15 18:22	1
<b>Thorium 234</b>	<b>1.11</b>		0.443	0.458		0.699	pCi/g	10/15/15 14:20	10/16/15 18:22	1
Uranium 235	0.0286	U	0.0681	0.0682		0.181	pCi/g	10/15/15 14:20	10/16/15 18:22	1
<b>Thorium 232</b>	<b>1.05</b>		0.0984	0.145		0.0704	pCi/g	10/15/15 14:20	10/16/15 18:22	1
<b>Other Detected</b>			<b>Count</b>	<b>Total</b>						
<b>Radionuclides</b>			<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
	<b>Result</b>	<b>Qualifier</b>	<b>(2σ+/-)</b>	<b>(2σ+/-)</b>						
Pb-210	0.697		0.448	0.455		0.648	pCi/g	10/15/15 14:20	10/16/15 18:22	1
Tl-208	0.388		0.0457	0.0609		0.0330	pCi/g	10/15/15 14:20	10/16/15 18:22	1

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

**Lab Sample ID: 160-14225-2**

Date Collected: 10/08/15 15:30

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 84.2

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
<b>Technetium 99</b>	<b>0.000033</b>	<b>J ^</b>	0.00011	0.000033	mg/Kg	☼	10/13/15 16:21	10/15/15 18:08	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Technetium 99</b>	<b>0.565</b>		1.15	1.15	2.23	0.381	pCi/g	10/13/15 16:21	10/15/15 18:08	1
<b>Carrier</b>			<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	54		30 - 110					10/13/15 16:21	10/15/15 18:08	1

**Client Sample ID: L03-01-04-P-S-S-00**

**Lab Sample ID: 160-14225-3**

Date Collected: 10/08/15 14:30

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.993</b>		0.169	0.197		0.168	pCi/g	10/15/15 14:20	10/16/15 18:54	1
Americium 241	0.00758	U	0.0706	0.0706		0.119	pCi/g	10/15/15 14:20	10/16/15 18:54	1
<b>Bismuth 212</b>	<b>1.46</b>		0.450	0.475		0.367	pCi/g	10/15/15 14:20	10/16/15 18:54	1
<b>Bismuth 214</b>	<b>0.920</b>		0.114	0.149		0.0694	pCi/g	10/15/15 14:20	10/16/15 18:54	1
<b>Lead 212</b>	<b>0.998</b>		0.0910	0.158		0.0772	pCi/g	10/15/15 14:20	10/16/15 18:54	1
<b>Lead 214</b>	<b>1.11</b>		0.111	0.160		0.0806	pCi/g	10/15/15 14:20	10/16/15 18:54	1
<b>Potassium 40</b>	<b>17.4</b>		1.36	2.24		0.297	pCi/g	10/15/15 14:20	10/16/15 18:54	1
Protactinium 234m	1.49	U	3.21	3.21		6.46	pCi/g	10/15/15 14:20	10/16/15 18:54	1
Protactinium 231	0.321	U	0.233	0.236		1.40	pCi/g	10/15/15 14:20	10/16/15 18:54	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-04-P-S-S-00**

**Lab Sample ID: 160-14225-3**

Date Collected: 10/08/15 14:30

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Radium 226</b>	<b>0.920</b>		0.114	0.149		0.0694	pCi/g	10/15/15 14:20	10/16/15 18:54	1
Thorium 234	1.02	U	0.333	0.349		1.16	pCi/g	10/15/15 14:20	10/16/15 18:54	1
Uranium 235	0.0974	U	0.143	0.143		0.264	pCi/g	10/15/15 14:20	10/16/15 18:54	1
<b>Thorium 232</b>	<b>0.993</b>		0.169	0.197		0.168	pCi/g	10/15/15 14:20	10/16/15 18:54	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</b>	<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
			(2σ+/-)	(2σ+/-)						
Tl-208	0.389		0.0609	0.0731		0.0404	pCi/g	10/15/15 14:20	10/16/15 18:54	1

**Client Sample ID: L03-01-04-P-S-S-00**

**Lab Sample ID: 160-14225-3**

Date Collected: 10/08/15 14:30

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 87.4

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000091	0.000027	mg/Kg	☼	10/13/15 16:21	10/15/15 18:12	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	0.295	U	0.676	0.677	1.81	0.310	pCi/g	10/13/15 16:21	10/15/15 18:12	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	64		30 - 110					10/13/15 16:21	10/15/15 18:12	1

**Client Sample ID: L03-01-05-P-R-S-00**

**Lab Sample ID: 160-14225-4**

Date Collected: 10/08/15 14:45

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.974</b>		0.0951	0.138		0.0945	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Americium 241	-0.0128	U	0.0573	0.0573		0.0958	pCi/g	10/15/15 14:20	10/16/15 18:55	1
<b>Bismuth 212</b>	<b>0.983</b>		0.389	0.402		0.378	pCi/g	10/15/15 14:20	10/16/15 18:55	1
<b>Bismuth 214</b>	<b>0.962</b>		0.0856	0.132		0.0535	pCi/g	10/15/15 14:20	10/16/15 18:55	1
<b>Lead 212</b>	<b>0.990</b>		0.0666	0.144		0.0537	pCi/g	10/15/15 14:20	10/16/15 18:55	1
<b>Lead 214</b>	<b>0.953</b>		0.0802	0.127		0.0675	pCi/g	10/15/15 14:20	10/16/15 18:55	1
<b>Potassium 40</b>	<b>16.0</b>		0.922	1.88		0.280	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Protactinium 234m	2.00	U	2.55	2.55		3.75	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Protactinium 231	0.323	U	0.161	0.165		0.954	pCi/g	10/15/15 14:20	10/16/15 18:55	1
<b>Radium 226</b>	<b>0.962</b>		0.0856	0.132		0.0535	pCi/g	10/15/15 14:20	10/16/15 18:55	1
<b>Thorium 234</b>	<b>0.772</b>		0.241	0.255		0.715	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Uranium 235	0.0697	U	0.132	0.133		0.212	pCi/g	10/15/15 14:20	10/16/15 18:55	1
<b>Thorium 232</b>	<b>0.974</b>		0.0951	0.138		0.0945	pCi/g	10/15/15 14:20	10/16/15 18:55	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-05-P-R-S-00**

**Lab Sample ID: 160-14225-4**

Date Collected: 10/08/15 14:45

Matrix: Solid

Date Received: 10/12/15 14:27

Other Detected Radionuclides		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Pb-210	1.39	0.536	0.560		0.674	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Tl-208	0.331	0.0424	0.0546		0.0315	pCi/g	10/15/15 14:20	10/16/15 18:55	1

**Client Sample ID: L03-01-05-P-R-S-00**

**Lab Sample ID: 160-14225-4**

Date Collected: 10/08/15 14:45

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 81.4

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00011	0.000032	mg/Kg	☼	10/13/15 16:21	10/15/15 18:16	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	0.0962	U	0.275	0.275	2.15	0.367	pCi/g	10/13/15 16:21	10/15/15 18:16	1
Carrier	%Yield	Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Re	58		30 - 110		10/13/15 16:21	10/15/15 18:16	1			

**Client Sample ID: L03-01-07-P-S-S-00**

**Lab Sample ID: 160-14225-5**

Date Collected: 10/08/15 16:05

Matrix: Solid

Date Received: 10/12/15 14:27

**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	0.756		0.0877	0.117		0.0696	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Americium 241	0.0312	U	0.0413	0.0415		0.0683	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Bismuth 212	1.09		0.291	0.312		0.224	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Bismuth 214	0.784		0.0882	0.120		0.0574	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Lead 212	0.839		0.0671	0.128		0.0549	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Lead 214	0.813		0.0827	0.118		0.0603	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Potassium 40	14.1		0.968	1.74		0.123	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Protactinium 234m	0.000	U	1.41	1.41		4.43	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Protactinium 231	0.401	U	0.223	0.227		0.934	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Radium 226	0.784		0.0882	0.120		0.0574	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Thorium 234	0.911		0.442	0.452		0.703	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Uranium 235	0.102	U	0.114	0.114		0.187	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Thorium 232	0.756		0.0877	0.117		0.0696	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Other Detected Radionuclides		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac	
Pb-210	1.60		0.504	0.538		0.630	pCi/g	10/15/15 14:20	10/16/15 18:55	1
Tl-208	0.295		0.0370	0.0480		0.0222	pCi/g	10/15/15 14:20	10/16/15 18:55	1

TestAmerica St. Louis



# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-07-P-S-S-00**

**Lab Sample ID: 160-14225-5**

Date Collected: 10/08/15 16:05

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 89.6

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00010	0.000030	mg/Kg	☼	10/13/15 16:21	10/15/15 18:20	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	0.143	U	0.514	0.514	2.02	0.346	pCi/g	10/13/15 16:21	10/15/15 18:20	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Re	55		30 - 110	10/13/15 16:21	10/15/15 18:20	1

**Client Sample ID: L03-01-08-P-R-S-00**

**Lab Sample ID: 160-14225-6**

Date Collected: 10/08/15 16:15

Matrix: Solid

Date Received: 10/12/15 14:27

**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	1.44		0.167	0.221		0.0993	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Americium 241	-0.0351	U	0.0996	0.0997		0.0973	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Bismuth 212	1.38		0.362	0.388		0.335	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Bismuth 214	0.959		0.104	0.143		0.0716	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Lead 212	1.13		0.0812	0.167		0.0716	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Lead 214	1.05		0.0826	0.137		0.0649	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Potassium 40	17.8		0.990	2.05		0.289	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Protactinium 234m	1.69	U	2.60	2.60		4.34	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Protactinium 231	0.475	U	0.222	0.228		1.16	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Radium 226	0.959		0.104	0.143		0.0716	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Thorium 234	1.32		0.491	0.511		0.775	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Uranium 235	0.0889	U	0.0896	0.0900		0.164	pCi/g	10/15/15 14:20	10/16/15 18:57	1
Thorium 232	1.44		0.167	0.221		0.0993	pCi/g	10/15/15 14:20	10/16/15 18:57	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.361		0.0446	0.0580		0.0333	pCi/g	10/15/15 14:20	10/16/15 18:57	1

**Client Sample ID: L03-01-08-P-R-S-00**

**Lab Sample ID: 160-14225-6**

Date Collected: 10/08/15 16:15

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 79.9

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00011	0.000033	mg/Kg	☼	10/13/15 16:21	10/15/15 18:24	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	-0.0257	U	0.179	0.179	2.17	0.372	pCi/g	10/13/15 16:21	10/15/15 18:24	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-08-P-R-S-00**

Date Collected: 10/08/15 16:15

Date Received: 10/12/15 14:27

**Lab Sample ID: 160-14225-6**

Matrix: Solid

Percent Solids: 79.9

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Re	58		30 - 110	10/13/15 16:21	10/15/15 18:24	1

**Client Sample ID: L03-01-10-P-S-S-00**

Date Collected: 10/08/15 13:40

Date Received: 10/12/15 14:27

**Lab Sample ID: 160-14225-7**

Matrix: Solid

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.902		0.166	0.190		0.126	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Americium 241	-0.0228	U	0.0661	0.0661		0.111	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Bismuth 212	1.31		0.454	0.474		0.446	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Bismuth 214	0.915		0.112	0.147		0.0715	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Lead 212	0.956		0.0934	0.155		0.0798	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Lead 214	0.998		0.0933	0.140		0.0693	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Potassium 40	16.7		1.30	2.15		0.401	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Protactinium 234m	2.80	U	2.82	2.83		5.73	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Protactinium 231	0.331	U	0.221	0.224		1.24	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Radium 226	0.915		0.112	0.147		0.0715	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Thorium 234	0.918	U	0.355	0.368		0.940	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Uranium 235	0.113	U	0.140	0.141		0.256	pCi/g	10/15/15 14:20	10/16/15 19:34	1
Thorium 232	0.902		0.166	0.190		0.126	pCi/g	10/15/15 14:20	10/16/15 19:34	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.283		0.0506	0.0585		0.0418	pCi/g	10/15/15 14:20	10/16/15 19:34	1

**Client Sample ID: L03-01-10-P-S-S-00**

Date Collected: 10/08/15 13:40

Date Received: 10/12/15 14:27

**Lab Sample ID: 160-14225-7**

Matrix: Solid

Percent Solids: 90.0

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00010	0.000030	mg/Kg	☼	10/13/15 16:21	10/15/15 18:27	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	0.0209	U	0.252	0.252	2.01	0.343	pCi/g	10/13/15 16:21	10/15/15 18:27	1
<b>Carrier</b>			<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>			<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	56		30 - 110					10/13/15 16:21	10/15/15 18:27	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-11-P-R-S-00**

**Lab Sample ID: 160-14225-8**

Date Collected: 10/08/15 14:05

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.925</b>		0.0874	0.129		0.0808	pCi/g	10/15/15 14:20	10/16/15 19:35	1
Americium 241	0.000164	U	0.0526	0.0526		0.0886	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Bismuth 212</b>	<b>1.29</b>		0.346	0.371		0.293	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Bismuth 214</b>	<b>0.731</b>		0.0752	0.107		0.0554	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Lead 212</b>	<b>0.930</b>		0.0665	0.137		0.0563	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Lead 214</b>	<b>0.828</b>		0.0818	0.119		0.0632	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Potassium 40</b>	<b>16.2</b>		0.873	1.87		0.159	pCi/g	10/15/15 14:20	10/16/15 19:35	1
Protactinium 234m	1.02	U	2.12	2.12		4.19	pCi/g	10/15/15 14:20	10/16/15 19:35	1
Protactinium 231	-0.484	U	0.564	0.567		0.928	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Radium 226</b>	<b>0.731</b>		0.0752	0.107		0.0554	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Thorium 234</b>	<b>1.21</b>		0.449	0.466		0.704	pCi/g	10/15/15 14:20	10/16/15 19:35	1
Uranium 235	0.0185	U	0.0402	0.0403		0.160	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Thorium 232</b>	<b>0.925</b>		0.0874	0.129		0.0808	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Other Detected</b>			<b>Count</b>	<b>Total</b>						
<b>Radionuclides</b>			<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
<i>Tl-208</i>			<i>0.0334</i>	<i>0.0456</i>		<i>0.0234</i>	<i>pCi/g</i>	<i>10/15/15 14:20</i>	<i>10/16/15 19:35</i>	<i>1</i>

**Client Sample ID: L03-01-11-P-R-S-00**

**Lab Sample ID: 160-14225-8**

Date Collected: 10/08/15 14:05

Matrix: Solid

Date Received: 10/12/15 14:27

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		0.00010	0.000031	mg/Kg	☼	10/13/15 16:21	10/15/15 18:31	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	-0.0274	U	0.158	0.158	2.08	0.356	pCi/g	10/13/15 16:21	10/15/15 18:31	1
<b>Carrier</b>			<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
<i>Re</i>			<i>30 - 110</i>					<i>10/13/15 16:21</i>	<i>10/15/15 18:31</i>	<i>1</i>

**Client Sample ID: L03-01-13-P-S-S-00**

**Lab Sample ID: 160-14225-9**

Date Collected: 10/08/15 11:15

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.923</b>		0.109	0.144		0.0790	pCi/g	10/15/15 14:20	10/16/15 19:35	1
Americium 241	0.0152	U	0.0505	0.0505		0.0847	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Bismuth 212</b>	<b>1.25</b>		0.351	0.374		0.298	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Bismuth 214</b>	<b>0.780</b>		0.0952	0.125		0.0629	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Lead 212</b>	<b>0.935</b>		0.0795	0.145		0.0687	pCi/g	10/15/15 14:20	10/16/15 19:35	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-13-P-S-S-00**

**Lab Sample ID: 160-14225-9**

Date Collected: 10/08/15 11:15

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Lead 214</b>	<b>0.920</b>		0.0831	0.127		0.0716	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Potassium 40</b>	<b>16.5</b>		1.12	2.03		0.262	pCi/g	10/15/15 14:20	10/16/15 19:35	1
Protactinium 234m	3.20	U	2.41	2.43		4.69	pCi/g	10/15/15 14:20	10/16/15 19:35	1
Protactinium 231	0.438	U	0.403	0.406		0.942	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Radium 226</b>	<b>0.780</b>		0.0952	0.125		0.0629	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Thorium 234</b>	<b>1.07</b>		0.467	0.480		0.735	pCi/g	10/15/15 14:20	10/16/15 19:35	1
Uranium 235	0.167	U	0.133	0.134		0.177	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Thorium 232</b>	<b>0.923</b>		0.109	0.144		0.0790	pCi/g	10/15/15 14:20	10/16/15 19:35	1
<b>Other Detected</b>			<b>Count</b>	<b>Total</b>						
<b>Radionuclides</b>			<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
			(2σ+/-)	(2σ+/-)						
Tl-208	0.263		0.0390	0.0476		0.0289	pCi/g	10/15/15 14:20	10/16/15 19:35	1

**Client Sample ID: L03-01-13-P-S-S-00**

**Lab Sample ID: 160-14225-9**

Date Collected: 10/08/15 11:15

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 90.2

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000096	0.000029	mg/Kg	☼	10/13/15 16:21	10/15/15 18:35	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	0.0306	U	0.268	0.268	1.92	0.329	pCi/g	10/13/15 16:21	10/15/15 18:35	1
<b>Carrier</b>			<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re			57	30 - 110				10/13/15 16:21	10/15/15 18:35	1

**Client Sample ID: L03-01-14-P-R-S-00**

**Lab Sample ID: 160-14225-10**

Date Collected: 10/08/15 11:30

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>1.12</b>		0.134	0.175		0.122	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Americium 241	-0.0288	U	0.0965	0.0966		0.0880	pCi/g	10/15/15 14:20	10/16/15 19:36	1
<b>Bismuth 212</b>	<b>1.10</b>		0.267	0.290		0.317	pCi/g	10/15/15 14:20	10/16/15 19:36	1
<b>Bismuth 214</b>	<b>0.798</b>		0.0875	0.120		0.0647	pCi/g	10/15/15 14:20	10/16/15 19:36	1
<b>Lead 212</b>	<b>0.975</b>		0.0833	0.152		0.0741	pCi/g	10/15/15 14:20	10/16/15 19:36	1
<b>Lead 214</b>	<b>0.866</b>		0.0823	0.122		0.0626	pCi/g	10/15/15 14:20	10/16/15 19:36	1
<b>Potassium 40</b>	<b>17.0</b>		0.979	1.97		0.366	pCi/g	10/15/15 14:20	10/16/15 19:36	1
<b>Protactinium 234m</b>	<b>5.08</b>		2.25	2.31		4.07	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Protactinium 231	-0.548	U	0.629	0.632		1.03	pCi/g	10/15/15 14:20	10/16/15 19:36	1
<b>Radium 226</b>	<b>0.798</b>		0.0875	0.120		0.0647	pCi/g	10/15/15 14:20	10/16/15 19:36	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-14-P-R-S-00**

**Lab Sample ID: 160-14225-10**

Date Collected: 10/08/15 11:30

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Thorium 234	0.942		0.464	0.475		0.747	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Uranium 235	0.0582	U	0.101	0.101		0.207	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Thorium 232	1.12		0.134	0.175		0.122	pCi/g	10/15/15 14:20	10/16/15 19:36	1
<b>Other Detected</b>										
			Count	Total						
Radionuclides	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Pb-210	0.868		0.606	0.614		0.739	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Tl-208	0.373		0.0422	0.0570		0.0299	pCi/g	10/15/15 14:20	10/16/15 19:36	1

**Client Sample ID: L03-01-14-P-R-S-00**

**Lab Sample ID: 160-14225-10**

Date Collected: 10/08/15 11:30

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 83.5

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99		ND	0.000099	0.000030	mg/Kg	☼	10/13/15 16:21	10/15/15 18:39	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	-0.0896	U	0.0410	0.0418	1.98	0.339	pCi/g	10/13/15 16:21	10/15/15 18:39	1
<b>Carrier</b>										
	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Re	60		30 - 110					10/13/15 16:21	10/15/15 18:39	1

**Client Sample ID: L03-01-16-P-S-S-00**

**Lab Sample ID: 160-14225-11**

Date Collected: 10/08/15 10:30

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.948		0.107	0.144		0.0899	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Americium 241	0.0278	U	0.0526	0.0527		0.0875	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Bismuth 212	1.02		0.286	0.305		0.339	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Bismuth 214	0.774		0.0877	0.119		0.0625	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Lead 212	0.879		0.0699	0.133		0.0601	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Lead 214	0.823		0.0723	0.112		0.0690	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Potassium 40	17.4		1.04	2.06		0.279	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Protactinium 234m	1.79	U	2.58	2.59		4.37	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Protactinium 231	-0.489	U	0.600	0.602		0.987	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Radium 226	0.774		0.0877	0.119		0.0625	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Thorium 234	1.43		0.427	0.453		0.649	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Uranium 235	0.110	U	0.129	0.129		0.212	pCi/g	10/15/15 14:20	10/16/15 19:36	1
Thorium 232	0.948		0.107	0.144		0.0899	pCi/g	10/15/15 14:20	10/16/15 19:36	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-16-P-S-S-00**

**Lab Sample ID: 160-14225-11**

Date Collected: 10/08/15 10:30

Matrix: Solid

Date Received: 10/12/15 14:27

Other Detected		Count	Total							
Radionuclides		Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac	
Result	Qualifier	(2σ+/-)	(2σ+/-)							
Tl-208		0.0406	0.0523		0.0284	pCi/g	10/15/15 14:20	10/16/15 19:36	1	

**Client Sample ID: L03-01-16-P-S-S-00**

**Lab Sample ID: 160-14225-11**

Date Collected: 10/08/15 10:30

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 92.5

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000099	0.000030	mg/Kg	☼	10/13/15 16:21	10/15/15 18:43	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	-0.0207	U	0.113	0.113	1.98	0.339	pCi/g	10/13/15 16:21	10/15/15 18:43	1
Carrier	%Yield	Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Re	54		30 - 110		10/13/15 16:21	10/15/15 18:43	1			

**Client Sample ID: L03-01-17-P-R-S-00**

**Lab Sample ID: 160-14225-12**

Date Collected: 10/08/15 11:05

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.19		0.151	0.193		0.133	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Americium 241	0.000	U	0.0490	0.0490		0.115	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Bismuth 212	0.727		0.417	0.424		0.626	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Bismuth 214	0.944		0.114	0.150		0.0702	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Lead 212	1.04		0.0973	0.166		0.0836	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Lead 214	0.971		0.102	0.144		0.0735	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Potassium 40	18.5		1.32	2.31		0.261	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Protactinium 234m	3.13	U	3.38	3.40		5.46	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Protactinium 231	0.454	U	0.257	0.261		1.32	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Radium 226	0.944		0.114	0.150		0.0702	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Thorium 234	0.861		0.303	0.316		0.855	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Uranium 235	0.106	U	0.144	0.145		0.276	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Thorium 232	1.19		0.151	0.193		0.133	pCi/g	10/15/15 14:20	10/16/15 20:32	1
Other Detected		Count	Total							
Radionuclides		Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac	
Result	Qualifier	(2σ+/-)	(2σ+/-)							
Pb-210		0.619	0.641		0.793	pCi/g	10/15/15 14:20	10/16/15 20:32	1	
Tl-208		0.0552	0.0695		0.0344	pCi/g	10/15/15 14:20	10/16/15 20:32	1	

TestAmerica St. Louis



# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-17-P-R-S-00**

**Lab Sample ID: 160-14225-12**

Date Collected: 10/08/15 11:05

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 84.4

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00011	0.000034	mg/Kg	☼	10/13/15 16:21	10/15/15 19:00	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	0.378	U	0.995	0.996	2.25	0.385	pCi/g	10/13/15 16:21	10/15/15 19:00	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Re	53		30 - 110	10/13/15 16:21	10/15/15 19:00	1

**Client Sample ID: L03-01-19-P-S-S-00**

**Lab Sample ID: 160-14225-13**

Date Collected: 10/08/15 10:00

Matrix: Solid

Date Received: 10/12/15 14:27

**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	1.03		0.103	0.147		0.0898	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Americium 241	-0.0113	U	0.0606	0.0607		0.102	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Bismuth 212	1.12		0.349	0.368		0.320	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Bismuth 214	0.812		0.0871	0.121		0.0593	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Lead 212	0.917		0.0709	0.138		0.0586	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Lead 214	0.816		0.0759	0.114		0.0783	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Potassium 40	17.9		1.07	2.12		0.288	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Protactinium 234m	2.41	U	1.72	1.74		5.59	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Protactinium 231	0.294	U	0.181	0.184		0.995	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Radium 226	0.812		0.0871	0.121		0.0593	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Thorium 234	0.834		0.266	0.280		0.766	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Uranium 235	0.139	U	0.126	0.127		0.223	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Thorium 232	1.03		0.103	0.147		0.0898	pCi/g	10/15/15 14:20	10/16/15 20:33	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Tl-208	0.317		0.0429	0.0541		0.0307	pCi/g	10/15/15 14:20	10/16/15 20:33	1

**Client Sample ID: L03-01-19-P-S-S-00**

**Lab Sample ID: 160-14225-13**

Date Collected: 10/08/15 10:00

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 85.5

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00011	0.000033	mg/Kg	☼	10/13/15 16:21	10/15/15 19:04	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	0.511		1.15	1.15	2.22	0.380	pCi/g	10/13/15 16:21	10/15/15 19:04	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-19-P-S-S-00**

Date Collected: 10/08/15 10:00

Date Received: 10/12/15 14:27

**Lab Sample ID: 160-14225-13**

Matrix: Solid

Percent Solids: 85.5

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Re	53		30 - 110	10/13/15 16:21	10/15/15 19:04	1

**Client Sample ID: L03-01-20-P-R-S-00**

Date Collected: 10/08/15 10:15

Date Received: 10/12/15 14:27

**Lab Sample ID: 160-14225-14**

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	1.26		0.160	0.205		0.0753	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Americium 241	-0.0166	U	0.0555	0.0555		0.0928	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Bismuth 212	1.29		0.454	0.473		0.418	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Bismuth 214	0.865		0.0946	0.131		0.0591	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Lead 212	0.952		0.0752	0.144		0.0654	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Lead 214	0.769		0.0836	0.116		0.0657	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Potassium 40	17.6		1.09	2.10		0.124	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Protactinium 234m	0.634	U	2.82	2.82		4.94	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Protactinium 231	0.260	U	0.215	0.217		0.989	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Radium 226	0.865		0.0946	0.131		0.0591	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Thorium 234	0.896		0.270	0.286		0.755	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Uranium 235	0.0292	U	0.100	0.100		0.199	pCi/g	10/15/15 14:20	10/16/15 20:33	1
Thorium 232	1.26		0.160	0.205		0.0753	pCi/g	10/15/15 14:20	10/16/15 20:33	1
<b>Other Detected Radionuclides</b>			<b>Count Uncert. (2σ+/-)</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Tl-208	0.343		0.0427	0.0556		0.0299	pCi/g	10/15/15 14:20	10/16/15 20:33	1

**Client Sample ID: L03-01-20-P-R-S-00**

Date Collected: 10/08/15 10:15

Date Received: 10/12/15 14:27

**Lab Sample ID: 160-14225-14**

Matrix: Solid

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		0.00011	0.000034	mg/Kg	☼	10/13/15 16:21	10/15/15 19:08	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	0.253	U	0.528	0.528	2.29	0.392	pCi/g	10/13/15 16:21	10/15/15 19:08	1
<b>Carrier</b>			<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>			<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	52		30 - 110					10/13/15 16:21	10/15/15 19:08	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-22-P-S-S-00**

**Lab Sample ID: 160-14225-15**

Date Collected: 10/08/15 09:25

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.678		0.109	0.129		0.110	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Americium 241	0.0138	U	0.0550	0.0550		0.0928	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Bismuth 212	1.07		0.332	0.349		0.319	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Bismuth 214	0.841		0.0938	0.128		0.0635	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Lead 212	0.794		0.0836	0.133		0.0774	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Lead 214	0.954		0.0911	0.135		0.0755	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Potassium 40	18.4		1.11	2.16		0.355	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Protactinium 234m	2.53	U	2.80	2.81		4.56	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Protactinium 231	0.165	U	0.336	0.336		0.570	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Radium 226	0.841		0.0938	0.128		0.0635	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Thorium 234	0.809		0.475	0.482		0.770	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Uranium 235	0.0939	U	0.127	0.128		0.229	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Thorium 232	0.678		0.109	0.129		0.110	pCi/g	10/15/15 14:20	10/16/15 20:34	1
<b>Other Detected</b>			<b>Count</b>	<b>Total</b>						
<b>Radionuclides</b>			<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Tl-208			0.0411	0.0503		0.0314	pCi/g	10/15/15 14:20	10/16/15 20:34	1

**Client Sample ID: L03-01-22-P-S-S-00**

**Lab Sample ID: 160-14225-15**

Date Collected: 10/08/15 09:25

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 87.6

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00010	0.000030	mg/Kg	☼	10/13/15 16:21	10/15/15 19:12	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	0.135	U	0.371	0.372	2.00	0.342	pCi/g	10/13/15 16:21	10/15/15 19:12	1
<b>Carrier</b>			<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re			30 - 110					10/13/15 16:21	10/15/15 19:12	1

**Client Sample ID: L03-01-23-P-R-S-00**

**Lab Sample ID: 160-14225-16**

Date Collected: 10/08/15 09:40

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.00		0.113	0.152		0.0754	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Americium 241	-0.00749	U	0.0510	0.0510		0.0857	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Bismuth 212	1.24		0.317	0.342		0.287	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Bismuth 214	0.816		0.0814	0.118		0.0530	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Lead 212	0.965		0.0668	0.142		0.0541	pCi/g	10/15/15 14:20	10/16/15 20:34	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-23-P-R-S-00**

**Lab Sample ID: 160-14225-16**

Date Collected: 10/08/15 09:40

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Lead 214	0.932		0.0675	0.118		0.0439	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Potassium 40	16.8		0.973	1.97		0.293	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Protactinium 234m	3.85		2.54	2.57		3.84	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Protactinium 231	-0.454	U	0.567	0.569		0.934	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Radium 226	0.816		0.0814	0.118		0.0530	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Thorium 234	1.06		0.394	0.409		0.615	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Uranium 235	0.0572	U	0.125	0.126		0.203	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Thorium 232	1.00		0.113	0.152		0.0754	pCi/g	10/15/15 14:20	10/16/15 20:34	1
<b>Other Detected</b>			<b>Count</b>	<b>Total</b>						
<b>Radionuclides</b>			<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
	<b>Result</b>	<b>Qualifier</b>	<b>(2σ+/-)</b>	<b>(2σ+/-)</b>						
Pb-210	0.843		0.499	0.509		0.663	pCi/g	10/15/15 14:20	10/16/15 20:34	1
Tl-208	0.347		0.0417	0.0551		0.0288	pCi/g	10/15/15 14:20	10/16/15 20:34	1

**Client Sample ID: L03-01-23-P-R-S-00**

**Lab Sample ID: 160-14225-16**

Date Collected: 10/08/15 09:40

Matrix: Solid

Date Received: 10/12/15 14:27

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	0.00010	0.000030	mg/Kg	☼	10/13/15 16:21	10/15/15 19:15	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	0.0562	U	0.0886	0.0888	2.00	0.343	pCi/g	10/13/15 16:21	10/15/15 19:15	1
<b>Carrier</b>			<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	60		30 - 110					10/13/15 16:21	10/15/15 19:15	1

**Client Sample ID: L03-01-01-P-S-Q-00**

**Lab Sample ID: 160-14225-17**

Date Collected: 10/08/15 15:15

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.02		0.126	0.164		0.112	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Americium 241	0.0142	U	0.0600	0.0601		0.101	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Bismuth 212	1.08		0.393	0.409		0.350	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Bismuth 214	0.826		0.112	0.141		0.0809	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Lead 212	1.03		0.0876	0.160		0.0743	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Lead 214	0.906		0.0949	0.134		0.0779	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Potassium 40	18.5		1.33	2.31		0.391	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Protactinium 234m	5.57		3.27	3.32		5.15	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Protactinium 231	0.663	U	0.306	0.314		1.02	pCi/g	10/15/15 14:20	10/16/15 21:07	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-01-P-S-Q-00**

**Lab Sample ID: 160-14225-17**

Date Collected: 10/08/15 15:15

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium 226	0.826		0.112	0.141		0.0809	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Thorium 234	1.27		0.536	0.552		0.840	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Uranium 235	0.0773	U	0.140	0.140		0.233	pCi/g	10/15/15 14:20	10/16/15 21:07	1
Thorium 232	1.02		0.126	0.164		0.112	pCi/g	10/15/15 14:20	10/16/15 21:07	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</b>	<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Tl-208	0.328		0.0505	0.0609		0.0403	pCi/g	10/15/15 14:20	10/16/15 21:07	1

**Client Sample ID: L03-01-01-P-S-Q-00**

**Lab Sample ID: 160-14225-17**

Date Collected: 10/08/15 15:15

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 88.1

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99		ND	0.00011	0.000034	mg/Kg	☼	10/13/15 16:21	10/15/15 19:19	1

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	-0.00462	U	0.154	0.154	2.25	0.385	pCi/g	10/13/15 16:21	10/15/15 19:19	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	51		30 - 110					10/13/15 16:21	10/15/15 19:19	1

**Client Sample ID: L03-01-05-P-R-Q-00**

**Lab Sample ID: 160-14225-18**

Date Collected: 10/08/15 14:45

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.16		0.128	0.173		0.0834	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Americium 241	0.0273	U	0.0556	0.0557		0.0929	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Bismuth 212	1.31		0.420	0.441		0.392	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Bismuth 214	0.843		0.0871	0.123		0.0603	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Lead 212	0.996		0.0768	0.150		0.0696	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Lead 214	1.05		0.0886	0.141		0.0726	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Potassium 40	18.4		1.02	2.11		0.311	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Protactinium 234m	2.44	U	2.38	2.39		3.81	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Protactinium 231	-0.541	U	0.675	0.678		1.11	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Radium 226	0.843		0.0871	0.123		0.0603	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Thorium 234	0.742	U	0.317	0.327		0.927	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Uranium 235	0.0923	U	0.139	0.139		0.230	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Thorium 232	1.16		0.128	0.173		0.0834	pCi/g	10/15/15 14:20	10/16/15 21:08	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-05-P-R-Q-00**

**Lab Sample ID: 160-14225-18**

Date Collected: 10/08/15 14:45

Matrix: Solid

Date Received: 10/12/15 14:27

Other Detected		Count	Total								
Radionuclides		Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
		(2σ+/-)	(2σ+/-)								
Pb-210		1.19		0.572	0.589		0.721	pCi/g	10/15/15 14:20	10/16/15 21:08	1
Tl-208		0.197		0.0435	0.0480		0.0614	pCi/g	10/15/15 14:20	10/16/15 21:08	1

**Client Sample ID: L03-01-05-P-R-Q-00**

**Lab Sample ID: 160-14225-18**

Date Collected: 10/08/15 14:45

Matrix: Solid

Date Received: 10/12/15 14:27

Percent Solids: 81.3

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00010	0.000030	mg/Kg	☼	10/13/15 16:21	10/15/15 19:23	1

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

Analyte		Count	Total								
Result		Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac		
		(2σ+/-)	(2σ+/-)								
Technetium 99		-0.0256	U	0.0734	0.0735	1.99	0.341	pCi/g	10/13/15 16:21	10/15/15 19:23	1
Carrier		%Yield	Qualifier	Limits							
Re		62		30 - 110							
							Prepared	Analyzed	Dil Fac		
							10/13/15 16:21	10/15/15 19:23	1		

**Client Sample ID: L03-01-25-P-S-B-00**

**Lab Sample ID: 160-14225-19**

Date Collected: 10/09/15 10:10

Matrix: Solid

Date Received: 10/12/15 14:27

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

Analyte		Count	Total								
Result		Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac		
		(2σ+/-)	(2σ+/-)								
Actinium 228		0.778		0.0965	0.125	0.0737	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Americium 241		-0.00933	U	0.0552	0.0552	0.0929	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Bismuth 212		1.11		0.375	0.392	0.329	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Bismuth 214		0.706		0.0808	0.109	0.0728	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Lead 212		0.915		0.0699	0.138	0.0542	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Lead 214		0.829		0.0824	0.119	0.0691	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Potassium 40		15.9		1.03	1.93	0.287	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Protactinium 234m		0.410	U	2.67	2.67	4.80	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Protactinium 231		-0.604	U	0.679	0.682	1.11	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Radium 226		0.706		0.0808	0.109	0.0728	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Thorium 234		1.28		0.517	0.534	0.698	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Uranium 235		0.160	U	0.123	0.124	0.178	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Thorium 232		0.778		0.0965	0.125	0.0737	pCi/g	10/15/15 14:20	10/16/15 21:09	1	
Other Detected		Count	Total								
Radionuclides		Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
		(2σ+/-)	(2σ+/-)								
Pb-210		2.10		0.604	0.653		0.712	pCi/g	10/15/15 14:20	10/16/15 21:09	1
Tl-208		0.248		0.0362	0.0444		0.0278	pCi/g	10/15/15 14:20	10/16/15 21:09	1

TestAmerica St. Louis



# Client Sample Results

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

TestAmerica Job ID: 160-14225-1

**Client Sample ID: L03-01-25-P-S-B-00**

**Lab Sample ID: 160-14225-19**

**Date Collected: 10/09/15 10:10**

**Matrix: Solid**

**Date Received: 10/12/15 14:27**

**Percent Solids: 86.7**

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.00011	0.000034	mg/Kg	☼	10/13/15 16:21	10/15/15 19:27	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	-0.0116	U	0.200	0.200	2.26	0.386	pCi/g	10/13/15 16:21	10/15/15 19:27	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Re	51		30 - 110	10/13/15 16:21	10/15/15 19:27	1

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

# QC Sample Results

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

TestAmerica Job ID: 160-14225-1

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

**Lab Sample ID: MB 160-216230/1-A**  
**Matrix: Solid**  
**Analysis Batch: 216733**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 216230**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000081	0.000024	mg/Kg		10/13/15 16:21	10/15/15 17:32	1

**Lab Sample ID: LCS 160-216230/2-A**  
**Matrix: Solid**  
**Analysis Batch: 216733**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 216230**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Technetium 99	0.00123	0.00119		mg/Kg		97	80 - 120

**Lab Sample ID: 160-14228-A-21-B MS**  
**Matrix: Solid**  
**Analysis Batch: 216733**

**Client Sample ID: Matrix Spike**  
**Prep Type: Total/NA**  
**Prep Batch: 216230**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Technetium 99	0.00014		0.00148	0.00161		mg/Kg	☼	99	75 - 125

**Lab Sample ID: 160-14228-A-21-C MSD**  
**Matrix: Solid**  
**Analysis Batch: 216733**

**Client Sample ID: Matrix Spike Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 216230**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Technetium 99	0.00014		0.00148	0.00163		mg/Kg	☼	100	75 - 125	1	30

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

**Lab Sample ID: MB 160-216230/1-A**  
**Matrix: Solid**  
**Analysis Batch: 216734**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 216230**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.09370	U	0.316	0.316	1.61	0.276	pCi/g	10/13/15 16:21	10/15/15 17:32	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Re	62		30 - 110	10/13/15 16:21	10/15/15 17:32	1

**Lab Sample ID: LCS 160-216230/2-A**  
**Matrix: Solid**  
**Analysis Batch: 216734**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 216230**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Limits
Technetium 99	21.0	20.31		36.3	1.66	0.283	pCi/g	97	80 - 120

Carrier	LCS %Yield	LCS Qualifier	Limits
Re	60		30 - 110

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-14225-1

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

**Lab Sample ID: 160-14228-A-21-B MS**

**Matrix: Solid**

**Analysis Batch: 216734**

**Client Sample ID: Matrix Spike**

**Prep Type: Total/NA**

**Prep Batch: 216230**

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Technetium 99	2.44		25.3	27.50		48.5	2.12	0.363	pCi/g	99	75 - 125
<b>Carrier</b>	<b>%Yield</b>	<b>MS Qualifier</b>	<b>Limits</b>								
Re	57		30 - 110								

**Lab Sample ID: 160-14228-A-21-C MSD**

**Matrix: Solid**

**Analysis Batch: 216734**

**Client Sample ID: Matrix Spike Duplicate**

**Prep Type: Total/NA**

**Prep Batch: 216230**

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	2.44		25.4	27.87		37.2	1.75	0.299	pCi/g	100	75 - 125	0	1
<b>Carrier</b>	<b>%Yield</b>	<b>MSD Qualifier</b>	<b>Limits</b>										
Re	69		30 - 110										

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

**Lab Sample ID: MB 160-216682/1-A**

**Matrix: Solid**

**Analysis Batch: 216815**

**Client Sample ID: Method Blank**

**Prep Type: Total/NA**

**Prep Batch: 216682**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	-0.01502	U	0.298	0.298		0.0955	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Americium 241	0.004920	U	0.0104	0.0104		0.0182	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Bismuth 212	-0.0008331	U	0.122	0.122		0.248	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Bismuth 214	0.002309	U	0.0198	0.0198		0.0384	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Lead 212	-0.005929	U	0.0516	0.0516		0.0285	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Lead 214	0.004655	U	0.0158	0.0158		0.0333	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Potassium 40	-0.02427	U	0.234	0.234		0.322	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Protactinium 234m	0.9933	U	1.29	1.29		2.07	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Protactinium 231	0.0000	U	0.0606	0.0606		0.265	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Radium 226	0.002309	U	0.0198	0.0198		0.0384	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Thorium 234	0.05029	U	0.137	0.137		0.281	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Uranium 235	0.02030	U	0.0369	0.0370		0.0634	pCi/g	10/15/15 14:20	10/16/15 17:46	1
Thorium 232	-0.01502	U	0.298	0.298		0.0955	pCi/g	10/15/15 14:20	10/16/15 17:46	1
<b>Other Detected Radionuclides</b>	<b>MB Result</b>	<b>MB Qualifier</b>	<b>Count Uncert. (2σ+/-)</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Other Detected Radionuclide	None						pCi/g	10/15/15 14:20	10/16/15 17:46	1

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-14225-1

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

**Lab Sample ID: LCS 160-216682/2-A**  
**Matrix: Solid**  
**Analysis Batch: 216815**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 216682**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	104.4		10.9		0.614	pCi/g	104	87 - 116
Cesium 137	34.4	34.79		3.65	0.200	0.205	pCi/g	101	87 - 120
Cobalt 60	33.7	34.00		3.44		0.138	pCi/g	101	87 - 115

**Lab Sample ID: 160-14225-1 DU**  
**Matrix: Solid**  
**Analysis Batch: 216824**

**Client Sample ID: L03-01-01-P-S-S-00**  
**Prep Type: Total/NA**  
**Prep Batch: 216682**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	1.09		0.9586		0.162		0.0717	pCi/g	0.39	1
Americium 241	-0.0150	U	0.02315	U	0.0548		0.0914	pCi/g	0.33	1
Bismuth 212	1.04		1.310		0.436		0.365	pCi/g	0.31	1
Bismuth 214	0.917		0.8132		0.127		0.0696	pCi/g	0.39	1
Lead 212	1.03		1.016		0.149		0.0527	pCi/g	0.05	1
Lead 214	0.959		0.9047		0.126		0.0709	pCi/g	0.21	1
Potassium 40	17.9		18.42		2.18		0.299	pCi/g	0.11	1
Protactinium 234m	1.72	U	1.347	U	2.63		4.54	pCi/g	0.06	1
Protactinium 231	0.599	U	-0.5727	U F	0.644		1.05	pCi/g	1.21	1
Radium 226	0.917		0.8132		0.127		0.0696	pCi/g	0.39	1
Thorium 234	0.848		1.183		0.468		0.706	pCi/g	0.44	1
Uranium 235	0.0718	U	0.08023	U	0.128		0.210	pCi/g	0.04	1
Thorium 232	1.09		0.9586		0.162		0.0717	pCi/g	0.39	1
<b>Other Detected Radionuclides</b>	<b>Sample Result</b>	<b>Sample Qual</b>	<b>DU Result</b>	<b>DU Qual</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>RER</b>	<b>RER Limit</b>
Tl-208	0.338		0.3141		0.0516		0.0301	pCi/g	0.21	1

# QC Association Summary

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

TestAmerica Job ID: 160-14225-1

## Metals

### Prep Batch: 216230

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14225-1	L03-01-01-P-S-S-00	Total/NA	Solid	None	
160-14225-2	L03-01-02-P-R-S-00	Total/NA	Solid	None	
160-14225-3	L03-01-04-P-S-S-00	Total/NA	Solid	None	
160-14225-4	L03-01-05-P-R-S-00	Total/NA	Solid	None	
160-14225-5	L03-01-07-P-S-S-00	Total/NA	Solid	None	
160-14225-6	L03-01-08-P-R-S-00	Total/NA	Solid	None	
160-14225-7	L03-01-10-P-S-S-00	Total/NA	Solid	None	
160-14225-8	L03-01-11-P-R-S-00	Total/NA	Solid	None	
160-14225-9	L03-01-13-P-S-S-00	Total/NA	Solid	None	
160-14225-10	L03-01-14-P-R-S-00	Total/NA	Solid	None	
160-14225-11	L03-01-16-P-S-S-00	Total/NA	Solid	None	
160-14225-12	L03-01-17-P-R-S-00	Total/NA	Solid	None	
160-14225-13	L03-01-19-P-S-S-00	Total/NA	Solid	None	
160-14225-14	L03-01-20-P-R-S-00	Total/NA	Solid	None	
160-14225-15	L03-01-22-P-S-S-00	Total/NA	Solid	None	
160-14225-16	L03-01-23-P-R-S-00	Total/NA	Solid	None	
160-14225-17	L03-01-01-P-S-Q-00	Total/NA	Solid	None	
160-14225-18	L03-01-05-P-R-Q-00	Total/NA	Solid	None	
160-14225-19	L03-01-25-P-S-B-00	Total/NA	Solid	None	
160-14228-A-21-B MS	Matrix Spike	Total/NA	Solid	None	
160-14228-A-21-C MSD	Matrix Spike Duplicate	Total/NA	Solid	None	
LCS 160-216230/2-A	Lab Control Sample	Total/NA	Solid	None	
MB 160-216230/1-A	Method Blank	Total/NA	Solid	None	

### Analysis Batch: 216733

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14225-1	L03-01-01-P-S-S-00	Total/NA	Solid	6020A	216230
160-14225-2	L03-01-02-P-R-S-00	Total/NA	Solid	6020A	216230
160-14225-3	L03-01-04-P-S-S-00	Total/NA	Solid	6020A	216230
160-14225-4	L03-01-05-P-R-S-00	Total/NA	Solid	6020A	216230
160-14225-5	L03-01-07-P-S-S-00	Total/NA	Solid	6020A	216230
160-14225-6	L03-01-08-P-R-S-00	Total/NA	Solid	6020A	216230
160-14225-7	L03-01-10-P-S-S-00	Total/NA	Solid	6020A	216230
160-14225-8	L03-01-11-P-R-S-00	Total/NA	Solid	6020A	216230
160-14225-9	L03-01-13-P-S-S-00	Total/NA	Solid	6020A	216230
160-14225-10	L03-01-14-P-R-S-00	Total/NA	Solid	6020A	216230
160-14225-11	L03-01-16-P-S-S-00	Total/NA	Solid	6020A	216230
160-14225-12	L03-01-17-P-R-S-00	Total/NA	Solid	6020A	216230
160-14225-13	L03-01-19-P-S-S-00	Total/NA	Solid	6020A	216230
160-14225-14	L03-01-20-P-R-S-00	Total/NA	Solid	6020A	216230
160-14225-15	L03-01-22-P-S-S-00	Total/NA	Solid	6020A	216230
160-14225-16	L03-01-23-P-R-S-00	Total/NA	Solid	6020A	216230
160-14225-17	L03-01-01-P-S-Q-00	Total/NA	Solid	6020A	216230
160-14225-18	L03-01-05-P-R-Q-00	Total/NA	Solid	6020A	216230
160-14225-19	L03-01-25-P-S-B-00	Total/NA	Solid	6020A	216230
160-14228-A-21-B MS	Matrix Spike	Total/NA	Solid	6020A	216230
160-14228-A-21-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6020A	216230
LCS 160-216230/2-A	Lab Control Sample	Total/NA	Solid	6020A	216230
MB 160-216230/1-A	Method Blank	Total/NA	Solid	6020A	216230

TestAmerica St. Louis

# QC Association Summary

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

TestAmerica Job ID: 160-14225-1

## General Chemistry

### Analysis Batch: 216501

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14225-1	L03-01-01-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-1 DU	L03-01-01-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-2	L03-01-02-P-R-S-00	Total/NA	Solid	Moisture	
160-14225-3	L03-01-04-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-4	L03-01-05-P-R-S-00	Total/NA	Solid	Moisture	
160-14225-5	L03-01-07-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-6	L03-01-08-P-R-S-00	Total/NA	Solid	Moisture	
160-14225-7	L03-01-10-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-8	L03-01-11-P-R-S-00	Total/NA	Solid	Moisture	
160-14225-9	L03-01-13-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-10	L03-01-14-P-R-S-00	Total/NA	Solid	Moisture	
160-14225-11	L03-01-16-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-12	L03-01-17-P-R-S-00	Total/NA	Solid	Moisture	
160-14225-13	L03-01-19-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-14	L03-01-20-P-R-S-00	Total/NA	Solid	Moisture	
160-14225-15	L03-01-22-P-S-S-00	Total/NA	Solid	Moisture	
160-14225-16	L03-01-23-P-R-S-00	Total/NA	Solid	Moisture	
160-14225-17	L03-01-01-P-S-Q-00	Total/NA	Solid	Moisture	
160-14225-18	L03-01-05-P-R-Q-00	Total/NA	Solid	Moisture	
160-14225-19	L03-01-25-P-S-B-00	Total/NA	Solid	Moisture	

## Rad

### Leach Batch: 216044

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14225-1	L03-01-01-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-1 DU	L03-01-01-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-2	L03-01-02-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14225-3	L03-01-04-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-4	L03-01-05-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14225-5	L03-01-07-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-6	L03-01-08-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14225-7	L03-01-10-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-8	L03-01-11-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14225-9	L03-01-13-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-10	L03-01-14-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14225-11	L03-01-16-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-12	L03-01-17-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14225-13	L03-01-19-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-14	L03-01-20-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14225-15	L03-01-22-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-14225-16	L03-01-23-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-14225-17	L03-01-01-P-S-Q-00	Total/NA	Solid	Dry and Grind	
160-14225-18	L03-01-05-P-R-Q-00	Total/NA	Solid	Dry and Grind	
160-14225-19	L03-01-25-P-S-B-00	Total/NA	Solid	Dry and Grind	

### Prep Batch: 216230

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14225-1	L03-01-01-P-S-S-00	Total/NA	Solid	None	
160-14225-2	L03-01-02-P-R-S-00	Total/NA	Solid	None	

TestAmerica St. Louis



# QC Association Summary

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

TestAmerica Job ID: 160-14225-1

## Rad (Continued)

### Prep Batch: 216230 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14225-3	L03-01-04-P-S-S-00	Total/NA	Solid	None	
160-14225-4	L03-01-05-P-R-S-00	Total/NA	Solid	None	
160-14225-5	L03-01-07-P-S-S-00	Total/NA	Solid	None	
160-14225-6	L03-01-08-P-R-S-00	Total/NA	Solid	None	
160-14225-7	L03-01-10-P-S-S-00	Total/NA	Solid	None	
160-14225-8	L03-01-11-P-R-S-00	Total/NA	Solid	None	
160-14225-9	L03-01-13-P-S-S-00	Total/NA	Solid	None	
160-14225-10	L03-01-14-P-R-S-00	Total/NA	Solid	None	
160-14225-11	L03-01-16-P-S-S-00	Total/NA	Solid	None	
160-14225-12	L03-01-17-P-R-S-00	Total/NA	Solid	None	
160-14225-13	L03-01-19-P-S-S-00	Total/NA	Solid	None	
160-14225-14	L03-01-20-P-R-S-00	Total/NA	Solid	None	
160-14225-15	L03-01-22-P-S-S-00	Total/NA	Solid	None	
160-14225-16	L03-01-23-P-R-S-00	Total/NA	Solid	None	
160-14225-17	L03-01-01-P-S-Q-00	Total/NA	Solid	None	
160-14225-18	L03-01-05-P-R-Q-00	Total/NA	Solid	None	
160-14225-19	L03-01-25-P-S-B-00	Total/NA	Solid	None	
160-14228-A-21-B MS	Matrix Spike	Total/NA	Solid	None	
160-14228-A-21-C MSD	Matrix Spike Duplicate	Total/NA	Solid	None	
LCS 160-216230/2-A	Lab Control Sample	Total/NA	Solid	None	
MB 160-216230/1-A	Method Blank	Total/NA	Solid	None	

### Prep Batch: 216682

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-14225-1	L03-01-01-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-1 DU	L03-01-01-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-2	L03-01-02-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-3	L03-01-04-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-4	L03-01-05-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-5	L03-01-07-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-6	L03-01-08-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-7	L03-01-10-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-8	L03-01-11-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-9	L03-01-13-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-10	L03-01-14-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-11	L03-01-16-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-12	L03-01-17-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-13	L03-01-19-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-14	L03-01-20-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-15	L03-01-22-P-S-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-16	L03-01-23-P-R-S-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-17	L03-01-01-P-S-Q-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-18	L03-01-05-P-R-Q-00	Total/NA	Solid	Fill_Geo-0	216044
160-14225-19	L03-01-25-P-S-B-00	Total/NA	Solid	Fill_Geo-0	216044
LCS 160-216682/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-0	
MB 160-216682/1-A	Method Blank	Total/NA	Solid	Fill_Geo-0	

TestAmerica St. Louis

# Tracer/Carrier Summary

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

TestAmerica Job ID: 160-14225-1

**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)
160-14225-1	L03-01-01-P-S-S-00	58
160-14225-2	L03-01-02-P-R-S-00	54
160-14225-3	L03-01-04-P-S-S-00	64
160-14225-4	L03-01-05-P-R-S-00	58
160-14225-5	L03-01-07-P-S-S-00	55
160-14225-6	L03-01-08-P-R-S-00	58
160-14225-7	L03-01-10-P-S-S-00	56
160-14225-8	L03-01-11-P-R-S-00	58
160-14225-9	L03-01-13-P-S-S-00	57
160-14225-10	L03-01-14-P-R-S-00	60
160-14225-11	L03-01-16-P-S-S-00	54
160-14225-12	L03-01-17-P-R-S-00	53
160-14225-13	L03-01-19-P-S-S-00	53
160-14225-14	L03-01-20-P-R-S-00	52
160-14225-15	L03-01-22-P-S-S-00	57
160-14225-16	L03-01-23-P-R-S-00	60
160-14225-17	L03-01-01-P-S-Q-00	51
160-14225-18	L03-01-05-P-R-Q-00	62
160-14225-19	L03-01-25-P-S-B-00	51
160-14228-A-21-B MS	Matrix Spike	57
160-14228-A-21-C MSD	Matrix Spike Duplicate	69
LCS 160-216230/2-A	Lab Control Sample	60
MB 160-216230/1-A	Method Blank	62

### Tracer/Carrier Legend

Re = Re