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095689

Environmental
Restoration
Contractor

ERC Team**Interoffice Memorandum****Job No. 22192**

Written Response Required: NO

Due Date: N/A

Action: N/A

Closes CCN: N/A

OU: 233-S

TSD: N/A

ERA: N/A

Subject Code: 8600

TO: J. H. Kessner H0-25

DATE: January 17, 2002

COPIES: R. P. Ollero H0-18
D. L. Moder T6-05
G. J. Borden H0-18
Document and Info Services H0-09FROM: Richard L. Weiss *K24*
H9-03/372-9592SUBJECT: **ISSUANCE OF FINALIZED DATA FOR NONDESTRUCTIVE ASSAY (NDA) OF
233-S WASTE ITEMS 1697, 1739, 2025, AND 2026**

The attached interim report (Attachment 1) describes nondestructive assay (NDA) activities performed for 233-S Waste Items 1697, 1739, 2025, and 2026 by Canberra Hanford, Inc. (Canberra). The report was issued as an interim report, as not all procedures and documentation used by Canberra at the time of issuance were fully issued and accepted for use for Bechtel Hanford Inc. activities. All Canberra procedures and documentation have been issued and accepted, and require no modifications to the interim report provided. In addition, the data and results have been reviewed for technical adequacy and no errors were noted. It is considered appropriate to allow issuance of the attached data as finalized.

It must be noted that the data presented in the attached report was generated using different Plutonium/Americium isotopic ratio data than is currently being used by Canberra for Hanford analyses. This differing isotopic ratio data was used with the knowledge and effective request of the data users (see Attachment 2). Use of this data for other purposes should evaluate the suitability of the isotopic ratios used for data generation before use.

RLW:sls

- Attachments: 1. Interim Report of Assay Results for Waste Items 1697, 1739, 2025, and 2026, issued by Canberra Hanford, Inc. to J. H. Kessner, dated November 9, 2001.
2. Email from G. J. Borden to J. H. Kessner, (cc: R. L. Weiss) dated January 14, 2002, regarding Canberra Interim Report

RECEIVED
JUN 13 2002
EDMC





November 9, 2001

Joan Kessner
Bechtel Hanford Inc
3350 George Washington Way
Richland, WA 99352

The following is an interim report of assay results for four items that had been previously assayed by PFP and had been reported with MDA results. These items were modeled, assayed, and analyzed by Martin Winterrose under the Canberra Hanford measurement program on October 29, 2001 through October 30, 2001. The results have been reviewed and approved by Bruce Gillespie.

Quality control charts are included which cover this time period which demonstrate that the ISOCS system was in control during this measurement period.

These assays were performed using the standard analysis procedures. The results are reported based on the Analysis V2 spreadsheet. This is the spreadsheet which had been developed by Canberra Hanford for reporting ISOCS results under the under the PFP contract. This spreadsheet calculates the results using the same isotopic ratios as the PFP data utilized. A copy of this isotopic distribution is attached for reference.

The interim results and some additional detail concerning each of the assay results is addressed below for each assay.

Item 1697:

Using the standard assay procedure with a 900 second count summed with a 900 second count along the length of the pipe. The assay report for the full 1800 second count had no detectable Am-241 or Pu-239 peaks. An MDA report was run for this assay, and the MDA result for the 59.5 keV Am-241 energy was used to calculate the total TRU activity. Because the result is an MDA there is no uncertainty propagation.

Item Weight: 19.0 kg
Total TRU concentration: 2.28E+1 nCi/g

Item 1739:

This item was assayed using the standard assay procedure with a 900 second count summed with a 900 second count at 180 degrees. Plutonium was not detected in the analysis results, although there was a very weak 413.5 keV peak which was rejected as being below the MDA value. This measured value for the 413.5 keV peak was only slightly lower than the Pu value calculated from the Am-241 result. An MDA report was

run to provide additional information. The Am-241 59.5 keV result was used to calculate the total TRU activity. The calculated Pu activity was $2.06\text{E}+2$ nCi/g that is almost equal to the Pu-239 MDA result for the 413.7 keV line which was $2.47\text{E}+2$. The uncertainty reported for the total TRU activity is based on the measured uncertainty at 1 sigma.

Item Weight: 3.63 kg
Total TRU concentration: $3.56\text{E}+2 \pm 2.57\text{E}+01$ nCi/g

Item 2025:

This item was assayed using the standard assay procedure with a 900 second count summed with a 900 second count at 180 degrees. Pu-239 was detected and quantified for all three key gamma lines (129, 375, and 413.7).

Item Weight: 2.72 kg
Total TRU concentration: $2.14\text{E}+2 \pm 3.31\text{E}+01$ nCi/g

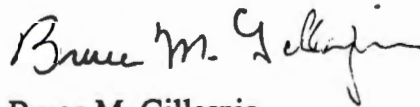
Item 2026:

This item was assayed using the standard assay procedure with a 900 second front count summed with a 900 second back count. Pu-239 was detected and quantified for the 129 and 375 keV gamma peaks. The measured values for these gamma lines are actually below the calculated MDA value for that energy.

Item Weight: 2.27 kg
Total TRU concentration: $4.61\text{E}+2 \pm 1.19\text{E}+01$ nCi/g

Copies of the item worksheets, ISOCS model parameters, and analysis spreadsheets are attached.

Sincerely,



Bruce M. Gillespie
Project Manager

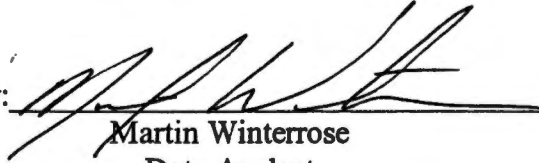
Attachment

Data Package Submittal for November 9, 2001

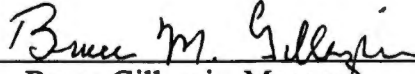
Supporting data for Nondestructive Assay of 233-S Waste Packages

From this page through page 31

Analyzed by:


Martin Winterrose
Data Analyst

Checked by


Bruce Gillespie, Manager
Canberra Hanford

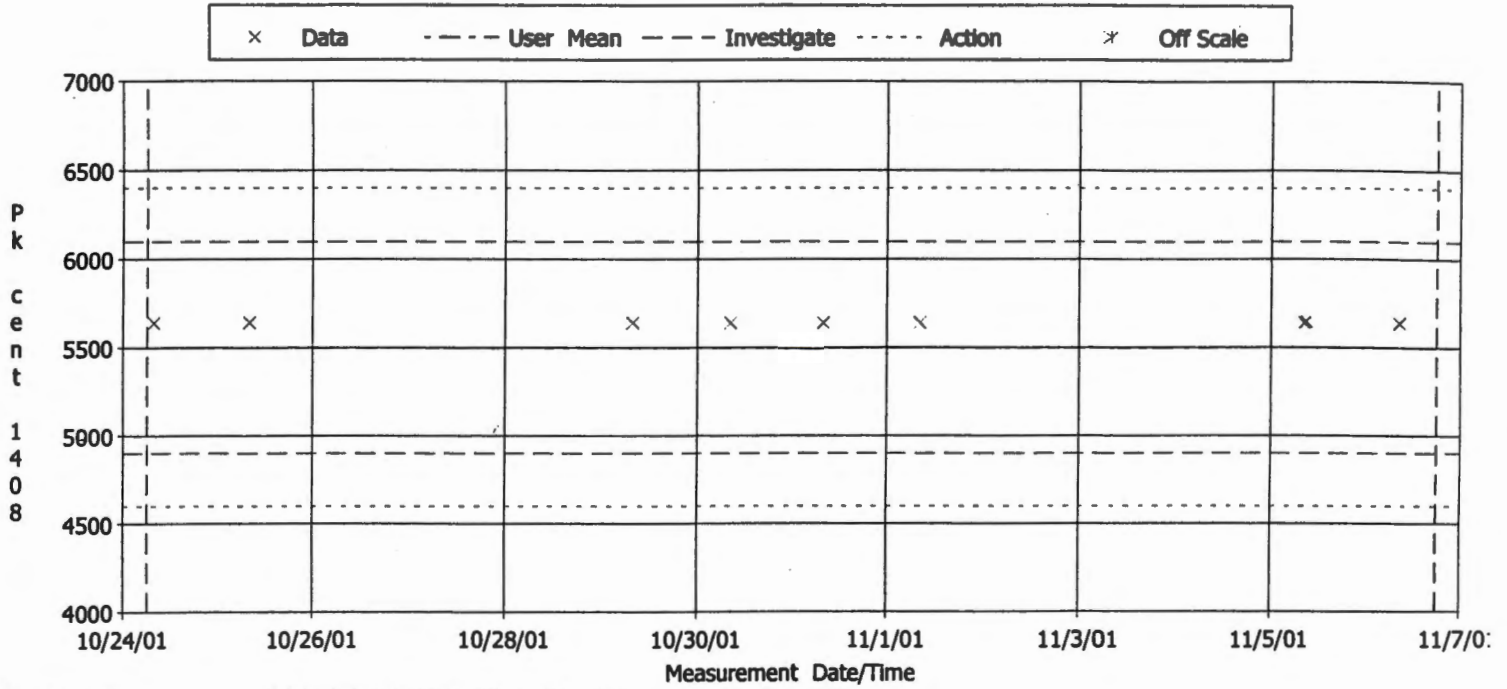
Isotopic Analysis of 233-S Loadout Table
Provided by PFP

Isotope	Shot 1 Wt. %	Shot 2 Wt. %	Average Wt. %	Specific Activity d/m/g	TRU dpm
Pu-238	0.081	0.082	0.08	3.80E+13	3.09E+12
Pu-239	90.847	90.225	90.54	1.36E+11	1.23E+13
Pu-240	8.64	9.235	9.235 8.94	5.00E+11	4.47E+12
Pu-241	0.348	0.368	0.368 ^{RW}	2.50E+14	
Pu-242	0.084	0.090	0.090 ⁰¹⁻¹⁶⁻⁰²	8.60E+09	7.49E+08
Am-241	1.253	1.277	1.277	7.60E+12	9.62E+12

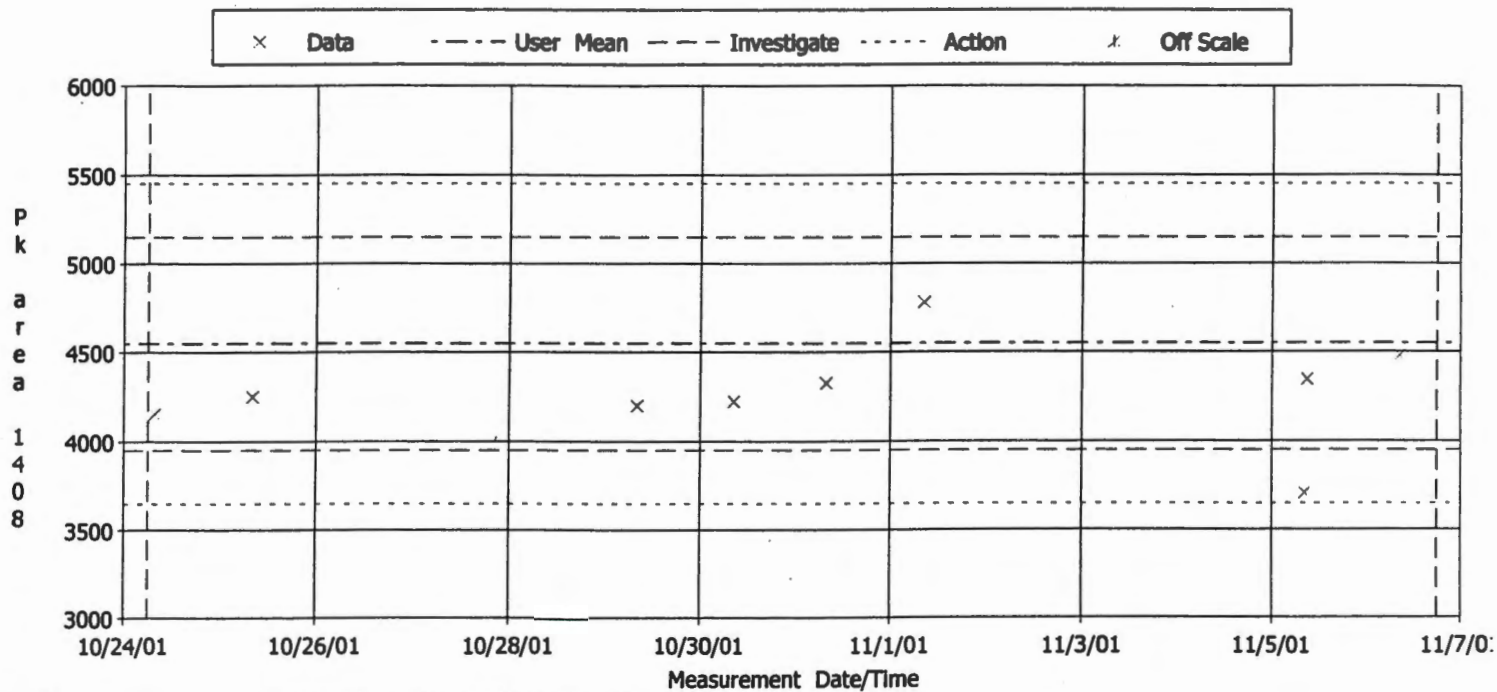
Pu-241 is not included in the calculation of the TRU activity since it is a beta emitter and therefore not considered as TRU waste.

Total Pu can be calculated from the measured Pu-239 using the factor 1.61

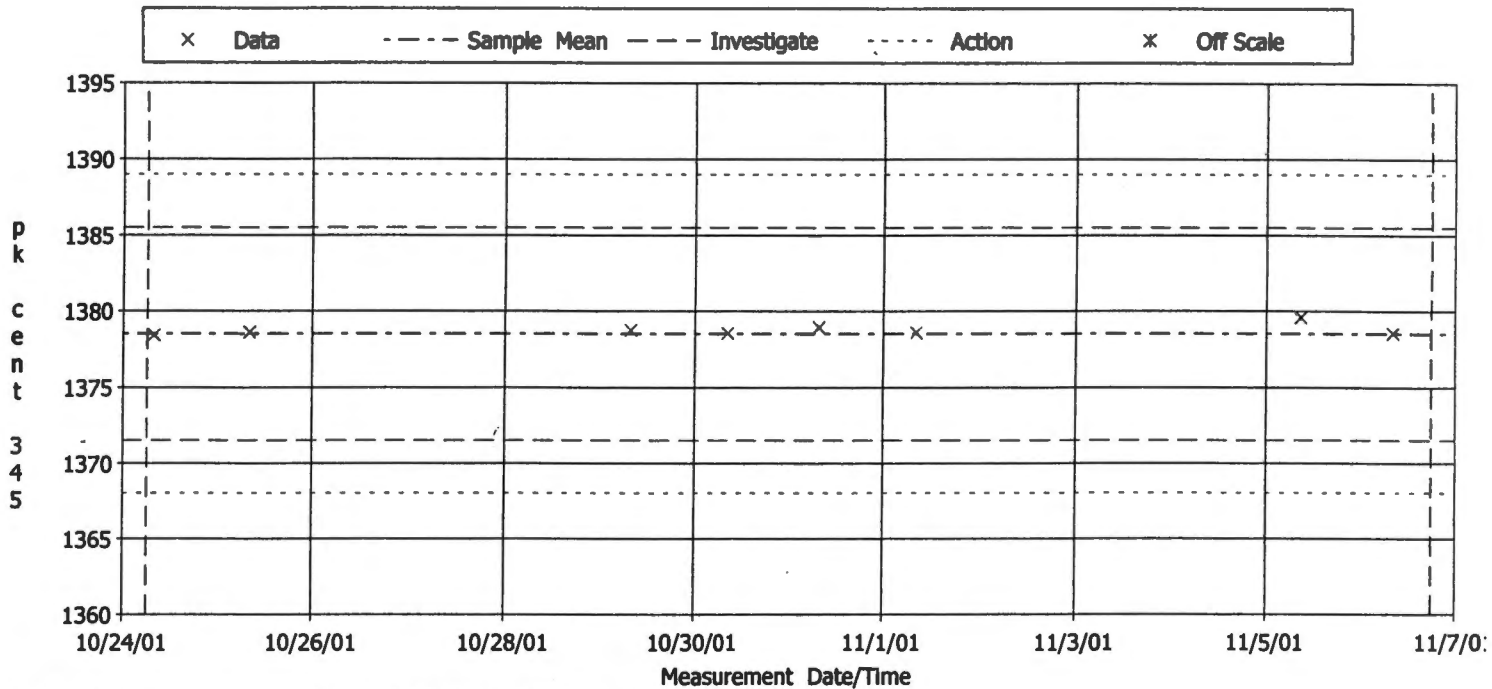
Am-241 can be calculated from the Total Pu using the factor 0.484



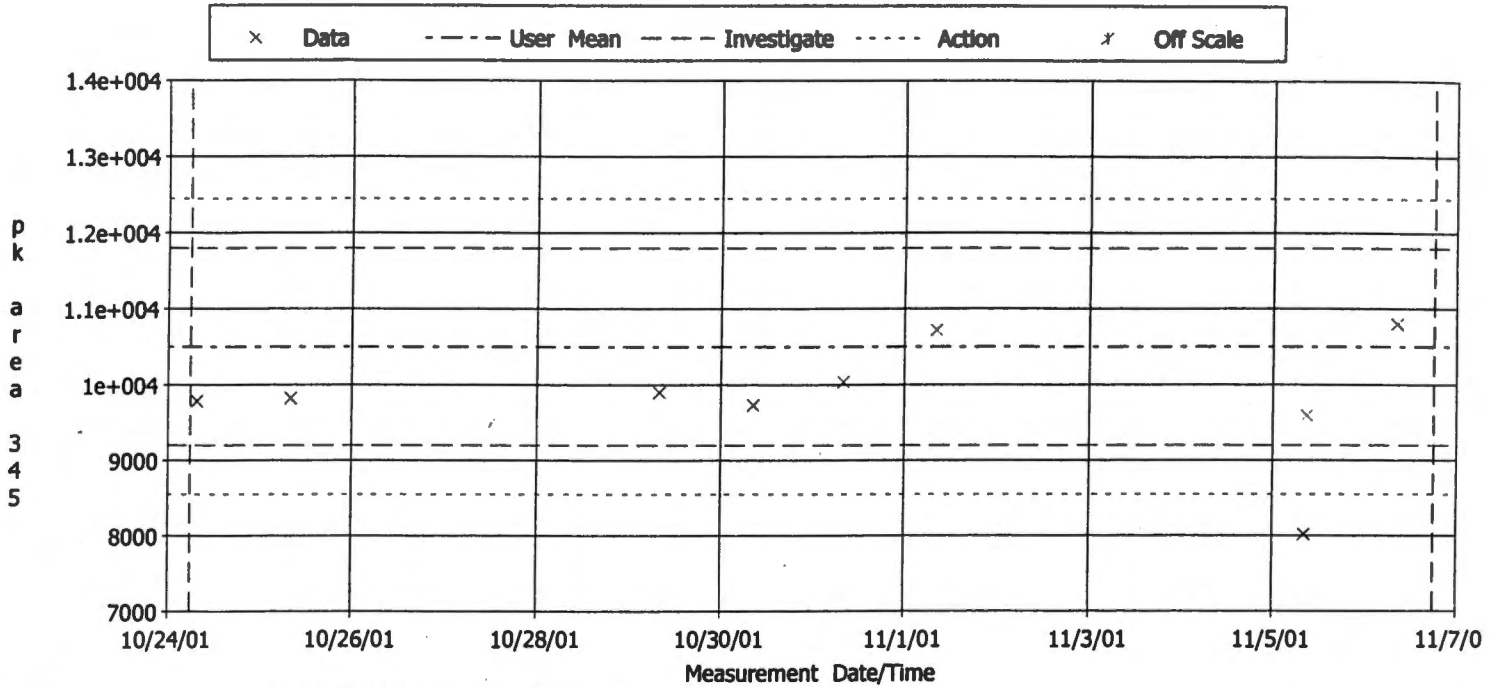
QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
 Parameter Description : Pk cent 1408 (ch)
 Selection Dates : 10/24/01 6:00:00 AM - 11/06/01 6:00:00 PM
 User Mean +/- Std Dev : 5500.000 +/- 3.00e+002



QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
 Parameter Description : Pk area 1408 (counts)
 Selection Dates : 10/24/01 6:00:00 AM -- 11/06/01 6:00:00 PM
 User Mean +/- Std Dev : 4550.000 +/- 3.00e+002

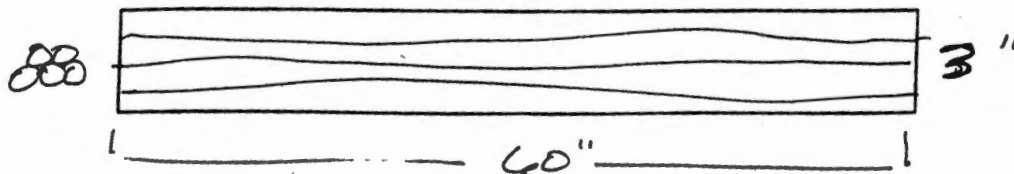


QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
 Parameter Description : pk cent 345 (ch)
 Selection Dates : 10/24/01 6:00:00 AM - 11/06/01 6:00:00 PM
 Sample Mean +/- Std Dev : 1378.519 +/- 3.494



QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
 Parameter Description : pk area 345 (counts)
 Selection Dates : 10/24/01 6:00:00 AM - 11/06/01 6:00:00 PM
 User Mean +/- Std Dev : 10500.000 +/- 6.50e+002

Bldg 233-S
NDA Item Description Sheet
Pipe Geometry



Put Dimensions on Pipe

Item ID: 1497

Weight (kg): 42 LBS 19.007

Material Description: 5 1" Pipes

Packaging: 3 layers Poly

Detector Distance (in): 50"

Detector Filters: NONE

Dose Rate: <.5

Comments: 5 1" Pipes Modeled as 1 3" Pipe
A 900 SEC
B 1800 SEC

#Date & Time: Tue Oct 30 13:08:51 2001

~g=PIPE

~description=1697_PIPE

~comment=5_1" PIPES

~Ccollimator=50MM-180D

~crpn=4

~Detector=7219

~Convergence in %=1

~MDRPN=4

~Lunit=IN ~Tunit=C ~Dunit=G/CU.C ~Punit=MM.HG

~at=20 ~ap=760 ~rh=50

~Energies kev= 50.000, 100.000, 128.000, 130.000, 150.000, 200.000, #

300.000, 500.000, 700.000, 1000.000, 1400.000, 2000.000, #

4000.000,

~Error in %= 10.000, 10.000, 10.000, 10.000, 10.000, 8.000, #

8.000, 6.000, 6.000, 4.000, 4.000, 4.000, #

4.000,

~d1.1=0.216 ~d1.2=3 ~d1.3=30 ~d1.4=30 ~1mater=304SS ~1den=7.81

~d2.1=0.133 ~d2.2=30 ~d2.3=30 ~2mater=DRYDIRT ~2den=1.6 ~2con=1

~sd1=50

233-S Item Analysis

Spreadsheet Version 2.0

Item ID: 1697RC
Assay Date: 10/30/2001

Measurement Data

Cnt #:

Isotope	Activity (uCi/kg)	Meas Uncert
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Am-241	7.42E+00	
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MRA RESULT Bms 11/9/01

TRU/LLW Analysis

Calculation of Total Pu TRU Activity in nCi/g based on waste stream
profile is equal to Am-241 Activity * 2.07

Pu total TRU Activity: 1.53E+01 +/- 0.00E+00 nCi/g

Meas Am-241 activity 7.42E+00 +/- 0.00E+00 nCi/g

Total TRU Activity in nCi/g = Pu total TRU + Am-241 +
any other detected TRU nuclides such as Np-237

Total TRU Activity (nCi/g): 2.28E+01 +/- 0.00E+00
TRU Activity + 2 sigma: 2.28E+01

Note: All Uncertainties are measurement uncertainties
reported at 1 sigma

Report Generated On : 11/05/01 1:18:06 PM

Sample Title : 1697 Side B

Spectrum Description :

Sample Identification : 0908

Sample Size : 19.1 kg

Sample Taken On : 10/30/01 1:28:00 PM

Acquisition Started : 10/30/01 1:44:34 PM

Live Time: 1800.0 seconds Real Time: 1802.3 seconds

ISOCS Calabration : 1697 PIPE

Energy Calibration Used Done On : 2/27/01

Efficiency Calibration Used Done On : 10/30/01

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	340.26	85.14	9.01E+002	70.68	2.49E+003
2	954.38	238.62	1.11E+002	19.23	2.85E+002
3	1408.77	352.18	1.07E+002	15.24	1.23E+002
4	2045.44	511.30	1.48E+002	17.56	6.49E+001
5	2333.99	583.41	8.41E+001	12.36	6.51E+001
6	2438.63	609.56	2.10E+002	16.90	5.76E+001
7	2648.98	662.13	5.68E+001	10.92	4.61E+001
8	4485.47	1121.11	6.03E+001	9.82	2.65E+001
9	5849.15	1461.92	5.26E+002	23.64	8.20E+000
10	7066.42	1766.13	6.48E+001	9.06	2.91E+000

NUCLIDE IDENTIFICATION REPORT

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CS-137	0.991	661.65*	85.12	2.27406E-003	4.43326E-004

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CS-137	0.991	2.274058E-003	4.433262E-004

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/kg)	Nuclide MDA (uCi/kg)	Activity (uCi/kg)
	CO-60	1173.22	100.00	2.0149E-003	1.60E-003	-1.0927E-003
		1332.49	100.00	1.5970E-003		7.2581E-004
	CS-134	475.35	1.46	1.6092E-001	2.40E-003	-5.4042E-002
		563.23	8.38	2.6982E-002		7.4284E-003
		569.32	15.43	1.4770E-002		1.5574E-002
		604.70	97.60	3.2332E-003		-2.0072E-004
		795.84	85.40	2.3988E-003		6.5776E-004
		801.93	8.73	2.4150E-002		-3.1030E-003
		1038.57	1.00	2.0345E-001		2.2470E-001
		1167.94	1.80	1.1061E-001		4.9905E-002
		1365.15	3.04	5.3208E-002		1.1897E-002
+	CS-137	661.65*	85.12	1.3735E-003	1.37E-003	2.2741E-003
	NP-237	300.17	6.20	4.4743E-002	7.52E-003	5.6094E-003
		312.00	36.00	7.5169E-003		4.1038E-003
		340.60	4.20	6.1876E-002		6.4847E-002
		375.45	0.68	3.5302E-001		1.6141E-002
		415.76	1.75	1.4354E-001		-1.0094E-001
	Pu-239	129.28	0.01	1.8678E+002	1.52E+002	-2.4543E+001
		375.00	0.00	1.5163E+002		-1.1538E+001
		413.70	0.00	1.6665E+002		-2.3939E+001
		451.50	0.00	1.2350E+003		-9.1647E+002
	AM-241	59.54	35.70	7.4158E+000	7.42E+000	-1.1059E+001
		125.28	0.00	3.2106E+002		8.3858E+001
		335.40	0.00	5.2539E+002		3.8641E+002
		662.42	0.00	7.3159E+002		6.9585E+002
		722.70	0.00	1.5351E+003		-1.2895E+003
	PU-241	114.00	0.02	7.7302E+001	7.73E+001	-4.7000E+001
		332.60	0.00	8.8443E+001		-2.2274E+001
	CM-243	209.70	3.27	1.0004E-001	1.98E-002	9.4500E-002
		228.18	10.56	2.8724E-002		-1.2739E-003
		277.60	14.00	1.9831E-002		1.8175E-002

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

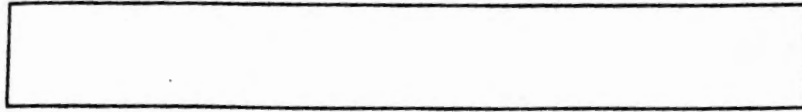
@ = Half-life too short to be able to perform the decay correction

N U C L I D E T O T A L S

Nuclide

Mass (g)

Bldg 233-S
NDA Item Description Sheet
Pipe Geometry



56"

2

Put Dimensions on Pipe

Item ID: 1789

Weight (kg): 8.65 3.63

Material Description: 2 PIPES 1/2 CONDGT

Packaging: 3 LAYERS

Detector Distance (in): 23"

Detector Filters: NONE

Dose Rate: 4.5

Comments: 900 -14 910
900 +14 911

#Date & Time: Tue Oct 30 14:29:29 2001

~g=PIPE

~description=1739 PIPE

~comment=2 1/1 PIPES

~Ccollimator=50MM-180D

~crpn=4

~Detector=7219

~Convergence in %=1

~MDRPN=4

~Lunit=IN ~Tunit=C ~Dunit=G/CU.C ~Punit=MM.HG

~at=20 ~ap=760

~rh=50

~Energies kev= 50.000, 100.000, 128.000, 130.000, 150.000, 200.000, #

300.000, 500.000, 700.000, 1000.000, 1400.000, 2000.000, #

4000.000,

~Error in %= 10.000, 10.000, 10.000, 10.000, 10.000, 8.000, #

8.000, 6.000, 6.000, 4.000, 4.000, 4.000, #

4.000,

~d1.1=0.133

~d1.2=1

~d1.3=28

~d1.4=28

~1mater=CSTEEL

~1den=7.86

~d2.1=0.133

~d2.2=28

~d2.3=28

~2mater=DRYDIRT

~2den=1.6

~2con=1

~sd1=25

~sd5=-14

233-S Item Analysis

Spreadsheet Version 2.0

Item ID: 1739 RC
Assay Date: 10/30/01

Measurement Data

Cnt #: 910

Isotope	Activity (uCi/kg)	Meas Uncert
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Am-241	9.94E+01	8.36E+00
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TRU/LLW Analysis

Calculation of Total Pu TRU Activity in nCi/g based on waste stream
profile is equal to Am-241 Activity * 2.07

Pu total TRU Activity:	2.06E+02	+/-	1.73E+01 nCi/g
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Meas Am-241 activity	9.94E+01	+/-	8.36E+00 nCi/g
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Total TRU Activity in nCi/g = Pu total TRU + Am-241 +
any other detected TRU nuclides such as Np-237

Total TRU Activity (nCi/g):	3.05E+02	+/-	2.57E+01
TRU Activity + 2 sigma:	3.56E+02		

Note: All Uncertainties are measurement uncertainties
reported at 1 sigma

C A N B E R R A I S O C S A N A L Y S I S

Report Generated On : 11/05/01 1:19:11 PM

Sample Title : 1739 Side A +14
 Spectrum Description :
 Sample Identification : 0911
 Sample Size : 3.6 kg

Sample Taken On : 10/30/01 2:48:00 PM
 Acquisition Started : 10/30/01 2:49:33 PM

Live Time: 1800.0 seconds Real Time: 1802.9 seconds

ISOCS Calibration : 1739 PIPE
 Energy Calibration Used Done On : 2/27/01
 Efficiency Calibration Used Done On : 10/30/01

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	198.29	49.66	2.20E+002	52.00	2.30E+003
2	239.31	59.91	2.13E+004	585.70	2.16E+003
3	340.23	85.13	9.49E+002	67.89	2.42E+003
4	350.53	87.71	2.43E+002	57.21	2.43E+003
5	396.07	99.09	1.26E+002	47.22	2.43E+003
6	1408.90	352.22	1.26E+002	15.91	1.52E+002
7	1654.10	413.50	3.17E+001	11.19	1.05E+002
8	2045.03	511.19	1.15E+002	14.58	8.31E+001
9	2334.32	583.49	8.90E+001	12.54	6.85E+001
10	2438.89	609.63	2.23E+002	17.42	6.05E+001
11	2649.13	662.17	1.29E+002	13.74	4.30E+001
12	3647.44	911.67	5.45E+001	10.44	3.72E+001
13	4485.44	1121.10	6.70E+001	10.15	1.96E+001
14	5849.73	1462.06	5.31E+002	23.67	8.42E+000
15	7067.16	1766.32	6.68E+001	9.40	3.24E+000

NUCLIDE IDENTIFICATION REPORT

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CS-137	0.989	661.65*	85.12	7.99131E-003	8.86977E-004
AM-241	0.993	59.54*	35.70	9.94192E+001	8.36013E+000
		125.28	0.00		
		335.40	0.00		
		662.42* @	0.00	1.88950E+003	2.09659E+002
		722.70	0.00		

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CS-137	0.989	7.570833E-003	8.874192E-004
AM-241 @	0.993	9.941917E+001	8.360130E+000

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/kg)	Nuclide MDA (uCi/kg)	Activity (uCi/kg)
	CO-60	1173.22	100.00	3.2648E-003	2.91E-003	9.2186E-004
		1332.49	100.00	2.9051E-003		1.0755E-003
	CS-134	475.35	1.46	2.3384E-001	4.13E-003	-9.8916E-002
		563.23	8.38	3.9418E-002		-1.1549E-002
		569.32	15.43	2.1991E-002		-7.3502E-003
		604.70	97.60	5.0398E-003		-6.2280E-004
		795.84	85.40	4.1278E-003		1.8163E-003
		801.93	8.73	3.8551E-002		2.1909E-002
		1038.57	1.00	2.9806E-001		-2.6762E-002
		1167.94	1.80	1.8268E-001		5.7244E-002
		1365.15	3.04	9.4863E-002		3.9498E-002
+	CS-137	661.65*	85.12	2.0568E-003	2.06E-003	7.9913E-003
	NP-237	300.17	6.20	6.7957E-002	1.09E-002	6.1825E-002
		312.00	36.00	1.0894E-002		6.1177E-003
		340.60	4.20	9.1000E-002		9.0085E-003
		375.45	0.68	5.3178E-001		-2.5676E-001
		415.76	1.75	2.1609E-001		1.7087E-001
	Pu-239	129.28	0.01	2.0484E+002	2.05E+002	-1.4430E+002
		375.00	0.00	2.2878E+002		1.0787E+000
		413.70	0.00	2.4983E+002		2.7314E+002
		451.50	0.00	1.8827E+003		-6.5087E+000
+	AM-241	59.54*	35.70	1.0236E+000	1.02E+000	9.9419E+001
		125.28	0.00	3.4327E+002		7.0162E+001
		335.40	0.00	7.9986E+002		2.8291E+002
		662.42*	0.00	4.8633E+002		1.8895E+003
		722.70	0.00	2.6296E+003		5.5321E+002
	PU-241	114.00	0.02	7.5730E+001	7.57E+001	2.4107E+001
		332.60	0.00	1.3551E+002		4.0113E+001
	CM-243	209.70	3.27	1.4090E-001	2.84E-002	-5.8277E-003
		228.18	10.56	4.0811E-002		-2.8583E-002
		277.60	14.00	2.8407E-002		8.3875E-004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

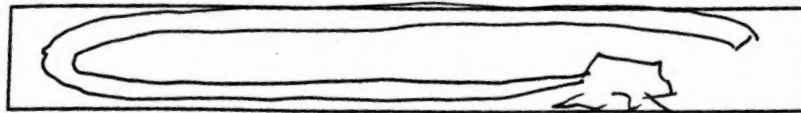
@ = Half-life too short to be able to perform the decay correction

N U C L I D E T O T A L S

Nuclide	Mass (g)
---------	----------

Bldg 233-S
NDA Item Description Sheet
Pipe Geometry

10/27/01



17"

Put Dimensions on Pipe

Item ID: 2025

Weight (kg): 6 LBS - 2.72 kg

Material Description: L-18 PIPE 1"

Packaging: 3 MYKES Poly

Detector Distance (in): 24

Detector Filters: NONE

Dose Rate: 2.5

Comments: SIDE A 500512 08915
SIDE B 1200512 08917

#Date & Time: FRI NOV 09 09:24:39 2001

-g=PIPE

-description=2025_PIPE

-comment=1" _PIPE_BENT_WITH_FLANGE

-Ccollimator=50MM-180D

-crpn=4

-Detector=7219

-Convergence in %=1 ~MDRPN=4

-Lunit=IN ~Tunit=C ~Dunit=G/CU.C ~Punit=MM.HG

-at=20 ~ap=760 ~rh=50

-Energies kev= 50.000, 100.000, 128.000, 130.000, 150.000, 200.000,#
 300.000, 500.000, 700.000, 1000.000, 1400.000, 2000.000,#
 4000.000,

-Error in %= 10.000, 10.000, 10.000, 10.000, 10.000, 8.000,#
 8.000, 6.000, 6.000, 4.000, 4.000, 4.000,#
 4.000,

-d1.1=0.1 ~d1.2=1 ~d1.3=8.5 ~d1.4=8.5 ~1mater=304SS

-d2.1=0.02 ~d2.2=8.5 ~d2.3=8.5 ~2mater=DRYDIRT ~2den=1.6

-sd1=24

233-S Item Analysis

Spreadsheet Version 2.0

Item ID: 2025
Assay Date: 10/29/2001

Measurement Data

Cnt #: 897

Isotope	Activity (uCi/kg)	Meas Uncert
Pu-239	8.98E+01	1.39E+01
Am-241	1.58E+02	1.99E+01
Np-237		

Pu-239(g): 3.94E-03 0.000608

TRU/LLW Analysis

Calculation of Total Pu TRU Activity in nCi/g based on waste stream profile is equal to Pu-239 Activity * 1.61

Pu total TRU Activity: 1.45E+02 +/- 2.23E+01 nCi/g

Calculation of Am-241 activity in nCi/g based on waste stream profile is equal to Pu total Activity * 0.484

Calculated Am-241: 7.00E+01 +/- 1.08E+01 nCi/g

Total TRU Activity in nCi/g = Pu total TRU + Am-241 + any other detected TRU nuclides such as Np-237

Total TRU Activity (nCi/g): 2.14E+02 +/- 3.31E+01
TRU Activity + 2 sigma: 2.81E+02

Pu gram Value

Pu (g): 0.004 +/- 0.001 Based on waste stream isotopics
Pu(g)+3 sigma 0.006

Note: All Uncertainties are measurement uncertainties reported at 1 sigma

Report Generated On : 11/09/01 9:26:18 AM

Sample Title : 2025 Side B
Spectrum Description :
Sample Identification : 0896
Sample Size : 2.7 kg

Sample Taken On : 10/29/01 10:32:00 AM
Acquisition Started : 10/29/01 10:33:20 AM

Live Time: 1800.0 seconds Real Time: 1808.2 seconds

ISOCS Calabration : 2025 PIPE
Energy Calibration Used Done On : 2/27/01
Efficiency Calibration Used Done On : 11/09/01

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	239.35	59.92	1.68E+005	5212.01	3.64E+003
2	300.87	75.30	2.25E+003	88.97	3.10E+003
3	340.17	85.12	8.56E+002	69.28	3.20E+003
4	379.53	94.96	1.54E+002	56.15	3.19E+003
5	395.95	99.06	3.72E+002	57.55	3.15E+003
6	457.24	114.38	1.54E+002	51.31	3.13E+003
7	517.71	129.49	2.91E+002	54.14	2.72E+003
8	1408.80	352.19	1.43E+002	16.60	1.50E+002
9	1501.39	375.33	5.20E+001	12.81	1.33E+002
10	1655.38	413.82	4.21E+001	11.91	1.12E+002
11	2043.50	510.81	1.09E+002	14.70	7.87E+001
12	2334.74	583.60	7.70E+001	11.70	5.78E+001
13	2439.15	609.69	1.52E+002	14.82	5.84E+001
14	2648.51	662.02	5.44E+001	10.62	5.21E+001
15	7067.97	1766.52	5.19E+001	8.48	2.02E+000

N U C L I D E I D E N T I F I C A T I O N R E P O R T

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CS-137	0.995	661.65*	85.12	2.35672E-003	4.68427E-004
Pu-239	0.970	129.28*	0.01	1.03605E+002	2.59459E+001
		375.00*	0.00	8.89497E+001	2.30201E+001
		413.70*	0.00	7.94136E+001	2.33706E+001
		451.50 @	0.00		
AM-241	0.993	59.54*	35.70	1.58433E+002	1.98760E+001
		125.28	0.00		
		335.40	0.00		
		662.42* @	0.00	5.57233E+002	1.10747E+002
		722.70	0.00		
PU-241	0.818	114.00*	0.02	1.67235E+001	5.64908E+000
		332.60	0.00		

I N T E R F E R E N C E C O R R E C T E D R E P O R T

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CS-137	0.995	1.686657E-003	4.758673E-004
Pu-239	@ 0.970	8.977802E+001	1.386298E+001
AM-241	@ 0.993	1.584327E+002	1.987595E+001
PU-241	0.818	1.672348E+001	5.649085E+000

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

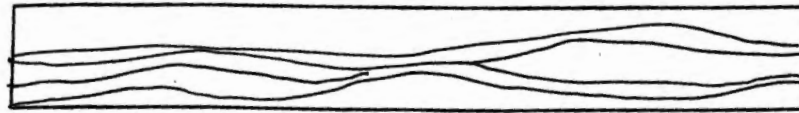
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

N U C L I D E T O T A L S

Nuclide	Mass (g)
Pu-239	3.94E-003 +/- 6.08E-004

Bldg 233-S
NDA Item Description Sheet
Pipe Geometry



5" NW
2"

38

Put Dimensions on Pipe

Item ID: 2026

Weight (kg): 5lbs 2.27 kg

Material Description: 2 1/2" NW Pipe L-18 1"

Packaging: 3 layers

Detector Distance (in): 38

Detector Filters: None

Dose Rate: 1.5

Comments: A 900 SEC 0878

B 1800 SEC 0800

```
#Date & Time: Mon Oct 29 11:08:32 2001
~g=PIPE
~description=2026 PIPE
~comment=2_1" PIPES
~Ccollimator=50MM-180D
~crpn=4
~Detector=7219
~Convergence in %=1 ~MDRPN=4
~Lunit=IN ~Tunit=C ~Dunit=G/CU.C ~Punit=MM.HG
~at=20 ~ap=760 ~rh=50
~Energies kev= 50.000, 100.000, 128.000, 130.000, 150.000, 200.000,#
               300.000, 500.000, 700.000, 1000.000, 1400.000, 2000.000,#
               4000.000,
~Error in %= 10.000, 10.000, 10.000, 10.000, 10.000, 8.000,#
              8.000, 6.000, 6.000, 4.000, 4.000, 4.000,#
              4.000,
~d1.1=0.133 ~d1.2=2 ~d1.3=19 ~d1.4=19 ~1mater=304SS ~1den=7.81
~d2.1=0.133 ~d2.2=19 ~d2.3=19 ~2mater=DRYDIRT ~2den=1.6 ~2con=1
~sd1=38
```

233-S Item Analysis

Spreadsheet Version 2.0

Item ID: 2026
Assay Date: 10/29/01

Measurement Data

Cnt #: 899

Isotope	Activity (uCi/kg)	Meas Uncert
Pu-239	1.93E+02	4.98E+01
Am-241	9.00E+02	7.59E+01
Np-237	0.00E+00	0.00E+00
U-235	8.67E-03	3.06E-03
Pu-239(g):	7.08E-03	1.82E-03

TRU/LLW Analysis

Calculation of Total Pu TRU Activity in nCi/g based on waste stream profile is equal to Pu-239 Activity * 1.61

Pu total TRU Activity: 3.11E+02 +/- 8.02E+01 nCi/g

Calculation of Am-241 activity in nCi/g based on waste stream profile is equal to Pu total Activity * 0.484

Calculated Am-241: 1.50E+02 +/- 3.88E+01 nCi/g

Total TRU Activity in nCi/g = Pu total TRU + Am-241 + any other detected TRU nuclides such as Np-237

Total TRU Activity (nCi/g): 4.61E+02 +/- 1.19E+02
TRU Activity + 2 sigma: 6.99E+02

Pu gram Value
Pu (g): 0.008 +/- 0.002 Based on waste stream isotopics
Pu(g)+3 sigma 0.014

Note: All Uncertainties are measurement uncertainties reported at 1 sigma

Report Generated On : 11/05/01 1:20:16 PM

Sample Title : 2026 Side B

Spectrum Description :

Sample Identification : 0899

Sample Size : 2.3 kg

Sample Taken On : 10/29/01 11:27:00 AM

Acquisition Started : 10/29/01 11:27:38 AM

Live Time: 1800.0 seconds Real Time: 1805.1 seconds

ISOCS Calibration : 2026 PIPE

Energy Calibration Used Done On : 2/27/01

Efficiency Calibration Used Done On : 10/29/01

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	207.54	51.97	3.66E+002	98.56	3.34E+003
2	239.36	59.92	9.24E+004	2620.95	2.42E+003
3	340.47	85.19	9.67E+002	71.33	2.21E+003
4	350.59	87.72	2.13E+002	54.40	2.22E+003
5	394.52	98.70	2.92E+002	47.45	2.21E+003
6	413.57	103.46	1.56E+002	46.00	2.19E+003
7	517.96	129.55	1.14E+002	41.89	1.90E+003
8	744.05	186.06	6.25E+001	21.88	5.64E+002
9	955.97	239.02	1.24E+002	19.10	2.77E+002
10	1409.77	352.43	9.70E+001	14.78	1.34E+002
11	1502.07	375.50	3.70E+001	11.72	1.09E+002
12	2045.81	511.39	1.66E+002	16.07	6.55E+001
13	2439.31	609.73	1.37E+002	14.17	5.38E+001
14	2648.17	661.93	7.54E+001	11.69	4.68E+001
15	3646.48	911.43	7.32E+001	10.90	2.77E+001
16	7068.57	1766.67	4.17E+001	7.48	5.55E-001

N U C L I D E I D E N T I F I C A T I O N R E P O R T

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CS-137	0.997	661.65*	85.12	1.15927E-002	1.83425E-003
U-235	0.654	143.76	10.50		
		185.71*	54.00	8.41144E-003	2.97314E-003
		205.31	4.70		
Pu-239	0.726	129.28*	0.01	1.63501E+002	6.61513E+001
		375.00*	0.00	2.32380E+002	7.56809E+001
		413.70	0.00		
		451.50 @	0.00		
AM-241	0.993	59.54*	35.70	9.00133E+002	7.59435E+001
		125.28	0.00		
		335.40	0.00		
		662.42* @	0.00	2.74102E+003	4.33636E+002
		722.70	0.00		

I N T E R F E R E N C E C O R R E C T E D R E P O R T

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CS-137	0.997	7.785724E-003	1.861900E-003
U-235	0.654	8.411440E-003	2.973136E-003
Pu-239 @	0.726	1.933335E+002	4.980658E+001
AM-241 @	0.993	9.001333E+002	7.594353E+001

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/kg)	Nuclide MDA (uCi/kg)	Activity (uCi/kg)
	CO-60	1173.22	100.00	8.0090E-003	7.37E-003	8.6190E-003
		1332.49	100.00	7.3656E-003		-2.2302E-004
	CS-134	475.35	1.46	5.6673E-001	9.35E-003	4.9586E-001
		563.23	8.38	9.9933E-002		-9.1696E-003
		569.32	15.43	5.3892E-002		6.5655E-003
		604.70	97.60	1.0776E-002		1.4763E-004
		795.84	85.40	9.3514E-003		-1.0653E-003
		801.93	8.73	9.8362E-002		4.3513E-002
		1038.57	1.00	8.1658E-001		8.8100E-002
		1167.94	1.80	4.6149E-001		3.3773E-001
		1365.15	3.04	2.2795E-001		2.3308E-002
+	CS-137	661.65*	85.12	5.3094E-003	5.31E-003	1.1593E-002
	NP-237	300.17	6.20	1.6116E-001	2.53E-002	8.5633E-002
		312.00	36.00	2.5259E-002		-3.1868E-002
		340.60	4.20	2.2759E-001		2.4826E-001
		375.45	0.68	1.3139E+000		1.0223E+000
		415.76	1.75	4.9004E-001		-5.3740E-002
+	Pu-239	129.28*	0.01	2.9563E+002	2.96E+002	1.6350E+002
		375.00*	0.00	3.2143E+002		2.3238E+002
		413.70	0.00	5.6676E+002		-2.0599E+001
		451.50	0.00	4.6947E+003		-3.1782E+003
+	AM-241	59.54*	35.70	2.2559E+000	2.26E+000	9.0013E+002
		125.28	0.00	8.3018E+002		-5.6170E+001
		335.40	0.00	1.9161E+003		2.7828E+002
		662.42*	0.00	1.2554E+003		2.7410E+003
		722.70	0.00	5.9456E+003		2.8378E+003
	PU-241	114.00	0.02	1.8088E+002	1.81E+002	1.9517E+002
		332.60	0.00	3.2303E+002		-1.7870E+002
	CM-243	209.70	3.27	3.3083E-001	6.72E-002	-4.7124E-001
		228.18	10.56	9.7386E-002		-1.3577E-002
		277.60	14.00	6.7202E-002		-5.9169E-003

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

N U C L I D E T O T A L S

Nuclide	Mass (g)
U-235	8.67E-003 +/- 3.06E-003
Pu-239	7.08E-003 +/- 1.82E-003

From: Borden, Gregory J
Sent: Monday, January 14, 2002 9:56 AM
To: Kessner, Joan H
Cc: Weiss, Richard L
Subject: Canberra interim Report

Joan:

Approximately 3 months ago Canberra submitted an interim report on the NDA of 4 items that had been previously NDA'ed by PFP. We would like this report to be finalized. I am aware that the report used a different isotopic ratio than the one specified in the SAP. The purpose of this activity is to have a point of comparison between the Canberra system and the PFP system. Therefore, the isotopic ration used was the same as that utilized by PFP. This is acceptable (and in fact preferable) from an end use perspective. We would like to supply this data to the EPA as soon as possible.

If there are any questions please feel free to call.

Greg Borden
372-9688
531-0750 (cell)

to: dan moder
fax: 373-6862
phone: 373-2735

from: jan kremen
phone: 373-4688
date: 11/12/01
pages: 32

dan =>

interim data from camberra for items:

- 1697
- 1739
- 2025
- 2026

If you have any questions please give
me a call.

Jan

RECEIVED
JUN 13 2002
EDMC



November 9, 2001

Joan Kessner
Bechtel Hanford Inc
3350 George Washington Way
Richland, WA 99352



The following is an interim report of assay results for four items that had been previously assayed by PFP and had been reported with MDA results. These items were modeled, assayed, and analyzed by Martin Winterrose under the Canberra Hanford measurement program on October 29, 2001 through October 30, 2001. The results have been reviewed and approved by Bruce Gillespie.

Quality control charts are included which cover this time period which demonstrate that the ISOCS system was in control during this measurement period.

These assays were performed using the standard analysis procedures. The results are reported based on the Analysis V2 spreadsheet. This is the spreadsheet which had been developed by Canberra Hanford for reporting ISOCS results under the under the PFP contract. This spreadsheet calculates the results using the same isotopic ratios as the PFP data utilized. A copy of this isotopic distribution is attached for reference.

The interim results and some additional detail concerning each of the assay results is addressed below for each assay.

Item 1697:

Using the standard assay procedure with a 900 second count summed with a 900 second count along the length of the pipe. The assay report for the full 1800 second count had no detectable Am-241 or Pu-239 peaks. An MDA report was run for this assay, and the MDA result for the 59.5 keV Am-241 energy was used to calculate the total TRU activity. Because the result is an MDA there is no uncertainty propagation.

Item Weight: 19.0 kg
Total TRU concentration: 2.28E+1 nCi/g

Item 1739:

This item was assayed using the standard assay procedure with a 900 second count summed with a 900 second count at 180 degrees. Plutonium was not detected in the analysis results, although there was a very weak 413.5 keV peak which was rejected as being below the MDA value. This measured value for the 413.5 keV peak was only slightly lower than the Pu value calculated from the Am-241 result. An MDA report was

run to provide additional information. The Am-241 59.5 keV result was used to calculate the total TRU activity. The calculated Pu activity was $2.06\text{E}+2$ nCi/g that is almost equal to the Pu-239 MDA result for the 413.7 keV line which was $2.47\text{E}+2$. The uncertainty reported for the total TRU activity is based on the measured uncertainty at 1 sigma.

Item Weight: 3.63 kg
Total TRU concentration: $3.56\text{E}+2 \pm 2.57\text{E}+01$ nCi/g

Item 2025:

This item was assayed using the standard assay procedure with a 900 second count summed with a 900 second count at 180 degrees. Pu-239 was detected and quantified for all three key gamma lines (129, 375, and 413.7).

Item Weight: 2.72 kg
Total TRU concentration: $2.14\text{E}+2 \pm 3.31\text{E}+01$ nCi/g

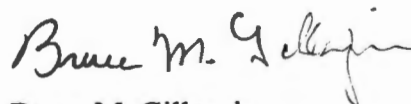
Item 2026:

This item was assayed using the standard assay procedure with a 900 second front count summed with a 900 second back count. Pu-239 was detected and quantified for the 129 and 375 keV gamma peaks. The measured values for these gamma lines are actually below the calculated MDA value for that energy.

Item Weight: 2.27 kg
Total TRU concentration: $4.61\text{E}+2 \pm 1.19\text{E}+01$ nCi/g

Copies of the item worksheets, ISOCS model parameters, and analysis spreadsheets are attached.

Sincerely,



Bruce M. Gillespie
Project Manager

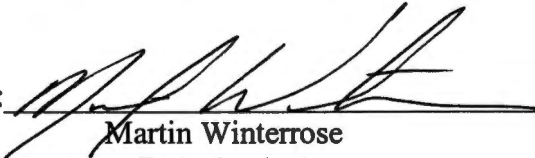
Attachment

Data Package Submittal for November 9, 2001

Supporting data for Nondestructive Assay of 233-S Waste Packages

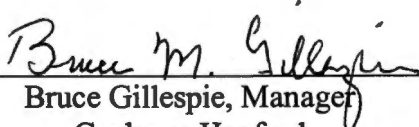
From this page through page 31

Analyzed by:



Martin Winterrose
Data Analyst

Checked by



Bruce Gillespie, Manager
Canberra Hanford

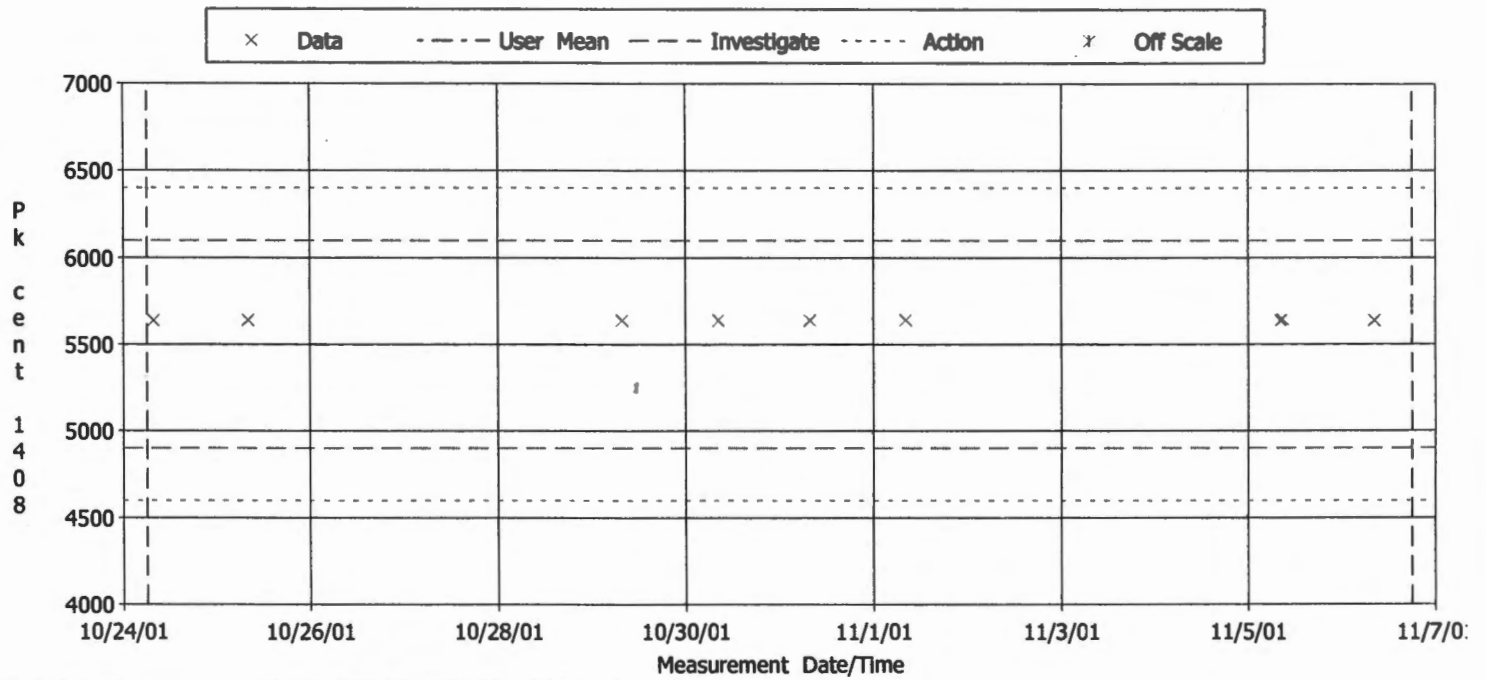
Isotopic Analysis of 233-S Loadout Table
Provided by PFP

Isotope	Shot 1 Wt. %	Shot 2 Wt. %	Average Wt. %	Specific Activity d/m/g	TRU dpm
Pu-238	0.081	0.082	0.08	3.80E+13	3.09E+12
Pu-239	90.847	90.225	90.54	1.36E+11	1.23E+13
Pu-240	8.64	9.235	9.235 8.94	5.00E+11	4.47E+12
Pu-241	0.348	0.368	0.368 ^{RLW} 1-16-02	2.50E+14	
Pu-242	0.084	0.090	0.090	8.60E+09	7.49E+08
Am-241	1.253	1.277	1.277	7.60E+12	9.62E+12

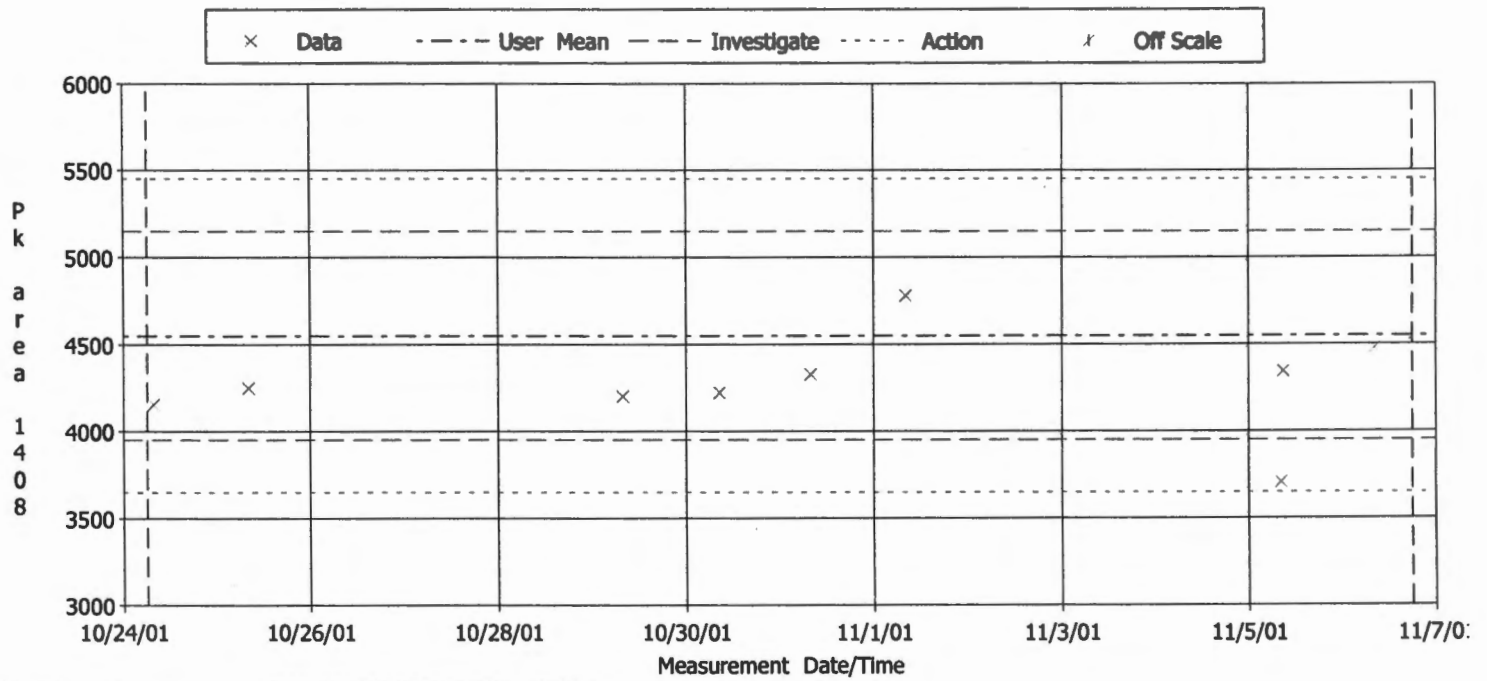
Pu-241 is not included in the calculation of the TRU activity since it is a beta emitter and therefore not considered as TRU waste.

Total Pu can be calculated from the measured Pu-239 using the factor 1.61

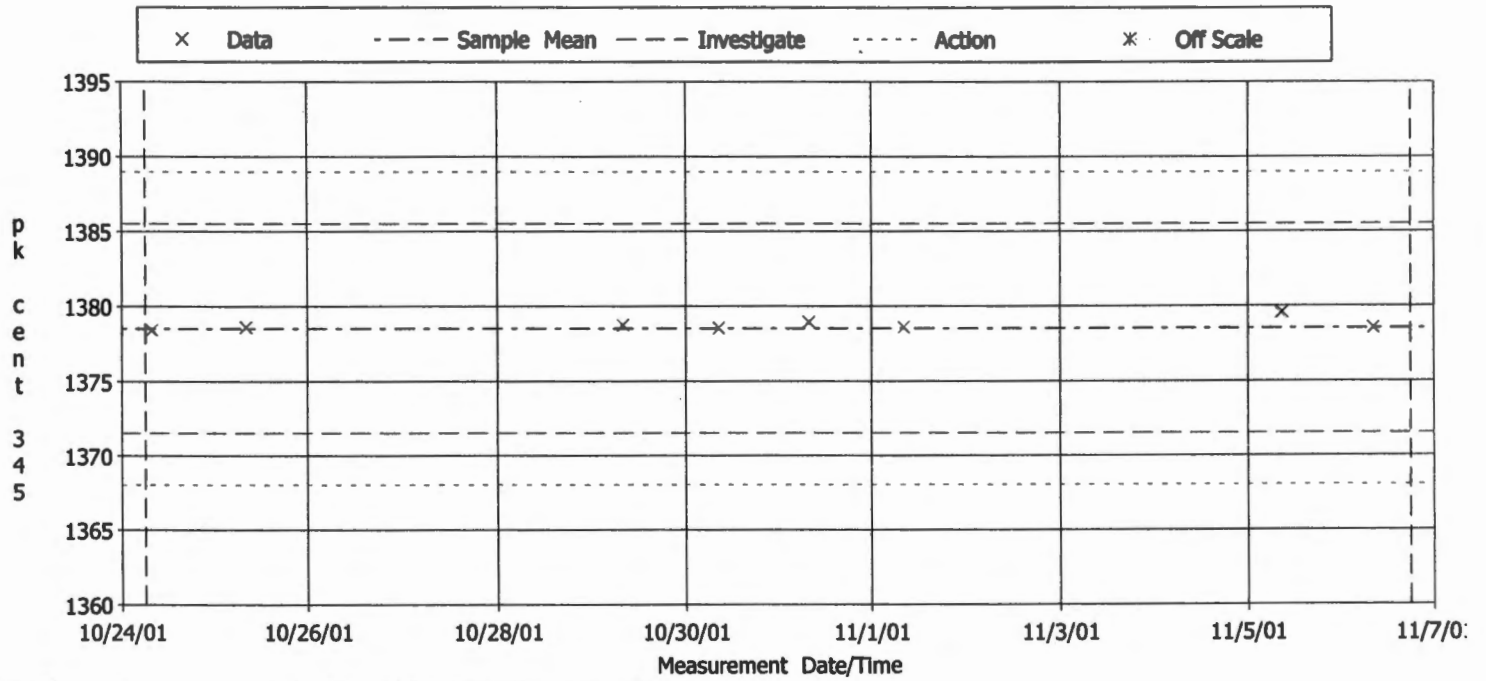
Am-241 can be calculated from the Total Pu using the factor 0.484



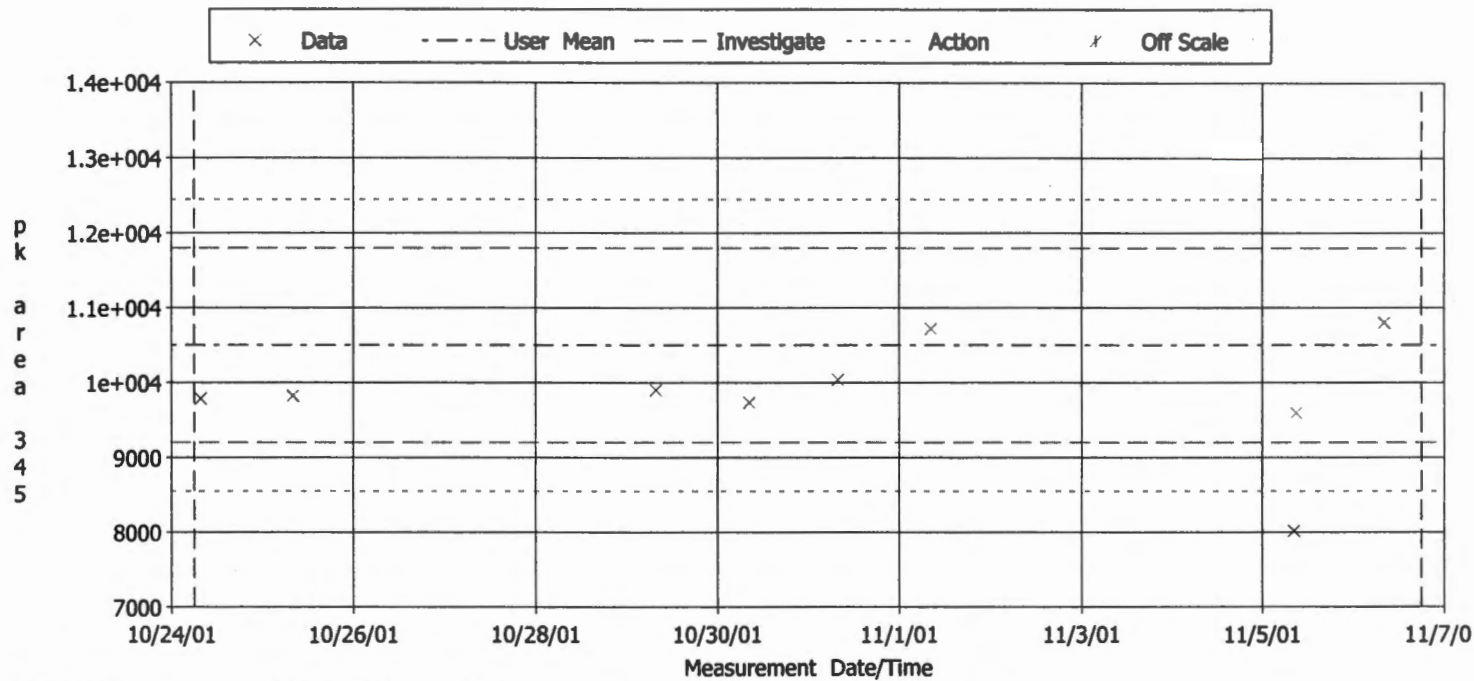
QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
 Parameter Description : Pk cent 1408 (ch)
 Selection Dates : 10/24/01 6:00:00 AM - 11/06/01 6:00:00 PM
 User Mean +/- Std Dev : 5500.000 +/- 3.00e+002



QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
 Parameter Description : Pk area 1408 (counts)
 Selection Dates : 10/24/01 6:00:00 AM - 11/06/01 6:00:00 PM
 User Mean +/- Std Dev : 4550.000 +/- 3.00e+002

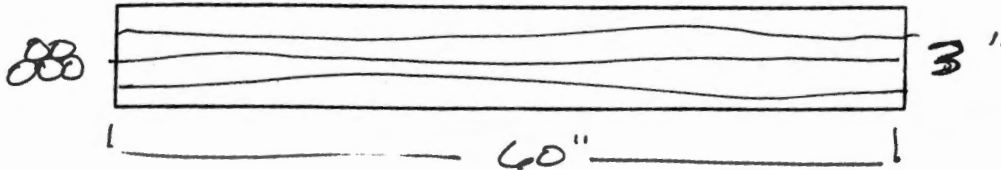


QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
 Parameter Description : pk cent 345 (ch)
 Selection Dates : 10/24/01 6:00:00 AM - 11/06/01 6:00:00 PM
 Sample Mean +/- Std Dev : 1378.519 +/- 3.494



QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
 Parameter Description : pk area 345 (counts)
 Selection Dates : 10/24/01 6:00:00 AM - 11/06/01 6:00:00 PM
 User Mean +/- Std Dev : 10500.000 +/- 6.50e+002

Bldg 233-S
NDA Item Description Sheet
Pipe Geometry



Put Dimensions on Pipe

Item ID: 1497

Weight (kg): 42 LBS 19.007

Material Description: 5 1" Pipes

Packaging: 3 Layers Poly

Detector Distance (in): 50"

Detector Filters: NONE

Dose Rate: <.5

Comments: 5 1" Pipes Modeled As 1 3" Pipe
1A 900 SEC
B 1800 SEC

#Date & Time: Tue Oct 30 13:08:51 2001

~g=PIPE

~description=1697_PIPE

~comment=5_1" PIPES

~Ccollimator=50MM-180D

~crpn=4

~Detector=7219

~Convergence in %=1

~MDRPN=4

~Lunit=IN ~Tunit=C ~Dunit=G/CU.C ~Punit=MM.HG

~at=20 ~ap=760 ~rh=50

~Energies kev= 50.000, 100.000, 128.000, 130.000, 150.000, 200.000, #

300.000, 500.000, 700.000, 1000.000, 1400.000, 2000.000, #

4000.000,

~Error in %= 10.000, 10.000, 10.000, 10.000, 10.000, 8.000, #

8.000, 6.000, 6.000, 4.000, 4.000, 4.000, #

4.000,

~d1.1=0.216

~d1.2=3

~d1.3=30

~d1.4=30

~1mater=304SS

~1den=7.81

~d2.1=0.133

~d2.2=30

~d2.3=30

~2mater=DRYDIRT

~2den=1.6

~2con=1

~sd1=50

233-S Item Analysis

Spreadsheet Version 2.0

Item ID: 1697RC
Assay Date: 10/30/2001

Measurement Data

Cnt #:

Isotope	Activity (uCi/kg)	Meas Uncert
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Am-241	7.42E+00	
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 MRA RESULT 7m9 11/9/01**TRU/LLW Analysis**

Calculation of Total Pu TRU Activity in nCi/g based on waste stream
profile is equal to Am-241 Activity * 2.07

Pu total TRU Activity:	1.53E+01	+/-	0.00E+00 nCi/g
------------------------	----------	-----	----------------

Meas Am-241 activity	7.42E+00	+/-	0.00E+00 nCi/g
----------------------	----------	-----	----------------

Total TRU Activity in nCi/g = Pu total TRU + Am-241 +
any other detected TRU nuclides such as Np-237

Total TRU Activity (nCi/g):	2.28E+01	+/-	0.00E+00
TRU Activity + 2 sigma:	2.28E+01		

Note: All Uncertainties are measurement uncertainties
reported at 1 sigma

C A N B E R R A I S O C S A N A L Y S I S

Report Generated On : 11/05/01 1:18:06 PM

Sample Title : 1697 Side B
 Spectrum Description :
 Sample Identification : 0908
 Sample Size : 19.1 kg

Sample Taken On : 10/30/01 1:28:00 PM
 Acquisition Started : 10/30/01 1:44:34 PM

Live Time: 1800.0 seconds Real Time: 1802.3 seconds

ISOCS Calabration : 1697 PIPE
 Energy Calibration Used Done On : 2/27/01
 Efficiency Calibration Used Done On : 10/30/01

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	340.26	85.14	9.01E+002	70.68	2.49E+003
2	954.38	238.62	1.11E+002	19.23	2.85E+002
3	1408.77	352.18	1.07E+002	15.24	1.23E+002
4	2045.44	511.30	1.48E+002	17.56	6.49E+001
5	2333.99	583.41	8.41E+001	12.36	6.51E+001
6	2438.63	609.56	2.10E+002	16.90	5.76E+001
7	2648.98	662.13	5.68E+001	10.92	4.61E+001
8	4485.47	1121.11	6.03E+001	9.82	2.65E+001
9	5849.15	1461.92	5.26E+002	23.64	8.20E+000
10	7066.42	1766.13	6.48E+001	9.06	2.91E+000

NUCLIDE IDENTIFICATION REPORT

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CS-137	0.991	661.65*	85.12	2.27406E-003	4.43326E-004

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CS-137	0.991	2.274058E-003	4.433262E-004

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/kg)	Nuclide MDA (uCi/kg)	Activity (uCi/kg)
	CO-60	1173.22	100.00	2.0149E-003	1.60E-003	-1.0927E-003
		1332.49	100.00	1.5970E-003		7.2581E-004
	CS-134	475.35	1.46	1.6092E-001	2.40E-003	-5.4042E-002
		563.23	8.38	2.6982E-002		7.4284E-003
		569.32	15.43	1.4770E-002		1.5574E-002
		604.70	97.60	3.2332E-003		-2.0072E-004
		795.84	85.40	2.3988E-003		6.5776E-004
		801.93	8.73	2.4150E-002		-3.1030E-003
		1038.57	1.00	2.0345E-001		2.2470E-001
		1167.94	1.80	1.1061E-001		4.9905E-002
		1365.15	3.04	5.3208E-002		1.1897E-002
+	CS-137	661.65*	85.12	1.3735E-003	1.37E-003	2.2741E-003
	NP-237	300.17	6.20	4.4743E-002	7.52E-003	5.6094E-003
		312.00	36.00	7.5169E-003		4.1038E-003
		340.60	4.20	6.1876E-002		6.4847E-002
		375.45	0.68	3.5302E-001		1.6141E-002
		415.76	1.75	1.4354E-001		-1.0094E-001
	Pu-239	129.28	0.01	1.8678E+002	1.52E+002	-2.4543E+001
		375.00	0.00	1.5163E+002		-1.1538E+001
		413.70	0.00	1.6665E+002		-2.3939E+001
		451.50	0.00	1.2350E+003		-9.1647E+002
	AM-241	59.54	35.70	7.4158E+000	7.42E+000	-1.1059E+001
		125.28	0.00	3.2106E+002		8.3858E+001
		335.40	0.00	5.2539E+002		3.8641E+002
		662.42	0.00	7.3159E+002		6.9585E+002
		722.70	0.00	1.5351E+003		-1.2895E+003
	PU-241	114.00	0.02	7.7302E+001	7.73E+001	-4.7000E+001
		332.60	0.00	8.8443E+001		-2.2274E+001
	CM-243	209.70	3.27	1.0004E-001	1.98E-002	9.4500E-002
		228.18	10.56	2.8724E-002		-1.2739E-003
		277.60	14.00	1.9831E-002		1.8175E-002

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

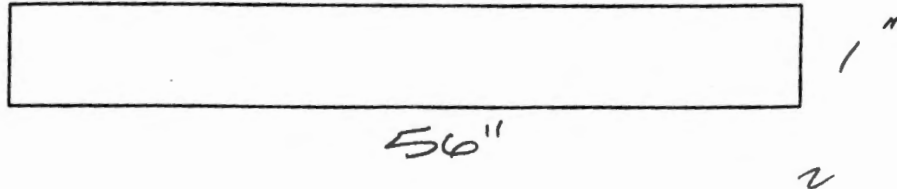
> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

N U C L I D E T O T A L S

Nuclide	Mass (g)
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Bldg 233-S
NDA Item Description Sheet
Pipe Geometry



Put Dimensions on Pipe

Item ID: 1739

Weight (kg): 8 lbs. 3.63

Material Description: 2 pieces 1/2 CONDOR

Packaging: 3 LAYERS

Detector Distance (in): 23"

Detector Filters: NONE

Dose Rate: 4.5

Comments: 900 -14 910
900 +14 911

#Date & Time: Tue Oct 30 14:29:29 2001

~g=PIPE

~description=1739_PIPE

~comment=2_1/1_PIPES

~Ccollimator=50MM-180D

~crpn=4

~Detector=7219

~Convergence in %=1

~MDRPN=4

~Lunit=IN ~Tunit=C ~Dunit=G/CU.C ~Punit=MM.HG

~at=20 ~ap=760 ~rh=50

~Energies kev= 50.000, 100.000, 128.000, 130.000, 150.000, 200.000, #

300.000, 500.000, 700.000, 1000.000, 1400.000, 2000.000, #

4000.000,

~Error in %= 10.000, 10.000, 10.000, 10.000, 10.000, 8.000, #

8.000, 6.000, 6.000, 4.000, 4.000, 4.000, #

4.000,

~d1.1=0.133

~d1.2=1

~d1.3=28

~d1.4=28

~1mater=CSTEEL

~1den=7.86

~d2.1=0.133

~d2.2=28

~d2.3=28

~2mater=DRYDIRT

~2den=1.6

~2con=1

~sd1=25 ~sd5=-14

233-S Item Analysis

Spreadsheet Version 2.0

Item ID: 1739 RC
Assay Date: 10/30/01

Measurement Data

Cnt #: 910

Isotope	Activity (uCi/kg)	Meas Uncert
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Am-241	9.94E+01	8.36E+00
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TRU/LLW Analysis

Calculation of Total Pu TRU Activity in nCi/g based on waste stream profile is equal to Am-241 Activity * 2.07

Pu total TRU Activity:	2.06E+02	+/-	1.73E+01 nCi/g
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Meas Am-241 activity	9.94E+01	+/-	8.36E+00 nCi/g
----------------------	----------	-----	----------------

Total TRU Activity in nCi/g = Pu total TRU + Am-241 +
any other detected TRU nuclides such as Np-237

Total TRU Activity (nCi/g):	3.05E+02	+/-	2.57E+01
TRU Activity + 2 sigma:	3.56E+02		

Note: All Uncertainties are measurement uncertainties
reported at 1 sigma

Report Generated On : 11/05/01 1:19:11 PM

Sample Title : 1739 Side A +14

Spectrum Description :

Sample Identification : 0911

Sample Size : 3.6 kg

Sample Taken On : 10/30/01 2:48:00 PM

Acquisition Started : 10/30/01 2:49:33 PM

Live Time: 1800.0 seconds Real Time: 1802.9 seconds

ISOCS Calabration : 1739 PIPE

Energy Calibration Used Done On : 2/27/01

Efficiency Calibration Used Done On : 10/30/01

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	198.29	49.66	2.20E+002	52.00	2.30E+003
2	239.31	59.91	2.13E+004	585.70	2.16E+003
3	340.23	85.13	9.49E+002	67.89	2.42E+003
4	350.53	87.71	2.43E+002	57.21	2.43E+003
5	396.07	99.09	1.26E+002	47.22	2.43E+003
6	1408.90	352.22	1.26E+002	15.91	1.52E+002
7	1654.10	413.50	3.17E+001	11.19	1.05E+002
8	2045.03	511.19	1.15E+002	14.58	8.31E+001
9	2334.32	583.49	8.90E+001	12.54	6.85E+001
10	2438.89	609.63	2.23E+002	17.42	6.05E+001
11	2649.13	662.17	1.29E+002	13.74	4.30E+001
12	3647.44	911.67	5.45E+001	10.44	3.72E+001
13	4485.44	1121.10	6.70E+001	10.15	1.96E+001
14	5849.73	1462.06	5.31E+002	23.67	8.42E+000
15	7067.16	1766.32	6.68E+001	9.40	3.24E+000

N U C L I D E I D E N T I F I C A T I O N R E P O R T

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CS-137	0.989	661.65*	85.12	7.99131E-003	8.86977E-004
AM-241	0.993	59.54*	35.70	9.94192E+001	8.36013E+000
		125.28	0.00		
		335.40	0.00		
		662.42* @	0.00	1.88950E+003	2.09659E+002
		722.70	0.00		

I N T E R F E R E N C E C O R R E C T E D R E P O R T

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CS-137	0.989	7.570833E-003	8.874192E-004
AM-241 @	0.993	9.941917E+001	8.360130E+000

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/kg)	Nuclide MDA (uCi/kg)	Activity (uCi/kg)
	CO-60	1173.22	100.00	3.2648E-003	2.91E-003	9.2186E-004
		1332.49	100.00	2.9051E-003		1.0755E-003
	CS-134	475.35	1.46	2.3384E-001	4.13E-003	-9.8916E-002
		563.23	8.38	3.9418E-002		-1.1549E-002
		569.32	15.43	2.1991E-002		-7.3502E-003
		604.70	97.60	5.0398E-003		-6.2280E-004
		795.84	85.40	4.1278E-003		1.8163E-003
		801.93	8.73	3.8551E-002		2.1909E-002
		1038.57	1.00	2.9806E-001		-2.6762E-002
		1167.94	1.80	1.8268E-001		5.7244E-002
		1365.15	3.04	9.4863E-002		3.9498E-002
+	CS-137	661.65*	85.12	2.0568E-003	2.06E-003	7.9913E-003
	NP-237	300.17	6.20	6.7957E-002	1.09E-002	6.1825E-002
		312.00	36.00	1.0894E-002		6.1177E-003
		340.60	4.20	9.1000E-002		9.0085E-003
		375.45	0.68	5.3178E-001		-2.5676E-001
		415.76	1.75	2.1609E-001		1.7087E-001
	Pu-239	129.28	0.01	2.0484E+002	2.05E+002	-1.4430E+002
		375.00	0.00	2.2878E+002		1.0787E+000
		413.70	0.00	2.4983E+002		2.7314E+002
		451.50	0.00	1.8827E+003		-6.5087E+000
+	AM-241	59.54*	35.70	1.0236E+000	1.02E+000	9.9419E+001
		125.28	0.00	3.4327E+002		7.0162E+001
		335.40	0.00	7.9986E+002		2.8291E+002
		662.42*	0.00	4.8633E+002		1.8895E+003
		722.70	0.00	2.6296E+003		5.5321E+002
	PU-241	114.00	0.02	7.5730E+001	7.57E+001	2.4107E+001
		332.60	0.00	1.3551E+002		4.0113E+001
	CM-243	209.70	3.27	1.4090E-001	2.84E-002	-5.8277E-003
		228.18	10.56	4.0811E-002		-2.8583E-002
		277.60	14.00	2.8407E-002		8.3875E-004

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

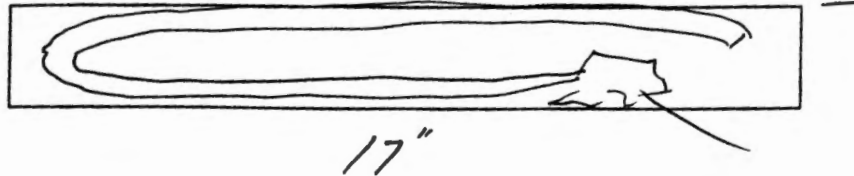
@ = Half-life too short to be able to perform the decay correction

N U C L I D E T O T A L S

Nuclide	Mass (g)
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Bldg 233-S
NDA Item Description Sheet
Pipe Geometry

10/27/01



Put Dimensions on Pipe

Item ID: 2025

Weight (kg): 6 LBS - 2.72 kg

Material Description: L-18 P.P.R. 1"

Packaging: 3 Layers Poly

Detector Distance (in): 24

Detector Filters: None

Dose Rate: 2.5

Comments: SIDE A 00002 0896
SIDE B 00003 0897

#Date & Time: Fri Nov 09 09:24:39 2001

~g=PIPE

~description=2025_PIPE

~comment=1"_PIPE_BENT_WITH_FLANGE

~Ccollimator=50MM-180D

~crpn=4

~Detector=7219

~Convergence in %=1 ~MDRPN=4

~Lunit=IN ~Tunit=C ~Dunit=G/CU.C ~Punit=MM.HG

~at=20 ~ap=760 ~rh=50

~Energies kev= 50.000, 100.000, 128.000, 130.000, 150.000, 200.000,#
300.000, 500.000, 700.000, 1000.000, 1400.000, 2000.000,#
4000.000,

~Error in %= 10.000, 10.000, 10.000, 10.000, 10.000, 8.000,#
8.000, 6.000, 6.000, 4.000, 4.000, 4.000,#
4.000,

~d1.1=0.1 ~d1.2=1 ~d1.3=8.5 ~d1.4=8.5 ~1mater=304SS

~d2.1=0.02 ~d2.2=8.5 ~d2.3=8.5 ~2mater=DRYDIRT ~2den=1.6

~sd1=24

233-S Item Analysis

Spreadsheet Version 2.0

Item ID: 2025
Assay Date: 10/29/2001

Measurement Data

Cnt #: 897

Isotope	Activity (uCi/kg)	Meas Uncert
Pu-239	8.98E+01	1.39E+01
Am-241	1.58E+02	1.99E+01
Np-237		

Pu-239(g): 3.94E-03 0.000608

TRU/LLW Analysis

Calculation of Total Pu TRU Activity in nCi/g based on waste stream
profile is equal to Pu-239 Activity * 1.61

Pu total TRU Activity: 1.45E+02 +/- 2.23E+01 nCi/g

Calculation of Am-241 activity in nCi/g based on waste stream
profile is equal to Pu total Activity * 0.484

Calculated Am-241: 7.00E+01 +/- 1.08E+01 nCi/g

Total TRU Activity in nCi/g = Pu total TRU + Am-241 +
any other detected TRU nuclides such as Np-237

Total TRU Activity (nCi/g): 2.14E+02 +/- 3.31E+01
TRU Activity + 2 sigma: 2.81E+02

Pu gram Value

Pu (g): 0.004 +/- 0.001 Based on waste stream isotopics
Pu(g)+3 sigma 0.006

Note: All Uncertainties are measurement uncertainties
reported at 1 sigma

Report Generated On : 11/09/01 9:26:18 AM

Sample Title : 2025 Side B

Spectrum Description :

Sample Identification : 0896

Sample Size : 2.7 kg

Sample Taken On : 10/29/01 10:32:00 AM

Acquisition Started : 10/29/01 10:33:20 AM

Live Time: 1800.0 seconds Real Time: 1808.2 seconds

ISOCS Calabration : 2025 PIPE

Energy Calibration Used Done On : 2/27/01

Efficiency Calibration Used Done On : 11/09/01

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	239.35	59.92	1.68E+005	5212.01	3.64E+003
2	300.87	75.30	2.25E+003	88.97	3.10E+003
3	340.17	85.12	8.56E+002	69.28	3.20E+003
4	379.53	94.96	1.54E+002	56.15	3.19E+003
5	395.95	99.06	3.72E+002	57.55	3.15E+003
6	457.24	114.38	1.54E+002	51.31	3.13E+003
7	517.71	129.49	2.91E+002	54.14	2.72E+003
8	1408.80	352.19	1.43E+002	16.60	1.50E+002
9	1501.39	375.33	5.20E+001	12.81	1.33E+002
10	1655.38	413.82	4.21E+001	11.91	1.12E+002
11	2043.50	510.81	1.09E+002	14.70	7.87E+001
12	2334.74	583.60	7.70E+001	11.70	5.78E+001
13	2439.15	609.69	1.52E+002	14.82	5.84E+001
14	2648.51	662.02	5.44E+001	10.62	5.21E+001
15	7067.97	1766.52	5.19E+001	8.48	2.02E+000

N U C L I D E I D E N T I F I C A T I O N R E P O R T

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CS-137	0.995	661.65*	85.12	2.35672E-003	4.68427E-004
Pu-239	0.970	129.28*	0.01	1.03605E+002	2.59459E+001
		375.00*	0.00	8.89497E+001	2.30201E+001
		413.70*	0.00	7.94136E+001	2.33706E+001
		451.50 @	0.00		
AM-241	0.993	59.54*	35.70	1.58433E+002	1.98760E+001
		125.28	0.00		
		335.40	0.00		
		662.42* @	0.00	5.57233E+002	1.10747E+002
PU-241	0.818	722.70	0.00		
		114.00*	0.02	1.67235E+001	5.64908E+000
		332.60	0.00		

I N T E R F E R E N C E C O R R E C T E D R E P O R T

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CS-137	0.995	1.686657E-003	4.758673E-004
Pu-239 @	0.970	8.977802E+001	1.386298E+001
AM-241 @	0.993	1.584327E+002	1.987595E+001
PU-241	0.818	1.672348E+001	5.649085E+000

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

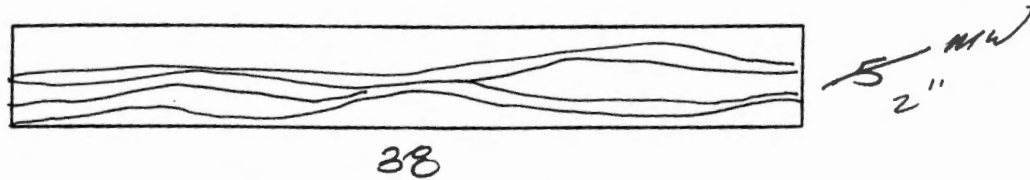
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

N U C L I D E T O T A L S

Nuclide	Mass (g)
Pu-239	3.94E-003 +/- 6.08E-004

Bldg 233-S
NDA Item Description Sheet
Pipe Geometry



Put Dimensions on Pipe

Item ID: 2026

Weight (kg): 565 ^{2.27 Km}

Material Description: 2 1/2" ^{MW} P.I.P.E L-18 1"

Packaging: 3 layers

Detector Distance (in): 38

Detector Filters: None

Dose Rate: C.S

Comments: A 900 STEEL 0878

B 1800 STEEL 0899

#Date & Time: Mon Oct 29 11:08:32 2001

~g=PIPE

~description=2026_PIPE

~comment=2_1" PIPES

~Ccollimator=50MM-180D

~crpn=4

~Detector=7219

~Convergence in %=1

~MDRPN=4

~Lunit=IN ~Tunit=C ~Dunit=G/CU.C ~Punit=MM.HG

~at=20 ~ap=760 ~rh=50

~Energies kev=	50.000,	100.000,	128.000,	130.000,	150.000,	200.000,#
	300.000,	500.000,	700.000,	1000.000,	1400.000,	2000.000,#
	4000.000,					

~Error in %=	10.000,	10.000,	10.000,	10.000,	10.000,	8.000,#
	8.000,	6.000,	6.000,	4.000,	4.000,	4.000,#
	4.000,					

~d1.1=0.133

~d1.2=2

~d1.3=19

~d1.4=19

~1mater=304SS

~1den=7.81

~d2.1=0.133

~d2.2=19

~d2.3=19

~2mater=DRYDIRT

~2den=1.6

~2con=1

~sd1=38

233-S Item Analysis

Spreadsheet Version 2.0

Item ID: 2026
Assay Date: 10/29/01

Measurement Data

Cnt #: 899

Isotope	Activity (uCi/kg)	Meas Uncert
Pu-239	1.93E+02	4.98E+01
Am-241	9.00E+02	7.59E+01
Np-237	0.00E+00	0.00E+00
U-235	8.67E-03	3.06E-03
Pu-239(g):	7.08E-03	1.82E-03

TRU/LLW Analysis

Calculation of Total Pu TRU Activity in nCi/g based on waste stream profile is equal to Pu-239 Activity * 1.61

Pu total TRU Activity: 3.11E+02 +/- 8.02E+01 nCi/g

Calculation of Am-241 activity in nCi/g based on waste stream profile is equal to Pu total Activity * 0.484

Calculated Am-241: 1.50E+02 +/- 3.88E+01 nCi/g

Total TRU Activity in nCi/g = Pu total TRU + Am-241 + any other detected TRU nuclides such as Np-237

Total TRU Activity (nCi/g): 4.61E+02 +/- 1.19E+02
TRU Activity + 2 sigma: 6.99E+02

Pu gram Value

Pu (g): 0.008 +/- 0.002 Based on waste stream isotopics
Pu(g)+3 sigma 0.014

Note: All Uncertainties are measurement uncertainties reported at 1 sigma

CANBERRA ISOCS ANALYSIS

Report Generated On : 11/05/01 1:20:16 PM

Sample Title : 2026 Side B

Spectrum Description :

Sample Identification : 0899

Sample Size : 2.3 kg

Sample Taken On : 10/29/01 11:27:00 AM

Acquisition Started : 10/29/01 11:27:38 AM

Live Time: 1800.0 seconds Real Time: 1805.1 seconds

ISOCS Calibration : 2026 PIPE

Energy Calibration Used Done On : 2/27/01

Efficiency Calibration Used Done On : 10/29/01

PEAK ANALYSIS REPORT

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	207.54	51.97	3.66E+002	98.56	3.34E+003
2	239.36	59.92	9.24E+004	2620.95	2.42E+003
3	340.47	85.19	9.67E+002	71.33	2.21E+003
4	350.59	87.72	2.13E+002	54.40	2.22E+003
5	394.52	98.70	2.92E+002	47.45	2.21E+003
6	413.57	103.46	1.56E+002	46.00	2.19E+003
7	517.96	129.55	1.14E+002	41.89	1.90E+003
8	744.05	186.06	6.25E+001	21.88	5.64E+002
9	955.97	239.02	1.24E+002	19.10	2.77E+002
10	1409.77	352.43	9.70E+001	14.78	1.34E+002
11	1502.07	375.50	3.70E+001	11.72	1.09E+002
12	2045.81	511.39	1.66E+002	16.07	6.55E+001
13	2439.31	609.73	1.37E+002	14.17	5.38E+001
14	2648.17	661.93	7.54E+001	11.69	4.68E+001
15	3646.48	911.43	7.32E+001	10.90	2.77E+001
16	7068.57	1766.67	4.17E+001	7.48	5.55E-001

N U C L I D E I D E N T I F I C A T I O N R E P O R T

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CS-137	0.997	661.65*	85.12	1.15927E-002	1.83425E-003
U-235	0.654	143.76	10.50		
		185.71*	54.00	8.41144E-003	2.97314E-003
		205.31	4.70		
Pu-239	0.726	129.28*	0.01	1.63501E+002	6.61513E+001
		375.00*	0.00	2.32380E+002	7.56809E+001
		413.70	0.00		
		451.50 @	0.00		
AM-241	0.993	59.54*	35.70	9.00133E+002	7.59435E+001
		125.28	0.00		
		335.40	0.00		
		662.42* @	0.00	2.74102E+003	4.33636E+002
		722.70	0.00		

I N T E R F E R E N C E C O R R E C T E D R E P O R T

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CS-137	0.997	7.785724E-003	1.861900E-003
U-235	0.654	8.411440E-003	2.973136E-003
Pu-239 @	0.726	1.933335E+002	4.980658E+001
AM-241 @	0.993	9.001333E+002	7.594353E+001

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

 ***** N U C L I D E M D A R E P O R T *****

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/kg)	Nuclide MDA (uCi/kg)	Activity (uCi/kg)
	CO-60	1173.22	100.00	8.0090E-003	7.37E-003	8.6190E-003
		1332.49	100.00	7.3656E-003		-2.2302E-004
	CS-134	475.35	1.46	5.6673E-001	9.35E-003	4.9586E-001
		563.23	8.38	9.9933E-002		-9.1696E-003
		569.32	15.43	5.3892E-002		6.5655E-003
		604.70	97.60	1.0776E-002		1.4763E-004
		795.84	85.40	9.3514E-003		-1.0653E-003
		801.93	8.73	9.8362E-002		4.3513E-002
		1038.57	1.00	8.1658E-001		8.8100E-002
		1167.94	1.80	4.6149E-001		3.3773E-001
		1365.15	3.04	2.2795E-001		2.3308E-002
+	CS-137	661.65*	85.12	5.3094E-003	5.31E-003	1.1593E-002
	NP-237	300.17	6.20	1.6116E-001	2.53E-002	8.5633E-002
		312.00	36.00	2.5259E-002		-3.1868E-002
		340.60	4.20	2.2759E-001		2.4826E-001
		375.45	0.68	1.3139E+000		1.0223E+000
		415.76	1.75	4.9004E-001		-5.3740E-002
+	Pu-239	129.28*	0.01	2.9563E+002	2.96E+002	1.6350E+002
		375.00*	0.00	3.2143E+002		2.3238E+002
		413.70	0.00	5.6676E+002		-2.0599E+001
		451.50	0.00	4.6947E+003		-3.1782E+003
+	AM-241	59.54*	35.70	2.2559E+000	2.26E+000	9.0013E+002
		125.28	0.00	8.3018E+002		-5.6170E+001
		335.40	0.00	1.9161E+003		2.7828E+002
		662.42*	0.00	1.2554E+003		2.7410E+003
		722.70	0.00	5.9456E+003		2.8378E+003
	PU-241	114.00	0.02	1.8088E+002	1.81E+002	1.9517E+002
		332.60	0.00	3.2303E+002		-1.7870E+002
	CM-243	209.70	3.27	3.3083E-001	6.72E-002	-4.7124E-001
		228.18	10.56	9.7386E-002		-1.3577E-002
		277.60	14.00	6.7202E-002		-5.9169E-003

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

N U C L I D E T O T A L S

Nuclide	Mass (g)
U-235	8.67E-003 +/- 3.06E-003
Pu-239	7.08E-003 +/- 1.82E-003