This document was too large to scan as a whole document, therefore it required breaking into smaller sections.

Document number: SD-WM-DP-053

Section 5 **of** 6

Title: DST Evaporator Project 242A for Tank 241AP107 [Pgs 895 Thru 1125]

Date: 01/28/1994 **Revision:** A000

Originator: Miller GL
Co: WHC

Recipient:
Co:

References: EDT-140729

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WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

Batch 2242

ANALYTICAL BATCH

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. V 33, 34	Customer ID: BLK, 107APCOM
Analysis: GEA	Sample Prep: ACID DIGEST

Instrument: WB57237, WB57265	Procedure/ Rev: LA-548-121/D-0
Technologist: TANIA BATES	Date: 11-18-93
Starting Time: 0800	Temperature 23°C
Ending Time: 1015	Chemist: S. CATLOW

Comments:

	Description	Lab ID		Description	Lab ID
1	LMCS	V 32-8530	11		
2	BLK	V 33-8630	12		
3	SAMPLE	V 34-8830	13		
4	SAMPLE DUP.	V 34-8830	14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS	Colex 22B51			

895

Tania Bates 11-18-93

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-548-121

DATE START: 18 NOV 1993

PREPARED BY: P. P. Bachelor

DATE COMPLETE: 19 NOV 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD	V32-8530	CO-60	1.06E+02				104		1.4
		CS-134	6.96E+01				89.7		1.7
		CS-137	1.37E+02				104		0.9
BLANK	V33-8630	CO-60	<1.30E-05					1.30E-05	
		CS-134	<1.16E-05					1.16E-05	
		CS-137	<1.31E-05					1.31E-05	
		CEPR-144	<8.15E-05					8.15E-05	
		EU-154	<3.58E-05					3.58E-05	
		EU-155	<2.44E-05					2.44E-05	
		NB-94	<9.63E-06					9.63E-06	
		RA-226	<1.74E-04					1.74E-04	
		RURH-106	<1.78E-04					1.78E-04	
107APCOM	V34-8730	CO-60	<6.15E-05	<6.90E-05					
	V34-8830	CS-134	<5.25E-05	<5.65E-05					
		CS-137	<8.35E-05	<7.25E-05					
		CEPR-144	<4.19E-04	<3.79E-04					
		EU-154	<1.88E-04	<1.24E-04					
		EU-155	<1.29E-04	<1.24E-04					
		NB-94	<4.90E-05	<4.44E-05					
		RA-226	<8.75E-04	<8.90E-04					
		RURH-106	<9.50E-04	<9.15E-04					

NARRATIVE: NO SPECIAL PROBLEMS

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

GAMMA ENERGY ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

4887

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-8530	107-AP	8- 3-93	10:44	25

Determination	Method Standard	Result Units	Charge Code	Reruns
GEA	LA-548-121	% RECOVERY	N1L17	1

Sample Size	Customer ID
? . 100 ml	STD

Remarks, Calculations, Results:

COLX STD#32851 ^{60}Co: $\frac{1.06\ E+02}{1.0204\ E+02} * 100 = 104\%$

RS01 STD VAL

RESULT % REC ^{134}Cs: $\frac{6.96\ E+01}{7.7591\ E+01} * 100 = 89.7\%$

RS05 STD VAL

RESULT % REC ^{137}Cs: $\frac{1.37\ E+02}{1.3136\ E+02} * 100 = 104\%$

NOTED RUSH

Janice Bates

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
		Raymond		
Hrs	Hrs	Hrs	Hrs	Hrs
		11-18-93		
Date	Time Completed	Lab Unit Mgr		
11-18-93	1015	R Bachelor		

54-6800-067 (R-10-83)

BEST AVAILABLE COPY

4888 ~~3887~~ R

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8630	107-AP	8- 3-93	10:53	25

Determination	Method-Standard	Result Units	Charge Code	Reruns
GEA	LA-548-121	uCi/ML	N1L17	1

Sample Size	Customer ID
? 1 ml	BLK

Remarks, Calculations, Results

COUNT AS uCi/L
LASER PRINTOUT

Li .001

REDO

RUSH

^{60}Co: < 1.30 E-05 µCi/mL
^{134}Cs: < 1.16 E-05 "
^{137}Cs: < 1.31 E-05 "
$^{144}Ce/^{144}Pr$: < 8.15 E-05 "
^{154}Eu: < 3.58 E-05 µCi/mL
^{155}Eu: < 2.44 E-05 "
^{94}Nb: < 9.63 E-06 " 11/24/93
^{226}Ra: < 1.74 E-04 "
$^{106}Ru/^{106}Rh$: < 1.78 E-04 "

Donna Bates

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Raymond			
Hrs	Hrs	Hrs	Hrs	Hrs
	11-18-93			
Date	Time Completed	Lab Unit Mgr		
11-18-93	1015	R Bachelor		

54-6600-061 (R-10-83)

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GAMMA ENERGY ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

4891

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8730	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
GEA	LA-548-121	uCi/ML	N1L17	1

Sample Size	Customer ID
? / ml Acid Dig: 5	107APCOM

Remarks, Calculations, Results

COUNT AS uCI/L
LASER PRINTOUT

^{60}Co: <6.15 E-05 µCi/mL
^{134}Cs: <5.25 E-05 µCi/mL
^{137}Cs: <8.35 E-05 "
$^{144}Ce/^{144}Pr$: ~~<1.88 E-04~~ <4.19 E-04 "
^{154}Eu: <1.88 E-04 µCi/mL
^{155}Eu: <1.29 E-04 "
^{94}Nb: <4.90 E-05 "
^{226}Ra: <8.35 E-04
$^{106}Ru/^{106}Rh$: <9.50 E-04 "

Li .001

RERUN

RUSH

12/8/93

Dana Bates

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Raymond			
Hrs	Hrs 11.18.93	Hrs	Hrs	Hrs
Date 11-18-93	Time Completed 1015	Lab Unit Mgr Bachelor		

54-6800-061 (R-10) 831

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GAMMA ENERGY ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

4880

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8830	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
GEA	LA-548-121	uCi/ML	N1L17	1

Sample Size	Customer ID
? 1 ml Acid Dig DF = 5	107APCOM

Remarks, Calculations, Results

COUNT AS uCI/L
LASER PRINTOUT

^{60}Co: < 6.90 E-05 µCi/mL ^{154}Eu: < 1.24 E-04 µCi/mL
^{134}Cs: < 5.65 E-05 " ^{155}Eu: < 1.24 E-04 "
^{137}Cs: < 7.25 E-05 " ^{94}Nb: < 4.44 E-05 "
^{144}Ce ^{144}Pr: < 3.79 E-04 " ^{226}Ra: < 8.90 E-04 12/8/93
^{106}Ru ^{106}Rh: < 9.15 E-04 "

RERUN
RUSH

James Bates

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
		Raymond		
Hrs	Hrs	Hrs	Hrs	Hrs
		11.18.93		
Date	Time Completed	Lab Unit Mgr		
11-18-93	1015	Bachelor		

54-6800-061 (R-10-93)

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* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                   *
*          G A M M A   S P E C T R U M   A N A L Y S I S            *
*                                                                   *
*   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

18-NOV-9315:18:53

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 1 / ADC UNIT NUMBER: 1.0
DETECTOR NUMBER: 4 / GEOMETRY NUMBER: 41
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 85.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER ANO:
AN' 'ZED BY: JLA

SAMPLE DESCRIPTION: V32-8530
GEOMETRY DESCRIPTION: 22CC LIQ
SAMPLE SIZE: 1.0000E-03 LI / CONVERSION FACTOR: 1.0000E-01
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL000

COLLECT STARTED ON 18-NOV-93 AT 10:52:00

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3021. SECONDS
DEAD TIME: 0.70 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 30-MAR-93
EFFICIENCY CALIBRATION PERFORMED 1-APR-93

SIGNATURE ABOVE REPRESENTS CHEMICAL TECHNOLOGIST/CHEMIST THAT COMPLETED/VERIFIED THE CALIBRATION/ANALYSIS ON PAGES 901 **TO** 917.

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1	98.69	49.32	1.00	1656.	1347.	9.7	U-234
2C	1126.41	563.21	1.50	2145.	2483.	6.3	CS-134, EU-152
3C	1138.53	569.27	1.50	2198.	4589.	5.1	CS-134, BI-207
4	1209.36	604.69	1.56	2244.	27826.	1.3	CS-134
5	1323.25	661.65	1.59	1690.	47001.	0.9	CS-137
5B		661.44			159.	5.8	
6C	1591.65	795.87	1.68	1328.	20340.	1.7	CS-134
7C	1603.79	801.95	1.68	1310.	1892.	4.2	CS-134
8C	2336.11	1168.21	1.89	727.	385.	17.1	CS-134
9C	2346.36	1173.34	1.89	683.	25346.	1.4	CO-60
10	2664.84	1332.64	1.99	206.	22955.	1.3	CO-60
11	2730.36	1365.42	1.85	91.	501.	10.6	CS-134
12	2800.99	1400.75	1.88	80.	234.	17.6	BI-214
13	2921.47	1461.02	2.00	59.	835.	7.4	K-40
13B		1460.67			769.	1.7	
14	3528.17	1764.52	1.67	28.	73.	32.9	BI-214C
14B		1764.58			64.	7.3	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 85.0%

C - MULTIPLET ANALYSIS CONVERGED NORMALLY
B - ENVIRONMENTAL BACKGROUND PEAK

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0014
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 22-JUL-92 AT 14:00:00
BACKGROUND LIVE TIME: 60000. SECONDS

18-NOV-9315:18:53

SAMPLE: V32-8530
DA COLLECTED ON 18-NOV-93 AT 10:52:00
DEC..ED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/LI MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AC-228	LLD<1.55E+00		LLD<1.55E+00		911.07	
AC-228A	LLD<1.55E+00		LLD<1.55E+00		911.10	
AC-228B	LLD<2.17E+00		LLD<2.17E+00		338.40	
AG-108M	LLD<3.63E-01		LLD<3.63E-01		433.94	
AG-110M	LLD<1.85E+00		LLD<1.85E+00		657.76	
AM-241	LLD<1.59E+00		LLD<1.59E+00		59.54	
AM-243	LLD<4.24E-01		LLD<4.24E-01		74.67	
AM-243A	LLD<4.24E-01		LLD<4.24E-01		74.67	
AM-243B	LLD<1.36E+00		LLD<1.36E+00		43.10	
AR-41	LLD<2.51E-01		LLD<2.51E-01		1293.64	
AU-198	LLD<3.24E-01		LLD<3.24E-01		411.80	
BA-133	LLD<4.78E-01		LLD<4.78E-01		356.02	
BA-139	LLD<8.93E-01		LLD<8.93E-01		165.85	
BA-140	LLD<1.35E+00		LLD<1.35E+00		537.27	
BA-141	LLD<9.15E-01		LLD<9.15E-01		190.23	
BE-7	LLD<3.41E+00		LLD<3.41E+00		477.59	
BI 7	LLD<3.48E-01		LLD<3.48E-01		569.70	
BI 2	LLD<2.61E+00		LLD<2.61E+00		727.27	
BI-214	LLD<2.19E+00		LLD<2.19E+00		609.32	
BI-214A	LLD<2.19E+00		LLD<2.19E+00		609.32	
BI-214B	LLD<3.01E+00		LLD<3.01E+00		1120.28	
BI-214C	LLD<9.51E-01		LLD<9.51E-01		1764.51	
CD-109	LLD<5.27E+00		LLD<5.27E+00		88.03	
CE 144	LLD<1.15E+00		LLD<1.15E+00		133.51	
CE-139	LLD<2.02E-01		LLD<2.02E-01		165.85	
CE-141	LLD<2.74E-01		LLD<2.74E-01		145.44	
CEPR144	LLD<2.30E+00		LLD<2.30E+00		133.51	
CO-56	LLD<3.87E-01		LLD<3.87E-01		846.76	
CO-57	LLD<1.51E-01		LLD<1.51E-01		122.06	
CO-58	LLD<3.54E-01		LLD<3.54E-01		810.75	
CO-60	1.06E+02	+-1.47E+00	1.06E+02	+-1.47E+00	1332.50	0.14
					1173.24	0.10
CR-51	LLD<2.67E+00		LLD<2.67E+00		320.09	
CS-134	6.96E+01	+-1.22E+00	6.96E+01	+-1.22E+00	795.84	0.03
					604.70	-0.01
CS-136	LLD<3.75E-01		LLD<3.75E-01		818.51	
CS-137	1.37E+02	+-1.45E+00	1.37E+02	+-1.45E+00	661.65	-0.00
CS-138	LLD<3.04E-01		LLD<3.04E-01		1435.86	
EU-152	LLD<7.48E-01		LLD<7.48E-01		1408.01	
EU-154	LLD<6.41E-01		LLD<6.41E-01		1274.45	
EU-154A	LLD<3.18E-01		LLD<3.18E-01		123.10	
EU 5	LLD<7.18E-01		LLD<7.18E-01		105.31	
FE	LLD<8.75E-01		LLD<8.75E-01		1099.25	
HF-181	LLD<4.03E-01		LLD<4.03E-01		482.20	
HG-203	LLD<2.86E-01		LLD<2.86E-01		279.20	
I-131	LLD<3.69E-01		LLD<3.69E-01		364.48	
I-132	LLD<3.81E-01		LLD<3.81E-01		667.69	

I-133	LLD<3.57E-01		LLD<3.57E-01		529.69	
I-134	LLD<5.48E-01		LLD<5.48E-01		847.03	
I-135	LLD<8.31E-01		LLD<8.31E-01		1260.41	
K-40	3.04E+00	+-2.92E+00	3.04E+00	+-2.92E+00	1460.75	0.27
KR-85	LLD<7.44E+01		LLD<7.44E+01		513.99	
KR-85M	LLD<2.12E-01		LLD<2.12E-01		151.17	
KR-87	LLD<8.12E-01		LLD<8.12E-01		402.58	
KR-89	LLD<1.18E+01		LLD<1.18E+01		220.90	
LA-140	LLD<1.61E-01		LLD<1.61E-01		1596.20	
LA-142	LLD<7.88E-01		LLD<7.88E-01		641.83	
MN-54	LLD<3.72E-01		LLD<3.72E-01		834.83	
MN-56	LLD<4.37E-01		LLD<4.37E-01		846.76	
NA-22	LLD<2.17E-01		LLD<2.17E-01		1274.55	
NA-24	LLD<3.01E-01		LLD<3.01E-01		1368.60	
NB-94	LLD<3.27E-01		LLD<3.27E-01		702.63	
NB-95	LLD<3.51E-01		LLD<3.51E-01		765.78	
NB-97	LLD<2.25E+00		LLD<2.25E+00		657.92	
NP-237	LLD<1.57E+00		LLD<1.57E+00		86.50	
NP-237A	LLD<8.41E+01		LLD<8.41E+01		195.00	
NP-237B	LLD<8.71E+01		LLD<8.71E+01		213.00	
NP-238	LLD<1.67E+00		LLD<1.67E+00		984.45	
NP-239	LLD<1.64E+00		LLD<1.64E+00		277.60	
PA-233	LLD<7.48E-01		LLD<7.48E-01		311.98	
PA-234M	LLD<7.68E+01		LLD<7.68E+01		1001.03	
PB-210	LLD<3.05E+01		LLD<3.05E+01		46.50	
PB-212	LLD<5.20E-01		LLD<5.20E-01		239.00	
PB-212A	LLD<5.18E-01		LLD<5.18E-01		239.00	
PB-212B	LLD<8.01E+00		LLD<8.01E+00		300.10	
PB-214	LLD<7.97E-01		LLD<7.97E-01		351.92	
PB-214A	LLD<7.97E-01		LLD<7.97E-01		351.92	
PB-214B	LLD<1.26E+00		LLD<1.26E+00		295.21	
PO-210	LLD<3.42E+04		LLD<3.42E+04		804.00	
PO-214	LLD<1.49E+04		LLD<1.49E+04		799.70	
PO-216	LLD<2.64E+04		LLD<2.64E+04		804.90	
PU-239	LLD<2.23E+03		LLD<2.23E+03		129.30	
PU-241	LLD<7.22E+04		LLD<7.22E+04		148.57	
RA-224	LLD<5.64E+00		LLD<5.64E+00		240.99	
RA-226	LLD<5.42E+00		LLD<5.42E+00		186.10	
RB-88	LLD<1.50E+00		LLD<1.50E+00		1836.00	
RB-89	LLD<2.07E+00		LLD<2.07E+00		1031.88	
RN-220	LLD<3.08E+02		LLD<3.08E+02		549.73	
RU-103	LLD<3.39E-01		LLD<3.39E-01		497.08	
RURH106	LLD<6.49E+00		LLD<6.49E+00		621.80	
SB-124	LLD<6.81E-01		LLD<6.81E-01		602.72	
SB-125	LLD<1.13E+00		LLD<1.13E+00		427.89	
SB-125A	LLD<1.13E+00		LLD<1.13E+00		427.89	
SC-46	LLD<4.45E-01		LLD<4.45E-01		1120.45	
SE-75	LLD<3.86E-01		LLD<3.86E-01		264.66	
SN-113	LLD<4.99E-01		LLD<4.99E-01		391.67	
SR-85	LLD<3.27E-01		LLD<3.27E-01		513.99	
SR-91	LLD<5.65E-01		LLD<5.65E-01		555.60	
SR-92	LLD<1.52E-01		LLD<1.52E-01		1383.94	
TA-182	LLD<1.40E+00		LLD<1.40E+00		1121.30	
TC-99M	LLD<1.53E-01		LLD<1.53E-01		140.51	
TE-123M	LLD<1.69E-01		LLD<1.69E-01		159.00	
TE-125M	LLD<5.41E+01		LLD<5.41E+01		109.27	
TE-132	LLD<2.46E-01		LLD<2.46E-01		228.16	
TH-228	LLD<1.62E+01		LLD<1.62E+01		84.37	
TH-229	LLD<6.59E+00		LLD<6.59E+00		86.44	
TH-229B	LLD<8.04E+00		LLD<8.04E+00		137.02	

TH-229C	LLD<4.24E+00	LLD<4.24E+00	193.59
TH-234	LLD<3.10E+00	LLD<3.10E+00	92.50
TH-234A	LLD<3.10E+00	LLD<3.10E+00	92.50
T[illegible]4B	LLD<1.18E+01	LLD<1.18E+01	63.30
T[illegible]8	LLD<3.96E-01	LLD<3.96E-01	583.14
U-232	LLD<6.08E+02	LLD<6.08E+02	270.26
U-235	LLD<3.48E-01	LLD<3.48E-01	185.71
U-235A	LLD<3.48E-01	LLD<3.48E-01	185.71
U-235B	LLD<1.40E+00	LLD<1.40E+00	143.76
U-237	LLD<8.90E-01	LLD<8.90E-01	208.00
W-187	LLD<1.11E+00	LLD<1.11E+00	685.74
XE-131M	LLD<7.55E+00	LLD<7.55E+00	163.98
XE-133	LLD<5.97E-01	LLD<5.97E-01	81.00
XE-133M	LLD<2.19E+00	LLD<2.19E+00	233.21
XE-135	LLD<2.57E-01	LLD<2.57E-01	249.79
XE-138	LLD<1.95E+00	LLD<1.95E+00	258.41
Y-88	LLD<1.50E-01	LLD<1.50E-01	1836.06
Y-91	LLD<1.06E+02	LLD<1.06E+02	1204.90
Y-91M	LLD<4.28E-01	LLD<4.28E-01	555.60
ZN-65	LLD<9.65E-01	LLD<9.65E-01	1115.55
ZR-95	LLD<6.27E-01	LLD<6.27E-01	756.73
ZR-97	LLD<3.36E-01	LLD<3.36E-01	743.33
TOTAL	3.15E+02 +-3.78E+00	3.15E+02 +-3.78E+00	

STANDARD DEVIATION = 0.11

EBAR = ***** MEV/DISINTEGRATION
MAXIMUM PERMISSABLE ACTIVITY = 1.42E-09 UC/LI
TO[illegible] MEASURED ACTIVITY = 3.15E+02 (+-3.78E+00) UC/LI
% [illegible]H. SPEC. = ****** (+-****)

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 85.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
98.69	49.32	1347.	9.7	3.84E+01
1126.41	563.21	2483.	6.3	1.99E+01
1138.53	569.27	4589.	5.1	3.71E+01
1603.79	801.95	1892.	4.2	2.06E+01
2336.11	1168.21	385.	17.1	5.89E+00
2730.36	1365.42	501.	10.6	8.73E+00
2800.99	1400.75	234.	17.6	4.17E+00

PEAKS ELIMINATED BY BACKGROUND SUBTRACTION

CE[illegible]TROID C[illegible]EL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
3528.17	1764.52	73.	32.9	1.52E+00

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* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                   *
*          G A M M A   S P E C T R U M   A N A L Y S I S            *
*                                                                   *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE **WHC-SD-WM-DP-053 REV 0**

18-NOV-9312:41:19

Rubbles
11-18-93

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 1 / ADC UNIT NUMBER: 1.0
DETECTOR NUMBER: 4 / GEOMETRY NUMBER: 41
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 85.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER ANO:
ANALYZED BY: VR

SAMPLE DESCRIPTION: V33-8630
GEOMETRY DESCRIPTION: 22CC LIQ
SAMPLE SIZE: 1.0000E-03 LI / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL205

COLLECT STARTED ON 18-NOV-93 AT 11:51:09

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 30-MAR-93
EFFICIENCY CALIBRATION PERFORMED 1-APR-93

18-NOV-9312:41:19

P E A K A N A L Y S I S **WHC-SD-WM-DP-053 REV 0**

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1C	1022.12	511.05	2.88	383.	397.	20.9	RN-222,I-133,
1B		510.83			317.	3.8	TL-208,NA-22, ZN-65,RH-106
2	1218.94	609.48	1.39	174.	103.	42.2	BI-214A,
2B		609.18			177.	5.7	RU-103
3	1323.10	661.57	1.26	113.	173.	23.4	CS-137
3B		661.44			159.	5.8	
4	2921.49	1461.03	2.25	24.	785.	7.3	K-40
4B		1460.67			769.	1.7	
5	3528.35	1764.61	1.73	19.	72.	30.5	BI-214C
5B		1764.58			64.	7.3	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 85.0%

C - MULTIPLET ANALYSIS CONVERGED NORMALLY
B - ENVIRONMENTAL BACKGROUND PEAK

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0014
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 22-JUL-92 AT 14:00:00
BACKGROUND LIVE TIME: 60000. SECONDS

18-NOV-9312:41:19

SAMPLE: V33-8630
DATA COLLECTED ON 18-NOV-93 AT 11:51:09
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/LI MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<5.38E-02		LLD<5.38E-02		59.54	
AM-243	LLD<1.62E-02		LLD<1.62E-02		74.67	
BA-133	LLD<1.49E-02		LLD<1.49E-02		356.02	
BA-140	LLD<3.54E-02		LLD<3.54E-02		537.27	
BI-212	LLD<9.55E-02		LLD<9.55E-02		727.20	
CEPR144	LLD<8.15E-02		LLD<8.15E-02		133.51	
CO-60	LLD<1.30E-02		LLD<1.30E-02		1332.50	
CR-51	LLD<8.17E-02		LLD<8.17E-02		320.09	
CS-134	LLD<1.16E-02		LLD<1.16E-02		795.84	
CS-137	LLD<1.31E-02		LLD<1.31E-02		661.65	
EU-152	LLD<4.86E-02		LLD<4.86E-02		1408.01	
EU-154	LLD<3.58E-02		LLD<3.58E-02		1274.45	
EU-154H	LLD<3.35E-02		LLD<3.35E-02		1274.80	
EU-155	LLD<2.44E-02		LLD<2.44E-02		105.31	
FE-59	LLD<2.01E-02		LLD<2.01E-02		1099.25	
I-131	LLD<9.32E-03		LLD<9.32E-03		364.48	
K-40	LLD<2.98E-01		LLD<2.98E-01		1460.75	
LA-140	LLD<1.38E-02		LLD<1.38E-02		1596.20	
MN-54	LLD<1.03E-02		LLD<1.03E-02		834.83	
NA-22	LLD<1.16E-02		LLD<1.16E-02		1274.55	
NB-94	LLD<9.63E-03		LLD<9.63E-03		702.63	
NB-95	LLD<9.85E-03		LLD<9.85E-03		765.78	
NP-237	LLD<5.76E-02		LLD<5.76E-02		86.50	
PB-212	LLD<1.78E-02		LLD<1.78E-02		239.00	
PU-239	LLD<7.62E+01		LLD<7.62E+01		129.30	
PU-241	LLD<2.58E+03		LLD<2.58E+03		148.57	
RA-224	LLD<1.87E-01		LLD<1.87E-01		240.99	
RA-226	LLD<1.74E-01		LLD<1.74E-01		186.10	
RU-103	LLD<8.45E-03		LLD<8.45E-03		497.08	
RU103	LLD<8.89E-03		LLD<8.89E-03		497.08	
RURH106	LLD<1.78E-01		LLD<1.78E-01		621.80	
SB-125	LLD<2.82E-02		LLD<2.82E-02		427.89	
SB-125A	LLD<2.82E-02		LLD<2.82E-02		427.89	
SE-75	LLD<1.20E-02		LLD<1.20E-02		264.66	
SN-113	LLD<1.13E-02		LLD<1.13E-02		391.67	
SR-85	LLD<1.34E-02		LLD<1.34E-02		513.99	
TH-228	LLD<6.05E-01		LLD<6.05E-01		84.37	
TL-208	LLD<1.26E-02		LLD<1.26E-02		583.20	
U-235	LLD<1.09E-02		LLD<1.09E-02		185.71	
Y-88	LLD<7.05E-03		LLD<7.05E-03		1836.06	
ZN-65	LLD<2.78E-02		LLD<2.78E-02		1115.55	
ZR-95	LLD<1.86E-02		LLD<1.86E-02		756.73	
TOTAL	0.00E-01	+-0.00E-01	0.00E-01	+-0.00E-01		

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 85.0%

ALL DETECTED PEAKS WERE USED IN THE ANALYSIS

PEAKS ELIMINATED BY BACKGROUND SUBTRACTION

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
1022.12	511.05	397.	20.9	2.93E+00
1218.94	609.48	103.	42.2	8.83E-01
1323.10	661.57	173.	23.4	1.58E+00
2921.49	1461.03	785.	7.3	1.44E+01
3528.35	1764.61	72.	30.5	1.51E+00

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*                                                                   *
*          G A M M A   S P E C T R U M   A N A L Y S I S            *
*                                                                   *
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CANBERRA SPECTRAN-F V2.00 SOFTWARE

WHC-SD-WM-DP-053 REV 0

18-NOV-9314:51:52

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 1 / ADC UNIT NUMBER: 1.0
DETECTOR NUMBER: 4 / GEOMETRY NUMBER: 41
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 85.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER ANO:
ANALYZED BY: VR

SAMPLE DESCRIPTION: V34-8730 107
GEOMETRY DESCRIPTION: 22CC LIQ
SAMPLE SIZE: 1.0000E-03 LI / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL205

COLLECT STARTED ON 18-NOV-93 AT 14:01:38

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 30-MAR-93
EFFICIENCY CALIBRATION PERFORMED 1-APR-93

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1	1022.32	511.16	2.57	209.	324.	16.8	RN-222,I-133,
1B		510.83			317.	3.8	TL-208,NA-22,
							ZN-65,RH-106
2	1166.23	583.12	1.06	149.	130.	31.9	EU-154,
2B		583.05			117.	7.9	TL-208
3	1218.52	609.27	1.52	159.	171.	26.3	BI-214A,
3B		609.18			177.	5.7	RU-103
4	1323.49	661.77	1.76	129.	216.	20.4	CS-137
4B		661.44			159.	5.8	
5	1822.47	911.31	1.79	89.	104.	33.6	AC-228A
5B		910.95			101.	7.7	
6	2921.44	1461.00	1.78	24.	867.	6.9	K-40
6B		1460.67			769.	1.7	
7	3528.88	1764.98	2.49	25.	71.	32.6	BI-214C
7B		1764.58			64.	7.3	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 85.0%

B - ENVIRONMENTAL BACKGROUND PEAK

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0014
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 22-JUL-92 AT 14:00:00
BACKGROUND LIVE TIME: 60000. SECONDS

18-NOV-9314:51:52

WHC-SD-WM-DP-053 REV 0

SAMPLE: V34-8730 107
DATA COLLECTED ON 18-NOV-93 AT 14:01:38
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/LI MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<5.24E-02		LLD<5.24E-02		59.54	
AM-243	LLD<1.59E-02		LLD<1.59E-02		74.67	
BA-133	LLD<1.43E-02		LLD<1.43E-02		356.02	
BA-140	LLD<3.37E-02		LLD<3.37E-02		537.27	
BI-212	LLD<9.00E-02		LLD<9.00E-02		727.20	
CEPR144	LLD<8.37E-02		LLD<8.37E-02		133.51	
CO-60	LLD<1.23E-02		LLD<1.23E-02		1332.50	
CR-51	LLD<7.55E-02		LLD<7.55E-02		320.09	
CS-134	LLD<1.05E-02		LLD<1.05E-02		795.84	
~~CS-137~~	~~1.67E-02~~	~~+-1.31E-02~~	~~1.67E-02~~	~~+-1.31E-02~~	~~661.65~~	~~0.12~~ BKG SBB 11/19/93
EU-152	LLD<4.51E-02		LLD<4.51E-02		1408.01	
EU-154	LLD<3.75E-02		LLD<3.75E-02		1274.45	
EU-154H	LLD<3.83E-02		LLD<3.83E-02		1274.80	
EU-155	LLD<2.57E-02		LLD<2.57E-02		105.31	
FE-59	LLD<2.39E-02		LLD<2.39E-02		1099.25	
I-131	LLD<9.93E-03		LLD<9.93E-03		364.48	
~~K-40~~	~~4.53E-01~~	~~+-2.84E-01~~	~~4.53E-01~~	~~+-2.84E-01~~	~~1460.75~~	~~0.25~~ BKG SBB 11/19/93
LA-140	LLD<1.10E-02		LLD<1.10E-02		1596.20	
MN-54	LLD<1.13E-02		LLD<1.13E-02		834.83	
NA-22	LLD<1.22E-02		LLD<1.22E-02		1274.55	
NB-94	LLD<9.80E-03		LLD<9.80E-03		702.63	
NB-95	LLD<1.10E-02		LLD<1.10E-02		765.78	
NP-237	LLD<5.43E-02		LLD<5.43E-02		86.50	
PB-212	LLD<1.78E-02		LLD<1.78E-02		239.00	
PU-239	LLD<7.44E+01		LLD<7.44E+01		129.30	
PU-241	LLD<2.61E+03		LLD<2.61E+03		148.57	
RA-224	LLD<1.92E-01		LLD<1.92E-01		240.99	
RA-226	LLD<1.75E-01		LLD<1.75E-01		186.10	
RU-103	LLD<8.98E-03		LLD<8.98E-03		497.08	
RU103	LLD<9.45E-03		LLD<9.45E-03		497.08	
RURH106	LLD<1.90E-01		LLD<1.90E-01		621.80	
SB-125	LLD<2.52E-02		LLD<2.52E-02		427.89	
SB-125A	LLD<2.52E-02		LLD<2.52E-02		427.89	
SE-75	LLD<1.18E-02		LLD<1.18E-02		264.66	
SN-113	LLD<1.25E-02		LLD<1.25E-02		391.67	
SR-85	LLD<1.33E-02		LLD<1.33E-02		513.99	
TH-228	LLD<5.99E-01		LLD<5.99E-01		84.37	
TL-208	LLD<1.28E-02		LLD<1.28E-02		583.20	
U-235	LLD<1.10E-02		LLD<1.10E-02		185.71	
Y-88	LLD<8.22E-03		LLD<8.22E-03		1836.06	
ZN-65	LLD<3.19E-02		LLD<3.19E-02		1115.55	
ZR-95	LLD<1.84E-02		LLD<1.84E-02		756.73	
TOTAL	4.70E-01	+-2.84E-01	4.70E-01	+-2.84E-01		

STANDARD DEVIATION = 0.09

EBAR = ***** MEV/DISINTEGRATION
MAXIMUM PERMISSABLE ACTIVITY = 3.25E-07 UC/LI
TOTAL MEASURED ACTIVITY = 4.70E-01 (+-2.84E-01) UC/LI
% `H. SPEC. = ****** (+-****)

ERROR QUOTATION AT 1.96 SIGMA
LED CONFIDENCE LEVEL AT 95.0%

ALL DETECTED PEAKS WERE USED IN THE ANALYSIS

PEAKS ELIMINATED BY BACKGROUND SUBTRACTION

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
1022.32	511.16	324.	16.8	2.39E+00
1166.23	583.12	130.	31.9	1.07E+00
1218.52	609.27	171.	26.3	1.46E+00
1822.47	911.31	104.	33.6	1.27E+00
3528.88	1764.88	71.	32.6	1.47E+00

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*                                                                     *
*          G A M M A   S P E C T R U M   A N A L Y S I S              *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

19-NOV-9310:23:49

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 1 / ADC UNIT NUMBER: 1.0
DETECTOR NUMBER: 4 / GEOMETRY NUMBER: 41
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 85.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER AN0:
ANALYZED BY: JLA

SAMPLE DESCRIPTION: V34-8830
GEOMETRY DESCRIPTION: 22CC LIQ
SAMPLE SIZE: 1.0000E-03 LI / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL205

COLLECT STARTED ON 18-NOV-93 AT 13:05:00

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 30-MAR-93
EFFICIENCY CALIBRATION PERFORMED 1-APR-93

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1	1021.75	510.87	2.36	228.	307.	18.3	RN-222,I-133,
1B		510.83			317.	3.8	TL-208,NA-22,
							ZN-65,RH-106
2	1166.39	583.20	1.37	178.	100.	44.0	EU-154,
2B		583.05			117.	7.9	TL-208
3	1218.77	609.39	1.50	130.	185.	23.2	BI-214A,
3B		609.18			177.	5.7	RU-103
4	1323.27	661.65	1.24	153.	177.	25.3	CS-137
4B		661.44			159.	5.8	
5	1821.91	911.03	1.89	80.	100.	33.3	AC-228A
5B		910.95			101.	7.7	
6	2921.58	1461.07	2.25	24.	827.	7.1	K-40
6B		1460.67			769.	1.7	
7	3528.69	1764.79	1.39	18.	71.	30.3	BI-214C
7B		1764.58			64.	7.3	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 85.0%

B - ENVIRONMENTAL BACKGROUND PEAK

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0014
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 22-JUL-92 AT 14:00:00
BACKGROUND LIVE TIME: 60000. SECONDS

19-NOV-9310:23:49

SAMPLE: V34-8830
DATA COLLECTED ON 18-NOV-93 AT 13:05:00
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/LI MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<4.92E-02		LLD<4.92E-02		59.54	
AM-243	LLD<1.63E-02		LLD<1.63E-02		74.67	
BA-133	LLD<1.43E-02		LLD<1.43E-02		356.02	
BA-140	LLD<3.51E-02		LLD<3.51E-02		537.27	
BI-212	LLD<9.13E-02		LLD<9.13E-02		727.20	
CEPR144	LLD<7.57E-02		LLD<7.57E-02		133.51	
CO-60	LLD<1.38E-02		LLD<1.38E-02		1332.50	
CR-51	LLD<7.74E-02		LLD<7.74E-02		320.09	
CS-134	LLD<1.13E-02		LLD<1.13E-02		795.84	
CS-137	LLD<1.45E-02		LLD<1.45E-02		661.65	
EU-152	LLD<6.48E-02		LLD<6.48E-02		1408.01	
EU-154	LLD<2.48E-02		LLD<2.48E-02		1274.45	
EU-154H	LLD<2.78E-02		LLD<2.78E-02		1274.80	
EU-155	LLD<2.48E-02		LLD<2.48E-02		105.31	
FE-59	LLD<2.19E-02		LLD<2.19E-02		1099.25	
I-131	LLD<9.84E-03		LLD<9.84E-03		364.48	
K-40	LLD<3.01E-01		LLD<3.01E-01		1460.75	
LA-140	LLD<1.10E-02		LLD<1.10E-02		1596.20	
MN-54	LLD<1.04E-02		LLD<1.04E-02		834.83	
NA-22	LLD<8.90E-03		LLD<8.90E-03		1274.55	
NB-94	LLD<8.87E-03		LLD<8.87E-03		702.63	
NB-95	LLD<1.12E-02		LLD<1.12E-02		765.78	
NP-237	LLD<5.69E-02		LLD<5.69E-02		86.50	
PB-212	LLD<1.75E-02		LLD<1.75E-02		239.00	
PU-239	LLD<7.39E+01		LLD<7.39E+01		129.30	
PU-241	LLD<2.43E+03		LLD<2.43E+03		148.57	
RA-224	LLD<1.88E-01		LLD<1.88E-01		240.99	
RA-226	LLD<1.78E-01		LLD<1.78E-01		186.10	
RU-103	LLD<9.07E-03		LLD<9.07E-03		497.08	
RU103	LLD<9.54E-03		LLD<9.54E-03		497.08	
RURH106	LLD<1.83E-01		LLD<1.83E-01		621.80	
SB-125	LLD<2.73E-02		LLD<2.73E-02		427.89	
SB-125A	LLD<2.73E-02		LLD<2.73E-02		427.89	
SE-75	LLD<1.27E-02		LLD<1.27E-02		264.66	
SN-113	LLD<1.21E-02		LLD<1.21E-02		391.67	
SR-85	LLD<1.34E-02		LLD<1.34E-02		513.99	
TH-228	LLD<5.83E-01		LLD<5.83E-01		84.37	
TL-208	LLD<1.30E-02		LLD<1.30E-02		583.20	
U-235	LLD<1.09E-02		LLD<1.09E-02		185.71	
Y-88	LLD<7.66E-03		LLD<7.66E-03		1836.06	
ZN-65	LLD<2.78E-02		LLD<2.78E-02		1115.55	
ZR-95	LLD<2.00E-02		LLD<2.00E-02		756.73	
TOTAL	0.00E-01	+-0.00E-01	0.00E-01	+-0.00E-01		

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 85.0%

'A JETECTED PEAKS WERE USED IN THE ANALYSIS

PEAKS ELIMINATED BY BACKGROUND SUBTRACTION

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
1021.75	510.87	307.	18.3	2.27E+00
1166.39	583.20	100.	44.0	8.20E-01
1218.77	609.39	185.	23.2	1.58E+00
1323.27	661.65	177.	25.3	1.62E+00
1821.91	911.03	100.	33.3	1.23E+00
2921.58	1461.07	827.	7.1	1.52E+01
3528.69	1764.79	71.	30.3	1.47E+00

WESTINGHOUSE HANFORD COMPANY

Batch 1552

WHC-SD-WM-DP-053 REV 0

222-S LABORATORY

ANALYTICAL BATCH

Lab Segment Serial No. V34	Customer ID: 107 Gp Com
Analysis: GEA	Sample Prep: acid digestion

Instrument:	WC38461	Procedure/ Rev:	LA-548-121 (0-0)
Technologist:	SUE LAI (Sue Lai)	Date:	4-8-93 9-1-93
Starting Time:	10:20	Temperature	25°c
Ending Time:	11:20	Chemist:	A. K. Dasgupta

Comments:

	Description	Lab ID		Description	Lab ID
1	STD	V32-8530	11		
2	BLK	V33-8630	12		
3	Sample	V34-8730	13		
4	Duplicate Sample	V34-8830	14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS	32B51 (0.1 ml)			

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-548-121

DATE START: 3 AUG 1993

PREPARED BY: P. P. Bachelor

DATE COMPLETE: ~~10 SEP 1993~~ 17 NOV 1993

11/17/93

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD	V32-8530	CO-60	1.066E+02 uCi/L				101		1.3
		CS-134	7.46E+01 uCi/L 11/17/93						1.6
		CS-137	1.35E+02 uCi/L				102		0.9
BLANK	V33-8630	CO-60	<1.20E-05					1.20E-05	
		CS-134	<1.05E-05					1.05E-05	
		CS-137	2.61E-05					1.80E-05	
		CEPR-144	<7.99E-05					7.99E-05	
		EU-154	<3.83E-05					3.83E-05	
		EU-155	<2.56E-05					2.56E-05	
		NB-94	<1.12E-05					1.12E-05	
		RA-226	<1.76E-04					1.76E-04	
		RURH-106	<1.63E-04					1.63E-04	
107APCOM	V34-8730	CO-60	<5.55E-05	<4.19E-05					
	V34-8830	CS-134	<5.80E-05	<4.50E-05					
		CS-137	1.23E-04	<6.15E-05					
		CEPR-144	<4.04E-04	<3.40E-02					
		EU-154	<1.92E-04	<1.15E-04					
		EU-155	<1.25E-04	<1.04E-04					
		NB-94	<4.96E-05	<4.25E-05					
		RA-226	<9.15E-04	<1.19E-03					
		RURH-106	<9.05E-04	<7.55E-04					

NARRATIVE: [ ] NO SPECIAL PROBLEMS

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

I don't believe ^{137}Cs is present in blank (or sample) due to the high % count error. May be due to contamination.

Bachelor
11/17/93

GAMMA ENERGY ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

4257

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-8530	107-AP	8- 3-93	10:44	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
GEA	LA-548-121	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 0.1 ml	STD

Remarks, Calculations, Results

COLX STD# 32851
R901 STD VAL
RESULT % REC 102.3
R905 STD VAL
RESULT % REC 101.2%

^{60}Co = 1.06E+02 uCi/L
^{134}Cs = 7.46E+01 uCi/L
^{137}Cs = 1.35E+02 uCi/L

Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-1-93	11:20	RA Jones

54-6800-001 (R-10-83)

BEST AVAILABLE COPY

GAMMA ENERGY ANALYSIS - ACID DIGESTION

4258

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8630	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
GEA	LA-548-121	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1 ml	BLK

Remarks, Calculations, Results

COUNT AS uCI/L
LASER PRINTOUT

^{137}Cs = 2.61E-02 uCi/L

2.61E-5 uci/ml

Sue Li

Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-1-93	11:20	

SA-8800-061 (R-10-83)

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GAMMA ENERGY ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

4259

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8730	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
GEA	LA-548-121	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1ml	107APCOM

Remarks, Calculations, Results,

COUNT AS uCI/L
LASER PRINTOUT

^{137}Cs = 2.46E-02 uCi/L

2.46E-5 uCi/mL

Sue Li

	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-1-93	11:20	RA Jones

54-6800(DET) (R-10-83)

BEST AVAILABLE COPY

GAMMA ENERGY ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

4260.

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8830	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
GEA	LA-548-121	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1ml	107APCOM

Remarks, Calculations, Results

COUNT AS uCI/L
LASER PRINTOUT

Cs 137

Duplicate sample

<1.23E-5 uci/ml 8/4/93

Sue Li

	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
9-1-93	11:20		9/8

S4-6800-061 (R-10-83)

BEST AVAILABLE COPY

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* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                   *
*            G A M M A   S P E C T R U M   A N A L Y S I S          *
*                                                                   *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

01-SEP-9315:15:41

Rulli 9-1-93

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 1 / ADC UNIT NUMBER: 1.0
DETECTOR NUMBER: 4 / GEOMETRY NUMBER: 41
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 85.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER AND:
ANALYZED BY:

SAMPLE DESCRIPTION: V32-8530
GEOMETRY DESCRIPTION: 22CC LIQ
SAMPLE SIZE: 1.0000E-03 LI / CONVERSION FACTOR: 1.0000E-01
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL205

COLLECT STARTED ON 1-SEP-93 AT 14:25:11

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3023. SECONDS
DEAD TIME: 0.76 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 30-MAR-93
EFFICIENCY CALIBRATION PERFORMED 1-APR-93

SIGNATURE ABOVE REPRESENTS CHEMICAL TECHNOLOGIST/CHEMIST THAT COMPLETED/VERIFIED THE CALIBRATION/ANALYSIS ON PAGES [illegible] TO [illegible].

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1	98.94	49.45	1.00	1684.	1140.	11.3	U-234
2C	1126.19	563.10	1.39	2087.	2719.	6.0	CS-134, EU-152
3C	1138.40	569.20	1.39	2075.	4694.	5.0	CS-134, BI-207
4	1209.16	604.59	1.47	2027.	29731.	1.2	CS-134
5	1323.02	661.53	1.49	1584.	46434.	0.9	CS-137
5B		661.44			159.	5.8	
6C	1591.38	795.74	1.59	1342.	21799.	1.6	CS-134
7C	1603.61	801.85	1.59	1289.	2068.	4.5	CS-134
8C	2335.61	1167.97	1.85	822.	378.	20.1	CS-134
9C	2345.96	1173.14	1.85	676.	25754.	1.4	CO-60
10	2664.42	1332.43	2.04	179.	22947.	1.3	CO-60
11	2729.67	1365.07	1.92	93.	536.	10.2	CS-134
12	2799.83	1400.17	2.19	82.	252.	17.0	BI-214
13	2921.04	1460.80	2.05	57.	845.	7.3	K-40
13B	·	1460.67			769.	1.7	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 85.0%

C ULTIPLET ANALYSIS CONVERGED NORMALLY
B - ENVIRONMENTAL BACKGROUND PEAK

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0014
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 22-JUL-92 AT 14:00:00
BACKGROUND LIVE TIME: 60000. SECONDS

01-SEP-9315:15:41

SAMPLE: V32-8530
DATA COLLECTED ON 1-SEP-93 AT 14:25:11
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/LI MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<1.59E+00		LLD<1.59E+00		59.54	
AM-243	LLD<4.28E-01		LLD<4.28E-01		74.67	
BA-133	LLD<4.91E-01		LLD<4.91E-01		356.02	
BA-140	LLD<1.40E+00		LLD<1.40E+00		537.27	
BI-212	LLD<2.80E+00		LLD<2.80E+00		727.20	
CEPR144	LLD<2.36E+00		LLD<2.36E+00		133.51	
CO-60	1.06E+02	+-1.46E+00	1.06E+02	+-1.46E+00	1332.50	-0.07
					1173.24	-0.10
CR-51	LLD<2.71E+00		LLD<2.71E+00		320.09	
CS-134	7.46E+01	+-1.25E+00	7.46E+01	+-1.25E+00	795.84	-0.11
					604.70	-0.11
CS-137	1.35E+02	+-1.43E+00	1.35E+02	+-1.43E+00	661.65	-0.12
EU-152	LLD<6.73E-01		LLD<6.73E-01		1408.01	
EU-154	LLD<6.07E-01		LLD<6.07E-01		1274.45	
EU-154H	LLD<6.32E-01		LLD<6.32E-01		1274.80	
EU-155	LLD<7.26E-01		LLD<7.26E-01		105.31	
FE-59	LLD<9.02E-01		LLD<9.02E-01		1099.25	
I-131	LLD<3.78E-01		LLD<3.78E-01		364.48	
~~K-40~~	~~3.54E+00~~	~~+-2.93E+00~~	~~3.54E+00~~	~~+-2.93E+00~~	~~1460.75~~	~~0.05~~
LA-140	LLD<1.76E-01		LLD<1.76E-01		1596.20	
MN-54	LLD<3.68E-01		LLD<3.68E-01		834.83	
NA-22	LLD<2.03E-01		LLD<2.03E-01		1274.55	
NB-94	LLD<3.22E-01		LLD<3.22E-01		702.63	
NB-95	LLD<3.65E-01		LLD<3.65E-01		765.78	
NP-237	LLD<1.56E+00		LLD<1.56E+00		86.50	
PB-212	LLD<5.14E-01		LLD<5.14E-01		239.00	
PU-239	LLD<2.23E+03		LLD<2.23E+03		129.30	
PU-241	LLD<7.19E+04		LLD<7.19E+04		148.57	
RA-224	LLD<5.71E+00		LLD<5.71E+00		240.99	
RA-226	LLD<5.35E+00		LLD<5.35E+00		186.10	
RU-103	LLD<3.42E-01		LLD<3.42E-01		497.08	
RU103	LLD<3.60E-01		LLD<3.60E-01		497.08	
RURH106	LLD<6.47E+00		LLD<6.47E+00		621.80	
SB-125	LLD<1.14E+00		LLD<1.14E+00		427.89	
SB-125A	LLD<1.14E+00		LLD<1.14E+00		427.89	
SE-75	LLD<3.88E-01		LLD<3.88E-01		264.66	
SN-113	LLD<5.06E-01		LLD<5.06E-01		391.67	
SR-85	LLD<3.37E-01		LLD<3.37E-01		513.99	
TH-228	LLD<1.63E+01		LLD<1.63E+01		84.37	
TL-208	LLD<4.15E-01		LLD<4.15E-01		583.20	
U-235	LLD<3.24E-01		LLD<3.24E-01		185.71	
Y-88	LLD<1.21E-01		LLD<1.21E-01		1836.06	
ZN-65	LLD<9.78E-01		LLD<9.78E-01		1115.55	
ZR-95	LLD<6.29E-01		LLD<6.29E-01		756.73	
TOTAL	3.19E+02	+-3.79E+00	3.19E+02	+-3.79E+00		

AB Jones 9-7-93

STANDARD DEVIATION = 0.06

EBAR = ***** MEV/DISINTEGRATION
MA MUM PERMISSABLE ACTIVITY = 1.40E-09 UC/LI
Tu _ MEASURED ACTIVITY = 3.19E+02 (+-3.79E+00) UC/LI
% TECH. SPEC. = ****** (+-****)

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 85.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
98.94	49.45	1140.	11.3	3.22E+01
1126.19	563.10	2719.	6.0	2.18E+01
1138.40	569.20	4694.	5.0	3.79E+01
1603.61	801.85	2068.	4.5	2.25E+01
2335.61	1167.97	378.	20.1	5.78E+00
2729.67	1365.07	536.	10.2	9.35E+00
2799.83	1400.17	252.	17.0	4.48E+00

D.H. Milian
9-1-93

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* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                   *
*          G A M M A   S P E C T R U M   A N A L Y S I S            *
*                                                                   *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

01-SEP-9316:11:06

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 1 / ADC UNIT NUMBER: 1.0
DETECTOR NUMBER: 4 / GEOMETRY NUMBER: 41
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 85.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER ANO:
ANALYZED BY:

SAMPLE DESCRIPTION: V33-8630
GEOMETRY DESCRIPTION: 22CC LIQ
SAMPLE SIZE: 1.0000E-03 LI / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL205

COLLECT STARTED ON 1-SEP-93 AT 15:20:56

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3003. SECONDS
DEAD TIME: 0.10 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 30-MAR-93
EFFICIENCY CALIBRATION PERFORMED 1-APR-93

01-SEP-9316:11:06

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1	703.29	351.63	1.31	278.	148.	36.0	PB-214A
1B		351.84			131.	8.8	
2	1021.95	510.97	2.99	171.	341.	15.3	RN-222,I-133,
2B		510.83			317.	3.8	TL-208,NA-22,
							ZN-65,RH-106
3	1166.31	583.16	1.49	162.	127.	33.5	EU-154,
3B		583.05			117.	7.9	TL-208
4	1218.17	609.10	1.79	118.	191.	21.6	BI-214A,
4B		609.18			177.	5.7	RU-103
5	1322.82	661.43	1.49	114.	248.	17.7	CS-137
5B		661.44			159.	5.8	
6	1822.12	911.14	1.12	65.	97.	31.9	AC-228A
6B		910.95			101.	7.7	
7	2920.68	1460.62	2.20	46.	827.	7.3	K-40
7B		1460.67			769.	1.7	
8	3527.48	1764.18	1.64	19.	79.	28.5	BI-214C
8B		1764.58			64.	7.3	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 85.0%

B NVIRONMENTAL BACKGROUND PEAK

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0014
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 22-JUL-92 AT 14:00:00
BACKGROUND LIVE TIME: 60000. SECONDS

01-SEP-9316:11:06

SAMPLE: V33-8630
DATA COLLECTED ON 1-SEP-93 AT 15:20:56
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/LI MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<5.09E-02		LLD<5.09E-02		59.54	
AM-243	LLD<1.63E-02		LLD<1.63E-02		74.67	
BA-133	LLD<1.45E-02		LLD<1.45E-02		356.02	
BA-140	LLD<3.45E-02		LLD<3.45E-02		537.27	
BI-212	LLD<9.63E-02		LLD<9.63E-02		727.20	
CEPR144	LLD<7.99E-02		LLD<7.99E-02		133.51	
CO-60	LLD<1.20E-02		LLD<1.20E-02		1332.50	
CR-51	LLD<8.22E-02		LLD<8.22E-02		320.09	
CS-134	LLD<1.05E-02		LLD<1.05E-02		795.84	
CS-137	2.61E-02	+-1.31E-02	2.61E-02	+-1.31E-02	661.65	-0.22
EU-152	LLD<5.39E-02		LLD<5.39E-02		1408.01	
EU-154	LLD<3.83E-02		LLD<3.83E-02		1274.45	
EU-154H	LLD<3.83E-02		LLD<3.83E-02		1274.80	
EU-155	LLD<2.56E-02		LLD<2.56E-02		105.31	
FE-59	LLD<2.25E-02		LLD<2.25E-02		1099.25	
I-131	LLD<9.87E-03		LLD<9.87E-03		364.48	
K-40	LLD<3.07E-01		LLD<3.07E-01		1460.75	
LA-140	LLD<1.40E-02		LLD<1.40E-02		1596.20	
MN-54	LLD<1.19E-02		LLD<1.19E-02		834.83	
NA-22	LLD<1.25E-02		LLD<1.25E-02		1274.55	
NB-94	LLD<1.12E-02		LLD<1.12E-02		702.63	
NB-95	LLD<1.21E-02		LLD<1.21E-02		765.78	
NP-237	LLD<5.74E-02		LLD<5.74E-02		86.50	
PB-212	LLD<1.73E-02		LLD<1.73E-02		239.00	
PU-239	LLD<7.93E+01		LLD<7.93E+01		129.30	
PU-241	LLD<2.54E+03		LLD<2.54E+03		148.57	
RA-224	LLD<1.90E-01		LLD<1.90E-01		240.99	
RA-226	LLD<1.76E-01		LLD<1.76E-01		186.10	
RU-103	LLD<9.23E-03		LLD<9.23E-03		497.08	
RU103	LLD<9.72E-03		LLD<9.72E-03		497.08	
RURH106	LLD<1.63E-01		LLD<1.63E-01		621.80	
SB-125	LLD<2.68E-02		LLD<2.68E-02		427.89	
SB-125A	LLD<2.68E-02		LLD<2.68E-02		427.89	
SE-75	LLD<1.23E-02		LLD<1.23E-02		264.66	
SN-113	LLD<1.22E-02		LLD<1.22E-02		391.67	
SR-85	LLD<1.31E-02		LLD<1.31E-02		513.99	
TH-228	LLD<5.93E-01		LLD<5.93E-01		84.37	
TL-208	LLD<1.30E-02		LLD<1.30E-02		583.20	
U-235	LLD<1.06E-02		LLD<1.06E-02		185.71	
Y-88	LLD<5.61E-03		LLD<5.61E-03		1836.06	
ZN-65	LLD<3.04E-02		LLD<3.04E-02		1115.55	
ZR-95	LLD<2.01E-02		LLD<2.01E-02		756.73	
TOTAL	2.61E-02	+-1.31E-02	2.61E-02	+-1.31E-02		

EBAR = ***** MEV/DISINTEGRATION
MAXIMUM PERMISSABLE ACTIVITY = 1.16E-08 UC/LI

TOTAL MEASURED ACTIVITY = 2.61E-02 (+-1.31E-02) UC/LI
% TECH. SPEC. = ****** (+-****)

EI. .X QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 85.0%

ALL DETECTED PEAKS WERE USED IN THE ANALYSIS

PEAKS ELIMINATED BY BACKGROUND SUBTRACTION

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
703.29	351.63	148.	36.0	8.28E-01
1021.95	510.97	341.	15.3	2.52E+00
1166.31	583.16	127.	33.5	1.05E+00
1218.17	609.10	191.	21.6	1.63E+00
1822.12	911.14	97.	31.9	1.19E+00
2920.68	1460.62	827.	7.3	1.52E+01
3527.48	1764.18	79.	28.5	1.65E+00

D. H. Mitchell
9-1-93

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*                                                                   *
*          G A M M A   S P E C T R U M   A N A L Y S I S            *
*                                                                   *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

01-SEP-9317:06:50

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 1 / ADC UNIT NUMBER: 1.0
DETECTOR NUMBER: 4 / GEOMETRY NUMBER: 41
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 85.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER ANO:
ANALYZED BY: DM

SAMPLE DESCRIPTION: V-34-8730
GEOMETRY DESCRIPTION: 22CC LIQ
SAMPLE SIZE: 1.0000E-03 LI / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL205

COLLECT STARTED ON 1-SEP-93 AT 16:16:40

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 30-MAR-93
EFFICIENCY CALIBRATION PERFORMED 1-APR-93

01-SEP-9317:06:50

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1	703.44	351.70	1.13	277.	130.	40.3	PB-214A
1B		351.84			131.	8.8	
2	1022.00	511.00	2.15	203.	323.	16.7	RN-222,I-133,
2B		510.83			317.	3.8	TL-208,NA-22,
							ZN-65,RH-106
3	1165.92	582.97	1.65	134.	128.	31.7	EU-154,
3B		583.05			117.	7.9	TL-208
4	1218.20	609.11	1.38	124.	198.	21.2	BI-214A,
4B		609.18			177.	5.7	RU-103
5	1322.92	661.48	1.63	114.	243.	18.0	CS-137
5B		661.44			159.	5.8	
6	1821.80	910.98	1.83	86.	119.	30.1	AC-228A
6B		910.95			101.	7.7	
7	2920.83	1460.69	1.89	25.	863.	6.9	K-40
7B		1460.67			769.	1.7	
8	3527.62	1764.25	1.86	19.	73.	30.2	BI-214C
8B		1764.58			64.	7.3	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 85.0%

B ENVIRONMENTAL BACKGROUND PEAK

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0014
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 22-JUL-92 AT 14:00:00
BACKGROUND LIVE TIME: 60000. SECONDS

SAMPLE: V-34-8730
DATA COLLECTED ON 1-SEP-93 AT 16:16:40
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/LI MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<5.36E-02		LLD<5.36E-02		59.54	
AM-243	LLD<1.56E-02		LLD<1.56E-02		74.67	
BA-133	LLD<1.49E-02		LLD<1.49E-02		356.02	
BA-140	LLD<3.41E-02		LLD<3.41E-02		537.27	
BI-212	LLD<8.73E-02		LLD<8.73E-02		727.20	
CEPR144	LLD<8.07E-02		LLD<8.07E-02		133.51	
CO-60	LLD<1.11E-02		LLD<1.11E-02		1332.50	
CR-51	LLD<7.70E-02		LLD<7.70E-02		320.09	
CS-134	LLD<1.16E-02		LLD<1.16E-02		795.84	
CS-137	2.46E-02	+-1.31E-02	2.46E-02	+-1.31E-02	661.65	-0.17
EU-152	LLD<5.96E-02		LLD<5.96E-02		1408.01	
EU-154	LLD<3.83E-02		LLD<3.83E-02		.1274.45	
EU-154H	LLD<3.83E-02		LLD<3.83E-02		1274.80	
EU-155	LLD<2.50E-02		LLD<2.50E-02		105.31	
FE-59	LLD<2.09E-02		LLD<2.09E-02		1099.25	
I-131	LLD<9.80E-03		LLD<9.80E-03		364.48	
~~K-40~~	~~4.34E-01~~	~~+-2.84E-01~~	~~4.34E-01~~	~~+-2.84E-01~~	~~1460.75~~	~~-0.06~~
LA-140	LLD<1.30E-02		LLD<1.30E-02		1596.20	
MN-54	LLD<1.07E-02		LLD<1.07E-02		834.83	
NA-22	LLD<1.25E-02		LLD<1.25E-02		1274.55	
NB-94	LLD<9.91E-03		LLD<9.91E-03		702.63	
NB-95	LLD<1.08E-02		LLD<1.08E-02		765.78	
NP-237	LLD<5.61E-02		LLD<5.61E-02		86.50	
PB-212	LLD<1.78E-02		LLD<1.78E-02		239.00	
PU-239	LLD<7.99E+01		LLD<7.99E+01		129.30	
PU-241	LLD<2.41E+03		LLD<2.41E+03		148.57	
RA-224	LLD<1.90E-01		LLD<1.90E-01		240.99	
RA-226	LLD<1.83E-01		LLD<1.83E-01		186.10	
RU-103	LLD<8.92E-03		LLD<8.92E-03		497.08	
RU103	LLD<9.39E-03		LLD<9.39E-03		497.08	
RURH106	LLD<1.81E-01		LLD<1.81E-01		621.80	
SB-125	LLD<2.77E-02		LLD<2.77E-02		427.89	
SB-125A	LLD<2.77E-02		LLD<2.77E-02		427.89	
SE-75	LLD<1.20E-02		LLD<1.20E-02		264.66	
SN-113	LLD<1.32E-02		LLD<1.32E-02		391.67	
SR-85	LLD<1.38E-02		LLD<1.38E-02		513.99	
TH-228	LLD<5.97E-01		LLD<5.97E-01		84.37	
TL-208	LLD<1.22E-02		LLD<1.22E-02		583.20	
U-235	LLD<1.10E-02		LLD<1.10E-02		185.71	
Y-88	LLD<1.21E-02		LLD<1.21E-02		1836.06	
ZN-65	LLD<3.37E-02		LLD<3.37E-02		1115.55	
ZR-95	LLD<1.91E-02		LLD<1.91E-02		756.73	
TOTAL	4.59E-01	+-2.84E-01	4.59E-01	+-2.84E-01		

RBJ 7-7-93

STANDARD DEVIATION = 0.08

EBAR = ***** MEV/DISINTEGRATION
MAXIMUM PERMISSABLE ACTIVITY = 2.15E-07 UC/LI
TOTAL MEASURED ACTIVITY = 4.59E-01 (+-2.84E-01) UC/LI
% ^H. SPEC. = ****** (+-****)

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 85.0%

ALL DETECTED PEAKS WERE USED IN THE ANALYSIS

PEAKS ELIMINATED BY BACKGROUND SUBTRACTION

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
703.44	351.70	130.	40.3	7.28E-01
1022.00	511.00	323.	16.7	2.39E+00
1165.92	582.97	128.	31.7	1.06E+00
1218.20	609.11	198.	21.2	1.69E+00
1821.80	910.98	119.	30.1	1.45E+00
3527.62	1764.25	73.	30.2	1.52E+00

D. H. Williams
9-1-93

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*                                                                   *
*          G A M M A   S P E C T R U M   A N A L Y S I S            *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

01-SEP-9318:03:27 **WHC-SD-WM-DP-053 REV 0**

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 1 / ADC UNIT NUMBER: 1.0
DETECTOR NUMBER: 4 / GEOMETRY NUMBER: 41
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 85.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER ANO:
ANALYZED BY: DM

SAMPLE DESCRIPTION: V-34-8830
GEOMETRY DESCRIPTION: 22CC LIQ
SAMPLE SIZE: 1.0000E-03 LI / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL205

COLLECT STARTED ON 1-SEP-93 AT 17:13:17

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 30-MAR-93
EFFICIENCY CALIBRATION PERFORMED 1-APR-93

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1C	73.60	36.78	0.87	84.	98.	62.9	TE-125M
2C	81.55	40.75	0.87	217.	65.	81.8	I-129,BI-212, CE-144
3	382.02	190.99	1.40	627.	312.	24.3	BA-141,FE-59
4	703.53	351.75	1.58	146.	77.	48.9	PB-214A
4B		351.84			131.	8.8	
5	1021.13	510.56	2.23	124.	176.	23.3	RN-222,I-133,
5B		510.83			317.	3.8	TL-208,NA-22, ZN-65,RH-106
6	1218.35	609.18	1.11	96.	102.	34.4	BI-214A,
6B		609.18			177.	5.7	RU-103
7	1322.95	661.49	1.54	80.	136.	25.6	CS-137
7B		661.44			159.	5.8	
8	2920.89	1460.73	2.29	25.	485.	9.5	K-40
8B		1460.67			769.	1.7	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 85.0%

C - MULTIPLET ANALYSIS CONVERGED NORMALLY
B ENVIRONMENTAL BACKGROUND PEAK

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0014
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 22-JUL-92 AT 14:00:00
BACKGROUND LIVE TIME: 60000. SECONDS

01-SEP-9318:03:27

SAMPLE: V-34-8830
DATA COLLECTED ON 1-SEP-93 AT 17:13:17
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/LI MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<5.46E-02		LLD<5.46E-02		59.54	
AM-243	LLD<1.54E-02		LLD<1.54E-02		74.67	
BA-133	LLD<1.14E-02		LLD<1.14E-02		356.02	
BA-140	LLD<2.83E-02		LLD<2.83E-02		537.27	
BI-212	LLD<7.18E-02		LLD<7.18E-02		727.20	
CEPR144	LLD<6.79E-02		LLD<6.79E-02		133.51	
CO-60	LLD<8.37E-03		LLD<8.37E-03		1332.50	
CR-51	LLD<6.75E-02		LLD<6.75E-02		320.09	
CS-134	LLD<9.00E-03		LLD<9.00E-03		795.84	
CS-137	LLD<1.23E-02		LLD<1.23E-02		661.65	
EU-152	LLD<4.39E-02		LLD<4.39E-02		1408.01	
EU-154	LLD<2.89E-02		LLD<2.89E-02		1274.45	
EU-154H	LLD<3.05E-02		LLD<3.05E-02		1274.80	
EU-155	LLD<2.08E-02		LLD<2.08E-02		105.31	
FE-59	LLD<1.42E-02		LLD<1.42E-02		1099.25	
I-131	LLD<7.99E-03		LLD<7.99E-03		364.48	
K-40	LLD<2.97E-01		LLD<2.97E-01		1460.75	
LA-140	LLD<1.10E-02		LLD<1.10E-02		1596.20	
MN-54	LLD<7.87E-03		LLD<7.87E-03		834.83	
NA-22	LLD<9.48E-03		LLD<9.48E-03		1274.55	
NB-94	LLD<8.49E-03		LLD<8.49E-03		702.63	
NB-95	LLD<7.92E-03		LLD<7.92E-03		765.78	
NP-237	LLD<4.80E-02		LLD<4.80E-02		86.50	
PB-212	LLD<1.45E-02		LLD<1.45E-02		239.00	
PU-239	LLD<6.28E+01		LLD<6.28E+01		129.30	
PU-241	LLD<2.36E+03		LLD<2.36E+03		148.57	
RA-224	LLD<1.57E-01		LLD<1.57E-01		240.99	
RA-226	LLD<2.38E-01		LLD<2.38E-01		186.10	
RU-103	LLD<6.44E-03		LLD<6.44E-03		497.08	
RU103	LLD<6.78E-03		LLD<6.78E-03		497.08	
RURH106	LLD<1.51E-01		LLD<1.51E-01		621.80	
SB-125	LLD<2.18E-02		LLD<2.18E-02		427.89	
SB-125A	LLD<2.18E-02		LLD<2.18E-02		427.89	
SE-75	LLD<9.64E-03		LLD<9.64E-03		264.66	
SN-113	LLD<9.95E-03		LLD<9.95E-03		391.67	
SR-85	LLD<1.04E-02		LLD<1.04E-02		513.99	
TH-228	LLD<5.63E-01		LLD<5.63E-01		84.37	
TL-208	LLD<9.98E-03		LLD<9.98E-03		583.20	
U-235	LLD<1.40E-02		LLD<1.40E-02		185.71	
Y-88	LLD<7.66E-03		LLD<7.66E-03		1836.06	
ZN-65	LLD<2.52E-02		LLD<2.52E-02		1115.55	
ZR-95	LLD<1.24E-02		LLD<1.24E-02		756.73	
TOTAL	0.00E-01	+-0.00E-01	0.00E-01	+-0.00E-01		

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 85.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
73.60	36.78	98.	62.9	1.33E+01
81.55	40.75	65.	81.8	4.85E+00
382.02	190.99	312.	24.3	1.11E+00

PEAKS ELIMINATED BY BACKGROUND SUBTRACTION

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
703.53	351.75	77.	48.9	4.30E-01
1021.13	510.56	176.	23.3	1.30E+00
1218.35	609.18	102.	34.4	8.70E-01
1322.95	661.49	136.	25.6	1.25E+00
2920.89	1460.73	485.	9.5	8.90E+00

CH
15

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH

Batch 1547

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. V-34	Customer ID: 107 AP Lcm
Analysis: H3	Sample Prep: Direct

Instrument: WB3751-5 WC-16085	Procedure/ Rev: LA-218-114 / A-2
Technologist: RG Achen	Date: 8/17/93
Starting Time: 09:00	Temperature 130 °C
Ending Time: 11:00	Chemist: Ken Kawabata

Comments:

	Description	Lab ID		Description	Lab ID
1	STD	V-32-5587	11		
2	BLK	V-33-5687	12		
3	Sample	V-34-5787	13		
4	Sample Dup	V-34-5887	14		
5	Sample Spike	V-34-5987	15		
6	Sample Spike Dup	V-34-5087	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS	83BS1 / 3 ml			
99HS 25.73 Sample Spike	83BS1 / 1.5 ml			
		940		

A-6000-881 (03/92)

CA

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-218-114

DATE START: Aug 17, 1993

PREPARED BY: K Kawabata

DATE COMPLETE: Aug 19, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD 83B51	V-32	H-3	6.08E-1				104		1.05
BLANK	V-33	H-3	<4.45E-6						6.22
107APCOM	V-34	H-3	3.35E-2	3.37E-2	3.36E-2	0.6	2989	4.45E-6	0.15
							3438		0.15
									0.17
									0.16

NARRATIVE: [ ] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH
LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

High spike recovery values are due to the sample values are greater than 125% of the standard value.

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

(USER 1)

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-5587	107-AP	8- 3-93	10:44	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	% RECOVERY	N1L17	0

Sample Size	Customer ID
? / ml	STD

Remarks, Calculations, Results

EDP R907 ENVSTD
STD#63B51 RESULT .608
STD VAL. .584 %REC 104.11%

$\left(\frac{0.6083}{0.584}\right)(100\%)$ 104%

$\frac{1350.47}{2220} = .6083$

	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 8.18.93	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8/17/93	11:00	

54-6800-061 (R-10-83)

H3: LA-218-111(E-0), 113(B-0), 114(A-2) TRITIUM LIQUIDS

Serial No.			STANDARD
	Disintegrations per Minute from Counter	(dpm)	1350.47
V32-5587	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1547	Digest Dilution Factor	(DDF)	1
Rerun No:	Background Count Rate in Counts per Minute	(BKG cpm)	54.16
0	Background Count Time in Minutes	(BKG Time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.4932
	Detection Limit	(Ld)	9.89
Date:	Critical Level	(Lc)	2.42
08/17/93	Tritium Concentration in µCi/L =		6.0832E-01

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]
Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF
H3 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]
H3 µCi/mL = µCi/L / 1000mL/L

Tritium Concentration in µCi/L =	6.08E-01

Tritium Concentration in µCi/mL =	6.08E-04

942

Data Entry by:		Date:	19-Aug-93
Approved by:		Date:	19 AUG 93

Form M1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-5687	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	uCi/ML	N1L17	0

Sample Size	Customer ID
? /ml	BLK

Remarks, Calculations, Results

REAGENT BLANK

COUNT AS uCI/L

L4.45E-6

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	C.J. Opinn	Raymond		
Hrs	Hrs	Hrs 8.18.93	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8/12/93	11:00		Gary Hammitt

54-6800-061 (R-10-83)

WHC-SD-WM-DP-053 REV 0

H3: LA-218-111(E-0), 113(B-0), 114(A-2) TRITIUM LIQUIDS

			BLANK
Serial No.	Disintegrations per Minute from Counter	(dpm)	-67.48
V33-5687	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1547	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	54.16
0	Background Count Time in Minutes	(BKG Time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.4941
	Detection Limit	(Ld)	9.87
Date:	Critical Level	(Lc)	2.42
08/17/93	Tritium Concentration in µCi/L =		4.4460E-03

Critical Level (Lc) = 2.33 (Square Root of (BKG cpm / BKG Time))

Detection Limit (Ld) = ((2.72 / BKG Time) + (2) (Lc)) / EFF

H3 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / ((SS) (2220000dpm/µCi))

H3 µCi/mL = µCi/L / 1000mL/L

NOTE: Reported result is a LESS THAN value calculated from the statistical Detection Limit (Ld).

Tritium Concentration in µCi/L =	< 4.45E-03

Tritium Concentration in µCi/mL =	< 4.45E-06

Data Entry by:	R akeb	Date:	19-Aug-93
Approved by:		Date:	19 AUG 93

Form M1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5787	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	uCi/ML	N1L17	0

Sample Size	Customer ID
? / ml	107APCOM

Remarks, Calculations, Results

COUNT AS uCI/L

3.35E-2

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
		8.18.93		

Date	Time Completed	Lab Unit Mgr
8/17/93	11:00	

54-6800-061 (R-10-83)

WHC-SD-WM-DP-053 REV 0

H3: LA-218-111(E-0), 113(B-0), 114(A-2) TRITIUM LIQUIDS			SAMPLE
Serial No.	Disintegrations per Minute from Counter	(dpm)	74470.34
V34-5784	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1547	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	54.16
0	Background Count Time in Minutes	(BKG Time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.4951
	Detection Limit	(Ld)	9.85
Date:	Critical Level	(Lc)	2.42
08/17/93	Tritium Concentration in µCi/L =		3.3545E+01

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]

Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF

H3 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

H3 µCi/mL = µCi/L / 1000mL/L

Tritium Concentration in µCi/L =	3.35E+01

Tritium Concentration in µCi/mL =	3.35E-02

Data Entry by:	R Abuto	Date:	19-Aug-93
Approved by:		Date:	19 Aug 93

Form M1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5887	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	uCi/ML	N1L17	0

Sample Size	Customer ID
? / ml	107APCOM

Remarks, Calculations, Results

DUPLICATE SAMPLE

COUNT AS uCI/L

3.37E-2

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 8.18.93	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8/17/93	11:02	Gary Hammond

54-6800-061 (R-10-83)

WHC-SD-WM-DP-053 REV 0

H3: LA-218-111(E-0), 113(B-0), 114(A-2) TRITIUM LIQUIDS

			DUPLICATE
Serial No.	Disintegrations per Minute from Counter	(dpm)	74709.2
V34-5887	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1547	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	54.16
0	Background Count Time in Minutes	(BKG Time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.4956
	Detection Limit	(Ld)	9.84
Date:	Critical Level	(Lc)	2.42
08/17/93	Tritium Concentration in µCi/L =		3.3653E+01

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]

Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF

H3 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

H3 µCi/mL = µCi/L / 1000mL/L

Tritium Concentration in µCi/L =	3.37E+01

Tritium Concentration in µCi/mL =	3.37E-02

Data Entry by:		Date:	19-Aug-93
Approved by:		Date:	19 AUG 93

Form M1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5987	107-AP	8- 3-93	10:56	25

Determination	Method-Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	% RECOVERY	N1L17	0

Sample Size	Customer ID
? / ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKED ID

SPIKE ID - 83B51

SPIKE VOLUME - 1.5 ml
COUNT AS uCI/L

3438.32

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 8-18-93	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8/12/93	11:00	

WHC-SD-WM-DP-053 REV 0

54-6800-061 (R-10-83)

H3: LA-218-113(B-0), LA-218-114(A-2) TRITIUM SPIKE

			SPIKE
Serial No.	dpm of Sample from Counter	(dpm1)	74709.2
V34-5987	dpm of Sample + Spike from Counter	(dpm2)	59643.21
Batch ID	Volume of Sample in Distillation Vial in mL	(Svol)	1.5
1547	Volume of Spike in Distillation Vial in mL	(SPK vol)	1.5
Rerun No.	Volume Transferred to Scintillation Vial in mL	(TR vol)	1
0	Spike Value in µCi/L	(SPK val)	0.584
Analyst	Background Count Rate in cpm	(BKG cpm)	54.16
	Background Count Time in Minutes	(BKG time)	50
Date:	Instrument Fractional Efficiency of Sample	(EFF)	0.4948
08/12/93	Detection Limit	(Ld)	9.91
	Critical Level	(Lc)	2.42
	H3 µCi/L in Sample Vial	(Rsam)	3.37E+01
	H3 µCi/L in Sample + Spike Vial	(Rs+s)	2.69E+01
	Vol. Ratio Sample Vol. to Total Vol.	(VRsam)	5.00E-01
	Vol. Ratio Spike Vol. to Total Vol.	(VRspike)	5.00E-01

Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)

H3 µCi/L in Sample Vial (Rsam) = dpm1 * (1000mL/L) / (TR vol * (2220000dpm/µCi))

H3 µCi/L in Sample + Spike Vial (Rs+s) = dpm2 * (1000mL/L) / (TR vol * (2220000dpm/µCi))

Volume Ratio of Sample Volume to Total Volume (VRsam)= Svol / (Svol + SPK vol)

Volume Ratio of Spike Volume to Total Volume (VRspike) = SPK vol / (Svol + SPK vol)

% Spike Recovery = ((Rs+s) - (Rsam * VRsam) / (SPK val * VRspike)) * 100

(2.69E-1 - (3.37E+1)(0.5)

Spike Recovery	=	3438.3%

Data Entry by:		Date:	19-Aug-93
Approved by:		Date:	19 AUG 93

Form M3 Rev. 1.1

Page 1 of 1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5087	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	% RECOVERY	N1L17	0

Sample Size	Customer ID
? / ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKE
DUPLICATE

SPIKE ID-83251
SPIKE VOL-1.5ml

2989.3%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
		8-18-93		

Date	Time Completed	Lab Unit Mgr
8/12/93	11:00	

54-6800-061 (R-10-83)

WHC-SD-WM-DP-053 REV 0

H3: LA-218-113(B-0), LA-218-114(A-2) TRITIUM SPIKE

			SPIKE
Serial No.	dpm of Sample from Counter	(dpm1)	74470.34
V34-5087	dpm of Sample + Spike from Counter	(dpm2)	56613.22
Batch ID	Volume of Sample in Distillation Vial in mL	(Svol)	1.5
1547	Volume of Spike in Distillation Vial in mL	(SPK vol)	1.5
Rerun No.	Volume Transferred to Scintillation Vial in mL	(TR vol)	1
0	Spike Value in µCi/L	(SPK val)	0.584
Analyst	Background Count Rate in cpm	(BKG cpm)	54.16
	Background Count Time in Minutes	(BKG time)	50
Date:	Instrument Fractional Efficiency of Sample	(EFF)	0.4926
08/12/93	Detection Limit	(Ld)	9.96
	Critical Level	(Lc)	2.42
	H3 µCi/L in Sample Vial	(Rsam)	3.35E+01
	H3 µCi/L in Sample + Spike Vial	(Rs+s)	2.55E+01
	Vol. Ratio Sample Vol. to Total Vol.	(VRsam)	5.00E-01
	Vol. Ratio Spike Vol. to Total Vol.	(VRspike)	5.00E-01

Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)

H3 µCi/L in Sample Vial (Rsam) = dpm1 * (1000mL/L) / (TR vol * (2220000dpm/µCi))

H3 µCi/L in Sample + Spike Vial (Rs+s) = dpm2 * (1000mL/L) / (TR vol * (2220000dpm/µCi))

Volume Ratio of Sample Volume to Total Volume (VRsam)= Svol / (Svol + SPK vol)

Volume Ratio of Spike Volume to Total Volume (VRspike) = SPK vol / (Svol + SPK vol)

% Spike Recovery = ((Rs+s) - (Rsam * VRsam) / (SPK val * VRspike)) * 100

$$\left[\frac{(2.55E+1 - (3.35E+1)(0.5))}{(0.584)(0.5)}\right] 100\% = 2989\%$$

Spike Recovery	=	2989.3%

Data Entry by:		Date:	19-Aug-93
Approved by:		Date:	19 AUG 93

Form M3 Rev. 1.1

Page 1 of 1

Raymond 8-15-93

WHC-SD-WM-DP-053 REV 0

ID: H3 LOW LEVEL 17 AUG 1993 18:27

USER: 1 COMMENT:

PRESET TIME :	50.00						
DATA CALC :	SL DPM	H#	:YES	SAMPLE REPEATS:	1	PRINTER	: ST
COUNT BLANK :	YES	IC#	: NO	REPLICATES :	1	RAZIE	:EDIT
WO PHASE :	YES	AOC	: NO	CYCLE REPEATS :	1		
SCINTILLATOR:	LIQUID	LUMEX	:YES	LOW SAMPLE REJ:	0		
LOW LEVEL :	YES	HALF LIFE CORRECTION DATE:				none	

ISOTOPE 1: H3LL %ERROR: 0.00 FACTOR: 1.000000 BKG. SUB: 0

BACKGROUND QUENCH CURVE: Off COLOR QUENCH CORRECTION: Off

Quench Limits Low:56.611 High:246.80

SAM NO	POS	TIME MIN	H#	H3LL CPM	H3LL %ERROR	H3LL DPM	H3LL EFF-1	LUMEX %	ELAPSED TIME	2P
81	**-1	50.00	86.4	54.16	3.84	109.29	49.56	0.01	51.55	
		Blank Average		DPM for		H3LL :	109.29	COEF. OF VAR:		0.000
1	**-3	50.00	87.7	719.90	1.05	1350.47	49.32	0.02	103.47	
2	**-4	50.00	87.2	20.66	6.22	-67.48	49.41	0.04	155.35	
3	**-5	50.00	86.7	36925.10	0.15	74470.34	49.51	0.00	208.52	
4	**-6	50.00	86.9	37003.44	0.15	74709.20	49.46	0.00	261.88	
5	**-7	50.00	88.0	27939.78	0.17	56613.22	49.26	0.00	314.98	
6	**-8	50.00	86.8	29562.52	0.16	59643.21	49.48	0.00	368.72	

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH

Batch 1953

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. V-34	Customer ID: 107 AP Com
Analysis: 1/3	Sample Prep: Direct

Instrument:	Procedure/ Rev: LA-218-114 / A-2
Technologist: RG Acher [illegible] 8259	Date: 10/15/93
Starting Time: 08:30	Temperature 25°
Ending Time: 11:00	Chemist: ~~Jim Lochet~~ [illegible] K Kawasaki

Comments: 200-10 ~~Dilution~~ Dilution K 10-15-93

	Description	Lab ID 10-15-93		Description	Lab ID
1	STD	V-32-5587	11		
2	BLK	V-33-5687	12		
3	Sample	V-34-5787	13		
4	Sample Dup	V-34-5887	14		
5	Sample spike	V-34-5987	15		
6	Sample Spike Dup	V-34-5087	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS	103B51 / 1ml			
Pro Spike	103B51 / 1.5ml			
		949		

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-218-114

DATE START: Oct 15, 1993

PREPARED BY: K Kawabata

DATE COMPLETE: Oct 20, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD 103B51	V32	H-3	7.22E-1				97		1.02
BLANK	V33	H-3	<1.81E-4						5.81
107APCOM	V34	H-3	3.53E-2	3.51E-2	3.52E-2	0.57		1.81E-4	1.04
									1.04
107APCOM	V34	H-3	7.17E-4	6.79E-4	6.98E-4	5.4	99.7	1.81E-4	1.02
Spike							90.0		1.05
[illegible]									
11/18/93									

NARRATIVE: [X] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

The detection limit for the sample is 3.55E-6uCi/mL.(Value noted is for the diluted sample)

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

1 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-5587	107-AP	8- 3-93	10:44	25

Determination	Method-Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	% RECOVERY	N1L17	1

Sample Size	Customer ID
? 1 ml	STD

Remarks, Calculations, Results

EDP R907 ENVSTD
STD# 103B51 RESULT 7.22 E-1
STD VAL. 7.44 E-1 %REC 97.0%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
10/15/93	11:00	

10/18

(R-5900-041 (R/10-83))

H3: LA-218-111(E-0), 113(B-0), 114(A-2) TRITIUM LIQUIDS

			STANDARD
Serial No.	Disintegrations per Minute from Counter	(dpm)	1601.9
V32-5587	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1953	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	29.94
1	Background Count Time in Minutes	(BKG Time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	~~0.467~~ 0.4633
	Detection Limit	(Ld)	7.78
Date:	Critical Level	(Lc)	1.80
10/15/93	Tritium Concentration in µCi/L =		7.2158E-01

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]
Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF
H3 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]
H3 µCi/mL = µCi/L / 1000mL/L

Tritium Concentration in µCi/L =	7.22E-01

Tritium Concentration in µCi/mL =	7.22E-04

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	20 Oct 93

Form M1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

2

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-5687	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	uCi/ML	N1L17	1

Sample Size	Customer ID
? ZOC-10 ~~4.5~~ 3 mL 1 mL Transfer	BLK

Remarks, Calculations, Results: RAC 10/14/93

REAGENT BLANK

COUNT AS uCI/L

<1.81E-4

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	D.H. Miller	E.M. Brock		
Hrs	Hrs	Hrs	Hrs	Hrs
		C.A. Plank		
Date	Time Completed	Lab Unit Mgr		
10/15/93	11:00			10/15

5-6800-065 (R-10-93)

WHC-SD-WM-DP-053 REV 0

H3: LA-218-111(E-0), 113(B-0), 114(A-2) TRITIUM LIQUIDS			BLANK
Serial No.	Disintegrations per Minute from Counter	(dpm)	-12.62
V33-5687	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	51
1953	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	29.94
1	Background Count Time in Minutes	(BKG Time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.461
	Detection Limit	(Ld)	7.88
Date:	Critical Level	(Lc)	1.80
10/15/93	Tritium Concentration in µCi/L =		1.8095E-01

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]

Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF

H3 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

H3 µCi/mL = µCi/L / 1000mL/L

NOTE: Reported result is a LESS THAN value calculated from the statistical Detection Limit (Ld).

Tritium Concentration in µCi/L =	< 1.81E-01

Tritium Concentration in µCi/mL =	< 1.81E-04

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	20 Oct 93

Form M1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

3

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5787	107-AP	8- 3-93	10:56	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	uCi/ML	N1L17	1

Sample Size	Customer ID
? 200-10 - 3ML 1ML Transfer	107APCOM

Remarks, Calculations, Results

COUNT AS uCI/L

3.53E-2

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	D.H. Milian			
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Mgr		
10/15/93	11:00			

54-6800-001 (8-10-83)

WHC-SD-WM-DP-053 REV 0

H3: LA-218-111(E-0), 113(B-0), 114(A-2) TRITIUM LIQUIDS			SAMPLE
Serial No.	Disintegrations per Minute from Counter	(dpm)	1535.07
V34-5787	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	51
1953	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	29.94
1	Background Count Time in Minutes	(BKG Time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.4619
	Detection Limit	(Ld)	7.86
Date:	Critical Level	(Lc)	1.80
10/15/93	Tritium Concentration in µCi/L =		3.5265E+01

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]

Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF

H3 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

H3 µCi/mL = µCi/L / 1000mL/L

Tritium Concentration in µCi/L =	3.53E+01

Tritium Concentration in µCi/mL =	3.53E-02

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	20 Oct 93

Form M1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

4

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5887	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	uCi/ML	N1L17	1

Sample Size	Customer ID
? 200-10-3mL 1 mL Transfer	107APCOM

Remarks, Calculations, Results

DUPLICATE SAMPLE

COUNT AS uCI/L

3.51E-2

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
10/15/93	11:00	10/19

54-6800-DPT (R-10-83)

WHC-SD-WM-DP-053 REV 0

H3: LA-218-111(E-0), 113(B-0), 114(A-2) TRITIUM LIQUIDS

			DUPLICATE
Serial No.	Disintegrations per Minute from Counter	(dpm)	1528.69
V34-5887	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	51
1953	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	29.94
1	Background Count Time in Minutes	(BKG Time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.4656
	Detection Limit	(Ld)	7.80
Date:	Critical Level	(Lc)	1.80
10/15/93	Tritium Concentration in µCi/L =		3.5119E+01

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]

Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF

H3 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

H3 µCi/mL = µCi/L / 1000mL/L

Tritium Concentration in µCi/L =	3.51E+01

Tritium Concentration in µCi/mL =	3.51E-02

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	20 OCT 93

Form M1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

5

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5987	107-AP	8- 3-93	10:56	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	% RECOVERY	N1L17	1

Sample Size	Customer ID
? 200-10-1.5 mL 1 mL Transfer	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKED ID

SPIKE ID - 03BS1

SPIKE VOLUME - 1.5 mL

COUNT AS uCI/L

99.7 %

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
10/15/93	11:00	10/19

WHC-SD-WM-DP-053 REV 0

54-6808-061 (R-10/83)

H3: LA-218-113(B-0), LA-218-114(A-2) TRITIUM SPIKE

			SPIKE
Serial No.	dpm of Sample from Counter	(dpm1)	1535.07
V34-5987	dpm of Sample + Spike from Counter	(dpm2)	1590.66
Batch ID	Volume of Sample in Distillation Vial in mL	(Svol)	1.5
1953	Volume of Spike in Distillation Vial in mL	(SPK vol)	1.5
Rerun No.	Volume Transferred to Scintillation Vial in mL	(TR vol)	1
1	Spike Value in µCi/L	(SPK val)	0.744
Analyst	Background Count Rate in cpm	(BKG cpm)	29.94
	Background Count Time in Minutes	(BKG time)	50
Date:	Instrument Fractional Efficiency of Sample	(EFF)	0.4619
10/15/93	Detection Limit	(Ld)	7.92
	Critical Level	(Lc)	1.80
	H3 µCi/L in Sample Vial	(Rsam)	6.91E-01
	H3 µCi/L in Sample + Spike Vial	(Rs+s)	7.17E-01
	Vol. Ratio Sample Vol. to Total Vol.	(VRsam)	5.00E-01
	Vol. Ratio Spike Vol. to Total Vol.	(VRspike)	5.00E-01

Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)

H3 µCi/L in Sample Vial (Rsam) = dpm1 * (1000mL/L) / (TR vol * (2220000dpm/µCi))

H3 µCi/L in Sample + Spike Vial (Rs+s) = dpm2 * (1000mL/L) / (TR vol * (2220000dpm/µCi))

Volume Ratio of Sample Volume to Total Volume (VRsam)= Svol / (Svol + SPK vol)

Volume Ratio of Spike Volume to Total Volume (VRspike) = SPK vol / (Svol + SPK vol)

% Spike Recovery = ((Rs+s) - (Rsam * VRsam) / (SPK val * VRspike)) * 100

Spike Recovery	=	99.7%

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	28 OCT 93

Form M3 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

6

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5087	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
H3	LA-218-114	% RECOVERY	N1L17	1

Sample Size	Customer ID
? 200-10-1.5mL 1 mL Transfer	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKE
DUPLICATE

SPIKE ID 103PS1
SPIKE VOL 1.5 mL

90.0 %

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
10/15/93	11:00	

54-6800-05 (R 10-83)

H3: LA-218-113(B-0), LA-218-114(A-2) TRITIUM SPIKE

			SPIKE
Serial No.	dpm of Sample from Counter	(dpm1)	1528.69
V34-5087	dpm of Sample + Spike from Counter	(dpm2)	1507.7
Batch ID	Volume of Sample in Distillation Vial in mL	(Svol)	1.5
1953	Volume of Spike in Distillation Vial in mL	(SPK vol)	1.5
Rerun No.	Volume Transferred to Scintillation Vial in mL	(TR vol)	1
1	Spike Value in µCi/L	(SPK val)	0.744
Analyst	Background Count Rate in cpm	(BKG cpm)	29.94
	Background Count Time in Minutes	(BKG time)	50
Date:	Instrument Fractional Efficiency of Sample	(EFF)	0.4656
10/15/93	Detection Limit	(Ld)	7.86
	Critical Level	(Lc)	1.80
	H3 µCi/L in Sample Vial	(Rsam)	6.89E-01
	H3 µCi/L in Sample + Spike Vial	(Rs+s)	6.79E-01
	Vol. Ratio Sample Vol. to Total Vol.	(VRsam)	5.00E-01
	Vol. Ratio Spike Vol. to Total Vol.	(VRspike)	5.00E-01

Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)

H3 µCi/L in Sample Vial (Rsam) = dpm1 * (1000mL/L) / (TR vol * (2220000dpm/µCi))

H3 µCi/L in Sample + Spike Vial (Rs+s) = dpm2 * (1000mL/L) / (TR vol * (2220000dpm/µCi))

Volume Ratio of Sample Volume to Total Volume (VRsam)= Svol / (Svol + SPK vol)

Volume Ratio of Spike Volume to Total Volume (VRspike) = SPK vol / (Svol + SPK vol)

% Spike Recovery = ((Rs+s) - (Rsam * VRsam) / (SPK val * VRspike)) * 100

Spike Recovery	=	90.0%

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	20 Oct 93

Form M3 Rev. 1.1

Em Bowden
10-15-93

ID: H-3 TRITIUM 15 OCT 1993 15:19

USER: 1 COMMENT: **WHC-SD-WM-DP-053 REV 0**

RESET TIME :	50.00						
AUTO CALC :	SL OPM	H#	:YES	SAMPLE REPEATS:	1	SAMPLE	[illegible]
COUNT BLANK :	YES	ICM	: NO	REPLICATES :	1	PRINT	[illegible]
USE APASE :	YES	AQC	: NO	CYCLE REPEATS :	1		
SCINTILLATOR:	LIQUID	LUMEX	:YES	LOW SAMPLE REJ:	0		
LOW LEVEL :	NO	HA...	LINE	CORRECTION DATE:		None	

ISOTOPE 1: 3H %ERROR: 0.00 FACTOR: 1.000000 BKG. SUB: 0

BACKGROUND QUENCH CURVE: Off COLOR QUENCH CORRECTION: On

Quench Limits Low:-4.323 High:294.48

SAM NO	POS	TIME MIN	H#	3H CPM	3H %ERROR	3H DPM	3H EFF-1	LUMEX %	ELAPSED TIME	2P
B1	**-1	50.00	85.9	29.94	5.17	64.12	46.70	0.12	51.56	
		Blank Average DPM for 3H : 64.12 COEF. OF VAR: 0.000								
1	**-3	50.00	87.4	771.94	1.02	1601.90	46.33	0.07	103.55	
2	**-4	50.00	88.3	23.74	5.81	-12.62	46.10	0.08	155.40	
3	**-5	50.00	87.9	738.68	1.04	1535.07	46.19	0.01	207.18	
4	**-6	50.00	86.5	741.58	1.04	1528.69	46.56	0.01	259.05	
5	**-7	50.00	86.6	769.84	1.02	1590.66	46.52	0.01	310.92	
6	**-8	50.00	86.4	731.96	1.05	1507.70	46.57	0.00	362.79	

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

WHC-SD-WM-DP-053 REV 0

ANALYTICAL BATCH 1931

Lab Segment Serial No. V-34	Customer ID: 107APCOM
Analysis: C-14	Sample Prep: WATER DIGEST

Instrument: WB27818	Procedure/ Rev: LA 348-104 B-0
Technologist: J T KNIGHT	Date: 10/14/93
Starting Time: 09:00	Temperature 25 CENTIGRADE
Ending Time: 14:30	Chemist: KEN KAWABATA

Comments: BATCH #1931
RERUNS

	Description	Lab ID		Description	Lab ID
1	INITIAL LMCS STD	V32-5588	11		
2	REAGENT BLANK	V33-5688	12		
3	SAMPLE	V34-5788	13		
4	SAMPLE DUPLICATE	V34-5888	14		
5	SAMPLE + SPIKE	V34-5988	15		
6	SAMPLE DUPLICATE + SPIKE	V34-5088	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS	82B51 1 ML			
SPIKE	82B51 1 ML			

958

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-348-104

DATE START: Oct 14, 1993

PREPARED BY: K Kawabata

DATE COMPLETE: Oct 18, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD 82B51	V32	C-14	1.54				87		0.5
BLANK	V33	C-14	<2.17E-6						4.11
101APCOM	V34	C-14	<2.18E-6	3.18E-6	N/A	N/A	N/A	2.17E-6	4.09
									3.98
101APCOM	V34/Spike	C-14	1.55E-3	1.44E-3	1.495E-3	7.4	87.5	2.17E-6	0.50
							81.1		0.52

NARRATIVE: [ ] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH
LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

No rerun requested. Sample analyte concentration is at the lower limit of detection for this method.

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 32 - 5588	107-AP	8- 3-93	10:44	25

Determination	Method Standard	Result Units	Charge Code	Reruns
C14	LA-348-104	% RECOVERY	N1L1Z	1

Sample Size	Customer ID
1 ml	STD

Remarks Calculations Results

RERUN

EDP R909 C14EDTA

STD# 82B51 RESULT 1.54 uCi/L

STD VAL 1.77 %REC 87.00%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
		10-15-93		

Date	Time Completed	Lab Unit Mgr
10.14.93	11:00	10/19

54-6800-001 (R-10-83)

WHC-SD-WM-DP-053 REV 0

C-14: LA-348-104 (B-0) Carbon-14 LIQUIDS

Serial No.			STANDARD
V32-5588	Disintegrations per Minute from Counter	(dpm)	3423.79
	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1931	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	44.2
1	Background Count Time in Minutes	(BKG time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	~~0.9137~~ 0.9185
	Detection Limit	(Ld)	4.85
Date	Critical Level	(Lc)	2.19
10/14/93			

KL 10-19-93

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG time)]

Detection Limit (Ld) = [(2.72 / BKG time) + (2) (Lc)] / EFF

C-14 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

µCi/mL = µCi/L / 1000mL/L

C-14 Concentration in µCi/L	=	1.54E+00

C-14 Concentration in µCi/mL	=	1.54E-03

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	18 OCT 93

Form 1 Rev. 1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 33-5688	107-AP	8-3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
C14	LA-348-104	uCi/ML	N1L17	1

Sample Size	Customer ID
1 ml	BLK

Remarks, Calculations, Results

REAGENT BLANK

COUNT AS uCI/L

RERUN

< 2.17E-6

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
		10-15-93		

Date	Time Completed	Lab Unit Mgr
10-14-93	11:00	10/19

WHC-SD-WM-DP-053 REV 0

54-6800-961 (R/10-83)

C-14: LA-348-104 (B-0) Carbon-14 LIQUIDS

			BLANK
Serial No.	Disintegrations per Minute from Counter	(dpm)	3.17
V33-5688	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1931	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	44.2
1	Background Count Time in Minutes	(BKG time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.9223
	Detection Limit	(Ld)	4.81
Date	Critical Level	(Lc)	2.19
10/14/93			

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG time)]

Detection Limit (Ld) = [(2.72 / BKG time) + (2) (Lc)] / EFF

C-14 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

µCi/mL = µCi/L / 1000mL/L

NOTE: Reported result is a LESS THAN value calculated from the statistical Detection Limit (Ld).

C-14 Concentration in µCi/L	=	< 2.17E-03

C-14 Concentration in µCi/mL	=	< 2.17E-06

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	18 OCT 93

Form 1 Rev. 1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

3

Serial No	Sample Point	Date	Time Issued	Priority
V 34 -5788	107-AP	8- 3-93	10:50	25

Determination	Method Standard	Result Units	Charge Code	Reruns
C14	LA-348-104	uCi/ML	N1L17	1

Sample Size	Customer ID
2 ml	107APCOM

Remarks, Calculations, Results

COUNT AS uCI/L

RERUN

<2.18E-6

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 10-15-93	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
10-14-93	11:00	10/18

WHC-SD-WM-DP-053 REV 0

54-6800-061 (R-10/83)

C-14: LA-348-104 (B-0) Carbon-14 LIQUIDS

			SAMPLE
Serial No.	Disintegrations per Minute from Counter	(dpm)	4.09
V34-5788	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1931	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	44.2
1	Background Count Time in Minutes	(BKG time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.915
	Detection Limit	(Ld)	4.85
Date	Critical Level	(Lc)	2.19
10/14/93			

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG time)]

Detection Limit (Ld) = [(2.72 / BKG time) + (2) (Lc)] / EFF

C-14 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

µCi/mL = µCi/L / 1000mL/L

NOTE: Reported result is a LESS THAN value calculated from the statistical Detection Limit (Ld).

C-14 Concentration in µCi/L = < 2.18E-03

C-14 Concentration in µCi/mL = < 2.18E-06

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	18 Oct 93

Form 1 Rev. 1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

4

Serial No	Sample Point	Date	Time Issued	Priority
V 34 -5888	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
C14	LA-348-104	uCi/ML	N1L17	1

Sample Size	Customer ID
2 ml	107APCOM

Remarks, Calculations, Results

DUPLICATE SAMPLE

COUNT AS uCI/L

RERUN

3.18E-6

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst 5
Hrs	Hrs	Hrs	Hrs	Hrs
		10-15-93		

Date	Time Completed	Lab Unit Mgr	
10-14-93	1100		10/19

34-6800-961 (4-10-83)

WHC-SD-WM-DP-053 REV 0

C-14: LA-348-104 (B-0) Carbon-14 LIQUIDS

			DUPLICATE
Serial No.	Disintegrations per Minute from Counter	(dpm)	7.06
V34-5888	Sample Volume in mL	(SS)	1
Batch ID	Dilution Factor	(DF)	1
1931	Digest Dilution Factor	(DDF)	1
Rerun No.	Background Count Rate in Counts per Minute	(BKG cpm)	44.2
1	Background Count Time in Minutes	(BKG time)	50
Analyst	Instrument Fractional Efficiency	(EFF)	0.9171
---	Detection Limit	(Ld)	4.84
Date	Critical Level	(Lc)	2.19
10/14/93			

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG time)]

Detection Limit (Ld) = [(2.72 / BKG time) + (2) (Lc)] / EFF

C-14 µCi/L = (dpm) (1000mL/L) (DF) (DDF) / [(SS) (2220000dpm/µCi)]

µCi/mL = µCi/L / 1000mL/L

C-14 Concentration in µCi/L	=	3.18E-03

C-14 Concentration in µCi/mL	=	3.18E-06

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	18 OCT 93

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 34-5988	107-AP	8-3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
C14	LA-348-104	% RECOVERY	N11-17	1

Sample Size	Customer ID
2 ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKED ID

SPIKE ID

SPIKE VOLUME 1 ml

COUNT AS uCI/L

RERUN

87.5 %

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
		10-15-93		

Date	Time Completed	Lab Unit Mgr
10-14-93	14:30	10/19

54-6800-061 (R-10-83)

WHC-SD-WM-DP-053 REV 0

C-14: LA-348-104 (B-0) CARBON-14

			SPIKE
Serial No.	dpm of Sample from Counter	(dpm1)	4.09
V34-5988	dpm of Sample + Spike from Counter	(dpm2)	3437.21
Batch ID	Volume of Sample in Sample Vial in mL	(SS)	1.000
1931	Volume of Sample in Sample + Spike Vial in mL	(SPK'D SS)	1.000
Rerun No.	Volume of Spike in mL	(SPK vol)	1.000
1	Sample Dilution Factor	(SAM DF)	1
Analyst	Spike Dilution Factor	(SPK DF)	1
	Spike Value in µCi/L	(SPK val)	1.77
Date	Background Count Rate in cpm	(BKG cpm)	44.2
10/14/93	Background Count Time in Minutes	(BKG time)	50
	Instrument Fractional Efficiency	(EFF)	0.9150
	Detection Limit	(Ld)	4.84
	C-14 µCi/L in Sample	(Rsam)	0.00E+00
	C-14 µCi/L in Sample + Spike	(Rs+s)	1.55E+00

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]

Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF

C-14 µCi/L in Sample = (dpm1) (1000mL/L) (DF) / [(SS) (2220000dpm/µCi)]

C-14 µCi/L in S+S = (dpm2) (1000mL/L) (DF) / [(SS) (2220000dpm/µCi)]

Spike Recovery = [(Rs+s - Rsam) ((SPK DF/SPK vol) / (SAM DF/SPK'D SS)) / (SPK val)] 100

Spike Recovery = 87.5%

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	18 Oct 93

Form 3 Rev. 2

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 34 - 5088	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
C14	LA-348-104	% RECOVERY	N1L17	1

Sample Size	Customer ID
2 ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKE
DUPLICATE

SPIKE ID 82B51
SPIKE VOL 1ml

RERUN

81.1%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
		10/15-93		

Date	Time Completed	Lab Unit Mgr
10/14/93	14:30	10/19

54-6880-061 (R-10-83)

WHC-SD-WM-DP-053 REV 0

C-14: LA-348-104 (B-0) CARBON-14

			SPIKE
Serial No.	dpm of Sample from Counter	(dpm1)	7.06
V34-5088	dpm of Sample + Spike from Counter	(dpm2)	3194.67
Batch ID	Volume of Sample in Sample Vial in mL	(SS)	1.000
1931	Volume of Sample in Sample + Spike Vial in mL	(SPK'D SS)	1.000
Rerun No.	Volume of Spike in mL	(SPK vol)	1.000
1	Sample Dilution Factor	(SAM DF)	1
Analyst	Spike Dilution Factor	(SPK DF)	1
	Spike Value in µCi/L	(SPK val)	1.77
Date	Background Count Rate in cpm	(BKG cpm)	44.2
10/14/93	Background Count Time in Minutes	(BKG time)	50
	Instrument Fractional Efficiency	(EFF)	0.9171
	Detection Limit	(Ld)	4.83
	C-14 µCi/L in Sample	(Rsam)	3.18E-03
	C-14 µCi/L in Sample + Spike	(Rs+s)	1.44E+00

Critical Level (Lc) = 2.33 [Square Root of (BKG cpm / BKG Time)]
Detection Limit (Ld) = [(2.72 / BKG Time) + (2) (Lc)] / EFF
C-14 µCi/L in Sample = (dpm1) (1000mL/L) (DF) / [(SS) (2220000dpm/µCi)]
C-14 µCi/L in S+S = (dpm2) (1000mL/L) (DF) / [(SS) (2220000dpm/µCi)]
Spike Recovery = [(Rs+s - Rsam) ((SPK DF/SPK vol) / (SAM DF/SPK'D SS)) / (SPK val)] 100

Spike Recovery = 81.1%

Data Entry by:		Date:	18-Oct-93
Approved by:		Date:	18 oct 93

Form 3 Rev. 2

ID : C-14 14 OCT 1993 20:26
USER: 2 COMMENT:
PRESET TIME : 50.00
[illegible]

ISOTOPE 1: 14C %ERROR: 0.00 FACTOR: 1.000000 BKG. SUB: 0

BACKGROUND QUENCH CURVE: Off COLOR QUENCH CORRECTION: On

Quench Limits Low:-4.483 High:297.53

SAM NO	POS	TIME MIN	H#	14C CPM	14C %ERROR	14C DPM	14C EFF-1	LUMEX %	ELAPSED TIME	2P
01	**-1	50.00	142.8	44.20	4.26	48.37	91.37	0.22	[illegible]	
		Blank	Average	DPM	for	14C :	48.37	COEF. OF	VAR:	0.000
1	**-3	50.00	135.4	3189.06	0.50	3423.79	91.85	0.01	[illegible]	
2	**-4	50.00	129.1	47.54	4.11	3.17	92.23	0.33	[illegible]	
3	**-5	50.00	140.9	48.00	4.09	4.09	91.50	0.49	207.[illegible]	
4	**-6	50.00	137.6	50.84	3.98	7.06	91.71	0.75	259.[illegible]	
5	**-7	50.00	129.9	3213.12	0.50	3437.21	92.18	0.01	311.[illegible]	
6	**-8	50.00	122.3	3003.16	0.52	3194.67	92.60	0.01	364.[illegible]	

✓ OA 3

WESTINGHOUSE HANFORD COMPANY Batch 1558

222-S LABORATORY

ANALYTICAL BATCH

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. ~~V33 ; V34~~ 9-9-93 V34	Customer ID: 107 APCOM
Analysis: Se 79	Sample Prep: Acid Digest

Instrument: UV 27818	Procedure/ Rev: LA-365-132/B-0
Technologist: Jennifer Slippern	Date: 9/2/93
Starting Time: 08:00	Temperature 24 C
Ending Time: ~~10:30~~ 13:30 JS 9/2/93	Chemist: Jennifer Slippern

Comments:

	Description	Lab ID		Description	Lab ID
1	BLANK	V33-8689	11		
2	SAMPLE	V34-8789	12		
3	DUPLICATE	V34-8889	13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
N/A				

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-365-132

DATE START: AUGUST 24, 1993

PREPARED BY: JL SLIPPERN

DATE COMPLETE: SEPTEMBER 8, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
BLANK	V33	Se-79	<5.38E-6				27.5	5.38E-6	4.1
107APCOM	V34	Se-79	<5.38E-6	<5.38E-6	N/A	N/A	23.0	5.38E-6	3.9
							28.5	5.38E-6	4.2

NARRATIVE: [ ] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

Low %REC values due to initial qualification run.

Results are less than detectable limits.

No rerun requested.

ACID DIGESTION ANALYSIS

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8689	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Se79	LA-365-132	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1.0 mL	BLK

Remarks, Calculations, Results

REAGENT BLANK
COUNT AS C14

tare weight .7787g
weight .7842g

< 2.15 x 10-6 µCi/mL

Jennifer L Sleppern

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	[signature]	Eric Barcus		
Hrs	Hrs 9-2-93 1400	Hrs	Hrs	Hrs
Date 9/2/93	Time Completed ~~16:30~~	Lab Unit Mgr J L Sleppern		9/8

13:30 JS 9/2/93

54-6800-061 (R-10-83)

2

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8789	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Se79	LA-365-132	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1.0 mL	107APCOM

Remarks, Calculations, Results

VOLUME

MASS

OTR
PREVIOUS SAMPLE NO.

tare weight .7653g
weight .7699g

< 2.15 x 10-6 µCi/mL

Jennifer L Sleppern

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	[signature]	Eric Barcus		
Hrs	Hrs 9-2-93 1400	Hrs	Hrs	Hrs
Date 9/2/93	Time Completed ~~16:30~~	Lab Unit Mgr J L Sleppern		9/8

13:30 JS 9/2/93

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

ACID DIGESTION ANALYSIS

WHC-SD-WM-DP-053 REV 0

3

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8889	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Se79	LA-365-132	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1.0 mL	107APCOM

Remarks, Calculations, Results:

DUPLICATE SAMPLE
COUNT AS C14

tare weight .7646 g
weight .7703 g

< 2.15 x 10-6 uCi/mL

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs 9-2-93 14:00	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/2/93	~~16:30~~	

13:30 JS 9/2/93

54-3300-061 (R-10-83)

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FROM Jennifer B. Gilpeau

V33-8689 $(2.5)(5.28\ dpm)(1000\ mL/L) / (1.0\ mL)(2.22E6)\left[\frac{(.78229 - .77873)}{2(10.009\ mg\ Se/mL)(1g/1000mg)}\right]$

$= 2.17 \times 10^{-2}\ \mu Ci/L$ % Rec = 27.5 %

detection limit $= \left(\left(\left[\frac{2.72}{50} + 2\left(2.33\sqrt{44.4/50}\right)\right] / .9278\right) / 2.22E6\right)(2.5)$

$= \cancel{4.30 \times 10^{-6}\ \mu Ci/mL}$ JS 10-7-93

$5.38 \times 10^{-6}\ \mu Ci/mL$

V34-8789 $5.98 \times 10^{-2}\ \mu Ci/L$

% Rec = 23.0 % detection limit = JS 10/7/93 $\cancel{4.}$ $5.38 \times 10^{-6}\ \mu Ci/mL$

V34-8889 $1.10 \times 10^{-2}\ \mu Ci/L$ detection limit = $5.38 \times 10^{-6}\ \mu Ci/mL$

% Rec = 28.5 %

Jim Bussell
9-2-93

ID: C-14 2 SEP 1993 18:0

USER: 2 COMMENT:

PRESET TIME : 50.00

DATA CALC : SL DPM H# : YES SAMPLE REPEATS: 1 [illegible]

COUNT BLANK : YES IC# : NO REPLICATES : 1 [illegible]

TWO PHASE : YES ASC : NO CYCLE REPEATS : 1

SCINTILLATOR: LIQUID LUMEX: YES LOW SAMPLE REJ: 0

LOW LEVEL : NO HALF LIFE CORRECTION DATE: none

ISOTOPE 1: 14C %ERROR: 0.00 FACTOR: 1.000000 BKG. SUB: 0

BACKGROUND QUENCH CURVE: Off COLOR QUENCH CORRECTION: On

Quench Limits Low:-4.483 High:297.53

SAM NO	POS	TIME MIN	H#	14C CPM	14C %ERROR	14C DPM	14C EFF-1	LUMEX %	ELAPSED TIME	2P
B1	**-1	50.00	120.6	44.14	4.28	47.62	92.69	0.86	51.71	
		Blank Average		DPM for		14C :	47.62	COEF. OF	VAR:	0.000
1	**-3	50.00	119.0	49.08	4.14	5.28	92.78	3.67	104.17	
2	**-4	50.00	120.0	55.48	3.87	12.21	92.72	3.05	156.56	
3	**-5	50.00	121.7	46.70	4.22	2.79	92.64	2.86	208.91	

BEST AVAILABLE COPY

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH

Batch 1556

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. V-34	Customer ID: 107 AP Com
Analysis: TC 99	Sample Prep: ~~Direct~~ Acid Digestion

Instrument: WBL7818	Procedure/ Rev: LA-438-101 / D-1
Technologist: RG Acheson	Date: 9/1/93
Starting Time: 09:30	Temperature NA
Ending Time: 15:30	Chemist: Jennifer Slippern

Comments:

	Description	Lab ID		Description	Lab ID
1	STD	V-32-8584	11		
2	BLK	V-33-8684	12		
3	Sample	V-34-8784	13		
4	Sample Dup	V-34-8884	14		
5	Sample Spike	V-34-8984	15		
6	Sample Spike Dup	V-34-8084	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS	73B51 / .25ml			
Pro. Spike	76B51 / .100ml			

A-6000-881 (03/92)

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1A

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-348-101

DATE START: SEPTEMBER 1, 1993

PREPARED BY: JL Slippern

DATE COMPLETE: SEPTEMBER 2, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
73B51	V32	Tc99	4.06				104	3.40E-5	1.4
BLANK	V33	Tc99	3.63E-5				64.2	2.17E-5	5.5
107APCOM	V34	Tc99	<2.05E-5	<2.05E-5	NA	NA	67.8	2.05E-5	5.9
							67.3	2.05E-5	
	V34	SPIKE	107.6	90.1	98.9	17.7			1.5

NARRATIVE: [X] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

The results for the spike are in % recovery.

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

1-2

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-8584	107-AP	8- 3-93	10:44	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Tc99	LA-438-101	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 250 ml	STD

Remarks, Calculations, Results

EDP S363 TC99

STD# 73B51 RESULT 4.06 uCi/L

STD VAL 3.912 uCi/L %REC 103.78 %

~~.100 ml~~ Spike #76B51

0.10 ml 9-8-93

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	D. H. McGrice	Em Bueas		
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/1/93	15:30	

54-68[illegible]061 (R-10-83)

Tc-99: LA-438-101 (D-1) LIQUIDS

			STANDARD
Serial No.	Spike (Tracer) Book Number		76B51
V32-8584	Activity for 100µl of Spike Added in dpm	(dm3)	8151
Batch ID	Volume of Sample in mL	(SS)	0.25
1566	Dilution Factor	(DF)	1
Rerun No.	Digest Dilution Factor	(DDF)	1
0	dpm of Sample from Liquid Scintillation Counter	(dm1)	987.1214
Analyst	dpm of Sample + Spike from Liquid Scintillation Counter	(dm2)	4561.488
	Background cpm	(BKG cpm)	52.65
Date	Background Time Counted in Minutes	(BKG time)	20
09/01/93	Instrument Fractional Efficiency	(EFF)	0.9312
	Detection Limit	(Ld)	8.27
	Critical Level	(Lc)	3.78
	Tc-99 Concentration in µCi/L =		4.0559E+00

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)

Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF

Detection Level = Ld * dm3 * DF * DDF / ((2220000dpm/µCi) * SS * (dm2 - dm1))

Tc-99 µCi/L = (dm1 * (1000mL/L) * dm3 * DF * DDF) / ((2220000dpm/µCi) * SS * (dm2 - dm1))

Tc-99 µCi/mL = µCi/L / (1000mL/L)

Spike (Tracer) Recovery = (dm2 - dm1) * 1.5 * 100 / dm3

			DETECTION LEVEL
Tc-99 Concentration in µCi/L	=	4.06E+00	
Tc-99 Concentration in µCi/mL	=	4.06E-03	3.40E-05 µCi/mL
Spike (Tracer) Recovery	=	65.8%	

Data Entry by:	Jennifer L. Skipper	Date:	07-Oct-93
Approved by:	J. L. Skipper	Date:	10/7/93

Form 1 Rev. 2.0

Page 1 of 1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

3-4

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8684	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Tc99	LA-438-101	uCi/ML	N1L17	0

Sample Size	Customer ID
? /ml	BLK

Remarks, Calculations, Results

REAGENT BLANK

.100ml spike #76B51

3.63E-5 µCi/mL

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/1/93	15:50 9/1/93	

54-6800-064 (10-83)

Tc-99: LA-438-101 (D-1) LIQUIDS

			BLANK
Serial No.	Spike (Tracer) Book Number		76B51
V33-8684	Activity for 100µl of Spike Added in dpm	(dm3)	8151
Batch ID	Volume of Sample in mL	(SS)	1
1566	Dilution Factor	(DF)	1
Rerun No.	Digest Dilution Factor	(DDF)	2.5
0	dpm of Sample from Liquid Scintillation Counter	(dm1)	13.78158
Analyst	dpm of Sample + Spike from Liquid Scintillation Counter	(dm2)	3501.59
	Background cpm	(BKG cpm)	52.65
Date	Background Time Counted in Minutes	(BKG time)	20
09/01/93	Instrument Fractional Efficiency	(EFF)	0.9324
	Detection Limit	(Ld)	8.25
	Critical Level	(Lc)	3.78
	Tc-99 Concentration in µCi/L =		3.6270E-02

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)

Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF

Detection Level = Ld * dm3 * DF * DDF / ((2220000dpm/µCi) * SS * (dm2 - dm1))

Tc-99 µCi/L = (dm1 * (1000mL/L) * dm3 * DF * DDF) / ((2220000dpm/µCi) * SS * (dm2 - dm1))

Tc-99 µCi/mL = µCi/L / (1000mL/L)

Spike (Tracer) Recovery = (dm2 - dm1) * 1.5 * 100 / dm3

			DETECTION LEVEL
Tc-99 Concentration in µCi/L	=	3.63E-02	
Tc-99 Concentration in µCi/mL	=	3.63E-05	2.17E-05 µCi/mL
Spike (Tracer) Recovery	=	64.2%	

Data Entry by:	Jennifer D. Shuppern	Date:	07-Oct-93
Approved by:	J.D. Shuppern	Date:	10/7/93

Form 1 Rev. 2.0

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

5-6

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8784	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Tc99	LA-438-101	uCi/ML	N1L17	0

Sample Size	Customer ID
? /ml	107APCOM

Remarks, Calculations, Results

100 ml spike #76B51

< 2.05 E-5 µCi/mL

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	D Hinitis	Eric Barber		
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/1/93	~~15:00~~ 1530 9/1/93	9/2

54-6800-06 (R-10-831)

Tc-99: LA-438-101 (D-1) LIQUIDS

			SAMPLE
Serial No.	Spike (Tracer) Book Number		76B51
V34-8784	Activity for 100µl of Spike Added in dpm	(dm3)	8151
Batch ID	Volume of Sample in mL	(SS)	1
1566	Dilution Factor	(DF)	1
Rerun No.	Digest Dilution Factor	(DDF)	2.5
0	dpm of Sample from Liquid Scintillation Counter	(dm1)	4.226216
Analyst	dpm of Sample + Spike from Liquid Scintillation Counter	(dm2)	3688.896
	Background cpm	(BKG cpm)	52.65
Date	Background Time Counted in Minutes	(BKG time)	20
09/01/93	Instrument Fractional Efficiency	(EFF)	0.9346
	Detection Limit	(Ld)	8.24
	Critical Level	(Lc)	3.78
	Tc-99 Concentration in µCi/L =	<	2.0516E-02

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)
Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF
Detection Level = Ld * dm3 * DF * DDF / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/L = (dm1 * (1000mL/L) * dm3 * DF * DDF) / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/mL = µCi/L / (1000mL/L)
Spike (Tracer) Recovery = (dm2 - dm1) * 1.5 * 100 / dm3

NOTE: Reported result is a LESS THAN value calculated from the statistical Detection Limit (Ld).

			DETECTION LEVEL
Tc-99 Concentration in µCi/L	=	< 2.05E-02	
Tc-99 Concentration in µCi/mL	=	< 2.05E-05	2.05E-05 µCi/mL
Spike (Tracer) Recovery	=	67.8%	

Data Entry by:	Jennifer L. Stuppern	Date:	07-Oct-93
Approved by:	J. L. Stuppern	Date:	10/7/93

Form 1 Rev. 2.0

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

7-8

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8884	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Tc99	LA-438-101	uCi/ML	N1L17	0

Sample Size	Customer ID
? /ml	107APCOM

Remarks, Calculations, Results

.100ml spike #76851

< 2.05 E-5 µCi/mL

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/1/93	15:30	

54-6800-061 (R 10-83)

Tc-99: LA-438-101 (D-1) LIQUIDS

			DUPLICATE
Serial No.	Spike (Tracer) Book Number		76851
V34-8884	Activity for 100µl of Spike Added in dpm	(dm3)	8151
Batch ID	Volume of Sample in mL	(SS)	1
1566	Dilution Factor	(DF)	1
Rerun No.	Digest Dilution Factor	(DDF)	2.5
0	dpm of Sample from Liquid Scintillation Counter	(dm1)	3.921983
Analyst	dpm of Sample + Spike from Liquid Scintillation Counter	(dm2)	3661.654
	Background cpm	(BKG cpm)	52.65
Date	Background Time Counted in Minutes	(BKG time)	20
09/01/93	Instrument Fractional Efficiency	(EFF)	0.9434
	Detection Limit	(Ld)	8.16
	Critical Level	(Lc)	3.78
	Tc-99 Concentration in µCi/L =	<	2.0474E-02

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)
Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF
Detection Level = Ld * dm3 * DF * DDF / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/L = (dm1 * (1000mL/L) * dm3 * DF * DDF) / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/mL = µCi/L / (1000mL/L)
Spike (Tracer) Recovery = (dm2 - dm1) * 1.5 * 100 / dm3

NOTE: Reported result is a LESS THAN value calculated from the statistical Detection Limit (Ld).

			DETECTION LEVEL
Tc-99 Concentration in µCi/L	=	< 2.05E-02	
Tc-99 Concentration in µCi/mL	=	< 2.05E-05	2.05E-05 µCi/mL
Spike (Tracer) Recovery	=	67.3%	

Data Entry by:		Date:	07-Oct-93
Approved by:		Date:	10/7/93

Form 1 Rev. 2.0

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

9-10

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8984	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Tc99	LA-438-101	% RECOVERY	N1L17	0

Sample Size	Customer ID
? /ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKED ID
SPIKE ID - 23B51
SPIKE VOLUME - .250ml
.100ml spike #76B51 107.58%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/1/93	15:30	

54-6800-061 (R-10-83)

Tc-99: LA-438-101 (D-1) LIQUIDS

			CHK EXT NO.
Serial No.	Spike (Tracer) Book Number		76B51
V34-8984	Activity for 100µl of Spike Added in dpm	(dm3)	8151
Batch ID	Volume of Sample in mL	(SS)	1
1556	Dilution Factor	(DF)	1
Rerun No.	Digest Dilution Factor	(DDF)	2.5
0	dpm of Sample from Liquid Scintillation Counter	(dm1)	990.1439
Analyst	dpm of Sample + Spike from Liquid Scintillation Counter	(dm2)	4418.85
	Background cpm	(BKG cpm)	52.65
Date	Background Time Counted in Minutes	(BKG time)	20
09/01/93	Instrument Fractional Efficiency	(EFF)	0.9339
	Detection Limit	(Ld)	8.24
	Critical Level	(Lc)	3.78
	Tc-99 Concentration in µCi/L =		2.6507E+00

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)
Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF
Detection Level = Ld * dm3 * DF * DDF / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/L = (dm1 * (1000mL/L) * dm3 * DF * DDF) / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/mL = µCi/L / (1000mL/L)
Spike (Tracer) Recovery = (dm2 - dm1) * 1.5 * 100 / dm3

(1.0603 - .0032063) (1.5/1/1) / 3.912 = 107.58%

Tc-99 Concentration in µCi/L =	2.65E+00	DETECTION LEVEL	
Tc-99 Concentration in µCi/mL =	2.65E-03	2.21E-05 µCi/mL	
Spike (Tracer) Recovery =	63.1%		

Data Entry by:		Date:	07-Oct-93
Approved by:		Date:	10/7/93

Form 1 Rev. 2.0

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

11-12

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8084	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Tc99	LA-438-101	% RECOVERY	N1L17	0

Sample Size	Customer ID
? /ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKE
DUPLICATE

SPIKE ID-73B51
SPIKE VOL-.250ml
.100ml spike #76B51

90.09%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/1/93	15:30	

54-6800-001 (R-10-83)

Tc-99: LA-438-101 (D-1) LIQUIDS

Serial No.			ERR
V34-8084	Spike (Tracer) Book Number		76B51
	Activity for 100µl of Spike Added in dpm	(dm3)	8151
Batch ID	Volume of Sample in mL	(SS)	1
1566	Dilution Factor	(DF)	1
Rerun No.	Digest Dilution Factor	(DDF)	2.5
0	dpm of Sample from Liquid Scintillation Counter	(dm1)	887.4512
Analyst	dpm of Sample + Spike from Liquid Scintillation Counter	(dm2)	4551.497
	Background cpm	(BKG cpm)	52.65
Date	Background Time Counted in Minutes	(BKG time)	20
09/01/93	Instrument Fractional Efficiency	(EFF)	0.9339
	Detection Limit	(Ld)	8.24
	Critical Level	(Lc)	3.78
	Tc-99 Concentration in µCi/L =		2.2232E+00

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)
Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF
Detection Level = Ld * dm3 * DF * DDF / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/L = (dm1 * (1000mL/L) * dm3 * DF * DDF) / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/mL = µCi/L / (1000mL/L)
Spike (Tracer) Recovery = (dm2 - dm1) * 1.5 * 100 / dm3

(88939 - .0051896) (1/.25/1/1) / 3.913 = 90.09%

Tc-99 Concentration in µCi/L	=	2.22E+00	DETECTION LEVEL
Tc-99 Concentration in µCi/mL	=	2.22E-03	2.06E-05 µCi/mL
Spike (Tracer) Recovery	=	67.4%	

Data Entry by:		Date:	07-Oct-93
Approved by:		Date:	10/7/93

Form 1 Rev. 2.0

Jm Brulle
9-2-93

USER: S ID:TC 99 PRESET TIME: 20.00 WED 01 SEP 1993 19:39
SAMPLE REPEAT: 1 CYCLE REPEAT: 1 SCP:N RS232:N
[illegible]
[illegible]
[illegible]

% MULT LABEL DPM SET UP ON 20 DEC 1991 13:14

UNKNOWN ID:TC 99 UNKNOWN REPLICATES: 1
UNKNOWN NORM FACTOR ISO1:Q 1.00000
UNKNOWN UNITS ISO1:DPM
UNKNOWN HALF LIFE CORRECTION:N
INDIVIDUAL UNKNOWN NORM FACTORS:N BACKGROUND QUENCH CURVES:Y
STANDARD ID:131B28-A 1-10 QUENCH LIMITS LOW:73.67 HIGH:207.7
HALF LIFE(DAYS) ISO1:N
STANDARD DPM ISO1:0.00000000

SAM	POS	CH	CPM	2SIG%	TIME	EL TIME	AVG H#	RCM%	[illegible]
B1	**- 1	1	52.65	6.16	20.00	20.87	138.0	1.68	

BACKGROUND QUENCH CURVES: CONSTANT

CHANNEL 1
QUENCH CURVE COEFFICIENTS
A: 52.65000 B:0.00000000 C:0.00000000 D:0.00000000000

BACKGROUND QUENCH CURVE CORRELATION TABLE

BKG	H#	MEASURED CPM.	CALCULATED CPM.	PERCENT DIFF.	FLAG
1	138.0	52.65	52.65	0.00	

BACKGROUND QUENCH LIMITS LOW:0.000 HIGH:1000.
TOTAL QUENCH LIMITS LOW:73.67 HIGH:207.7

SAM	POS	CH	CPM	2SIG%	TIME	EL TIME	AVG H#	RCM%	[illegible]
1	**- 3	1	971.85	1.43	20.00	42.25	163.0	1.63	
	ISO1	%EFF	CH1:93.12				ISO1	DPM	:987.1014
2	**- 4	1	4305.80	0.68	20.00	63.44	161.0	0.34	
	ISO1	%EFF	CH1:93.24				ISO1	DPM	:4[illegible].46M
3	**- 5	1	65.50	5.53	20.00	84.60	161.0	14.06	
	ISO1	%EFF	CH1:93.24				ISO1	DPM	:[illegible]
4	**- 6	1	3320.00	0.76	20.00	105.78	160.0	0.29	
	ISO1	%EFF	CH1:93.31				ISO1	DPM	:3501.590

AM	POS	CH	CPM	2SIG%	TIME	EL TIME	AVG HH#	RCM%	SPE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	ISO1	%EFF	CH1:[illegible]				ISO1 DPM	:[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	ISO1	%EFF	CH1:93.55				ISO1 DPM	:[illegible]	
7	**- 9	1	56.35	5.96	20.00	169.22	145.0	7.26	
	ISO1	%EFF	CH1:94.34				ISO1 DPM	:3.921983	
8	**-10	1	3472.10	0.76	20.00	190.35	159.0	0.24	
	ISO1	%EFF	CH1:93.39				ISO1 DPM	:3661.654	
9	**-11	1	977.30	1.43	20.00	211.49	159.0	0.92	
	ISO1	%EFF	CH1:93.39				ISO1 DPM	:990.1439	
10	**-12	1	4175.90	0.69	20.00	232.67	160.0	0.22	
	ISO1	%EFF	CH1:93.31				ISO1 DPM	:4413.850	
11	**- 1	1	881.40	1.51	20.00	253.85	159.0	1.00	
	ISO1	%EFF	CH1:93.39				ISO1 DPM	:887.4512	
12	**- 2	1	4325.45	0.68	20.00	274.95	153.0	0.19	
	ISO1	%EFF	CH1:93.88				ISO1 DPM	:4551.497	

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

9-10

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8984	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Tc99	LA-438-101	% RECOVERY	N1L17	0

Sample Size	Customer ID
? /ml	107APCOM

Remarks Calculations Results

SAMPLE SPIKED ID
SPIKE ID-73B51
SPIKE VOLUME-.250ml
.100ml spike #76B51 107.58%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/1/93	15:30	

54-6800-061 (R-10-83)

WHC-SD-WM-DP-053 REV 0

Tc-99: LA-438-101 (D-1) LIQUIDS

			CHK EXT NO.
Serial No.	Spike (Tracer) Book Number		76B51
V34-8984	Activity for 100µl of Spike Added in dpm	(dm3)	8151
Batch ID	Volume of Sample in mL	(SS)	1
1556	Dilution Factor	(DF)	1
Rerun No.	Digest Dilution Factor	(DDF)	2.5
0	dpm of Sample from Liquid Scintillation Counter	(dm1)	990.1439
Analyst	dpm of Sample + Spike from Liquid Scintillation Counter	(dm2)	4418.85
	Background cpm	(BKG cpm)	52.65
Date	Background Time Counted in Minutes	(BKG time)	20
09/01/93	Instrument Fractional Efficiency	(EFF)	0.9339
	Detection Limit	(Ld)	8.24
	Critical Level	(Lc)	3.78
	Tc-99 Concentration in µCi/L =		2.6507E+00

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)
Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF
Detection Level = Ld * dm3 * DF * DDF / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/L = (dm1 * (1000mL/L) * dm3 * DF * DDF) / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/mL = µCi/L / (1000mL/L)
Spike (Tracer) Recovery = (dm2 - dm1) * 1.5 * 100 / dm3

(1.0603 - .0082063) (1.5/1/1) / 3.912 = 107.58%

Tc-99 Concentration in µCi/L	=	2.65E+00	DETECTION LEVEL
Tc-99 Concentration in µCi/mL	=	2.65E-03	2.21E-05 µCi/mL
Spike (Tracer) Recovery	=	63.1%	

Data Entry by:		Date:	07-Oct-93
Approved by:		Date:	10/7/93

Form 1 Rev. 2.0

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

11-12

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8084	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Tc99	LA-438-101	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 1ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKE
DUPLICATE

SPIKE ID -73B51
SPIKE VOL-.250ml
.100ml spike #76B51

90.09%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9/1/93	15:30	

54-6800-001 (R-10-83)

WHC-SD-WM-DP-053 REV 0

Tc-99: LA-438-101 (D-1) LIQUIDS

			ERR
Serial No.	Spike (Tracer) Book Number		76B51
V34-8084	Activity for 100µl of Spike Added in dpm	(dm3)	8151
Batch ID	Volume of Sample in mL	(SS)	1
1566	Dilution Factor	(DF)	1
Rerun No.	Digest Dilution Factor	(DDF)	2.5
0	dpm of Sample from Liquid Scintillation Counter	(dm1)	887.4512
Analyst	dpm of Sample + Spike from Liquid Scintillation Counter	(dm2)	4551.497
	Background cpm	(BKG cpm)	52.65
Date	Background Time Counted in Minutes	(BKG time)	20
09/01/93	Instrument Fractional Efficiency	(EFF)	0.9339
	Detection Limit	(Ld)	8.24
	Critical Level	(Lc)	3.78
	Tc-99 Concentration in µCi/L =		2.2232E+00

Critical Level (Lc) = 2.33 * the Square Root of (BKG cpm / BKG time)
Detection Limit (Ld) = ((2.72 / BKG time) + (2 * Lc)) / EFF
Detection Level = Ld * dm3 * DF * DDF / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/L = (dm1 * (1000mL/L) * dm3 * DF * DDF) / ((2220000dpm/µCi) * SS * (dm2 - dm1))
Tc-99 µCi/mL = µCi/L / (1000mL/L)
Spike (Tracer) Recovery = (dm2 - dm1) * 1.5 * 100 / dm3

(88939 - .0031896) (1/.25 / 1/1) / 3.912 = 90.09 %

Tc-99 Concentration in µCi/L	=	2.22E+00	DETECTION LEVEL
Tc-99 Concentration in µCi/mL	=	2.22E-03	2.06E-05 µCi/mL
Spike (Tracer) Recovery	=	67.4%	

Data Entry by:	Jennifer L Skippen	Date:	07-Oct-93
Approved by:	J L Skippen	Date:	10/7/93

Form 1 Rev. 2.0

OA 41 ✓

WESTINGHOUSE HANFORD COMPANY

WHC-SD-WM-DP-053 REV 0 222-S LABORATORY

Batch 1557

ANALYTICAL BATCH

Lab Segment Serial No. V 34	Customer ID: 107 AP COM
Analysis: SR 90	Sample Prep: ACID DIGESTION

Instrument: WB - 27812	Procedure/ Rev: LA - 220-101/D-0
Technologist: TANIA BATES	Date: 9-20-93
Starting Time: 1340	Temperature 23°C
Ending Time: 1600	Chemist: S. CATLOW

Comments:

	Description	Lab ID		Description	Lab ID
1	LMCS	V32-8586	11		
2	BLK	V33-8686	12		
3	SAMPLE	V34-8786	13		
4	SAMPLE DUP.	V34-8886	14		
5	SAMPLE SPIKE	V34-8986	15		
6	SAMPLE SPIKE DUP.	V34-8086	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS	90B51/1ml			
CARRIER	39S10/1ml			
SPIKE	90B51/1ml			

985

Tania Bates

A-6000-881 (03/92)

1A

ANALYTICAL BATCH SUMMARY SHEET WHC-SD-WM-DP-053 REV 0

METHOD: LA 220-101

DATE START: SEPTEMBER 20, 1993

PREPARED BY: C. G. GRASER

DATE COMPLETE: SEPTEMBER 21, 1993

C Graser 21 SEPT 93

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD-90B51	V-32	SR-90	1.17				102.8	8.66E-3	1.1
BLANK	V-33	SR-90	3.45E-5				72.2	4.73E-5	42.5
								SLF 2-Nov-93	
107APCOM	V-34	SR-90	1.14E-4	1.22E-4	1.18E-4	7.0	~~97.1~~	4.05E-5	12.8
							~~97.1~~	5.08E-5	14.6
					SLF 2-Nov-93		* 84.2		
							* 67.1		
107APCOM	V-34 SPIKE	SR-90	1.13E+00	1.13E+00	1.13E+00	0.6	97.1		
							97.1		

NARRATIVE: [ ] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in ~~pCi~~ µci/L

CG 23 SEPT 93

* chemical yields for Sr carbonate weights

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-8586	107-4P	8- 3-93	10:44	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Sr90	LA-220-101	% RECOVERY	N1L17	0

Sample Size	Customer ID
? ml + 1ml Sr Carrier 39510	STD

Remarks, Calculations, Results 537 9-3-93

LMCS CHECK SAMPLE
LMCS ID ~~31851~~ 90851 09-9-93
Sep time : 15:15
DATE : 9-20-93

1.17 µci/L

102.8% rec.

G 8.1666
T 8.0875
~~7.6111~~ T.B.
N 0.0791 9-20-93

Darin Batin

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Eric Barein			
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-20-93	1600	C Brauer

54-6800-061 (R-10-83)

Sr-89/90 LA-220-101(D-0),102(E-0),104(D-0),105(E-1) LIQUIDS

							STANDARD
Serial No.	DETECTOR NUMBER		11	CARRIER ADDED in mL	(CVA)		1.000
V32-8586	TOTAL COUNTS	(TC)	8534	GROSS WEIGHT	(W2)		8.1666
Batch ID	COUNT TIME in MINUTES	(CT)	10	TARE WEIGHT	(W1)		8.0875
1557	BACKGROUND in cpm	(BKG)	16	NET WEIGHT	(W3)		0.0791
Rerun No.	SAMPLE VOLUME in mL	(SS)	1.000	DELTA TIME	(DT)		3
0	DILUTION FACTOR	(DF)	1	SR-90 EFFICIENCY FACTOR	(C1)		0.3919
Analyst	DIGEST DILUTION FACTOR	(DDF)	1	Y-90 EFFICIENCY FACTOR	(C2)		0.4443
	SAMPLE COUNT RATE	(Rs)	837.40	Rmax			N/A
Date	CRITICAL LEVEL	(Lc)	2.95	DETECTION LIMIT	(Ld)		6.18
09/20/93				Sr-89/90 CONCENTRATION (µCi/L)			1.1744E+00

Sample Count Rate (Rs) = (Total Counts (TC) / Count Time (CT)) - Background in cpm (BKG)

Sr-89/90 µCi/L = Rs*1000mL/L *DF*DDF/(C1 + C2 * (1 - e to the power of ((-natural log 2) / 64.2 * DT)) *SS*Rec.*2220000dpm/µCi)

NOTE: 64.2 = Half Life for Y-90 and Rec. = Fractional Carrier Recovery ((W2-W1) / (CVA x 0.1000))

Sr-89/90 µCi/mL = (Sr-89/90 µCi/L) / 1000mL/L

Relative Counting Error = The Square Root of ((TC + BKG * CT) / (TC - BKG * CT))

Percent Carrier Recovery = (Net Weight / Expected Weight) * 100

NOTE: Expected Weight = CVA * 0.1

Detection Levels and Less Than Values are determined from Procedure LA-508-002.

Sr-89/90 CONCENTRATION	=	1.17E+00	µCi/L
Sr-89/90 CONCENTRATION	=	1.17E-03	µCi/mL
RELATIVE COUNTING ERROR	=	1.1%	
PERCENT CARRIER RECOVERY	=	79.1%	

DETECTION LEVEL 8.66E-06 µCi/mL

987

Data Entry by:		Date:	21-Sep-93
Approved by:	C Brauer	Date:	21 SEPT 93

Form M1 Rev. 2.1

WHC-SD-WM-DP-053 REV 0

11/2 9-20-93 @ 1815 ΔT = 3.0

8534/10

Sr Calculation (CRPC_CAL 2.0)
By: EM ZIZELA. on 09-20-1993 at 16:52:54
Det #11 2 -inch mount Sr eff : .3919 Y eff : .4443
Sample size : 1 mL Dilution : 1 Method : 1

Sample # V-32
Mount # 1 Decay time = 3.0 hrs

8534
---------- - 16.0 = 9.2867E-01 uCi/L strontium
10

V32-8586

BEST AVAILABLE COPY

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8686	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Sr90	LA-220-101	uCi/ML	N1L17	0

Sample Size	Customer ID
? / mL + 1ml Sr Carrier 3951D	BLK

Remarks Calculations Results

REAGENT BLANK
Sep Time: 15:15
DATE: 9-20-93

G 8.1531
T 8.0809
7.6130 T.B.
N 0.07229 2.48

~~47 02~~ 20 SEPT. 93
3.45 -5 uci/mL

Darrick Bates

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Em Bella			
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
9-20-93	1600	C Green	

54-6800-061 (R-10-83)

WHC-SD-WM-DP-053 REV 0

Sr-89/90 LA-220-101(D-0),102(E-0),104(D-0),105(E-1) LIQUIDS

Serial No						BLANK
V33-8686	DETECTOR NUMBER		11	CARRIER ADDED in mL	(CVA)	1.000
	TOTAL COUNTS	(TC)	205	GROSS WEIGHT	(W2)	8.1531
Batch ID	COUNT TIME in MINUTES	(CT)	10	TARE WEIGHT	(W1)	8.0809
1557	BACKGROUND in cpm	(BKG)	16	NET WEIGHT	(W3)	0.0722
Rerun No.	SAMPLE VOLUME in mL	(SS)	1.000	DELTA TIME	(DT)	3.17
0	DILUTION FACTOR	(DF)	1	SR-90 EFFICIENCY FACTOR	(C1)	0.3919
Analyst	DIGEST DILUTION FACTOR	(DDF)	5	Y-90 EFFICIENCY FACTOR	(C2)	0.4443
	SAMPLE COUNT RATE	(Rs)	4.50	Rmax		N/A
Date	CRITICAL LEVEL	(Lc)	2.95	DETECTION LIMIT	(Ld)	6.18
09/20/93				Sr-89/90 CONCENTRATION (µCi/L)		3.4503E-02

Sample Count Rate (Rs) = (Total Counts (TC) / Count Time (CT)) - Background in cpm (BKG)
Sr-89/90 µCi/L = Rs*1000mL/L *DF*DDF/(C1 + C2 * (1 - e to the power of ((-natural log 2) / 64.2 * DT)) *SS*Rec.*2220000dpm/µCi)
NOTE: 64.2 = Half Life for Y-90 and Rec. = Fractional Carrier Recovery ((W2-W1) / (CVA x 0.1000))
Sr-89/90 µCi/mL = (Sr-89/90 µCi/L) / 1000mL/L
Relative Counting Error = The Square Root of ((TC + BKG * CT) / (TC - BKG * CT))
Percent Carrier Recovery = (Net Weight / Expected Weight) * 100
NOTE: Expected Weight = CVA * 0.1
Detection Levels and Less Than Values are determined from Procedure LA-508-002.

Sr-89/90 CONCENTRATION	=	3.45E-02	µCi/L
Sr-89/90 CONCENTRATION	=	3.45E-05	µCi/mL
RELATIVE COUNTING ERROR	=	42.5%	
PERCENT CARRIER RECOVERY	=	72.2%	

DETECTION LEVEL
4.73E-05
µCi/mL

989

Data Entry by:	CA Clark	Date:	21-Sep-93
Approved by:	C Green	Date:	21 SEPT 93

Form M1 Rev. 2.1

11/2 9-20-93 @ 1825 ΔT 3.17

Sr Calculation (CRPC_CAL 2.0)
By: EM EARELA, on 09-20-1993 at 18:53:45
Det #11 2/2 mount Sr eff : .3919 Y eff : .4443
Sample size : 1 mL Dilution : 1 Method : 1

205/10

Sample # V-33
Mount # 1 Decay time = 3.17 hrs

205
---------- 16.0 = 4.9619E-03 uCi/L strontium
10

V33 - 8686

WHC-SD-WM-DP-053 REV 0

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8786	107-AF	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Sr-90	LA-220-101	uCi/ML	N1L17	0

Sample Size	Customer ID
? / ml +1ml Sr Carrier 39 S LD	107APCOM

Remarks, Calculations, Results

SEP TIME: 15:15
DATE: 9-20-93

G 8.1864
T 8.1022
~~9.6415~~
N 0.0842 T.6 9.2.8

1.14 E-4 uCi/ml

Daniel Bates

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Em Bureau			
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-20-93	1600	C Bauer

54-6800-061 (R-10-83)

Sr-89/90 LA-220-101(D-0),102(E-0),104(D-0),105(E-1) LIQUIDS

						SAMPLE
Serial No.	DETECTOR NUMBER		11	CARRIER ADDED in mL	(CVA)	1.000
V34-8786	TOTAL COUNTS	(TC)	333	GROSS WEIGHT	(W2)	8.1864
Batch ID	COUNT TIME in MINUTES	(CT)	10	TARE WEIGHT	(W1)	8.1022
1557	BACKGROUND in cpm	(BKG)	16	NET WEIGHT	(W3)	0.0842
Rerun No.	SAMPLE VOLUME in mL	(SS)	1.000	DELTA TIME	(DT)	3.33
0	DILUTION FACTOR	(DF)	1	SR-90 EFFICIENCY FACTOR	(C1)	0.3919
Analyst	DIGEST DILUTION FACTOR	(DDF)	5	Y-90 EFFICIENCY FACTOR	(C2)	0.4443
	SAMPLE COUNT RATE	(Rs)	17.30	Rmax		N/A
Date	CRITICAL LEVEL	(Lc)	2.95	DETECTION LIMIT	(Ld)	6.18
09/20/93				Sr-89/90 CONCENTRATION (µCi/L)		1.1353E-01

Sample Count Rate (Rs) = (Total Counts (TC) / Count Time (CT)) - Background in cpm (BKG)

Sr-89/90 µCi/L = Rs*1000mL/L *DF*DDF/(C1 + C2 * (1 - e to the power of ((-natural log 2) / 64.2 * DT)) *SS*Rec.*2220000dpm/µCi)

NOTE: 64.2 = Half Life for Y-90 and Rec. = Fractional Carrier Recovery ((W2-W1) / (CVA x 0.1000))

Sr-89/90 µCi/mL = (Sr-89/90 µCi/L) / 1000mL/L

Relative Counting Error = The Square Root of ((TC + BKG * CT) / (TC - BKG * CT))

Percent Carrier Recovery = (Net Weight / Expected Weight) * 100

NOTE: Expected Weight = CVA * 0.1

Detection Levels and Less Than Values are determined from Procedure LA-508-002.

Sr-89/90 CONCENTRATION	=	1.14E-01	µCi/L
Sr-89/90 CONCENTRATION	=	1.14E-04	µCi/mL
RELATIVE COUNTING ERROR	=	12.8%	
PERCENT CARRIER RECOVERY	=	84.2%	

DETECTION LEVEL
4.05E-05 µCi/mL

991

Data Entry by:		Date:	21-Sep-93
Approved by:	C Bauer	Date:	21 SEPT 93

Form M1 Rev. 2.1

WHC-SD-WM-DP-053 REV 0

11/2 9-20-93 @ 1855 DT= 3:53

Sr Calculation (CRPC_CAL 2.0)
By: EM BARRIA, J, on 09-20-1993 at 18:54:07
Det #11 X 4 Mch count Sr eff : .3915 Y eff : .4443
Sample size : 1 xL Dilution : 1 Method : 1

333
10

Sample # V-34
Mount # 1 Decay time = 3.33 hrs

$$\frac{333}{10} \times 16.0 = 1.9118E\text{-}02 \text{ uCi/L strontium}$$

V34-8786

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8886	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Sr90	LA-220-101	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1 ml + 1 ml Sr Carrier (39511)	107APCOM

Remarks, Calculations, Results

DUPLICATE SAMPLE
SAP. TIME: 15:15
DATE: 9-20-93

G 7.4129
T 7.3458
N 0.0671 9-20-93

1.22 E-4 uCi/ml

Janice Bates

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Eric Bauer			
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
9-20-93	1600	C Green	

54-6800-061 (R-10-83)

Sr-89/90 LA-220-101(D-0),102(E-0),104(D-0),105(E-1) LIQUIDS

							DUPLICATE
Serial No.	DETECTOR NUMBER		11	CARRIER ADDED in mL	(CVA)		1.000
V34-8886	TOTAL COUNTS	(TC)	308	GROSS WEIGHT	(W2)		7.4129
Batch ID	COUNT TIME in MINUTES	(CT)	10	TARE WEIGHT	(W1)		7.3458
1557	BACKGROUND in cpm	(BKG)	16	NET WEIGHT	(W3)		0.0671
Rerun No.	SAMPLE VOLUME in mL	(SS)	1.000	DELTA TIME	(DT)		3.5
0	DILUTION FACTOR	(DF)	1	SR-90 EFFICIENCY FACTOR	(C1)		0.3919
Analyst	DIGEST DILUTION FACTOR	(DDF)	5	Y-90 EFFICIENCY FACTOR	(C2)		0.4443
	SAMPLE COUNT RATE	(Rs)	14.80	Rmax			N/A
Date	CRITICAL LEVEL	(Lc)	2.95	DETECTION LIMIT	(Ld)		6.18
09/20/93				Sr-89/90 CONCENTRATION (µCi/L)			1.2165E-01

Sample Count Rate (Rs) = (Total Counts (TC) / Count Time (CT)) - Background in cpm (BKG)

Sr-89/90 µCi/L = Rs*1000mL/L *DF*DDF/(C1 + C2 * (1 - e to the power of ((-natural log 2) / 64.2 * DT)) *SS*Rec.*2220000dpm/µCi)

NOTE: 64.2 = Half Life for Y-90 and Rec. = Fractional Carrier Recovery ((W2-W1) / (CVA x 0.1000))

Sr-89/90 µCi/mL = (Sr-89/90 µCi/L) / 1000mL/L

Relative Counting Error = The Square Root of ((TC + BKG * CT) / (TC - BKG * CT))

Percent Carrier Recovery = (Net Weight / Expected Weight) * 100

NOTE: Expected Weight = CVA * 0.1

Detection Levels and Less Than Values are determined from Procedure LA-508-002.

Sr-89/90 CONCENTRATION	=	1.22E-01	µCi/L
Sr-89/90 CONCENTRATION	=	1.22E-04	µCi/mL
RELATIVE COUNTING ERROR	=	14.6%	
PERCENT CARRIER RECOVERY	=	67.1%	

DETECTION LEVEL
5.08E-05 µCi/mL

993

Date Entry by:		Date:	21-Sep-93
Approved by:	C Green	Date:	21 SEPT. 93

Form M1 Rev. 2.1

11/2 9-20-93 @1545 DE 3-50.

Sr Calculation (CRPC_CAL 2.0)
By: EM BARELA on 09-20-1993 at 16:54:28
Det #11 2"-inch count Sr eff : .3919 Y eff : .4443
Sample size : 1 mL Dilution : 1 Method : 1

308
10

Sample # V-34
Mount # 1 Decay time = 3.50 hrs

308
---------- - 16.0 = 1.6323E-02 uCi/L strontium
10

V34-8886

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STRONTIUM 90 ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8986	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Sr90	LA-220-101	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 1 mL + 1 mL ~~31851~~ 90851 + 1 mL Sr Carrier 39510	107APCOM

Remarks Calculations Results

SAMPLE SPIKED ID
SPIKE ID ~~31851~~ T.B 9-20-93 90851
SPIKE VOLUME 1 mL
SEP TIME: 15:25
DATE: 9-20-93

G 7.4353
T 7.3525
~~9.6094~~ T.B
N 0.0828 9-20-93

$$\frac{(1.1278 - 1.1353E^{-1/5})(100)}{1.1378} = \cancel{89.1\%}$$

97.1%

Dania Batio

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Em Baeza			
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
9-20-93	1600	C Bruser	

54-6800-061 (R-10-83)

11/2 9-20-93 @ 1900 ΔT = 3.58

8634/10

Sr Calculation (CRPC_CAL 2.0)
By: EM BAEZA, 62820, on 09-20-1993 at 19:17:44
Det #11 2 -inch mount Sr eff : .3919 Y eff : .4443
Sample size : 1 mL Dilution : 1 Method : 1

Sample # V-34
Mount # 1 Decay time = 3.58 hrs

$$\frac{8634}{10} - 16.0 = \frac{9.3378E-01 \text{ uCi/L strontium}}{(108.28 \times 10)} = 1.1278$$

V34-8986

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STRONTIUM 90 ANALYSIS - ACID DIGESTION

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8086	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Sr90	LA-220-101	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 1ml +1ml ~~31851~~ 90851 (Sr94-2) +1ml SrCarrier 39510	107APCOM

Remarks Calculations Results

SAMPLE SPIKE
DUPLICATE

SPIKE ID ~~31851~~ 90851 T.B. 9-20-93
SPIKE VOL 1ml
SEP TIME: 15:25
DATE: 9-20-93

G 7.4271
T 7.3432
7.6338 T.B.
N 0.0839 9-20-93

$\frac{(1.1295 - .12165/5)}{1.1378}(100)$ CDC 9/21/93 ~~88.6%~~ 97.1%

Danica Bates

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-20-93	1600	

54-6800-061 (R-10-83)

11/2 9-20-93 @ 1910 ΔT = 3.75

8776 / 10 = 16.9

Sr Calculation (CRPC_CAL 2.0)
By: EM BARELA, 62820, on 09-20-1993 at 19:17:17
Det #11 2 -inch mount Sr eff : .3919 Y eff : .4443
Sample size : 1 mL Dilution : 1 Method : 1

Sample # V-34
Mount # 1 Decay time = 3.75 hrs

$$\frac{8776}{10} - 16.0 = \frac{9.4761E\text{-}01 \text{ uCi/L strontium}}{.839} =$$

V34-8086

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WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

Batch 1546

ANALYTICAL BATCH

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. V34	Customer ID: 107APCom
Analysis: I129	Sample Prep: direct

Instrument:	WB27818 WC16085	Procedure/ Rev:	LA-378-103 (B-2)
Technologist:	SUE LAI (Sue Lai)	Date:	8-11-93
Starting Time:	13:00 8-11-93	Temperature	25 c
Ending Time:	15:20 8-12-93	Chemist:	S. Cilos

Comments:

	Description	Lab ID		Description	Lab ID
1	STD	V32-5585	11		
2	BLK	V33-5685	12		
3	Sample	V34-5785	13		
4	Duplicate Sample	V34-5885	14		
5	Sample + spike	V34-5985	15		
6	Duplicate + spike	V34-5085	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS	63B51 (1ml)			
spike	63B51 (1ml)			

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-378-103

DATE START: Aug 12, 1993

PREPARED BY: K Kawabata

DATE COMPLETE: Aug 13, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD 63B51	V32	I-129	8.01E-1				102.2		5.0
BLANK	V33	I-129	<3.81E-5						
107APCOM	V34	I-129	<4.35E-5	<3.57E-5	N/A	N/A		3.81E-5	N/A
									N/A
107APCOM	V34/Spike	I-129	7.43E-4	7.31E-4	7.37E-4	1.6	94.8	3.81E-5	5.4
							93.3		5.6

NARRATIVE: [X] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

6559 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-5585	107-AP	8- 3-93	10:44	25

Determination	Method Standard	Result Units	Charge Code	Reruns
I129	LA-378-103	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 1 ml	STD

Remarks Calculations Results

EDP S928 ITANK
STD# 63B51 RESULT
STD VAL. .7835 %REC
GROSS WT. 2.7912
TARE WT. 2.7668
NET WT. 0.0244

$\left(\frac{0.0244}{0.7835}\right)(100\%) = 102.2\%$

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Eric Barcelo			
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Mgr		
8-12-93	15:22			

54-6800-063 (R-10-83)

B-2 SL 12-13-93

I-129: LA-378-103 ~~(B-1)~~ LIQUIDS

Serial No.			STANDARD
V32-5585	Gross Weight	(wt2)	2.7912
	Tare Weight	(wt1)	2.7668
Batch ID	Mass Precipitate	(net wt)	0.0244
1546	I-129 µCi / Sample from GEA	(I-129 GEA)	6.41E-4
Rerun No.	Sample Volume in mL	(SS)	1
0	Dilution Factor	(DF)	1
Analyst	Digest Dilution Factor	(DDF)	1
	Carrier Fractional Recovery	(Rec)	0.8000
Date			
08/13/93	IODINE 129 =	8.01E-01	µCi/L

The carrier solution contains 0.281131 gm's of KI/mL. One mL of the solution is equivalent to 0.0305 grams.

$$\text{Carrier Percent Recovery} = \frac{(wt2-wt1)(100)}{0.0305}$$

$$\text{I-129 } \mu Ci/L = \frac{(\text{I-129 GEA})(1000\,mL/L)(DF)(DDF)}{(Rec)(SS)} \qquad \mu Ci/mL = \frac{\mu Ci/L}{1000\,mL/L}$$

IODINE 129 = 8.01E-04 µCi/mL

CARRIER PERCENT RECOVERY = 80.0%

Data Entry by:		Date:	13-Aug-93
Approved by:		Date:	13 AUG 93

Form 1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

6560

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-5685	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
I129	LA-378-103	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1 ml	BLK

Remarks, Calculations Results

REAGENT BLANK

COUNT AS uCI/L

Gross: 2.7984

Tare: 2.7738

net: 0.0246

<3.81E-5

Sue Li

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-12-93	15:20	

54-6800-061 (8-10-83)

(B-2) SL. 12-13-93

I-129: LA-378-103 ~~(B-1)~~ LIQUIDS

Serial No.			BLANK
V33-5685	Gross Weight	(wt2)	2.7984
Batch ID	Tare Weight	(wt1)	2.7738
1546	Mass Precipitate	(net wt)	0.0246
Rerun No.	I-129 µCi / Sample from GEA	(I-129 GEA)	<3.07E-5
0	Sample Volume in mL	(SS)	1
Analyst	Dilution Factor	(DF)	1
	Digest Dilution Factor	(DDF)	1
	Carrier Fractional Recovery	(Rec)	0.8066
Date			
08/13/93	IODINE 129 = < 3.81E-02 µCi/L		

The carrier solution contains 0.281131 gm's of KI/mL. One mL of the solution is equivalent to 0.0305 grams.

$$\text{Carrier Percent Recovery} = \frac{(wt2-wt1)\,(100)}{0.0305}$$

$$\text{I-129 } \mu Ci/L = \frac{(\text{I-129 GEA})\,(1000mL/L)\,(DF)\,(DDF)}{(Rec)\,(SS)} \qquad \mu Ci/mL = \frac{\mu Ci/L}{1000mL/L}$$

IODINE 129 = < 3.81E-05 µCi/mL

CARRIER PERCENT RECOVERY = 80.7%

Data Entry by:		Date:	13-Aug-93
Approved by:		Date:	13 Aug 93

Form 1 Rev. 1.1

1000

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

6561 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5785	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
I129	LA-378-103	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1ml	107APCOM

Remarks, Calculations Results

COUNT AS uCI/L

Gross: 2.8113

Tare: 2.7873

~~0.0240~~ 10-20-93

net: 0.0240

<4.35E-5

Sue Li

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst 5
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Mgr		
8-12-93	15:20			

54-6800-081 (R-10-83)

(B-2) SL. 12-13-93

I-129: LA-378-103 (B-1) LIQUIDS

			SAMPLE
Serial No.	Gross Weight	(wt2)	2.8113
V34-5785	Tare Weight	(wt1)	2.7873
Batch ID	Mass Precipitate	(net wt)	0.024
1546	I-129 µCi / Sample from GEA	(I-129 GEA)	<3.42E-5
Rerun No.	Sample Volume in mL	(SS)	1
0	Dilution Factor	(DF)	1
Analyst	Digest Dilution Factor	(DDF)	1
	Carrier Fractional Recovery	(Rec)	0.7869
Date			
08/13/93	IODINE 129 = < 4.35E-02 µCi/L		

The carrier solution contains 0.281131 gm's of KI/mL. One mL of the solution is equivalent to 0.0305 grams.

$$\text{Carrier Percent Recovery} = \frac{(wt2-wt1)\,(100)}{0.0305}$$

$$\text{I-129 } \mu Ci/L = \frac{(\text{I-129 GEA})\,(1000\,mL/L)\,(DF)\,(DDF)}{(Rec)\,(SS)} \qquad \mu Ci/mL = \frac{\mu Ci/L}{1000\,mL/L}$$

IODINE 129 = < 4.35E-05 µCi/mL

CARRIER PERCENT RECOVERY = 78.7%

1001

Data Entry by:		Date:	13-Aug-93
Approved by:		Date:	13 Aug 93

Form 1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

6562 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5885	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
I129	LA-378-103	uCi/ML	N1L17	0

Sample Size	Customer ID
? 1 ml	107APCOM

Remarks, Calculations, Results

DUPLICATE SAMPLE

COUNT AS uCI/L

Gross: 2.7749

Tare: 2.7497

net: 0.0252

<3.57E-5

Sue Li

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Em Bowles			
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-12-93	15:	

54-6800-061 (R-10-83)

(B-2) SL. 12-13-93

I-129: LA-378-103 ~~(B-1)~~ LIQUIDS

			DUPLICATE
Serial No.	Gross Weight	(wt2)	2.7749
V34-5885	Tare Weight	(wt1)	2.7497
Batch ID	Mass Precipitate	(net wt)	0.0252
1546	I-129 µCi / Sample from GEA	(I-129 GEA)	<2.95E-5
Rerun No.	Sample Volume in mL	(SS)	1
0	Dilution Factor	(DF)	1
Analyst	Digest Dilution Factor	(DDF)	1
	Carrier Fractional Recovery	(Rec)	0.8262
Date			
08/13/93	IODINE 129 = < 3.57E-02 µCi/L		

The carrier solution contains 0.281131 gm's of KI/mL. One mL of the solution is equivalent to 0.0305 grams.

$$\text{Carrier Percent Recovery} = \frac{(wt2-wt1)(100)}{0.0305}$$

$$\text{I-129 } \mu Ci/L = \frac{(\text{I-129 GEA})(1000 mL/L)(DF)(DDF)}{(Rec)(SS)} \qquad \mu Ci/mL = \frac{\mu Ci/L}{1000 mL/L}$$

IODINE 129 = < 3.57E-05 µCi/mL

CARRIER PERCENT RECOVERY = 82.6%

1002

Data Entry by:		Date:	13-Aug-93
Approved by:		Date:	13 AUG 93

Form 1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

6563 — WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5985	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
I129	LA-378-103	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 1ml	107APCOM

Remarks Calculations Results

SAMPLE SPIKED ID

SPIKE ID 13B5

SPIKE VOLUME 1ml

COUNT AS uCI/L

Gross 2.7978

Tare 2.7740

Net: 0.0238

$\left(\frac{0.7477}{0.7835}\right)100\% = 94.89\%$

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst 5
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Mgr		
8-12-93	15:20			

54-6800-061 (R-10-83)

(B-2) SL. 12-13-93

I-129: LA-378-103 ~~(B-1)~~ LIQUIDS

			CHK EXT NO.
Serial No.	Gross Weight	(wt2)	2.7978
V34-5985	Tare Weight	(wt1)	2.774
Batch ID	Mass Precipitate	(net wt)	0.0238
1546	I-129 µCi / Sample from GEA	(I-129 GEA)	5.8E-4
Rerun No.	Sample Volume in mL	(SS)	1
0	Dilution Factor	(DF)	1
Analyst	Digest Dilution Factor	(DDF)	1
	Carrier Fractional Recovery	(Rec)	0.7803
Date			
08/13/93	IODINE 129 =	7.43E-01	µCi/L

The carrier solution contains 0.281131 gm's of KI/mL. One mL of the solution is equivalent to 0.0305 grams.

$$\text{Carrier Percent Recovery} = \frac{(wt2-wt1)\,(100)}{0.0305}$$

$$\text{I-129 } \mu Ci/L = \frac{(\text{I-129 GEA})\,(1000\text{mL/L})\,(DF)\,(DDF)}{(Rec)\,(SS)} \qquad \mu Ci/mL = \frac{\mu Ci/L}{1000\text{mL/L}}$$

IODINE 129 = 7.43E-04 µCi/mL

CARRIER PERCENT RECOVERY = 78.0%

1003

Data Entry by:		Date:	13-Aug-93
Approved by:		Date:	13 AUG 93

Form 1 Rev. 1.1

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

6564

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-5085	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
I129	LA-378-103	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 1 ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKE DUPLICATE

SPIKE ID 63B51

SPIKE VOL 1 ml

$\left(\frac{0.731}{0.7833}\right)(100\%) = 93.3\%$

Gross 2.8013

Tare 2.7778

net 0.0235

Sue Lai

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	D. Williams			
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-12-93	15:20	

54-6800-061 (R-10-88)

(B-2) SL 12-13-93

I-129: LA-378-103 ~~(B-1)~~ LIQUIDS

Serial No.			ERR
V34-5085	Gross Weight	(wt2)	2.8013
Batch ID	Tare Weight	(wt1)	2.7778
1546	Mass Precipitate	(net wt)	0.0235
Rerun No.	I-129 µCi / Sample from GEA	(I-129 GEA)	5.63E-4
0	Sample Volume in mL	(SS)	1
Analyst	Dilution Factor	(DF)	1
	Digest Dilution Factor	(DDF)	1
	Carrier Fractional Recovery	(Rec)	0.7705
Date			
08/13/93	IODINE 129 =	7.31E-01 µCi/L	

The carrier solution contains 0.281131 gm's of KI/mL. One mL of the solution is equivalent to 0.0305 grams.

$$\text{Carrier Percent Recovery} = \frac{(wt2-wt1)\,(100)}{0.0305}$$

$$\text{I-129 } \mu Ci/L = \frac{(\text{I-129 GEA})\,(1000\,mL/L)\,(DF)\,(DDF)}{(Rec)\,(SS)} \qquad \mu Ci/mL = \frac{\mu Ci/L}{1000\,mL/L}$$

IODINE 129 = 7.31E-04 µCi/mL

CARRIER PERCENT RECOVERY = 77.0%

1004

Data Entry by:		Date:	13-Aug-93
Approved by:		Date:	13 AUG 93

Form 1 Rev. 1.1

Em Lucela
8-12-93

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* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                   *
*            G A M M A   S P E C T R U M   A N A L Y S I S          *
*                                                                   *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

12-AUG-9320:11:51

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 2 / ADC UNIT NUMBER: 4.0
DETECTOR NUMBER: 6 / GEOMETRY NUMBER: 1
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 95.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER AN1:
ANALYZED BY:

SAMPLE DESCRIPTION: V-32-5585
GEOMETRY DESCRIPTION: I-129/CULTURE TUBE
SAMPLE SIZE: 1.0000E+00 EA / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL129

COLLECT STARTED ON 12-AUG-93 AT 19:21:40

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 21-JUN-90
EFFICIENCY CALIBRATION PERFORMED 18-JUN-90

SIGNATURE ABOVE REPRESENTS CHEMICAL TECHNOLOGIST/CHEMIST THAT COMPLETED/VERIFIED THE CALIBRATION/ANALYSIS ON PAGES 1005 TO ____.

12-AUG-9320:11:51

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1C	149.24	29.71	1.65	1266.	20591.	2.4	
2C	162.55	32.37	1.65	1185.	695.	39.4	CE-144
3C	169.75	33.81	1.65	1140.	4045.	8.1	CE-144
4	199.19	39.69	1.52	528.	2780.	5.0	I-129,BI-212, CE-144
5C	3309.61	662.27	2.28	33.	2210.	4.3	CS-137

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 95.0%

C - MULTIPLET ANALYSIS CONVERGED NORMALLY

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0024
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 5-JUN-90 AT 13:00:00
BACKGROUND LIVE TIME: 3000. SECONDS
BACKGROUND WAS INSIGNIFICANT

12-AUG-9320:11:51

SAMPLE: V-32-5585
DATA COLLECTED ON 12-AUG-93 AT 19:21:40
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/EA MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<2.75E-06		LLD<2.75E-06		59.54	
AM-243	LLD<1.21E-06		LLD<1.21E-06		74.67	
I-129	6.41E-04	+-3.18E-05	6.41E-04	+-3.18E-05	39.60	0.09
SB-125	LLD<2.50E-05		LLD<2.50E-05		176.33	
SE-75	LLD<2.14E-06		LLD<2.14E-06		136.00	
SN-113	LLD<6.33E-06		LLD<6.33E-06		391.67	
TOTAL	6.41E-04	+-3.18E-05	6.41E-04	+-3.18E-05		

EBAR = ***** MEV/DISINTEGRATION
MAXIMUM PERMISSABLE ACTIVITY = 5.77E-03 UC/EA
TOTAL MEASURED ACTIVITY = 6.41E-04 (+-3.18E-05) UC/EA
% TECH. SPEC. = 11.12 (+-0.55)

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 95.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
149.24	29.71	20591.	2.4	2.83E+01
162.55	32.37	695.	39.4	7.35E-01
169.75	33.81	4045.	8.1	3.79E+00
3309.61	662.27	2210.	4.3	9.46E+00

Em Barela

8-12-93

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*          G A M M A   S P E C T R U M   A N A L Y S I S            *
*                                                                   *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE **WHC-SD-WM-DP-053 REV 0**

12-AUG-9321:08:13

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 2 / ADC UNIT NUMBER: 4.0
DETECTOR NUMBER: 6 / GEOMETRY NUMBER: 1
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 95.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER AN1:
A ZED BY:

SAMPLE DESCRIPTION: V-33-5685
GEOMETRY DESCRIPTION: I-129/CULTURE TUBE
SAMPLE SIZE: 1.0000E+00 EA / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL129

COLLECT STARTED ON 12-AUG-93 AT 20:18:04

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 21-JUN-90
EFFICIENCY CALIBRATION PERFORMED 18-JUN-90

12-AUG-9321:08:13

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1C	3309.48	662.25	1.80	24.	2114.	4.4	CS-137

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 95.0%

C - MULTIPLET ANALYSIS CONVERGED NORMALLY

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0024
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 5-JUN-90 AT 13:00:00
BACKGROUND LIVE TIME: 3000. SECONDS
BACKGROUND WAS INSIGNIFICANT

12-AUG-9321:08:13

S E: V-33-5685
DATA COLLECTED ON 12-AUG-93 AT 20:18:04
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/EA MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<2.56E-06		LLD<2.56E-06		59.54	
AM-243	LLD<1.29E-06		LLD<1.29E-06		74.67	
I-129	LLD<3.07E-05		LLD<3.07E-05		39.60	
SB-125	LLD<2.50E-05		LLD<2.50E-05		176.33	
SE-75	LLD<1.95E-06		LLD<1.95E-06		136.00	
SN-113	LLD<4.62E-06		LLD<4.62E-06		391.67	
TOTAL	0.00E-01	+-0.00E-01	0.00E-01	+-0.00E-01		

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 95.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
3309.48	662.25	2114.	4.4	9.05E+00

Em Barela
8-12-93

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*          G A M M A   S P E C T R U M   A N A L Y S I S            *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

12-AUG-9322:09:44

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 2 / ADC UNIT NUMBER: 4.0
DETECTOR NUMBER: 6 / GEOMETRY NUMBER: 1
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 95.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER AN1:
ANALYZED BY:

SAMPLE DESCRIPTION: V-34-5785
GEOMETRY DESCRIPTION: I-129/CULTURE TUBE
SAMPLE SIZE: 1.0000E+00 EA / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL129

COLLECT STARTED ON 12-AUG-93 AT 21:19:32

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 21-JUN-90
EFFICIENCY CALIBRATION PERFORMED 18-JUN-90

12-AUG-9322:09:44

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1C	3309.07	662.17	1.67	16.	2044.	4.4	CS-137

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 95.0%

C - MULTIPLET ANALYSIS CONVERGED NORMALLY

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0024
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 5-JUN-90 AT 13:00:00
BACKGROUND LIVE TIME: 3000. SECONDS
BACKGROUND WAS INSIGNIFICANT

SAMPLE: V-34-5785
DATA COLLECTED ON 12-AUG-93 AT 21:19:32
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/EA MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<2.54E-06		LLD<2.54E-06		59.54	
AM-243	LLD<1.32E-06		LLD<1.32E-06		74.67	
I-129	LLD<3.42E-05		LLD<3.42E-05		39.60	
SB-125	LLD<2.19E-05		LLD<2.19E-05		176.33	
SE-75	LLD<2.08E-06		LLD<2.08E-06		136.00	
SN-113	LLD<6.00E-06		LLD<6.00E-06		391.67	
TOTAL	0.00E-01	+-0.00E-01	0.00E-01	+-0.00E-01		

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 95.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
3309.07	662.17	2044.	4.4	8.75E+00

Em Barela
8-12-93

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*                                                                     *
          G A M M A   S P E C T R U M   A N A L Y S I S               *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

12-AUG-9323:07:25

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 2 / ADC UNIT NUMBER: 4.0
DETECTOR NUMBER: 6 / GEOMETRY NUMBER: 1
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 95.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER AN1:
ALYZED BY:

SAMPLE DESCRIPTION: V-34-5885
GEOMETRY DESCRIPTION: I-129/CULTURE TUBE
SAMPLE SIZE: 1.0000E+00 EA / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL129

COLLECT STARTED ON 12-AUG-93 AT 22:17:15

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 21-JUN-90
EFFICIENCY CALIBRATION PERFORMED 18-JUN-90

12-AUG-9323:07:25

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
1	161.77	32.21	1.37	306.	573.	14.8	CE-144
2C	3304.76	661.30	1.33	15.	526.	39.3	CS-137
3C	3309.66	662.28	1.33	15.	1547.	14.5	CS-137
4C	3315.12	663.38	1.33	15.	321.	51.1	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 95.0%

C - MULTIPLET ANALYSIS CONVERGED NORMALLY

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0024
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 5-JUN-90 AT 13:00:00
BACKGROUND LIVE TIME: 3000. SECONDS
BACKGROUND WAS INSIGNIFICANT

S. E: V-34-5885
DATA COLLECTED ON 12-AUG-93 AT 22:17:15
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/EA MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<2.60E-06		LLD<2.60E-06		59.54	
AM-243	LLD<1.19E-06		LLD<1.19E-06		74.67	
I-129	LLD<2.95E-05		LLD<2.95E-05		39.60	
SB-125	LLD<2.41E-05		LLD<2.41E-05		176.33	
SE-75	LLD<2.14E-06		LLD<2.14E-06		136.00	
SN-113	LLD<6.33E-06		LLD<6.33E-06		391.67	
TOTAL	0.00E-01	+-0.00E-01	0.00E-01	+-0.00E-01		

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 95.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
161.77	32.21	573.	14.8	6.14E-01
3304.76	661.30	526.	39.3	2.25E+00
3309.66	662.28	1547.	14.5	6.62E+00
3315.12	663.38	321.	51.1	1.38E+00

8-13-93

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*                                                                     *
*          G A M M A   S P E C T R U M   A N A L Y S I S              *
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CANBERRA SPECTRAN-F V2.06 SOFTWARE

13-AUG-9300:02:53

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 2 / ADC UNIT NUMBER: 4.0
DETECTOR NUMBER: 6 / GEOMETRY NUMBER: 1
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 95.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER AN1:
ANALYZED BY:

SAMPLE DESCRIPTION: V-34-5985
GEOMETRY DESCRIPTION: I-129/CULTURE TUBE
SAMPLE SIZE: 1.0000E+00 EA / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL129

COLLECT STARTED ON 12-AUG-93 AT 23:12:41

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3003. SECONDS
DEAD TIME: 0.10 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 21-JUN-90
EFFICIENCY CALIBRATION PERFORMED 18-JUN-90

13-AUG-9300:02:53

P E A K A N A L Y S I S

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
PEAK AT CHANNEL 134.2 DROPPED FROM MULTIPLET ANALYSIS							
1?	149.22	29.70	1.67	1140.	19444.	2.2	
2?	169.14	33.69	1.67	1081.	4202.	7.2	CE-144
3	200.02	39.86	1.43	536.	2513.	5.4	I-129,BI-212, CE-144
4C	3305.37	661.42	1.52	11.	442.	72.0	CS-137
5C	3309.47	662.25	1.52	9.	1367.	24.4	CS-137
6C	3314.58	663.27	1.52	6.	265.	90.6	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 95.0%

C - MULTIPLET ANALYSIS CONVERGED NORMALLY
? - MULTIPLET ANALYSIS CONVERGED BUT GFIT > 4

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0024
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 5-JUN-90 AT 13:00:00
BACKGROUND LIVE TIME: 3000. SECONDS
B' GROUND WAS INSIGNIFICANT

13-AUG-9300:02:53

SAMPLE: V-34-5985
DATA COLLECTED ON 12-AUG-93 AT 23:12:41
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/EA MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<2.40E-06		LLD<2.40E-06		59.54	
AM-243	LLD<1.14E-06		LLD<1.14E-06		74.67	
I-129	5.80E-04	+-3.13E-05	5.80E-04	+-3.13E-05	39.60	0.26
SB-125	LLD<2.52E-05		LLD<2.52E-05		176.33	
SE-75	LLD<2.11E-06		LLD<2.11E-06		136.00	
SN-113	LLD<5.89E-06		LLD<5.89E-06		391.67	
TOTAL	5.80E-04	+-3.13E-05	5.80E-04	+-3.13E-05		

EBAR = ***** MEV/DISINTEGRATION
MAXIMUM PERMISSABLE ACTIVITY = 5.77E-03 UC/EA
TOTAL MEASURED ACTIVITY = 5.80E-04 (+-3.13E-05) UC/EA
% TECH. SPEC. = 10.05 (+-0.54)

ERROR QUOTATION AT 1.96 SIGMA
LLD CONFIDENCE LEVEL AT 95.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
149.22	29.70	19444.	2.2	2.68E+01
169.14	33.69	4202.	7.2	3.97E+00
3305.37	661.42	442.	72.0	1.89E+00
3309.47	662.25	1367.	24.4	5.85E+00
3314.58	663.27	265.	90.6	1.13E+00

D. H. Mitchell
8-13-93

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                   *
*            G A M M A   S P E C T R U M   A N A L Y S I S          *
*                                                                   *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

CANBERRA SPECTRAN-F V2.06 SOFTWARE

WHC-SD-WM-DP-053 REV 0

13-AUG-9301:03:34

A N A L Y S I S P A R A M E T E R S

MCA UNIT NUMBER: 2 / ADC UNIT NUMBER: 4.0
DETECTOR NUMBER: 6 / GEOMETRY NUMBER: 1
SPECTRUM SIZE: 4096 CHANNELS
ORDER OF SMOOTHING FUNCTION: 5
NUMBER OF BACKGROUND CHANNELS: 4 ON EACH SIDE OF PEAK
PEAK CONFIDENCE FACTOR: 95.0%
IDENTIFICATION ENERGY WINDOW: +- 1.50 KEV
ERROR QUOTATION: 1.96 SIGMA UNCERTAINTY

ENVIRONMENTAL BACKGROUND SUBTRACTED
LLD CALCULATION PERFORMED
MEASURED ENERGY DIFFERENCES LISTED
MULTIPLET ANALYSIS PERFORMED

SPECTRAL DATA READ DIRECTLY FROM MULTICHANNEL ANALYZER AN1:
ANALYZED BY:

SAMPLE DESCRIPTION: V-34-5085
GEOMETRY DESCRIPTION: I-129/CULTURE TUBE
SAMPLE SIZE: 1.0000E+00 EA / CONVERSION FACTOR: 1.0000E+00
STANDARD SIZE: 1.0000E+00 EA
ANALYSIS LIBRARY FILE: ANL129

COLLECT STARTED ON 13-AUG-93 AT 00:13:25

COLLECT LIVE TIME: 3000. SECONDS
REAL TIME: 3002. SECONDS
DEAD TIME: 0.07 %

DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT

ENERGY CALIBRATION PERFORMED 21-JUN-90
EFFICIENCY CALIBRATION PERFORMED 18-JUN-90

13-AUG-9301:03:34

P E A K A N A L Y S I S WHC-SD-WM-DP-053 REV 0

PK	CENTROID CHANNEL	ENERGY KEV	FWHM KEV	BACKGND COUNTS	NET AREA COUNTS	ERROR %	NUCLIDES
PEAK AT CHANNEL 161.2 DROPPED FROM MULTIPLET ANALYSIS							
1?	149.17	29.70	1.67	1296.	18782.	2.3	
2?	169.26	33.71	1.67	1122.	4322.	7.1	CE-144
3	199.13	39.68	1.45	588.	2442.	5.6	I-129,BI-212, CE-144
4$	3306.26	661.60	1.47	20.	823.	48.3	CS-137
5$	3310.66	662.48	1.47	20.	1152.	35.8	CS-137
6$	3316.23	663.60	1.47	19.	178.	150.7	

ERROR QUOTATION AT 1.96 SIGMA
PEAK CONFIDENCE LEVEL AT 95.0%

$ - MULTIPLET ANALYSIS CONVERGED DUE TO LACK OF CHI-SQ IMPROVEMENT
? - MULTIPLET ANALYSIS CONVERGED BUT GFIT > 4

BACKGROUND SUBTRACTION PERFORMED USING FILE BK0024
BACKGROUND DESCRIPTION: BKG
BACKGROUND COLLECT STARTED ON 5-JUN-90 AT 13:00:00
BACKGROUND LIVE TIME: 3000. SECONDS
BACKGROUND WAS INSIGNIFICANT

13-AUG-9301:03:34

S 'E: V-34-5085
D. . COLLECTED ON 13-AUG-93 AT 00:13:25
DECAYED TO 0. DAYS, 0.0000 HOURS BEFORE THE START OF COLLECT.

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

NUCLIDE	ACTIVITY CONCENTRATION IN uCi/EA MEASURED	ERROR	DECAY CORRECTED	ERROR	ENERGY COMPARISON (KEV) EXPECT	DIFF
AM-241	LLD<2.30E-06		LLD<2.30E-06		59.54	
AM-243	LLD<1.24E-06		LLD<1.24E-06		74.67	
I-129	5.63E-04	+-3.15E-05	5.63E-04	+-3.15E-05	39.60	0.08
SB-125	LLD<2.69E-05		LLD<2.69E-05		176.33	
SE-75	LLD<2.17E-06		LLD<2.17E-06		136.00	
SN-113	LLD<7.12E-06		LLD<7.12E-06		391.67	
TOTAL	5.63E-04	+-3.15E-05	5.63E-04	+-3.15E-05		

EBAR = ***** MEV/DISINTEGRATION
MAXIMUM PERMISSABLE ACTIVITY = 5.77E-03 UC/EA
TOTAL MEASURED ACTIVITY = 5.63E-04 (+-3.15E-05) UC/EA
% TECH. SPEC. = 9.76 (+-0.55)

ERROR QUOTATION AT 1.96 SIGMA
L' ' CONFIDENCE LEVEL AT 95.0%

PEAKS NOT USED IN ANALYSIS

CENTROID CHANNEL	ENERGY KEV	NET AREA COUNTS	ERROR %	GAMMAS/SEC
149.17	29.70	18782.	2.3	2.59E+01
169.26	33.71	4322.	7.1	4.08E+00
3306.26	661.60	823.	48.3	3.52E+00
3310.66	662.48	1152.	35.8	4.93E+00
3316.23	663.60	178.	150.7	7.62E-01

NEQA ✓ 37

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH

Batch 1555

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. 11-34	Customer ID: 100 HP Com
Analysis: NP 237	Sample Prep: Direct

Instrument: NA	Procedure/ Rev: LA-933-141-14-0
Technologist: Bill Syth	Date: 9-2-93
Starting Time: 0800	Temperature NA
Ending Time: 1500	Chemist: Stan Cotton

Comments: Bill Syth responded with an affirmative on running this batch on the direct rather than the acid digest. Larry Fitts

	Description	Lab ID		Description	Lab ID
1	STP	11-32-8583	11		
2	BLANK	11-33-8633	12		
3	SAM	11-34-8783	13		
4	DUP	11-34-8883	14		
5	SPIKE	11-34-8983	15		
6	SPIKE DUP	11-34-8883	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCC	94B45/100 ml			
Spike	94B45/0.1 ml			

1023

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-933-141

DATE START: September 2, 1993

PREPARED BY: L. L. Fritts LLFritts 9.9.93

DATE COMPLETE: September 9, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD 94B45	V32	Np-237	1.55E+2				81.5		0.3
BLANK	V33	Np-237	<3.91E-5					4.71E-5	88.8
107APCOM	V34	Np-237	<1.48E-5	<1.32E-5	N/A	N/A	84.4	2.04E-5	116.9
							78.5	2.04E-5	161.2
107APCOM	V34	SPIKE	6.42E-2	5.97E-2	6.20E-2	7.3			

NARRATIVE: [ ] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

The counts on the cards for the duplicate sample and the duplicate spike were apparently switched. The appropriate counts were used for the calculations. Rerun unnecessary.

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-8583	107-AP	8- 3-93	10:44	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
Np237	LA-933-141	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 100 ml	STD

Remarks, Calculations, Results

EDP S380 NP-237

STD# 941345 RESULT 1.55 E+2

STD VAL 1.902 E+2 %REC 81.5%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Mgr		
9-2-93	1500			9/9

54-6800-067 (H-10-83)

Np: LA-933-141 (H-0) Np-237 LIQUIDS

Serial No.	Sample Type		STANDARD
V32-8583			LIQUID
	Sample Volume in mL	(SS)	0.100
Batch ID	Dilution Factor	(DF)	1
1555	Mount FACTOR (1/Mount Volume in mL)	(Mt F)	2
Rerun No.	Digest Dilution Factor*	(DDF)	1
0	Gross Counts	(Gc)	86218
Analyst	Time counted in Minutes	(Tc)	30
	Background in cpm	(bkg)	7
Date	Rs, Rmax, or Rs (Sample Rate) as Appropriate		2866.93
09/02/93	µCi/L in Sample or Digest as Appropriate	=	1.5497E+02

Sample Count Rate (Rs) = (Gc / Tc) - bkg

Np-237 µCi/L = Rs * 1000mL/L * DF * 3 * Mt F * DDF / (0.5 * SS * 2220000dpm/µCi)

WHERE: 3 is an Internal Procedure Dilution Factor and 0.5 is the Counting Effeciency Factor.

Np-237 µCi/mL = Np-237 µCi/L / 1000mL/L

Relative Counting Error = The Square Root of (Gc + bkg * Tc) / | (Gc - bkg * Tc) |

Detection Levels and Less Than Values are determined from Procedure LA-508-002.

Np-237 µCi/L	=	1.55E+02
Np-237 µCi/mL	=	1.55E-01
Relative Counting Error	=	0.3%

DETECTION LEVEL

1.27E-04 µCi/mL

1025

Data Entry by:		Date:	09-Sep-93
Approved by:		Date:	Sept 9, 1993

Form 1 Rev. 1

WHC-SD-WM-DP-053 REV 0

#1 9-2-93

V32.-8583

86218/30 -7

BEST AVAILABLE COPY

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8683	107-AP	8- 3-93	10:53	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
Np237	LA-933-141	uCi/ML	N1L17	0

Sample Size	Customer ID
? .250 ml	BLK

Remarks, Calculations, Results

REAGENT BLANK $< 3.91 \times 10^{-5}$ uCi/ml

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Mgr		
9-2-93	1500			9/9

(S4-6800-061 (3-10-83))

Np: LA-933-141 (H-0) Np-237 LIQUIDS

Serial No.			BLANK
V33-8683	Sample Type ? enter LIQUID or SOLID		LIQUID
	Sample Volume in mL	(SS)	0.250
Batch ID	Dilution Factor	(DF)	1
1555	Mount FACTOR (1/Mount Volume in ml)	(MU F)	2
Rerun No.	Digest Dilution Factor	(DDF)	1
0	Gross Counts	(Gc)	202
Analyst	Time counted in Minutes	(Tc)	30
	Background in cpm	(bkg)	6
Date	Ir, Rmax, or Rs (Sample Rate) as Appropriate		1.81
09/02/93	µCi/L in Sample or Digest as Appropriate	= <	3.9098E-02

Sample Count Rate (Rs) = (Gc / Tc) - bkg

Np-237 µCi/L = Rs * 1000mL/L * DF * 3 * MU F * DDF / (0.5 * SS * 2220000dpm/µCi)

WHERE: 3 is an Internal Procedure Dilution Factor and 0.5 is the Counting Effeciency Factor.

Np-237 µCi/mL = Np-237 µCi/L / 1000mL/L

Relative Counting Error = The Square Root of (Gc + bkg * Tc) / | (Gc - bkg * Tc) |

Detection Levels and Less Than Values are determined from Procedure LA-500-002.

Np-237 µCi/L	=	< 3.91E-02
Np-237 µCi/mL	=	< 3.91E-05
Relative Counting Error	=	88.8%

LESS THAN Value was Determined from Rmax.

DETECTION LEVEL 4.71E-05 µCi/mL

1027

Date Entry by:		Date:	09-Sep-93
Approved by:		Date:	Sept 9, 1993

Form 1 Rev. 1

ACID DIGESTION ANALYSIS

WHC-SD-WM-DP-053 REV 0

#3 9-2-93

133.-8683

202
30 -4

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8783	107-AP	8- 3-93	10:56	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
Np237	LA-933-141	uCi/ML	N1L17	0

Sample Size	Customer ID
? ~250 ml	107APCOM

Remarks, Calculations, Results

$<1.48 \times 10^{-5}$ uCi/ml

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Eric Beecher			
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1500	

9/9

SX-6000-061 (R-10-83)

Np: LA-933-141 (H-0) Np-237 LIQUIDS

			SAMPLE
Serial No.	Sample Type ? enter LIQUID or SOLID		LIQUID
V34-8783	Sample Volume in mL	(SS)	0.250
Batch ID	Dilution Factor	(DF)	1
1556	Mount FACTOR (1/Mount Volume in mL)	(MtF)	2
Rerun No.	Digest Dilution Factor	(DDF)	1
0	Gross Counts	(Gc)	37
Analyst	Time counted in Minutes	(Tc)	30
	Background in cpm	(bkg)	1
Date	Rc, Rmax, or Rs (Sample Rate) as Appropriate		0.68
09/02/93	µCi/L in Sample or Digest as Appropriate	= <	1.4779E-02

Sample Count Rate (Rs) = (Gc / Tc) - bkg

Np-237 µCi/L = Rs * 1000mL/L * DF * 3 * Mt F * DDF / (0.5 * SS * 2220000dpm/µCi)

WHERE 3 is an Internal Procedure Dilution Factor and 0.5 is the Counting Effeciency Factor.

Np-237 µCi/mL = Np-237 µCi/L / 1000mL/L

Relative Counting Error = The Square Root of (Gc + bkg * Tc) / | (Gc - bkg * Tc) |

Detection Levels and Less Than Values are determined from Procedure LA-508-002.

Np-237 µCi/L	=	< 1.48E-02
Np-237 µCi/mL	=	< 1.48E-05

LESS THAN Value was Determined from Rmax.

Relative Counting Error	=	116.9%

DETECTION LEVEL

2.04E-05 µCi/mL

Data Entry by:		Date:	09-Sep-93
Approved by:		Date:	Sept. 9, 1993

Form 1 Rev. 1

ACID DIGESTION ANALYSIS

WHC-SD-WM-DP-053 REV 0

#2 9-2-93

V34.-8783

37/30 -1

BEST AVAILABLE COPY

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No.	Sample Point	Date	Time Issued	Priority
V 34.-8883	107-AP	8- 3-93	10:56	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
Np237	LA-933-141	uCi/ML	N1L17	0

Sample Size	Customer ID
? .250 ml	107APCOM

Remarks, Calculations, Results

DUPLICATE SAMPLE

~~78.5%~~

$<1.32 \times 10^{-5}$ 9.9.93

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Mgr.		
9-2-93	1500			9/9

54-6000-061 (11-10-83)

Np: LA-933-141 (H-0) Np-237 LIQUIDS

Serial No	Sample Type ? enter LIQUID or SOLID		DUPLICATE LIQUID
V34-8883	Sample Volume in mL	(SS)	0.250
Batch ID	Dilution Factor	(DF)	1
1555	Mount FACTOR (1/Mount Volume in mL)	(MLF)	2
Rerun No.	Digest Dilution Factor	(DDF)	1
0	Gross Counts	(Gc)	35
Analyst	Time counted in Minutes	(Tc)	30
	Background in cpm	(bkg)	1
Date	Rc, Rmax, or Rs (Sample Rate) as Appropriate		0.61
09/02/93	µCi/L in Sample or Digest as Appropriate	= <	1.3191E-02

Sample Count Rate (Rs) = (Gc / Tc) - bkg

Np-237 µCi/L = Rs * 1000mL/L * DF * 3 * MLF * DDF / (0.5 * SS * 2220000dpm/µCi)

WHERE: 3 is an Internal Procedure Dilution Factor and 0.5 is the Counting Efficiency Factor.

Np-237 µCi/mL = Np-237 µCi/L / 1000mL/L

Relative Counting Error = The Square Root of (Gc + bkg * Tc) / | (Gc - bkg * Tc) |

Detection Levels and Less Than Values are determined from Procedure LA-508-002.

Np-237 µCi/L	=	< 1.32E-02
Np-237 µCi/mL	=	< 1.32E-05

LESS THAN Value was Determined from Rmax.

Relative Counting Error	=	161.2%

DETECTION LEVEL

2.04E-05 µCi/mL

1031

Date Entry by:		Date:	09-Sep-93
Approved by:		Date:	Sept 9, 1993

Form 1 Rev. 1

ACID DIGESTION ANALYSIS

WHC-SD-WM-DP-053 REV 0

#1 9-2-93

V34.-8883

83097
30 →

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No.	Sample Point	Date	Time Issued	Priority
V 34.-8983	107-AP	8- 3-93	10:56	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
Np237	LA-933-141	% RECOVERY	N1L17	0

Sample Size	Customer ID
? .250ml + .100ml SPIKE	107APCOM

Remarks, Calculations, Results

SPIKE SAMPLE
SPIKE ID 941345
SPIKE VOLUME

84.4%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1500	

54-6800-081 (R-10-83)

H-0 12-13-93

Np-237: LA-933-141 ~~(D-0)~~ SPIKED SAMPLE

			SPIKE
Serial No.	Sample Volume in ml.	(SS)	0.250
V34-8983	Dilution Factor for Sample in Spiked Vial	(DF)	1
Batch ID	Mount Factor (1/Mount Volume in ml.)	(Mt F)	2
1555	Gross Counts	(Gc)	89243
Rerun No.	Time Counted in Minutes	(Tc)	30
0	Background in cpm	(bkg)	6
Analyst	Spike Volume in ml.	(Svol)	0.100
	Spike Dilution Factor	(SDF)	1
Date	Spike Value in µCi/L	(Sval)	1.9020E+02
09/02/93	Sample µCi/L in Sample or Digest as appropriate from Form #1		0.0000E+00
	Sample + Spike µCi/L	(S+S)	6.4190E+01

Sample Count Rate (Rs) = (Gc / Tc) − bkg

Sample + Spike µCi/L (S+S) = Rs * 1000mL/L * DF * 3 * Mt F / (0.5 * SS * 2220000dpm/µCi)

Percent Spike Recovery = (((S+S) − Sample µCi/L) * ((SDF/Svol) / (DF/SS)) / Sval) * 100

WHERE 3 is an Internal Procedure Dilution Factor and 0.5 is the Counting Effeciency Factor.

NOTE Original Sample result was a LESS THAN value. Zero (0) was subtracted from the spiked value for percent recovery calculation.

PERCENT SPIKE RECOVERY = 84.4%

Data Entry by:	Date: 07-Sep-93
Approved by:	Date: Sept 9, 1993

Form 2 Rev. 1

WHC-SD-WM-DP-053 REV 0

#3 9-2-93

V34.-8983

89243
30 -6

BEST AVAILABLE COPY

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8083	107-AP	8- 3-93	10:56	25

Determination	Method/Standard	Result Units	Charge Code	Reruns
Np237	LA-933-141	% RECOVERY	N1L17	0

Sample Size	Customer ID
? .250 ml + .100 ml SPIKE	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKE DUPLICATE

SPIKE ID 941345

SPIKE VOL

78.5%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1500	

54-6800-061 (R/10-83)

H-0 12·13·93

Np-237: LA-933-141 ~~(D-0)~~ SPIKED SAMPLE

			SPIKE
Serial No.	Sample Volume in ml.	(SS)	0.250
V34-8083	Dilution Factor for Sample in Spiked Vial	(DF)	1
Batch ID	Mount Factor (1/Mount Volume in ml)	(Mt. F)	2
1555	Gross Counts	(Gc)	83097
Rerun No.	Time Counted in Minutes	(Tc)	30
0	Background in cpm	(bkg)	7
Analyst	Spike Volume in ml.	(Svol)	0.100
	Spike Dilution Factor	(SDF)	1
Date	Spike Value in µCi/L	(Sval)	1.9020E+02
09/02/93	Sample µCi/L in Sample or Digest as appropriate from Form #1		0.0000E+00
	Sample + Spike µCi/L	(S+S)	5.9738E+01

Sample Count Rate (Rs) = (Gc / Tc) - bkg

Sample + Spike µCi/L (S+S) = Rs * 1000mL/L * DF * 3 * Mt F / (0.5 * SS * 2220000dpm/µCi)

Percent Spike Recovery = (((S+S) - Sample µCi/L) * ((SDF/Svol) / (DF/SS)) / Sval) * 100

WHERE: 3 is an Internal Procedure Dilution Factor and 0.5 is the Counting Effeciency Factor.

NOTE: Original Sample result was a LESS THAN value. Zero (0) was subtracted from the spiked value for percent recovery calculation.

PERCENT SPIKE RECOVERY = 78.5%

Data Entry by:		Date:	09-Sep-93
Approved by:		Date:	Sept 9, 1993

Form 2 Rev. 1

ACID DIGESTION ANALYSIS

WHC-SD-WM-DP-053 REV 0

#2 9-2-93 V34.-8083

$\frac{35}{30}$ -1

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WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH

Batch 1553

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. V34	Customer ID: 107 ARCom
Analysis: PU 239/40	Sample Prep: Acid digest

Instrument: WBS7237	Procedure/ Rev: LA 503-156 D-0
Technologist: TAM Pollock	Date: 9-2-93
Starting Time: 0800	Temperature 24°C
Ending Time: 1400	Chemist: SA Carlson

Comments:

	Description	Lab ID		Description	Lab ID
1	Lmcs	V32-8581	11		
2	Blk	V33-8681	12		
3	SAm	V34-8781	13		
4	SAm Dup	V34-8881	14		
5	Sam Spike	V34-8981	15		
6	SAm Dup Spike	V34-8081	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
Lmcs	63B43- .100 ml			
Spike	74B43- .100 ml			
Spike	63B43 - .100 ml			

1037

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-503-156

DATE START: September 2, 1993

PREPARED BY: L. L. Fritts LL Fritts 9.7.93

DATE COMPLETE: September 7, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD 63B43	V32	Pu-239/40	1.39E+2				106.5		0.9
BLANK	V33	Pu-239/40	<4.17E-4				81.3		100.0
107APCOM	V34	Pu-239/40	<5.34E-4	<4.23E-4	N/A	N/A	75.4	5.34E-4	3.8
							69.2		100.0
					Recovery:	Spike	100.4		
						Dup	101.1		
107APCOM	V34	Pu-238	<5.97E-4	<6.51E-4	N/A	N/A	75.4	5.97E-4	4.8
							69.2		100.0
107APCOM	V34	SPIKE	1.31E-1	1.32E-1	1.32E-1	0.8			

NARRATIVE: [X] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

2 2203

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-8581	107-AP	8- 3-93	10:44	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Pu239/40	LA-503-156	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 100-10-100	STD

Remarks Calculations Results

EDP R211 AR001 "AEA" - 480MIN

STD# 63B43 RESULT 1.39 E+2 ATTACH PRINTOUT

STD VAL. 1.305 E+2 %REC ~~106.5%~~ 9-7-93 9.7.93

1 ml 8m HNO_3

.100 ml Pu236- 74B43 ~~107.0%~~ ~~9.7.93~~

106.5%

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1400	

54-6800-061 (R-10/91)

WHC-SD-WM-DP-053 REV 0

Pu 238 & 239/240: LA-503-156 (D-0) LIQUIDS

Serial No.	Date Counted	09/02/93	Pu 236 AEA Frac. (C236)	STANDARD 0.533
V32-8581	Sample Volume in mL (SS)	0.1	Pu 238 AEA Frac. (C238)	0.015
Batch ID	Sample D.F. (DF)	101	Pu 239 AEA Frac. (C239)	0.449
1553	Tracer Volume in mL (SPKV)	0.1	Total AT Counts	8518
Rerun No.	Digest D.F. (DDF)	1	Time Counted (min)	30
0	Tracer Book No.	74B43	Background (cpm)	7
Analyst	Tracer Preparation Date	07/30/93	Pu 236 Counts	62.08
	Pu-236 Preparation Value	3712	Pu 238 Counts	1.78
Date	Pu-236 Decay Corr'd value	3628.90	Pu 239 Counts	52.27
09/02/93	Pu-238 Tracer Value	0	AEA Count Time (min)	480

Decay Time = Counting Date No. - Preparation Date No.

Pu 236 Decay Correction = Tracer Prep Value * { e to the power of [- ln2 * Decay Time) / 1040.95] }

Pu 236 Tracer Recovery = { AT Counts / Time Ct'd - Bkg } (2) (C236) (100) / Tracer 236 Decay Corr'd Value * mL added.

Pu 239/240 µCi/l = (C239) (Tracer 236 Decay Corr'd Val) (SPKV) (DF) (DDF) (1000mL/L) / { (C236) (SS) (2220000dpm/µCi) }

Pu 238 dpm = { (Total AT Ct's / Time Ct'd) - Bkg * (2) (C238)) - ((Pu 238 dpm/mL in Tracer) (SPKV) (Pu236 Tracer Recovery / 100) }

Pu 238 µCi/mL = { (Pu 238 dpm) (DF) (DDF) } / { (Pu-236 Tracer Recovery / 100) (2220000dpm/µCi) (SS) }

Relative Counting Error = Square Root of { (1/Pu 236 Total Counts) + (1 / Pu 238 or 239/240 Total Counts) } * 100

Pu-239/240 µCi/L	=	1.39E+02

NOTE: Tracer values are in dpm/mL.

Pu 239/240 µCi/mL	=	1.39E-01
Relative Counting Error	=	0.9%
Pu 238 µCi/mL	=	< 1.12E-02
Relative Counting Error	=	3.5%
Pu 236 Tracer Recovery	=	81.3%

NOTE: Pu 238 Reported result is a LESS THAN value using 20 dpm for the Pu-238 sample activity.

Data Entry by:	Date: 03-Sep-93
Approved by:	Date: Sept 7, 1993

Form 1 Rev. 1.2

#1 9-2-93 gd

V32-8581

$\frac{8518}{30}$ -7

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

3 3590

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8681	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Pu239/40	LA-503-156	uCi/ML	N1L17	0

Sample Size	Customer ID
? .100 ml	BLK

Remarks Calculations Results

REAGENT BLANK

COUNT AS uCI/L

.100 ml Pu236- 74B43

<4.17x10^-4 uCi/ml

480MIN

ATTACH PRINTOUT

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1400	

Pu 238 & 239/240: LA-503-156 (D-0) LIQUIDS

Serial No.	Date Counted	09/02/93	Pu 236 AEA Frac. (C236)	0.98
V33-8681	Sample Volume in mL (SS)	0.1	Pu 238 AEA Frac. (C238)	0
Batch ID	Sample D.F. (DF)	1	Pu 239 AEA Frac. (C239)	0
1553	Tracer Volume in mL (SPKV)	0.1	Total AT Counts	4547
Rerun No.	Digest D.F. (DDF)	5	Time Counted (min)	30
0	Tracer Book No.	74B43	Background (cpm)	1
Analyst	Tracer Preparation Date	07/30/93	Pu 236 Counts	58.63
	Pu-236 Preparation Value	3712	Pu 238 Counts	0
Date	Pu-236 Decay Corr'd value	3628.90	Pu 239 Counts	0
09/02/93	Pu-238 Tracer Value	0	AEA Count Time (min)	480

BLANK

Decay Time = Counting Date No. - Preparation Date No.

Pu 236 Decay Correction = Tracer Prep Value * (e to the power of [- ln2 * Decay Time) / 1040.95])

Pu 236 Tracer Recovery = (AT Counts / Time Ct'd - Bkg) (2) (C236) (100) / Tracer 236 Decay Corr'd Value * mL added

Pu 239/240 µCi/l = (C239) (Tracer 236 Decay Corr'd Val) (SPKV) (DF) (DDF) (1000mL/L) / ((C236) (SS) (2220000dpm/µCi))

Pu 238 dpm = ((Total AT Ct's / Time Ct'd) - Bkg * (2) (C238)) - ((Pu 238 dpm/mL in Tracer) (SPKV) (Pu236 Tracer Recovery / 100))

Pu 238 µCi/mL = ((Pu 238 dpm) (DF) (DDF)) / ((Pu-236 Tracer Recovery / 100) (2220000dpm/µCi) (SS))

Relative Counting Error = Square Root of ((1/Pu 236 Total Counts) + (1 / Pu 238 or 239/240 Total Counts)) * 100

Pu-239/240 µCi/L	=	< 4.17E-01

NOTE: Tracer values are in dpm/mL.

Pu 239/240 µCi/mL	=	< 4.17E-04
Relative Counting Error	=	100.0%
Pu 238 µCi/mL	=	< 5.54E-04
Relative Counting Error	=	100.0%
Pu 236 Tracer Recovery	=	81.3%

NOTE: Pu 239/240 Reported result is a LESS THAN value using 0.05 for the Pu-239/240 peak height.

NOTE: Pu 238 Reported result is a LESS THAN value using 20 dpm for the Pu-238 sample activity.

Data Entry by:	Date: 07-Sep-93
Approved by:	Date: Sept 9, 1993

Form 1 Rev. 1.2

PLUTONIUM 239\240 ANALYSIS - ACID DIGESTION

#2 9-2-93 JRC

V32-8681

$\frac{4547}{30}$ - 1

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

4 4803 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8781	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Pu239/40	LA-503-156	uCi/ML	N1L17	0

Sample Size	Customer ID
? .100 ml	107APCOM

Remarks, Calculations, Results

COUNT AS uCI/L

1 ml 8m HNO_3
.100 ml Con HNO_3
.100 ml Pu 236 - 74B43

$< 5.34 \times 10^{-4}$ µCi/ml

"AEA" - 480MIN

ATTACH PRINTOUT

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1400	

54-6800-061 (R-10/93)

Pu 238 & 239/240: LA-503-156 (D-0) LIQUIDS

Serial No.	Date Counted	09/02/93	Pu 236 AEA Frac. (C236)	0.765
V34-8781	Sample Volume in mL (SS)	0.1	Pu 238 AEA Frac. (C238)	0.016
Batch ID	Sample D.F. (DF)	1	Pu 239 AEA Frac. (C239)	0.026
1553	Tracer Volume in mL (SPKV)	0.1	Total AT Counts	5545
Rerun No.	Digest D.F. (DDF)	5	Time Counted (min)	30
0	Tracer Book No.	74B43	Background (cpm)	6
Analyst	Tracer Preparation Date	07/30/93	Pu 236 Counts	44.43
	Pu-236 Preparation Value	3712	Pu 238 Counts	0.92
Date	Pu-236 Decay Corr'd value	3628.90	Pu 239 Counts	1.52
09/02/93	Pu-238 Tracer Value	0	AEA Count Time (min)	480

SAMPLE

Decay Time = Counting Date No. - Preparation Date No.

Pu 236 Decay Correction = Tracer Prep Value * (e to the power of (- ln2 * Decay Time) / 1040.95))

Pu 236 Tracer Recovery = (AT Counts / Time Ct'd - Bkg) (2) (C236) (100) / Tracer 236 Decay Corr'd Value * mL added.

Pu 239/240 µCi/l = (C239) (Tracer 236 Decay Corr'd Val) (SPKV) (DF) (DDF) (1000mL/L) / ((C236) (SS) (2220000dpm/µCi))

Pu 238 dpm = ((Total AT Ct's / Time Ct'd) - Bkg * (2) (C238)) - ((Pu 238 dpm/mL in Tracer) (SPKV) (Pu236 Tracer Recovery / 100))

Pu 238 µCi/mL = ((Pu 238 dpm) (DF) (DDF)) / ((Pu-236 Tracer Recovery / 100) (2220000dpm/µCi) (SS))

Relative Counting Error = Square Root of ((1/Pu 236 Total Counts) + (1 / Pu 238 or 239/240 Total Counts)) * 100

Pu-239/240 µCi/L	=	< 5.34E-01

NOTE: Tracer values are in dpm/mL.

Pu 239/240 µCi/mL	=	< 5.34E-04
Relative Counting Error	=	3.8%
Pu 238 µCi/mL	=	< 5.97E-04
Relative Counting Error	=	4.8%
Pu 236 Tracer Recovery	=	75.4%

NOTE: Pu 239/240 Reported result is a LESS THAN value using 0.05 for the Pu-239/240 peak height.

NOTE: Pu 238 Reported result is a LESS THAN value using 20 dpm for the Pu-238 sample activity.

Data Entry by:	Date: 07-Sep-93
Approved by:	Date: Sept 7, 1993

Form 1 Rev. 1.2

PLUTONIUM 239\240 ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

#3 9-2-93 JQ

5545/30 -6 V34-8781

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

5 5720 **WHC-SD-WM-DP-053 REV 0**

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8881	107-AP	8- 8-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Pu239/40	LA-503-156	uCi/ML	N1L17	0

Sample Size	Customer ID
? .100 ml	107APCOM

Remarks Calculations Results

DUPLICATE SAMPLE

COUNT AS uCI/L

1 ml 8m HNO_3
.100 ml Con HNO_3
.100 ml Pu 236 - 74843

$<4.23 \times 10^{-4}$ uCi/ml "AEA" - 480MIN
ATTACH PRINTOUT

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs 9-2-93	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1400	

(54-6800-061) (R-10/83)

Pu 238 & 239/240: LA-503-156 (D-0) LIQUIDS

Serial No.	Date Counted	09/02/93	Pu 236 AEA Frac. (C236)	DUPLICATE 0.967
V34-8881	Sample Volume in mL (SS)	0.1	Pu 238 AEA Frac. (C238)	0
Batch ID	Sample D.F. (DF)	1	Pu 239 AEA Frac. (C239)	0
1553	Tracer Volume in mL (SPKV)	0.1	Total AT Counts	4103
Rerun No.	Digest D.F. (DDF)	5	Time Counted (min)	30
0	Tracer Book No.	74843	Background (cpm)	7
Analyst	Tracer Preparation Date	07/30/93	Pu 236 Counts	52.26
	Pu-236 Preparation Value	3712	Pu 238 Counts	0
Date	Pu-236 Decay Corr'd value	3628.90	Pu 239 Counts	0
09/02/93	Pu-238 Tracer Value	0	AEA Count Time (min)	480

Decay Time = Counting Date No. - Preparation Date No.

Pu 236 Decay Correction = Tracer Prep Value * (e to the power of (- ln2 * Decay Time) / 1040.95))

Pu 236 Tracer Recovery = (AT Counts / Time Ct'd - Bkg) (2) (C236) (100) / Tracer 236 Decay Corr'd Value * mL added.

Pu 239/240 µCi/l = (C239) (Tracer 236 Decay Corr'd Val) (SPKV) (DF) (DDF) (1000mL/L) / ((C236) (SS) (2220000dpm/µCi))

Pu 238 dpm = ((Total AT Ct's / Time Ct'd) - Bkg * (2) (C238)) - ((Pu 238 dpm/mL in Tracer) (SPKV) (Pu236 Tracer Recovery / 100))

Pu 238 µCi/mL = ((Pu 238 dpm) (DF) (DDF)) / ((Pu-236 Tracer Recovery / 100) (2220000dpm/µCi) (SS))

Relative Counting Error = Square Root of ((1/Pu 236 Total Counts) + (1 / Pu 238 or 239/240 Total Counts)) * 100

Pu-239/240 µCi/L	=	< 4.23E-01

NOTE: Tracer values are in dpm/mL.

Pu 239/240 µCi/mL	=	< 4.23E-04
Relative Counting Error	=	100.0%
Pu 238 µCi/mL	=	< 6.51E-04
Relative Counting Error	=	100.0%
Pu 236 Tracer Recovery	=	69.2%

NOTE: Pu 239/240 Reported result is a LESS THAN value using 0.05 for the Pu-239/240 peak height.

NOTE: Pu 238 Reported result is a LESS THAN value using 20 dpm for the Pu-238 sample activity.

Data Entry by:	Date: 07-Sep-93
Approved by:	Date: Sept 7, 1993

Form 1 Rev. 1.2

PLUTONIUM 239\240 ANALYSIS - ACID DIGESTION

#1 9-2-93 AJ

WHC-SD-WM-DP-053 REV 0

4103/30 -7

V34-8881

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

6 6635 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8981	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Pu239/40	LA-503-156	% RECOVERY	N1L17	0

Sample Size	Customer ID
? .100 ml	107APCOM

Remarks Calculations Results

SAMPLE SPIKED ID
SPIKE ID
SPIKE VOLUME

1 ml 8m HNO_3
.100 ml Con HNO_3
.100 ml Pu 236-74B43
.100 ml 63B43

% Recovery = 131 / 130.5 = ~~100.4%~~ 480MIN ATTACH PRINTOUT
100.4% 9.7.93

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs 9-2-93	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1400	

SW-0800-061 (R/10-83)

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Pu 238 & 239/240: LA-503-156 (D-0) LIQUIDS

Serial No.	Date Counted	09/02/93	Pu 236 AEA Frac. (C236)	0.012
V34-8981	Sample Volume in mL (SS)	0.1	Pu 238 AEA Frac. (C238)	0.015
Batch ID	Sample D.F. (DF)	1	Pu 239 AEA Frac. (C239)	0.965
1553	Tracer Volume in mL (SPKV)	0.1	Total AT Counts	140280
Rerun No.	Digest D.F. (DDF)	1	Time Counted (min)	30
0	Tracer Book No.	74B43	Background (cpm)	1
Analyst	Tracer Preparation Date	07/30/93	Pu 236 Counts	23.85
	Pu-236 Preparation Value	3712	Pu 238 Counts	30.63
Date	Pu-236 Decay Corr'd value	3628.90	Pu 239 Counts	1974.94
09/02/93	Pu-238 Tracer Value	0	AEA Count Time (min)	480

CHK EXT NO.

Decay Time = Counting Date No. - Preparation Date No.

Pu 236 Decay Correction = Tracer Prep Value * (e to the power of [- ln2 * Decay Time) / 1040.95])

Pu 236 Tracer Recovery = (AT Counts / Time Ct'd - Bkg) (2) (C236) (100) / Tracer 236 Decay Corr'd Value * mL added

Pu 239/240 µCi/l = (C239) (Tracer 236 Decay Corr'd Val) (SPKV) (DF) (DDF) (1000mL/L) / ((C236) (SS) (2220000dpm/µCi))

Pu 238 dpm = ((Total AT Ct's / Time Ct'd) - Bkg * (2) (C238)) - ((Pu 238 dpm/mL in Tracer) (SPKV) (Pu236 Tracer Recovery / 100))

Pu 238 µCi/mL = ((Pu 238 dpm) (DF) (DDF)) / ((Pu-236 Tracer Recovery / 100) (2220000dpm/µCi) (SS))

Relative Counting Error = Square Root of ((1/Pu 236 Total Counts) + (1 / Pu 238 or 239/240 Total Counts)) * 100

Pu-239/240 µCi/L	=	1.31E+02

NOTE: Tracer values are in dpm/mL.

Pu 239/240 µCi/mL	=	1.31E-01
Relative Counting Error	=	0.9%
Pu 238 µCi/mL	=	2.04E-03
Relative Counting Error	=	1.2%
Pu 236 Tracer Recovery	=	30.9%

Data Entry by:		Date:	07-Sep-93
Approved by:		Date:	Sept 7, 1993

Form 1 Rev. 1.2

PLUTONIUM 239\240 ANALYSIS - ACID DIGESTION

#2 9-2-93 AB

WHC-SD-WM-DP-053 REV 0

140280 - 1
30

V34-8981

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

7 7167 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8081	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Pu239/40	LA-503-156	% RECOVERY	N1L17	0

Sample Size	Customer ID
? .100 ml	107APCOM

Remarks Calculations Results

SAMPLE SPIKE DUPLICATE

SPIKE ID

SPIKE VOL

1 ml 8m HNO_3
.100 ml CON HNO_3
.100 ml Pu236-74B43
.100 ml 63B43

% Recovery = 132 / 130.5 = 101%

"AEA" ATTACH PRINTOUT

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs 9-2-93	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-2-93	1400	

54-6800-001 (R-10-83)

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Pu 238 & 239/240: LA-503-156 (D-0) LIQUIDS

Serial No.	Date Counted	09/02/93	Pu 236 AEA Frac. (C236)	ERR 0.012
V34-8081	Sample Volume in mL (SS)	0.1	Pu 238 AEA Frac. (C238)	0
Batch ID	Sample D.F. (DF)	1	Pu 239 AEA Frac. (C239)	0.97
1553	Tracer Volume in mL (SPKV)	0.1	Total AT Counts	216995
Rerun No.	Digest D.F. (DDF)	1	Time Counted (min)	30
0	Tracer Book No.	74B43	Background (cpm)	6
Analyst	Tracer Preparation Date	07/30/93	Pu 236 Counts	31.64
	Pu-236 Preparation Value	3712	Pu 238 Counts	0
Date	Pu-236 Decay Corr'd value	3628.90	Pu 239 Counts	2658.7
09/02/93	Pu-238 Tracer Value	0	AEA Count Time (min)	480

Decay Time = Counting Date No. - Preparation Date No.

Pu 236 Decay Correction = Tracer Prep Value * (e to the power of { - ln2 * Decay Time) / 1040.95 })

Pu 236 Tracer Recovery = (AT Counts / Time Ct'd - Bkg) (2) (C236) (100) / Tracer 236 Decay Corr'd Value * mL added

Pu 239/240 µCi/l = (C239) (Tracer 236 Decay Corr'd Val) (SPKV) (DF) (DDF) (1000mL/L) / ((C236) (SS) (2220000dpm/µCi))

Pu 238 dpm = ((Total AT Ct's / Time Ct'd) - Bkg * (2) (C238)) - ((Pu 238 dpm/mL in Tracer) (SPKV) (Pu236 Tracer Recovery / 100))

Pu 238 µCi/mL = ((Pu 238 dpm) (DF) (DDF)) / ((Pu-236 Tracer Recovery / 100) (2220000dpm/µCi) (SS))

Relative Counting Error = Square Root of ((1/Pu 236 Total Counts) + (1 / Pu 238 or 239/240 Total Counts)) * 100

Pu-239/240 µCi/L	=	1.32E+02

NOTE: Tracer values are in dpm/mL.

Pu 239/240 µCi/mL	=	1.32E-01
Relative Counting Error	=	0.8%
Pu 238 µCi/mL	=	< 1.88E-04
Relative Counting Error	=	100.0%
Pu 236 Tracer Recovery	=	47.8%

NOTE: Pu 238 Reported result is a LESS THAN value using 20 dpm for the Pu-238 sample activity.

Data Entry by:	Date: 07-Sep-93
Approved by:	Date: Sept 7, 1993

Form 1 Rev. 1.2

PLUTONIUM 239\240 ANALYSIS - ACID DIGESTION

3 9-2-93 AG

WHC-SD-WM-DP-053 REV 0

216925 -6
30

V34-8081

BEST AVAILABLE COPY

Eric Bowler
9-3-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT WHC-SD-WM-DP-053 REV 0

SAMPLE
V-32-8581
File ID: 2a2203.CNF

Counted on: 9/ 2/93 @17:37
Detector: AEA2
Geometry number: 1
Count time: 28804. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	1352.7	1352.7	359.398	359.398	18.000	14.610	9.000	5.047
2	23.9	23.9	295.351	294.903	26.000	21.527	13.000	3.394
3	1189.1	1189.1	228.543	228.540	18.000	13.946	9.000	5.209

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Cm243	0.533	5.786	5.785	0.001	0.07	62.08	1.1	800.8	0.361E-03
	Cm244		5.796	5.785	0.011				584.6	0.263E-03
2	Am241	0.015	5.480	5.482	-.002	0.10	1.78	8.6	17.8	0.803E-05
	Pu238		5.499	5.482	0.017				23.3	0.105E-04
3	Pu239	0.449	5.143	5.170	-.027	0.07	52.27	1.2	492.2	0.222E-03
	Pu240		5.144	5.170	-.026				492.2	0.222E-03
		---					---			
Totals:		0.997	<--valid peaks only-->				116.13			

DETECTOR CALIBRATION
Energy(MEV) = 4.096 + (0.0047)*Channel
Energy range (MeV): 4.096 TO 6.502
Efficiency = 0.1062 CPM/DPM

TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	55895.0	100.000
Smoothed	56008.3	100.203
Composite fit	55751.0	99.742
Residuals	144.0	0.258

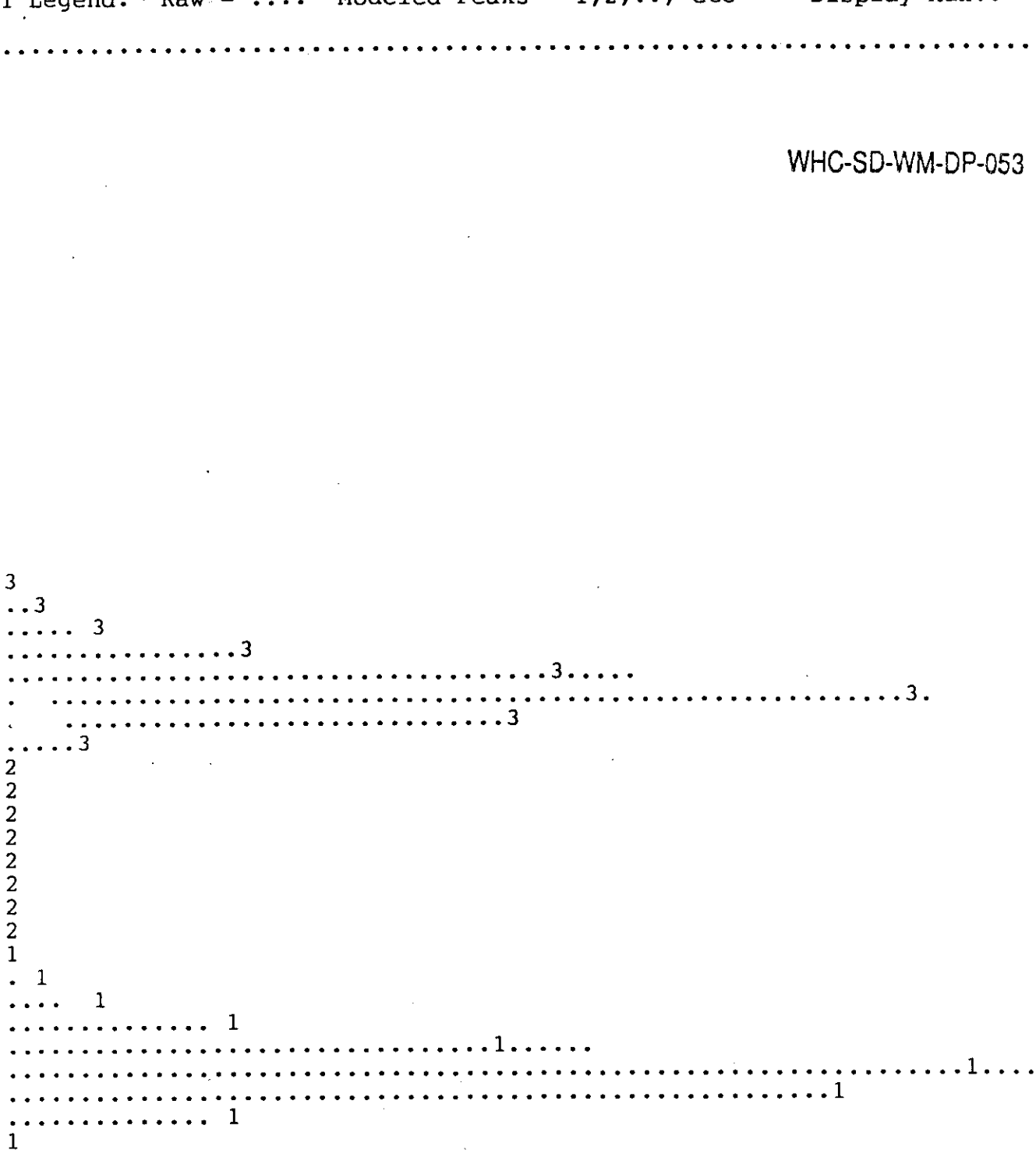
Analyzed by: _____
EMB

1051

SIGNATURE ABOVE REPRESENTS CHEMICAL TECHNOLOGIST/CHEMIST THAT COMPLETED/VERIFIED THE CALIBRATION/ANALYSIS ON PAGES 1051 TO 1070.

Spectrum 2a2203.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 10052.7



Raw Data Dump for AEA Spectrum: 2a2203.CNF

1	28804.	0.	0.	1.	1.	1.	1.	2.	0.	1.
11	1.	2.	0.	2.	0.	1.	1.	2.	4.	4.
21	1.	0.	1.	0.	1.	1.	1.	2.	3.	1.
31	3.	3.	1.	1.	3.	2.	2.	0.	0.	1.
41	0.	1.	4.	2.	3.	1.	2.	3.	1.	1.
51	3.	1.	1.	6.	1.	1.	1.	2.	3.	3.
61	0.	0.	4.	1.	2.	3.	1.	1.	2.	2.
71	2.	2.	2.	1.	4.	4.	0.	4.	2.	1.
81	0.	2.	2.	0.	2.	4.	2.	1.	2.	3.
91	3.	1.	1.	0.	4.	2.	1.	2.	1.	4.
101	1.	2.	1.	4.	2.	1.	3.	6.	3.	5.
111	2.	5.	1.	0.	6.	4.	2.	0.	0.	1.
121	5.	5.	3.	1.	1.	1.	4.	3.	1.	0.
131	7.	2.	2.	6.	2.	3.	3.	2.	4.	2.
141	6.	2.	3.	5.	3.	4.	5.	3.	4.	1.
151	3.	8.	7.	4.	4.	5.	1.	3.	8.	4.
161	6.	4.	2.	4.	8.	10.	6.	5.	12.	9.
171	10.	13.	14.	10.	10.	12.	14.	17.	17.	15.
181	8.	26.	13.	14.	10.	14.	22.	27.	14.	26.
191	30.	32.	44.	46.	34.	34.	51.	42.	47.	59.
201	62.	81.	77.	85.	126.	130.	141.	166.	206.	224.
211	255.	251.	330.	382.	453.	503.	562.	649.	718.	809.
221	912.	984.	1069.	1145.	1100.	1192.	1231.	1258.	1235.	1246.
231	1110.	1078.	915.	831.	683.	560.	426.	367.	245.	164.
241	143.	106.	53.	41.	25.	16.	8.	9.	5.	8.
251	10.	5.	9.	5.	8.	11.	14.	9.	9.	8.
261	13.	6.	7.	12.	10.	5.	12.	7.	11.	6.
271	13.	8.	8.	15.	10.	11.	12.	9.	8.	15.
281	12.	13.	19.	23.	17.	17.	19.	19.	29.	19.
291	23.	25.	23.	21.	33.	35.	18.	25.	20.	25.
301	29.	27.	24.	20.	27.	25.	22.	18.	23.	30.
311	19.	13.	12.	31.	16.	16.	20.	25.	26.	26.
321	24.	26.	27.	35.	47.	30.	41.	49.	52.	62.
331	71.	84.	78.	112.	113.	161.	177.	179.	208.	254.
341	270.	323.	352.	408.	543.	534.	674.	719.	832.	946.
351	1022.	1119.	1122.	1249.	1376.	1330.	1324.	1368.	1403.	1421.
361	1368.	1292.	1166.	1060.	899.	766.	649.	526.	371.	313.
371	190.	160.	94.	57.	31.	25.	11.	8.	6.	3.
381	4.	0.	0.	0.	0.	0.	0.	0.	0.	0.
391	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
411	1.	0.	0.	1.	0.	0.	0.	1.	1.	1.
421	1.	0.	0.	0.	0.	1.	1.	0.	2.	0.
431	0.	0.	1.	0.	0.	0.	0.	0.	1.	1.
441	2.	0.	0.	0.	1.	0.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	1.	0.	1.	1.	0.
461	0.	1.	0.	0.	1.	0.	1.	0.	0.	1.
471	2.	0.	3.	1.	1.	0.	1.	1.	0.	1.
481	2.	0.	0.	0.	0.	1.	0.	1.	0.	0.
491	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
511	1.	0.								

Em Bueta
9-3-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V-33-8681
File ID: 3a3590.CNF

Counted on: 9/ 2/93 @17:38
Detector: AEA3
Geometry number: 1
Count time: 28803. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	1217.3	1217.3	358.175	358.175	22.000	18.975	11.000	7.440

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Cm243	0.980	5.786	5.779	0.007	0.09	58.63	1.2	756.3	0.341E-03
	Cm244		5.796	5.779	0.017				552.1	0.249E-03
Totals:		0.980	<--valid peaks only-->				58.63			

DETECTOR CALIBRATION
Energy(MEV) = 4.096 + (0.0047)*Channel
Energy range (MeV): 4.096 TO 6.502
Efficiency = 0.1062 CPM/DPM

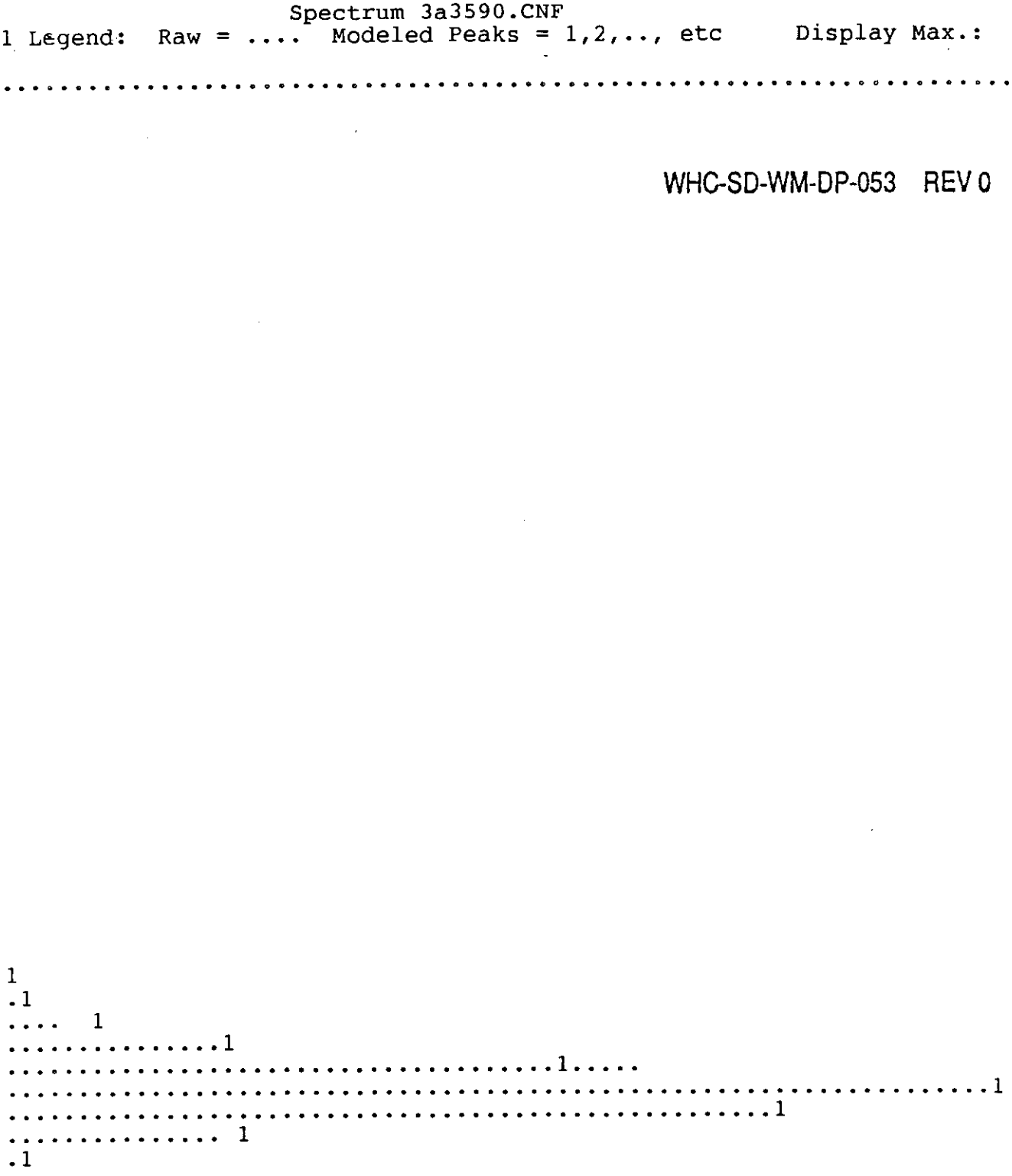
TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	28736.0	100.000
Smoothed	28848.8	100.393
Composite fit	28147.5	97.952
Residuals	588.5	2.048

Analyzed by: _____
EMB

Spectrum 3a3590.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 9213.2



Raw Data Dump for AEA Spectrum: 3a3590.CNF

1	28803.	0.	0.	1.	0.	0.	1.	1.	1.	1.
11	0.	0.	1.	0.	0.	0.	1.	0.	1.	0.
21	0.	0.	0.	0.	1.	0.	0.	1.	3.	0.
	0.	0.	1.	2.	0.	1.	0.	1.	0.	1.
	1.	0.	0.	0.	1.	1.	0.	0.	0.	1.
51	0.	0.	0.	0.	0.	1.	0.	2.	0.	0.
61	0.	0.	0.	0.	1.	2.	0.	1.	1.	1.
71	0.	1.	0.	0.	0.	0.	0.	2.	2.	0.
81	1.	1.	1.	0.	1.	0.	0.	0.	1.	1.
91	1.	1.	0.	3.	2.	0.	0.	1.	0.	1.
101	1.	2.	0.	1.	1.	0.	2.	0.	0.	0.
111	2.	4.	1.	1.	2.	2.	3.	0.	0.	0.
121	0.	0.	0.	2.	0.	0.	4.	0.	1.	1.
131	1.	0.	1.	1.	0.	1.	0.	1.	0.	3.
141	2.	0.	0.	0.	0.	1.	2.	1.	0.	3.
151	2.	4.	0.	0.	1.	4.	2.	0.	1.	2.
161	3.	1.	1.	0.	3.	1.	3.	2.	1.	0.
171	1.	2.	0.	1.	1.	1.	4.	4.	1.	0.
181	0.	2.	1.	3.	0.	0.	0.	1.	2.	2.
191	4.	3.	0.	3.	3.	2.	1.	3.	2.	2.
201	1.	2.	2.	4.	1.	2.	8.	2.	5.	3.
211	4.	3.	2.	3.	4.	2.	3.	3.	2.	3.
221	1.	3.	2.	3.	5.	5.	9.	5.	7.	1.
231	4.	6.	1.	2.	5.	2.	3.	5.	2.	0.
241	6.	4.	1.	4.	5.	6.	4.	11.	4.	4.
251	2.	1.	4.	6.	11.	4.	2.	6.	4.	3.
261	12.	6.	4.	9.	8.	3.	8.	5.	5.	11.
271	9.	11.	7.	5.	4.	6.	9.	8.	9.	7.
281	9.	10.	6.	9.	9.	10.	13.	7.	7.	18.
291	13.	9.	9.	12.	12.	11.	12.	17.	11.	16.
[illegible]	11.	15.	13.	11.	16.	12.	9.	11.	18.	16.
[illegible]	14.	27.	17.	16.	15.	17.	18.	28.	16.	26.
321	35.	30.	31.	41.	45.	43.	59.	49.	56.	44.
331	71.	73.	91.	91.	122.	137.	147.	167.	221.	283.
341	311.	343.	455.	500.	527.	587.	678.	748.	828.	976.
351	1006.	1051.	1098.	1150.	1150.	1226.	1274.	1282.	1255.	1236.
361	1097.	1085.	972.	846.	831.	691.	618.	483.	392.	316.
371	219.	147.	138.	85.	48.	36.	39.	17.	11.	5.
381	3.	3.	2.	0.	2.	0.	0.	0.	0.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	1.	0.	0.	1.	0.	0.	0.
411	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
421	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
431	1.	0.	0.	0.	0.	0.	0.	1.	1.	0.
441	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	2.	0.	1.	0.	0.
461	1.	0.	2.	1.	0.	0.	0.	0.	0.	1.
471	0.	1.	2.	1.	1.	2.	1.	3.	2.	2.
481	1.	1.	1.	0.	0.	2.	1.	1.	1.	0.
491	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
511	0.	0.								

Em Barker
9-3-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT WHC-SD-WM-DP-053 REV 0

SAMPLE
V-34-8781
File ID: 4a4803.CNF

Counted on: 9/ 2/93 @17:39
Detector: AEA4
Geometry number: 1
Count time: 28803. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	1553.1	1553.1	361.859	361.859	12.000	3.988	6.000	1.786
2	29.5	29.5	301.729	301.652	12.000	4.858	6.000	2.031
3	45.1	45.1	256.741	256.734	10.000	4.004	5.000	2.367
4	57.8	57.8	230.474	230.443	14.000	4.300	7.000	2.402

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Cm243	0.765	5.786	5.797	-.011	0.02	44.43	1.3	573.1	0.258E-03
	Cm244		5.796	5.797	-.001				418.3	0.188E-03
2	Pu238	0.016	5.499	5.514	-.015	0.02	0.92	9.8	12.0	0.541E-05
	Am241		5.480	5.514	-.034				9.2	0.414E-05
3	Am243	0.020	5.276	5.302	-.026	0.02	1.13	8.5	10.8	0.485E-05
4	Pu239	0.026	5.143	5.179	-.036	0.02	1.52	7.5	14.3	0.643E-05
	Pu240		5.144	5.179	-.035				14.3	0.643E-05
		---					---			
Totals:		0.827	<--valid peaks only-->				47.99			

DETECTOR CALIBRATION
Energy(MEV) = 4.096 + (0.0047)*Channel
Energy range (MeV): 4.096 TO 6.502
Efficiency = 0.1062 CPM/DPM

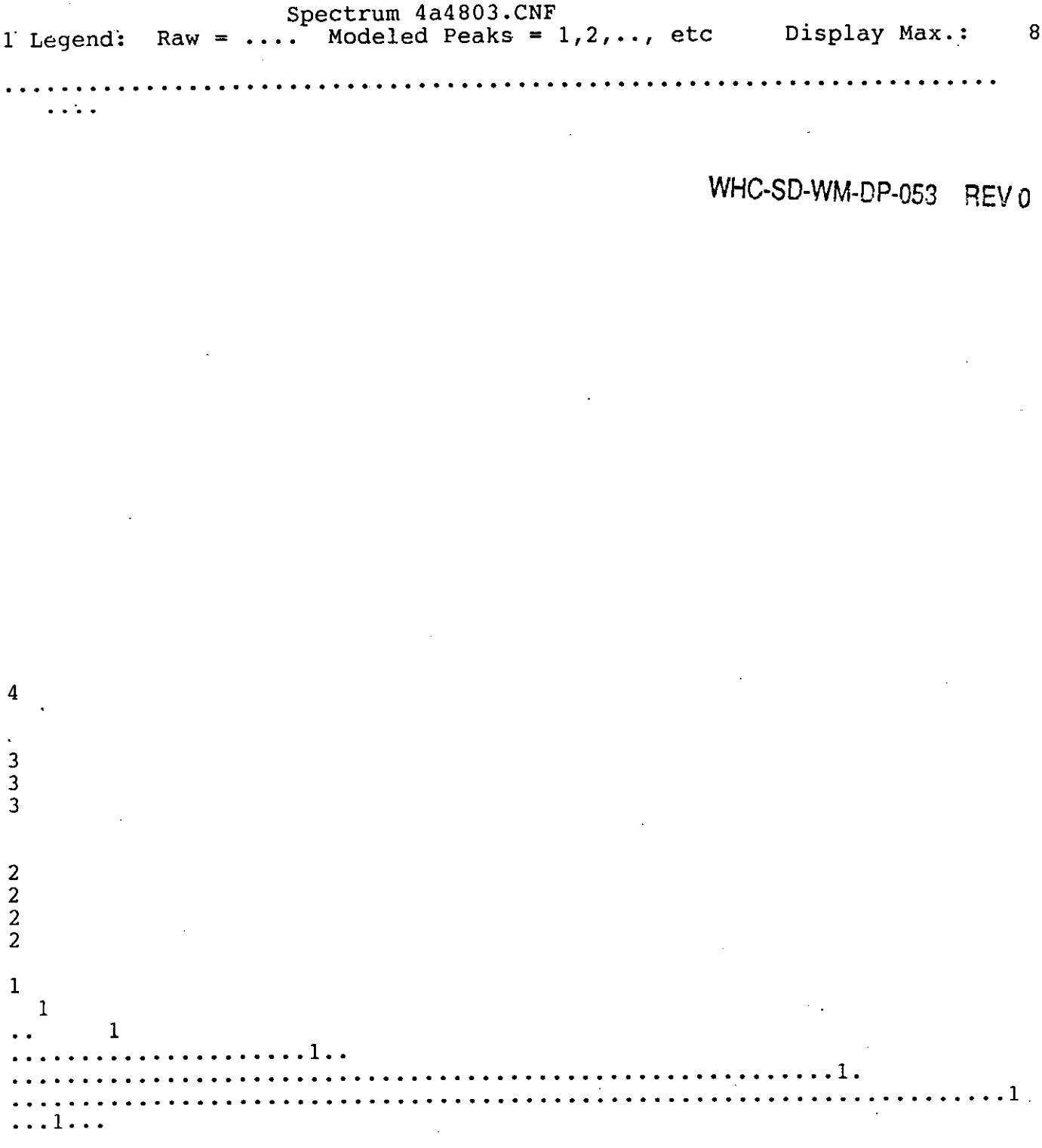
TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	27861.0	100.000
Smoothed	30789.1	110.510
Composite fit	23038.8	82.692
Residuals	4822.3	17.308

Analyzed by: _____
EMB

Spectrum 4a4803.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 8709.7



Raw Data Dump for AEA Spectrum: 4a4803.CNF

1	28803.	0.	0.	5090.	231.	0.	1.	0.	0.	1.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	1.	1.	0.	0.	0.
31	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.
41	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
71	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
101	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
111	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
121	0.	2.	1.	0.	0.	0.	0.	0.	1.	1.
131	1.	0.	1.	0.	0.	1.	0.	1.	0.	0.
141	0.	0.	2.	0.	0.	1.	0.	1.	1.	1.
151	0.	0.	0.	1.	0.	0.	0.	0.	1.	0.
161	0.	0.	0.	0.	0.	0.	1.	1.	0.	2.
171	0.	0.	0.	1.	3.	1.	1.	1.	0.	1.
181	1.	0.	0.	0.	0.	1.	1.	0.	2.	4.
191	0.	0.	1.	0.	2.	0.	0.	1.	3.	2.
201	1.	0.	3.	1.	3.	3.	2.	0.	2.	3.
211	3.	1.	1.	5.	6.	10.	14.	7.	20.	23.
221	12.	19.	24.	25.	35.	38.	52.	45.	51.	74.
231	73.	55.	40.	36.	25.	17.	9.	2.	3.	3.
241	6.	2.	8.	8.	8.	11.	15.	14.	12.	15.
251	25.	28.	29.	39.	45.	48.	54.	56.	35.	22.
261	12.	7.	8.	6.	3.	8.	2.	3.	4.	7.
271	6.	5.	4.	1.	1.	6.	3.	0.	2.	4.
281	3.	1.	4.	6.	9.	11.	10.	11.	8.	12.
291	16.	11.	9.	10.	13.	11.	16.	23.	23.	41.
301	29.	37.	31.	33.	12.	18.	13.	7.	7.	2.
311	5.	6.	4.	5.	3.	9.	2.	2.	4.	2.
321	2.	4.	3.	10.	7.	4.	8.	11.	9.	13.
331	8.	9.	17.	8.	11.	20.	25.	22.	25.	36.
341	37.	58.	89.	84.	131.	202.	276.	325.	492.	578.
351	684.	768.	796.	811.	863.	810.	825.	1026.	1300.	1515.
361	1697.	1866.	1730.	1416.	929.	594.	315.	143.	45.	16.
371	4.	1.	1.	0.	0.	0.	0.	0.	0.	0.
381	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
411	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
421	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
431	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
441	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
461	0.	0.	0.	2.	0.	0.	0.	0.	0.	1.
471	1.	1.	0.	0.	0.	0.	0.	0.	0.	1.
481	0.	0.	1.	0.	1.	0.	0.	0.	0.	0.
491	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
511	0.	0.								

Em Bowen
9-3-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V-34-8881
File ID: 5a5720.CNF

Counted on: 9/ 2/93 @17:39
Detector: AEA5
Geometry number: 1
Count time: 28805. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	1232.7	1232.7	362.822	362.822	18.000	12.269	9.000	4.529
2	11.2	11.2	268.727	268.702	18.000	41.124	9.000	7.082

PEAK RESULTS
Peak Error Limit: 15%

Peak	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
	Cm244	0.967	5.796	5.801	-.005	0.06	52.26	1.2	492.1	0.222E-03
	Cm243		5.786	5.801	-.015				674.1	0.304E-03
2	Th228	0.017	5.430	5.359	0.071	0.19	0.93	9.8	12.3	0.556E-05
	Am243		5.276	5.359	-.083				8.9	0.399E-05
Totals:		0.984	<--valid peaks only-->				53.19			

DETECTOR CALIBRATION
Energy(MEV) = 4.096 + (0.0047)*Channel
Energy range (MeV): 4.096 TO 6.502
Efficiency = 0.1062 CPM/DPM

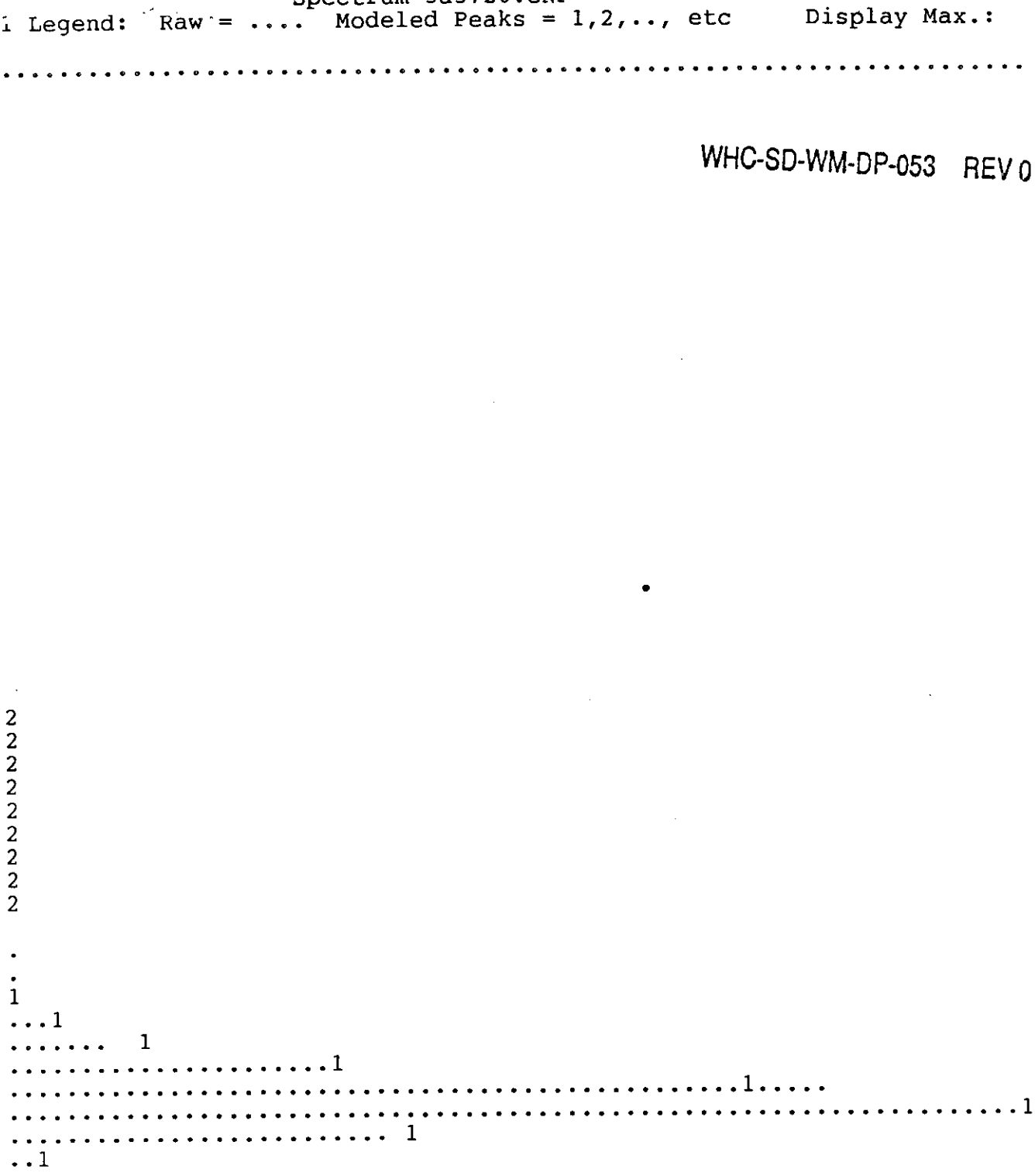
TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	25947.0	100.000
Smoothed	26060.5	100.437
Composite fit	25535.4	98.414
Residuals	411.6	1.586

Analyzed by: _____
EMB

Spectrum 5a5720.CNF

i Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 9017.3



Raw Data Dump for AEA Spectrum: 5a5720.CNF

1	28805.	0.	0.	2.	0.	0.	0.	2.	2.	0.
11	1.	1.	0.	2.	0.	1.	0.	1.	0.	0.
21	0.	0.	0.	1.	1.	0.	0.	0.	0.	2.
	0.	1.	0.	1.	1.	1.	2.	1.	2.	0.
	2.	1.	0.	1.	1.	0.	1.	0.	0.	0.
51	1.	1.	1.	0.	0.	0.	0.	2.	0.	1.
61	1.	0.	1.	3.	1.	0.	0.	0.	0.	2.
71	0.	1.	2.	0.	2.	0.	1.	0.	1.	0.
81	0.	3.	1.	0.	1.	1.	0.	1.	0.	1.
91	1.	4.	0.	1.	0.	1.	2.	2.	1.	2.
101	1.	3.	0.	1.	1.	2.	0.	3.	1.	1.
111	0.	1.	1.	0.	3.	1.	0.	1.	0.	1.
121	1.	0.	1.	1.	0.	2.	0.	0.	0.	1.
131	2.	1.	2.	1.	2.	1.	3.	2.	1.	0.
141	3.	2.	1.	2.	2.	3.	2.	1.	1.	3.
151	1.	2.	4.	0.	5.	3.	2.	0.	2.	1.
161	3.	2.	0.	2.	3.	0.	0.	1.	2.	2.
171	2.	2.	3.	2.	4.	1.	3.	1.	2.	1.
181	2.	1.	4.	3.	0.	0.	1.	1.	3.	1.
191	2.	3.	0.	1.	5.	2.	5.	0.	2.	3.
201	2.	3.	1.	3.	6.	2.	4.	3.	3.	2.
211	1.	2.	1.	3.	3.	2.	2.	2.	7.	2.
221	6.	4.	3.	4.	6.	8.	8.	1.	2.	6.
231	14.	9.	7.	3.	9.	4.	3.	1.	7.	2.
241	2.	5.	6.	4.	5.	2.	4.	4.	1.	4.
251	2.	2.	4.	6.	7.	3.	5.	6.	5.	6.
261	5.	8.	6.	11.	8.	9.	13.	3.	18.	10.
271	8.	8.	2.	9.	5.	8.	3.	6.	6.	8.
281	6.	7.	5.	10.	7.	11.	11.	11.	9.	9.
291	6.	10.	7.	9.	14.	9.	17.	10.	10.	24.
301	11.	19.	12.	18.	13.	14.	22.	23.	20.	16.
[illegible]	22.	12.	24.	20.	13.	23.	19.	23.	18.	21.
321	20.	19.	27.	36.	28.	33.	45.	42.	51.	45.
331	47.	45.	40.	49.	57.	70.	76.	81.	81.	101.
341	129.	149.	165.	226.	241.	256.	307.	398.	409.	511.
351	553.	634.	759.	816.	856.	987.	1052.	1099.	1129.	1203.
361	1312.	1230.	1324.	1269.	1181.	1136.	961.	808.	726.	534.
371	443.	288.	235.	167.	99.	63.	34.	24.	8.	6.
381	7.	2.	0.	0.	0.	0.	0.	0.	0.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	1.	0.	0.	0.	0.	0.	0.	1.
411	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
421	1.	0.	0.	0.	0.	0.	0.	1.	0.	0.
431	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.
441	0.	0.	2.	1.	0.	0.	0.	0.	0.	0.
451	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
461	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
471	0.	0.	1.	1.	0.	0.	0.	0.	0.	1.
481	0.	1.	1.	2.	0.	1.	3.	0.	0.	1.
491	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
511	0.	0.								

Eric Barnes
9-3-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V-34-8981
File ID: 6a6638.CNF

Counted on: 9/ 2/93 @17:40
Detector: AEA6
Geometry number: 1
Count time: 28806. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	459.8	459.8	362.632	362.632	24.000	21.391	12.000	7.503
2	459.3	459.3	301.354	301.334	22.000	18.558	11.000	3.347
3	43295.6	43295.6	227.604	227.603	20.000	17.239	10.000	7.265
4?	17.1	17.1	75.202	75.200	236.000	1.000	118.000	0.100
5?	14.7	14.7	71.402	71.069	218.000	1.000	109.000	0.100
6?	0.0	0.1	53.057	53.057	0.000	0.100	0.000	0.100
7?	0.0	0.1	51.801	51.801	0.000	0.100	0.000	0.100
8?	5.3	5.3	29.338	28.927	8.000	1.958	4.000	0.152

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Cm243	0.012	5.786	5.800	-.014	0.10	23.85	1.8	307.7	0.139E-03
	Cm244		5.796	5.800	-.004				224.6	0.101E-03
2	Am241	0.015	5.480	5.512	-.032	0.09	30.63	1.6	306.8	0.138E-03
	Pu238		5.499	5.512	-.013				400.6	0.180E-03
3	Pu239	0.965	5.143	5.166	-.023	0.08	1974.94	0.2	18596.4	0.838E-02
	Pu240		5.144	5.166	-.022				18596.4	0.838E-02
4		????		4.449			1.20	8.2		
5		????		4.430			1.02	13.1		
6		????		4.345			0.00	*****		
7		????		4.339			0.00	*****		
8		????		4.232			0.26	31.7		
Totals:		0.992	<--valid peaks only-->				2029.42			

DETECTOR CALIBRATION
Energy(MEV) = 4.096 + (0.0047)*Channel
Energy range (MeV): 4.096 TO 6.502
Efficiency = 0.1062 CPM/DPM

TOTAL COUNT DATA:

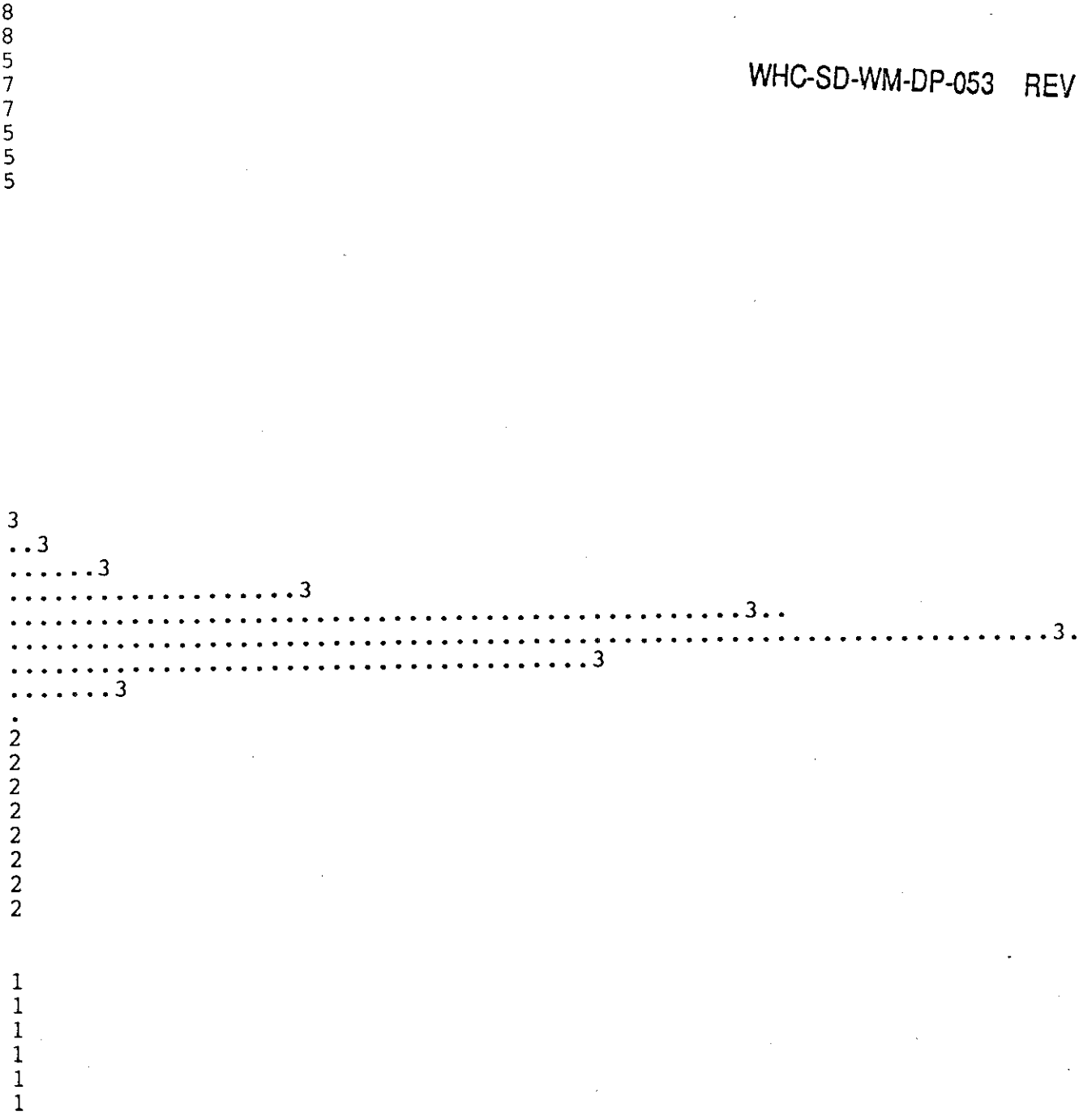
Item	Total	% Recovery

Raw spectrum	982484.0	100.000
Smoothed	982606.3	100.012
Composite fit	975514.9	99.291
Residuals	6969.1	0.709

Analyzed by: _____
EMB

Spectrum 6a6638.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 330734.9



WHC-SD-WM-DP-053 REV 0

Raw Data Dump for AEA Spectrum: 6a6638.CNF

1	28806.	0.	1.	13.	13.	15.	15.	15.	11.	18.
11	16.	12.	13.	10.	10.	12.	9.	12.	14.	11.
21	9.	8.	9.	5.	10.	13.	13.	12.	19.	16.
	14.	7.	14.	14.	12.	8.	11.	13.	10.	15.
	14.	10.	13.	13.	15.	13.	9.	12.	7.	18.
51	17.	11.	18.	10.	19.	8.	14.	11.	18.	12.
61	9.	16.	17.	19.	13.	20.	14.	15.	11.	12.
71	21.	20.	15.	9.	17.	17.	15.	13.	10.	20.
81	14.	11.	15.	20.	17.	14.	20.	22.	20.	17.
91	23.	19.	14.	22.	14.	26.	31.	14.	21.	24.
101	25.	27.	17.	12.	21.	30.	28.	25.	23.	28.
111	21.	31.	27.	30.	33.	34.	39.	30.	39.	29.
121	46.	36.	35.	41.	48.	53.	55.	53.	51.	56.
131	54.	60.	63.	73.	57.	72.	84.	88.	78.	77.
141	79.	96.	100.	98.	97.	97.	100.	114.	121.	134.
151	141.	121.	140.	136.	159.	164.	159.	191.	187.	187.
161	204.	229.	208.	261.	214.	235.	257.	265.	286.	329.
171	364.	311.	304.	362.	324.	357.	376.	441.	448.	446.
181	494.	488.	521.	534.	579.	578.	628.	670.	726.	799.
191	873.	928.	990.	1119.	1234.	1323.	1483.	1753.	1906.	2089.
201	2520.	2756.	3141.	3777.	4138.	4951.	5866.	6684.	7786.	8852.
211	10325.	11979.	13628.	15807.	17989.	20463.	23084.	26017.	28631.	31444.
221	34567.	37587.	39817.	42140.	44112.	44983.	45827.	45186.	44051.	41780.
231	39409.	35996.	32346.	28836.	24618.	20687.	16928.	13489.	10922.	8358.
241	6324.	4748.	3375.	2366.	1772.	1199.	884.	641.	469.	371.
251	318.	278.	248.	215.	218.	201.	172.	154.	169.	186.
261	146.	159.	129.	151.	116.	141.	148.	131.	134.	107.
271	129.	124.	125.	134.	129.	134.	131.	159.	137.	164.
281	150.	175.	172.	185.	176.	212.	221.	261.	250.	287.
291	331.	340.	324.	374.	369.	422.	411.	461.	446.	485.
301	490.	469.	475.	428.	407.	371.	325.	306.	289.	244.
[illegible]	186.	182.	138.	115.	97.	76.	62.	33.	46.	29.
321	23.	33.	24.	19.	19.	21.	17.	28.	14.	26.
331	20.	28.	27.	41.	42.	39.	41.	56.	61.	67.
341	75.	100.	100.	114.	138.	124.	189.	174.	214.	218.
351	273.	295.	279.	327.	375.	389.	407.	435.	438.	448.
361	473.	462.	491.	468.	443.	393.	378.	362.	346.	319.
371	263.	215.	225.	150.	121.	94.	90.	48.	45.	33.
381	28.	20.	13.	13.	9.	8.	4.	8.	3.	4.
391	4.	4.	3.	2.	3.	3.	1.	2.	1.	0.
401	2.	2.	1.	2.	1.	3.	1.	0.	0.	1.
411	0.	4.	1.	3.	4.	3.	0.	1.	1.	1.
421	4.	0.	3.	0.	2.	1.	1.	2.	4.	2.
431	0.	2.	1.	0.	0.	0.	1.	0.	0.	3.
441	1.	1.	1.	1.	1.	0.	0.	0.	1.	1.
451	0.	0.	0.	0.	0.	1.	0.	0.	0.	3.
461	1.	1.	1.	0.	0.	0.	2.	1.	3.	2.
471	2.	2.	1.	4.	2.	2.	1.	1.	0.	0.
481	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.
491	2.	2.	1.	0.	4.	4.	5.	0.	0.	0.
511	9.	0.								

Em Bauer
9-3-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V-34-8081
File ID: 7a7167.CNF

Counted on: 9/ 2/93 @17:40
Detector: AEA7
Geometry number: 1
Count time: 28802. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	719.4	719.4	360.191	360.191	20.000	15.953	10.000	6.931
2?	597.6	597.6	301.760	301.745	22.000	16.329	11.000	7.827
3	64300.6	64300.6	228.092	228.092	20.000	15.264	10.000	8.083
4?	42.2	42.2	82.403	82.403	228.000	1.000	114.000	0.100
5?	11.8	11.8	45.913	45.115	36.000	52.554	18.000	23.126
6?	69.7	69.7	14.759	13.933	4.000	0.000	2.000	3.758

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Cm243	0.012	5.786	5.789	-.003	0.07	31.64	1.6	408.1	0.184E-03
	Cm244		5.796	5.789	0.007				297.9	0.134E-03
2		????		5.514			25.90	1.8		
3	Pu239	0.970	5.143	5.168	-.025	0.07	2658.70	0.2	25034.8	0.113E-01
	Pu240		5.144	5.168	-.024				25034.8	0.113E-01
4		????		4.483			3.04	5.1		
5		????		4.308			0.85	20.7		
6		????		4.161			0.00	1000.		
Totals:		0.981	<--valid peaks only-->				2690.33			

DETECTOR CALIBRATION
Energy(MEV) = 4.096 + (0.0047)*Channel
Energy range (MeV): 4.096 TO 6.502
Efficiency = 0.1062 CPM/DPM

TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	1315917.0	100.000
Smoothed	1316053.1	100.010
Composite fit	1305755.5	99.228
Residuals	10161.5	0.772

Analyzed by: _____
EMB

Spectrum 7a7167.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 489632.4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Raw Data Dump for AEA Spectrum: 7a7167.CNF

1	28802.	0.	3.	22.	26.	20.	17.	10.	17.	10.
11	15.	18.	19.	19.	26.	22.	19.	18.	19.	18.
21	21.	19.	22.	20.	16.	18.	24.	25.	19.	20.
31	26.	24.	14.	20.	29.	23.	18.	19.	24.	21.
[illegible]	31.	14.	23.	33.	23.	28.	29.	28.	19.	21.
51	27.	23.	22.	22.	30.	22.	26.	33.	36.	25.
61	30.	26.	32.	25.	26.	35.	29.	36.	39.	33.
71	34.	24.	37.	25.	33.	36.	33.	30.	35.	43.
81	34.	51.	43.	44.	32.	29.	39.	43.	36.	38.
91	46.	37.	35.	46.	51.	38.	51.	35.	46.	50.
101	49.	47.	47.	59.	52.	41.	52.	35.	59.	51.
111	61.	47.	46.	75.	62.	55.	63.	50.	51.	74.
121	76.	71.	84.	76.	78.	83.	81.	83.	72.	73.
131	98.	73.	99.	105.	83.	106.	98.	92.	104.	85.
141	100.	103.	117.	118.	103.	101.	132.	121.	96.	132.
151	111.	125.	123.	148.	142.	160.	168.	156.	167.	164.
161	151.	165.	167.	184.	205.	200.	203.	226.	210.	234.
171	219.	239.	253.	277.	271.	298.	295.	315.	343.	335.
181	353.	406.	415.	396.	485.	489.	534.	562.	687.	644.
191	692.	735.	771.	894.	911.	1061.	1148.	1271.	1402.	1551.
201	1866.	2115.	2544.	2921.	3429.	4082.	4859.	5804.	6914.	8226.
211	9848.	12038.	14145.	16733.	19791.	23306.	26913.	31489.	36163.	41110.
221	46295.	51475.	56351.	61060.	64021.	66728.	67835.	68020.	66613.	63643.
231	59778.	54576.	48266.	42576.	36128.	30371.	24473.	19433.	15258.	11792.
241	8753.	6458.	4779.	3349.	2375.	1691.	1184.	811.	595.	350.
251	229.	157.	131.	87.	57.	45.	31.	31.	14.	19.
261	13.	11.	6.	9.	16.	12.	18.	8.	19.	16.
271	12.	16.	26.	27.	17.	35.	24.	33.	30.	49.
281	58.	60.	75.	95.	113.	127.	161.	193.	227.	281.
291	307.	317.	365.	388.	488.	496.	519.	573.	637.	607.
301	655.	612.	594.	616.	527.	485.	443.	381.	339.	276.
[illegible]	222.	217.	140.	118.	87.	69.	62.	48.	22.	20.
[illegible]	20.	14.	23.	13.	17.	14.	15.	17.	22.	19.
331	26.	19.	22.	29.	38.	44.	41.	61.	70.	94.
341	97.	108.	141.	186.	229.	224.	266.	302.	356.	381.
351	466.	456.	589.	559.	630.	729.	710.	748.	706.	764.
361	756.	706.	661.	633.	556.	489.	388.	366.	278.	227.
371	176.	135.	121.	74.	63.	48.	27.	23.	9.	9.
381	3.	2.	2.	2.	2.	1.	0.	0.	0.	0.
391	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	2.	0.	1.	0.	0.	0.	0.
411	1.	0.	0.	0.	0.	1.	1.	0.	0.	0.
421	0.	1.	0.	0.	1.	0.	0.	0.	0.	0.
431	0.	0.	2.	1.	0.	0.	0.	0.	0.	0.
441	1.	1.	0.	0.	0.	1.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	0.	0.	1.	0.	2.
461	0.	0.	0.	0.	1.	0.	0.	0.	0.	1.
471	1.	1.	0.	1.	0.	1.	0.	0.	0.	0.
481	0.	1.	0.	0.	2.	1.	1.	1.	0.	0.
491	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
511	7.	0.								

Batch # 185 QA

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. U-34	Customer ID: 107 AP Com
Analysis: Am241	Sample Prep: Acid Digest

Instrument: WB57237	Procedure/ Rev: LA-503-156 / D-0
Technologist: [illegible]	Date: 9/8/93
Starting Time: 08:30	Temperature 24 °C
Ending Time: 17:30	Chemist: Stan Gatlow

Comments:

	Description	Lab ID		Description	Lab ID
1	STD	U-32-8582	11		
2	BLK	U-33-8582	12		
3	Sample	U-34-8283	13		
4	Sample Dup	U-34-8882	14		
5	Sample Spike	U-34-8982	15		
6	Sample Spike Dup	U-34-8082	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LCS	13B43 - 1 ml			
Spike	58B43 - .100 ml			
		1071		

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-503-156

DATE START: September 8, 1993

PREPARED BY: L. L. Fritts LLFritts 9 13 93

DATE COMPLETE: September 13, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD 63B43	V32	Am-241	3.05E+1				113.8		3.9
BLANK	V33	Am-241	<6.37E-5				61.8	6.37E-5	37.9
107APCOM	V34	Am-241	<6.37E-5	<6.37E-5	N/A	N/A	42.4	6.37E-5	44.9
							11.4	6.37E-5	41.4
					Recovery:	Spike	82.4		
						Dup	91.8		
107APCOM	V34	Cm-243/44	<6.37E-5	<6.37E-5	N/A	N/A	42.4	6.37E-5	44.9
							11.4	6.37E-5	41.4
107APCOM	V34	SPIKE	2.21E-2	2.46E-2	2.34E-2	10.7			

NARRATIVE: [X] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

Cm-243/244 is below detection limit.

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

2 2223 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-8582	107-AP	8- 3-93	10:44	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	% RECOVERY	N1L17	1

Sample Size	Customer ID
? .100-10-1ml	STD

Remarks Calculations Results

EDP R201 AR001 **RERUN**

STD# 63B43 RESULT 3.05 E+1

STD VAL 2.6804 E+1 %REC 113.8 %

1ml 8m HNO_3

.100ml Am243 -58B43

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 9-8-93	Hrs	Hrs 9-10-93

Date	Time Completed	Lab Unit Mgr
9/8/93	17:30	

54-5800-001 (4-10-83)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.			STANDARD
	Spike (Tracer) Book Number		58B43
V32-8582	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1852	Volume of Sample in mL	(SS)	1
Rerun No.	Dilution Factor	(DF)	101
1	Digest Dilution Factor	(DDF)	1
Analyst	Am-241 Area Peak Height from AEA	(C241)	1430
	Am-243 Area Peak Height from AEA	(C243)	1205
Date	Total AT Count	(ATOT)	13289
09/08/93	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	7

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))

µCi/mL = µCi/L / (1000mL/L)

Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100

Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

Am-241 µCi/L	=	3.05E+01
Am-241 µCi/mL	=	3.05E-02
Relative counting error	=	3.9%
Am-243 Tracer Recovery	=	70.5%

Data Entry by:	Date: 13-Sep-93
Approved by:	Date: Sept 13, 1993

Form 3 Rev. 1.1

#3 VR 9-8-93
13282-7
30

WHC-SD-WM-DP-053 REV 0

V32-8592

BEST AVAILABLE COPY

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

4 4820

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8682	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	uCi/ML	N1L17	1

Sample Size	Customer ID
? 1ml	BLK

Remarks Calculations Results

REAGENT BLANK

COUNT AS uCI/L

1ml Con HNO_3

.100ml Am/243-58B43

$<6.37 \times 10^{-5}$ uCi/ml RERUN

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 9-8-93	Hrs	Hrs 9-10-93 1550

Date	Time Completed	Lab Unit Mgr
9/8/93	17'30	

54-6800-061 (R-10-90)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.			BLANK
V33-8682	Spike (Tracer) Book Number		58B43
	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1852	Volume of Sample in mL	(SS)	1
Rerun No.	Dilution Factor	(DF)	1
1	Digest Dilution Factor	(DDF)	5
Analyst	Am-241 Area Peak Height from AEA	(C241)	7
	Am-243 Area Peak Height from AEA	(C243)	1100
Date	Total AT Count	(ATOT)	5308
09/08/93	AT Count Time in Minutes	(MIN CT'd)	30
	Background in CPM	(BKG)	1

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))

µCi/mL = µCi/L / (1000mL/L)

Tracer % Rec = ((ATOT / MIN CT'd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100

Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

NOTE: Reported result is a LESS THAN value using 5% of the Am-241 peak as the Am-241 peak.

Am-241 µCi/L	=	< 6.37E-02
Am-241 µCi/mL	=	< 6.37E-05
Relative counting error	=	37.9%
Am-243 Tracer Recovery	=	61.8%

Data Entry by:	Date: 13-Sep-93
Approved by:	Date: Sept 13, 1993

Form 3 Rev. 1.1

AMERICIUM 241 ANALYSIS - ACID DIGESTION

2 vr 9-8-93

$\frac{5308}{30} - 1$

V33-8682

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

6 6656

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8782	107-AP	8- 3-93	10:56	25

Determination	Method-Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	uCi/ML	N1L17	1

Sample Size	Customer ID
? / ml	107APCOM

Remarks, Calculations, Results

COUNT AS uCI/L

<6.37x10^-5 uCi/ml

RERUN

1 ml Con HNO3

.100 ml Am243-58B43

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 9-8-93	Hrs	Hrs 9-10-93
Date 9/8/93	Time Completed 12:70	Lab Unit Mgr		

54-6800-051 (R-10-63)

AM-241: LA-503-156 (D-0) LIQUIDS

			SAMPLE
Serial No.	Spike (Tracer) Book Number		58B43
V34-8782	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1852	Volume of Sample in mL	(SS)	1
Rerun No.	Dilution Factor	(DF)	1
1	Digest Dilution Factor	(DDF)	5
Analyst	Am-241 Area Peak Height from AEA	(C241)	5
	Am-243 Area Peak Height from AEA	(C243)	707
Date	Total AT Count	(ATOT)	3805
09/08/93	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	6

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))

µCi/mL = µCi/L / (1000mL/L)

Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100

Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

NOTE: Reported result is a LESS THAN value using 5% of the Am-243 peak as the Am-241 peak.

Am-241 µCi/L	=	< 6.37E-02
Am-241 µCi/mL	=	< 6.37E-05
Relative counting error	=	44.9%
Am-243 Tracer Recovery	=	42.4%

Data Entry by:		Date:	13-Sep-93
Approved by:		Date:	Sept 13, 1993

Form 3 Rev. 1.1

Page 1 of 1

AMERICIUM 241 ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

#1 VR 9-8-93
3805/30 -6

V34-8782

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

7 7183

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8882	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	uCi/ML	N1L17	1

Sample Size	Customer ID
? / ml	107APCOM

Remarks Calculations Results

DUPLICATE SAMPLE

COUNT AS uCI/L

1 ml Con HNO_3

.100 ml Am243 58B43

$<6.37 \times 10^{-5}$ uCi/ml RERUN

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 9-8-93	Hrs	Hrs 9-10-93 1600
Date 9/8/93	Time Completed 17:30	Lab Unit Mgr		

54-6800-061 (R 10-83)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.	Spike (Tracer) Book Number		DUPLICATE
V34-8882	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1852	Volume of Sample in mL	(SS)	1
Rerun No.	Dilution Factor	(DF)	1
1	Digest Dilution Factor	(DDF)	5
Analyst	Am-241 Area Peak Height from AEA	(C241)	6
	Am-243 Area Peak Height from AEA	(C243)	216
Date	Total AT Count	(ATOT)	1024
09/08/93	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	1

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))

µCi/mL = µCi/L / (1000mL/L)

Tracer % Rec = ((ATOT / MIN CTd − BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100

Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

NOTE: Reported result is a LESS THAN value using 5% of the Am-243 peak as the Am-241 peak.

Am-241 µCi/L	=	< 6.37E-02
Am-241 µCi/mL	=	< 6.37E-05
Relative counting error	=	41.4%
Am-243 Tracer Recovery	=	11.4%

Data Entry by: Date: 13-Sep-93

Approved by: Date: Sept 13, 1993

Form 3 Rev. 1.1

Page 1 of 1

#2 ✓ 9-8-93
1024/30 - 1

V34-8882

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

5 5736

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8982	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	% RECOVERY	N1L17	1

Sample Size	Customer ID
? /ml	107APCOM

Remarks Calculations Results

SAMPLE SPIKED ID
SPIKE ID-63B43
SPIKE VOLUME-1ml

1ml Con HNO_3
.100 ml Am1243-58B43

RERUN

% Recovery = $\frac{22.1}{26.807}$ = 82.4%

Analyst - 1		Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs 9-8-93	Hrs	Hrs 9-10-93 1600
Date 9/8/93	Time Completed 17:30	Lab Unit Mgr		

54-6800-067 (R-10-83)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.	Spike (Tracer) Book Number		CHK EXT NO.
V34-8982			58B43
Batch ID	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
1852	Spike (Tracer) Volume in mL	(SPKV)	0.1
Rerun No.	Volume of Sample in mL	(SS)	1
1	Dilution Factor	(DF)	101
Analyst	Digest Dilution Factor	(DDF)	1
E	Am-241 Area Peak Height from AEA	(C241)	221
Date	Am-243 Area Peak Height from AEA	(C243)	257
09/08/93	Total AT Count	(ATOT)	2816
	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	6

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))
µCi/mL = µCi/L / (1000mL/L)
Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100
Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

Am-241 µCi/L	=	2.21E+01
Am-241 µCi/mL	=	2.21E-02
Relative counting error	=	9.2%
Am-243 Tracer Recovery	=	16.7%

Data Entry by:	Date: 13-Sep-93
Approved by:	Date: Sept 13, 1993

Form 3 Rev. 1.1

AMERICIUM 241 ANALYSIS - ACID DIGESTION

#1 VR 9-8-93

2816/30 - 6

WHC-SD-WM-DP-053 REV 0

Y348982

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

8 8401 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8082	107-AP	8- 3-93	10:56	25

Determination	Method-Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	% RECOVERY	N1L17	1

Sample Size	Customer ID
? /ml	107APCOM

Remarks Calculations Results

SAMPLE SPIKE DUPLICATE

SPIKE ID - 63B43
SPIKE VOL - 1ml
1ml Con HNO_3
.100ml Am243-58B43

% Recovery = $\frac{24.6}{26.807} = 91.8\%$

RERUN

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
		Raymond		
Hrs	Hrs	Hrs 9-8-93	Hrs	Hrs 9-10-93
Date 9/8/93	Time Completed 17:30	Lab Unit No		

54-6800-061 (R 10/93)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.			ERR
V34-8082	Spike (Tracer) Book Number		58B43
	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1852	Volume of Sample in mL	(SS)	1
Rerun No.	Dilution Factor	(DF)	101
1	Digest Dilution Factor	(DDF)	1
Analyst	Am-241 Area Peak Height from AEA	(C241)	267
	Am-243 Area Peak Height from AEA	(C243)	279
Date	Total AT Count	(ATOT)	2279
09/08/93	AT Count Time in Minutes	(MIN CT'd)	30
	Background in CPM	(BKG)	7

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))
µCi/mL = µCi/L / (1000mL/L)
Tracer % Rec = ((ATOT / MIN CT'd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100
Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

Am-241 µCi/L	=	2.46E+01
Am-241 µCi/mL	=	2.46E-02
Relative counting error	=	8.6%
Am-243 Tracer Recovery	=	12.5%

Data Entry by:	Date: 13-Sep-93
Approved by:	Date: Sept 13, 1993

Form 3 Rev. 1.1

AMERICIUM 241 ANALYSIS - ACID DIGESTION

WHC-SD-WM-DP-053 REV 0

#3 R 9-8-93
2279/30 -7

V348082

BEST AVAILABLE COPY

9-10-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT WHC-SD-WM-DP-053 REV 0

SAMPLE
V-32-8582
File ID: 2a2223.CNF

Counted on: 9/10/93 @ 6:52
Detector: AEA2
Geometry number: 1
Count time: 28801. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1?	30.4	30.4	358.981	358.981	16.000	11.927	8.000	2.282
2	1370.4	1370.4	297.445	297.440	24.000	20.507	12.000	5.087
3	1081.8	1081.8	252.555	252.172	20.000	16.036	10.000	1.883
4	255.2	255.2	229.455	227.887	12.000	5.131	6.000	2.547
5?	9.5	9.5	75.119	74.726	84.000	356.702	42.000	116.447
6?	1.9	1.9	52.361	51.903	4.000	0.000	2.000	3.758

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Cm243	0.010	5.786	5.785	0.001	0.06	1.79	6.7	22.1	0.995E-05
	Cm244		5.796	5.785	0.011				16.1	0.727E-05
2	Am241	0.448	5.480	5.495	-.015	0.10	79.60	1.0	761.5	0.343E-03
	Pu238		5.499	5.495	0.004				994.2	0.448E-03
3	Am243	0.524	5.276	5.283	-.007	0.08	93.17	1.0	846.3	0.381E-03
	Pu240		5.144	5.283	-.139				837.9	0.377E-03
4	Pu239	0.042	5.143	5.168	-.025	0.02	7.41	9.4	66.7	0.300E-04
	Pu240		5.144	5.168	-.024				66.7	0.300E-04
5		????		4.449			1.75	16.0		
6		????		4.341			0.00	1000.		
Totals:		1.024	<--valid peaks only-->				181.98			

DETECTOR CALIBRATION
Energy(MEV) = 4.097 + (0.0047)*Channel
Energy range (MeV): 4.097 TO 6.504
Efficiency = 0.1112 CPM/DPM

TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	85300.0	100.000
Smoothed	85415.5	100.135
Composite fit	88191.3	103.390

1085

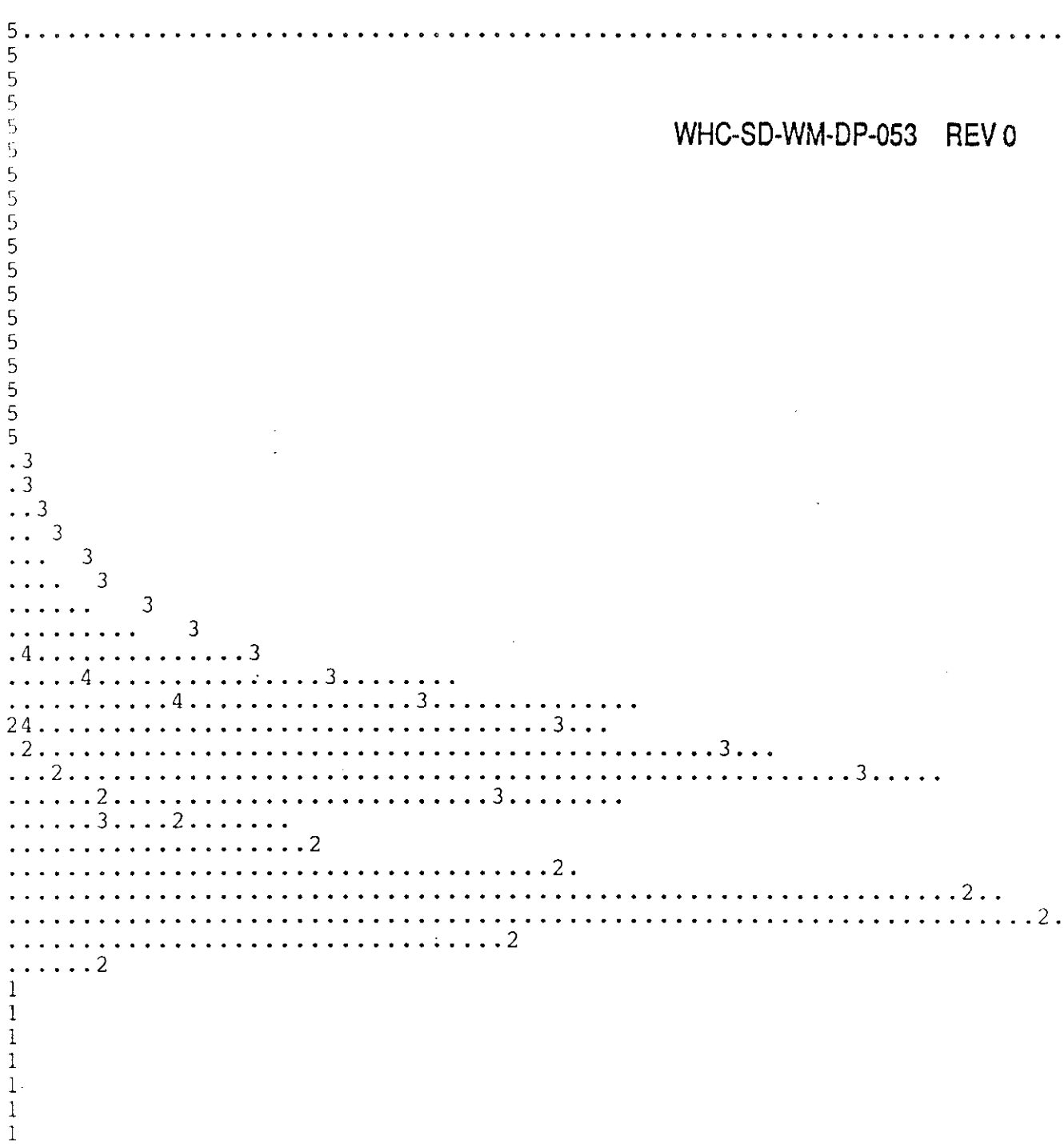
SIGNATURE ABOVE REPRESENTS CHEMICAL TECHNOLOGIST/CHEMIST THAT COMPLETED/VERIFIED THE CALIBRATION/ANALYSIS ON PAGES 108 TO 114.

Residuals	-2891.3	-3.390

Analyzed by: _____
DM

Spectrum 2a2223.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 10058.4



WHC-SD-WM-DP-053 REV 0

Raw Data Dump for AEA Spectrum: 2a2223.CNF

1	28801.	0.	0.	2.	4.	3.	2.	3.	3.	4.
11	2.	5.	3.	4.	4.	6.	13.	5.	3.	8.
21	6.	7.	4.	6.	7.	6.	6.	9.	6.	2.
31	9.	9.	4.	10.	11.	7.	5.	11.	7.	9.
	4.	7.	6.	11.	5.	11.	7.	6.	8.	7.
51	8.	18.	10.	10.	8.	6.	6.	9.	10.	8.
61	10.	9.	8.	10.	6.	11.	4.	13.	12.	8.
71	10.	14.	14.	11.	14.	16.	11.	11.	12.	5.
81	8.	11.	10.	10.	13.	14.	12.	15.	14.	11.
91	10.	13.	17.	13.	16.	18.	14.	21.	10.	8.
101	21.	18.	14.	20.	24.	19.	12.	15.	17.	17.
111	17.	15.	21.	20.	25.	13.	13.	22.	19.	21.
121	22.	28.	21.	16.	28.	25.	28.	24.	18.	22.
131	32.	22.	20.	20.	18.	31.	31.	32.	27.	28.
141	25.	34.	26.	26.	31.	30.	29.	30.	24.	34.
151	31.	32.	30.	38.	40.	39.	38.	51.	43.	36.
161	43.	41.	42.	35.	52.	56.	46.	49.	42.	48.
171	51.	47.	50.	59.	62.	67.	63.	59.	51.	64.
181	71.	72.	70.	83.	82.	65.	81.	75.	56.	95.
191	94.	74.	120.	89.	120.	110.	129.	125.	132.	128.
201	145.	145.	148.	138.	191.	193.	201.	219.	246.	239.
211	278.	310.	314.	361.	405.	461.	479.	484.	538.	547.
221	601.	676.	696.	700.	692.	755.	768.	856.	782.	855.
231	775.	747.	720.	705.	712.	717.	706.	711.	739.	769.
241	778.	860.	911.	930.	979.	1036.	1123.	1072.	1094.	1178.
251	1170.	1178.	1205.	1188.	1104.	1065.	1031.	885.	804.	695.
261	582.	535.	463.	399.	343.	348.	299.	267.	273.	288.
271	307.	290.	292.	349.	301.	377.	374.	420.	456.	512.
281	544.	551.	637.	685.	762.	792.	943.	996.	1065.	1094.
291	1146.	1274.	1288.	1372.	1408.	1430.	1419.	1413.	1367.	1347.
301	1311.	1172.	1063.	951.	857.	716.	659.	535.	452.	382.
	256.	221.	175.	142.	109.	65.	52.	24.	28.	25.
[illegible]	9.	10.	2.	11.	10.	6.	5.	3.	4.	5.
331	5.	4.	6.	6.	8.	6.	6.	7.	8.	11.
341	14.	19.	15.	19.	14.	13.	22.	22.	30.	29.
351	30.	24.	25.	36.	33.	25.	24.	22.	36.	38.
361	14.	35.	25.	22.	21.	8.	5.	10.	10.	4.
371	3.	4.	2.	2.	0.	2.	0.	0.	0.	0.
381	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
391	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	2.	0.	0.	0.	0.	0.	0.	1.	1.	0.
411	0.	0.	1.	0.	0.	1.	0.	0.	0.	0.
421	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.
431	0.	0.	0.	1.	1.	0.	0.	1.	0.	0.
441	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
451	0.	0.	1.	1.	1.	0.	0.	0.	1.	1.
461	0.	0.	0.	0.	0.	1.	0.	0.	0.	1.
471	0.	0.	0.	1.	2.	1.	0.	0.	0.	0.
481	1.	1.	1.	0.	0.	2.	0.	0.	0.	0.
491	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
511	0.	0.								

9-10-2

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V-33-8682
File ID: 4a4820.CNF

Counted on: 9/10/93 @ 6:54
Detector: AEA4
Geometry number: 1
Count time: 28806. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	997.8	997.8	253.903	253.903	14.000	7.012	7.000	1.956
2	22.3	22.3	157.511	157.433	138.000	1.000	69.000	0.100
3?	6.5	6.5	114.599	114.103	8.000	0.714	4.000	0.854
4?	5.7	5.7	107.146	106.706	6.000	0.797	3.000	0.325

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Peak Centroid Obs.	Peak Centroid Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Am243	0.849	5.276	5.291	-.0150	3.03	42.13	1.4	382.7	0.172E-03
2		0.036		4.837	0.00		1.77	6.8	16.0	0.719E-05
3		????		4.634			0.07	97.6		
4		????		4.599			0.13	52.9		
Totals:		0.885	<--valid peaks only-->				43.90			

DETECTOR CALIBRATION
Energy(MEV) = 4.097 + (0.0047)*Channel
Energy range (MeV): 4.097 TO 6.504
Efficiency = 0.1112 CPM/DPM

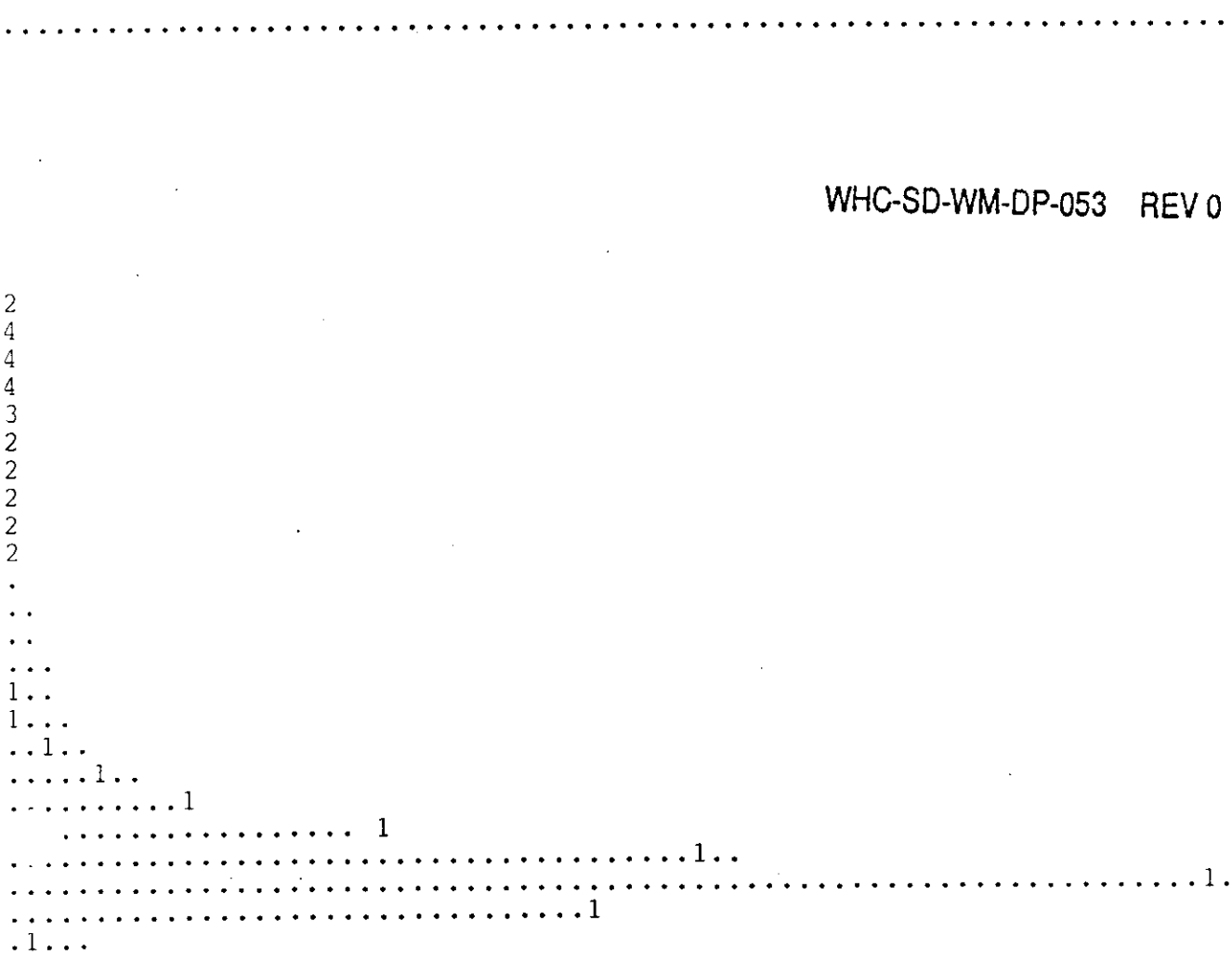
TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	23825.0	100.000
Smoothed	23990.5	100.695
Composite fit	21178.2	88.891
Residuals	2646.8	11.109

Analyzed by: _____
DM

Spectrum 4a4820.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 7259.7



Raw Data Dump for AEA Spectrum: 4a4820.CNF

1	28806.	0.	0.	82.	15.	6.	3.	1.	2.	2.
11	0.	3.	2.	0.	1.	2.	2.	1.	3.	2.
21	2.	1.	1.	2.	3.	2.	2.	2.	3.	2.
31	1.	4.	5.	0.	2.	1.	5.	7.	0.	6.
41	1.	1.	2.	6.	0.	5.	4.	2.	2.	3.
51	0.	6.	5.	5.	5.	8.	5.	7.	3.	5.
61	3.	4.	14.	3.	5.	1.	7.	5.	9.	4.
71	8.	8.	8.	2.	5.	2.	8.	6.	7.	8.
81	9.	3.	1.	5.	2.	4.	2.	4.	9.	10.
91	11.	6.	9.	9.	7.	9.	3.	5.	7.	9.
101	8.	7.	11.	6.	6.	13.	16.	15.	8.	7.
111	8.	8.	8.	16.	8.	12.	9.	8.	10.	8.
121	14.	5.	9.	6.	13.	15.	11.	15.	10.	11.
131	16.	16.	6.	8.	18.	13.	19.	9.	13.	28.
141	12.	11.	23.	17.	15.	24.	15.	18.	15.	21.
151	22.	14.	25.	25.	18.	16.	30.	20.	22.	23.
161	14.	16.	14.	23.	19.	23.	25.	19.	33.	28.
171	25.	27.	29.	23.	30.	30.	33.	32.	36.	37.
181	38.	29.	35.	34.	44.	32.	42.	39.	45.	41.
191	46.	37.	44.	43.	40.	51.	47.	43.	55.	54.
201	59.	47.	57.	67.	55.	63.	66.	60.	80.	60.
211	75.	75.	72.	100.	80.	98.	97.	90.	84.	119.
221	98.	133.	118.	127.	125.	136.	130.	155.	144.	172.
231	203.	183.	215.	192.	252.	288.	257.	310.	379.	381.
241	419.	470.	534.	542.	620.	654.	695.	788.	805.	885.
251	906.	980.	1061.	1100.	1057.	954.	829.	659.	475.	300.
261	182.	105.	84.	68.	56.	51.	48.	40.	44.	30.
271	22.	16.	12.	4.	6.	2.	0.	1.	1.	2.
281	1.	1.	1.	0.	1.	3.	2.	5.	3.	3.
291	6.	5.	3.	7.	7.	4.	4.	7.	4.	5.
301	1.	5.	3.	1.	2.	2.	1.	0.	1.	2.
311	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.
321	0.	0.	0.	0.	0.	0.	1.	0.	0.	1.
331	1.	0.	0.	0.	1.	0.	0.	0.	0.	1.
341	1.	0.	0.	0.	0.	3.	1.	4.	0.	3.
351	3.	3.	1.	1.	1.	0.	0.	1.	1.	1.
361	2.	1.	1.	0.	0.	0.	0.	0.	2.	1.
371	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
381	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
411	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
421	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
431	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
441	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
461	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
471	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
481	1.	0.	1.	0.	0.	0.	0.	0.	0.	0.
491	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
511	0.	0.								

9-10-93

Westinghouse Hanford Co.

WHC-SD-WM-DP-053 REV 0

G E N E R A L A L P H A E N E R G Y A N A L Y S I S

Rev. 2.01

DATA REDUCTION REPORT

SAMPLE
V-34-8782
File ID: 6a6656.CNF

Counted on: 9/10/93 @ 6:55
Detector: AEA6
Geometry number: 1
Count time: 28803. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	669.7	669.7	251.139	251.139	26.000	24.507	13.000	3.940
2	22.0	22.0	146.131	145.467	108.000	1.000	54.000	0.100
3?	0.3	0.1	130.455	130.000	4.000	0.100	2.000	0.100

PEAK RESULTS

Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
	Am243	0.911	5.276	5.278	-.002	0.12	50.62	1.3	459.8	0.207E-03
	Pu240		5.144	5.278	-.134				455.2	0.205E-03
2	Np237	0.031	4.781	4.781	0.000	0.00	1.74	7.6	18.0	0.811E-05
3		????		4.708			0.00	*****		
Totals:		0.942	<--valid peaks only-->				52.36			

DETECTOR CALIBRATION

Energy(MEV) = 4.097 + (0.0047)*Channel
Energy range (MeV): 4.097 TO 6.504
Efficiency = 0.1112 CPM/DPM

TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	26670.0	100.000
Smoothed	26788.4	100.444
Composite fit	25135.9	94.248
Residuals	1534.1	5.752

Analyzed by: _____
DM

Spectrum 6a6656.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 5163.2

Raw Data Dump for AEA Spectrum: 6a6656.CNF

1	28803.	0.	0.	2.	5.	1.	2.	5.	2.	1.
11	3.	0.	1.	1.	0.	3.	0.	2.	1.	2.
21	2.	2.	3.	1.	2.	4.	1.	0.	3.	1.
31	4.	2.	3.	2.	4.	1.	3.	2.	3.	3.
	4.	4.	1.	2.	3.	1.	3.	4.	2.	2.
51	3.	5.	3.	2.	7.	4.	6.	3.	4.	2.
61	2.	7.	4.	6.	4.	2.	3.	2.	7.	4.
71	0.	4.	6.	5.	2.	6.	8.	8.	4.	6.
81	4.	3.	5.	9.	8.	6.	5.	7.	4.	8.
91	3.	3.	8.	6.	8.	10.	10.	2.	9.	10.
101	13.	3.	8.	11.	12.	11.	6.	14.	8.	13.
111	12.	4.	9.	17.	7.	12.	18.	15.	9.	14.
121	13.	19.	9.	9.	9.	17.	20.	15.	13.	20.
131	24.	13.	13.	18.	10.	21.	23.	26.	16.	28.
141	20.	22.	21.	24.	37.	20.	27.	27.	26.	21.
151	26.	27.	17.	33.	44.	25.	38.	38.	22.	44.
161	44.	37.	40.	41.	46.	31.	45.	35.	38.	50.
171	41.	40.	38.	54.	57.	42.	46.	60.	58.	66.
181	61.	63.	50.	67.	70.	73.	60.	66.	78.	79.
191	86.	89.	82.	94.	84.	80.	93.	104.	98.	84.
201	93.	117.	106.	120.	118.	113.	124.	115.	111.	129.
211	143.	134.	142.	169.	168.	163.	153.	199.	176.	193.
221	171.	189.	191.	215.	229.	214.	210.	238.	286.	271.
231	318.	309.	316.	355.	387.	373.	416.	424.	474.	439.
241	518.	521.	527.	586.	586.	600.	657.	612.	684.	707.
251	691.	698.	650.	666.	581.	601.	536.	476.	441.	417.
261	342.	306.	234.	227.	170.	146.	110.	82.	89.	67.
271	57.	36.	24.	37.	21.	21.	10.	7.	8.	3.
281	8.	2.	3.	3.	4.	3.	3.	6.	3.	1.
291	4.	4.	3.	3.	5.	4.	2.	3.	1.	2.
301	3.	2.	3.	1.	4.	1.	2.	0.	0.	0.
	0.	1.	1.	0.	0.	2.	2.	0.	1.	0.
321	0.	0.	1.	1.	1.	0.	0.	0.	1.	0.
331	1.	2.	0.	0.	0.	3.	1.	0.	1.	0.
341	1.	0.	1.	0.	1.	0.	0.	0.	0.	0.
351	3.	1.	0.	0.	1.	1.	1.	0.	0.	1.
361	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
371	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
381	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
411	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
421	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
431	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
441	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
451	0.	1.	0.	0.	0.	0.	0.	0.	1.	0.
461	0.	0.	0.	1.	1.	0.	0.	0.	0.	1.
471	1.	3.	1.	3.	3.	1.	0.	2.	0.	1.
481	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
491	1.	0.	1.	2.	4.	9.	4.	0.	0.	0.
511	0.	0.								

9-10-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

SAMPLE
V-34-8882
File ID: 7a7183.CNF

WHC-SD-WM-DP-053 REV 0

Counted on: 9/10/93 @ 6:56
Detector: AEA7
Geometry number: 1
Count time: 28801. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	189.6	189.6	252.430	252.430	16.000	10.353	8.000	2.397

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Am243	0.910	5.276	5.284	-.008	0.05	9.68	2.9	87.9	0.396E-04
Totals:		0.910	<--valid peaks only-->				9.68			

DETECTOR CALIBRATION
Energy(MEV) = 4.097 + (0.0047)*Channel
Energy range (MeV): 4.097 TO 6.504
Efficiency = 0.1112 CPM/DPM

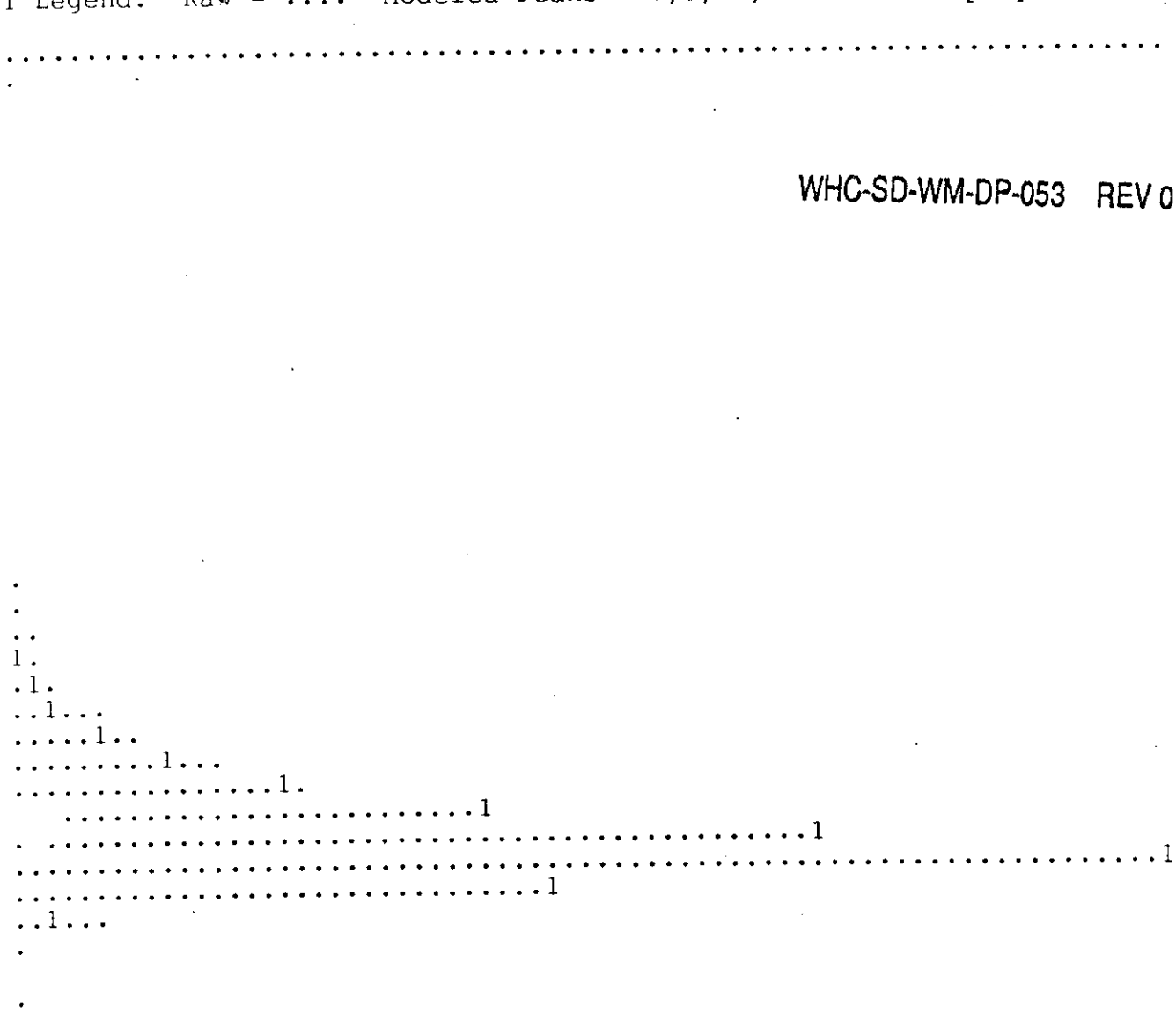
TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	5107.0	100.000
Smoothed	5220.5	102.223
Composite fit	4646.5	90.982
Residuals	460.5	9.018

Analyzed by: _____
DM

Spectrum 7a7183.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 1402.2



Raw Data Dump for AEA Spectrum: 7a7183.CNF

1	28801.	0.	0.	0.	1.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.
31	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
51	0.	0.	1.	0.	0.	0.	0.	1.	0.	0.
61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
71	0.	0.	1.	1.	0.	0.	0.	0.	0.	0.
81	0.	0.	1.	0.	0.	1.	0.	1.	0.	0.
91	1.	0.	0.	0.	0.	0.	0.	0.	1.	0.
101	0.	0.	1.	0.	1.	0.	0.	0.	1.	1.
111	0.	1.	0.	0.	0.	0.	1.	1.	2.	0.
121	3.	1.	1.	1.	4.	1.	0.	0.	2.	1.
131	1.	2.	0.	1.	2.	4.	1.	4.	1.	2.
141	2.	2.	1.	4.	1.	4.	1.	2.	6.	0.
151	1.	1.	3.	3.	0.	2.	0.	1.	3.	2.
161	4.	3.	5.	2.	3.	2.	3.	6.	3.	1.
171	4.	1.	2.	5.	4.	5.	3.	3.	8.	7.
181	7.	13.	3.	8.	5.	7.	10.	8.	6.	5.
191	5.	6.	5.	10.	15.	8.	6.	13.	11.	15.
201	19.	12.	16.	16.	23.	18.	28.	18.	14.	13.
211	27.	20.	20.	23.	35.	24.	27.	32.	35.	30.
221	36.	39.	51.	39.	41.	42.	35.	51.	42.	46.
231	63.	68.	73.	57.	65.	58.	70.	98.	78.	84.
241	97.	120.	102.	126.	140.	139.	150.	157.	164.	193.
251	297.	182.	203.	216.	148.	158.	126.	119.	82.	60.
261	44.	42.	32.	15.	15.	11.	11.	9.	11.	9.
271	6.	3.	4.	4.	1.	0.	2.	1.	0.	1.
281	1.	1.	2.	3.	1.	3.	0.	0.	0.	4.
291	1.	3.	6.	1.	4.	6.	1.	2.	4.	1.
301	3.	0.	1.	1.	1.	1.	0.	0.	0.	0.
311	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
321	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
331	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
341	1.	0.	0.	0.	1.	0.	0.	1.	2.	1.
351	2.	1.	0.	1.	1.	2.	0.	0.	1.	0.
361	1.	1.	1.	2.	2.	0.	0.	0.	0.	0.
371	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
381	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
411	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
421	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
431	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
441	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
461	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
471	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
481	0.	0.	0.	1.	0.	0.	0.	0.	1.	0.
491	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
511	1.	0.								

9-10-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V-34-8982
File ID: 5a5736.CNF

Counted on: 9/10/93 @ 6:54
Detector: AEA5
Geometry number: 1
Count time: 28804. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	198.7	198.7	300.288	300.288	26.000	22.829	13.000	2.882
2	193.8	193.8	255.354	254.627	20.000	19.560	10.000	1.594
3?	3.6	3.6	147.962	146.544	4.000	0.481	2.000	0.850
4?	2.1	2.1	111.360	110.821	6.000	0.733	3.000	1.540

PEAK RESULTS
Peak Error Limit: 15%

ak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Am241	0.435	5.480	5.509	-.029	0.11	17.19	2.2	164.4	0.741E-04
	Pu238		5.499	5.509	-.010				214.7	0.967E-04
2	Am243	0.569	5.276	5.294	-.018	0.09	22.47	2.1	204.1	0.919E-04
	Pu240		5.144	5.294	-.150				202.0	0.910E-04
3		????		4.786			0.03	394.		
4		????		4.618			0.02	415.		
		---					---			
Totals:		1.004	<--valid peaks only-->				39.65			

DETECTOR CALIBRATION
Energy(MEV) = 4.097 + (0.0047)*Channel
Energy range (MeV): 4.097 TO 6.504
Efficiency = 0.1112 CPM/DPM

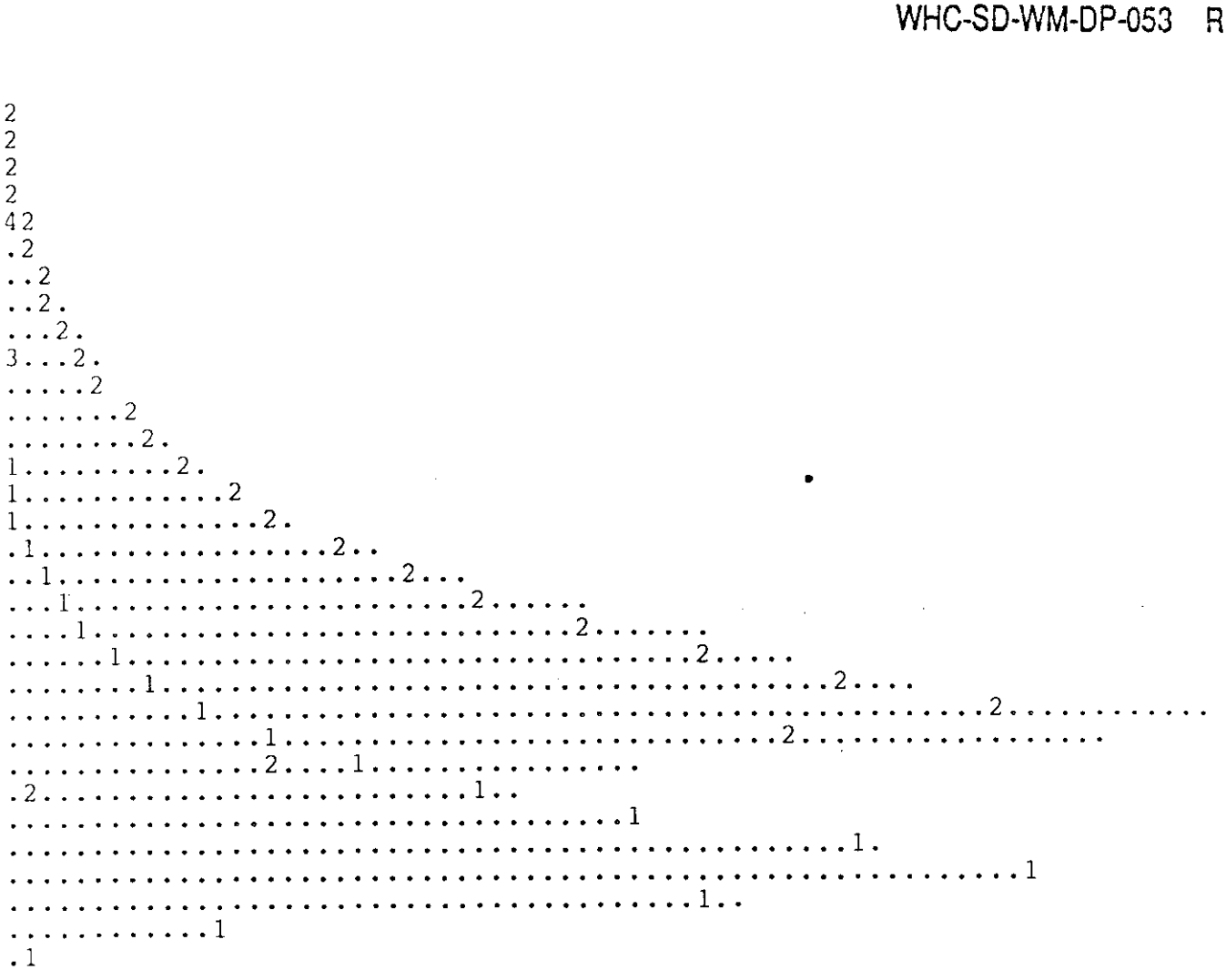
TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	18957.0	100.000
Smoothed	19072.6	100.610
Composite fit	19060.4	100.545
Residuals	-103.4	-0.545

Analyzed by: _____
DM

Spectrum 5a5736.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 1783.2



Raw Data Dump for AEA Spectrum: 5a5736.CNF

1	28804.	0.	0.	6.	2.	3.	2.	1.	3.	0.
11	2.	1.	1.	1.	1.	2.	4.	2.	3.	2.
21	1.	0.	3.	3.	2.	1.	1.	0.	2.	3.
31	1.	3.	1.	4.	2.	2.	4.	1.	1.	3.
	0.	2.	3.	3.	3.	5.	4.	3.	2.	1.
51	2.	4.	1.	4.	2.	8.	1.	3.	3.	2.
61	5.	2.	2.	4.	3.	2.	0.	3.	5.	6.
71	2.	4.	3.	6.	3.	7.	2.	5.	3.	3.
81	3.	10.	6.	6.	7.	5.	4.	4.	8.	4.
91	3.	9.	9.	7.	5.	4.	6.	6.	7.	9.
101	1.	5.	7.	3.	6.	12.	6.	8.	11.	9.
111	11.	13.	9.	8.	8.	7.	8.	9.	6.	9.
121	10.	11.	8.	11.	14.	9.	14.	19.	12.	11.
131	12.	10.	13.	13.	13.	16.	18.	18.	17.	18.
141	11.	17.	21.	17.	22.	17.	30.	19.	20.	19.
151	27.	16.	16.	20.	20.	21.	20.	13.	19.	28.
161	23.	36.	27.	19.	22.	28.	35.	28.	30.	42.
171	32.	26.	37.	33.	31.	38.	38.	38.	37.	37.
181	44.	43.	42.	41.	45.	34.	45.	51.	42.	52.
191	48.	54.	51.	58.	53.	47.	65.	59.	48.	69.
201	74.	77.	65.	80.	75.	70.	77.	76.	69.	74.
211	87.	101.	69.	101.	100.	102.	120.	82.	110.	116.
221	118.	118.	134.	124.	123.	125.	137.	138.	125.	146.
231	133.	146.	153.	149.	144.	112.	158.	183.	142.	150.
241	153.	173.	163.	173.	158.	183.	209.	178.	204.	213.
251	215.	237.	257.	246.	229.	245.	252.	230.	185.	238.
261	199.	189.	161.	161.	134.	119.	108.	140.	85.	92.
271	77.	101.	106.	110.	81.	86.	106.	88.	89.	107.
281	93.	103.	110.	128.	132.	126.	147.	154.	160.	147.
291	150.	158.	193.	176.	196.	174.	188.	192.	196.	209.
301	221.	166.	211.	179.	160.	174.	173.	136.	126.	97.
	80.	78.	50.	50.	30.	29.	21.	17.	10.	6.
321	7.	2.	4.	2.	0.	0.	1.	0.	2.	0.
331	2.	0.	1.	1.	0.	0.	0.	0.	1.	1.
341	1.	0.	1.	1.	3.	3.	1.	3.	1.	2.
351	1.	2.	1.	4.	0.	2.	1.	1.	1.	0.
361	1.	0.	0.	1.	1.	0.	0.	0.	0.	0.
371	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
381	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
411	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
421	0.	0.	0.	0.	0.	1.	1.	0.	0.	0.
431	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
441	0.	0.	1.	0.	1.	0.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.
461	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
471	0.	1.	0.	0.	0.	0.	1.	2.	2.	0.
481	0.	0.	0.	1.	0.	2.	0.	3.	2.	1.
491	0.	1.	1.	0.	0.	0.	1.	0.	0.	0.
511	0.	0.								

9-10-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S

Rev. 2.01

DATA REDUCTION REPORT

SAMPLE
V-34-8082
File ID: 8a8401.CNF

WHC-SD-WM-DP-053 REV 0

Counted on: 9/10/93 @ 6:56
Detector: AEA8
Geometry number: 1
Count time: 28804. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	14.0	14.0	355.968	355.968	22.000	14.403	11.000	5.796
2	240.6	240.6	299.814	299.813	14.000	10.084	7.000	2.694
3	227.0	227.0	254.010	253.887	16.000	9.248	8.000	2.326
4	118.7	118.7	227.884	227.128	14.000	7.181	7.000	1.852

PEAK RESULTS

Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1		????		5.770			0.61	11.5		
2	Am241	0.166	5.480	5.507	-.027	0.05	11.26	2.7	107.7	0.485E-04
	Pu238		5.499	5.507	-.008				140.6	0.633E-04
3	Am243	0.159	5.276	5.291	-.015	0.04	10.78	2.8	97.9	0.441E-04
4	Pu239	0.078	5.143	5.165	-.022	0.03	5.28	5.1	47.5	0.214E-04
	Pu240		5.144	5.165	-.021				47.5	0.214E-04
		---					---			
Totals:		0.402	<--valid peaks only-->				27.32			

DETECTOR CALIBRATION

Energy(MEV) = 4.097 + (0.0047)*Channel
Energy range (MeV): 4.097 TO 6.504
Efficiency = 0.1112 CPM/DPM

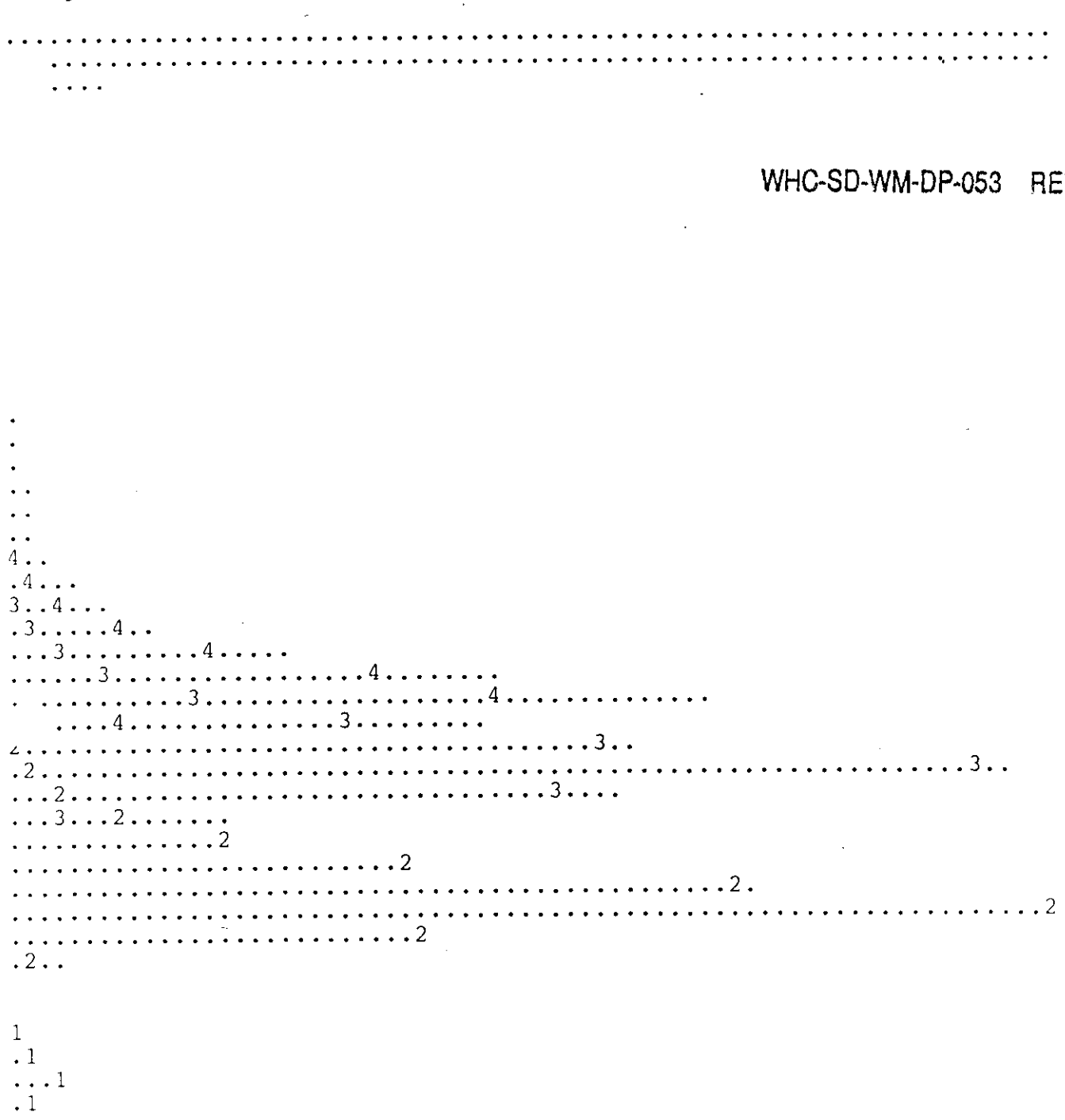
TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	32624.0	100.000
Smoothed	44137.9	135.293
Composite fit	13407.8	41.098
Residuals	19216.2	58.902

Analyzed by: _____
DM

Spectrum 8a8401.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 1775.6



Raw Data Dump for AEA Spectrum: 8a8401.CNF

1	28804.	0.	0.	14594.	3991.	1.	0.	2.	1.	1.
11	1.	0.	1.	3.	1.	2.	0.	1.	0.	1.
21	1.	1.	2.	4.	1.	0.	1.	1.	0.	1.
31	2.	2.	0.	2.	1.	2.	0.	0.	3.	0.
41	0.	1.	1.	2.	1.	2.	6.	2.	2.	2.
51	3.	1.	1.	3.	1.	1.	2.	2.	1.	3.
61	0.	2.	2.	1.	2.	2.	2.	0.	1.	0.
71	2.	2.	1.	1.	2.	0.	1.	4.	0.	2.
81	4.	1.	2.	2.	1.	3.	1.	2.	2.	1.
91	4.	1.	5.	2.	1.	4.	3.	2.	4.	0.
101	2.	2.	2.	1.	5.	2.	0.	4.	2.	3.
111	1.	2.	3.	2.	6.	5.	3.	3.	3.	1.
121	2.	0.	6.	3.	1.	4.	6.	2.	2.	8.
131	3.	4.	6.	7.	4.	5.	4.	7.	8.	7.
141	3.	5.	3.	8.	4.	6.	2.	1.	2.	11.
151	3.	9.	6.	7.	4.	5.	8.	9.	5.	9.
161	5.	8.	8.	9.	6.	9.	9.	9.	6.	9.
171	11.	12.	8.	5.	7.	9.	6.	12.	12.	11.
181	8.	11.	16.	15.	19.	18.	8.	21.	17.	17.
191	19.	20.	21.	22.	24.	29.	26.	28.	27.	26.
201	25.	39.	29.	36.	34.	30.	31.	30.	44.	51.
211	49.	61.	84.	58.	84.	96.	84.	104.	102.	100.
221	118.	124.	126.	127.	156.	173.	154.	185.	162.	148.
231	142.	126.	123.	123.	91.	81.	76.	73.	77.	114.
241	82.	95.	133.	152.	157.	158.	175.	167.	185.	207.
251	221.	236.	236.	279.	220.	236.	205.	178.	139.	103.
261	91.	70.	60.	55.	50.	37.	49.	44.	40.	29.
271	42.	46.	38.	34.	55.	50.	43.	50.	42.	73.
281	77.	61.	78.	94.	94.	102.	106.	109.	123.	142.
291	152.	151.	190.	192.	220.	210.	226.	258.	259.	236.
301	267.	241.	201.	156.	131.	123.	94.	59.	45.	43.
311	27.	27.	16.	15.	7.	10.	2.	2.	0.	3.
321	1.	1.	1.	0.	4.	3.	4.	2.	2.	6.
331	2.	3.	0.	3.	2.	2.	3.	3.	2.	4.
341	3.	6.	5.	2.	5.	5.	3.	6.	7.	7.
351	10.	12.	11.	17.	14.	16.	15.	13.	11.	11.
361	16.	12.	8.	11.	6.	3.	4.	3.	1.	1.
371	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
381	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
411	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
421	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
431	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
441	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
461	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
471	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
481	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
491	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
511	0.	0.								

✓ SA 49

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH

Batch 1554

WHC-SD-WM-DP-053 REV 0

Lab Segment Serial No. V34	Customer ID: 107APCom
Analysis: Am 241	Sample Prep: Acid digest

Instrument: WB57237	Procedure/ Rev: LA 503-156 D-0
Technologist: TA McCulloch	Date: 9-1-93
Starting Time: 0800	Temperature 24°C
Ending Time: 1400	Chemist: SA Catlow

Comments:

	Description	Lab ID		Description	Lab ID
1	Lmcs	V32-8582	11		
2	Blk	V33-8612	12		
3	Sam	V34-8782	13		
4	Sam Dup	V34-8882	14	OUT FOR RERUN	
5	Sam spike	V34-8982	15		
6	Sam Dup spike	V34-8082	16		
7			17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
Lmcs	63B43 - 1ml			
spike	58B43 - .100 ml			
Spike	63B43 - .100 ml			
		1104		

A-6000-881 (03/92)

CA

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA-503-156

DATE START: September 1, 1993

PREPARED BY: L. L. Fritts LL Fritts 9.2.93

DATE COMPLETE: September 2, 1993

	UNITS:	uCi/mL							
SPL NAME	SPL ID	ANALYTE	RESULT #1	RESULT #2	AVERAGE	RPD%	%REC	DET LIM	% CT ER
STD 63B43	V32	Am-241	2.86E+1				91.4		4.5
BLANK	V33	Am-241	<6.37E-4				55.6		15.7
107APCOM	V34	Am-241	<6.37E-4	<6.37E-4	N/A	N/A	10.5	6.37E-4	32.2
							11.9		38.2
					Recovery:	Spike	84.7		7.1
						Dup	66.4		12.2
107APCOM	V34	Cm-243/44	<6.37E-4	<6.37E-4	N/A	N/A	10.5	6.37E-4	32.2
							11.9		38.2
					Recovery:	Spike	84.7		7.1
						Dup	66.4		12.2
107APCOM	V34	SPIKE	2.27E-2	1.78E-2	2.03E-2	24.1			

NARRATIVE: [ ] NO SPECIAL PROBLEMS/METHOD VARIATIONS IN THIS BATCH

LIST SPECIFIC PROBLEMS/VARIATIONS FOR THIS BATCH:

The results for the standard are in uCi/L.

The Cm-243/244 is below detection limit.

Rerun requested: RPD on spike and spike duplicate is greater than 20%.

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

4 4801

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 32.-8582	107-AP	8- 3-93	10:44	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	% RECOVERY	N1L17	0

Sample Size	Customer ID
? 100-10-1 ml	STD

Remarks, Calculations, Results

EDP R201 AR001 "AEA" - 480MIN

STD# 63B43 RESULT 28.6 ATTACH PRINTOUT

STD VAL 26.506 %REC 106.7%

.100 ml Am 243-5B343 1064 (.1)(101)(1000)(2.547E-3) = 28.6

958 OUT FOR RERUN

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-1-93	1400	

54-6800-081 (R/10-83)

AM-241: LA-503-156 (D-0) LIQUIDS

			STANDARD
Serial No.	Spike (Tracer) Book Number		58B43
V32-8582	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1554	Volume of Sample in mL	(SS)	1
Rerun No.	Dilution Factor	(DF)	101
0	Digest Dilution Factor	(DDF)	1
Analyst	Am-241 Area Peak Height from AEA	(C241)	1064
	Am-243 Area Peak Height from AEA	(C243)	958
Date	Total AT Count	(ATOT)	16569
09/01/93	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	7

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))

µCi/mL = µCi/L / (1000mL/L)

Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100

Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

Am-241 µCi/L	=	2.86E+01
Am-241 µCi/mL	=	2.86E-02
Relative counting error	=	4.5%
Am-243 Tracer Recovery	=	91.4%

Data Entry by:	Date: 02-Sep-93
Approved by:	Date: Sept 2, 1993

Form 3 Rev. 1.1

WHC-SD-WM-DP-053 REV 0

#1 9-1-93

Y32-8582

16569/30 -7

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

3 3588

Serial No	Sample Point	Date	Time Issued	Priority
V 33.-8682	107-AP	8- 3-93	10:53	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	uCi/ML	N1L17	0

Sample Size	Customer ID
? .100 ml	BLK

Remarks Calculations Results

REAGENT BLANK

COUNT AS uCI/L

$<6.37 \times 10^{-4}$ µCi/ml "AEA" - 450MIN ATTACH PRINTOUT

.100 ml Am 243 - 58343

OUT FOR RERUN

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-1-93	1400	

54-6800-001 (R-10-83)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.	Spike (Tracer) Book Number		BLANK
V33-8682	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1554	Volume of Sample in mL	(SS)	0.1
Rerun No.	Dilution Factor	(DF)	1
0	Digest Dilution Factor	(DDF)	5
Analyst	Am-241 Area Peak Height from AEA	(C241)	42
	Am-243 Area Peak Height from AEA	(C243)	1165
Date	Total AT Count	(ATOT)	4916
09/01/93	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	1

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))

µCi/mL = µCi/L / (1000mL/L)

Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100

Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

NOTE: Reported result is a LESS THAN value using 5% of the Am-243 peak as the Am-241 peak.

Am-241 µCi/L	=	< 6.37E-01
Am-241 µCi/mL	=	< 6.37E-04
Relative counting error	=	15.7%
Am-243 Tracer Recovery	=	55.6%

Data Entry by:		Date:	02-Sep-93
Approved by:		Date:	Sept 2, 1993

Form 3 Rev. 1.1

AMERICIUM 241 ANALYSIS - ACID DIGESTION

#2 9-1-93

V33 8682

4916-1
30

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

2 2200 WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8782	107-AP	8- 3-93	10:56	25

Determination	Method-Standard	Result Units	Charge Code	Returns
Am241	LA-503-156	uCi/ML	N1L17	0

Sample Size	Customer ID
? .100 ml	107APCOM

Remarks Calculations Results

COUNT AS uCI/L <6.37x10^-4 µCi/ml

1 ml 8m HNO_3

.100 ml Con HNO_3

.100 ml Am 243-58B43

"AEA" - 480MIN

ATTACH PRINTOUT

OUT FOR RERUN

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-1-93	1400	

54-6800 (R-10-83)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.			SAMPLE
V34-8782	Spike (Tracer) Book Number		58B43
	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1554	Volume of Sample in mL	(SS)	0.1
Rerun No.	Dilution Factor	(DF)	1
0	Digest Dilution Factor	(DDF)	5
Analyst	Am-241 Area Peak Height from AEA	(C241)	10
	Am-243 Area Peak Height from AEA	(C243)	267
Date	Total AT Count	(ATOT)	1103
09/01/93	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	6

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))

µCi/mL = µCi/L / (1000mL/L)

Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100

Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

NOTE: Reported result is a LESS THAN value using 5% of the Am-241 peak as the Am-241 peak.

Am-241 µCi/L	=	< 6.37E-01
Am-241 µCi/mL	=	< 6.37E-04
Relative counting error	=	32.2%
Am-243 Tracer Recovery	=	10.5%

Data Entry by:	Date: 02-Sep-93
Approved by:	Date: Sept 2, 1993

Form 3 Rev. 1.1

#3 9-1-93

V34-8782

1103/30 - 6

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

7 7165

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8882	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	uCi/ML	N1L17	0

Sample Size	Customer ID
? .100 ml	107APCOM

Remarks Calculations Results

DUPLICATE SAMPLE <6.37x10^-4 uCi/ml

COUNT AS uCI/L

1 ml 8m HNO_3

.100 ml Con HNO_3

.100 ml Am 243- 58B43

"AEA" - 430MIN

ATTACH PRINTOUT

OUT FOR RERUN

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Mgr		
9-1-93	1400			

54-6800-065 (R 10-93)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.			DUPLICATE
V34-8882	Spike (Tracer) Book Number		58B43
	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1554	Volume of Sample in mL	(SS)	0.1
Rerun No.	Dilution Factor	(DF)	1
0	Digest Dilution Factor	(DDF)	5
Analyst	Am-241 Area Peak Height from AEA	(C241)	7
	Am-243 Area Peak Height from AEA	(C243)	342
Date	Total AT Count	(ATOT)	1238
09/01/93	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	7

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))

µCi/mL = µCi/L / (1000mL/L)

Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100

Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

NOTE: Reported result is a LESS THAN value using 5% of the Am-243 peak as the Am-241 peak.

Am-241 µCi/L	=	< 6.37E-01
Am-241 µCi/mL	=	< 6.37E-04
Relative counting error	=	38.2%
Am-243 Tracer Recovery	=	11.9%

Data Entry by:	Date: 02-Sep-93
Approved by:	Date: Sept 2, 1993

Form 3 Rev. 1.1

AMERICIUM 241 ANALYSIS - ACID DIGESTION

#1 9-1-93

1238/30 -7

V34-8882

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PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

WHC-SD-WM-DP-053 REV 0

6 6636

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8982	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	% RECOVERY	N1L17	0

Sample Size	Customer ID
? .100 ml	107APCOM

Remarks, Calculations, Results

SAMPLE SPIKED ID
SPIKE ID
SPIKE VOLUME

1 ml 8m HNO_3
.100 ml Con HNO_3
.100 ml Am 243-58843
.100 ml 63843

"AEA" - 480MIN
ATTACH PRINTOUT

OUT FOR RERUN

$\%Recovery = \frac{22.7}{26.8} = 84.7\%$

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
9-1-93	1400	

54-6800(DR) (R-10-83)

AM-241: LA-503-156 (D-0) LIQUIDS

Serial No.	Spike (Tracer) Book Number		CHK EXT NO.
V34-8982	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1554	Volume of Sample in mL	(SS)	0.1
Rerun No.	Dilution Factor	(DF)	1
0	Digest Dilution Factor	(DDF)	1
Analyst	Am-241 Area Peak Height from AEA	(C241)	1977
	Am-243 Area Peak Height from AEA	(C243)	222
Date	Total AT Count	(ATOT)	8095
09/01/93	AT Count Time in Minutes	(MIN CTd)	30
	Background in CPM	(BKG)	1

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))
µCi/mL = µCi/L / (1000mL/L)
Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100
Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

Am-241 µCi/L	=	2.27E+01
Am-241 µCi/mL	=	2.27E-02
Relative counting error	=	7.1%
Am-243 Tracer Recovery	=	9.6%

Data Entry by:	Date: 02-Sep-93
Approved by:	Date: Sept 2, 1993

Form 3 Rev. 1.1

AMERICIUM 241 ANALYSIS - ACID DIGESTION

#2 9-1-93

WHC-SD-WM-DP-053 REV 0

V34-8982

8095 -1
30

BEST AVAILABLE COPY

PLACE ANALYTICAL CARD IN BOX BELOW-DO NOT WRITE IN SPACE

5 5717

WHC-SD-WM-DP-053 REV 0

Serial No	Sample Point	Date	Time Issued	Priority
V 34.-8082	107-AP	8- 3-93	10:56	25

Determination	Method Standard	Result Units	Charge Code	Reruns
Am241	LA-503-156	% RECOVERY	N1L17	0

Sample Size	Customer ID
? .100 ml	107APCOM

Remarks Calculations Results

SAMPLE SPIKE DUPLICATE

SPIKE ID
SPIKE VOL

1ml 8m HNO_3
.100ml Con HNO_3
.100 ml Am 243-58B43
.100ml 63B43

"AEA" - 480MII ATTACH PRINTOUT

OUT FOR RERUN

% Recovery = $\frac{17.8}{26.8}$ = 66.4

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs
Date	Time Completed	Lab Unit Manager		
9-1-93	1400			

34-6800-061 (R 10/93)

AM-241: LA-503-156 (D-0) LIQUIDS

			ERR
Serial No.	Spike (Tracer) Book Number		58B43
V34-8082	Activity of Am243 Tracer in dpm/mL	(SPKA)	5655
Batch ID	Spike (Tracer) Volume in mL	(SPKV)	0.1
1554	Volume of Sample in mL	(SS)	0.1
Rerun No.	Dilution Factor	(DF)	1
0	Digest Dilution Factor	(DDF)	1
Analyst	Am-241 Area Peak Height from AEA	(C241)	538
	Am-243 Area Peak Height from AEA	(C243)	77
Date	Total AT Count	(ATOT)	38375
09/01/93	AT Count Time in Minutes	(MIN CTd)	10
	Background in CPM	(BKG)	6

Am-241 µCi/L = ((C241 * SPKA * SPKV * DF * DDF * (1000mL/L)) / ((C243 * SS * (2220000dpm/mL))
µCi/mL = µCi/L / (1000mL/L)
Tracer % Rec = ((ATOT / MIN CTd - BKG) * 2 * (C243 / (C241 + C243)) / (SPKA * SPKV)) * 100
Relative Counting Error = Square Root of ((1 / C241) + (1/C243)) * 100

Am-241 µCi/L	=	1.78E+01
Am-241 µCi/mL	=	1.78E-02
Relative counting error	=	12.2%
Am-243 Tracer Recovery	=	169.7%

Data Entry by:	Date: 02-Sep-93
Approved by:	Date: Sept 2, 1993

Form 3 Rev. 1.1

AMERICIUM 241 ANALYSIS - ACID DIGESTION

43 9-1-93

38375-6
10

Y34-8087

BEST AVAILABLE COPY

D. Hamilton
9-1-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V32-8582
File ID: 4a4801.CNF

Counted on: 9/ 1/93 @14:55
Detector: AEA4
Geometry number: 1
Count time: 28806. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	898.7	898.7	302.552	302.552	14.000	6.390	7.000	1.615
2	781.7	781.7	257.176	257.113	12.000	4.568	6.000	1.234
3	1883.6	1883.6	230.878	230.781	12.000	5.177	6.000	1.414
4	34.3	34.3	147.231	146.095	56.000	213.618	28.000	69.619
5?	9.7	9.7	105.976	103.936	16.000	11.200	8.000	8.326
6?	14.2	14.2	92.140	92.140	20.000	1.479	10.000	16.442
7	14.4	14.4	72.296	72.075	36.000	43.697	18.000	1.655

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Pu238	0.259	5.499	5.515	-.016	0.03	39.62	1.4	331.9	0.150E-03
	Am241		5.480	5.515	-.035				254.2	0.115E-03
2	Am243	0.203	5.276	5.302	-.026	0.02	31.13	1.7	189.6	0.854E-04
3	Pu239	0.497	5.143	5.178	-.035	0.02	76.08	1.1	458.9	0.207E-03
	Pu240		5.144	5.178	-.034				458.9	0.207E-03
4	Np237	0.033	4.640	4.780	-.140	1.00	4.98	14.6	500.8	0.226E-03
	Np237		4.781	4.780	0.001				34.5	0.156E-04
5		????		4.582			0.33	32.3		
6		????		4.526			0.17	38.2		
7	U 235	0.013	4.396	4.432	-.036	0.21	1.97	7.8	20.8	0.937E-05
Totals:		1.005	<--valid peaks only-->				153.78			

DETECTOR CALIBRATION
Energy(MEV) = 4.093 + (0.0047)*Channel
Energy range (MeV): 4.093 TO 6.500
Efficiency = 0.1658 CPM/DPM

TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	73441.0	100.000
Smoothed	73669.6	100.311

SIGNATURE ABOVE REPRESENTS CHEMICAL TECHNOLOGIST/CHEMIST THAT COMPLETED/VERIFIED THE CALIBRATION/ANALYSIS ON PAGES 1118 TO 1136.

Composite fit	74069.8	100.856
Residuals	-628.8	-0.856

Analyzed by: _____
RW

Spectrum 4a4801.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 13112.8

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7.....................................................................
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4.3
4....3
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2....................3.....
.2.....................................3
.  2.......................................................................3.
   ...2.............................3........
3...........2.....
1...................... 2
.1....................2..
2.1...
.....1
..........1..
....................1
.............................. 1
..................1
1.
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WHC-SD-WM-DP-053 REV 0

Raw Data Dump for AEA Spectrum: 4a4801.CNF

1	28806.	0.	0.	92.	73.	4.	8.	3.	9.	13.
11	7.	6.	5.	5.	10.	6.	8.	10.	10.	10.
21	10.	7.	4.	2.	9.	7.	14.	8.	11.	10.
31	11.	7.	11.	4.	13.	9.	13.	11.	10.	10.
41	6.	21.	6.	12.	11.	15.	10.	16.	9.	15.
51	13.	9.	6.	13.	17.	10.	10.	14.	8.	15.
61	10.	10.	12.	19.	17.	9.	13.	14.	15.	16.
71	12.	18.	14.	19.	9.	13.	15.	11.	18.	19.
81	15.	18.	12.	14.	17.	24.	15.	17.	21.	12.
91	18.	23.	21.	17.	16.	9.	19.	12.	22.	16.
101	16.	14.	22.	23.	27.	12.	29.	20.	16.	24.
111	15.	15.	25.	20.	17.	23.	33.	24.	17.	25.
121	33.	20.	24.	30.	23.	25.	25.	23.	23.	33.
131	31.	29.	34.	35.	32.	33.	17.	28.	29.	41.
141	28.	32.	36.	34.	29.	36.	43.	26.	39.	33.
151	30.	25.	44.	44.	48.	42.	35.	40.	48.	43.
161	61.	37.	38.	50.	47.	36.	47.	52.	58.	51.
171	56.	69.	74.	54.	67.	54.	73.	78.	53.	60.
181	72.	69.	63.	89.	77.	86.	104.	89.	96.	97.
191	118.	98.	104.	120.	129.	122.	125.	166.	181.	181.
201	217.	260.	280.	277.	353.	360.	407.	422.	466.	551.
211	612.	637.	731.	745.	789.	803.	907.	914.	981.	1028.
221	947.	958.	932.	963.	1111.	1277.	1456.	1815.	1993.	2241.
231	2316.	2206.	1806.	1487.	1093.	766.	530.	426.	392.	337.
241	376.	419.	380.	374.	396.	429.	356.	415.	392.	406.
251	421.	498.	586.	650.	796.	866.	958.	941.	794.	629.
261	454.	271.	197.	156.	106.	108.	112.	112.	101.	112.
271	105.	100.	95.	107.	139.	132.	159.	153.	194.	206.
281	262.	253.	293.	305.	344.	367.	392.	448.	434.	478.
291	464.	468.	471.	477.	472.	505.	544.	605.	706.	803.
301	955.	1064.	1001.	909.	841.	606.	423.	270.	228.	164.
311	126.	109.	88.	69.	44.	31.	24.	11.	4.	3.
321	3.	1.	0.	0.	0.	0.	0.	1.	0.	0.
331	0.	1.	0.	0.	0.	0.	0.	0.	1.	0.
341	0.	1.	0.	1.	2.	0.	0.	0.	0.	4.
351	1.	0.	0.	2.	0.	4.	2.	1.	2.	0.
361	2.	4.	1.	2.	2.	1.	2.	0.	0.	1.
371	1.	0.	1.	0.	0.	0.	0.	0.	0.	0.
381	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
391	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
411	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
421	0.	1.	1.	0.	1.	0.	0.	0.	0.	0.
431	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
441	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
451	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
461	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
471	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
481	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
491	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
511	0.	0.								

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V33-8682
File ID: 3a3588.CNF

Counted on: 9/ 1/93 @14:54
Detector: AEA3
Geometry number: 1
Count time: 28802. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	35.6	35.6	293.589	293.589	24.000	17.778	12.000	0.486
2	1075.6	1075.6	246.652	246.639	24.000	21.909	12.000	5.828
3?	5.2	5.2	133.336	133.148	158.000	1.000	79.000	0.100

PEAK RESULTS
Peak Error Limit: 15%

Peak	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
-	Am241	0.131	5.480	5.473	0.007	0.08	9.50	2.9	61.0	0.275E-04
	Pu238		5.499	5.473	0.026				79.6	0.358E-04
2	Am243	0.853	5.276	5.253	0.023	0.10	61.85	1.2	376.8	0.170E-03
	Pu240		5.144	5.253	-.109				373.0	0.168E-03
3		????		4.719			0.41	34.2		
Totals:		0.984	<--valid peaks only-->				71.35			

DETECTOR CALIBRATION
Energy(MEV) = 4.093 + (0.0047)*Channel
Energy range (MeV): 4.093 TO 6.500
Efficiency = 0.1658 CPM/DPM

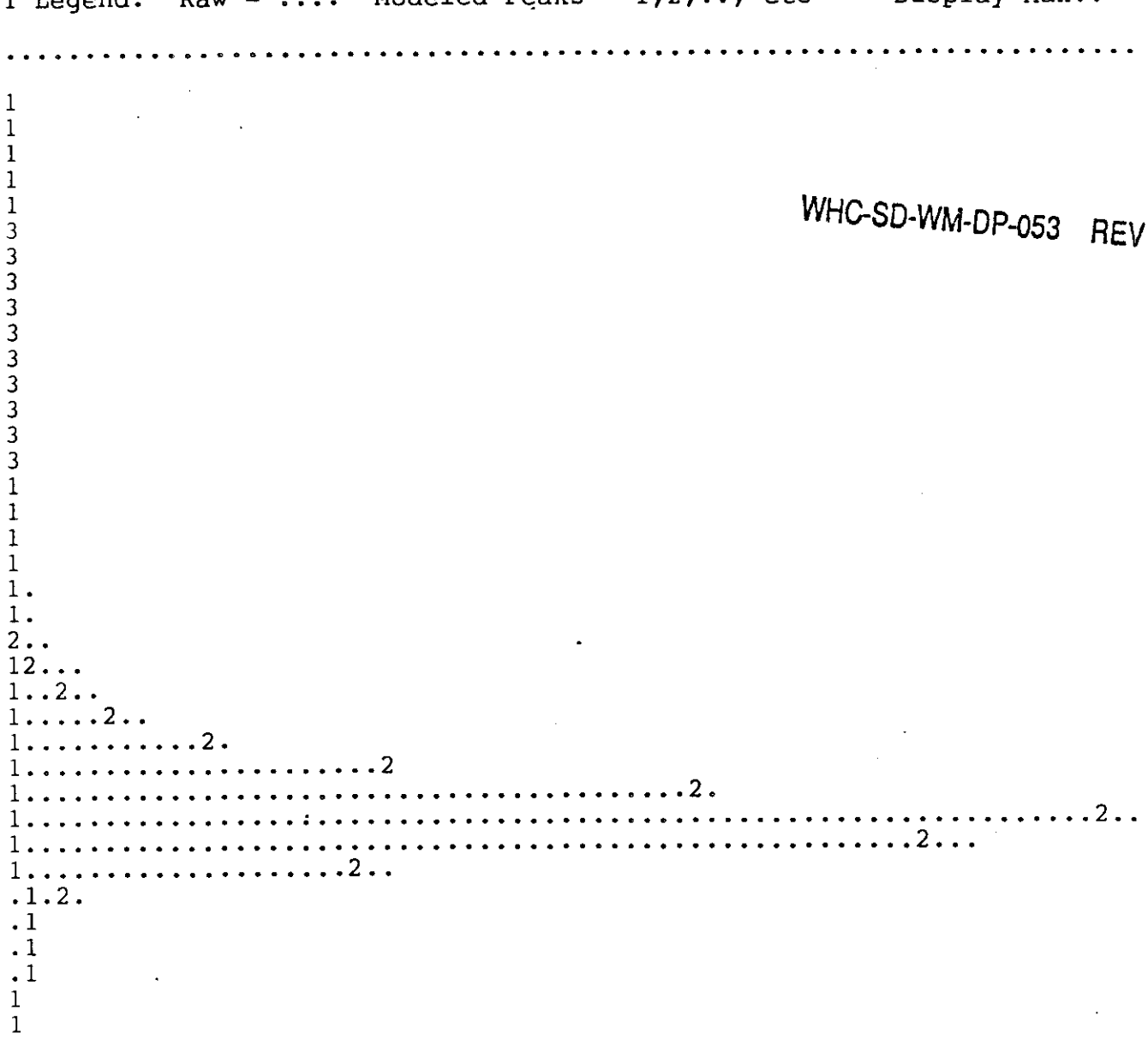
TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	34815.0	100.000
Smoothed	34926.6	100.320
Composite fit	34443.4	98.933
Residuals	371.6	1.067

Analyzed by: _____
RW

Spectrum 3a3588.CNF

1 Legend: Raw = ... Modeled Peaks = 1,2,.., etc Display Max.: 8259.3



WHC-SD-WM-DP-053 REV 0

Raw Data Dump for AEA Spectrum: 3a3588.CNF

1	28802.	0.	0.	0.	0.	1.	2.	2.	1.	1.
11	0.	0.	3.	4.	3.	5.	0.	1.	3.	0.
21	2.	3.	3.	1.	0.	3.	4.	3.	2.	4.
[illegible]	2.	2.	2.	2.	1.	0.	2.	4.	2.	4.
[illegible]	5.	4.	1.	2.	5.	1.	0.	4.	5.	3.
51	0.	6.	3.	1.	2.	3.	4.	4.	2.	3.
61	3.	5.	6.	2.	3.	4.	2.	0.	3.	2.
71	5.	4.	4.	3.	3.	5.	1.	4.	5.	5.
81	1.	4.	7.	3.	8.	9.	8.	6.	4.	8.
91	3.	8.	9.	7.	6.	4.	2.	4.	6.	5.
101	7.	13.	12.	7.	7.	5.	6.	9.	8.	4.
111	6.	4.	4.	4.	4.	15.	9.	11.	7.	13.
121	13.	16.	9.	14.	10.	18.	14.	13.	15.	15.
131	8.	19.	17.	17.	14.	13.	16.	10.	18.	6.
141	19.	13.	23.	13.	23.	18.	25.	14.	20.	17.
151	21.	26.	23.	18.	17.	18.	21.	30.	24.	30.
161	32.	32.	34.	23.	27.	26.	29.	30.	32.	33.
171	34.	31.	45.	34.	41.	31.	47.	46.	46.	35.
181	36.	43.	51.	55.	52.	49.	61.	44.	45.	64.
191	69.	74.	83.	86.	78.	79.	76.	64.	79.	77.
201	91.	97.	94.	91.	132.	111.	110.	104.	109.	136.
211	124.	154.	158.	166.	135.	187.	201.	185.	211.	235.
221	227.	241.	278.	265.	299.	304.	354.	359.	402.	414.
231	429.	489.	488.	570.	585.	646.	735.	816.	889.	894.
241	992.	969.	1050.	1117.	1165.	1110.	1152.	1136.	1039.	1010.
251	980.	976.	810.	780.	667.	581.	502.	421.	336.	291.
261	276.	197.	155.	136.	99.	74.	70.	58.	54.	37.
271	27.	29.	20.	16.	21.	11.	16.	16.	14.	18.
281	18.	14.	16.	20.	25.	28.	29.	21.	31.	39.
291	32.	33.	42.	36.	34.	32.	35.	24.	29.	26.
301	17.	19.	18.	10.	9.	8.	8.	3.	5.	1.
[illegible]	2.	6.	1.	3.	1.	2.	0.	1.	0.	0.
321	0.	0.	1.	1.	2.	0.	0.	0.	2.	0.
331	1.	3.	0.	1.	3.	0.	1.	3.	1.	2.
341	2.	3.	2.	2.	3.	2.	1.	2.	1.	1.
351	0.	2.	2.	1.	2.	0.	2.	0.	3.	0.
361	0.	2.	0.	0.	0.	0.	0.	0.	0.	0.
371	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
381	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
391	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
401	0.	0.	0.	1.	0.	0.	1.	0.	0.	0.
411	0.	0.	0.	0.	0.	0.	3.	0.	1.	0.
421	1.	0.	0.	1.	0.	1.	0.	2.	0.	0.
431	0.	1.	0.	0.	0.	0.	0.	1.	1.	0.
441	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
451	0.	1.	1.	0.	0.	0.	2.	2.	0.	0.
461	1.	0.	1.	0.	1.	1.	0.	0.	0.	0.
471	0.	0.	0.	0.	0.	2.	1.	0.	1.	0.
481	0.	1.	0.	0.	1.	0.	0.	0.	0.	1.
491	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
511	0.	0.								

D.H. Mitchell
9-1-93

Westinghouse Hanford Co.

G E N E R A L A L P H A E N E R G Y A N A L Y S I S
Rev. 2.01

DATA REDUCTION REPORT

WHC-SD-WM-DP-053 REV 0

SAMPLE
V34-8782
File ID: 2a2200.CNF

Counted on: 9/ 1/93 @14:54
Detector: AEA2
Geometry number: 1
Count time: 28806. Sec

PEAK ANALYSIS

Peak ID	Peak height Initial	Peak height Final	Peak center Initial	Peak center Final	FWHM Initial	FWHM Final	Tau Initial	Tau Final
1	241.3	241.3	254.721	254.721	20.000	15.110	10.000	5.401

PEAK RESULTS
Peak Error Limit: 15%

Peak ID	Isotope	AEA Frac	Peak Centroid Exp.	Obs.	Diff.	FWHM	Count Rate c/m	%err @95	d/m	Activity uCi/ea
1	Am243	0.941	5.276	5.290	-.014	0.07	11.05	2.7	67.3	0.303E-04
Totals:		0.941	<--valid peaks only-->				11.05			

DETECTOR CALIBRATION
Energy(MEV) = 4.093 + (0.0047)*Channel
Energy range (MeV): 4.093 TO 6.500
Efficiency = 0.1658 CPM/DPM

TOTAL COUNT DATA:

Item	Total	% Recovery
Raw spectrum	5638.0	100.000
Smoothed	5750.5	101.995
Composite fit	5307.0	94.130
Residuals	331.0	5.870

Analyzed by: _____
RW