

50-369
50-370

DUKE POWER COMPANY

P.O. BOX 33189
CHARLOTTE, N.C. 28242

HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

TELEPHONE
(704) 373-4531

November 27, 1984

Mr. Dayne H. Brown, Chief
Radiation Protection Section
North Carolina Department of Human Resources
P. O. Box 12200
Raleigh, North Carolina 27605-2200

Dear Mr. Brown:

As W. H. McDowell, J. E. Hogan, and M. L. Birch discussed with you yesterday, sludge samples collected on November 23 and November 25 from the initial holdup pond of the conventional waste-water treatment system at McGuire Nuclear Station, in preparation for sludge disposal by land spreading, contained trace levels of cesium-137 as well as the cobalt-58 and cobalt-60 previously identified. The cesium-137 was identified in two of ten samples (two samples were resamples) taken from various locations within the initial holdup pond; the average cesium-137 concentration is $1.66E-08 \mu\text{Ci/ml}$ (see analytical results attached). Also attached is the analytical results from analysis of a composite sample collected on November 28 from the eight locations in the initial holdup pond. The environmental impact of sludge disposal is essentially unaltered by the presence of cesium-137 in a small area of the pond.

Based on your concurrence that the presence of cesium-137 does not alter the November 9, 1984 approval for disposal by land farming of this sludge, we are planning to go ahead with removal of the sludge from the initial holdup pond and land spreading as previously approved.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

ly WAH

MLB/nem

cc: ☒ Ms. E. G. Adensam, Chief
Licensing Branch No. 4
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Cool
Add: E.G. Adensam
LB#4
4 to Each

8412040096 841127
PDR ADOCK 05000369
P PDR

Mr. Dayne H. Brown, Chief
November 27, 1984
Page 2

Mr. James P. O'Reilly
Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Mr. W. T. Orders
NRC Resident Inspector
McGuire Nuclear Station

Mr. Doug Finan, Acting Permit Supervisor
Division of Environmental Management
NC-DNR&CD - Archdale Building
Raleigh, North Carolina

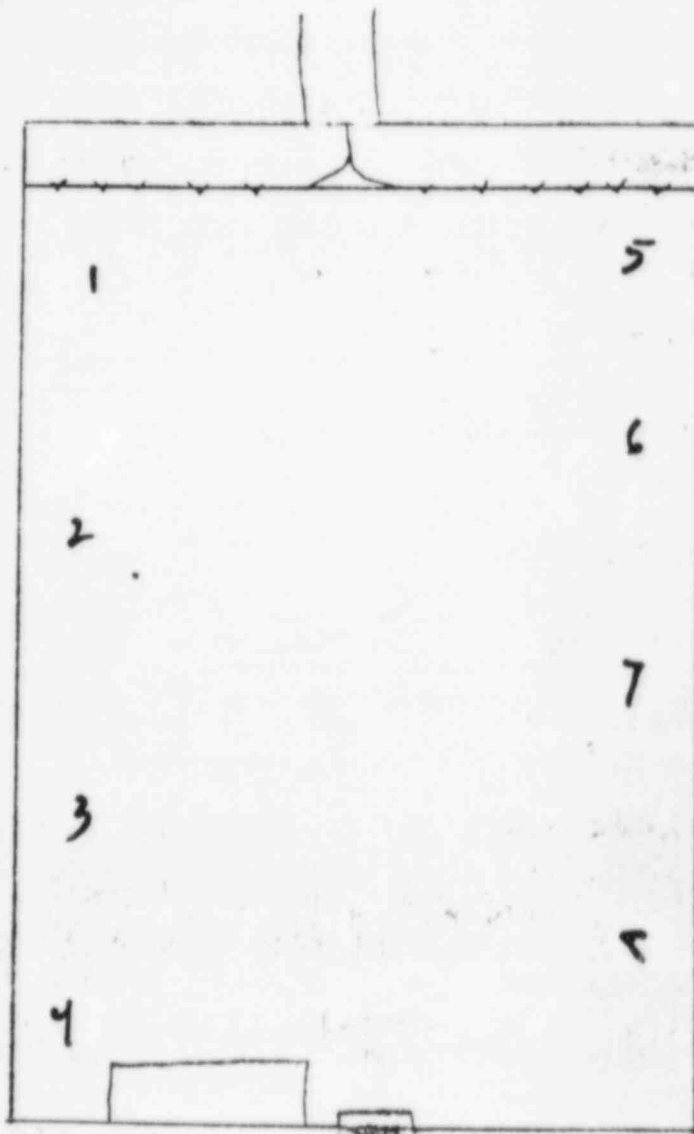
recount = ^(Wed 3) all samples on A detector
resample on 1+3
new samples
collected Sat

Inlet

45'

4 samples
from each
side

105'



Outlet
45'

22-NOV-84 16:02:36

MC-IHP #1 RECOUNT

SAMPLE DATE: 21-NOV-84 15:00:00

SAMPLE IDENTIFICATION: 84-20172

TYPE OF SAMPLE: C/LIQ

SAMPLE QUANTITY: 3500.000

UNITS: ML

SAMPLE GEOMETRY: MARI @ 0 CM

EFFICIENCY FILE NAME: AEFF.A3500M,

ACQUIRE DATE: 22-NOV-84 15:52:25

PRESET TIME(LIVE): 600. SEC

ELAPSED REAL TIME: 600. SEC

ELAPSED LIVE TIME: 600. SEC

* FWHM(1332) 2.004

* SENSITIVITY: 4.000

* SHAPE PARAMETER : 15.0 %

* NBR ITERATIONS: 10.

DETECTOR: A GELI 1729

CALIB DATE: 21-NOV-84 17:49:19

KEV/CHNL: 0.5007034

OFFSET: -0.1688086 KEV

Q. COEFF. : -1.679E-07 KEV/C**2

* LIBRARY:NUCL.MASTER

* ENERGY TOLERANCE: 1.500KV

* HALF LIFE RATIO: 8.00

* ABUNDANCE LIMIT: 80.00%

% DEAD TIME=

0.00 %

* REVIEWED BY:

J. Walcott

ENERGY WINDOW

49.90 TO 2059.91

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	185.81 <i>Pb-212</i>	17.	68.	1.07	371.48	365	13	2.78E-02	74.1	
2	0	239.78 <i>Pb-212</i>	38.	71.	<u>5.38</u>	479.29	468	22	6.30E-02	35.6	
3	0	296.75 <i>Pb-214</i>	65.	0.	1.23	593.12	586	34	1.08E-01	12.4	
4	0	351.71 <i>Pb-214</i>	66.	20.	1.05	702.93	696	13	1.10E-01	15.6	
<i>A-212</i> 5	0	408.37 <i>HP</i>	11.	6.	1.48	816.16	813	12	1.90E-02	42.4	
6	0	467.34 <i>HP</i>	4.	15.	<u>0.51</u>	934.00	930	<u>10</u>	6.08E-03	<u>****</u>	
7	0	609.57 <i>Pb-214</i>	33.	11.	1.56	1218.25	1212	15	5.44E-02	22.8	
8	0	661.75 <i>Cs-137</i>	9.	0.	1.06	1322.56	1318	11	1.50E-02	33.3	
<i>A-212</i> 9	0	835.36 <i>HP</i>	7.	6.	1.00	1669.64	1664	11	1.17E-02	<u>60.6</u>	
10	0	1461.75 <i>K-40</i>	11.	15.	<u>0.95</u>	2922.59	2915	30	1.83E-02	58.2	

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM 10
LINES NOT LISTED IN LIBRARY 4
IDENTIFIED IN SUMMARY REPORT 3 30.00%

1

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
MAL-54	AD	312.700	1.001	2.000E -8	1.703E -8	60.61

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
CS-137	FP	30.17Y	1.000	3.353E -8	1.118E -8	33.33

NATURAL PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
K-40	ND *****Y		1.000	5.004E -6	3.483E -6	58.21

Recount
on same
detector
of same
samples as
above
done Thurs pm

25-NOV-84 01:38:38

W.C. I.H.P. SLUDGE #1 RESAMPLE

SAMPLE DATE: 24-NOV-84 15:00:00

SAMPLE IDENTIFICATION: 84-20270

TYPE OF SAMPLE: C SLUDGE

SAMPLE QUANTITY: 3500.000

UNITS: ML

SAMPLE GEOMETRY: MARINELLI

EFFICIENCY FILE NAME: AEF.FA3500M,,

ACQUIRE DATE: 25-NOV-84 01:28:26 * FWHM(1332) 2.004
PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
ELAPSED REAL TIME: 600. SEC * SHAPE PARAMETER : 15.0 %
ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.

DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER
CALIB DATE: 22-NOV-84 18:31:18 * ENERGY TOLERANCE: 1.500KV
KEV/CHNL: 0.5003820 * HALF LIFE RATIO: 8.00
OFFSET: -0.0154081 KEV * ABUNDANCE LIMIT: 80.00%
Q. COEFF. : -1.694E-07 KEV/C**2

% DEAD TIME= 0.00 %

* REVIEWED BY: *JKL*

ENERGY WINDOW 50.02 TO 2038.72

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	241.63	NP	5.	124.	0.65	483.00	477	16	8.05E-03	****
2	0	294.83	Pb-214	35.	36.	1.13	589.36	584	11	5.87E-02	29.3
3	0	351.71	Pb-214	76.	18.	1.16	703.09	697	18	1.27E-01	13.9
4	0	483.81	NP	15.	16.	9.44	967.23	957	32	2.50E-02	45.7
5	0	583.63	Tl-208	21.	0.	3.38	1166.86	1162	20	3.50E-02	21.8
6	0	609.14	Bi-214	57.	3.	1.52	1217.88	1212	13	9.54E-02	14.0
7	0	1172.98	Co-60	16.	4.	1.13	2346.07	2340	15	2.69E-02	30.1
8	0	1332.91	Co-60	14.	7.	1.37	2666.22	2661	14	2.25E-02	38.8
9	0	1460.79	K-40	15.	0.	1.69	2922.27	2915	13	2.50E-02	25.8

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM 9
LINES NOT LISTED IN LIBRARY 3
IDENTIFIED IN SUMMARY REPORT 3 33.33%

#1

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
C0-60	AP	5.27Y	1.000	7.402E -8	2.906E -8	38.84

NATURAL PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
K-40	NP *****Y		1.000	8.155E -6	2.106E -6	25.82

Re samples
SAT
11-24-84
CLEAR

22-NOV-84 16:29:11

WC. IHP #2 RECOUNT✓

SAMPLE DATE: 21-NOV-84 15:00:00✓

SAMPLE IDENTIFICATION: 84-20173✓

TYPE OF SAMPLE: C/LIQ✓

SAMPLE QUANTITY: 3500.000✓ UNITS: ML✓

SAMPLE GEOMETRY: MARI @ 0 CM✓

EFFICIENCY FILE NAME: AEFF.A3500M,,✓

ACQUIRE DATE: 22-NOV-84 16:18:59 * FWHM(1332) 2.004
 PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
 ELAPSED REAL TIME: 600. SEC * SHAPE PARAMETER : 15.0 %
 ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.

DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER✓
 CALIB DATE: 21-NOV-84 17:49:19 * ENERGY TOLERANCE: 1.500KV
 KEV/CHNL: 0.5007034 * HALF LIFE RATIO: 8.00
 OFFSET: -0.1688086 KEV * ABUNDANCE LIMIT: 80.00%
 Q. COEFF. : -1.679E-07 KEV/C**2 *

% DEAD TIME= 0.00%

* REVIEWED BY:

D. J. Walcott

ENERGY WINDOW 49.90 TO 2039.91

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	185.84	Pb-212 18.	75.	1.31	371.55	368	10	2.93E-02	73.6	
2	5	238.40	Pb-212 22.	17.	0.91	476.54	472	18	3.67E-02	34.1	1.39E 00
3	5	241.30	Pb-214 17.	14.	0.91	482.33	472	18	2.81E-02	40.0	
4	0	295.58	Pb-214 53.	74.	0.74	590.79	582	21	8.77E-02	26.8	
5	0	351.58	Pb-214 72.	27.	1.56	702.68	695	18	1.21E-01	15.5	
6	0	582.96	Tl-208 14.	38.	1.69	1165.07	1158	38	2.33E-02	67.8	
7	0	609.44	Pb-214 69.	11.	1.03	1218.01	1210	14	1.14E-01	13.8	
8	0	1173.89	Co-60 20.	4.	0.76	2346.67	2342	17	3.41E-02	26.3	
9	0	1333.23	Co-60 16.	0.	1.94	2665.44	2661	13	2.67E-02	25.0	

PEAK SEARCH COMPLETED (REV 11)

SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM	9	
LINES NOT LISTED IN LIBRARY	4	
IDENTIFIED IN SUMMARY REPORT	2	22.22%

#2

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
CO-60	AP	5.27Y	1.000	8.871E -8	2.218E -8	25.00

22-NOV-84 16:45:14

WC IHP#3 RECOUNT

SAMPLE DATE: 21-NOV-84 15:00:00
 SAMPLE IDENTIFICATION: 84-20174
 TYPE OF SAMPLE: C/LIQ
 SAMPLE QUANTITY: 3520.000 UNITS: ML
 SAMPLE GEOMETRY: MARI 0 0 CM
 EFFICIENCY FILE NAME: REFF.A3500M,

ACQUIRE DATE: 22-NOV-84 16:35:01 * FWHM(1332) 2.004
 PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
 ELAPSED REAL TIME: 600. SEC * SHAPE PARAMETER : 15.0 %
 ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.

DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER
 CALIB DATE: 21-NOV-84 17:49:19 * ENERGY TOLERANCE: 1.500KV
 KEV/CHNL: 0.5007034 * HALF LIFE RATIO: 8.00
 OFFSET: -0.1688086 KEV * ABUNDANCE LIMIT: 80.00%
 Q. COEFF. : -1.679E-07 KEV/C**2

% DEAD TIME= 0.00 %

* REVIEWED BY:

ENERGY WINDOW 49.90 TO 2039.91

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
Split peaks 51	7	237.77	Pb-212 8.	9.	0.59	475.28	473	10	1.33E-02	64.9	9.28E 00
2	7	238.65	Pb-212 15.	14.	0.59	477.03	473	10	2.56E-02	42.6	
3	0	241.67	Pb-214 20.	33.	4.98	483.08	482	6	3.29E-02	46.9	
4	0	295.14	Pb-214 57.	28.	1.02	589.90	585	11	9.42E-02	18.7	
5	0	351.67	Pb-214 42.	76.	0.99	702.86	698	16	7.00E-02	33.2	
6	0	364.28	I-131 55.	18.	1.20	728.05	721	14	9.20E-02	17.2	
7	0	583.18	Tl-208 15.	7.	1.07	1165.52	1162	10	2.54E-02	36.1	
8	3	605.00	Cs-134 21.	8.	1.56	1209.14	1203	22	3.48E-02	28.8	1.35E 00
9	3	609.35	Bi-214 71.	10.	1.53	1217.82	1203	22	1.18E-01	13.5	
10	0	661.58	Cs-137 29.	3.	1.22	1322.23	1316	13	4.79E-02	20.7	
11	0	768.02	N/A 4.	17.	0.68	1535.00	1532	11	6.14E-03	****	
12	0	796.14	Cs-134 21.	0.	1.82	1591.24	1586	31	3.50E-02	21.8	
13	0	912.12	Pb-214 9.	12.	1.50	1823.12	1814	16	1.48E-02	64.5	
14	0	1120.79	Bi-214 9.	0.	1.06	2240.44	2236	11	1.50E-02	33.3	

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM 14
LINES NOT LISTED IN LIBRARY 6
IDENTIFIED IN SUMMARY REPORT 4 28.57%

#3

HALOGEN FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
I-131	HFP	8.04D	1.041	1.489E -7	2.562E -8	17.21

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
CS-134	FP	2.06Y	1.000	9.389E -8	2.049E -8	21.82
CS-137	FP	30.17Y	1.000	1.071E -7	2.211E -8	20.65

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

resample A
#3

TOTAL LINES IN SPECTRUM	7	
LINES NOT LISTED IN LIBRARY	4	
IDENTIFIED IN SUMMARY REPORT	0	0.00%

Resample
Sat 11-24

 22-NOV-84 17:02:17 *****

NC IHP #4 RECOUNT ✓

SAMPLE DATE: 21-NOV-84 15:00:00 ✓
 SAMPLE IDENTIFICATION: 84-20175 ✓
 TYPE OF SAMPLE: C/LIQ ✓
 SAMPLE QUANTITY: 3500.000 UNITS: ML ✓
 SAMPLE GEOMETRY: MARI @ 0 CM ✓
 EFFICIENCY FILE NAME: AEFF.A3500M, ✓

ACQUIRE DATE: 22-NOV-84 16:52:05 * FWHM(1332) 2.004
 PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
 ELAPSED REAL TIME: 600. SEC * SHAPE PARAMETER : 15.0 %
 ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.
 *

DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER ✓
 CALIB DATE: 21-NOV-84 17:49:19 * ENERGY TOLERANCE: 1.500KV
 KEV/CHNL: 0.5007034 * HALF LIFE RATIO: 8.00
 OFFSET: -0.1688086 KEV * ABUNDANCE LIMIT: 80.00%
 Q. COEFF. : -1.679E-07 KEV/C**2 *
 *

% DEAD TIME= 0.00 % * REVIEWED BY: *dfwalcott*

ENERGY WINDOW 49.90 TO 2039.91

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	67.43 <i>NP</i>	9.	106.	<u>6.77</u>	135.00	128	25	1.55E-02	<u>****</u>	
2	0	186.66 <i>Pb-220</i>	26.	43.	5.29	373.18	366	19	4.27E-02	41.1	
3	0	237.88 <i>Pb-212</i>	16.	34.	1.05	475.50	469	15	2.70E-02	56.5	
4	0	294.99 <i>Pb-214</i>	10.	25.	0.98	589.60	584	20	1.62E-02	79.7	
5	0	351.71 <i>Pb-214</i>	30.	7.	0.80	702.94	698	14	5.03E-02	22.0	
6	0	364.77 <i>I-131</i>	6.	16.	1.41	729.04	722	13	9.55E-03	****	
7	0	510.84 <i>NP</i>	7.	12.	<u>0.49</u>	1020.94	1016	10	1.13E-02	<u>82.9</u>	
8	0	609.27 <i>Bi-214</i>	29.	0.	1.36	1217.66	1213	10	4.83E-02	18.6	

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM 8
LINES NOT LISTED IN LIBRARY 3
IDENTIFIED IN SUMMARY REPORT 1 12.50%

#4

HALOGEN FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
I 131	HFP	8.04D	1.041	1.549E-8	1.671E-8	107.89

22-NOV-84 18:20:32

WC IHP #5 RECOUNT ✓

SAMPLE DATE: 21-NOV-84 15:00:00 ✓

SAMPLE IDENTIFICATION: 84-20176 ✓

TYPE OF SAMPLE: C/LIQ ✓

SAMPLE QUANTITY: 3500.000 ✓

UNITS: ML ✓

SAMPLE GEOMETRY: MARI @ 0 CM ✓

EFFICIENCY FILE NAME: AEFF.A3500M, ✓

ACQUIRE DATE: 22-NOV-84 18:10:22 * FWHM(1332) 2.004
 PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
 ELAPSED REAL TIME: 600. SEC * SHAPE PARAMETER : 15.0 %
 ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.

DETECTOR: A GELI 1729 * LIBRARY: NUCL.MASTER ✓
 CALIB DATE: 21-NOV-84 17:49:19 * ENERGY TOLERANCE: 1.500KV
 KEV/CHNL: 0.5007034 * HALF LIFE RATIO: 8.00
 OFFSET: -0.1688086 KEV * ABUNDANCE LIMIT: 80.00%
 Q. COEFF. : -1.679E-07 KEV/C**2 *

% DEAD TIME= 0.00 %

* REVIEWED BY: *D. Walcott*

ENERGY WINDOW 49.90 TO 2039.91

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	77.17	Pb-214 25.	81.	1.38	154.47	152	7	4.12E-02	55.1	
2	0	185.57	Pb-214 15.	153.	0.65	371.00	365	12	2.55E-02	****	
3	3	238.20	Pb-214 25.	27.	0.83	476.14	473	22	4.19E-02	35.2	1.57E 00
4	3	241.63	Pb-214 36.	26.	0.83	483.00	473	22	6.04E-02	25.8	
5	0	294.91	Pb-214 88.	70.	1.08	589.45	583	14	1.47E-01	17.2	
6	0	351.59	Pb-214 177.	51.	1.05	702.89	695	17	2.95E-01	9.4	
7	0	458.03	NP 9.	19.	1.10	915.38	913	11	1.53E-02	75.2	
8	0	583.31	Pb-214 13.	25.	1.84	1165.78	1160	14	2.17E-02	60.5	
9	0	609.40	Pb-214 127.	98.	1.29	1217.92	1211	26	2.12E-01	14.1	
10	0	662.05	NP 5.	44.	1.50	1323.16	1313	16	8.39E-03	****	
11	0	803.14	NP 11.	17.	9.29	1605.22	1596	22	1.90E-02	58.6	
12	0	832.04	NP 3.	26.	3.14	1663.00	1652	21	4.54E-03	****	
13	0	969.92	Pb-214 12.	10.	1.53	1938.71	1934	10	1.99E-02	47.3	
14	0	1120.75	Pb-214 24.	10.	1.53	2240.39	2230	21	4.02E-02	27.9	
15	0	1378.99	Pb-214 6.	0.	1.50	2757.00	2753	10	1.00E-02	40.8	
16	0	1461.73	Pb-214 30.	8.	1.51	2922.55	2918	11	5.04E-02	22.6	

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM 16
LINES NOT LISTED IN LIBRARY 9
IDENTIFIED IN SUMMARY REPORT 2 12.50%

#5

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
CS-137	FP	30.17Y	1.000	1.075E -8	3.595E -8	191.71

NATURAL PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
K-40	NP *****Y		1.000	1.645E -5	3.719E -6	22.60

22-NOV-84 19:05:09

IHP #6 RECOUNT

SAMPLE DATE: 21-NOV-84 15:00:00
 SAMPLE IDENTIFICATION: 84-20177
 TYPE OF SAMPLE: C/LIQ
 SAMPLE QUANTITY: 3500.000 UNITS: ML
 SAMPLE GEOMETRY: MARI @ 0 CM
 EFFICIENCY FILE NAME: AEFF.A3500M,

ACQUIRE DATE: 22-NOV-84 18:54:57 * FWHM(1332) 2.004
 PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
 ELAPSED REAL TIME: 601. SEC * SHAPE PARAMETER : 15.0 %
 ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.

DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER
 CALIB DATE: 22-NOV-84 18:31:18 * ENERGY TOLERANCE: 1.500KV
 KEV/CHNL: 0.5003820 * HALF LIFE RATIO: 8.00
 OFFSET: -0.0154081 KEV * ABUNDANCE LIMIT: 80.00%
 Q. COEFF. : -1.694E-07 KEV/C**2

% DEAD TIME= 0.17 %

* REVIEWED BY: *DJ Walcott*

ENERGY WINDOW 50.02 TO 2038.72

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	77.23 Pb-214	24.	47.	0.91	154.38	152	7	4.02E-02	45.1	
2	0	186.01 Pb-214	33.	74.	2.45	371.81	366	11	5.43E-02	41.3	
3	0	207.91 <i>HP</i>	14.	88.	3.27	415.58	411	16	2.35E-02	97.6	
4	4	238.51 Pb-212	18.	19.	0.68	476.77	471	27	2.94E-02	42.1	1.05E 01
5	4	241.63 Pb-214	28.	16.	0.68	483.00	471	27	4.64E-02	27.7	
6	0	294.87 Pb-214	46.	85.	0.97	589.43	582	17	7.70E-02	31.8	
7	0	351.70 Pb-214	105.	19.	0.96	703.07	698	11	1.75E-01	11.4	
8	0	609.04 Bi-214	86.	21.	1.38	1217.69	1212	12	1.43E-01	13.2	
9	0	1120.31 Bi-214	16.	3.	1.32	2240.64	2236	10	2.65E-02	28.8	
10	0	1461.27 K-40	13.	0.	0.64	2923.23	2915	14	2.17E-02	27.7	

PEAK SEARCH COMPLETED (REV 11)

TOTAL LINES IN SPECTRUM	10	
LINES NOT LISTED IN LIBRARY	5	
IDENTIFIED IN SUMMARY REPORT	1	10.00%

#6

NATURAL PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
K-40	NP *****Y		1.000	7.070E -6	1.961E -6	27.73

22-NOV-84 19:20:16

WC IHP #7 RECOUNT

SAMPLE DATE: 21-NOV-84 15:00:00
SAMPLE IDENTIFICATION: 84-20178
TYPE OF SAMPLE: C/LIQ
SAMPLE QUANTITY: 3500.000 UNITS: ML
SAMPLE GEOMETRY: MARI @ 0 CM
EFFICIENCY FILE NAME: AEFF.A3500M,,

ACQUIRE DATE: 22-NOV-84 19:10:04 * FWHM(1332) 2.004
PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
ELAPSED REAL TIME: 600. SEC * SHAPE PARAMETER : 15.0 %
ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.

DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER
CALIB DATE: 22-NOV-84 18:31:18 * ENERGY TOLERANCE: 1.500KV
KEV/CHNL: 0.5003820 * HALF LIFE RATIO: 8.00
OFFSET: -0.0154081 KEV * ABUNDANCE LIMIT: 80.00%
G. COEFF. : -1.694E-07 KEV/C**2

% DEAD TIME= 0.00 %

* REVIEWED BY: *R. G. Miller*

ENERGY WINDOW 50.02 TO 2038.72

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	241.64	Pb-214	31.	38.	0.85	483.03	477	10	5.13E-02	33.4
2	0	295.22	Pb-214	42.	65.	1.49	590.14	583	26	6.98E-02	31.3
3	0	353.09	Pb-214	84.	60.	1.45	705.84	697	40	1.39E-01	17.1
4	0	510.81	U-238	13.	11.	0.92	1021.23	1013	22	2.17E-02	45.5
5	0	609.23	Bi-214	45.	7.	1.15	1218.06	1211	14	7.45E-02	17.1
6	0	810.41	Co-58	6.	0.	4.00	1620.50	1615	18	1.00E-02	40.8
7	0	1120.22	Bi-214	15.	0.	1.83	2240.47	2236	12	2.50E-02	25.8

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM	7	
LINES NOT LISTED IN LIBRARY	2	
IDENTIFIED IN SUMMARY REPORT	1	14.29%

7

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
CO-58	AP	70.80D	1.005	2.371E -8	9.678E -9	40.82

22-NOV-84 19:40:17

WL IHP #8 RECOUNT

SAMPLE DATE: 21-NOV-84 15:00:00
 SAMPLE IDENTIFICATION: 84-20179
 TYPE OF SAMPLE: C/LIQ
 SAMPLE QUANTITY: 3500.000 UNITS: ML
 SAMPLE GEOMETRY: MARI @ 0 CM
 EFFICIENCY FILE NAME: REFF.A3500M,,

ACQUIRE DATE: 22-NOV-84 19:30:36 * FWHM(1332) 2.004
 PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
 ELAPSED REAL TIME: 601. SEC * SHAPE PARAMETER : 15.0 %
 ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.

DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER
 CALIB DATE: 22-NOV-84 18:31:18 * ENERGY TOLERANCE: 1.500KV
 KEV/CHNL: 0.5003820 * HALF LIFE RATIO: 8.00
 OFFSET: -0.0154081 KEV * ABUNDANCE LIMIT: 80.00%
 Q. COEFF. : -1.694E-07 KEV/C**2 *

% DEAD TIME= 0.17 % * REVIEWED BY: *Exulla*
 ENERGY WINDOW 50.02 TO 2038.72

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	3	238.24 Pb-212	18.	6.	1.04	476.23	471	18	2.97E-02	30.6	9.46E-01
2	3	242.11 Pb-214	14.	6.	1.04	483.96	471	18	2.25E-02	37.4	
3	0	294.93 Pb-214	26.	29.	1.29	589.56	586	13	4.35E-02	35.3	
4	0	352.28 Pb-214	61.	0.	1.58	704.23	697	23	1.02E-01	12.8	
5	0	609.11 Bi-214	31.	3.	1.87	1217.83	1212	13	5.12E-02	19.9	

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM	5	
LINES NOT LISTED IN LIBRARY	2	
IDENTIFIED IN SUMMARY REPORT	0	0.00%

8

***** 28-NOV-84 12:14:17 *****

IHP COMPOSITE

SAMPLE DATE: 28-NOV-84 10:45:00
SAMPLE IDENTIFICATION: 84-20548
TYPE OF SAMPLE: C LIQUID
SAMPLE QUANTITY: 3500.000
SAMPLE GEOMETRY: MARINELLI
EFFICIENCY FILE NAME: AEFF.A3500M,,

UNITS: ML

*
ACQUIRE DATE: 28-NOV-84 12:04:05 * FWHM(1332) 2.004
PRESET TIME(LIVE): 600. SEC * SENSITIVITY: 4.000
ELAPSED REAL TIME: 600. SEC * SHAPE PARAMETER : 15.0 %
ELAPSED LIVE TIME: 600. SEC * NBR ITERATIONS: 10.
*

*
DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER
CALIB DATE: 27-NOV-84 06:34:47 * ENERGY TOLERANCE: 1.500KV
KEV/CHNL: 0.5006844 * HALF LIFE RATIO: 8.00
OFFSET: -0.0044154 KEV * ABUNDANCE LIMIT: 80.00%
Q. COEFF. : -1.609E-07 KEV/C**2 *
*

% DEAD TIME= 0.00 % * REVIEWED BY: *G. Craft*

ENERGY WINDOW 50.06 TO 2040.11

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	4	238.57	37.	11.	1.21	476.58	472	17	6.18E-02	20.6	2.13E 00
2	4	241.91	34.	8.	1.21	483.25	472	17	5.64E-02	20.9	
3	0	295.03	52.	23.	1.37	589.38	583	13	8.73E-02	18.9	
4	0	351.67	76.	30.	1.35	702.54	697	20	1.27E-01	15.3	
5	0	609.32	56.	44.	1.16	1217.45	1210	22	9.37E-02	21.4	
6	0	662.92	16.	21.	4.45	1324.61	1314	21	2.71E-02	46.9	
7	0	1120.42	9.	9.	0.96	2239.39	2234	18	1.50E-02	57.7	
8	0	1173.84	8.	0.	1.50	2346.25	2340	23	1.33E-02	35.4	
9	0	1461.31	21.	0.	1.34	2921.38	2916	11	3.50E-02	21.8	

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
 NUCLIDE LINE ACTIVITY REPORT

PAGE 1

FISSION GAS

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI /UNIT	1 SIGMA ERROR
XE-135	FG	249.79	0.	0.	89.90*	0.000E-01	0.000E 0	0.000E 0
		608.19	56.	44.	2.90	4.332E-01	6.406E -6	1.369E -6

ACTIVATION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI /UNIT	1 SIGMA ERROR
C0-60	AP	1173.22	8.	0.	100.00	2.569E-01	4.009E -8	1.417E -8
		1332.49	0.	0.	100.00*	0.000E-01	0.000E 0	0.000E 0

FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI /UNIT	1 SIGMA ERROR
CS-137	FP	661.65	16.	21.	85.10*	4.053E-01	6.076E -8	2.849E -8

NATURAL PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI /UNIT	1 SIGMA ERROR
K-40	NP	1460.81	21.	0.	1.10*	2.151E-01	1.142E -5	2.492E -6
PB-214	NP	295.21	52.	23.	17.50	7.697E-01	4.392E -6	8.295E -7
		351.92	76.	30.	37.20*	6.626E-01	3.499E -6	5.351E -7
BI-214	NP	609.31	56.	44.	46.30	4.332E-01	6.712E -6	1.434E -6
		1120.29	9.	9.	15.10*	2.639E-01	5.410E -6	3.124E -6
		1764.49	0.	0.	15.80	0.000E-01	0.000E 0	0.000E 0

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
UNKNOWN LINE REPORT

PAGE 2

	PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	%EFF
TH-228	1	4	238.57	37.	11.	1.21	476.58	472	17	6.18E-02	20.6	8.50E-01
Pb-214	2	4	241.91	34.	8.	1.21	483.25	472	17	5.64E-02	20.9	8.45E-01

LINES NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	UCI /UNIT	ABNDIFF	FAILED
5	XE-135	608.19	9.11H	1.113E 0	6.406E -6	3.12%	ABN
5	BI-214	609.31	19.90M	1.861E 1	6.712E -6	79.53%	ABN
7	BI-214	1120.29	19.90M	1.861E 1	5.410E -6	79.53%	ABN
8	CO-60	1173.22	5.27Y	1.000E 0	4.009E -8	50.00%	ABN

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM	9	
LINES NOT LISTED IN LIBRARY	2	
IDENTIFIED IN SUMMARY REPORT	4	44.44%

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
CS-137	FP	30.17Y	1.000	6.076E -8	2.849E -8	46.88

NATURAL PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
K-40	NP *****Y		1.000	1.142E -5	2.492E -6	21.82
PB-214	NP	26.80M	2.568	3.499E -6	5.351E -7	15.29

 ***** 28-NOV-84 12:49:20 *****

IHP COMPOSITE

SAMPLE DATE: 28-NOV-84 10:45:00

SAMPLE IDENTIFICATION: 84-20548

TYPE OF SAMPLE: C LIQUID

SAMPLE QUANTITY: 3500.000

UNITS: ML

SAMPLE GEOMETRY: MARINELLI

EFFICIENCY FILE NAME: AEFF.A3500M,,

ACQUIRE DATE: 28-NOV-84 12:19:08 * FWHM(1332) 2.004
 PRESET TIME(LIVE): 1800. SEC * SENSITIVITY: 4.000
 ELAPSED REAL TIME: 1801. SEC * SHAPE PARAMETER : 15.0 %
 ELAPSED LIVE TIME: 1800. SEC * NBR ITERATIONS: 10.

DETECTOR: A GELI 1729 * LIBRARY:NUCL.MASTER
 CALIB DATE: 27-NOV-84 06:34:47 * ENERGY TOLERANCE: 1.500KV
 KEV/CHNL: 0.5006844 * HALF LIFE RATIO: 8.00
 OFFSET: -0.0044154 KEV * ABUNDANCE LIMIT: 80.00%
 Q. COEFF. : -1.609E-07 KEV/C**2 *

% DEAD TIME= 0.06 % * REVIEWED BY: *RCrimmer*

 ENERGY WINDOW 50.06 TO 2040.11

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	74.93	34.	137.	0.91	149.67	147	6	1.86E-02	52.3	
2	0	185.92	59.	184.	1.69	371.38	368	9	3.27E-02	35.1	
3	0	223.27	30.	154.	3.94	446.00	441	14	1.65E-02	61.9	
4	8	238.50	79.	63.	1.26	476.42	471	17	4.41E-02	18.1	1.24E 00
5	8	241.69	52.	67.	1.35	482.80	471	17	2.91E-02	26.0	
6	0	295.18	134.	96.	1.16	589.68	585	12	7.44E-02	13.5	
7	0	351.72	219.	75.	1.35	702.65	695	15	1.22E-01	8.8	
8	0	428.71	13.	32.	1.87	856.49	853	9	7.41E-03	65.5	
9	0	583.33	9.	56.	1.21	1165.51	1157	16	5.21E-03	****	
10	0	609.51	144.	178.	1.55	1217.84	1210	34	8.02E-02	15.5	
11	0	661.62	25.	25.	1.14	1322.00	1317	11	1.40E-02	34.2	
12	0	834.69	5.	26.	0.78	1668.00	1661	13	2.91E-03	****	
13	0	911.49	18.	15.	1.97	1821.56	1813	15	1.00E-02	38.5	
14	0	1120.61	50.	19.	1.08	2239.77	2232	26	2.78E-02	18.8	
15	0	1174.28	41.	80.	1.66	2347.13	2339	40	2.28E-02	34.5	
16	0	1238.66	19.	17.	1.55	2475.92	2466	34	1.03E-02	39.2	
17	0	1332.91	43.	3.	2.30	2664.47	2657	14	2.37E-02	16.5	
18	0	1378.79	9.	17.	0.62	2756.27	2750	22	4.82E-03	74.4	
19	0	1461.26	55.	0.	1.89	2921.27	2914	13	3.06E-02	13.5	
20	0	1765.13	29.	0.	2.59	3529.45	3521	15	1.61E-02	18.6	

PEAK SEARCH COMPLETED (REV 11)

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
NUCLIDE LINE ACTIVITY REPORT

PAGE 1

FISSION GAS

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI /UNIT	1 SIGMA ERROR
KR-88	FG	165.98	0.	0.	3.10	0.000E-01	0.000E 0	0.000E 0
		196.32	0.	0.	26.30*	0.000E-01	0.000E 0	0.000E 0
		362.23	0.	0.	2.30	0.000E-01	0.000E 0	0.000E 0
		834.83	5.	26.	13.10	3.217E-01	8.295E -8	1.200E -7
		1518.39	0.	0.	2.20	0.000E-01	0.000E 0	0.000E 0
		1529.77	0.	0.	10.90	0.000E-01	0.000E 0	0.000E 0
		2029.84	0.	0.	4.60	0.000E-01	0.000E 0	0.000E 0
		2035.41	0.	0.	3.80	0.000E-01	0.000E 0	0.000E 0
XE-135	FG	249.79	0.	0.	89.90*	0.000E-01	0.000E 0	0.000E 0
		608.19	144.	178.	2.90	4.331E-01	5.663E -6	8.783E -7

ACTIVATION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI /UNIT	1 SIGMA ERROR
MN-54	AP	834.83	5.	26.	100.00*	3.217E-01	6.976E -9	1.009E -8
CO-60	AP	1173.22	41.	80.	100.00	2.568E-01	6.858E -3	2.369E -8
		1332.49	43.	3.	100.00*	2.322E-01	7.890E -8	1.302E -8
SB-125	AP	427.89	13.	32.	29.30*	5.694E-01	3.429E -8	2.247E -8
		600.56	0.	0.	17.80	0.000E-01	0.000E 0	0.000E 0

FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI /UNIT	1 SIGMA ERROR
CS-137	FP	661.65	25.	25.	85.10*	4.060E-01	3.135E -8	1.073E -8

NATURAL PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI /UNIT	1 SIGMA ERROR
K-40	NP	1460.81	55.	0.	1.10*	2.151E-01	9.970E -6	1.344E -6
PB-214	NP	295.21	134.	96.	17.50	7.694E-01	6.999E -6	9.438E -7
		351.92	219.	75.	37.20*	6.625E-01	6.252E -6	5.486E -7
BI-214	NP	609.31	144.	178.	46.30	4.331E-01	1.322E -5	2.050E -6
		1120.29	50.	19.	15.10*	2.638E-01	2.308E -5	4.349E -6
		1764.49	29.	0.	15.80	1.839E-01	1.833E -5	3.403E -6

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
UNKNOWN LINE REPORT

PAGE 2

	PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	%EFF
Ra226	1	0	74.92	34.	137.	0.91	149.67	147	6	1.86E-02	52.3	0.00E-01
	2	0	185.92	59.	184.	1.69	371.38	368	9	3.27E-02	35.1	9.64E-01
	3	0	223.27	30.	154.	3.94	446.00	441	14	1.65E-02	61.9	0.76E-01
Th228	4	8	238.50	79.	63.	1.26	476.42	471	17	4.41E-02	18.1	8.50E-01
Pb-214	5	8	241.69	52.	67.	1.35	482.80	471	17	2.91E-02	26.0	8.45E-01
	9	0	583.22	9.	56.	1.21	1165.51	1157	16	5.21E-03	****	4.48E-01
Ac228	13	0	911.49	18.	15.	1.97	1821.56	1813	15	1.00E-02	38.5	2.96E-01
Ra226	16	0	1238.66	19.	17.	1.55	2475.92	2466	34	1.03E-02	39.2	2.46E-01
	18	0	1378.79	9.	17.	0.62	2756.27	2750	22	4.82E-03	74.4	2.26E-01

LINE NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	UCI /UNIT	ABNDIFF	FAILED
8	SB-125	427.89	2.77Y	1.000E 0	3.429E -8	62.21%	ABN
10	XE-135	608.19	9.11H	1.148E 0	5.663E -6	3.12%	ABN
12	KR-88	834.83	2.84H	1.558E 0	8.295E -8	19.76%	ABN

NUCLIDE IDENTIFICATION SYSTEM (REV 5/80)
SUMMARY OF NUCLIDE ACTIVITY

PAGE 3

TOTAL LINES IN SPECTRUM 20
LINES NOT LISTED IN LIBRARY 9
IDENTIFIED IN SUMMARY REPORT 10 50.00%

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
MN-54	AP	312.70D	1.000	6.976E -9	1.009E -8	144.63 NP
C0-60	AP	5.27Y	1.000	7.890E -8	1.302E -8	16.51

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
CS-137	FP	30.17Y	1.000	3.135E -8	1.073E -8	34.24

NATURAL PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI /UNIT	1-SIGMA ERROR	%ERR
K-40	NP *****Y		1.000	9.970E -6	1.344E -6	13.48
PB-214	NP	26.80M	3.371	6.252E -6	5.486E -7	8.78
BI-214	NP	19.90M	5.111	2.308E -5	4.349E -6	18.85