
DETROIT EDISON FERNI-2 POWER PLANT

2-MAR-1994 17:49:07.00

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

Sample ID Number: LLD2000

Aquisition Time: 2-MAR-1994 17:15:40.85

Storage file: LLD2000.cnf

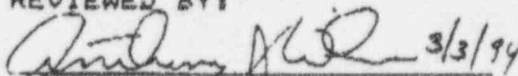
REMARKS Drinking fountain water - 12 Macinelli - LLD
verification of detector 1 - 2000 sec count

PERFORMED BY:



SIGNATURE

REVIEWED BY:


3/3/94

SIGNATURE/DATE

9510270257 951023
PDR FOIA
DEER IN95-349 PDR

MAR-03-1994 16:23 FROM DETROIT EDISON RPD OPS

Sample ID : LLD2000

Page : 2
Acquisition date : 2-MAR-1994 17:15:40

Fermi 2 Radiation Protection Gamma Spectroscopy Report

***** Sample Parameters *****

Sample ID Number: LLD2000
Sample collection start date: 2-MAR-1994 17:15:00.00
Sample collection end date : 2-MAR-1994 17:15:00.00
Type of sample : 1 Liter Marinell
Sample quantity : 1.00610E+03 ml
Sample geometry : MILL Operator: BPB

***** Acquisition Parameters *****

Detector number : DET1 Acquire date : 2-MAR-1994 17:15:40.85
Preset live time : 0 00:33:20.00 Elapsed live time : 0 00:33:20.00
Elapsed real time : 0 00:33:20.22 Percent dead time : 0.00 %

***** Calibration Parameters *****

Detector number : DET1 Yearly cal date : 2-MAR-1994 13:47:45.33
Key/channel : 4.99924E-01 Zero offset: 3.26084E-01
Daily cal date : 2-MAR-1994 13:47:45.33

***** Peak Search Parameters *****

Start channel : 100 End channel : 4096
Height sensitivity : 5.00000 Shape sensitivity : 10.00000
Maximum number of iterations to resolve multiplets : 5

***** Nuclide Identification Parameters *****

Energy tolerance : 1.25000 Half life ratio : 10.00000
Abundance limit : 75.00000 Library : decaaster.nlb
Efficiency file : EFFD1_mill Efficiencies at : Peak energy

No peaks were found

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/ml)
BE-7	3.	477.59	1.6030E-07
F-18	12.	511.00	1.8086E-08
NA-22	0.	1274.54	1.0280E-08
NA-24	2.	1368.53	3.9984E-08
MG-27	0.	1014.44	8.4822E-08
CL-38	1.	1642.42	1.4582E-07
K-40	2.	1460.81	3.9424E-07
AR-41	1.	1293.64	3.1852E-08
SC-46	4.	889.25	3.3734E-08
CR-51	4.	320.08	1.3737E-07
MN-54	4.	834.83	3.1193E-08
CO-56	2.	1238.25	5.1158E-08
MN-56	0.	1810.69	5.5286E-08
NI-56	8.	158.38	1.0601E-08
CO-57	8.	122.06	1.2228E-08
CO-58	3.	810.76	2.7617E-08
FE-59	4.	1099.22	7.0800E-08
CO-60	3.	1332.49	4.2641E-08
CU-64	0.	1345.90	3.5422E-06
NI-65	1.	1481.84	1.4694E-07
ZN-65	3.	1115.52	7.1440E-08
ZN-69M	2.	438.63	1.4488E-08
SE-75	6.	136.00	1.5968E-08
AS-76	5.	559.10	5.4503E-08
BR-82	3.	776.49	3.1704E-08
BR-83	1.	529.64	1.0439E-06
BR-84	0.	881.50	2.5595E-08
BR-85	4.	802.41	1.0864E-05
KR-85	3.	513.99	4.0513E-06
KR-85M	3.	151.18	7.7050E-09
SR-85	3.	513.99	1.7551E-08
RB-86	1.	1076.63	2.7464E-07
KR-87	4.	402.58	3.6271E-08
ER-87M	3.	388.40	1.8289E-08
KR-88	5.	196.32	4.0416E-08
RD-88	0.	1382.39	2.7401E-06
Y-88	0.	1836.01	1.4183E-08
KR-89	2.	220.90	3.4788E-07
RB-89	0.	1031.88	2.9351E-08
KR-90	3.	1118.69	1.0116E-05
RB-90	3.	831.69	8.6341E-07
RB-90M	4.	824.23	2.5027E-06
Y-90M	7.	202.51	1.2540E-08
SK-91	3.	1024.30	1.0644E-07
Y-91	2.	1204.90	1.1124E-05
Y-91M	4.	555.60	2.8921E-08
SR-92	0.	1383.94	1.3231E-08
Y-92	2.	934.46	2.0703E-07
SR-93	3.	590.28	1.0558E-07
Y-93	7.	266.90	2.0377E-07
NB-94	3.	702.63	2.2469E-08
NB-95	2.	765.79	2.0921E-08

Minimum Detectable Activity Report (continued)

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Sample ID : LLD2000

Acquisition date : 2-MAR-1994 17:15:40

Nuclide	Backgd Sum	Energy (keV)	MDA (uCi/ml)
NB-95M	7.	235.69	5.2000E-08
ZR-95	1.	756.72	3.3124E-08
NB-97	0.	657.90	6.6749E-09
ZR-97	3.	743.36	2.5936E-08
MO-99✓	4.	739.56	2.1847E-07
TC-99M	13.	140.50	1.4676E-08
TC-101	11.	306.81	4.5352E-08
RU-103	2.	497.08	1.6750E-08
TC-104	3.	357.99	2.6381E-08
RH-105	5.	318.90	7.3587E-08
RU-105	1.	724.50	3.5679E-08
RU-106	2.	621.84	1.8534E-07
CD-109	5.	88.03	3.1027E-07
AG-110M	2.	937.48	7.9751E-08
SN-113	3.	391.69	2.1542E-08
SN-117M	7.	158.56	1.1174E-08
SB-122	2.	563.93	2.3686E-08
SB-124	2.	602.71	1.6779E-08
SB-125	5.	427.89	6.2726E-08
TE-125M	11.	109.28	4.6779E-06
TE-127	3.	417.90	1.4752E-06
TE-127M	15.	57.60	1.8055E-05
XE-127	6.	202.84	1.6086E-08
TF-129	5.	459.60	2.3619E-07
TE-129M	2.	695.88	6.1272E-07
XE-129M	6.	196.56	2.1465E-07
I-130	0.	536.09	4.7650E-09
BA-131	7.	103.00	3.4305E-08
I-131	7.	364.48	2.2381E-08
TE-131	3.	149.72	1.3565E-08
TE-131M	3.	773.67	6.8957E-08
XE-131M	8.	163.93	5.4331E-07
I-132	4.	667.69	2.6633E-08
TE-132	8.	228.16	1.5267E-08
BA-133	3.	302.84	6.2612E-08
BA-133M	6.	276.09	7.5820E-08
I-133	1.	529.87	1.4621E-08
TE-133M	2.	912.58	3.7846E-08
XE-133	7.	81.00	4.1586E-08
XE-133M	8.	233.22	1.3157E-07
CS-134✓	1.	604.70	1.4394E-08
I-134	0.	884.09	1.4417E-08
TE-134	6.	210.47	6.4945E-08
BA-135M	6.	268.24	8.5881E-08
I-135	1.	1260.41	9.9614E-08
XE-135	6.	249.79	1.4215E-08
XE-135M	2.	526.56	3.8615E-08
CS-136	3.	818.50	2.7496E-08
I-136	2.	1313.02	1.2286E-06
CS-137✓	1.	661.65	1.7883E-08
XE-137	2.	455.49	3.0424E-07

Minimum Detectable Activity Report (continued)

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Sample ID : LLD2000

Acquisition date : 2-MAR-1994 17:15:40

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/ml)
CS-138	1.	1435.86	5.2750E-08
XE-138	3.	258.31	6.4639E-08
BA-139	0.	1420.50	4.6556E-06
CE-139	8.	165.85	1.3011E-08
CS-139	7.	1283.23	2.2773E-06
BA-140	1.	537.32	5.0645E-08
LA-140	2.	1596.49	4.1847E-08
BA-141	7.	190.22	4.0137E-08
CE-141✓	5.	145.44	1.7825E-08
LA-141	1.	1354.52	1.1870E-06
BA-142	4.	255.12	1.5242E-07
LA-142	3.	641.17	4.4718E-08
CE-143	9.	293.26	3.9334E-08
CE-144✓	6.	133.54	8.7563E-08
PR-144	0.	1489.15	7.3197E-06
ND-147	12.	91.10	5.6108E-08
PM-148M	3.	550.27	2.0817E-08
EU-152	9.	344.27	7.1554E-08
EU-154	2.	1004.76	1.6930E-07
EU-156	2.	646.29	2.6485E-07
HF-181	4.	482.03	2.1913E-08
TA-182	4.	1221.42	1.6140E-07
W-187	2.	685.81	6.8759E-08
RE-188	9.	155.03	7.2546E-08
HG-203	6.	279.19	1.7677E-08
BI-207	5.	569.67	2.4305E-08
TL-208	3.	583.14	2.0126E-07
PB-212	2.	238.63	1.8495E-08
BI-214	9.	609.31	1.1974E-07
PB-214	10.	351.92	8.2787E-08
RA-224	5.	240.98	2.9586E-07
RA-226	13.	186.21	4.2616E-07
AC-228	3.	338.32	1.0610E-07
TH-232	6.	84.37	1.0977E-06
PA-234	8.	131.20	5.4043E-08
TH-234	23.	63.29	1.3445E-06
U-235	6.	143.76	8.6637E-08
NP-239	7.	106.13	4.7001E-08
AM-241	9.	59.54	1.2871E-07

13-MAR-94 15:17:55

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94-198 FERMI CST WATER

SPECTRAL FILE NAME: L941981.R3L
 SAMPLE DATE: 15-MAR-94 06:40:00
 SAMPLE IDENTIFICATION: L941981.R3L
 TYPE OF SAMPLE: WATER
 SAMPLE QUANTITY: 510.3000 UNITS: GRAM
 SAMPLE GEOMETRY: MAR500
 EFFICIENCY FILE NAME: MAR50093.EFF

ACQUIRE DATE: 13-MAR-94 14:16:55 * FWHM(1332) 1.975
 PRESET TIME(LIVE): 3600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER: 10.0 %
 ELAPSED LIVE TIME: 3600. SEC * NBR ITERATIONS: 10.

DETECTOR: ADC Detector * LIBRARY: NUCL.LIB
 CALIB DATE: 02-FEB-94 11:04:12 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: .5012213 * HALF LIFE RATIO: 8.00
 OFFSET: -.7430013 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW - .24 TO 4105.26

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	244.57	62.	315.	14.67	489.44	472	36	1.72E-02	96.2	
2	0	365.15	30.	65.	.72	730.00	722	13	8.45E-03	60.4	
3	0	427.71	63.	73.	1.86	854.82	847	14	1.74E-02	32.2	
4	5	600.53	83.	15.	2.20	1199.63	1192	33	2.31E-02	18.3	2.29E+00
5	5	604.66	193.	20.	2.17	1207.85	1192	33	5.37E-02	9.5	
6	0	661.55	131.	26.	1.39	1321.36	1314	15	3.64E-02	11.9	
7	0	795.55	94.	30.	1.42	1588.70	1583	12	2.61E-02	14.9	
8	0	810.24	50.	17.	1.36	1618.01	1614	12	1.39E-02	25.0	
9	0	834.53	59.	24.	1.76	1666.47	1662	10	1.63E-02	23.1	
10	0	1114.39	35.	16.	1.09	2224.83	2218	13	9.69E-03	33.4	
11	0	1172.40	287.	8.	1.85	2340.58	2331	16	7.97E-02	6.3	
12	0	1331.68	232.	0.	2.25	2656.34	2648	18	6.44E-02	6.6	

PEAK SEARCH COMPLETED (REV 15.2 - ND PC VERSION DEC 88)

PULSE-PILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR
1	0	244.57	62.	315.	14.67	489.44	472	36	1.72E-02	96.2
2	0	365.15	30.	65.	.72	730.00	722	13	8.45E-03	60.4
3	0	427.71	63.	73.	1.86	854.82	847	14	1.74E-02	32.2
4	5	600.53	83.	15.	2.20	1199.63	1192	33	2.31E-02	18.3
5	5	604.66	193.	20.	2.17	1207.85	1192	33	5.37E-02	9.5
6	0	661.55	131.	26.	1.39	1321.36	1314	15	3.64E-02	11.9
7	0	795.55	94.	30.	1.42	1588.70	1583	12	2.61E-02	14.9
8	0	810.24	50.	17.	1.36	1618.01	1614	12	1.39E-02	25.0

D-13

10	0	1114.39	35.	16.	1.09	2224.83	2218	13	9.69E-03	33.4
11	0	1172.40	287.	8.	1.85	2340.58	2331	16	7.97E-02	6.3
12	0	1331.68	232.	0.	2.25	2658.34	2648	10	6.44E-02	6.8

FILE-UP CORRECTION COMPLETED

FISSION GAS

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
KR-88	FG	196.32	0.	0.	26.00*	0.000E+00	.000E 0	.000E 0
		834.83	59.	24.	13.00	7.846E-01	4.996E-11	1.152E-11
		1529.77	0.	0.	10.90	0.000E+00	.000E 0	.000E 0
		2193.84	0.	0.	13.20	0.000E+00	.000E 0	.000E 0
		2392.11	0.	0.	34.60	0.000E+00	.000E 0	.000E 0

ACTIVATION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
MN-54	AF	834.83	59.	24.	99.98*	7.846E-01	1.096E -7	2.528E -8
CO-58	AF	810.76	50.	17.	99.40*	8.063E-01	9.044E -8	2.263E -8
CO-60	AP	1173.22	287.	8.	100.00	5.736E-01	7.356E -7	4.635E -6
		1332.49	232.	0.	100.00*	5.101E-01	6.687E -7	4.578E -8
NI-65	AP	366.27	30.	65.	4.61	1.676E+00	9.929E-12	6.002E-12
		1115.52	35.	16.	14.80	6.011E-01	9.887E-12	3.300E-12
		1461.34	0.	0.	23.50*	0.000E+00	.000E 0	.000E 0
ZN-65	AP	1115.52	35.	16.	30.75*	6.011E-01	1.674E -7	5.587E -8

HALOGEN FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
I-131	HFF	284.30	0.	0.	6.05	0.000E+00	.000E 0	.000E 0
		364.48	30.	65.	61.20*	1.676E+00	2.849E -8	1.722E -8
		636.97	0.	0.	7.26	0.000E+00	.000E 0	.000E 0
		722.89	0.	0.	1.80	0.000E+00	.000E 0	.000E 0

FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
MO-99	FP	140.51	0.	0.	90.60	0.000E+00	.000E 0	.000E 0
		181.06	0.	0.	6.20	0.000E+00	.000E 0	.000E 0
		366.43	30.	65.	1.37	1.676E+00	1.282E -6	7.750E -7
		739.38	0.	0.	12.80*	0.000E+00	.000E 0	.000E 0
		778.00	0.	0.	4.50	0.000E+00	.000E 0	.000E 0
SB-125	FP	176.33	0.	0.	6.89	0.000E+00	.000E 0	.000E 0
		427.89	63.	73.	29.33*	1.451E+00	2.162E -7	6.955E -8
		463.38	0.	0.	10.35	0.000E+00	.000E 0	.000E 0
		600.56	63.	15.	17.80	1.062E+00	6.456E -7	1.180E -7
		635.90	0.	0.	11.32	0.000E+00	.000E 0	.000E 0
CS-134	FP	563.23	0.	0.	8.38	0.000E+00	.000E 0	.000E 0
		569.32	0.	0.	15.43	0.000E+00	.000E 0	.000E 0
		604.70	193.	20.	97.60*	1.056E+00	2.756E -7	2.620E -8
		795.85	94.	30.	85.40	8.200E-01	1.967E -7	2.937E -8
		801.93	0.	0.	8.73	0.000E+00	.000E 0	.000E 0
CS-137	FP	661.65	131.	26.	85.12*	9.718E-01	2.328E -7	2.763E -8

ELAPSED LIVE TIME 3600. (PILE-UP CORRECTED)

UNIDENTIFIED PEAKS

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	%EFF
1	0	244.57	62.	315.	14.67	489.44	472	36	1.72E-02	96.2	2.39E+00
3	0	427.71	63.	73.	1.86	854.82	847	14	1.74E-02	32.2	1.45E+00
4	5	600.53	83.	15.	2.20	1199.63	1192	33	2.31E-02	18.3	1.06E+00

LINE NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	UCI/GRAM	ABNDIFF	FAILED
2	NI-65	366.27	2.52H	1.715E -5	9.929E-12	45.23%	ABN
2	MO-99	366.43	66.02H	6.579E -1	1.282E -6	1.19%	ABN
3	SB-125	427.89	2.77Y	9.989E -1	2.162E -7	62.27%	ABN
4	SB-125	600.56	2.77Y	9.989E -1	6.456E -7	62.27%	ABN
9	KR-88	834.83	2.84H	5.906E -5	4.996E-11	13.31%	ABN
10	NI-65	1115.52	2.52H	1.715E -5	9.887E-12	45.23%	ABN

NUCLIDE IDENTIFICATION SYSTEM
SUMMARY OF NUCLIDE ACTIVITY

(NC PC VERSION DEC 88)

PAGE 3

TOTAL LINES IN SPECTRUM	12	
UNIDENTIFIED PEAKS	3	
IDENTIFIED IN SUMMARY REPORT	9	75.00%

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
MN-54	AP	312.70D	.996	1.096E -7	2.528E -8	23.06
CO-58	AF	70.80D	.984	9.044E -8	2.263E -8	25.02
CO-60	AP	1923.00D	.999	6.687E -7	4.578E -8	6.85
ZN-65	AP	244.40D	.995	1.674E -7	5.567E -8	33.38

HALOGEN FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
I-131	HFP	8.04D	.867	2.849E -8	1.722E -8	60.45

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
CS-134	FP	753.10D	.998	2.756E -7	2.620E -8	9.51
CS-137	FP	30.17Y	1.000	2.328E -7	2.763E -8	11.87

MINIMUM DETECTABLE ACTIVITY REPORT (ND PC VERSION AUG 89)

PEAK WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 4.66.

NUCLIDE	BKG	ENERGY	MINIMUM UCI/GRAM
BE-7	34.	477.59	2.7841E-07
ANIL-511	88.	511.00	HALF LIFE TOO SHORT
NA-22	1.	1274.54	1.3015E-08
NA-24	3.	1368.53	3.8071E-09
CL-38	1.	2167.51	0.0000E+00
AR-41	4.	1293.64	HALF LIFE TOO SHORT
K-40	11.	1460.81	4.5768E-07
SC-46	23.	1120.51	5.4922E-08
CR-51	57.	320.08	2.7910E-07
MN-56	23.	846.75	HALF LIFE TOO SHORT
FE-59	30.	1099.22	1.0784E-07
CO-57	92.	122.06	2.1657E-08
NI-65	1.	1481.84	HALF LIFE TOO SHORT
CU-64	6.	1345.90	7.7545E-07
ZN-69M	47.	438.63	4.5705E-09
AS-76	22.	559.10	2.1557E-08
SE-75	77.	264.65	4.6142E-08
BR-82	40.	554.32	2.3831E-08
BR-84	25.	881.50	HALF LIFE TOO SHORT
KR-85	45.	513.99	8.4410E-06
KR-85M	97.	151.18	HALF LIFE TOO SHORT
KR-87	40.	402.58	HALF LIFE TOO SHORT
KR-88	108.	196.32	HALF LIFE TOO SHORT
RB-88	2.	1836.01	HALF LIFE TOO SHORT
RB-89	26.	1031.83	HALF LIFE TOO SHORT
SR-85	45.	513.99	3.5930E-08
SR-85M	84.	231.69	HALF LIFE TOO SHORT
SR-91	27.	1024.30	9.3396E-09
SF-92	1.	1583.94	HALF LIFE TOO SHORT
Y-88	2.	1836.01	2.5471E-08
Y-91	9.	1204.90	1.2141E-08
Y-91MD	39.	553.57	2.0376E-09
Y-92	29.	934.46	HALF LIFE TOO SHORT
Y-93	65.	266.90	2.4186E-08
ZR-95	21.	756.72	6.5083E-08
ZR-97	28.	743.36	8.7217E-09
NB-94	25.	702.63	3.7002E-08
NB-95	24.	765.79	3.8451E-08
NB-97D	27.	1024.50	1.0052E-08
MO-90	74.	257.34	2.6189E-10
MO-99	21.	739.58	1.8391E-07
TC-99MD	87.	140.51	1.2587E-08
RU-103	30.	497.08	3.1421E-08
RU-105	22.	724.50	HALF LIFE TOO SHORT
RU-106	34.	621.84	3.8803E-07
RH-105	52.	318.90	6.3799E-08
AG-110M	35.	657.75	4.3132E-08
CD-109	91.	88.03	5.9348E-07
SN-113	46.	391.69	4.4385E-08
SB-122	29.	563.93	2.9499E-08

NUCLIDE	BKG	ENERGY	MINIMUM UCI/GRAM
SD-124	232.	602.71	9.6837E-08
SB-125	115.	427.89	1.6857E-07
TE-123M	94.	158.99	2.4117E-08
TE-132	98.	228.16	2.2475E-08
I-131	19.	667.69	HALF LIFE TOO SHORT
I-133	38.	529.87	1.0526E-08
I-134	23.	847.03	HALF LIFE TOO SHORT
I-135	5.	1250.41	1.5384E-09
XE-131M	108.	163.93	1.0459E-06
XE-133	89.	80.99	5.3272E-08
XE-133M	78.	233.22	1.4636E-07
XE-135	101.	249.77	1.6313E-09
XE-135M	44.	526.56	HALF LIFE TOO SHORT
XE-138	68.	258.31	HALF LIFE TOO SHORT
CS-134M	84.	127.42	HALF LIFE TOO SHORT
CS-136	24.	818.50	3.9039E-08
CS-138	3.	1435.86	HALF LIFE TOO SHORT
BA-133	38.	356.00	4.1285E-08
BA-139	102.	165.85	HALF LIFE TOO SHORT
BA-140	25.	537.32	1.0518E-07
BA-141	96.	190.22	HALF LIFE TOO SHORT
LA-140	1.	1596.49	8.4008E-09
CE-139	102.	185.65	2.7407E-08
CE-141	85.	145.44	3.5859E-08
CE-143	82.	292.26	3.2286E-08
CE-144	90.	133.54	1.6612E-07
ND-147	86.	91.11	6.6835E-08
EU-152	54.	344.27	1.0893E-07
EU-154	1.	1274.45	3.6669E-08
HF-181	44.	482.03	3.9942E-08
W-187	41.	175.53	4.3750E-08
FS-203	60.	275.19	3.2445E-08
RA-226	61.	609.31	1.0816E-07
TH-232	110.	238.63	6.9013E-08
U-235	109.	185.72	4.7140E-08
U-238	81.	131.20	8.3930E-08
NP-239	89.	106.13	5.1706E-08
AM-241	87.	59.54	1.3560E-07

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**	*****	*****	*****	*****	*****

CALCULATES THE DOSE DUE TO

NUCLEAR POWER PLANT

LIQUID

RADIOACTIVE EFFLUENTS

U. S. NUCLEAR REGULATORY COMMISSION

PCDOSE

LIQUID DOSE CALCULATIONS

from

NUCLEAR POWER PLANT EFFLUENTS

Rev. 34 08/20/91

16-Mar-94

FILENAME ???????.WK1

PLANT NAME

Mar-94

16-Mar

I N D I V I D U A L M A X I M U M

06:59 AM

 Dilution
 ENTER PLANT SPECIFIC DATA

FRESH WATER
 Flow Rate = 1.68E+04 g/min
 Average Flow During Report Period

 Individual Average Consumption(kg/y)

Pathways Adult Teen Child

 Water 730 510 510
 SportFish 21 16 6.9

 Radioactive Release
 WHEN COMPLETED ====> Press ALT E

Flow Rate = 4.00E+02 g/min
 Flow Time = 2.30E+01 hr
 Report Period = 1.20E+01 mth

 Transit Times (hrs)
 Drinking Water = 0.01
 Fish/Invertebrates = 0.01

 Comments:

FILENAME ????????.WK1

PLANT NAME

Mar-94

16-Mar

I N D I V I D U A L M A X I M U M

06:59 AM

ENTER RADIOACTIVITY RELEASED FOR EACH RADIONUCLIDE

Nuclide uCi/ml

WHEN COMPLETED =====> Press ALT J

Mn-54 1.10E-07
Co-58 9.04E-08
Co-60 6.69E-07
Zn-65 1.67E-07
I-131 2.85E-08
Cs-134 2.76E-07
Cs-137 2.33E-07
H-3 3.30E-04

WHEN COMPLETED =====> Press ALT J

ADDITIONAL DILUTION FACTORS

Food Consumption Products:

1. Potable Water Near Field	=====>	Dw	=	7.70E+01
2. Sport Fish	=====>	Dsf	=	5.00E+00
3. Sport Invert	=====>	Ds1	=	5.00E+00
4. Commercial Fish	=====>	Dcf	=	5.00E+00
5. Commercial Invert	=====>	Dc1	=	5.00E+00

FILENAME ????????WK1
16-Mar

PLANT NAME
I N D I V I D U A L M A X I M U M

Mar-94
06:59 AM

ADULT TOTAL DOSE RECEIVED PER ORGAN

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli
Mn-54		5.29E-05	1.01E-05		1.57E-05		1.62E-04
Co-58		9.25E-07	2.07E-06				1.87E-05
Co-60		1.96E-05	4.33E-05				3.69E-04
Zn-65	4.25E-04	1.35E-03	6.11E-04		9.05E-04		8.52E-04
I-131	5.37E-07	7.68E-07	4.40E-07	2.52E-04	1.32E-06		2.03E-07
Cs-134	9.02E-03	2.15E-02	1.75E-02		6.94E-03	2.30E-03	3.75E-04
Cs-137	9.76E-03	1.33E-02	8.74E-03		4.53E-03	1.51E-03	2.58E-04
H-3		2.87E-05	2.87E-05	2.87E-05	2.87E-05	2.87E-05	2.87E-05

TOTALS	1.92E-02	3.63E-02	2.70E-02	2.81E-04	1.24E-02	3.84E-03	2.06E-03
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli

FILENAME ????????.WK1

PLANT NAME

Mar-94

16-Mar

I N D I V I D U A L M A X I M U M

06:59 AM

TEEN TOTAL DOSE RECEIVED PER ORGAN

Nuclide	mrem/ 12.00 mth						
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli
Mn-54		5.20E-05	1.03E-05		1.55E-05		1.07E-04
Co-58		9.16E-07	2.11E-06				1.26E-05
Co-60		1.96E-05	4.41E-05				2.55E-04
Zn-65	3.85E-04	1.34E-03	6.24E-04		8.56E-04		5.67E-04
I-131	5.69E-07	7.97E-07	4.28E-07	2.33E-04	1.37E-06		1.58E-07
Cs-134	9.24E-03	2.18E-02	1.01E-02		6.91E-03	2.64E-03	2.71E-04
Cs-137	1.04E-02	1.39E-02	4.84E-03		4.73E-03	1.84E-03	1.93E-04
H-3		2.08E-05	2.08E-05	2.08E-05	2.08E-05	2.08E-05	2.08E-05

TOTALS	2.01E-02	3.71E-02	1.56E-02	2.53E-04	1.25E-02	4.50E-03	1.43E-03
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli

FILENAME ????????WK1

PLANT NAME

Mar-94

16-Mar

I N D I V I D U A L M A X I M U M

06:59 AM

CHILD TOTAL DOSE RECEIVED PER ORGAN

Nuclide	mrem/ 12.00 mth.						
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli
Mn-54		4.10E-05	1.09E-05		1.15E-05		3.44E-05
Co-58		7.70E-07	2.36E-06				4.49E-06
Co-60		1.67E-05	4.93E-05				9.27E-05
Zn-65	3.96E-04	1.05E-03	6.56E-04		6.65E-04		1.85E-04
I-131	8.37E-07	8.42E-07	4.79E-07	2.78E-04	1.38E-06		7.50E-08
Cs-134	1.12E-02	1.83E-02	3.86E-03		5.67E-03	2.04E-03	9.87E-05
Cs-137	1.32E-02	1.26E-02	1.86E-03		4.11E-03	1.48E-03	7.89E-05
H-3		3.30E-05	3.30E-05	3.30E-05	3.30E-05	3.30E-05	3.30E-05

TOTALS	2.47E-02	3.21E-02	6.48E-03	3.11E-04	1.05E-02	3.55E-03	5.27E-04
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli

FILENAME ???????.WK1
16-Mar

PLANT NAME
I N D I V I D U A L M A X I M U M

Mar-94
06:59 AM

TOTAL DOSE SUMMARY REPORT

1.20E+01 mth

Group Organ Total

Adult Bone 1.92E-02
Adult Liver 3.63E-02
Adult Tot Body 2.70E-02
Adult Thyroid 2.81E-04
Adult Kidney 1.24E-02
Adult Lung 3.84E-03
Adult Gi-Lli 2.06E-03
Teen Bone 2.01E-02
Teen Liver 3.71E-02
Teen Tot Body 1.56E-02
Teen Thyroid 2.53E-04
Teen Kidney 1.25E-02
Teen Lung 4.50E-03
Teen Gi-Lli 1.43E-03
Child Bone 2.47E-02
Child Liver 3.21E-02
Child Tot Body 6.48E-03
Child Thyroid 3.11E-04
Child Kidney 1.05E-02
Child Lung 3.55E-03
Child Gi-Lli 5.27E-04

1.20E+01 mth

ORGAN WITH MAXIMUM DOSE

Group Organ Total
Teen Liver 3.71E-02

 ***** 17-MAR-94 14:52:56 *****

FERMI 2 CST LIQUID: DURING 3/94 DISCHARGE

SPECTRAL FILE NAME: L942011.R3L
 SAMPLE DATE: 16-MAR-94 07:05:00
 SAMPLE IDENTIFICATION: L942011.R3L
 TYPE OF SAMPLE: LIQUID
 SAMPLE QUANTITY: 506.1000 UNITS: GRAMS
 SAMPLE GEOMETRY: MAR50093.EFF
 EFFICIENCY FILE NAME: MAR50093.EFF

ACQUIRE DATE: 17-MAR-94 13:44:10 * FWHM(1332) 1.975
 PRESET TIME(LIVE): 3600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER : 10.0 %
 ELAPSED LIVE TIME: 3600. SEC * NBR ITERATIONS: 10.

DETECTOR: ADC Detector * LIBRARY:NUCL.LIB
 CALIB DATE: 02-FEB-94 11:04:12 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: .5012213 * HALF LIFE RATIO: 8.00
 OFFSET: -.7430013 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW -1.24 TO 4105.26

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	2	16.55	49.	12.	1.07	34.50	31	12	1.37E-02	22.5	4.77E-01
2	2	18.29	24.	63.	1.59	37.98	31	12	6.60E-03	74.1	
3	0	23.92	26.	57.	1.32	49.20	47	6	7.28E-03	54.5	
4	0	175.89	41.	90.	1.46	352.41	349	10	1.15E-02	47.1	
5	0	351.89	13.	50.	1.26	703.55	699	8	3.55E-03	96.1	
6	0	428.38	59.	91.	1.92	856.15	847	18	1.64E-02	40.7	
7	0	510.36	76.	29.	2.35	1019.72	1013	18	2.11E-02	23.3	
8	0	568.78	29.	15.	.94	1136.28	1132	10	8.18E-03	31.8	
9	0	604.47	174.	76.	1.74	1207.48	1199	15	4.84E-02	14.2	
10	0	635.57	32.	32.	1.33	1269.53	1263	13	8.92E-03	40.5	
11	0	661.47	97.	17.	1.29	1321.21	1316	11	2.70E-02	13.6	
12	0	795.74	101.	33.	1.81	1589.08	1582	17	2.82E-02	18.0	
13	0	810.39	50.	18.	1.28	1618.32	1614	10	1.38E-02	23.6	
14	0	834.37	64.	21.	2.06	1666.15	1661	13	1.78E-02	23.3	
15	0	1115.43	31.	21.	1.51	2226.91	2220	12	8.64E-03	39.5	
16	0	1172.49	234.	17.	2.33	2340.74	2333	16	6.50E-03	7.2	
17	0	1331.60	230.	15.	2.05	2658.19	2651	13	6.40E-02	7.1	

PEAK SEARCH COMPLETED (REV 15.8 - ND PC VERSION DEC 88)

PULSE-PILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR
1	2	16.55	49.	12.	1.07	34.50	31	12	1.37E-02	22.5
2	2	18.29	24.	65.	1.59	37.98	31	12	6.60E-03	74.1
3	0	23.92	26.	57.	1.32	49.20	47	6	7.28E-03	54.5

5	0	351.89	13.	50.	1.26	703.55	699	8	3.55E-03	96.1
6	0	428.38	59.	91.	1.92	856.15	847	18	1.64E-02	40.7
7	0	510.36	76.	29.	2.35	1019.72	1013	16	2.11E-02	23.3
8	0	596.78	29.	15.	.94	1136.28	1132	10	8.18E-03	31.8
9	0	604.47	174.	76.	1.74	1207.48	1199	15	4.84E-02	14.2
10	0	635.57	32.	32.	1.33	1269.53	1263	13	8.92E-03	40.5
11	0	661.47	97.	17.	1.29	1321.21	1316	11	2.70E-02	13.6
12	0	795.74	101.	33.	1.81	1589.08	1582	17	2.82E-02	18.0
13	0	810.39	50.	18.	1.28	1618.32	1614	10	1.38E-02	23.6
14	0	834.37	64.	21.	2.06	1666.15	1661	13	1.78E-02	23.3
15	0	1115.43	31.	21.	1.51	2226.91	2220	12	8.64E-03	39.5
16	0	1172.49	234.	17.	2.33	2340.74	2333	16	6.50E-02	7.2
17	0	1351.60	230.	13.	2.05	2658.19	2651	13	6.40E-02	7.1

PILE-UP CORRECTION COMPLETED

ELAPSED LIVE TIME: 3600. (FILE-UP CORRECTED)

FISSION GAS

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UC1/ GRAMS	1-SIGMA ERROR
KR-88	FG	196.32	0.	0.	26.00*	0.000E+00	.000E 0	.000E 0
		834.83	64.	21.	13.00	7.848E-01	1.863E -3	4.336E -4
		1529.77	0.	0.	10.90	0.000E+00	.000E 0	.000E 0
		2195.84	0.	0.	13.20	0.000E+00	.000E 0	.000E 0
		2392.11	0.	0.	34.60	0.000E+00	.000E 0	.000E 0

ACTIVATION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UC1/ GRAMS	1-SIGMA ERROR
ANIL-511	AP	511.00	76.	29.	96.73*	1.234E+00	1.244E -2	2.944E -3
MN-54	AP	834.83	64.	21.	99.98*	7.848E-01	1.215E -7	2.827E -8
CO-58	AP	810.76	50.	18.	99.40*	8.061E-01	9.284E -8	2.193E -8
CO-60	AP	1173.22	234.	17.	100.00	5.736E-01	6.054E -7	4.352E -8
		1332.49	230.	15.	100.00*	5.101E-01	6.704E -7	4.745E -8
NI-63	AP	366.27	0.	0.	4.61	0.000E+00	.000E 0	.000E 0
		1115.52	31.	21.	14.80	6.006E-01	2.723E -3	1.076E -3
		1481.84	0.	0.	23.50*	0.000E+00	.000E 0	.000E 0
ZN-65	AP	1115.52	31.	21.	50.75*	6.006E-01	1.520E -7	6.002E -8

HALOGEN FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UC1/ GRAMS	1-SIGMA ERROR
I-131	HFP	284.30	0.	0.	6.05	0.000E+00	.000E 0	.000E 0
		364.48	0.	0.	81.20*	0.000E+00	.000E 0	.000E 0
		636.97	32.	32.	7.26	1.008E+00	7.281E -7	2.952E -7
		722.89	0.	0.	1.89	0.000E+00	.000E 0	.000E 0

FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UC1/ GRAMS	1-SIGMA ERROR
SB-125	FF	176.33	41.	90.	6.89	3.100E+00	2.861E -7	1.307E -7
		427.89	59.	91.	29.33*	1.449E+00	2.059E -7	8.382E -8
		463.33	0.	0.	10.35	0.000E+00	.000E 0	.000E 0
		600.56	0.	0.	17.80	0.000E+00	.000E 0	.000E 0
		635.90	32.	32.	11.72	1.008E+00	4.119E -7	1.674E -7
CS-134	FP	563.23	0.	0.	8.33	0.300E+00	.000E 0	.000E 0
		569.32	29.	15.	15.43	1.117E+00	2.339E -7	6.074E -8
		604.70	174.	76.	97.60*	1.056E+00	2.513E -7	3.576E -8
		795.85	101.	33.	65.40	8.198E-01	2.152E -7	3.369E -8
		801.93	0.	0.	8.73	0.300E+00	.000E 0	.000E 0
CS-136	FP	176.55	41.	90.	13.56	3.100E+00	1.566E -7	7.375E -8
		273.65	0.	0.	12.66	0.000E+00	.000E 0	.000E 0
		340.57	0.	0.	48.50	0.000E+00	.000E 0	.000E 0
		818.50	0.	0.	99.70*	0.000E+00	.000E 0	.000E 0
		1048.07	0.	0.	79.60	0.000E+00	.000E 0	.000E 0
		1235.34	0.	0.	19.70	0.000E+00	.000E 0	.000E 0
CS-137	FP	661.65	97.	17.	85.12*	9.719E-01	1.745E -7	2.369E -8

NATURAL PRODUCT

NUCLIDE	SSHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAMS	1-SIGMA ERROR
Ra-226	NF	186.21	0.	0.	3.28	0.000E+00	.000E 0	.000E 0
		241.98	0.	0.	7.49	0.000E+00	.000E 0	.000E 0
		295.21	0.	0.	19.20	0.000E+00	.000E 0	.000E 0
		351.92	13.	50.	37.20	1.733E+00	2.942E -8	2.828E -8
		609.31	0.	0.	46.30*	0.000E+00	.000E 0	.000E 0
		1120.29	0.	0.	15.10	0.000E+00	.000E 0	.000E 0
		1238.11	0.	0.	5.94	0.000E+00	.000E 0	.000E 0
		1764.49	0.	0.	15.80	0.000E+00	.000E 0	.000E 0
		2204.22	0.	0.	4.98	0.000E+00	.000E 0	.000E 0
U-238	NF	131.20	0.	0.	20.40*	0.000E+00	.000E 0	.000E 0
		152.70	0.	0.	6.80	0.000E+00	.000E 0	.000E 0
		569.50	29.	15.	11.00	1.117E+00	3.557E -7	1.131E -7
		880.51	0.	0.	12.24	0.000E+00	.000E 0	.000E 0
		883.24	0.	0.	12.00	0.000E+00	.000E 0	.000E 0
		926.00	0.	0.	11.20	0.000E+00	.000E 0	.000E 0
		946.00	0.	0.	12.00	0.000E+00	.000E 0	.000E 0

ELAPSED LIVE TIME 3600. (FILE-UP CORRECTED)

UNIDENTIFIED PEAKS

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	FW	CTS/SEC	%ERR	%EFF
1	2	16.55	49.	12.	1.07	34.50	31	12	1.37E-02	22.5	2.43E-02
2	2	18.29	24.	65.	1.59	37.98	31	12	6.60E-03	74.1	3.36E-02
3	0	23.92	25.	57.	1.32	48.20	47	6	7.29E-03	54.5	6.01E-02
4	0	175.89	41.	90.	1.46	352.41	349	10	1.15E-02	47.1	3.10E+00
5	0	351.89	13.	50.	1.26	703.33	699	8	3.53E-03	96.1	1.73E+00
6	0	428.38	59.	91.	1.92	856.15	847	18	1.64E-02	40.7	1.45E+00
7	0	510.36	76.	29.	2.35	1019.72	1013	16	2.11E-02	23.3	1.23E+00
10	0	635.57	32.	32.	1.33	1269.53	1263	13	8.92E-03	40.5	1.01E+00

LINES NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	UCI/GRANS	ABNDIFF	FAILED
4	SB-125	176.33	2.77Y	1.001E 0	2.861E -7	62.81%	ABN
4	CS-136	176.55	13.16D	1.071E 0	1.566E -7	4.95%	ABN
5	RA-226	351.92	1500.00Y	1.000E 0	2.942E -8	23.96%	ABN
6	SB-125	427.89	2.77Y	1.001E 0	2.059E -7	62.81%	ABN
7	ANIL-511	511.00	109.70M	1.339E 3	1.264E -2	100.00%	DCY
8	U-238	569.50	1.00E+10Y	1.000E 0	3.507E -7	12.84%	ABN
10	SB-125	635.90	2.77Y	1.001E 0	4.179E -7	62.81%	ABN
10	I-131	636.97	8.04D	1.118E 0	7.281E -7	7.54%	ABN
14	KR-88	834.83	2.84H	2.000E 3	1.863E -3	13.31%	DCY,ABN
15	NI-65	1115.52	2.52H	5.248E 3	2.725E -3	34.49%	DCY,ABN

TOTAL LINES IN SPECTRUM 17
UNIDENTIFIED PEAKS 8
IDENTIFIED IN SUMMARY REPORT 9 52.94%

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAMS	1-SIGMA ERROR	%ERR
MN-54	AP	312.70D	1.003	1.215E -7	2.827E -8	23.27
CO-58	AP	70.80D	1.013	9.284E -8	2.193E -8	23.62
CO-60	AP	1925.00D	1.000	6.704E -7	4.746E -8	7.08
ZN-65	AP	244.40D	1.004	1.520E -7	6.002E -8	39.49

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAMS	1-SIGMA ERROR	%ERR
CS-134	FP	753.10D	1.001	2.513E -7	3.576E -8	14.23
CS-137	FP	30.17Y	1.000	1.745E -7	2.369E -8	13.58

NVLAQ

14

Date:

Mar 15, 1994

To:

Mike Knowski / Steve Orth

Ext:

Company Name:

NRC

From:

Lynda Graine

Ext:

313-586-1380

Location:

Fermi 2

No. of Pages (including cover):

16

Comments:

Please call me with NRC results. I would like a fax if possible. Thanks.

Detroit Edison Company

Fermi 2 Power Plant

6400 N. Dixie Hwy

Newport, MI 48166

FAX: (313) 586-1041

Verification: (313) 586-1036



Dosimetry - 100 AIB

D-14

PRE-RELEASE INFORMATION

Release Permit No. 94CST2

1. Discharge Monitor reading:

120 cpm

2. Circulating Water Decant Monitor reading from Recorder D11-R806 on Panel H11-P842C540 in Main Control Room:

180 cpm

3. Circulating Water Decant (CWD) line % flow from Control Room Recorder N71-R802:

56.0 %

$$\begin{aligned} \text{Flow in gallons per minute} &= \frac{56}{100} \% \text{ flow} \times 30,000 \text{ gpm maximum flow} \times 0.01 \\ &= \frac{1.68 \times 10^4}{100} \text{ gpm} \end{aligned}$$

4. Maximum tank discharge flow rate:
- 4.00E+02
- gpm
-
- (normally 50 gpm for Waste Sample Tank discharge)

5. Tank Volume to be released:
- 532,980
- gal
-
- (from Z3.718.05, Att 1, Page 1 for Waste Sample Tank)

6. Tank Volume to be released in ml: Vol in gal x 3785 =
- 2.02E+09
- ml

7. Calculation of dose equation multiplication factor (pre-release estimate):

$$\begin{aligned} \text{Multiplication Factor} &= \frac{1.67 \times 10^{-2} \times \text{Tank volume (from part 5 above)}}{\text{CWD flow rate} \times 5} \\ \frac{1.06 \times 10^{-1}}{1.68 \times 10^4 \text{ gpm} \times 5} &= \frac{1.67 \times 10^{-2} \times 532,980 \text{ gal}}{1.68 \times 10^4 \text{ gpm} \times 5} \end{aligned}$$

8. Discharge Monitor Sensitivity:

1.60E+07 ^{cpm} / (uCi/cc)

Performed by:

[Signature] 3-15-94
Signature / Date

Reviewed by:

[Signature] 3-15-94
Signature / Date

Reviewed by:

[Signature] 3-15-94 (CST only) [] NA
Signature / Date

Note: This was the first sample. It is used for the release calculations.

Equivalent to 62,000.120 Att 1 P1/1 010394

DTC: VSSURV File: 1202

CALCULATION OF MPC FRACTION

Release Permit No. 94CST2

Type of Sample: CST

	Col. 1 Isotope	Col. 2 Conc. (uCi/ml)	Col. 3 MPC	Col. 4 MPC Fraction
1.	Mn-54	1.64E-07	3.00E-04	5.47E-04
2.	Co-58	1.26E-07	2.00E-04	6.30E-04
3.	Co-60	8.11E-07	3.00E-05	2.70E-02
4.	Cs-134	2.73E-07	9.00E-06	3.03E-02
5.	Cs-137	2.27E-07	1.00E-05	2.27E-02
6.	Sr-125	3.88E-07	3.00E-04	1.29E-03
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
Total:		1.99E-06 uCi/ml	MPC:	8.25E-02

Performed by:

Signature

Date

Reviewed by:

Signature

Date

Reviewed by:

Signature

Date

(CST only) | | NA

CIRCULATING WATER DECANT MONITOR SETPOINT COMPARISON

Release Permit No. 94CST2

1. Estimated Circulating Water Decant Monitor alarm (high high) setpoint based on nuclide mix of batch to be released =

$$\frac{(\text{Cr-51 conc (att 2)} \times 0.098 \times 2.7\text{E}+8) + (\text{Total conc except Cr-51} \times 2.7\text{E}+8)}{\text{MPCF (Att 2)} \times 2} + \text{Circ Water Decant Monitor reading (Att 1)} =$$

$$\frac{(0.000001 \text{ uCi/cc} \times 0.098 \times 2.70\text{E}+08) + (1.99\text{E}-06 \text{ uCi/ml} \times 2.70\text{E}+08)}{8.25\text{E}-02 \times 2} + 180 \text{ cpm}$$

$$= 3.43\text{E}+03 \text{ cpm}$$

2. Installed Circulating Water Decant Monitor alarm (high high) setpoint

$$= 1700 \text{ cpm}$$

3. Setpoint change required? YES X NO

Performed by: [Signature] 3-15-94
Signature / Date

Reviewed by: [Signature] 3-15-94
Signature / Date

Reviewed by: [Signature] 3/15/94 (CST only) [] : NA
Signature / Date

CALCULATION OF DISCHARGE MONITOR RELEASE RATE AND SETPOINT - CIRCULATING WATER NOT CONTAMINATED

Release Permit No. 94CST2

BF = 0.1
H3MPCF = 0.13
H3F = 0.99

$$1. \text{ Maximum Allowable Release Rate} = \frac{\text{CWD flow rate (Att 1)} \times 0.5}{[(\text{MPCF (Att 2)} \times (1 + \text{BF})) + \text{H3MPCF}]} = \frac{1.68\text{E}+04 \text{ gpm} \times 0.5}{[(8.25\text{E}-02 \times (1 + 0.1)) + 1.3\text{E}-1]} = 3.80\text{E}+04 \text{ gpm}$$

2. Determination of "Estimated release rate" (for use in Part 3 and 4 below):

a) If maximum allowable release rate is greater than or equal to maximum release tank discharge flow rate, estimated release rate equals maximum release tank discharge flow rate (from Att 1, Part 4).

b) If maximum allowable release rate is less than maximum release tank discharge flow rate, estimated release rate equals maximum allowable release rate.

$$3. \text{ Total MPC fraction at discharge point} = \frac{\text{Estimated release rate} \times [\text{MPCF} \times (1 + \text{BF}) + \text{H3MPCF}]}{\text{CWD flow rate}}$$

$$= \frac{4.00\text{E}+02 \text{ gpm} \times [8.25\text{E}-02 \times (1 + 0.1) + 1.3\text{E}-1]}{1.68\text{E}+04 \text{ gpm}} = 5.26\text{E}-03$$

$$4. \text{ Discharge Monitor Setpoint} = \frac{\text{Total conc (Att 2)} \times \text{Monitor Sensitivity (Att 1)} \times \text{CWD flow rate (Att 1 Part 3)} \times \text{H3F}}{\text{MPCF (Att 2)} \times \text{Estimated release rate (Att 4 Part 2)} \times (1 + \text{BF})} + \text{Discharge Monitor Background Reading (Att 1 Part 1)}$$

$$= \frac{1.99\text{E}-06 \text{ uCi/cc} \times 1.60\text{E}+07 \text{ cpm/(uCi/cc)} \times 1.68\text{E}+04 \text{ gpm} \times 0.99}{8.25\text{E}-02 \times 4.00\text{E}+02 \text{ gpm} \times (1 + 0.1)} + 120 \text{ cpm}$$

$$= 1.47\text{E}+04 \text{ cpm}$$

Performed by [Signature] Date 3-15-94Reviewed by [Signature] Date 3-15-94Reviewed by [Signature] Date 3-15-94

(CST only) [] NA

PRE-RELEASE LIQUID EFFLUENT DOSE CALCULATION

Release Permit #
Multiplication factor

94CST2
1.08E-01

Nuclide	uCi/yr	Bone Factor	Bone Dose	Liver Factor	Liver Dose	T Body Factor	T Body Dose	Thyroid Factor	Thyroid Dose	Kidney Factor	Kidney Dose	Lung Factor	Lung Dose	GI-LLI Factor	GI-LLI Dose
Mn-54	1.84E-07			4.40E-03	7.85E-05	8.40E-02	1.45E-05			1.31E-05	2.28E-05			1.35E-04	2.38E-04
Co-58	1.20E-07			9.32E-01	1.24E-06	2.00E+02	2.79E-03							1.88E+03	2.62E-05
Co-60	8.11E-07			2.68E-02	2.30E-05	5.90E+02	5.07E-05							5.83E+03	4.32E-04
Ca-134	2.73E-07	2.98E+05	8.82E-03	7.09E+05	2.05E-02	5.80E+05	1.83E-02			2.30E+05	6.69E-03	7.62E+04	2.20E-03	1.24E+04	3.98E-04
Ca-137	2.27E-07	3.82E+05	9.19E-03	5.22E+05	1.20E-02	3.42E+05	8.23E-03			1.77E+05	4.28E-03	5.90E+04	1.42E-03	1.01E+04	2.43E-04
Sb-125	3.88E-07	1.40E+01	5.78E-07	1.56E-01	8.41E-09	3.32E+00	1.38E-07	1.42E-02	5.84E-10			1.08E+01	1.44E-07	1.54E+02	6.33E-06

This release	Bone	Liver	T Body	Thyroid	Kidney	Lung	GI-LLI
Gammas organ dose (mRem)	1.78E-02	3.32E-02	2.51E-02	5.84E-03	1.09E-02	3.62E-03	1.30E-03
Pure beta organ dose (mRem)	9.95E-04	3.79E-04	2.29E-04	1.09E-04	1.08E-04	2.60E-04	3.42E-04
Total organ dose (mRem)	1.88E-02	3.35E-02	2.53E-02	1.00E-04	1.10E-02	3.88E-03	1.64E-03
Cumulative Dose prior to release							
Gammas organ dose (mRem)	9.04E-03	1.73E-02	1.32E-02	5.83E-04	5.68E-03	1.89E-03	8.32E-04
Pure beta organ dose (mRem)	6.05E-04	2.68E-04	1.71E-04	1.02E-04	1.02E-04	1.94E-04	2.44E-04
Total organ dose (mRem)	9.65E-03	1.76E-02	1.34E-02	6.85E-04	5.70E-03	2.08E-03	8.76E-04
Cumulative Dose after release							
Gammas organ dose (mRem)	2.69E-02	5.05E-02	3.83E-02	5.83E-04	1.88E-02	5.51E-03	1.93E-03
Pure beta organ dose (mRem)	1.60E-03	8.46E-04	3.89E-04	2.12E-04	2.12E-04	4.54E-04	5.87E-04
Total organ dose (mRem)	2.85E-02	5.11E-02	3.87E-02	7.95E-04	1.89E-02	5.96E-03	2.52E-03
Cumulative Year prior to release							
Gammas organ dose (mRem)	9.04E-03	1.73E-02	1.32E-02	5.83E-04	5.68E-03	1.89E-03	8.32E-04
Pure beta organ dose (mRem)	6.05E-04	2.68E-04	1.71E-04	1.02E-04	1.02E-04	1.94E-04	2.44E-04
Total organ dose (mRem)	9.65E-03	1.76E-02	1.34E-02	6.85E-04	5.70E-03	2.08E-03	8.76E-04
Cumulative Year after release							
Gammas organ dose (mRem)	2.69E-02	5.05E-02	3.83E-02	5.83E-04	1.88E-02	5.51E-03	1.93E-03
Pure beta organ dose (mRem)	1.60E-03	8.46E-04	3.89E-04	2.12E-04	2.12E-04	4.54E-04	5.87E-04
Total organ dose (mRem)	2.85E-02	5.11E-02	3.87E-02	7.95E-04	1.89E-02	5.96E-03	2.52E-03

Performed by

Date

3-15-94

Reviewed by

Date

3-15-94

Reviewed by

Date

3-15-94

(CST only) () NA

DETROIT EDISON FERMI-2 POWER PLANT15-MAR-1994 08:57:15.43

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

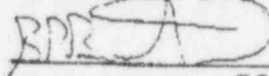
Sample ID Number: CST31594-1

Acquisition Time: 15-MAR-1994 08:23:48.84

Storage file: CST31594-1.cnf

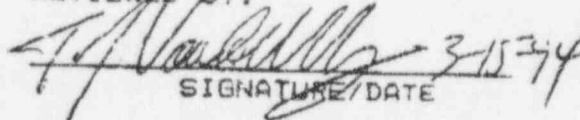
REMARKS _____

PERFORMED BY:



SIGNATURE

REVIEWED BY:



SIGNATURE/DATE

Sample ID : CST31594-1

Page : 2
Acquisition date : 15-MAR-1994 08:23:46*****
Fermi 2 Radiation Protection Gamma Spectroscopy Report

***** Sample Parameters *****

Sample ID Number: CST31594-1
 Sample collection start date: 15-MAR-1994 07:40:00.00
 Sample collection end date : 15-MAR-1994 07:40:00.00
 Type of sample : 1 Liter Marinell
 Sample quantity : 1.00210E+03 GM
 Sample geometry : MILL

Operator: BPE

***** Acquisition Parameters *****

Detector number : DET1 Acquire date : 15-MAR-1994 08:23:46.84
 Preset live time : 0 00:33:20.00 Elapsed live time : 0 00:33:20.00
 Elapsed real time : 0 00:33:20.43 Percent dead time : 0.00 %

***** Calibration Parameters *****

Detector number : DET1 Yearly cal date : 2-MAR-1994 13:47:45.33
 Kev/channel : 4.99915E-01 Zero offset: 5.38667E-01
 Daily cal date : 15-MAR-1994 08:08:18.41

***** Peak Search Parameters *****

Start channel : 100 End channel : 4096
 Height sensitivity : 5.00000 Shape sensitivity : 10.00000
 Maximum number of iterations to resolve multiplets : 5

***** Nuclide Identification Parameters *****

Energy tolerance : 1.25000 Half-life ratio : 10.00000
 Abundance limit : 75.00000 Library : dacmaster.nlb
 Efficiency file : EFFD1_m111 Efficiencies at : Peak energy

PK	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	427.84	81	36	1.60	854.75	849	14	4.03E-02	20.1	
2	0	604.59	159	48	1.78	1208.31	1203	13	6.94E-02	16.0	
3	0	661.47	93	28	1.73	1322.10	1313	19	4.65E-02	17.2	
4	0	795.91	79	19	1.70	1591.02	1586	14	3.94E-02	17.7	
5	0	810.14	49	27	2.24	1619.49	1608	19	2.45E-02	34.0	
6	0	835.01	62	20	1.79	1669.24	1661	16	3.11E-02	22.4	
7	0	1172.85	239	9	3.05	2345.05	2337	15	1.19E-01	6.6	
8	0	1332.21	204	9	2.06	2663.83	2655	16	1.02E-01	7.4	

 * Detroit Edison Fermi 2 Peak Report, Generated 15-MAR-1994 08:57:21.08 *

 * Sample ID : CST31594-1 *
 * Decay Time = 0 00:43:48.84 *
 Deposition Time = ^{by sigl} ~~17-NOV-1958~~ 00:00:00.0*

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	427.84	81	36	1.60	854.75	849	14	20.1		58-125
0	604.54	139	48	1.78	1208.31	1203	13	16.0		CS-134
0	661.47	93	28	1.73	1322.10	1313	19	17.2		CS-137
0	795.91	79	19	1.70	1591.02	1586	14	17.7		CS-134
0	810.14	49	27	2.24	1619.49	1608	19	34.0		CO-58
0	835.01	62	20	1.79	1669.24	1661	16	22.4		MN-54
0	1172.85	239	9	3.05	2345.05	2337	15	6.6		CO-60
0	1332.21	204	9	2.06	2663.83	2655	16	7.4		CO-60

Summary of Nuclide Activity

Page : 2

Sample ID : CST31394-1

Acquisition date : 15-MAR-1994 08:23:48

Total number of lines in spectrum 8
 Number of unidentified lines 0
 Number of lines tentatively identified by NID 8 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/GM	Decay Corr uCi/GM	Decay Corr 1-Sigma Error	1-Sigma %Error Flags
MN-54	312.70D	1.000	1.641E-07	1.641E-07	0.368E-07	22.42
CO-58	70.80D	1.000	1.264E-07	1.264E-07	0.430E-07	34.05
CO-60	5.27Y	1.000	8.110E-07	8.110E-07	0.603E-07	7.43 A
CS-134	2.06Y	1.000	2.729E-07	2.729E-07	0.436E-07	15.99
Total Activity :			1.374E-06	1.374E-06		

Nuclide Type : fission

Nuclide	Hlife	Decay	Uncorrected uCi/GM	Decay Corr uCi/GM	Decay Corr 1-Sigma Error	1-Sigma %Error Flags
CS-137	30.17Y	1.000	2.270E-07	2.270E-07	0.391E-07	17.22
Total Activity :			2.270E-07	2.270E-07		

Grand Total Activity : 1.601E-06 1.601E-06

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "H" = Nuclide specific abn. limit

Sb-125

3.88E-7

Total =

1.99E-6

Unidentified Energy Lines

Page : 3

Sample ID : CST31594-1

Acquisition date : 15-MAR-1994 08:23:48

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	427.84	81	36	1.60	854.75	849	14	4.03E-02	20.1	9.57E-01	T

Flags: "T" = Tentatively associated

Rejected Report

Sample ID : CS131594-1

Page : 4

Acquisition date : 15-MAR-1994 08:23:48

Nuclide	Half-life	Ratio	Energy	%Abund	Activity	1-Sigma %Error	Rejected by
BR-84	31.80M	1.90	604.80	1.80	5.410E-05	15.99	Abun.
			736.50	1.31	---	Not found	---
			802.20	6.10	---	Not found	---
			881.50*	42.00	---	Not found	---
			1015.90	6.20	---	Not found	---
			1213.30	2.60	---	Not found	---
			1463.80	2.00	---	Not found	---
			1741.20	1.60	---	Not found	---
			1877.50	1.14	---	Not found	---
			1897.30	14.90	---	Not found	---
			2029.60	2.10	---	Not found	---
% Abundances Found =			2.20				

KR-88	2.84H	0.35	165.98	2.10	---	Not found	---	Abun.
			196.32*	26.00	---	Not found	---	
			362.23	2.25	---	Not found	---	
			634.83	13.00	1.613E-06	22.42		
			985.78	1.31	---	Not found	---	
			1141.33	1.28	---	Not found	---	
			1179.51	1.00	---	Not found	---	
			1250.67	1.12	---	Not found	---	
			1309.50	1.48	---	Not found	---	
			1518.39	2.15	---	Not found	---	
			1569.77	10.90	---	Not found	---	
			2029.84	4.53	---	Not found	---	
			2035.41	3.74	---	Not found	---	
% Abundances Found =			18.09					

SB-125	2.77Y	0.00	√176.33	6.89	---	Not found	---	Abun.
			380.44	1.50	---	Not found	---	
			427.89*	29.33	3.877E-07	20.15		
			√463.38	10.35	---	Not found	---	
			√600.56	17.80	---	Not found	---	
			√606.64	5.02	---	Not found	---	
			√635.90	11.32	---	Not found	---	
			671.41	1.81	---	Not found	---	
% Abundances Found =			34.91					

AC-228	6.13Y	0.00	129.08	2.80	---	Not found	---	Abun.
			209.28	4.40	---	Not found	---	
			270.23	3.60	---	Not found	---	
			327.64	3.20	---	Not found	---	
			338.32*	11.40	---	Not found	---	
			409.51	2.13	---	Not found	---	
			463.00	4.40	---	Not found	---	
			794.70	4.60	4.312E-06	17.74		
			911.07	27.70	---	Not found	---	
			964.60	5.20	---	Not found	---	
			969.11	16.60	---	Not found	---	
			1588.00	3.50	---	Not found	---	
% Abundances Found =			5.14					

Rejected Report (continued)

Sample ID : CST31594-1

Page : 5

Acquisition date : 15-MAR-1994 08:23:48

Flag: "*" = Keyline

 * Detroit Edison Fermi 2 MDA Report, Generated 15-MAR-1994 09:19:34.48 *

 * Sample ID : CST31594-1 Page _____ of _____ *

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/GM)
BE-7	19.	477.59	3.4352E-07
F-18	58.	511.00	4.7661E-08
NA-22	0.	1274.54	1.0321E-08
NA-24	2.	1368.53	3.9023E-08
MG-27	12.	1014.44	1.3915E-05
CL-38	2.	1642.42	4.1261E-07
K-40	5.	1460.81	5.2864E-07
AR-41	3.	1293.64	6.2703E-08
SC-46	16.	889.25	5.9751E-08
CR-51	37.	320.08	3.4549E-07
CO-56	5.	1238.25	7.2715E-08
MN-56	1.	1810.69	1.8319E-07
NI-56	32.	158.38	1.9543E-08
CO-57	23.	122.06	2.3060E-08
FE-59	15.	1099.22	1.2272E-07
CU-64	3.	1345.00	1.4720E-05
NI-65	0.	1481.84	6.6084E-08
ZN-65	37.	1115.52	2.0677E-07
ZN-69M	28.	438.63	4.3380E-08
SE-75	31.	136.00	3.1796E-08
AS-76	21.	559.10	9.8030E-08
BR-82	17.	776.49	6.6137E-08
BR-83	18.	529.64	3.9246E-06
BR-84	19.	881.50	5.6519E-07
BR-85	0.	802.41	Half-Life too short
KR-85	22.	513.99	9.3752E-06
KR-85M	32.	151.18	2.9621E-08
SR-85	22.	513.99	4.0628E-08
RB-86	18.	1076.63	8.4553E-07
KR-87	30.	402.58	1.3069E-07
SR-87M	30.	388.40	5.7244E-08
KR-88	37.	196.32	1.1296E-07
RB-88	1.	1382.39	3.8478E-05
Y-88	0.	1836.01	1.4243E-08
KR-89	0.	220.90	Half-Life too short
RB-89	9.	1031.88	1.2455E-06
KR-90	0.	1118.69	Half-Life too short
RB-90	0.	831.69	Half-Life too short
RB-90M	0.	824.23	Half-Life too short
Y-90M	38.	202.51	3.0873E-08
SR-91	16.	1024.30	2.2424E-07
Y-91	3.	1204.90	1.2951E-05
Y-91M	15.	555.60	9.0199E-08
SR-92	1.	1383.94	4.3433E-08
Y-92	17.	934.46	5.5933E-07
BR-93	22.	590.28	1.4657E-05
Y-93	36.	266.90	4.4752E-07

Minimum Detectable Activity Report (continued)

Page : 2

Sample ID : CST31594-1

Acquisition date : 15-MAR-1994 08:23:48

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/GM)
NR-94	7.	702.63	3.3749E-08
NB-95	17.	765.79	5.3015E-08
NB-95M	41.	235.69	1.1330E-07
ZR-95	10.	756.72	7.3705E-08
NB-97	16.	657.90	7.9574E-08
ZR-97	17.	743.36	5.4698E-08
MD-99✓	8.	739.58	2.8761E-07
TC-99M	37.	140.50	2.5581E-08
TC-101	33.	306.81	6.0159E-07
RU-103	17.	497.08	3.9781E-08
TC-104	22.	357.99	3.1263E-07
RH-105	31.	318.90	1.6464E-07
RU-105	10.	724.50	9.6359E-08
RU-106	10.	621.84	3.4183E-07
CD-109	25.	88.03	6.8222E-07
AG-110M	18.	937.48	1.9489E-07
SN-113	32.	391.69	5.8690E-08
SN-117M	32.	158.56	2.2359E-08
SB-122	32.	563.93	7.5040E-08
SB-124	130.	602.71	1.0876E-07
SB-125	90.	427.89	2.2553E-07
TE-125M	42.	109.28	8.3931E-06
TE-127	18.	417.90	3.3793E-06
TE-127M	27.	57.60	2.3631E-05
XE-127	42.	202.84	3.6574E-08
TE-129	35.	459.60	1.1562E-06
TE-129M	12.	695.88	1.2291E-06
XE-129M	37.	196.56	4.8425E-07
I-130	19.	536.09	4.1934E-08
BA-131	31.	123.80	6.6210E-08
I-131	41.	364.48	4.9536E-08
TE-131	38.	149.72	1.5397E-07
TE-131M	18.	773.67	1.4723E-07
XE-131M	45.	163.93	1.1516E-06
I-132	12.	667.69	5.3369E-08
TE-132	40.	228.16	3.1014E-08
BA-133	38.	302.84	1.8284E-07
BA-133M	32.	276.09	1.5757E-07
I-133	18.	529.87	4.6083E-08
TE-133M	21.	912.58	1.6711E-07
XE-133	29.	81.00	7.7981E-08
XE-133M	37.	233.22	2.6113E-07
I-134	21.	884.09	2.2512E-07
TF-134	42.	210.47	3.1751E-07
BA-135M	37.	268.24	1.8746E-07
I-135	2.	1260.41	1.3609E-07
XE-135	31.	249.79	3.1091E-08
XE-135M	21.	526.56	6.9574E-07
CS-136	14.	818.50	5.2740E-08
I-136	0.	1313.02	Half-Life too short
XE-137	0.	455.49	Half-Life too short

Minimum Detectable Activity Report (continued)

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Sample ID : CST31594-1

Acquisition date : 15-MAR-1994 08:23:48

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/GM)
CS-138	2.	1435.86	1.9703E-07
XE-138	33.	258.31	1.5070E-06
BA-139	5.	1420.50	3.2466E-05
CE-139	26.	165.85	2.2218E-08
CS-139	3.	1283.23	4.2496E-05
BA-140	23.	537.32	1.7259E-07
LA-140	2.	1596.49	4.5931E-08
BA-141	33.	190.22	4.0244E-07
CE-141	38.	145.44	4.2528E-08
LA-141	3.	1354.52	1.9785E-06
RA-142	31.	255.12	6.0611E-06
LA-142	17.	641.17	1.2943E-07
CE-143	28.	293.26	6.6927E-08
CE-144	35.	133.54	1.8378E-07
PR-144	2.	1489.15	1.4234E-04
ND-147	22.	91.10	7.4169E-08
PM-148M	16.	550.27	3.2041E-00
EU-152	20.	344.27	1.0251E-07
EU-154	0.	1004.76	2.8957E-07
EU-156	14.	646.29	5.6816E-07
HF-181	22.	482.03	4.6440E-08
TA-182	7.	1221.42	2.0251E-07
W-187	11.	685.81	1.3933E-07
RE-188	44.	155.03	1.5291E-07
HG-203	33.	279.19	3.7200E-08
BI-207	32.	569.67	5.4367E-08
IL-208	0.	583.14	Half-Life too short
PB-212	46.	238.63	7.1546E-08
BI-214	28.	609.31	8.8643E-07
PB-214	42.	351.92	4.8753E-07
RA-224	44.	240.98	7.5772E-07
RA-226	47.	186.21	7.5167E-07
AC-228	26.	338.32	2.6516E-07
TH-228	26.	84.37	2.0706E-06
PA-234	35.	131.20	1.0912E-07
TH-234	49.	63.29	1.9097E-06
U-235	41.	143.76	2.0224E-07
NP-239	25.	106.13	8.4008E-08
AM-241	31.	59.54	2.1796E-07

 * 15-MAR-94 07:40:43 *

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BLANK DEMIN WATER 500ML MARINELLI TO DETERMINE MDA'S

SPECTRAL FILE NAME: BKG9410.LAB
 SAMPLE DATE: 15-MAR-94 17:00:00
 SAMPLE IDENTIFICATION: BKG9410.LAB
 TYPE OF SAMPLE: WATER
 SAMPLE QUANTITY: 500.0000 UNITS: GRAM
 SAMPLE GEOMETRY: MAR500
 EFFICIENCY FILE NAME: MAR50093.EFF

ACQUIRE DATE: 15-MAR-94 17:14:32 * FWHM(1532): 1.975
 PRESET TIME(LIVE): 3600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER: 10.0 %
 ELAPSED LIVE TIME: 3600. SEC * NBR ITERATIONS: 10.

DETECTOR: ADC Detector * LIBRARY: NUCL.LIB
 CALIB DATE: 02-FEB-94 11:04:12 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: .5012217 * HALF LIFE RATIO: 8.00
 OFFSET: -.7430013 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW -1.24 TO 4105.26

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	238.88	40.	22.	1.17	478.08	474	11	1.11E-02	26.8	
2	0	371.14	9.	4.	1.02	741.96	740	5	2.51E-03	54.1	

PEAK SEARCH COMPLETED (REV 15 8 - ND PC VERSION DEC 88)

PULSE-PILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR
1	0	238.88	40.	22.	1.17	478.08	474	11	1.11E-02	26.8
2	0	371.14	9.	4.	1.02	741.96	740	5	2.51E-03	54.1

FILE-UP CORRECTION COMPLETED

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ELAPSED LIVE TIME: 3600. (PILE-UP CORRECTED)

NATURAL PRODUCT

NUCLIDE	SDHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
TH-232	NP	233.63	40.	22.	44.60*	2.442E-00	5.514E -8	1.476E -E
		333.32	0.	0.	11.40	0.000E+00	.000E 0	.000E 0
		727.17	0.	0.	11.80	0.000E+00	.000E 0	.000E 0
		563.14	0.	0.	30.25	0.000E+00	.000E 0	.000E 0
		911.07	0.	0.	27.70	0.000E+00	.000E 0	.000E 0
		969.11	0.	0.	16.60	0.000E+00	.000E 0	.000E 0
		2614.66	0.	0.	35.86	0.000E+00	.000E 0	.000E 0

ELAPSED LIVE TIME 3600. (PILE-UP CORRECTED)

UNIDENTIFIED PEAKS

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	FW	CTS/SEC	WERR	WERR
1	0	238.88	40.	22.	1.17	478.08	474	11	1.11E-02	23.8	2.44E+00
2	0	371.14	9.	4.	1.02	741.96	740	5	2.51E-03	54.1	1.65E+00

LINE NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	UCI/GRAM	ABNDIFF	FAILED
1	TH-232	238.63	1.00E+10Y	1.000E 0	5.214E -8	25.03%	ABN

NUCLIDE IDENTIFICATION SYSTEM
SUMMARY OF NUCLIDE ACTIVITY

(ND PC VERSION DEC 88)

PAGE 3

TOTAL LINES IN SPECTRUM	2	
UNIDENTIFIED PEAKS	2	
IDENTIFIED IN SUMMARY REPORT	0	.00%

MINIMUM DETECTABLE ACTIVITY REPORT (ND PC VERSION AUG 89)

PEAK WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 9.86.

NUCLIDE	BKG	ENERGY	MINIMUM UCI/GRAM
BE-7	7.	477.59	1.3179E-07
BNL-511	33.	511.00	4.3240E-08
NA-22	1.	1274.54	1.3300E-08
NA-24	1.	1368.53	1.4663E-08
CL-38	4.	2167.51	0.0000E+00
AR-41	1.	1293.64	1.8003E-08
K-40	10.	1460.61	4.4537E-07
SC-46	8.	1120.51	3.3524E-08
CR-51	23.	320.08	1.8554E-07
MN-54	7.	834.83	2.3911E-08
MN-56	8.	846.75	3.2021E-08
FE-59	1.	1099.22	2.0630E-08
CO-57	32.	122.06	1.3092E-08
CO-58	6.	810.76	2.1602E-08
CO-60	2.	1332.49	1.9562E-08
NI-63	2.	1481.84	1.1235E-07
CU-64	1.	1345.90	2.9661E-08
ZN-65	7.	1115.52	6.1533E-08
ZN-69M	7.	438.63	1.3942E-08
AS-76	6.	559.10	3.3494E-08
SE-75	25.	264.60	2.7098E-08
BR-82	7.	554.32	2.2593E-08
BR-84	2.	881.50	8.5039E-08
KR-85	19.	513.99	5.5995E-08
KR-85M	38.	151.18	1.8839E-08
KR-87	17.	402.56	5.5823E-08
KR-88	29.	196.32	6.4667E-08
RB-88	1.	1836.01	4.8678E-07
RB-89	5.	1031.83	3.1362E-07
SR-85	19.	513.99	2.4263E-08
SR-85M	33.	231.69	3.1400E-08
SR-91	6.	1024.30	8.7084E-08
SR-92	4.	1383.94	3.8455E-08
Y-88	1.	1836.01	1.8586E-08
Y-91	2.	1204.90	5.9593E-08
Y-91MD	8.	555.37	1.8701E-08
Y-92	5.	934.46	1.8800E-07
Y-93	21.	266.90	2.2801E-07
ZR-95	8.	756.72	4.1756E-08
ZR-97	9.	743.36	2.6709E-08
NB-94	3.	702.63	1.3082E-08
NB-95	7.	765.79	2.1915E-08
NB-97D	6.	1024.50	2.5596E-08
MO-90	26.	257.34	2.2740E-08
MO-99	6.	739.58	1.5370E-07
TC-99MD	33.	140.51	1.2120E-08
RU-103	9.	497.08	1.8096E-08
RU-105	8.	724.50	5.0555E-08
RU-106	11.	621.84	2.2597E-07
RH-105	16.	318.90	8.0094E-08

NUCLIDE	BKG	ENERGY	MINIMUM UCI/GRAM
AG-110M	.	657.75	1.4952E-08
CD-109	40.	88.03	4.0260E-07
BN-113	10.	391.69	2.1337E-08
SB-122	4.	563.93	1.7267E-08
SB-124	7.	602.71	1.7505E-08
SB-125	15.	427.89	6.2205E-08
TE-123M	33.	158.99	1.4727E-08
TE-132	24.	228.16	1.6272E-08
I-131	17.	364.48	2.1215E-08
I-132	6.	667.69	2.2236E-09
I-133	7.	529.87	1.7855E-08
I-134	8.	847.03	4.8910E-08
I-135	5.	1260.41	1.1121E-07
XE-131M	43.	163.93	7.4371E-07
XE-133	43.	80.99	4.7264E-08
XE-133M	32.	233.22	1.6349E-07
XE-135	26.	249.79	1.8586E-08
XE-135M	7.	526.56	1.3764E-07
XE-138	20.	258.31	4.0098E-07
CS-134	7.	604.70	1.7606E-08
CS-134M	32.	127.42	1.0231E-07
CS-136	2.	818.50	1.2575E-08
CS-137	8.	661.65	2.3587E-08
CS-138	3.	1435.85	8.7601E-08
BA-133	13.	356.00	2.4552E-08
BA-139	36.	165.85	1.1483E-07
BA-140	6.	537.32	5.6523E-08
BA-141	20.	190.22	1.2553E-07
LA-140	0.	1096.49	0.0000E+00
CE-139	36.	165.65	1.6760E-08
CE-141	24.	145.44	2.0162E-08
CE-143	18.	293.26	3.6241E-08
CE-144	32.	133.84	1.0152E-07
ND-147	50.	91.11	5.7877E-08
EU-152	18.	344.27	6.4203E-08
EU-154	1.	1274.45	3.7438E-08
HF-181	12.	482.03	2.1886E-08
W-187	8.	479.53	6.4299E-08
HG-203	17.	279.19	1.6075E-08
RA-226	13.	609.31	5.0959E-08
TH-232	59.	238.63	5.1584E-08
U-235	39.	185.72	2.8778E-08
U-238	42.	131.20	6.1682E-08
NP-239	32.	106.13	5.2079E-08
AM-241	41.	59.54	9.5008E-08

Table 1
Fermi 2 Nuclear Station
Confirmatory Measurements

SAMPLE	NUCLIDE	NRC VAL. ¹	NRC ERR. ¹	LIC.VAL. ¹	LIC.ERR. ¹	RATIO ²	RES ³	RESULT ⁴
CST	MN-54	5.63E-07	4.00E-08	6.57E-07	4.70E-07	1.17	14.1	Agreement
TANK	CO-58	9.37E-08	2.26E-08	9.19E-08	2.29E-08	0.98	4.2	Agreement
4/15/94	CO-60	4.15E-07	4.14E-08	5.71E-07	5.03E-08	1.38	10.0	Agreement
	ZN-65	1.69E-07	4.18E-08	< MDA ⁵			4.0	No Comparison
	Sb-125	2.02E-07	6.33E-08	2.14E-07	7.49E-08	1.06	3.2	Agreement
	CS-134	1.54E-07	3.17E-08	1.62E-07	3.84E-08	1.05	4.9	Agreement
	CS-137	1.80E-07	3.16E-08	1.93E-07	3.23E-08	1.07	5.7	Agreement

¹ These quantities are in the units of microcurie per milliliter.

² Ratio = Licensee Value / NRC Value

³ Resolution = NRC Value / NRC Error (one standard deviation)

⁴ Result : The result of the comparison is based on the criteria in Attachment 1 and is expressed by the following:

Agreement
Disagreement

* = Criteria Relaxed
No Comparison

⁵ MDA = Minimum Detectable Activity

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Table 2

Fermi 2 CST Discharge Activity Calculation
(April 15-17, 1994, Discharge)

Date of analysis: April 15, 1994

Volume(gallons) = 558360
(liters)= 2.114E+06

Flow Rates: (gallons per minute)
Dilution= 15600
CST dchg= 400

Isotope	EC ¹ uCi/ml	Result ² uCi/ml	Conc./EC ³	Activity (mCi)
Mn-54	3.000E-05	5.635E-07	4.696E-04	1.191E+00
Co-58	2.000E-05	9.372E-08	1.171E-04	1.981E-01
Co-60	3.000E-06	4.146E-07	3.455E-03	8.763E-01
Zn-65	5.000E-06	1.687E-07	8.435E-04	3.566E-01
Sb-125	3.000E-05	2.020E-07	1.683E-04	4.270E-01
Cs-134	9.000E-07	1.541E-07	4.281E-03	3.257E-01
Cs-137	1.000E-06	1.795E-07	4.488E-03	3.794E-01
H-3	1.000E-03	3.260E-04	8.150E-03	6.890E+02
Totals ⁴ (w/Dilution) ⁵		3.278E-04 8.194E-06	2.197E-02	6.928E+02

¹ Effluent concentrations for release to unrestricted areas as listed in 10 CFR 20, Appendix B, Table 2, Column 2.

² Result of gamma isotopic and tritium analyses of Condensate Storage Tank performed in NRC Region III Laboratory.

³ Fraction of 10 CFR 20 effluent concentrations. This fraction is calculated as the concentration of effluent as it enters the lake, including the dilution flow.

⁴ Total, undiluted activity from condensate storage tank.

⁵ Totals with dilution credit from recirculation water.

ANNUAL ADULT TOTAL DOSE RECEIVED PER ORGAN
(mrem)

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli
Mn-54		3.06E-04	5.83E-05		9.10E-05		9.37E-04
Co-58		1.08E-06	2.41E-06				2.18E-05
Co-60		1.37E-05	3.02E-05				2.57E-04
Zn-65	4.83E-04	1.54E-03	6.94E-04		1.03E-03		9.67E-04
Cs-134	5.66E-03	1.35E-02	1.10E-02		4.36E-03	1.45E-03	2.36E-04
Cs-137	8.45E-03	1.16E-02	7.57E-03		3.93E-03	1.30E-03	2.24E-04
H-3		3.19E-05	3.19E-05	3.19E-05	3.19E-05	3.19E-05	3.19E-05

TOTALS	1.46E-02	2.69E-02	1.94E-02	3.19E-05	9.44E-03	2.78E-03	2.67E-03
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli

ANNUAL TEEN TOTAL DOSE RECEIVED PER ORGAN
(mrem)

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli
Mn-54		3.01E-04	5.96E-05		8.97E-05		6.17E-04
Co-58		1.07E-06	2.46E-06				1.47E-05
Co-60		1.36E-05	3.07E-05				1.78E-04
Zn-65	4.38E-04	1.52E-03	7.09E-04		9.72E-04		6.43E-04
Cs-134	5.81E-03	1.37E-02	6.34E-03		4.34E-03	1.66E-03	1.70E-04
Cs-137	9.05E-03	1.20E-02	4.19E-03		4.10E-03	1.59E-03	1.71E-04
H-3		2.31E-05	2.31E-05	2.31E-05	2.31E-05	2.31E-05	2.31E-05

TOTALS	1.53E-02	2.76E-02	1.14E-02	2.31E-05	9.53E-03	3.27E-03	1.82E-03
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli

ANNUAL CHILD TOTAL DOSE RECEIVED PER ORGAN

Nuclide	(mrem)						
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli
Mn-54		2.37E-04	6.30E-05		6.64E-05		1.99E-04
Co-58		8.97E-07	2.74E-06				5.23E-06
Co-60		1.17E-05	3.44E-05				6.46E-05
Zn-65	4.49E-04	1.20E-03	7.45E-04		7.54E-04		2.10E-04
Cs-134	7.01E-03	1.15E-02	2.43E-03		3.57E-03	1.28E-03	6.20E-05
Cs-137	1.14E-02	1.09E-02	1.61E-03		3.56E-03	1.28E-03	6.84E-05
H-3		3.66E-05	3.66E-05	3.66E-05	3.66E-05	3.66E-05	3.66E-05
TOTALS	1.89E-02	2.39E-02	4.92E-03	3.66E-05	7.98E-03	2.60E-03	6.46E-04
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli

TOTAL DOSE SUMMARY REPORT (mrem)

Group	Organ	Total
Adult	Bone	1.46E-02
Adult	Liver	2.69E-02
Adult	Tot Body	1.94E-02
Adult	Thyroid	3.19E-05
Adult	Kidney	9.44E-03
Adult	Lung	2.78E-03
Adult	Gi-Lli	2.67E-03
Teen	Bone	1.53E-02
Teen	Liver	2.76E-02
Teen	Tot Body	1.14E-02
Teen	Thyroid	2.31E-05
Teen	Kidney	9.53E-03
Teen	Lung	3.27E-03
Teen	Gi-Lli	1.82E-03
Child	Bone	1.89E-02
Child	Liver	2.39E-02
Child	Tot Body	4.92E-03
Child	Thyroid	3.66E-05
Child	Kidney	7.98E-03
Child	Lung	2.60E-03
Child	Gi-Lli	6.46E-04

ORGAN WITH MAXIMUM DOSE

Group	Organ	Total
Teen	Liver	2.76E-02

*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
**	**	**	**	**	**
*****	**	**	**	*****	*****
*****	**	**	**	*****	*****
**	**	**	**	**	**
**	*****	*****	*****	*****	*****
**	*****	*****	*****	*****	*****

* C A L C U L A T E S T H E D O S E D U E T O *

* N U C L E A R P O W E R P L A N T *

* L I Q U I D *

* R A D I O A C T I V E E F F L U E N T S *

** U . S . N U C L E A R R E G U L A T O R Y C O M M I S S I O N **

** P C D O S E **

** ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ **

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

** ----- **

** from **

** N U C L E A R P O W E R P L A N T E F F L U E N T S **

** ----- **

** Rev. 34 08/20/91 **

** 18-Apr-94 **

FILENAME ???????.WK1

PLANT NAME

Apr-94

18-Apr

I N D I V I D U A L M A X I M U M

09:56 AM

```

-----
                Dilution
      ENTER PLANT SPECIFIC DATA
-----
                FRESH WATER
Flow Rate      = 1.56E+04 g/min
Average Flow During Report Period
-----
Individual Average Consumption(kg/y)
-----
Pathways      Adult      Teen      Child
-----
Water          730        510        510
SportFish      21         16         6.9
-----
                Radioactive Release
      WHEN COMPLETED ==> Press ALT E
-----
Flow Rate      = 4.00E+02 g/min
Flow Time      = 2.40E+01 hr
Report Period  = 1.20E+01 mth
-----
                Transit Times (hrs)
Drinking Water = 0.01
Fish/Invertebrates = 0.01
-----

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Comments:

FILENAME ????????WK1

PLANT NAME

Apr-94

18-Apr

I N D I V I D U A L M A X I M U M

09:56 AM

ENTER RADIOACTIVITY RELEASED FOR EACH RADIONUCLIDE

Nuclide uCi/ml WHEN COMPLETED =====> Press ALT J

Mn-54	5.63E-07
Co-58	9.37E-08
Co-60	4.15E-07
Zn-65	1.69E-07
Cs-134	1.54E-07
Cs-137	1.80E-07
H-3	3.26E-04

WHEN COMPLETED =====> Press ALT J

ADDITIONAL DILUTION FACTORS

Food Consumption Products:

1. Potable Water Near Field	=====>	Dw	=	7.70E+01
2. Sport Fish	=====>	Dsf	=	5.00E+00
3. Sport Invert	=====>	Ds1	=	5.00E+00
4. Commercial Fish	=====>	Dcf	=	5.00E+00
5. Commercial Invert	=====>	Dc1	=	5.00E+00

FILENAME ???????.WK1

PLANT NAME

18-Apr

I N D I V I D U A L M A X I M U M

Apr-94
09:56 AM

ADULT TOTAL DOSE RECEIVED PER ORGAN

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli
Mn-54		3.06E-04	5.83E-05		9.10E-05		9.37E-04
Co-58		1.08E-06	2.41E-06				2.18E-05
Co-60		1.37E-05	3.02E-05				2.57E-04
Zn-65	4.83E-04	1.54E-03	6.94E-04		1.03E-03		9.67E-04
Cs-134	5.66E-03	1.35E-02	1.10E-02		4.36E-03	1.45E-03	2.36E-04
Cs-137	8.45E-03	1.16E-02	7.57E-03		3.93E-03	1.30E-03	2.24E-04
H-3		3.19E-05	3.19E-05	3.19E-05	3.19E-05	3.19E-05	3.19E-05

TOTALS	1.46E-02	2.69E-02	1.94E-02	3.19E-05	9.44E-03	2.78E-03	2.67E-03
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli

FILENAME ????????.WK1

PLANT NAME

Apr-94

18-Apr

I N D I V I D U A L M A X I M U M

09:56 AM

TEEN TOTAL DOSE RECEIVED PER ORGAN

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli
Mn-54		3.01E-04	5.96E-05		8.97E-05		6.17E-04
Co-58		1.07E-06	2.46E-06				1.47E-05
Co-60		1.36E-05	3.07E-05				1.78E-04
Zn-65	4.38E-04	1.52E-03	7.09E-04		9.72E-04		6.43E-04
Cs-134	5.81E-03	1.37E-02	6.34E-03		4.34E-03	1.66E-03	1.70E-04
Cs-137	9.05E-03	1.20E-02	4.19E-03		4.10E-03	1.59E-03	1.71E-04
H-3		2.31E-05	2.31E-05	2.31E-05	2.31E-05	2.31E-05	2.31E-05

TOTALS	1.53E-02	2.76E-02	1.14E-02	2.31E-05	9.53E-03	3.27E-03	1.82E-03
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-Lli

FILENAME ????????.WK1

PLANT NAME

Apr-94

18-Apr

I N D I V I D U A L M A X I M U M

09:56 AM

CHILD TOTAL DOSE RECEIVED PER ORGAN

Nuclide	mrem/ 12.00 mth					
	Bone	Liver	T.Body	Thyroid	Kidney	Gi-L11
Mn-54		2.37E-04	6.30E-05		6.64E-05	1.99E-04
Co-58		8.97E-07	2.74E-06			5.23E-06
Co-60		1.17E-05	3.44E-05			6.46E-05
Zn-65	4.49E-04	1.20E-03	7.45E-04		7.54E-04	2.10E-04
Cs-134	7.01E-03	1.15E-02	2.43E-03		3.57E-03	1.28E-03
Cs-137	1.14E-02	1.09E-02	1.61E-03		3.56E-03	1.28E-03
H-3		3.66E-05	3.66E-05	3.66E-05	3.66E-05	3.66E-05

TOTALS	1.89E-02	2.39E-02	4.92E-03	3.66E-05	7.98E-03	2.60E-03	6.46E-04
	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-L11

FILENAME ????????.WK1

PLANT NAME

Apr-94

18-Apr

I N D I V I D U A L M A X I M U M

09:56 AM

TOTAL DOSE SUMMARY REPORT

1.20E+01 mth

Group	Organ	Total
Adult	Bone	1.46E-02
Adult	Liver	2.69E-02
Adult	Tot Body	1.94E-02
Adult	Thyroid	3.19E-05
Adult	Kidney	9.44E-03
Adult	Lung	2.78E-03
Adult	Gi-Lli	2.67E-03
Teen	Bone	1.53E-02
Teen	Liver	2.76E-02
Teen	Tot Body	1.14E-02
Teen	Thyroid	2.31E-05
Teen	Kidney	9.53E-03
Teen	Lung	3.27E-03
Teen	Gi-Lli	1.82E-03
Child	Bone	1.89E-02
Child	Liver	2.39E-02
Child	Tot Body	4.92E-03
Child	Thyroid	3.66E-05
Child	Kidney	7.98E-03
Child	Lung	2.60E-03
Child	Gi-Lli	6.46E-04

1.20E+01 mth

ORGAN WITH MAXIMUM DOSE

Group	Organ	Total
Teen	Liver	2.76E-02

18-Apr

INDIVIDUAL MAXIMUM

09:56 AM

Half Life-- (hrs)	Bioaccumulation ---SALT WATER---		Bioaccumulation ---FRESH WATER---		Bioaccumulation ---FRESH WATER---		Nuclide
	Fish	Invert	Fish	Invert	Fish	Invert	
	6.00E+03						
7.49E+03	5.50E+02	4.00E+02	4.00E+02	9.00E+04	4.00E+02	9.00E+04	Mn-54
1.70E+03	1.00E+02	1.00E+03	5.00E+01	2.00E+02	5.00E+01	2.00E+02	Co-58
4.62E+04	1.00E+02	1.00E+03	5.00E+01	2.00E+02	5.00E+01	2.00E+02	Co-60
5.85E+03	2.00E+03	5.00E+04	2.00E+03	1.00E+04	2.00E+03	1.00E+04	Zn-65
1.81E+04	4.00E+01	2.50E+01	2.00E+03	1.00E+03	2.00E+03	1.00E+03	Cs-134
2.64E+05	4.00E+01	2.50E+01	2.00E+03	1.00E+03	2.00E+03	1.00E+03	Cs-137
1.08E+05	9.00E-01	9.30E-01	9.00E-01	9.00E-01	9.00E-01	9.00E-01	H-3

FILENAME ???????.WK1

PLANT NAME

18-Apr

I N D I V I D U A L M A X I M U M

Apr-94
09:56 AM

Adult Dose Factors (mrem/pCi)				Select Position and Press ENTER			
Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	Gi-L11
Mn-54		4.57E-06	8.72E-07		1.36E-06		1.40E-05
Co-58		7.45E-07	1.67E-06				1.51E-05
Co-60		2.14E-06	4.72E-06				4.02E-05
Zn-65	4.84E-06	1.54E-05	6.96E-06		1.03E-05		9.70E-06
Cs-134	6.22E-05	1.48E-04	1.21E-04		4.79E-05	1.59E-05	2.59E-06
Cs-137	7.97E-05	1.09E-04	7.14E-05		3.70E-05	1.23E-05	2.11E-06
H-3		1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07

10-APR-94 17:27.25

1) CSY-DISCHARGE SAMPLE: 4/15/94

SPECTRAL FILE NAME: L942931.R3L
 SAMPLE DATE: 15-APR-94 06:37:00
 SAMPLE IDENTIFICATION: L942931.R3L
 TYPE OF SAMPLE: LIQUID
 SAMPLE QUANTITY: 511.900 UNITS: GM
 SAMPLE GEOMETRY: MAR500
 EFFICIENCY FILE NAME: MAR50053.EFF

ACQUIRE DATE: 15-APR-94 16:23.24 * FWHM(1332) 1.975
 PRESET TIME(LIVE): 3600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER: 10.0 %
 ELAPSED LIVE TIME: 3600. SEC * NBR ITERATIONS: 10.

DETECTOR: ABC Detector * LIBRARY: NUCL.LIB
 CALIB DATE: 1-APR-94 10:31:36 * ENERGY TOLERANCE: 1.500 KEV
 E/CHNL: 0000000 * HALF LIFE RATIO: 8.00
 PRESET: 1.000E-02 KEV * ABUNDANCE LIMIT: 5.000

ENERGY WINDOW -1.58 TO 4111.17

PK	IT	ENERGY	AREA	BK.GND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	428.43	59.	53.	1.53	855.62	849	15	1.62E-02	31.3	
2	0	569.06	48.	50.	1.32	1135.78	1131	13	1.33E-02	34.1	
3	0	604.82	108.	81.	1.78	1207.01	1200	13	3.00E-02	20.6	
4	0	660.91	101.	48.	1.53	1318.75	1311	15	2.81E-02	17.6	
5	0	795.57	137.	7.	1.78	1587.01	1582	10	3.79E-02	9.9	
6	0	810.27	51.	14.	2.36	1616.29	1611	14	1.42E-02	24.1	
7	0	834.36	301.	30.	1.56	1664.29	1656	17	8.37E-02	7.1	
8	0	1115.17	35.	10.	1.97	2223.68	2219	11	9.73E-03	24.8	
9	0	1172.58	177.	14.	1.79	2338.00	2329	15	4.56E-02	8.8	
10	0	1331.76	144.	18.	2.13	2655.15	2649	12	4.00E-02	10.0	

PEAK SEARCH COMPLETED (REV 15.6 - NO FC VERSION DEC 88)

PULSE-FILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PK	IT	ENERGY	AREA	BK.GND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR
0	0	428.43	59.	53.	1.53	855.62	849	15	1.62E-02	31.3
0	0	569.06	48.	50.	1.32	1135.78	1131	13	1.33E-02	34.1
3	0	604.82	108.	81.	1.76	1207.01	1200	13	3.00E-02	20.6
4	0	660.91	101.	48.	1.53	1318.75	1311	15	2.81E-02	17.6
5	0	795.57	137.	7.	1.78	1587.01	1582	10	3.79E-02	9.9
6	0	810.27	51.	14.	2.36	1616.29	1611	14	1.42E-02	24.1
7	0	834.36	301.	30.	1.56	1664.29	1656	17	8.37E-02	7.1
8	0	1115.17	35.	10.	1.97	2223.68	2219	11	9.73E-03	24.8

9	0	1172.58	179.	14.	1.75	2338.08	2325	13	4.98E-2	8.8
10	0	1331.76	144.	18.	2.13	2655.15	2649	12	4.00E-02	10.0

FILE-UP CORRECTION COMPLETED

NUCLIDE IDENTIFICATION SYSTEM (ND PC VERSION DEC 88)
 NUCLIDE LINE ACTIVITY REPORT
 ELAPSED LIVE TIME: 3600. (FILE-UP CORRECTED)

PAGE 1

FISSION GAS

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GM	1-SIGMA ERROR
KR-88	FB	196.32	0.	0.	26.00*	0.000E+00	1.000E 0	1.000E 0
		834.83	301.	30.	13.00	7.848E-01	5.300E -5	3.764E -5
		1525.77	0.	0.	10.90	0.000E+00	1.000E 0	1.000E 0
		2195.84	0.	0.	13.20	0.000E+00	1.000E 0	1.000E 0
		2392.11	0.	0.	34.50	0.000E+00	1.000E 0	1.000E 0

ACTIVATION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GM	1-SIGMA ERROR
KN-84	AP	834.83	301.	30.	99.98*	7.848E-01	5.635E -7	4.002E -5
CO-58	AP	810.76	51.	14.	99.40*	8.062E-01	9.372E -8	2.251E -5
CO-60	AP	1173.22	179.	14.	100.00	9.736E-01	4.564E -7	4.002E -5
		1332.49	144.	18.	100.00*	3.101E-01	4.146E -7	4.137E -5
NI-63	AP	366.27	0.	0.	4.8	0.000E+00	1.000E 0	1.000E 0
		1115.32	30.	10.	14.80	6.007E-01	5.711E -5	2.400E -5
		1481.84	0.	0.	23.00*	0.000E+00	1.000E 0	1.000E 0
CN-63	AP	1115.32	30.	10.	50.75*	6.007E-01	1.557E -7	4.137E -5

FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GM	1-SIGMA ERROR
SB-125	FF	176.33	0.	0.	6.89	0.000E+00	1.000E 0	1.000E 0
		427.89	39.	53.	29.33*	1.448E+00	2.020E -7	6.254E -5
		463.38	0.	0.	10.35	0.000E+00	1.000E 0	1.000E 0
		500.56	0.	0.	17.80	0.000E+00	1.000E 0	1.000E 0
		635.90	0.	0.	11.32	0.000E+00	1.000E 0	1.000E 0
SB-134	FF	563.23	0.	0.	8.38	0.000E+00	1.000E 0	1.000E 0
		569.32	45.	50.	15.43	1.116E+00	4.087E -7	1.352E -5
		604.70	108.	81.	97.60*	1.055E+00	1.541E -7	3.170E -5
		795.85	137.	7.	35.40	6.200E-01	2.861E -7	2.821E -5
		801.93	0.	0.	8.73	0.000E+00	1.000E 0	1.000E 0
SB-137	FF	661.65	101.	48.	85.12*	9.724E-01	1.790E -7	3.100E -5

NATURAL PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GM	1-SIGMA ERROR
U-238	NP	131.20	0.	0.	20.40*	0.000E+00	1.000E 0	1.000E 0
		152.70	0.	0.	6.80	0.000E+00	1.000E 0	1.000E 0
		569.50	45.	50.	11.00	1.116E+00	5.731E -7	1.902E -5
		830.51	0.	0.	12.24	0.000E+00	1.000E 0	1.000E 0
		883.24	0.	0.	12.00	0.000E+00	1.000E 0	1.000E 0
		926.00	0.	0.	11.20	0.000E+00	1.000E 0	1.000E 0
		946.00	0.	0.	12.00	0.000E+00	1.000E 0	1.000E 0

LAPSED LIVE TIME 3600. (PILE-UP CORRECTED)

UNIDENTIFIED PEAKS

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	FW	CTS/SEC	%ERR	%EFF
1	0	413.43	39.	53.	1.33	1003.64	849	13	1.63E-02	31.3	1.45E+00

LINEs NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	UCI	CM	ABNDIFF	FAILEI
1	SB-125	427.59	2.77Y	1.000E 0	2.020E -7		33.73%	ABN
2	U-238	569.50	1.00E+10Y	1.000E 0	5.731E -7		12.84%	ABN
7	KR-86	634.83	2.84h	1.224E 1	5.300E -3		13.31%	ABN
8	NI-63	1115.52	2.52h	1.682E 1	7.721E -6		34.49%	ABN

TOTAL LINES IN SPECTRUM 10
IDENTIFIED PEAKS 1
IDENTIFIED IN SUMMARY REPORT 9 90.00%

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GM	1-SIGMA ERROR	%ERR
MN-54	AP	312.70D	1.001	5.633E -7	4.002E -8	7.10
CO-58	AP	70.80D	1.004	9.372E -8	2.233E -8	24.07
CO-60	AP	1925.00D	1.000	4.146E -7	4.137E -8	9.98
ZN-65	AP	244.40D	1.001	1.687E -7	4.178E -8	24.76

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GM	1-SIGMA ERROR	%ERR
CS-134	FP	753.10D	1.000	1.541E -7	3.170E -8	20.58
CS-137	FP	30.17Y	1.000	1.795E -7	3.158E -8	17.59

MINIMUM DETECTABLE ACTIVITY REPORT (NO PC VERSION AUG 89)

WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 4.60.

NUCLIDE	BKG	ENERGY	MINIMUM UCI/CM
BE-7	42.	477.59	3.1694E-07
ANIL-511	86.	511.00	2.5189E-06
NA-22	0.	1274.54	1.8377E-08
NA-24	0.	1368.33	0.0000E+00
OL-36	1.	2167.51	0.0000E+00
AF-41	5.	1293.94	1.4632E-06
K-40	4.	1460.81	2.7513E-07
SO-46	14.	1159.21	4.3660E-08
CR-51	64.	320.08	3.0533E-07
MN-56	20.	346.75	6.4118E-07
FE-59	19.	1099.22	8.6377E-08
CO-57	92.	122.06	2.1705E-05
NI-65	2.	1481.84	1.5096E-06
CU-64	2.	1348.90	6.8926E-06
Zn-69M	46.	738.63	3.6431E-08
AS-76	14.	957.11	1.1367E-07
SE-75	73.	204.65	4.3021E-08
BR-82	31.	594.32	5.5997E-08
BR-84	14.	681.00	HALF LIFE TOO SHORT
KR-85	59.	513.69	9.6396E-06
BR-85M	77.	101.16	1.1446E-07
BR-87	49.	402.08	HALF LIFE TOO SHORT
KR-88	112.	196.32	1.2710E-06
RB-88	1.	1836.01	HALF LIFE TOO SHORT
RB-89	20.	1031.88	HALF LIFE TOO SHORT
BR-95	59.	513.99	4.1939E-08
BR-95M	86.	251.67	HALF LIFE TOO SHORT
BR-91	11.	1044.30	2.3087E-07
SR-92	3.	1363.94	3.7236E-07
Y-88	1.	1336.01	1.5200E-08
Y-91	6.	1704.90	1.1697E-05
Y-91MD	39.	553.57	8.0845E-08
Y-92	19.	934.46	2.3136E-06
Y-93	56.	166.90	6.9952E-07
ZR-95	23.	736.72	6.9453E-08
ZR-97	26.	743.76	6.5552E-08
NB-94	27.	702.63	3.8333E-08
NB-95	21.	765.79	3.7368E-08
NB-97D	11.	1024.50	5.0044E-06
MO-90	79.	257.34	1.2415E-07
MC-99	23.	739.58	3.2487E-07
TC-99MD	92.	140.51	2.1847E-08
RU-103	30.	497.08	3.2498E-08
RU-105	25.	724.50	3.8652E-07
RU-106	43.	621.84	4.3672E-07
RU-105	62.	318.90	1.8564E-07
RU-110M	40.	657.75	4.6233E-08
LD-109	75.	88.03	5.3878E-07
SN-113	43.	391.69	4.3321E-08
SB-122	59.	563.93	7.1726E-08

PEAK WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 4.66. PAGE 2

IDE	BKG	ENERGY	MINIMUM UCI/GR
SB-124	181.	602.71	8.7343E-08
SB-125	51.	427.89	1.4123E-07
TE-123M	91.	158.99	2.3943E-08
TE-132	91.	228.16	3.3677E-08
I-131	56.	364.48	3.8920E-08
I-132	29.	667.69	8.4413E-07
I-133	27.	529.87	4.7057E-08
I-134	21.	647.03	HALF LIFE TOO SHORT
I-135	3.	1260.41	2.2860E-07
XE-131M	110.	163.93	1.1892E-06
XE-133	89.	80.99	6.9995E-05
XE-133M	85.	233.22	2.9511E-07
XE-133	102.	249.79	7.4255E-08
XE-135M	33.	526.66	HALF LIFE TOO SHORT
XE-138	95.	258.31	HALF LIFE TOO SHORT
CS-134M	97.	127.42	1.6979E-06
CS-136	20.	818.50	3.9681E-08
CS-138	8.	1435.86	HALF LIFE TOO SHORT
BA-139	74.	556.00	5.7434E-08
BA-139	110.	165.85	2.3115E-05
BA-140	45.	537.32	1.5449E-07
BA-141	93.	190.22	HALF LIFE TOO SHORT
BA-140	1.	1576.49	1.9878E-08
BA-139	110.	165.85	2.8673E-08
BA-141	73.	145.44	3.4638E-09
CE-143	79.	293.26	9.0596E-08
CE-144	78.	133.54	1.5495E-07
NJ-147	104.	91.11	8.3601E-08
EU-152	58.	344.27	1.1257E-07
EU-154	2.	127.45	5.1720E-08
HF-181	28.	482.03	3.2868E-08
W-187	39.	479.53	1.8297E-07
HG-203	75.	279.19	3.7302E-08
RA-216	53.	609.31	1.0050E-07
TH-232	86.	238.63	6.0831E-08
J-235	104.	185.72	4.3902E-09
J-238	83.	131.10	8.4694E-08
NF-239	95.	106.13	9.8514E-08
AM-241	75.	59.54	1.2882E-07

PEAK WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 4.66. PAGE 2

ID#	BKG	ENERGY	MINIMUM UCI/GR
SB-124	181.	602.71	8.7343E-08
SB-125	61.	427.89	1.4123E-07
TE-123M	91.	158.99	2.3943E-08
TE-132	91.	228.16	3.3677E-08
I-131	56.	364.48	3.8920E-08
I-132	29.	667.69	8.4413E-07
I-133	27.	529.87	4.7057E-08
I-134	21.	847.03	HALF LIFE TOO SHORT
I-135	3.	1260.41	2.2660E-07
XE-131M	110.	163.93	1.1892E-06
XE-133	89.	60.99	6.9995E-05
XE-133M	85.	233.22	2.9511E-07
XE-135	102.	249.79	7.4255E-08
XE-135M	33.	526.56	HALF LIFE TOO SHORT
XE-139	95.	253.31	HALF LIFE TOO SHORT
CS-134M	97.	127.42	1.6979E-06
CS-136	20.	818.50	3.9661E-08
CS-138	8.	1435.86	HALF LIFE TOO SHORT
BA-139	74.	352.00	3.7434E-08
BA-139	110.	167.05	2.3119E-05
BA-140	45.	537.32	1.5449E-07
BA-141	93.	190.22	HALF LIFE TOO SHORT
BA-140	1.	1596.49	1.9670E-08
BA-139	110.	165.83	2.8673E-08
BA-141	73.	145.44	3.4638E-08
CE-143	79.	293.26	9.0596E-08
CE-144	78.	133.34	1.5495E-07
NO-147	104.	91.11	8.3601E-08
EU-152	58.	344.27	1.1257E-07
EU-154	2.	127.45	5.1720E-08
HF-181	28.	481.03	3.2868E-08
W-187	39.	475.53	1.8277E-07
HG-203	75.	275.19	3.7302E-08
RA-216	53.	609.31	1.0050E-07
TH-232	66.	238.63	6.0851E-08
J-235	104.	183.72	4.5902E-05
U-238	83.	131.10	8.4694E-08
NF-239	95.	106.13	9.3514E-08
AM-241	79.	59.54	1.2862E-07

ELAPSED LIVE TIME: 3600. (FILE-UP CORRECTED)

FISSION GAS

NUCLIDE	SDHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GM	1-SIGMA ERROR
KR-88	FB	196.32	0.	0.	28.00*	0.000E+00	1.000E 0	1.000E 0
		534.83	328.	17.	13.00	7.849E-01	9.540E -4	6.129E -5
		1829.77	0.	0.	10.70	0.000E+00	1.000E 0	1.000E 0
		2195.84	0.	0.	13.20	0.000E+00	1.000E 0	1.000E 0
		2392.11	0.	0.	34.60	0.000E+00	1.000E 0	1.000E 0

ACTIVATION PRODUCT

NUCLIDE	SDHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GM	1-SIGMA ERROR
MN-54	AP	834.83	328.	17.	99.99*	7.849E-01	6.338E -7	4.072E -8
CO-60	AP	1.73.23	205.	3.	100.00	2.737E-01	5.410E -7	4.090E -8
		1332.19	173.	0.	100.00*	3.142E-01	3.140E -7	4.100E -8

FISSION PRODUCT

NUCLIDE	SDHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GM	1-SIGMA ERROR
SB-125	FP	176.33	0.	0.	8.89	0.000E+00	1.000E 0	1.000E 0
		427.89	40.	71.	29.33*	1.470E+ 0	1.636E -7	7.663E -8
		463.38	0.	0.	10.35	0.000E+00	1.000E 0	1.000E 0
		600.56	0.	0.	17.80	0.000E+00	1.000E 0	1.000E 0
		635.90	0.	0.	11.32	0.000E+00	1.000E 0	1.000E 0
CS-134	FP	563.23	0.	0.	8.38	0.000E+00	1.000E 0	1.000E 0
		589.32	0.	0.	13.43	0.000E+00	1.000E 0	1.000E 0
		604.70	138.	44.	97.60*	1.055E+00	1.023E -7	2.663E -8
		740.85	121.	14.	85.40	0.000E-01	2.620E -7	3.127E -8
		801.90	0.	0.	3.73	0.000E+00	1.000E 0	1.000E 0
CS-137	FP	661.83	133.	18.	85.12*	9.770E-01	2.430E -7	2.970E -8

 ***** 15-APR-94 18:29:45 *****

AT OCT DISCHARGE SAMPLE: 4/14/94

SPECTRAL FILE NAME: L942941.R3L
 SAMPLE DATE: 14-APR-94 20:21:00
 SAMPLE IDENTIFICATION: L942941.R3L
 TYPE OF SAMPLE: LIQUID
 SAMPLE QUANTITY: 495.3000 UNITS: GM
 SAMPLE GEOMETRY: PAR500
 EFFICIENCY FILE NAME: PAR50093.EFF

 *
 ACQUIRE DATE: 15-APR-94 17:29:16 * FWHM(1332) 1.975
 PRESET TIME(LIVE): 3600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER : 10.0 %
 ELAPSED LIVE TIME: 3600. SEC * NBR ITERATIONS: 10.
 *

 *
 DETECTOR: ADC Detector * LIBRARY: NUCL.LIB
 CALIB DATE: 15-APR-94 13:43:36 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: 0.000000 * HALF LIFE RATIO: 8.00
 OFFSET: -1.0000120 KEV * ABUNDANCE LIMIT: 75.00X
 *

ENERGY WINDOW -1.58 TO 4111.17

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	FW	CTS/SEC	ZERR	FIT
1	0	427.97	0	71.	1.66	854.71	849	15	1.12E-02	53.4	
2	0	604.37	138.	44.	1.49	1206.12	1201	11	3.82E-02	14.1	
3	0	661.38	133.	18.	1.65	1319.68	1313	15	3.69E-02	12.2	
4	0	795.49	121.	14.	1.59	1586.86	1580	14	3.36E-02	11.9	
5	0	834.24	328.	17.	1.81	1664.05	1657	14	9.10E-02	6.4	
6	0	1172.32	205.	3.	2.36	2337.53	2331	13	5.69E-02	7.6	
7	0	1331.58	173.	0.	1.99	2654.79	2647	19	4.81E-02	8.1	

PEAK SEARCH COMPLETED (REV 15.8 - ND PC VERSION DEC 89)

PULSE-PILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	FW	CTS/SEC	ZERR
1	0	427.97	40.	71.	1.66	854.71	849	15	1.12E-02	53.4
2	0	604.37	138.	44.	1.49	1206.12	1201	11	3.82E-02	14.1
3	0	661.38	133.	18.	1.65	1319.68	1313	15	3.69E-02	12.2
4	0	795.49	121.	14.	1.59	1586.86	1580	14	3.36E-02	11.9
5	0	834.24	328.	17.	1.81	1664.05	1657	14	9.10E-02	6.4
6	0	1172.32	205.	3.	2.36	2337.53	2331	13	5.69E-02	7.6
7	0	1331.58	173.	0.	1.99	2654.79	2647	19	4.81E-02	8.1

PILE-UP CORRECTION COMPLETED

ELAPSED LIVE TIME 3600. (PILE-UP CORRECTED)

IDENTIFIED PEAKS

PK	IT	ENERGY	AREA	B-GND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	WERR	SEFF
1	0	427.97	40.	71.	1.66	834.71	849	15	1.12E-02	53.4	1.45E+00

LINE NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	LCI/GH	ABSDIF	FAILED
1	SB-125	427.89	2.77Y	1.001E	3	1.436E -7	38.72% ALN
3	KR-86	834.83	2.84H	1.961E	3	9.540E -4	13.31% ALN

TOTAL LINES IN SPECTRUM 7
 UNIDENTIFIED PEAKS 1
 IDENTIFIED IN SUMMARY REPORT 6 25.71%

ACTIVATION PRODUCT

NUCLIDE	SEHR	HLIFE	DECAY	UCI/GM	1-516M ERRR	%ERR
MN-54	AF	512.70D	1.002	6.338E -7	4.071E -8	6.41
CO-60	AF	1925.00D	1.000	5.140E -7	6.155E -8	9.08

FISSION PRODUCT

NUCLIDE	SEHR	HLIFE	DECAY	UCI/GM	1-516M ERRR	%ERR
CS-134	FP	753.10D	1.001	2.023E -7	2.863E -8	14.15
CS-137	FP	30.17Y	1.000	2.430E -7	2.573E -8	12.23

MINIMUM DETECTABLE ACTIVITY REPORT (ND PC VERSION AUG 89)

PEAK WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 4.66.

ISOTOPE	BKG	ENERGY	MINIMUM UCI/GM
BE-7	32.	477.59	2.8756E-07
ANIL-51	35.	511.00	HALF LIFE TOO SHORT
NA-22	5.	1274.54	3.0028E-08
NA-24	0.	1368.53	0.0000E+00
CL-36	3.	2167.51	0.0000E+00
AR-41	3.	1293.64	HALF LIFE TOO SHORT
K-40	12.	1460.81	4.9231E-07
SC-46	11.	1120.51	3.9954E-08
CR-51	51.	320.08	2.8494E-07
IN-56	17.	848.73	HALF LIFE TOO SHORT
FE-59	10.	1099.22	6.6727E-08
CO-57	88.	122.06	2.1957E-08
CO-58	46.	810.76	6.0874E-08
NI-65	2.	1481.84	HALF LIFE TOO SHORT
CU-64	1.	1345.70	9.5615E-06
ZN-65	34.	1115.52	1.3718E-07
LN-69M	36.	438.63	6.1433E-08
AS-76	33.	559.10	4.3742E-07
SE-78	75.	284.55	6.7918E-08
BR-82	43.	554.32	8.7125E-08
BR-84	18.	881.50	HALF LIFE TOO SHORT
85	51.	513.99	9.2587E-06
85M	84.	131.18	7.1663E-07
87	46.	402.58	HALF LIFE TOO SHORT
KR-88	96.	196.32	1.9471E-05
RG-63	2.	1836.01	HALF LIFE TOO SHORT
RG-69	12.	1031.88	HALF LIFE TOO SHORT
GR-83	51.	513.99	4.0437E-08
GR-85M	78.	231.65	HALF LIFE TOO SHORT
SR-91	18.	1024.30	6.9912E-07
SR-92	3.	1193.94	7.0390E-05
Y-88	2.	1836.01	2.6673E-08
Y-91	6.	1204.90	1.0524E-05
Y-91MD	43.	555.57	2.0096E-07
Z-92	28.	934.46	2.6857E-05
Y-93	67.	266.90	1.7243E-06
ZR-95	13.	756.71	5.4221E-08
ZR-97	25.	743.36	1.0584E-07
NB-94	19.	702.63	3.3221E-08
NB-95	19.	765.79	3.7066E-08
NB-97D	18.	1024.50	1.0541E-05
NO-90	94.	257.34	5.6129E-07
IO-99	23.	739.58	3.7816E-07
TC-99MD	86.	140.51	2.4587E-08
RU-103	34.	497.06	3.6041E-08
RU-105	29.	724.50	2.5354E-06
RU-106	44.	621.84	4.5680E-07
105	56.	318.90	2.2775E-07
110M	30.	657.75	4.1418E-08
CD-109	90.	88.03	6.1017E-07

PAGE 2
 PEAK WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 99.99.

NUCLIDE	SNR	ENERGY	MINIMUM DCI/GM
BN-110	52.	391.69	4.5356E-08
BB-122	51.	583.93	7.7799E-08
BE-124	186.	602.71	9.1972E-03
BB-125	81.	427.89	1.4593E-07
TE-123M	86.	138.99	2.4591E-08
TE-132	82.	228.16	3.6827E-08
I-131	48.	364.48	3.8776E-08
I-132	37.	667.67	HALF LIFE TOO SHORT
I-133	31.	329.87	7.6075E-08
I-134	21.	847.00	HALF LIFE TOO SHORT
I-135	4.	1260.41	8.9792E-07
XE-131M	94.	163.93	1.1676E-08
XE-133	73.	80.99	6.9718E-08
XE-133M	72.	233.72	3.2597E-07
XE-135	74.	249.79	1.5513E-07
XE-135M	44.	520.36	HALF LIFE TOO SHORT
XE-138	90.	258.31	HALF LIFE TOO SHORT
CS-134M	78.	127.42	2.3790E-08
CS-136	29.	818.50	4.6586E-08
CS-138	1.	1435.80	HALF LIFE TOO SHORT
BA-133	63.	136.00	5.4771E-08
134	96.	165.80	HALF LIFE TOO SHORT
140	10.	537.32	1.3438E-07
BA-141	86.	190.22	HALF LIFE TOO SHORT
LA-140	2.	1596.49	3.5326E-08
CE-139	96.	165.80	2.7738E-08
CE-141	80.	145.44	3.8544E-08
CE-143	58.	293.26	1.0182E-07
CE-144	67.	173.54	1.4854E-07
ND-147	98.	91.11	8.3497E-08
EU-152	40.	544.29	1.0015E-07
EU-154	3.	1274.45	8.4491E-08
HF-181	42.	482.03	4.1910E-08
W-187	44.	479.33	2.7943E-07
HO-203	57.	279.19	3.3833E-08
RA-226	53.	607.31	1.0577E-07
TH-232	99.	238.63	6.7427E-08
U-235	104.	185.72	4.7421E-08
U-238	58.	131.20	7.3143E-08
NP-239	91.	106.13	1.1451E-07
AM-241	90.	59.54	1.4204E-07

15 Apr 84 16:46

Page #1

Protocol #:12

H-3 DPM

User : ANDRE/GLINSKI

Time: 10.00

Data Mode: DPM

Nuclide: 3H-UGXR

Quench Set: 3H-UGXR

ma Coincidence On

Background Subtract: 1st Vial

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 18.6		0	0.5	11.10
Region B:	2.0 - 18.6		0	0.5	10.80
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

EPA INTERCOMPARISON SAMPLE 94-200

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPM1	tSIE
1	10.00	11.10 18.98	10.80 19.16		282.18
2	10.00	2016.50 1.43	1974.70 1.44	7113.89	252.46 94-293

3	10.00	2002.50 1.44	1861.70 1.45	7008.57	254.51 94-294
4	2.64	61799.5 0.50	60312.7 0.50	205679	268.26

CALCULATION OF MPC FRACTION

Sample #2

Release Permit No. 94CST3

Type of Sample: CST

	Col. 1 Isotope	Col. 2 Conc. (uCi/ml)	Col. 3 MPC	Col. 4 MPC Fraction
1.	Mn-54	6.97E-07	3.00E-04	2.32E-03
2.	Co-58	5.47E-08	2.00E-04	2.74E-04
3.	Cu-60	5.28E-07	3.00E-05	1.76E-02
4.	Cs-134	2.62E-07	9.00E-06	2.91E-02
5.	Cs-137	2.12E-07	1.00E-05	2.12E-02
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7.				
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26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
Total:		1.75E-06 uCi/ml	MPC:	7.05E-02

Performed by:

Signature

Date

Reviewed by:

Signature

Date

Reviewed by:

Signature

Date

(CST only) [1 NA

Equivalent to 62,000.120 At2 F1/1 010394

DCT: VSSURV File: 1202

D-17

CALCULATION OF MPC FRACTION

Release Permit No.

94CST3

Type of Sample:

CST

Sample #1: not used for release calculations

	Col. 1 Isotope	Col. 2 Conc. (uCi/ml)	Col. 3 MPC	Col. 4 MPC Fraction
1.	Mn-54	6.57E-07	3.00E-04	2.19E-03
2.	Co-58	9.19E-08	2.00E-04	4.59E-04
3.	Co-60	5.71E-07	3.00E-05	1.90E-02
4.	Cs-134	1.62E-07	9.00E-06	1.79E-02
5.	Cs-137	1.93E-07	1.00E-05	1.93E-02
6.	Sb-125	2.14E-07	3.00E-04	7.14E-04
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
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28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
Total:		1.89E-06 uCi/ml		MPCE: 5.96E-02

Performed by:

Signature

Date

Reviewed by:

Signature

Date

Reviewed by:

Signature

Date

(CST only) [] NA

Equivalent to 62.000.120 Ar2 P1/1 010394

DCT: VSSURV File: 1202

CIRCULATING WATER DECANT MONITOR SETPOINT COMPARISON

Release Permit No. 94CST3

1. Estimated Circulating Water Decant Monitor alarm (high high) setpoint based on nuclide mix of batch to be released =

$$\frac{(\text{Cr-51 conc (att 2)} \times 0.098 \times 2.7\text{E}+8) + (\text{Total conc except Cr-51} \times 2.7\text{E}+8)}{\text{MPCF (Att 2)} \times 2} + \text{Circ Water Decant Monitor reading (Att 1)} =$$

$$\frac{(\text{UC/cc} \times 0.098 \times 2.70\text{E}+08) + (1.75\text{E}-06 \text{ UC/ml} \times 2.70\text{E}+08)}{7.05\text{E}-02 \times 2} + 170 \text{ cpm}$$

$$= 3.53\text{E}+03 \text{ cpm}$$

2. Installed Circulating Water Decant Monitor alarm (high high) setpoint

$$= 1700 \text{ cpm}$$

3. Setpoint change required? YES X NO

Performed by:

Thomas J. Vandyke 4/5/94
Signature / Date

Reviewed by:

William V. Lister 4/15/94
Signature / Date

Reviewed by:

RC 4/15/94 (CST only) [] NA
Signature / Date

CALCULATION OF DISCHARGE MONITOR RELEASE RATE AND SETPOINT - CIRCULATING WATER NOT CONTAMINATED

Release Permit No. 94CST3

BF = 0.1
H3MPCF = 0.13
H3F = 0.99

$$1. \text{ Maximum Allowable Release Rate} = \frac{\text{CWD flow rate (Att 1)} \times 0.5}{[(\text{MPCF (Att 2)} \times (1 + \text{BF})) + \text{H3MPCF}]} = \frac{1.56\text{E}+04 \text{ gpm} \times 0.5}{[(7.05\text{E}-02 \times (1 + 0.1)) + 1.3\text{E}-1]} = 3.76\text{E}+04 \text{ gpm}$$

2. Determination of "Estimated release rate" (for use in Part 3 and 4 below):

a) If maximum allowable release rate is greater than or equal to maximum release tank discharge flow rate, estimated release rate equals maximum release tank discharge flow rate (from Att 1, Part 4).

b) If maximum allowable release rate is less than maximum release tank discharge flow rate, estimated release rate equals maximum allowable release rate.

$$3. \text{ Total MPC fraction at discharge point} = \frac{\text{Estimated release rate} \times [\text{MPCF} \times (1 + \text{BF}) + \text{H3MPCF}]}{\text{CWD flow rate}}$$

$$= \frac{4.00\text{E}+02 \text{ gpm} \times [7.05\text{E}-02 \times (1 + 0.1) + 1.3\text{E}-1]}{1.56\text{E}+04 \text{ gpm}} = 5.32\text{E}-03$$

$$4. \text{ Discharge Monitor Setpoint} = \frac{\text{Total conc (Att 2)} \times \text{Monitor Sensitivity (Att 1)} \times \text{CWD flow rate (Att 1 Part 3)} \times \text{H3F}}{\text{MPCF (Att 2)} \times \text{Estimated release rate (Att 4 Part 2)} \times (1 + \text{BF})} + \text{Discharge Monitor Background Reading (Att 1 Part 1)}$$

$$= \frac{1.75\text{E}-06 \text{ uCi/Voc} \times 1.60\text{E}+07 \text{ / (uCi/Voc)} \times 1.56\text{E}+04 \text{ gpm} \times 0.99}{7.05\text{E}-02 \times 4.00\text{E}+02 \text{ gpm} \times (1 + 0.1)} + 380 \text{ cpm}$$

$$= 1.43\text{E}+04 \text{ cpm}$$

Performed by *Thomas Van der Meer*Date 4-15-94Reviewed by *John A. John*Date 4/15/94Reviewed by *RLC*Date 4/15/94

(CST only) [] NA

PRE-RELEASE LIQUID EFFLUENT DOSE CALCULATION

Release Permit #
Multiplication factor

94CST3
1.24E-01

Radionuclide	Activity	Bone Factor	Bone Dose	Intest Factor	Intest Dose	Thyroid Factor	Thyroid Dose	Thyroid Factor	Thyroid Dose	Adrenal Factor	Adrenal Dose	Liver Factor	Liver Dose	GI-LU Factor	GI-LU Dose
Mn-54	8.97E-07			4.40E+03	3.87E-04	8.80E+02	7.27E-05			1.31E+03	1.13E-04			1.35E+04	1.17E-03
Co-58	5.47E-08			8.32E+01	8.33E-07	2.09E+02	1.42E-08							1.89E+03	1.28E-05
Co-60	5.28E-07			2.89E+02	1.78E-05	5.30E+02	3.87E-05							8.03E+03	3.30E-04
Co-134	2.82E-07	2.88E+05	8.70E-03	7.09E+05	2.31E-02	5.90E+05	1.89E-02			2.30E+05	7.46E-03	7.82E+04	2.66E-03	1.24E+04	4.04E-04
Co-137	2.12E-07	3.82E+05	1.01E-02	5.22E+05	1.38E-02	3.42E+05	9.01E-03			1.77E+05	4.86E-03	5.90E+04	1.55E-03	1.01E+04	2.88E-04

Radionuclide	Bone	Intest	Thyroid	Adrenal	Liver	GI-LU
Germine organ dose (mRem)	1.98E-02	3.72E-02	2.80E-02			2.18E-03
Pure beta organ dose (mRem)	9.97E-04	3.98E-04	2.42E-04	1.28E-04	1.28E-04	3.62E-04
Total organ dose (mRem)	2.08E-02	3.76E-02	2.82E-02	1.28E-04	1.24E-02	2.54E-03
Committed Year prior to release						
Germine organ dose (mRem)						
Pure beta organ dose (mRem)						
Total organ dose (mRem)						
Committed Year prior to release						
Germine organ dose (mRem)	1.36E-02	3.72E-02	2.80E-02		1.23E-02	2.18E-03
Pure beta organ dose (mRem)	9.97E-04	3.98E-04	2.42E-04	1.28E-04	1.28E-04	3.62E-04
Total organ dose (mRem)	2.08E-02	3.76E-02	2.82E-02	1.28E-04	1.24E-02	2.54E-03
Committed Year prior to release						
Germine organ dose (mRem)	2.50E-02	4.89E-02	3.71E-02	8.83E-04	1.61E-02	1.67E-03
Pure beta organ dose (mRem)	1.55E-03	6.27E-04	3.84E-04	2.07E-04	4.41E-04	5.73E-04
Total organ dose (mRem)	2.76E-02	4.95E-02	3.75E-02	7.89E-04	1.83E-02	2.44E-03
Committed Year prior to release						
Germine organ dose (mRem)	4.58E-02	8.81E-02	6.51E-02	5.83E-04	2.84E-02	4.06E-03
Pure beta organ dose (mRem)	2.56E-03	1.03E-03	6.26E-04	3.35E-04	7.21E-04	9.32E-04
Total organ dose (mRem)	4.83E-02	8.71E-02	6.57E-02	9.18E-04	2.87E-02	4.98E-03

Performed by

Date

4-15-94

Reviewed by

Matthew W. Hatten

Date

4/15/94

Reviewed by

Date

4-15-94

(CST only) [] NA

Equivalent to 82,000,120 AB7 P1/1 010394

OTC: V88URV File: f202

Sample ID : 0330 -E94

Acquisition date : 15-APR-1994 09:19:33

Fermi 2 Radiation Protection Gamma Spectroscopy Report

***** Sample Parameters *****

Sample ID Number: 0330 -E94
 Sample collection start date: 15-APR-1994 07:37:00.00
 Sample collection end date : 15-APR-1994 07:37:00.00
 Type of sample : 1 Liter Marinell
 Sample quantity : 1.00000E+03 ml
 Sample geometry : MILL

Operator: TLR

1st sample

***** Acquisition Parameters *****

Detector number : DET1 Acquire date : 15-APR-1994 09:19:33.32
 Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
 Elapsed real time : 0 00:30:00.36 Percent dead time : 0.00 %

***** Calibration Parameters *****

Detector number : DET1 Yearly cal date : 2-MAR-1994 13:47:45.33
 Kev/channel : 5.00200E-01 Zero offset: 2.18052E-02
 Daily cal date : 15-APR-1994 08:14:24.90

***** Peak Search Parameters *****

Start channel : 100 End channel : 4096
 Height sensitivity : 5.00000 Shape sensitivity : 10.00000
 Maximum number of iterations to resolve multiplets : 5

***** Nuclide Identification Parameters *****

Energy tolerance : 1.25000 Half-life ratio : 10.00000
 Abundance limit : 75.00000 Library : dacmaster.nlb
 Efficiency file : EFFD1_mill Efficiencies at : Peak energy

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	428.28	40	35	0.99	856.18	850	15	2.22E-02	35.5	
2	0	605.45	74	49	1.70	1210.38	1202	14	4.10E-02	23.8	
3	0	661.82	71	17	1.83	1323.08	1314	13	3.94E-02	16.7	
4	0	796.06	81	16	1.00	1571.46	1504	13	4.47E-02	15.2	
5	0	810.29	32	7	0.99	1619.91	1613	14	1.78E-02	24.9	
6	0	834.74	223	8	2.39	1668.79	1001	14	1.24E-01	7.2	
7	0	1172.85	144	4	2.85	2344.75	2336	17	7.99E-02	9.0	
8	0	1331.89	129	0	3.30	2652.71	2605	15	7.17E-02	8.8	

* Detroit Edison Fermi 2 Peak Report, Generated 15-APR-1994 09:49:48.19 *

* Sample ID : Q330 -E94 *

* Decay Time = 0 01:42:33.32 Deposition Time = 00:00:00.00 *

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	428.28	40	35	0.99	856.18	850	15	35.5		56-125
0	605.45	74	49	1.76	1210.38	1202	14	23.0		CS-134
0	661.82	71	17	1.83	1323.08	1314	13	16.7		CS-137
0	796.86	81	16	1.82	1591.46	1584	13	15.2		CO-134
0	810.29	32	7	0.99	1619.91	1613	14	24.9		CO-58
0	834.74	223	8	2.39	1668.79	1661	14	7.2		MN-54
0	1172.85	144	4	2.85	2344.75	2336	17	9.0		CO-60
0	1331.89	129	0	3.30	2662.71	2655	15	8.8		CO-60

Summary of Nuclide Activity

Page : 2

Sample ID : Q330-E94

Acquisition date : 15-APR-1994 09:19:33

Total number of lines in spectrum 8
 Number of unidentified lines 0
 Number of lines tentatively identified by NID 0 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/ml	Decay Corr uCi/ml	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
MN-54	312.70D	1.00	6.568E-07	6.569E-07	0.470E-07	7.16	
CO-58	70.80D	1.00	9.178E-08	9.185E-08	2.287E-08	24.90	
CO-60	5.27Y	1.00	5.714E-07	5.714E-07	0.503E-07	0.80	A
CS-134	2.06Y	1.00	1.615E-07	1.615E-07	0.384E-07	23.76	
Total Activity :			1.481E-06	1.482E-06			

Nuclide Type : fission

Nuclide	Hlife	Decay	Uncorrected uCi/ml	Decay Corr uCi/ml	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
CS-137	30.17Y	1.00	1.928E-07	1.928E-07	0.323E-07	16.73	
Total Activity :			1.928E-07	1.928E-07			

Grand Total Activity : 1.674E-06 1.675E-06

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "A" = Nuclide specific abn. limit

Sb-125

2.143E-7

Total

1.89E-6

Rejected Report

Sample ID : Q330-E94

Acquisition date : 15-APR-1994 09:19:33

Nuclide	Half-life	Ratio	Energy	%Abund	Activity	%Error	1-Sigma	Rejected by
BR-82	35.30H	0.06	221.45	2.26	---	Not Found	---	Abun.
			554.32	70.60	---	Not Found	---	
			606.30	1.17	1.400E-05	23.76		
			619.07	43.10	---	Not Found	---	
			698.33	28.20	---	Not Found	---	
			776.49*	83.31	---	Not Found	---	
			827.81	24.20	---	Not Found	---	
			1007.57	1.27	---	Not Found	---	
			1043.97	27.30	---	Not Found	---	
			1317.47	26.90	---	Not Found	---	
			1474.82	16.50	---	Not Found	---	
% Abundances Found =			0.36					

BR-84	31.80M	3.70	604.80	1.00	1.116E-04	23.76	Abun.
			736.50	1.31	---	Not Found	---
			802.20	6.10	---	Not Found	---
			881.50*	42.00	---	Not Found	---
			1015.90	6.20	---	Not Found	---
			1213.30	2.60	---	Not Found	---
			1463.90	2.00	---	Not Found	---
			1741.20	1.60	---	Not Found	---
			1877.50	1.14	---	Not Found	---
			1897.30	14.90	---	Not Found	---
			2029.60	2.10	---	Not Found	---
% Abundances Found =			2.20				

KR-88	2.84H	0.69	165.90	3.10	---	Not Found	---	Abun.
			196.32*	26.00	---	Not Found	---	
			362.23	2.25	---	Not Found	---	
			834.83	13.00	8.144E-06	7.16		
			985.78	1.31	---	Not Found	---	
			1141.33	1.20	---	Not Found	---	
			1179.51	1.00	---	Not Found	---	
			1250.67	1.12	---	Not Found	---	
			1369.50	1.48	---	Not Found	---	
			1518.39	2.15	---	Not Found	---	
			1529.77	10.90	---	Not Found	---	
			2029.84	4.53	---	Not Found	---	
			2035.41	3.74	---	Not Found	---	
% Abundances Found =			18.09					

SR-125	2.77Y	0.00	176.33	6.89	---	Not Found	---	Abun.
			380.44	1.50	---	Not Found	---	
			427.89*	29.33	2.143E-07	35.49		
			463.30	10.35	---	Not Found	---	
			600.56	17.80	---	Not Found	---	
			606.64	5.02	3.140E-06	23.76		

Abundance limit : 75.00000

Efficiency file : EFFD1_mill

Library : dacmaster.nlb

Efficiencies at : Peak energy

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	605.05	119	22	2.27	1209.50	1204	12	6.64E-02	12.2	
2	0	661.44	78	14	1.51	1322.33	1317	10	4.34E-02	14.6	
3	0	795.67	103	4	2.30	1590.69	1582	16	5.74E-02	10.7	
4	0	811.96	19	20	1.04	1623.25	1614	14	1.06E-02	55.7	

4	0	811.76	17	50	1.07	1053.10	1017	17	1.00E-01	Extended Page
5	0	834.66	237	14	2.25	1668.63	1659	19	1.32E-01	7.5
6	0	1173.24	122	22	1.96	2345.52	2339	13	6.79E-02	12.1
7	0	1332.01	119	5	3.14	2662.97	2653	10	6.62E-02	10.1

* Detroit Edison Fermi 2 Peak Report, Generated 15-APR-1994 10:42:50.60 *

* Sample ID : 0330-94

* Decay Time = 0 00:28:14.90

Deposition Time = 00:00:00.00 *

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	605.05	119	22	2.27	1209.58	1204	.2	12.2		CS-134
0	661.44	78	14	1.51	1322.33	1317	10	14.6		CS-137
0	795.67	103	4	2.30	1590.69	1582	16	10.7		CS-134
0	811.96	19	20	1.04	1623.25	1614	14	55.7		CO-58
0	834.66	237	14	2.25	1668.63	1659	19	7.5		MN-54
0	1173.24	122	22	1.96	2345.52	2339	13	12.1		CO-60
0	1332.01	119	5	3.14	2662.97	2653	10	10.1		CO-60

Summary of Nuclide Activity

Sample ID : 0330-94

Acquisition date : 15-APR-1994 10:00:14

Total number of lines in spectrum 7
 Number of unidentified lines 0
 Number of lines tentatively identified by NID 7 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected (uCi)	Decay Corr (uCi)	Decay Corr 1-Sigma Error	1-Sigma XError	Flags
MN-54	312.70D	1.00	6.972E-07	6.973E-07	0.525E-07	7.53	
CO-58	70.80D	1.00	5.468E-08	5.470E-08	3.049E-08	55.75	
CO-60	5.27Y	1.00	5.277E-07	5.277E-07	0.532E-07	10.00	A
CS-134	2.06Y	1.00	2.616E-07	2.616E-07	0.320E-07	12.21	
Total Activity :			1.541E-06	1.541E-06			

Nuclide Type : fission

Nuclide	Hlife	Decay	Uncorrected (uCi)	Decay Corr (uCi)	Decay Corr 1-Sigma Error	1-Sigma XError	Flags
CS-137	30.17Y	1.00	2.123E-07	2.123E-07	0.309E-07	14.57	
Total Activity :			2.123E-07	2.123E-07			

Grand Total Activity : 1.754E-06 1.754E-06

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "A" = Nuclide specific abn. limit

TABLE 2
U.S. NUCLEAR REGULATORY COMMISSION
REGION III
CONFIRMATORY MEASUREMENTS PROGRAM

FACILITY: FERMI 2

FOR THE 1ST QUARTER OF 1994

SAMPLE	NUCLID	NRC VA	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL	RESU
CST	CR-51	8.26E-06	6.73E-07	1.21E-05	1.26E-06	1.46	12.3	A
TANK	MN-54	6.52E-07	6.38E-08	6.74E-07	1.20E-07	1.03	10.2	A
DET 1	CO-60	6.37E-07	5.96E-08	8.42E-07	1.06E-07	1.32	10.7	A
1/11/94	I-131	1.55E-06	9.50E-08	2.06E-06	1.91E-07	1.33	16.3	D
	CS-134	7.85E-06	1.50E-07	9.43E-06	2.83E-07	1.20	52.4	A
	CS-136	2.49E-07	5.52E-08	0.00E+00	0.00E+00		4.5	D
	CS-137	7.22E-06	1.49E-07	7.47E-06	2.72E-07	1.04	48.4	A
CST	CR-51	3.26E-06	6.73E-07	9.58E-06	7.52E-07	1.16	12.3	A
TANK	MN-54	6.52E-07	6.38E-08	7.20E-07	6.69E-08	1.10	10.2	A
DET 2	CO-60	6.37E-07	5.96E-08	6.61E-07	7.11E-08	1.04	10.7	A
1/11/94	I-131	1.55E-06	9.50E-08	1.64E-06	1.12E-07	1.06	16.3	A
	CS-134	7.85E-06	1.50E-07	8.47E-06	1.86E-07	1.08	52.4	A
	CS-136	2.49E-07	5.52E-08	3.81E-07	6.61E-08	1.53	4.5	A
	CS-137	7.22E-06	1.49E-07	7.10E-06	1.80E-07	0.98	48.4	A
CST	CR-51	3.39E-07	1.52E-07	1.10E-06	2.97E-07	3.25	2.2	D
TANK	MN-54	2.06E-07	3.54E-08	1.85E-07	4.52E-08	0.90	5.8	A
DET 2	CO-58	1.60E-07	2.22E-08	1.43E-07	3.23E-08	0.89	7.2	A
2/17/94	CO-60	7.52E-07	5.16E-08	9.11E-07	8.29E-08	1.21	14.6	A
	I-131	7.70E-08	2.58E-08	9.00E-08	3.46E-08	1.17	3.0	A
	CS-134	7.08E-07	5.07E-08	7.95E-07	7.11E-08	1.12	14.0	A
	CS-137	6.37E-07	4.35E-08	5.04E-07	6.33E-08	0.79	14.6	A
CST	CR-51	3.08E-07	1.28E-07	6.10E-07	1.80E-07	1.98	2.4	A
TANK	SB-125	9.13E-08	2.85E-08	1.20E-07	4.70E-08	1.31	3.2	A
	CO-58	8.74E-08	1.93E-08	1.00E-07	2.20E-08	1.14	4.5	A
2/21/94	CO-60	5.06E-07	3.73E-08	5.20E-07	5.00E-08	1.03	13.6	A
	I-131	6.65E-08	2.16E-08	6.00E-08	1.40E-08	0.90	3.1	A
	CS-134	1.30E-07	2.49E-08	1.50E-07	3.20E-08	1.15	5.2	A
	CS-137	1.00E-07	2.33E-08	6.70E-08	3.20E-08	0.67	4.3	A
CST	CR-51	2.76E-07	9.24E-08	2.89E-07	1.20E-07	1.05	3.0	A
TANK	SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
PRE-	CO-58	6.47E-08	1.29E-08	0.00E+00	0.00E+00		5.0	D
DISCH	CO-60	4.26E-07	2.36E-08	5.06E-07	4.45E-08	1.19	18.0	A
2/24/94	I-131	3.02E-08	1.08E-08	7.30E-08	2.01E-08	2.42	2.8	A
	CS-134	1.47E-07	1.69E-08	1.64E-07	3.53E-07	1.12	8.7	A

12-18

CS-137 1.68E-07 1.69E-08 1.11E-07 3.00E-08 0.66 10.0 A

Fermi 2 Condensate Storage Tank Discharge

Regulations:

- 10 CFR 20.1302(b)(2)(i) -- Effluent releases to unrestricted area must be maintained as an annual average concentration less than the concentrations in Table 2 of Appendix B to 10 CFR 20.
- 10 CFR 50.34(a) -- Design objectives for equipment to control releases of radioactive material in effluents. This section refers only to applications for construction permits. "These numerical guides (i.e. Appendix I) for design objectives and limiting conditions for operations are not to be construed as radiation protection standards."
- 10 CFR 50.36(a) -- Requirement for Technical specifications on effluents from nuclear power reactors during operation. TS to maintain releases ALARA, including the requirement for procedures developed pursuant to 50.34(a). Appendix I provides numerical guidance to ensure releases are maintained ALARA. This section also sets the requirement for the annual effluent report.
- 10 CFR 50 APP I -- "Numerical Guides for design objectives and limiting conditions for operation to meet the criterion "As Low AS Reasonably Achievable."

Section II Guides:

Liquids -- Whole Body 3 mREM/yr and Organ 10 mREM/yr (Calculated). (Section II.A.)

Gases -- 10 mrad gamma and 20 mrad beta per year. (Section II.B.1) Or, the Commission may specify lower quantities if an estimated annual dose of 5 mREM Whole Body (B.2.a.) or must meet 5 mREM Whole Body and 15 mREM skin (B.2.b.).

Particulates -- Annual total of radioiodines and particulate radioactivity released to atmosphere will not results in an annual dose or dose commitment from all pathways of exposure in excess of 15 mREM to any organ of

D-19

any person in an unrestricted area.

Section III Implementation:
Land use Census -- A.1.

Section IV Technical Specifications:
Quarterly dose calculations -- If exceed one-half of annual limits, a report must be made to the Commission describing a causal investigation and program of corrective actions. (A (1-3))

Environmental Monitoring Program -- B.2.

Land Use Census -- B.3.

Regulatory Staff Position:
Liquid Effluents:
Total dose from all pathways less than 5 mREM per year whole body (A.1.)

Total quantity < 5 Curies (excluding H-3 and dissolved gases)

EPA Drinking Water Standards (i.e. Maximum contamination in community water)

40 CFR 141.15(a)

Ra-226 + Ra-228 < 5 picocuries/liter

40 CFR 141.15(b)

Gross alpha (including Ra-226, but excluding radon and uranium) < 15 picocuries/liter

40 CFR 141.16(a)

Annual concentration: Beta and Gamma annual dose equiv to the total body or internal organ cannot exceed 4 mrem/yr.

40 CFR 141.16(b)

Isotope

Limit

H-3

20,000 picocuries/liter

Sr-90

8 picocuries/liter

Licensee's Technical Specifications:

Offsite Dose Calculation Manual:

3.11.1.1 The concentration of radioactive material in liquid effluents is not to exceed ten times the conc. values specified in 10 CFR 20.1001-20.2401. The limits for dissolved or entrained noble gases will be limited to $2\text{E-}4$ microcuries/ml total activity.

3.11.1.2 The dose or dose commitments to a member of the public for radioactivity in liquid effluents, from each reactor, shall be limited:

Quarterly -- 1.5 mrems to the total body and 5 rems to any organ.

Annual -- 3 mrems to the total body or 10 mrems to any organ.

3.11.1.3 -- Appropriate portions of the radwaste treatment system shall be operable and used to reduce rad materials in liquid effluents when projected doses are greater than 0.06 whole body and 0.2 rem to any organ in a 31-day period.

Condensate Storage Tank Activity/NRC Analyses

Jan 11, 1994 - Split CST samples were analyzed by the NRC and the licensee. The results of these analyses were in good agreement and were documented in the Augmented Inspection Team report.

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESLT
CST TANK DET 1 1/11/94	CR-51	8.26E-06	6.73E-07	1.20E-05	1.26E-06	1.46	12.3	A
	MN-54	6.52E-07	6.38E-08	6.74E-07	1.20E-07	1.03	10.2	A
	CO-60	6.37E-07	5.96E-08	8.42E-07	1.06E-07	1.32	10.7	A
	I-131	1.55E-06	9.50E-08	2.06E-06	1.91E-07	1.33	16.3	A
	CS-134	7.85E-06	1.50E-07	9.43E-06	2.83E-07	1.20	52.4	A
	CS-136	2.49E-07	5.52E-08	0.00E+00	0.00E+00		4.5	D
	CS-137	7.22E-06	1.49E-07	7.47E-06	2.72E-07	1.04	48.4	A
CST TANK DET 2 1/11/94	CR-51	8.26E-06	6.73E-07	9.58E-06	7.52E-07	1.16	12.3	A
	MN-54	6.52E-07	6.38E-08	7.20E-07	6.69E-08	1.10	10.2	A
	CO-60	6.37E-07	5.96E-08	6.61E-07	7.11E-08	1.04	10.7	A
	I-131	1.55E-06	9.50E-08	1.64E-06	1.12E-07	1.06	16.3	A
	CS-134	7.85E-06	1.50E-07	8.47E-06	1.86E-07	1.08	52.4	A
	CS-136	2.49E-07	5.52E-08	3.81E-07	6.61E-08	1.53	4.5	A
	CS-137	7.22E-06	1.49E-07	7.10E-06	1.80E-07	0.98	48.4	A

Feb. 17, 1994 - The NRC and licensee analyzed a licensee collected CST sample (during recirculation). The results were in good agreement:

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESLT
CST TANK DET 2 2/17/94	CR-51	3.39E-07	1.52E-07	1.10E-06	2.97E-07	3.25	2.2	D
	MN-54	2.06E-07	3.54E-08	1.85E-07	4.52E-08	0.90	5.8	A
	CO-58	1.60E-07	2.22E-08	1.43E-07	3.23E-08	0.89	7.2	A
	CO-60	7.52E-07	5.16E-08	9.11E-07	8.29E-08	1.21	14.6	A
	I-131	7.70E-08	2.58E-08	9.00E-08	3.46E-08	1.17	3.0	A
	CS-134	7.08E-07	5.07E-08	7.95E-07	7.11E-08	1.12	14.0	A
	CS-137	6.37E-07	4.35E-08	5.04E-07	6.33E-08	0.79	14.6	A

Feb. 21, 1994 - A sample was collected by the licensee and was split between the licensee, NRC, and State of Michigan for analyses.

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESLT
CST	CR-51	3.08E-07	1.28E-07	3.00E-07	2.00E-07	0.97	2.4	A
TANK	SB-125	9.13E-08	2.85E-08	1.50E-07	7.00E-08	1.64	3.2	A
NRC VS	CO-58	8.74E-08	1.93E-08	8.00E-08	3.00E-08	0.92	4.5	A
MICHIGAN	CO-60	5.06E-07	3.73E-08	4.50E-07	7.00E-08	0.89	13.6	A
2/21/94	I-131	6.65E-08	2.16E-08	7.00E-08	3.00E-08	1.05	3.1	A
	CS-134	1.30E-07	2.49E-08	1.10E-07	4.00E-08	0.85	5.2	A
	CS-137	1.00E-07	2.33E-08	8.00E-08	3.00E-08	0.80	4.3	A
CST	CR-51	3.08E-07	1.28E-07	6.10E-07	1.80E-07	1.98	2.4	A
TANK	SB-125	9.13E-08	2.85E-08	1.20E-07	4.70E-08	1.31	3.2	A
NRC VS	CO-58	8.74E-08	1.93E-08	1.00E-07	2.20E-03	1.14	4.5	A
FERMI 2	CO-60	5.06E-07	3.73E-08	5.20E-07	5.00E-08	1.03	13.6	A
2/21/94	I-131	6.65E-08	2.16E-08	6.00E-08	1.40E-08	0.90	3.1	A
	CS-134	1.30E-07	2.49E-08	1.50E-07	3.20E-08	1.15	5.2	A
	CS-137	1.00E-07	2.33E-08	6.70E-08	3.20E-08	0.67	4.3	A

Prior to Discharge - Sample to be collected by the licensee and split between the licensee and NRC (2 samples). One sample will be analyzed onsite in the NRC mobile laboratory, and an additional sample will be split for analyses in the Region III office. Offsite dose calculations will be performed based on the results of these analyses.

During discharge - Sample to be taken at CST levels of 2/3 and 1/3 and analyzed in RIII mobile lab. One sample will also be taken prior to end of discharge for future analysis.

CST non-Radiological Chemistry

Prior to the Turbine-Generator Failure:

<u>System</u>	<u>CST</u>	<u>Hotwell</u>
Date	12/21/93	12/25/93
Cond (uS/cm)	0.78	0.060
TOC (ppb)	73	
Cl (ppb)	<1	
NO3 (ppb)	<1	
SO4 (ppb)	<1	
SiO2 (ppb)	<5	
Isotopic (uCi/gm)	<MDA*	<MDA*

*MDA: Approximately $1\text{E}-6$ to $1\text{E}-7$ uCi/gm per isotope.

After the event:

<u>System</u>	<u>CST</u>	<u>Hotwell</u>
Date	12/27/93	12/30/93
Cond (uS/cm)	240	147
TOC (ppb)	33180	3100
Cl (ppb)	18400	
NO3 (ppb)	2500	
SO4 (ppb)	25700	
SiO2 (ppb)	1126	
Isotopic (uCi/gm)	$7.27\text{E}-5$	

CST Demineralization Results

Isotope	Before(1/11/94) uCi/ml	After (2/21/94) uCi/ml
Cr-51	8.26E-6	3.08E-7
Mn-54	6.52E-7	0
Co-60	6.37E-7	5.06E-7
I-131	1.55E-6	6.65E-8
Cs-134	7.85E-6	1.3E-7
Cs-137	7.22E-6	1E-7
Sr-89	8E-6	Not analyzed.
H-3	1E-3	Not analyzed.

Typical RIII Plant Liquid Discharges

Plant	1991	1992	1993
Davis Besse ¹	37.7mCi w/o H-3 325Ci w/ H-3	23.65mCi w/o H-3 381Ci w/ H-3	
Fermi 2 ¹	0.02 Ci w/o H-3 2.24 Ci w/ H-3	0.000066Ci w/o H-3 0.352 Ci w/ H-3	
Perry	0.105 Ci w/o H-3	0.0598 Ci w/o H-3	

¹Isotopes reported: Co-60, Cs-134, Cs-137

Interactions with Canada

Sandra Weston, Head
Commercial Chemicals and Nuclear Programs
Environmental Contaminants and Nuclear Programs Division
Environmental Protection - Ontario Region
Conservation and Protection

Ms Weston arrived onsite at 1400 hrs on February 17, 1994. She observed the NRC counting a CST sample obtained by the licensee earlier that morning. She observed the NRC comparing the licensee and NRC result, in accordance with the acceptance criteria contained within Inspection Procedure 84750. Ms Weston was also shown an NRC dose projection calculated via PC DOSE with licensee data from 2/16/94. All data and dose parameters were discussed by S. Orth, and copies of the PC DOSE projection and IP 84750 were given to S. Weston.

Ms Weston toured the NRC mobile laboratory and walked down the licensee's modification for the CST discharge. S. Orth described the modification, including the new radiation monitor, monitoring and communications by operators, and conditions which would cause a termination of discharge.

Ms Weston left the Fermi 2 site at about 1630 hours when the assistant to the plant manager announced that the discharge had been postponed. S. Orth asked if she wished to wait for any further, unofficial analyses. She responded that she will probably be back for the official discharge analysis, so she saw no point in waiting for another split sample that day.

20

NRC FORM 303 (R111) (3-83)		U. S. NUCLEAR REGULATORY COMMISSION		LABORATORY USE ONLY			
REQUEST FOR ANALYSIS REGION III LABORATORY				CONTROL NUMBER 94-022			
SAMPLE LOCATION (LICENSEE) Fermi Power Plant		SAMPLE SUBMITTED		LICENSE NO.		DOCKET NO.	
# TOTAL 1	TYPE Waste	DATE SAMPLES SUBMITTED 2/23/94		PRIORITY <input checked="" type="checkbox"/> URGENT *** <input type="checkbox"/> ROUTINE			
				SAMPLE COLLECTION INTERVAL			
				START	MONTH	DAY	YEAR
				STOP			
INSPECTOR RESPONSIBLE Orth		TELEPHONE NUMBER					
ANALYSIS TO BE PERFORMED		LIST DESIRED LLD (Optional)		OTHER TYPE OF ANALYSIS (Specify)		LIST DESIRED LLD (Optional)	
<input checked="" type="checkbox"/> GROSS ALPHA (GA)							
<input checked="" type="checkbox"/> GROSS BETA (GB)							
<input type="checkbox"/> GAMMA SPEC (GS)							
<input checked="" type="checkbox"/> TRITIUM (H3)							
<input type="checkbox"/> CARBON-14 (C14)							
<input type="checkbox"/> IODINE-125 (I125)							
REMARKS Run Duplicates - sample came in two separate containers							
NOTE: SAMPLES WILL BE DISCARDED AFTER ANALYSIS UNLESS REASONS ARE NOTED IN REMARKS ABOVE.							
*** FOR URGENT USE ONLY - Signature blocks below must be completed by the Inspector's appropriate Section Chief and by the Chief, Effluents Radiation Protection Section BEFORE submitting this form to the Region III Laboratory.							
SIGNATURE - APPROPRIATE NUCLEAR MATERIALS SAFETY SECTION CHIEF J W McErmid Berger						DATE 2/23/94	
SIGNATURE - FUEL FACILITIES AND CONTAMINATED SITES SECTION Steve M. Zyc Zyc						DATE 2/24/94	

23 Feb 94 13:13

Protocol #:18

H-3/C-14 DPM

Page #1

User : GLINSKI/ANDRE

Time: 10.00

Data Mode: Dual DPM

Nuclides: 3H14C-UGXR

Quench Sets

Sigma Coincidence On

Low Energy: 3H-UGXR

Background Subtract: 1st Vial

High Energy: 14C-UGX

R

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 12.0		0	0.5	4.60
Region B:	4.0 - 156		0	0.5	19.30
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

WATER SAMPLES FROM FERMI

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPM1	DPM2	tSIE
1	10.00	4.60 29.49	19.30 14.36			247.85

2300

000000

0

KeV

50

2	10.00	2615.20	1.25	2530.60	1.27	10461.7	95.41	248.60
3	10.00	2657.70	1.24	2572.70	1.26	10724.6	90.84	246.64
4	3.62	44497.6	0.50	43994.0	0.50	208403	547.55	216.24

$$QA \text{ count} = \frac{\text{meas}}{\text{known}} = \frac{208400}{213000} = 0.978$$

H-3 Activity of Fermi Sample

$$\text{Activity} = \frac{\text{DPM}}{\text{Vol}(\text{ml}) \times 2,220,000 \frac{\text{DPM}}{\mu\text{Ci}}}$$

#1

$$\text{Act} = \frac{10462}{10\text{ml} \times 2.22\text{E}6 \frac{\text{DPM}}{\mu\text{Ci}}} = 4.7\text{E}-4 \mu\text{Ci}/\text{ml}$$

$$\text{\#2 Act} = \frac{10725}{10\text{ml} \times 2.22\text{E}6 \frac{\text{DPM}}{\mu\text{Ci}}} = 4.8\text{E}-4 \mu\text{Ci}/\text{ml}$$

2 σ counting uncertainty = 1.25%

Sample Number 4 Sample Id: blank Sample Type: smear
Thu Feb 24 15:06:48 1994
Counting Time: 30 min 0 sec

	Alpha Counts	Beta Counts
Gross	1	25
Net CPM	0.033	0.833
Std Deviation (%)	200.000	40.000
Concentration (DPM/swp)	0.0971817 (DPM/swp)	2.05255

Sample Number 5 Sample Id: NO. 1 Sample Type: SMEAR
Thu Feb 24 15:37:00 1994
Counting Time: 30 min 0 sec

	Alpha Counts	Beta Counts
Gross	6	1844
Net CPM	0.167	60.633
Std Deviation (%)	81.650	4.657
Concentration (DPM/swp)	0.485909 (DPM/swp)	149.343

Sample Number 6 Sample Id: NO. 2 Sample Type: SMEAR
Thu Feb 24 16:07:12 1994
Counting Time: 30 min 0 sec

	Alpha Counts	Beta Counts
Gross	6	1514
Net CPM	0.167	49.633
Std Deviation (%)	81.650	5.140
Concentration (DPM/swp)	0.485909 (DPM/swp)	122.25

Sample Number 7 Sample Id: PB-210 SOURCE Sample Type: CHECK
Thu Feb 24 16:08:24 1994
Counting Time: 1 min 0 sec

	Alpha Counts	Beta Counts
Gross	1357	3079
Net CPM	1357.000	3079.000
Std Deviation (%)	5.429	3.604
Concentration (DPM/gro)	1357 (DPM/gro)	3079

Gross Beta Activity of Fermi Sample

$$Act = \frac{DPM}{Vol.(ml) \times 2.22E0 \frac{dpm}{\mu Ci}}$$

$$\#1 = \frac{149}{50 \times 2.22} = 1.34 \mu Ci/ml$$

$$\text{or } 1340 \mu Ci/L \pm 60$$

$$\#2 = \frac{122}{50 \times 2.22} = 1.10 \mu Ci/ml$$

$$\text{or } 1100 \mu Ci/L \pm 60$$

Void #2 - poor geometry

NRC FORM 303 (R11)		U.S. NUCLEAR REGULATORY COMMISSION		LABORATORY USE ONLY	
REQUEST FOR ANALYSIS				CONTROL NUMBER 94-022	
REGION III LABORATORY				LICENSE NO. _____	
SAMPLE SUBMITTED				DOCKET NO. _____	
# TOTAL	TYPE			DATE SAMPLES SUBMITTED	PRIORITY
1	Waste			2/23/94	ROUTINE
					<input checked="" type="checkbox"/> URGENT ***
				SAMPLE COLLECTION INTERVAL	
				START	MONTH DAY YEAR TIME
				STOP	
INSPECTOR RESPONSIBLE		TELEPHONE NUMBER			
Orth					
ANALYSIS TO BE PERFORMED		LIST DESIRED LLD (Optional)	OTHER TYPE OF ANALYSIS (Specify)		LIST DESIRED LLD (Optional)
<input checked="" type="checkbox"/> GROSS ALPHA (GA)					
<input checked="" type="checkbox"/> GROSS BETA (GB)					
GAMMA SPEC (GS)					
<input checked="" type="checkbox"/> TRITIUM (H3)					
CARBON-14 (C14)					
IODINE-125 (I125)					
REMARKS					
<p style="font-size: 1.2em;">Run Duplicates - sample came in two separate containers</p>					
NOTE: SAMPLES WILL BE DISCARDED AFTER ANALYSIS UNLESS REASONS ARE NOTED IN REMARKS ABOVE.					
*** FOR URGENT USE ONLY - Signature blocks below must be completed by the inspector's appropriate Section Chief and by the Chief, Effluents Radiation Protection Section BEFORE submitting this form to the Region III Laboratory					
SIGNATURE - APPROPRIATE NUCLEAR MATERIALS SAFETY SECTION CHIEF				DATE	
J W McArmist-Berg				2/23/94	
SIGNATURE - FUEL FACILITIES AND CONTAMINATED SITES SECTION				DATE	
Dr. M. Zyc. M. C.				2/24/94	

SAMPLE RECORD SHEET

REGION III LABORATORY

94-022

ROUTINE

DATE REQUIRED

URGENT

2/23/94

SAMPLE LOCATION

Fermi Power Plant

DATE ANALYSIS BEGAN

2/23/94

DATE COMPLETED

2/23-94

ANALYZED BY

Andre / Glinski

DATE

2/23/94

COLLECTED BY

Corth

DIVISION

DRSS

TELEPHONE

CONTACT NOTIFIED

DATE

APPROVED BY

Glinski

DATE

2/23/94

SAMPLE				ANALYZE FOR	INSTRUMENT USED	QUANTITY USED	DATE COUNTED	COUNT TIME	GROSS COUNT	BACK-GROUND	NET COUNT	RESULT
NO	DATE	HOUR	DESCRIPTION									
463			#1	14-3	LSC	10ml	2/23/94	10 min				4.7E-4
464			#2	14-3	↓	↓	↓	↓				4.8E-4
												± 1.25%
463			#1	Gross 65000	50ml			30min				1340 ± 60
464			#2	↓	↓	↓	↓	↓				1100 ± 60
#2 sample had poor geometry for Gross Beta Analysis												

NRC FORM 304 (R11)

U. S. NUCLEAR REGULATORY COMMISSION

LABORATORY CONTROL NUMBER

94-027

ROUTINE

DATE REQUIRED

3/16/94

94

3/15/94

0740

Fermi, CST Water

DISCHARGE

Shah

DRS

DATE ANALYSIS BEGAN

3/15/94

DATE COMPLETED

3/16/94

DATE

3/16/94

ANALYZE FOR

INSTRUMENT USED

QUANTITY USED

DATE COUNTED

COUNT TIME

GROSS COUNT

BACK GROUND

NET COUNT

RESULT $\pm 2\sigma$

H-3

LSC

10ml

3/15/94

10 min

H-3

3.3E-4 \pm 5.0E-6

γ

POT

510.3 gms

3/15/94

1 hr

Mn 54

1.1E-7 \pm 5.0E-8

Co 58

9.0E-8 \pm 4.6E-8

Co 60

6.7E-7 \pm 9.2E-8

Zn 65

1.7E-7 \pm 1.1E-7

~~2.4E-8 \pm 5~~

I 131

2.9E-8 \pm 3.4E-8

Co 134

2.8E-7 \pm 5.2E-8

Co 137

2.3E-7 \pm 5.6E-8

H-3

3.4E-4 \pm 5.1E-6

Mn 54

1.6E-7 \pm 5.8E-8

Co 58

9.1E-8 \pm 5.4E-8

Co 60

7.5E-7 \pm 1.0E-7

Co 134

1.6E-7 \pm 4.8E-8

Co 137

2.0E-7 \pm 5.6E-8

NRC FORM 304 (R11) (4-93)

* Random uncertainties reported are 2 standard deviations, results $\leq 2\sigma$ are interpreted as including "zero" or as not directed. If appropriate, estimates of possible systematic errors are reported in parentheses.

15 Mar 94 16:52

Page #1

Protocol #:16

H-3/C-14 DPM

User : GLINSKI/ANDRE

Time: 10.00

Data Mode: Dual DPM

Nuclides: 3H14C-UGXR

Quench Sets

Sigma Coincidence On

Low Energy: 3H-UGXF

Background Subtract: 1st Vial

High Energy: 14C-UG>

R

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 12.0		0	0.5	4.00
Region B:	4.0 - 156		0	0.5	20.00
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

FERMI 2, CST SAMPLE, FOR H-3. (Andre/Orth)

Luminescence Correction On

S#	TIME	CPMA	A:2S%	CPMB	B:2S%	DPM1	DPM2	tSIE
1	10.00	4.00	31.62	20.00	14.14			258.20 <i>Blank</i>
2	10.00	1849.20	1.49	1832.10	1.50	7320.98	127.65	250.23 <i>94-198u</i>
3	10.00	1873.50	1.48	1851.80	1.49	7373.90	127.24	251.65 <i>94-198b</i>
4	10.00	1886.70	1.47	1887.90	1.48	7437.54	156.36	250.89 <i>94-199a</i>
5	10.00	1891.60	1.47	1878.40	1.48	7465.92	137.82	250.86 <i>94-199b</i>
6	2.54	73944.4	0.46	63130.4	0.50	207246	1484.22	371.16 <i>Quench Std</i>

Calculations

QC count

$$\text{Std} \quad 223600 \times .95(e^{-2\sigma}) = 212000$$

$$\frac{\text{meas}}{\text{known}} = \frac{207000}{212000} = 0.976$$

$$\textcircled{a} \quad \frac{7321 \text{ dpm}}{10 \text{ ml} \times 2.22 \text{E}6 \frac{\text{dpm}}{\mu\text{Ci}}} = 3.3 \text{E-}4 \mu\text{Ci/ml}$$

$$\textcircled{b} \quad \frac{7374 \text{ dpm}}{10 \text{ ml} \times 2.22 \text{E}6 \frac{\text{dpm}}{\mu\text{Ci}}} = 3.3 \text{E-}4 \mu\text{Ci/ml}$$

$$\textcircled{a} \quad \frac{7438 \text{ dpm}}{10 \text{ ml} \times 2.22 \text{E}6 \frac{\text{dpm}}{\mu\text{Ci}}} = 3.4 \text{E-}4 \mu\text{Ci/ml}$$

$$\textcircled{b} \quad \frac{7466 \text{ dpm}}{10 \text{ ml} \times 2.22 \text{E}6 \frac{\text{dpm}}{\mu\text{Ci}}} = 3.4 \text{E-}4 \mu\text{Ci/ml}$$

1. 1980年1月1日以前

[illegible][illegible]

OFFSET: - 7430013 KEV * ABUNDANCE LIMIT: 75.00%

PK	IT	ENERGY	AREA	ENGD	FWHM	CHANNEL	LEFT	PK	CTS/SEC	%ERR	FIT
1	C	244.57	62.	313.	14.67	489.44	472	36	1.72E-02	96.2	
2	C	335.15	30.	63.	72	730.60	722	13	8.45E-03	60.4	
3	C	427.71	63.	70.	1.66	854.32	847	14	1.74E-02	32.2	
4	S	690.53	83.	10.	2.20	1199.60	1192	33	2.31E-02	18.3	2.29E+00
5	S	904.66	193.	20.	2.17	1207.85	1192	18	5.37E-02	9.5	
6	C	987.13	101.	13.	1.37	1321.36	1314	15	3.64E-02	11.9	
7	C	700.55	74.	30.	1.42	1586.70	1583	11	2.61E-01	14.9	
8	C	510.34	50.	17.	1.36	1618.31	1614	12	1.39E-02	25.0	
9	C	677.33	55.	14.	1.76	1666.47	1662	10	1.65E-02	23.1	
10	C	1117.39	33.	16.	1.09	2224.33	2213	17	7.69E-03	31.4	
11	C	1117.40	287	11.	1.05	1040.36	1031	16	7.97E-02	6.3	
12	C	1117.43	37	11.	2.13	2097.31	2043	15	6.44E-02	6.8	

		1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0	195.17	30.	515.	14.67	435.44	47	12	1.71E-02	18.2
2	0	265.17	30.	65.	.77	9.35	7	12	3.45E-03	90.4
3	0	417.73	61.	73.	1.66	154.62	84	12	1.74E-03	32.2
4	5	604.33	81.	15.	2.20	1337.63	1172	12	2.31E-02	18.3
5	5	604.66	153	20.	2.17	1207.63	119	33	5.37E-02	9.5
6	0	611.51	121.	26.	1.39	1321.33	1314	15	3.64E-02	11.9
7	0	7-5.33	94.	30.	1.42	1568.70	1563	12	2.61E-02	14.9

TOTAL LINES IN SPECTRUM 12
 UNIDENTIFIED PEAKS 3
 IDENTIFIED IN SUMMARY REPORT 9 73.000

ACTIVATION PRODUCT

NUCLIDE	EBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
MN-54	AP	312.70D	.996	1.096E -7	2.529E -8	20.06
CO-58	AP	70.80D	.984	9.044E -8	2.263E -8	20.02
CO-60	AP	1923.00D	.999	6.687E -7	4.578E -8	6.80
ZN-65	AP	244.40D	.995	1.674E -7	5.567E -8	13.38

HALOGEN FISSION PRODUCT

NUCLIDE	EBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
I-131	HFP	8.04D	.867	2.649E -8	1.722E -8	60.45

FISSION PRODUCT

NUCLIDE	EBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
CS-134	FP	753.10D	.998	2.756E -7	2.620E -8	9.51
CS-137	FP	30.17Y	1.000	2.328E -7	2.763E -8	11.67

13-MAR-74 10:55:22

```

NO. LINE: 0001 15 APR 94 15:23:55 * F4H4(1332) 1.975
CLOCKED TIME (LIVE): 3600. SEC * SENSITIVITY: 0.000
BLANKED REAL TIME: 3600. SEC * SHAPE PARAMETER : 10.0 %
FLYBACK LIVE TIME: 3600. SEC * NMR ITERATIONS: 10.

```

```
DETECTOR: ADC Detector          * LIBRARY: NUCL.LIB
CALIB DATE: 02-FEB-94 11:04:12 * ENERGY TOLERANCE: 1.500 KEV
EVE/CHNL:      .5012213        * HALF LIFE RATIO: 8.00
OFFSET:      -.7430013 KEV      * ABUNDANCE LIMIT: 75.00%
```

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	KERR	FIT
1	0	176.72	76.	73.	1.02	354.05	350	9	2.10E-02	25.4	
2	0	295.46	70.	47.	.90	590.96	587	9	1.95E-02	22.1	
3	0	351.30	93.	60.	1.70	703.37	697	12	2.59E-02	20.9	
4	0	428.34	97.	96.	1.92	856.07	847	19	2.70E-02	28.7	
5	2	604.87	111.	56.	1.57	1207.67	1203	23	3.08E-02	13.5	1.02E+00
6	2	609.29	79.	43.	1.87	1217.10	1203	23	2.19E-02	22.3	
7	0	661.47	111.	24.	1.96	1321.20	1314	13	3.09E-02	14.5	
8	0	745.64	86.	20.	1.28	1588.88	1583	11	2.39E-02	17.2	
9	0	810.50	50.	36.	1.38	1618.52	1611	16	1.39E-02	29.3	
10	0	835.41	85.	18.	1.95	1668.22	1661	18	2.36E-02	18.4	
11	0	1172.56	287.	25.	1.80	2340.90	2336	15	7.97E-02	7.2	
12	0	1331.77	262.	7.	1.68	2658.53	2651	16	7.27E-02	6.6	

PULSE-FILE-UP CORRECTED DATA. CORRECTION = 1.000
UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PR	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	PW	CTS/SEC	ZERR
1	0	175.72	76.	73.	1.02	354.01	350	9	2.10E-02	26.4
2	0	275.46	70.	47.	1.90	590.96	587	9	1.93E-02	12.1
3	0	374.50	93.	60.	1.71	703.37	697	12	2.57E-02	10.5
4	0	421.34	57.	93.	1.92	836.17	847	9	2.70E-02	13.7
5	2	564.67	111.	56.	1.67	1207.87	1203	23	3.08E-02	13.4
6	2	601.29	79.	43.	1.87	1217.10	1203	13	2.14E-02	20.1
7	0	641.41	111.	24.	1.91	1331.31	1314	18	3.08E-02	14.1
8	2	711.04	76.	20.	1.28	1588.81	588	1	2.33E-02	17.1

TOTAL LINES IN SPECTRUM 2
 UNIDENTIFIED PEAKS 5
 IDENTIFIED IN SUMMARY REPORT 7 58.33%

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	GC/GRAM	1-SIGMA	ERROR	1-SIGMA
CS-134	FP	3.2.75D	1.999	1.578E -7	1.444E -8	15.43	
CS-137	FP	30.17Y	1.000	1.962E -7	1.838E -8	14.43	

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	GC/GRAM	1-SIGMA	ERROR	1-SIGMA
CS-134	FP	753.10L	.999	1.578E -7	1.444E -8	15.43	
CS-137	FP	30.17Y	1.000	1.962E -7	1.838E -8	14.43	

16 Mar 94 13:16

Protocol #:12

H-3 DPM

Page #1

User : ANDRE/GLINSKI

Time: 30.00

Data Mode: DPM

Nuclide: 3H-UGXR

Quench Set: 3H-UGXR

Sigma Coincidence On

Background Subtract: 1st Vial

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 18.6		0	0.5	9.53
Region B:	2.0 - 18.6		0	0.5	9.63
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

MONROE INTAKE WATER - FERMI ORTH

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPM1	tSIE
1	30.00	9.53 11.83	9.63 11.76		249.68 <i>Blank</i>
2	30.00	0.00 0.00	0.00 0.00	0.00	247.98 <i>94-043</i>
3	30.00	0.40 492.7	0.40 484.5	1.43	249.59 <i>94-049</i>
4	30.00	0.00 0.00	0.00 *****	0.00	249.85 <i>94-060</i>
5	3.98	40019.6 0.51	39841.4 0.51	206932	177.84 <i>Quench Std.</i>

Calculation

QC count $541 \times e^{-\lambda t} = 212,000$

$$\frac{\text{meas}}{\text{known}} = \frac{207,000}{212,000} = 0.976$$

$$\begin{aligned} \text{LLD} &\approx \frac{4.66 \times 1 \text{ cpm}}{10 \text{ ml} \times \frac{0.3 \text{ cpm}}{\text{dpm}} \times \frac{2.22 \text{ EG dpm}}{\mu\text{Ci}}} \\ &\approx 7\text{E}-7 \mu\text{Ci/ml} \text{ or } 700 \text{ pCi/L} \end{aligned}$$

94-027

REGION III LABORATORY

ROUTINE

DATE REQUIRED

URGENT

3/17/94

SAMPLE LOCATION

DATE ANALYSIS BEGAN

DATE COMPLETED

ANALYZED BY

DATE _____

COLLECTED BY

DIVISION

TELEPHONE

CONTACT NOTIFIED

DATE _____

APPROVED BY

DATE _____

SAMPLE

ANALYSTS:

INSTRU-

DOI: 10.1002/for

476 A. BERNARD

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

1999

1999

100

RESULT $\pm 2\sigma$ *int/pt*

NO.	DATE	HOUR	DESCRIPTION	FOR	MENT USED	USED	COUNTED	TIME	COUNT	GROUND	COUNT	RESULT $\pm 2\sigma$ $\mu\text{Ci/ml}$
96 201	3/16/44	0805	Form. CST Water	H-3	LSC	10 ml	3/17/44	30 min				H-3 $3.4E-4 \pm 2.9E-6$
				J	POT	506.1 grams	"	60 min				^{226}Ra 54 $1.2E-7 \pm 5.6E-8$
												^{60}Co 58 $9.3E-8 \pm 4.4E-8$
												^{60}Co 60 $6.7E-7 \pm 9.4E-8$
												^{226}Ra 65 $1.5E-7 \pm 1.2E-7$
												^{134}Cs 134 $2.5E-7 \pm 7.0E-8$
												^{137}Cs 137 $1.7E-7 \pm 4.8E-8$

 ***** 17-MAR-94 14:52:56 *****

FERMI 2 CST LIQUID: DURING 3/94 DISCHARGE

SPECTRAL FILE NAME: L942011.RSL
 SAMPLE DATE: 16-MAR-94 07:05:00
 SAMPLE IDENTIFICATION: L942011.RSL
 TYPE OF SAMPLE: LIQUID
 SAMPLE QUANTITY: 506.1000 UNITS: GRAMS
 SAMPLE GEOMETRY: MAR50093.EFF
 EFFICIENCY FILE NAME: MAR50093.EFF

 ACQUIRE DATE: 17-MAR-94 13:44:10 * FWHM(1332) 1.075
 PRESET TIME (LIVE): 3600. SEC * SENSITIVITY: 1.000
 ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER: 10.0 %
 ELAPSED LIVE TIME: 3600. SEC * NBR ITERATIONS: 10

 DETECTOR: ADC Detector * LIBRARY: NJCL.LIB
 CALIB DATE: 02-FEB-94 11:04:12 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: .5012213 * HALF LIFE RATIO: 8.00
 OFFSET: -.7430013 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW -1.24 TO 4105.26

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	2	16.55	49.	12.	1.07	34.50	31	12	1.37E-02	22.5	4.77E-01
2	2	18.29	24.	65.	1.59	37.98	31	12	6.60E-03	74.1	
3	0	23.92	26.	57.	1.32	49.20	47	6	7.28E-03	54.5	
4	0	175.89	41.	90.	1.46	352.41	349	10	1.15E-02	47.1	
5	0	351.89	13.	50.	1.26	703.55	699	8	3.55E-03	96.1	
6	0	428.38	39.	91.	1.92	856.15	847	18	1.64E-02	40.7	
7	0	510.36	76.	29.	2.35	1019.72	1013	16	2.11E-02	23.3	
8	0	528.78	29.	15.	.94	1136.28	1132	10	8.18E-03	31.8	
9	0	604.47	174.	76.	1.74	1207.48	1199	15	4.84E-02	14.2	
10	0	635.57	32.	32.	1.33	1269.53	1263	13	8.92E-03	40.5	
11	0	661.47	97.	17.	1.29	1321.21	1316	11	2.70E-02	13.6	
12	0	795.74	101.	33.	1.81	1589.08	1582	17	2.62E-02	18.0	
13	0	810.39	50.	18.	1.28	1618.32	1614	10	1.38E-02	23.6	
14	0	834.37	64.	21.	2.06	1666.13	1661	13	1.78E-02	23.3	
15	0	1115.43	31.	21.	1.51	2226.91	2220	12	8.64E-03	59.5	
16	0	1172.49	234.	17.	2.33	2340.74	2333	16	6.50E-02	7.2	
17	0	1331.60	230.	15.	2.05	2656.19	2651	13	6.40E-02	7.1	

PEAK SEARCH COMPLETED (REV 15.8 - ND PC VERSION DEC 88)

PULSE-PILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR
1	2	16.55	49.	12.	1.07	34.50	31	12	1.37E-02	22.5
2	2	18.29	24.	65.	1.59	37.98	31	12	6.60E-03	74.1
3	0	23.92	26.	57.	1.32	49.20	47	6	7.28E-03	54.5

TOTAL LINES IN SPECTRUM	7	
UNIDENTIFIED PEAKS	8	
IDENTIFIED IN SUMMARY REPORT	9	12.74%

ACTIVATION PRODUCT

NUCLIDE	SDHK	HLIFE	DECAY	UCI/GRAMS	1-SIGMA ERROR	ERR
DE-64	4P	12.70E	1.000	1.210E -7	1.321E -8	21.37
CO-58	4P	70.90E	1.013	1.284E -8	2.173E -8	17.82
CO-60	4P	192.10E	1.000	5.709E -7	4.748E -8	1.02
IR-62	4P	241.40E	1.004	1.520E -7	6.002E -8	39.45

FISSION PRODUCT

NUCLIDE	SDHK	HLIFE	DECAY	UCI/GRAMS	1-SIGMA ERROR	ERR
CS-134	FP	753.10E	1.001	2.513E -7	3.676E -8	14.23
CS-137	FP	30.17Y	1.000	1.745E -7	2.369E -8	13.58

17 Mar 94 15:31

Protocol #:16

H-3/C-14 DPM

Page #1

User : GLINSKI/ANDRE

Time: 30.00

Data Mode: Dual DPM

Nuclides: 3H14C-UGXR

Quench Sets

Sigma Coincidence On

Low Energy: 3H-UGXR

Background Subtract: 1st Vial

High Energy: 14C-UGXR

R

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 12.0		0	0.5	5.20
Region B:	4.0 - 156		0	0.5	21.20
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

FERMI CST SECOND DISCHARGE ORTH

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPM1	DPM2	tSIE
1	30.00	5.20 16.01	21.20 7.94			252.96 <i>Blank</i>
2	30.00	1878.57 0.85	1872.80 0.86	7475.04	141.39	248.89 <i>94-201</i>

$$H-3 \text{ Act} = \frac{DPM}{Vol \times \frac{DPM}{\mu C}}$$

$$= \frac{7475 \text{ dpm}}{10 \text{ ml} \times 222 \text{ EG dpm } \mu C}$$

$$= 3.4 \text{ E-}4 \pm 2.9 \text{ E-}6 \text{ } \mu C/\text{ml}$$

NRC FORM 303 (RIII) (3-93)		U. S. NUCLEAR REGULATORY COMMISSION		LABORATORY USE ONLY	
REQUEST FOR ANALYSIS REGION III LABORATORY				CONTROL NUMBER 94-027	
SAMPLE LOCATION (LICENSEE) Fermi				LICENSE NO.	
SAMPLE SUBMITTED				DOCKET NO.	
# TOTAL	TYPE			DATE SAMPLES SUBMITTED	PRIORITY
2	Water - Glass & plastic containers			3/15/94	<input type="checkbox"/> ROUTINE <input checked="" type="checkbox"/> URGENT ***
3	Water in glass - Monroe Entolite			SAMPLE COLLECTION INTERVAL	
INSPECTOR RESPONSIBLE Orth/Shah				START	STOP
ANALYSIS TO BE PERFORMED		LIST DESIRED LLD (Optional)	OTHER TYPE OF ANALYSIS (Specify)	LIST DESIRED LLD (Optional)	
GROSS ALPHA (GA)					
GROSS BETA (GB)					
<input checked="" type="checkbox"/> GAMMA SPEC (GS) - plastic					
<input checked="" type="checkbox"/> TRITIUM (H3) - glass					
CARBON-14 (C14)					
IODINE-125 (I125)					
REMARKS					
NOTE: SAMPLES WILL BE DISCARDED AFTER ANALYSIS UNLESS REASONS ARE NOTED IN REMARKS ABOVE.					
FOR URGENT USE ONLY: Signature block below must be completed by the Inspector, appropriate Section Chief and by the Chief, Emergency Radiation Protection Section BEFORE submitting this form to the Region III Laboratory.					
SIGNATURE (Inspector, Emergency Response, or Section Chief)				DATE	
3-16-94				3-16-94	
SIGNATURE (Emergency Response, or Contaminated Sites Section)				DATE	

REGION III LABORATORY

94-027

DATE REQUIRED

URGENT

SAMPLE LOCATION

DATE ANALYSIS BEGAN 11/11/68

DATE COMPLETED 12/1/78

ANALYZED BY

COLLECTED BY

DIVISION

TELEPHONE

CONTACT NOTIFIED

DATE _____

APPROVED BY _____

SAMPLE

ANALYZE
FORINSTRUMENT
USEDQUANTITY
USEDDATE
COUNTEDCOUNT
TIMEGROSS
COUNT

BACK-
CROWING

NET
COUNT

RESUM

[illegible]

16 Mar 94 13:16

Page #1

Protocol #:12

H-3 DPM

User : ANDRE/GLINSKI

Time: 30.00

Data Mode: DPM

Nuclide: 3H-UGXR

Quench Set: 3H-UGXR

Sigma Coincidence On

Background Subtract: 1st Vial

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 18.6		0	0.5	9.53
Region B:	2.0 - 18.6		0	0.5	9.63
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

MONROE INTAKE WATER - FERMI ORTH

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPM1	tSIE
1	30.00	9.53 11.83	9.63 11.76		249.68 <i>Blank</i>
2	30.00	0.00 0.00	0.00 0.00	0.00	247.98 <i>94-043</i>
3	30.00	0.40 492.7	0.40 484.5	1.43	249.59 <i>94-049</i>
4	30.00	0.00 0.00	0.00 *****	0.00	249.85 <i>94-060</i>
5	3.98	40019.6 0.51	39841.4 0.51	206932	177.84 <i>Quench Std.</i>

Calculation

QC count $5\text{td} \times e^{-\lambda t} = 212,000$

$$\frac{\text{meas}}{\text{known}} = \frac{207,000}{212,000} = 0.976$$

$$\text{LLD} \approx \frac{4.66 \times 1 \text{ cpm}}{10 \text{ ml} \times \frac{0.3 \text{ cpm}}{\text{dpm}} \times \frac{2.22 \text{ EG dpm}}{\mu\text{Ci}}}$$

$$\approx 7\text{E}-7 \mu\text{Ci/ml} \text{ or } 700 \text{ pCi/L}$$

15 Mar 94 16:52

Page #1

Protocol #:16

H-3/C-14 DPM

User : GLINSKI/ANDRE

Time: 10.00

Data Mode: Dual DPM

Nuclides: 3H14C-UGXR

Quench Sets

Sigma Coincidence On

Low Energy: 3H-UGXR

Background Subtract: 1st Vial

High Energy: 14C-UGX

R

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 12.0		0	0.5	4.00
Region B:	4.0 - 156		0	0.5	20.00
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

FERMI 2, CST SAMPLE, FOR H-3. (Andre/Orth)

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPM1	DPM2	tSIE
1	10.00	4.00 31.62	20.00 14.14			258.20
2	10.00	1849.20 1.49	1832.10 1.50	7320.98	127.65	250.23
3	10.00	1873.50 1.48	1851.80 1.49	7373.90	127.24	251.65
4	10.00	1886.70 1.47	1887.90 1.48	7437.54	156.36	250.89
5	10.00	1891.60 1.47	1878.40 1.49	7465.92	137.82	250.86
6	2.54	73944.4 0.46	63130.4 0.50	207246	1484.22	371.16

Blank
94-198a
94-198b
94-199a
94-199b
Quench Std

Calculations

QC count

$$\text{Std } 223600 \times .95(e^{-2t}) = 212000$$

$$\frac{\text{meas}}{\text{known}} = \frac{207000}{212000} = 0.976$$

$$\textcircled{a} \frac{7321 \text{ dpm}}{10 \text{ ml} \times 2.22 \text{E}6 \frac{\text{dpm}}{\mu\text{Ci}}} = 3.3 \text{E-}4 \mu\text{Ci/ml}$$

$$\textcircled{b} \frac{7374 \text{ dpm}}{10 \text{ ml} \times 2.22 \text{E}6 \frac{\text{dpm}}{\mu\text{Ci}}} = 3.3 \text{E-}4 \mu\text{Ci/ml}$$

$$\textcircled{c} \frac{7438 \text{ dpm}}{10 \text{ ml} \times 2.22 \text{E}6 \frac{\text{dpm}}{\mu\text{Ci}}} = 3.4 \text{E-}4 \mu\text{Ci/ml}$$

$$\textcircled{d} \frac{7466 \text{ dpm}}{10 \text{ ml} \times 2.22 \text{E}6 \frac{\text{dpm}}{\mu\text{Ci}}} = 3.4 \text{E-}4 \mu\text{Ci/ml}$$

 ***** 13-MAR-94 16:55:22 *****

74-199 FERMI CST WATER MID-CIRC

SPECTRAL FILE NAME: L941991.R3L
 SAMPLE DATE: 14-MAR-94 16:11:00
 SAMPLE IDENTIFICATION: L941991.R3L
 TYPE OF SAMPLE: WATER
 SAMPLE QUANTITY: 512.1000 UNITS: GRAM
 SAMPLE GEOMETRY: MAR500
 EFFICIENCY FILE NAME: MAR50093.EFF

ACQUIRE DATE: 13-MAR-94 15:22:53 * FWHM(1332) 1.975
 PRESET TIME(LIVE): 3600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER : 10.0 %
 ELAPSED LIVE TIME: 3600. SEC * NBR ITERATIONS: 10.

DETECTOR: ADC Detector * LIBRARY:NUCL.LIB
 CALIB DATE: 02-FEB-94 11:04:12 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: .5012213 * HALF LIFE RATIO: 8.00
 OFFSET: -.7430013 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW -1.24 TO 4105.26

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	176.72	76.	73.	1.02	354.05	350	9	2.10E-02	26.4	
2	0	295.46	70.	47.	.90	590.96	587	9	1.95E-02	22.1	
3	0	351.80	93.	60.	1.70	703.37	697	12	2.59E-02	20.9	
4	0	428.34	97.	96.	1.92	856.07	847	19	2.70E-02	28.7	
5	2	604.67	111.	56.	1.57	1207.87	1203	23	3.08E-02	15.5	1.00E-00
6	2	609.29	79.	43.	1.87	1217.10	1203	23	2.19E-02	22.3	
7	0	661.47	111.	24.	1.96	1321.20	1314	18	3.08E-02	14.5	
8	0	795.64	86.	20.	1.28	1588.88	1585	11	2.39E-02	17.0	
9	0	810.50	50.	36.	1.38	1618.52	1611	16	4.39E-02	26.3	
10	0	835.41	35.	18.	1.95	1668.22	1661	18	2.36E-02	12.4	
11	0	1172.56	287.	25.	1.80	2340.90	2336	15	7.97E-02	7.2	
12	0	1331.77	262.	7.	1.60	2658.53	2651	16	7.27E-02	3.0	

PEAK SEARCH COMPLETED (REV 15.8 - ND PC VERSION DEC 88)

PULSE-FILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR
1	0	176.72	76.	73.	1.02	354.05	350	9	2.10E-02	26.4
2	0	295.46	70.	47.	.90	590.96	587	9	1.95E-02	22.1
3	0	351.80	93.	60.	1.70	703.37	697	12	2.59E-02	20.9
4	0	428.34	97.	96.	1.92	856.07	847	19	2.70E-02	28.7
5	2	604.67	111.	56.	1.57	1207.87	1203	23	3.08E-02	15.5
6	2	609.29	79.	43.	1.87	1217.10	1203	23	2.19E-02	22.3
7	0	661.47	111.	24.	1.96	1321.20	1314	18	3.08E-02	14.5
8	0	795.64	86.	20.	1.28	1588.88	1585	11	2.39E-02	17.0

7	0	870.40	80.	29.	1.90	1818.02	1818.	18	1.87E-02	27.3
10	0	835.41	85.	18.	1.95	1668.22	1661	18	2.36E-02	18.4
11	0	1172.56	287.	25.	1.80	2340.90	2335	15	7.97E-02	7.2
12	0	1331.77	262.	7.	1.68	2658.53	2651	16	7.27E-02	6.6

FILE-UP CORRECTION COMPLETED

FISSION GAS

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
KR-88	FG	196.32	0.	0.	25.00*	0.000E+00	.000E 0	.000E 0
		834.83	85.	18.	13.00	7.839E-01	3.239E -9	5.961E-10
		1529.77	0.	0.	10.90	0.000E+00	.000E 0	.000E 0
		2193.84	0.	0.	13.20	0.000E+00	.000E 0	.000E 0
		2392.11	0.	0.	34.60	0.000E+00	.000E 0	.000E 0
Xe-135	FG	249.79	0.	0.	89.90*	0.000E+00	.000E 0	.000E 0
		608.18	79.	43.	2.89	1.048E+00	5.995E -7	1.337E -7

ACTIVATION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
MN-54	AP	834.83	85.	18.	97.98*	7.839E-01	1.586E -7	2.520E -8
CO-58	AP	810.76	50.	36.	99.40*	8.060E-01	9.055E -8	2.650E -8
CO-60	AP	1173.22	287.	25.	100.00	5.736E-01	7.332E -7	5.264E -8
		1332.49	262.	7.	100.00*	5.101E-01	7.515E -7	4.985E -8

HALOGEN FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
I-135	HFP	546.56	0.	0.	7.21	0.000E+00	.000E 0	.000E 0
		836.80	85.	18.	6.67	7.839E-01	1.663E -7	3.429E -8
		1038.76	0.	0.	7.90	0.000E+00	.000E 0	.000E 0
		1131.51	0.	0.	22.50	0.000E+00	.000E 0	.000E 0
		1260.41	0.	0.	28.60*	0.000E+00	.000E 0	.000E 0
		1457.56	0.	0.	3.50	0.000E+00	.000E 0	.000E 0
		1678.03	0.	0.	9.50	0.000E+00	.000E 0	.000E 0
		1791.20	0.	0.	7.70	0.000E+00	.000E 0	.000E 0

FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
RU-103	FP	497.02	0.	0.	89.00*	0.000E+00	.000E 0	.000E 0
		610.33	79.	43.	5.50	1.048E+00	1.931E -6	4.306E -7
Zr-138	FP	176.33	78.	73.	6.89	3.090E+00	5.200E -7	1.371E -7
		427.89	97.	96.	29.33*	1.449E+00	3.351E -7	9.627E -8
		463.38	0.	0.	10.35	0.000E+00	.000E 0	.000E 0
		600.50	0.	0.	17.80	0.000E+00	.000E 0	.000E 0
		635.90	0.	0.	11.32	0.000E+00	.000E 0	.000E 0
CS-134	FP	563.23	0.	0.	8.38	0.000E+00	.000E 0	.000E 0
		569.32	0.	0.	15.43	0.000E+00	.000E 0	.000E 0
		604.70	111.	56.	97.60*	1.056E+00	1.578E -7	2.444E -8
		795.85	86.	20.	85.40	6.199E-01	1.801E -7	3.099E -8
		801.93	0.	0.	8.73	0.000E+00	.000E 0	.000E 0

ELAPSED LIVE TIME: 3600. (FILE-UP CORRECTED)

FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
CS-136	FP	176.55	75.	73.	13.56	3.090E+00	2.507E -7	6.609E -8
		273.65	0.	0.	12.66	0.000E+00	.000E 0	.000E 0
		340.57	0.	0.	46.50	0.000E+00	.000E 0	.000E 0
		818.50	0.	0.	99.70*	0.000E+00	.000E 0	.000E 0
		1048.07	0.	0.	79.60	0.000E+00	.000E 0	.000E 0
		1235.34	0.	0.	19.70	0.000E+00	.000E 0	.000E 0
CS-137	FP	661.65	111.	24.	85.12*	9.719E-01	1.952E -7	2.838E -8

NATURAL PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
RA-226	NF	186.21	0.	0.	3.28	0.000E+00	.000E 0	.000E 0
		241.96	0.	0.	7.49	0.000E+00	.000E 0	.000E 0
		295.21	70.	47.	19.20	2.028E+00	2.536E -7	5.814E -8
		351.92	93.	60.	37.20	1.753E+00	2.117E -7	4.420E -8
		609.31	79.	43.	46.30*	1.048E+00	2.378E -7	5.302E -8
		1120.29	0.	0.	15.10	0.000E+00	.000E 0	.000E 0
		1238.11	0.	0.	5.94	0.000E+00	.000E 0	.000E 0
		1764.47	0.	0.	13.80	0.000E+00	.000E 0	.000E 0
		2204.22	0.	0.	4.98	0.000E+00	.000E 0	.000E 0

ELAPSED LIVE TIME 3600. (PILE-UP CORRECTED)

UNIDENTIFIED PEAKS

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	%EFF
1	0	176.72	76.	73.	1.02	354.05	350	9	2.10E-02	36.4	3.09E+00
2	0	295.46	70.	47.	.90	590.96	587	9	1.75E-02	22.1	2.03E+00
3	0	351.80	93.	60.	1.70	703.37	697	12	2.59E-02	20.9	1.73E+00
4	0	428.34	97.	96.	1.92	856.07	847	19	2.70E-02	28.7	1.45E+00
6	2	609.29	79.	43.	1.87	1217.10	1203	23	2.19E-02	22.3	1.05E+00

LINES NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	UCI/GRAM	ABNDIFF	FAILED
1	SB-125	176.33	2.77Y	9.993E -1	3.200E -7	47.85%	ABN
1	CS-136	176.55	13.16D	9.481E -1	2.507E -7	4.95%	ABN
2	RA-226	295.21	1600.00Y	10.000E -1	2.636E -7	66.13%	ABN
3	RA-226	351.92	1600.00Y	10.000E -1	2.117E -7	66.13%	ABN
4	SB-125	427.89	2.77Y	9.993E -1	3.351E -7	47.85%	ABN
6	RU-103	610.33	39.35D	9.823E -1	1.931E -6	0.92%	ABN
6	XE-135	608.18	9.11H	1.573E -1	5.993E -7	3.11%	ABN
6	RA-226	609.31	1600.00Y	10.000E -1	2.378E -7	66.13%	ABN
10	KR-88	834.83	2.84H	2.649E -3	3.239E -9	13.31%	ABN
10	I-135	835.60	6.61h	7.817E -2	1.863E -7	6.73%	ABN

TOTAL LINES IN SPECTRUM 12
 UNIDENTIFIED PEAKS 5
 IDENTIFIED IN SUMMARY REPORT 7 58.33%

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
MN-54	AP	312.70D	.998	1.386E -7	2.920E -8	18.41
CO-58	AP	70.80D	.990	9.055E -8	2.650E -8	29.27
CO-60	AP	1925.00D	1.000	7.515E -7	4.985E -8	6.63

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
CS-134	FP	753.10D	.999	1.578E -7	2.444E -8	15.49
CS-137	FP	30.17Y	1.000	1.962E -7	2.838E -8	14.46

NRC FORM 304 (R11)
(4-93)

U. S. NUCLEAR REGULATORY COMMISSION

LABORATORY CONTROL NUMBER

94-027

SAMPLE RECORD SHEET

REGION III LABORATORY

ROUTINE

DATE REQUIRED

☒ URGENT

3/17/94

SAMPLE LOCATION

Fermi 2 - Second Package

DATE ANALYSIS BEGAN

3/17/94

DATE COMPLETED

3/17/94

ANALYZED BY

DATE

COLLECTED BY

Chh

DIVISION

DRSS

TELEPHONE

CONTACT NOTIFIED

DATE

APPROVED BY

DATE

SAMPLE			ANALYZE FOR	INSTRUMENT USED	QUANTITY USED	DATE COUNTED	COUNT TIME	GROSS COUNT	BACK-GROUND	NET COUNT	RESULT
NO.	DATE	HOUR	DESCRIPTION								
94-027	3/16/94	0805	Fermi CSV Water	H-3	LSL	10 ml	3/17/94	30 min			H-3 3.4E-4
				J	POT1	506.1 gms	11	60 min			H-3 1.2E-2
											Co 58 9.3E-2
											Co 60 6.2E-2
											Zr 65 1.5E-2
											Cs 134 2.5E-2
											Cs 137 1.7E-2

NRC FORM 304 (R11) (4-93)

* Random uncertainties reported are 2 standard deviations, results $\leq 2\sigma$ are interpreted as including "zero" or as not directed. If appropriate, estimates of possible systematic errors are reported in parentheses.

INSPECTOR

NRC FORM 303 (RIII)
(3-93)

U. S. NUCLEAR REGULATORY COMMISSION

LABORATORY USE ONLY

REQUEST FOR ANALYSIS
REGION III LABORATORY

CONTROL NUMBER

94-043

SAMPLE LOCATION (LICENSEE)

Fermi 2

LICENSE NO.

DOCKET NO.

SAMPLE SUBMITTED

TOTAL

TYPE

3

Fermi 2 CST Water

DATE SAMPLES SUBMITTED

4/15/94
4/19/94

PRIORITY

ROUTINE

☒ URGENT ***

SAMPLE COLLECTION INTERVAL

MONTH

DAY

YEAR

TIME

START

STOP

INSPECTOR RESPONSIBLE

TELEPHONE NUMBER

ANALYSIS TO BE PERFORMED

LIST DESIRED
LLD (Optional)

OTHER TYPE OF ANALYSIS (Specify)

LIST DESIRED
LLD (Optional)

GROSS ALPHA (GA)

GROSS BETA (GB)

☒ GAMMA SPEC (GS)

☒ TRITIUM (H3)

CARBON-14 (C14)

IODINE-125 (I125)

REMARKS

NOTE: SAMPLES WILL BE DISCARDED AFTER ANALYSIS UNLESS REASONS ARE NOTED IN REMARKS ABOVE.

*** FOR URGENT USE ONLY *** Signature blocks below must be completed by the Inspector, appropriate Section Chief and by the Chief of the Radiation Protection Section BEFORE submitting this form to the Region III Laboratory.

SIGNATURE - APPROPRIATE NUCLEAR MATERIALS SAFETY SECTION CHIEF

DATE

SIGNATURE - RADIATION PROTECTION SECTION CHIEF

DATE

INSPECTOR

U. S. NUCLEAR REGULATORY COMMISSION

LABORATORY CONTROL NUMBER

94-043

SAMPLE RECORD SHEET

REGION III LABORATORY

REGION III LABORATORY		DATE ANALYSIS BEGAN 4-15-94		DATE COMPLETED		DATE	
SAMPLE LOCATION Term 2 CST-Hood		DATE ANALYSIS BEGAN 4-15-94		DATE COMPLETED		DATE	
COLLECTED BY [Signature]		CONTACT NOTIFIED		DATE		DATE	
DIVISION		TELEPHONE		DATE		DATE	
ROUTINE		ANALYZED BY [Signature]		DATE		DATE	
URGENT		APPROVED BY		DATE		DATE	

NO.	DATE	HOUR	SAMPLE	DESCRIPTION	ANALYZE FOR	INSTRUMENT USED	QUANTITY USED	DATE COUNTED	COUNT TIME	GROSS COUNT	BACK GROUND	NET COUNT	RESULT $\pm 2\sigma$ $\mu\text{Ci/gm}$
	4/15/94	6:27	Form 2	CST H_2O	T	PST-1	511.9 gm	4/15/94	1 hr			MA 54	5.64E-7 \pm 8.0E-8
												CO 58	9.37E-8 \pm 4.5E-8
												CO 60	4.15E-7 \pm 8.2E-8
												MA 65	1.69E-7 \pm 8.3E-8
												CS 134	1.54E-7 \pm 6.3E-8
												CS 137	1.87E-7 \pm 6.3E-8
					H-3	LS	10 mls	4/15/94	10 min			H-3	3.22E-4 \pm 4.6E-6 $\mu\text{Ci/ml}$
	4/14/94	10:21	Form 2	CST H_2O	T	PST-1	493.5 gm	4/15/94	1 hr			MA 54	6.34E-7 \pm 8.1E-8
												CO 60	5.14E-7 \pm 8.3E-8
												CS 134	2.02E-7 \pm 5.8E-8
												CS 137	2.43E-8 \pm 6.0E-8
					H-3	LS	10 mls	4/15/94	10 min			H-3	3.16E-4 \pm 4.5E-6 $\mu\text{Ci/ml}$
	4/16/94	09:08	Form 2	CST H_2O	T	PST-1	514.5 gm	5/2/94	2 hr			MA 54	5.57E-7 \pm 5.2E-8
												CO 58	5.96E-8 \pm 3.4E-8
												CO 60	4.58E-7 \pm 5.6E-8
												CS 134	2.05E-7 \pm 1.9E-8
												CS 137	2.32E-7 \pm 4.4E-8
					H-3	LS	3.14 \pm 0.3	4-14 E-4	4 \pm 4.5	4.5E-6	0.01/m		

* Random uncertainties reported are 2 standard deviations, results $\leq 2\sigma$ are interpreted as including "zero" or as not detected. If appropriate, estimates of possible systematic errors are reported in parentheses.

INSPECTOR-

19 Apr 94 13:44

Page #1

Protocol #:12

H-3 DPM

User : ANDRE/GLINSKI

Time: 10.00

Data Mode: DPM

Nuclide: 3H-UGXR

Quench Set: 3H-UGXR

Sigma Coincidence On

Background Subtract: 1st Vial

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 18.6		0	0.5	7.40
Region B:	2.0 - 18.6		0	0.5	7.50
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

FERMI CONDENSATE STORAGE TANK SAMPLE, 4/16/94.

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPM1	tSIE
1	10.00	7.40 23.25	7.50 23.09		257.52
2	10.00	1880.30 1.44	1838.30 1.46	6867.03	253.15
3	10.00	1867.10 1.45	1826.70 1.46	6900.61	253.90

Blank
94-295
Duplicates

$$\frac{6967 \text{ dpm}}{10 \text{ ml} \times 2220000 \frac{\text{dpm}}{\mu\text{Ci}}} = 0.000314 \mu\text{Ci}/\text{ml} \pm 4.5 \text{E-}6 \mu\text{Ci}/\text{ml}$$

$$\frac{6901 \text{ dpm}}{10 \text{ ml} \times 2220000 \frac{\text{dpm}}{\mu\text{Ci}}} = 0.000311 \mu\text{Ci}/\text{ml}$$

① $3.14 \text{E-}4 \pm 4.5 \text{E-}6 \mu\text{Ci}/\text{ml}$

② $3.11 \text{E-}4 \pm 4.5 \text{E-}6 \mu\text{Ci}/\text{ml}$

 ***** 02-MAY-94 10:17:34 *****

FERMI 2 CST WATER DURING DISCHARGE

SPECTRAL FILE NAME: L942951.R3L
 SAMPLE DATE: 16-APR-94 09:05:00
 SAMPLE IDENTIFICATION: L942951.R3L
 TYPE OF SAMPLE: WATER
 SAMPLE QUANTITY: 514.5000 UNITS: GRAM
 SAMPLE GEOMETRY: MAR300
 EFFICIENCY FILE NAME: MAR500R3.EFF

ACQUIRE DATE: 02-MAY-94 08:09:30 * FWHM(1332) 1.975
 PRESET TIME(LIVE): 57600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 7657. SEC * SHAPE PARAMETER : 10.0 %
 ELAPSED LIVE TIME: 7657. SEC * NBR ITERATIONS: 10.

DETECTOR: ADC Detector * LIBRARY:NUCL.LIB
 CALIB DATE: 30-APR-94 12:53:53 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: .5000960 * HALF LIFE RATIO: 8.00
 OFFSET: -1.315770 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW - .81 TO 4120.06

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	295.21	104.	132.	1.67	589.40	585	11	1.36E-02	25.1	
2	0	351.84	160.	182.	1.27	701.96	695	14	2.09E-02	19.1	
3	0	428.15	58.	132.	.93	853.64	848	11	7.57E-03	40.8	
4	0	566.50	134.	182.	10.79	1128.63	1114	27	1.76E-02	32.1	
5	0	604.71	318.	118.	1.55	1204.59	1199	11	4.15E-02	9.1	
6	0	609.44	112.	76.	1.81	1214.00	1211	8	1.47E-02	16.7	
7	0	661.83	260.	79.	1.80	1318.14	1310	16	3.65E-02	9.3	
8	0	731.28	18.	71.	7.39	1456.17	1443	26	4.93E-03	74.2	
9	0	795.82	240.	44.	2.07	1584.46	1576	17	3.14E-02	10.6	
10	0	810.87	60.	46.	1.66	1614.37	1608	13	7.77E-03	28.9	
11	0	834.91	615.	41.	1.78	1662.16	1655	13	8.03E-02	4.7	
12	0	1173.46	403.	19.	1.95	2335.10	2328	15	5.26E-02	5.7	
13	0	1332.83	339.	20.	1.92	2651.85	2645	14	4.42E-02	6.1	
14	0	1461.50	16.	7.	1.97	2907.63	2905	7	2.09E-03	35.5	

PEAK SEARCH COMPLETED (REV 15.8 - ND PC VERSION DEC 88)

PULSE-PILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 7657. CORRECTED LIVE TIME: 7657.

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR
1	0	295.21	104.	132.	1.67	589.40	585	11	1.36E-02	25.1
2	0	351.84	160.	182.	1.27	701.96	695	14	2.09E-02	19.1
3	0	428.15	58.	132.	.93	853.64	848	11	7.57E-03	40.8
4	0	566.50	134.	182.	10.79	1128.63	1114	27	1.76E-02	32.1

6	0	609.44	112.	76.	1.81	1214.00	1211.	8	1.47E-02	16.7
7	0	661.83	280.	79.	1.80	1318.14	1310	16	3.65E-02	9.3
8	0	731.28	38.	71.	7.39	1456.17	1443	26	4.93E-03	74.2
9	0	795.82	240.	44.	2.07	1584.46	1576	17	3.14E-02	10.8
10	0	810.87	60.	46.	1.66	1614.37	1608	13	7.77E-03	28.9
11	0	834.91	615.	41.	1.78	1662.16	1655	13	8.03E-02	4.7
12	0	1173.46	403.	19.	1.95	2335.10	2328	15	5.26E-02	5.7
13	0	1332.83	339.	20.	1.92	2651.85	2645	14	4.42E-02	6.1
14	0	1461.50	16.	7.	1.97	2907.63	2905	7	2.09E-03	35.5

FILE-UP CORRECTION COMPLETED

ELAPSED LIVE TIME: 7657. (PILE-UP CORRECTED)

FISSION GAS

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
KR-88	FG	196.32	0.	0.	26.00*	0.000E+00	.000E 0	.000E 0
		834.63	615.	41.	13.00	7.843E-01	2.133E 35	9.968E 33
		1529.77	0.	0.	10.90	0.000E+00	.000E 0	.000E 0
		2195.84	0.	0.	13.20	0.000E+00	.000E 0	.000E 0
		2392.11	0.	0.	34.60	0.000E+00	.000E 0	.000E 0
XE-135	FG	249.79	0.	0.	89.90*	0.000E+00	.000E 0	.000E 0
		608.18	112.	76.	2.89	1.048E+00	1.253E 7	2.096E 6

ACTIVATION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
MN-54	AP	834.63	615.	41.	99.98*	7.843E-01	5.572E -7	2.604E -8
CO-58	AP	810.76	60.	46.	99.40*	8.057E-01	5.962E -8	1.721E -8
CO-60	AP	1173.22	403.	19.	100.00	5.732E-01	4.802E -7	2.783E -8
		1332.49	339.	20.	100.00*	5.097E-01	4.584E -7	2.815E -8

FISSION PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
RU-103	FP	497.06	0.	0.	89.00*	0.000E+00	.000E 0	.000E 0
		610.33	112.	76.	5.60	1.048E+00	1.739E -6	2.908E -7
SB-125	FP	176.33	0.	0.	6.89	0.000E+00	.000E 0	.000E 0
		427.89	58.	132.	29.33*	1.449E+00	9.464E -8	3.863E -8
		463.38	0.	0.	10.35	0.000E+00	.000E 0	.000E 0
		600.56	0.	0.	17.80	0.000E+00	.000E 0	.000E 0
		635.90	0.	0.	11.32	0.000E+00	.000E 0	.000E 0
CS-134	FP	563.23	0.	0.	8.38	0.000E+00	.000E 0	.000E 0
		569.32	0.	0.	15.43	0.000E+00	.000E 0	.000E 0
		604.70	318.	118.	97.60*	1.056E+00	2.149E -7	1.546E -8
		795.85	240.	44.	85.40	8.197E-01	2.388E -7	2.026E -8
CS-137	FP	801.93	0.	0.	8.73	0.000E+00	.000E 0	.000E 0
		661.65	280.	79.	85.12*	9.714E-01	2.323E -7	2.164E -8

NATURAL PRODUCT

NUCLIDE	SBHR	ENERGY	AREA	BKGND	%ABN	%EFF	UCI/ GRAM	1-SIGMA ERROR
K-40	NP	1460.81	16.	7.	10.67*	4.682E-01	2.197E -7	7.791E -8
RA-226	NP	186.21	0.	0.	3.28	0.000E+00	.000E 0	.000E 0
		241.98	0.	0.	7.49	0.000E+00	.000E 0	.000E 0
		295.21	104.	132.	19.20	2.030E+00	1.831E -7	4.598E -8
		351.92	160.	182.	37.20	1.733E+00	1.700E -7	3.245E -8
		609.31	112.	76.	46.30*	1.048E+00	1.587E -7	2.653E -8
		1120.29	0.	0.	15.10	0.000E+00	.000E 0	.000E 0
		1238.11	0.	0.	5.94	0.000E+00	.000E 0	.000E 0
		1764.49	0.	0.	15.80	0.000E+00	.000E 0	.000E 0
		2204.22	0.	0.	4.98	0.000E+00	.000E 0	.000E 0

ELAPSED LIVE TIME 7657. (FILE-UP CORRECTED)

UNIDENTIFIED PEAKS

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	ZERR	%EFF
1	0	295.21	104.	132.	1.67	589.40	585	11	1.36E-02	25.1	2.03E+00
2	0	351.87	160.	182.	1.27	701.96	695	14	2.09E-02	19.1	1.73E+00
3	0	428.15	58.	132.	.93	853.64	848	11	7.57E-03	40.8	1.43E+00
4	0	566.50	134.	182.	10.79	1128.63	1114	27	1.76E-02	32.1	1.12E+00
6	0	609.44	112.	76.	1.81	1214.00	1211	8	1.47E-02	16.7	1.05E+00
8	0	731.28	38.	71.	7.39	1456.17	1443	26	4.93E-03	74.2	8.86E-01

LINES NOT MEETING SUMMARY CRITERIA

PK	NUCLIDE	ENERGY	HLFE	DECAY	UC1/GRAM	ABNDIFF	FAILED
1	RA-226	295.21	1600.00Y	1.000E 0	1.831E -7	66.13%	ABN
2	RA-226	351.92	1600.00Y	1.000E 0	1.700E -7	66.13%	ABN
3	SB-125	427.89	2.77Y	1.011E 0	9.464E -8	38.75%	ABN
6	RU-103	610.33	39.35D	1.326E 0	1.739E -6	5.92%	ABN
6	XE-135	608.18	9.11H	4.931E 12	1.253E -7	3.11%	DCY, ABN
6	RA-226	609.31	1600.00Y	1.000E 0	1.587E -7	66.13%	ABN
11	IR-88	834.83	2.84H	5.158E 40	2.133E -35	13.31%	DCY, ABN

NUCLIDE IDENTIFICATION SYSTEM
SUMMARY OF NUCLIDE ACTIVITY

(ND PC VERSION DEC 88)

PAGE 3

TOTAL LINES IN SPECTRUM	14	
UNIDENTIFIED PEAKS	6	
IDENTIFIED IN SUMMARY REPORT	8	57.14%

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
MN-54	AP	312.70D	1.036	5.572E -7	2.604E -8	4.67
CO-58	AP	70.80D	1.170	5.962E -8	1.721E -8	28.87
CO-60	AP	1925.00D	1.006	4.584E -7	2.815E -8	6.14

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
CS-134	FP	753.10D	1.015	2.149E -7	1.946E -8	9.06
CS-137	FP	30.17Y	1.001	2.323E -7	2.164E -8	9.32

NATURAL PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA ERROR	%ERR
K-40	NP	1.28E+09Y	1.000	2.197E -7	7.791E -8	35.46

REQUEST FOR ANALYSIS
REGION III LABORATORY

CONTROL NUMBER

94-043

SAMPLE LOCATION (LICENSEE)

Fermi 2

LICENSE NO.

DOCKET NO.

SAMPLE SUBMITTED

TOTAL

TYPE

3

Fermi 2 CST Water

DATE SAMPLES SUBMITTED

PRIORITY

4/15/94
4/19/94

ROUTINE

URGENT ***

SAMPLE COLLECTION INTERVAL

MONT

DAY

YEAR

TIME

START

STOP

INSPECTOR RESPONSIBLE

TELEPHONE NUMBER

ANALYSIS TO BE PERFORMED

LIST DESIRED
LLD (Optional)

OTHER TYPE OF ANALYSIS (Specify)

LIST DESIRED
LLD (Optional)

GROSS ALPHA (GA)

GROSS BETA (GB)

☒ GAMMA SPEC (GS)☒ TRITIUM (H3)

CARBON-14 (C14)

IODINE-125 (I125)

REMARKS

NOTE: SAMPLES WILL BE DISCARDED AFTER ANALYSIS UNLESS REASONS ARE NOTED IN REMARKS ABOVE.

*** FOR URGENT USE ONLY -- Signature blocks below must be completed by the Inspector's appropriate Section Chief and by the Chief, Effluents Radiation Protection Section BEFORE submitting this form to the Region III Laboratory.

SIGNATURE -- APPROPRIATE NUCLEAR MATERIALS SAFETY SECTION CHIEF

DATE

SIGNATURE -- FUEL FACILITIES AND CONTAMINATED SITES SECTION

DATE

SAMPLE RECORD SHEET

REGION III LABORATORY

94-043

SAMPLE LOCATION

Form 2 CST H₂O

DATE ANALYSIS BEGAN

4-15-94

DATE COMPLETED

DATE

COLLECTED BY

DIVISION

TELEPHONE

CONTACT NOTED

ANALYZED BY

DATE REQUIRED

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SAMPLE

DESCRIPTION

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02-MAY-94 10:17:34

ENVIRONMENTAL WATER SPRING DISCHARGE

ACQUIRE DATE: 02-MAY-94 08:09:00
 PRESET TIME (LIVE): 57600. SEC
 ELAPSED REAL TIME: 7657. SEC
 ELAPSED LIVE TIME: 7657. SEC
 SAMPLE DEPTH: 15429 CM
 SAMPLE QUANTITY: 514.5000 UNITS: GRAM
 SAMPLE DEPTH: 15429 CM
 EFFICIENCY FILE NAME: NARS0093.EFF

ACQUIRE DATE: 02-MAY-94 08:09:00 * FWHM(1332) 1.975
 PRESET TIME (LIVE): 57600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 7657. SEC * SHAPE PARAMETER: 10.0 %
 ELAPSED LIVE TIME: 7657. SEC * NBR ITERATIONS: 10.

DETECTOR: ADC Detector * LIBRARY: NUCLE.LIB
 CALIB DATE: 30-APR-94 12:53:53 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: .5030960 * HALF LIFE RATIO: 8.00
 OFFSET: -1.3175770 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW -1.81 TO 4120.06

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	PW	CTS/SEC	ERR	FIT
1	0	295.21	104.	132.	1.67	589.40	535	11	1.36E-02	25.1	
2	0	351.84	160.	182.	1.27	701.96	695	14	2.09E-02	19.1	
3	0	428.15	58.	132.	.93	853.64	846	11	7.57E-03	40.8	
4	0	566.50	134.	182.	10.79	1128.63	1114	27	1.76E-02	32.1	
5	0	604.71	318.	118.	1.55	1204.57	1199	11	4.15E-02	9.1	
6	0	609.44	112.	76.	1.81	1214.00	1211	8	1.47E-02	16.7	
7	0	661.83	280.	79.	1.80	1318.14	1310	16	3.65E-02	9.3	
8	0	731.28	38.	71.	7.39	1456.17	1443	26	4.93E-03	74.2	
9	0	795.82	240.	44.	2.07	1584.46	1576	17	3.14E-02	10.6	
10	0	810.87	60.	46.	1.66	1614.37	1608	13	7.77E-03	28.9	
11	0	834.91	615.	41.	1.78	1662.16	1655	13	8.03E-02	4.7	
12	0	1173.46	403.	19.	1.95	2335.10	2328	15	3.26E-02	5.7	
13	0	1332.83	339.	20.	1.92	2651.85	2645	14	4.42E-02	6.1	
14	0	1461.50	16.	7.	1.97	2907.63	2905	7	2.09E-03	35.3	

PEAK SEARCH COMPLETED (REV 10.8 - RD FC VERSION DEC 86)

PULSE-PILE-UP CORRECTED DATA. CORRECTION = 1.000
 UNCORR. LIVE TIME: 7657. CORRECTED LIVE TIME: 7657.

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	PW	CTS/SEC	ERR
1	0	295.21	104.	132.	1.67	589.40	535	11	1.36E-02	25.1
2	0	351.84	160.	182.	1.27	701.96	695	14	2.09E-02	19.1
3	0	428.15	58.	132.	.93	853.64	846	11	7.57E-03	40.8
4	0	566.50	134.	182.	10.79	1128.63	1114	27	1.76E-02	32.1

NUCLIDE IDENTIFICATION SYSTEM
SUMMARY OF NUCLIDE ACTIVITY

PL PC VERSION

DEC 80

PAGE 1

NUCLIDE LINE IN SPECTRUM

1

NUCLIDE LINE

2

IDENTIFIED IN SUMMARY REPORT

3

07.142

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA	ERROR	SEPA
Na-24	AP	312.70D	1.038	5.572E -7	2.604E -8	4.7	
Co-58	AP	70.80D	1.170	3.962E -3	1.721E -3	25.17	
Co-60	AP	1925.00D	1.006	4.584E -7	2.813E -8	5.4	

FISSION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA	ERROR	SEPA
Cs-134	FP	703.10D	1.015	2.149E -7	1.945E -8	9.16	
Cs-137	FP	30.17Y	1.001	2.323E -7	2.164E -8	9.2	

NATURAL PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/GRAM	1-SIGMA	ERROR	SE
K-40	NP	1.20E+09Y	1.000	2.197E -7	7.791E -8	33.3	

19 Apr 94 13:44

Page #1

Protocol #:12

H-3 DPM

User : ANDRE/GLINSKI

Time: 10.00

Data Mode: DPM

Nuclide: 3H-UGXR

Quench Set: 3H-UGXR

Sigma Coincidence On

Background Subtract: 1st Vial

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 18.6		0	0.5	7.40
Region B:	2.0 - 18.6		0	0.5	7.50
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

FERMI CONDENSATE STORAGE TANK SAMPLE, 4/16/94.

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPH1	tSIE
1	10.00	7.40 23.25	7.50 23.09		257.52
2	10.00	1880.30 1.44	1938.30 1.46	6967.03	253.15
3	10.00	1967.10 1.45	1926.70 1.46	6900.61	253.90

Blank
94-295
Duplicates

$$\frac{6967 \text{ dpm}}{10 \text{ ml} \times 2220000 \frac{\text{dpm}}{\mu\text{Ci}}} = .000314 \mu\text{Ci}/\text{ml} \pm 4.5 \text{E-}6 \mu\text{Ci}/\text{ml}$$

$$\frac{6901 \text{ dpm}}{10 \text{ ml} \times 2220000 \frac{\text{dpm}}{\mu\text{Ci}}} = .000311 \mu\text{Ci}/\text{ml}$$

$$\textcircled{1} 3.14 \text{E-}4 \pm 4.5 \text{E-}6 \mu\text{Ci}/\text{ml}$$

$$\textcircled{2} 3.11 \text{E-}4 \pm 4.5 \text{E-}6 \mu\text{Ci}/\text{ml}$$

13-APR-94 16:23:24

94-293

1. DET. DISTANCE SAMPLE: 4.11.17

SPECTRAL FILE NAME: L942931.RSL
 SAMPLE DATE: 13-APR-94 06:37:00
 SAMPLE IDENTIFICATION: L942931.RSL
 TYPE OF SAMPLE: LIQUID
 SAMPLE QUANTITY: 511.9000 UNITS: GM
 SAMPLE GEOMETRY: MAR300
 EFFICIENCY FILE NAME: MAR30093.EAF

ACQUIRE DATE: 13-APR-94 16:23:24 * FWHM(1332) 1.975
 PRESET TIME (LIVE): 3600. SEC * SENSITIVITY: 5.000
 ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER: 10.0 %
 ELAPSED LIVE TIME: 3600. SEC * NR ITERATIONS: 10.

DETECTOR: ABC Detector * LIBRARY: NUCL.LIB
 CALC DATE: 13-APR-94 13:13:36 * ENERGY TOLERANCE: 1.500 KEV
 KEV/CHNL: .5019835 * HALF LIFE RATIO: 8.00
 OFFSET: -1.0630120 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW - .56 TO 4.11.17

PE	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	PH	CTS/SEC	%ERR	FILE
1	0	423.43	59.	53.	1.57	830.62	849	15	1.62E-02	31.3	
2	0	539.06	43.	50.	1.71	1133.78	113	13	1.33E-02	34.1	
3	0	604.62	108.	81.	1.71	1207.01	1200	13	3.00E-02	20.3	
4	0	650.91	101.	46.	1.57	1318.75	1311	15	2.81E-02	17.6	
5	0	793.57	137.	7.	1.78	1567.01	1562	10	3.79E-02	9.9	
6	0	810.27	51.	14.	2.36	1616.29	1611	14	1.42E-02	24.1	
7	0	834.36	301.	30.	1.56	1664.29	1656	17	8.37E-02	7.1	
8	1	1113.4	35.	10.	1.57	1673.68	1679	11	7.73E-03	24.8	
9	1	1117.48	14.	14.	1.71	1721.03	1725	13	4.94E-02	1.8	
10	1	1371.76	14.	10.	2.17	2135.1	2137	12	4.00E-02	16.0	

20% CORRECTION COMPLETED 13-APR-94 13:13:36 43.72 MB 810H DEC 807

LIBRARY (NUCL) CORRECTED 13-APR-94 13:13:36 43.72 MB 810H DEC 807
 AREA = 178: 810.27 178: 810.27 178: 810.27 178: 810.27

PE	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	PH	CTS/SEC	%ERR
1	0	423.43	59.	53.	1.57	830.62	849	15	1.62E-02	31.3
2	0	539.06	43.	50.	1.71	1133.78	1131	13	1.33E-02	34.1
3	0	604.62	108.	81.	1.71	1207.01	1200	13	3.00E-02	20.3
4	0	650.91	101.	46.	1.57	1318.75	1311	15	2.81E-02	17.6
5	0	793.57	137.	7.	1.78	1567.01	1562	10	3.79E-02	9.9
6	0	810.27	51.	14.	2.36	1616.29	1611	14	1.42E-02	24.1
7	0	834.36	301.	30.	1.56	1664.29	1656	17	8.37E-02	7.1

NO LINES IF ON STDN 10
 IDENTIFIED PEAKS 1
 IDENTIFIED IN SUMMARY REPORT 2 90.00%

ACTIVATION PRODUCT

NUCLIDE	SSHR	HLIFE	DECAY	UCI/GM	1-SIGMA ERROR	%ERR
CS-134	AP	312.70D	1.001	5.633E -7	4.002E -8	7.10
CS-138	AP	70.80D	1.004	9.372E -8	2.256E -8	24.07
CS-130	AP	1925.00D	1.000	4.146E -7	4.137E -8	9.98
CS-135	AP	244.43D	1.001	1.687E -7	4.178E -8	24.76

FUSION PRODUCT

NUCLIDE	SSHR	HLIFE	DECAY	UCI/GM	1-SIGMA ERROR	%ERR
CS-134	FP	753.10D	1.000	1.541E -7	3.170E -8	20.56
CS-137	FP	30.17D	1.000	1.790E -7	3.158E -8	17.59

13-APR-84 18:29:45

94-294

DETECTOR FILE NAME: 00P00093.DAT
SAMPLING RATE: 1000.000
SAMPLING IDENTIFIER: 00000000
UNIT OF SAMPLE: 1.0000
SAMPLE QUANTITY: 95.3000 UNITS: GR
SAMPLE GEOMETRY: PNT 10
EXPERIMENT FILE NAME: 00P00093.DAT

ACQUIRE DATE: 13-APR-84 17:29:15 * FWHM(1332) 1.975
PRESET TIME(LIVE): 3600. SEC * SENSITIVITY: 1.000
ELAPSED REAL TIME: 3600. SEC * SHAPE PARAMETER: 10.0 %
ELAPSED LIVE TIME: 3600. SEC * NBR ITERATIONS: 10

DETECTOR: ADC Detector * LIBRARY: NUCL.LIB
CALIB DATE: 11-APR-84 13:43:36 * ENERGY TOLERANCE: 1.500 KEV
KEV/CHNL: 1.019839 * HALF LIFE RATIO: 5.00
OFFSET: -1.033120 KEV * ABUNDANCE LIMIT: 75.00%

ENERGY WINDOW - .58 TO 4111.17

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	FW	CTS/SEC	%ERR	FIT
1	0	427.97	40.	71.	1.66	854.71	849	10	1.12E-02	53.4	
2	0	604.37	138.	44.	1.49	1206.12	1201	11	3.82E-02	14.1	
3	0	661.38	133.	18.	1.65	1319.68	1313	15	3.69E-02	12.2	
4	0	795.49	121.	14.	1.59	1586.86	1580	14	3.36E-02	11.9	
5	0	834.24	323.	17.	1.81	1664.05	1657	14	9.10E-02	6.4	
6	0	1172.32	203.	3.	2.36	2337.53	2331	13	5.69E-02	7.6	
7	0	1331.58	173.	0.	1.99	2654.79	2647	19	4.81E-02	8.1	

PEAK SEARCH COMPLETED (REV 15.8 - ND PC VERSION DEC 88)

PULSE-FILE UP CORRECTED DATA. CORRECTION = 1.000
UNCORR. LIVE TIME: 3600. CORRECTED LIVE TIME: 3600.

PK	IT	ENERGY	AREA	BKGD	FWHM	CHANNEL	LEFT	FW	CTS/SEC	%ERR
1	0	427.97	40.	71.	1.66	854.71	849	10	1.12E-02	53.4
2	0	604.37	138.	44.	1.49	1206.12	1201	11	3.82E-02	14.1
3	0	661.38	133.	18.	1.65	1319.68	1313	15	3.69E-02	12.2
4	0	795.49	121.	14.	1.59	1586.86	1580	14	3.36E-02	11.9
5	0	834.24	323.	17.	1.81	1664.05	1657	14	9.10E-02	6.4
6	0	1172.32	203.	3.	2.36	2337.53	2331	13	5.69E-02	7.6
7	0	1331.58	173.	0.	1.99	2654.79	2647	19	4.81E-02	8.1

PEAK SEARCH COMPLETED

PEAK LINES IN SPECTRUM
 UNIDENTIFIED PEAKS

IDENTIFIED IN SUMMARY REPORT 5 85.71%

ACTIVATION PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/BM	1-SIGMA ERROR	%ERR
MN-54	AP	311.70D	1.002	6.338E -7	4.072E -8	6.42
CO-60	AP	1923.00D	1.000	5.140E -7	4.135E -8	8.06

FISSILE PRODUCT

NUCLIDE	SBHR	HLIFE	DECAY	UCI/BM	1-SIGMA ERROR	%ERR
CS-134	FP	753.10D	1.001	2.023E -7	2.863E -8	14.15
CS-137	FP	30.17Y	1.000	2.430E -7	2.973E -8	12.23

15 Apr 94 16:46

Page #1

Protocol #:12

H-3 DPM

User : ANDRE/GLINSKI

Time: 10.00

Data Mode: DPM

Nuclide: 3H-UGXR

Quench Set: 3H-UGXR

ma Coincidence On

Background Subtract: 1st Vial

	LL	UL	LCR	2S%	BKG
Region A:	0.0 - 18.6		0	0.5	11.10
Region B:	2.0 - 18.6		0	0.5	10.80
Region C:	0.0 - 0.0		0	0.5	0.00

Quench Indicator: tSIE/AEC

Ext Std Terminator: Count

EPA INTERCOMPARISON SAMPLE 94-200

Luminescence Correction On

S#	TIME	CPMA A:2S%	CPMB B:2S%	DPH1	tSIE
1	10.00	11.10 18.98	10.80 19.16		282.18
2	10.00	2016.50 1.43	1874.70 1.44	7113.89	252.46 94-293
3	10.00	2002.50 1.44	1861.70 1.45	7008.57	254.51 94-294
4	2.64	61799.5 0.50	60312.7 0.50	205679	268.26

$$QC \text{ count} = \frac{205700 \text{ meas}}{211500 \text{ known}} = 0.973$$

94-293

Activity

$$\frac{7114 \text{ dpm}}{10 \text{ ml} \times 2220000 \text{ dpm}/\mu\text{Ci}} = 3.2 \text{E-}4 \mu\text{Ci}/\text{ml}$$

$$\pm 9.6 \text{E-}6 \mu\text{Ci}/\text{ml}$$

94-294

Activity

$$\frac{7009 \text{ dpm}}{10 \text{ ml} \times 2220000 \text{ dpm}/\mu\text{Ci}} = 3.16 \text{E-}4 \pm 4.5 \text{E-}6 \mu\text{Ci}/\text{ml}$$