

**February 2005**

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-15020405

Sample Location (Well Number): 1 Shallow

1. Representative sample collected. Date/Time 2-4-05 / 1335

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Coonrad / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Berger / [Signature] Date: 2/24/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: March 18, 2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected.  
William V. Lipton 48051 March 18, 2005



Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-1S020405
2. Date Sampled	02/04/2005
3. Time Sampled	13:35
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	02/21/2005
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.0 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

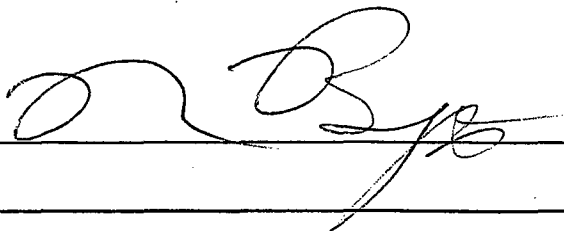
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician



Date

2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-15020405

Sample Location (Well Number): 1 Shallow

1. Representative sample collected. Date/Time 2-4-05 / 1335

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: Jon Cavallaro / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name / Signature

Sample number: EFT-18020405

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. Mcley / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: March 18, 2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 48005 March 18, 2005

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

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Sample ID Number: EFT-19020405

Sample End Time: 4-FEB-2005 13:35:00.00

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PERFORMED BY:

*J. Meg*  
\_\_\_\_\_  
SIGNATURE

REVIEWED BY:

*William V. Lynn 4/8/05/mar 18, 2005*  
\_\_\_\_\_  
SIGNATURE/DATE

Sample ID : EFT-15020405

Acquisition date : 7-MAR-2005 11:50:22

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-15020405
Sample collection start date: 4-FEB-2005 13:35:00.00
Sample collection end date : 4-FEB-2005 13:35:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 11:50:22.34
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.16 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
KeV/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.68

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 8 rows of peak data with handwritten annotations on the right side.

Pb 214
doubtful
Hw c
Pb 214
Pb 214
K40
Pb 214

Sample Title : EFT-16020405  
Decay Time = 30 22:15:22.34

Page : 1  
Acquisition Time = 7-MAR-2005 11:50:22.34

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	352.19	50	43	1.21	704.27	698	10	26.0		
0	510.75	163	47	2.16	1021.10	1013	20	12.8		
0	550.01	57	17	1.51	1117.25	1113	11	19.9		
0	609.20	64	26	1.70	1210.14	1212	15	21.3		
0	1120.07	20	4	2.33	2241.10	2236	13	23.2		
0	1377.76	24	9	0.73	2755.13	2749	13	20.4		
0	1461.24	02	10	1.81	2922.17	2913	10	16.3		K-40
0	1764.93	24	3	0.97	3530.03	3524	12	25.0		

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.91	82	10.67*	2.389E+00	4.855E-07	4.855E-07	16.33

Flag: "\*" = Keyline

Sample ID : EFT-18820405

Acquisition date : 7-MAR-2005 11:50:22

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

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.855E-07	4.855E-07	0.793E-07	16.33	
Total Activity :			4.855E-07	4.855E-07			
Grand Total Activity :			4.855E-07	4.855E-07			

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

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



It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	352.19	50	43	1.21	704.27	698	10	2.80E-02	20.0	5.52E+00	T
0	510.75	163	47	2.16	1021.10	1013	20	9.04E-02	12.0	4.74E+00	T
0	558.81	57	17	1.51	1117.25	1113	11	3.14E-02	19.9	4.55E+00	T
0	609.28	64	26	1.70	1210.14	1212	15	3.58E-02	21.3	4.39E+00	T
0	1120.87	20	4	2.33	2241.10	2236	13	1.56E-02	23.2	2.70E+00	T
0	1377.76	24	0	0.73	2755.13	2749	13	1.33E-02	20.4	2.46E+00	T
0	1764.93	24	3	0.97	3530.03	3524	12	1.34E-02	25.0	2.16E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	1.1070E-07
F-18	0.	511.00	Half-Life too short
NA-22	11.	1274.54	1.0751E-08 X
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	9.	809.25	1.0417E-08
CR-51	35.	320.00	1.7454E-07
MN-54	23.	634.03	1.2112E-08
CO-56	15.	1238.25	2.3197E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	40.	158.30	2.7904E-07
CO-57	44.	122.06	1.1030E-08
CO-58	17.	810.76	1.3170E-08
FE-59	9.	1099.22	2.5400E-08
CO-60	16.	1332.49	1.2052E-08 X
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.04	Half-Life too short
ZN-65	15.	1115.52	2.4209E-08
ZN-69M	0.	430.63	Half-Life too short
SE-75	47.	136.00	1.7770E-08
AG-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	44.	513.99	2.4926E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	44.	513.99	1.4947E-08
RB-86	11.	1076.63	3.4546E-07
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	300.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1302.39	Half-Life too short
Y-88	5.	1036.01	1.1609E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RB-90	0.	831.69	Half-Life too short
RB-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	10.	1204.90	4.6334E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1303.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-15020405

Acquisition date : 7-MAR-2005 11:50:22

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SI-93	0.	590.20	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	20.	702.63	8.7914E-09
NB-95	14.	765.79	1.5240E-08
NB-95M	37.	235.69	1.1710E-05
ZR-95	17.	756.72	2.2610E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.01	Half-Life too short
RU-103	30.	497.00	1.7101E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	24.	621.04	9.4651E-08
CD-109	40.	00.00	3.9753E-07
AG-110M	13.	937.40	3.1420E-08
SN-113	20.	391.69	1.4315E-08
SN-117M	49.	150.56	4.6602E-08
SB-122	0.	563.93	Half-Life too short
SB-124	25.	602.71	1.3020E-08
SB-125	32.	427.09	2.9310E-08
TE-125M	46.	109.20	5.5323E-06
TE-127	0.	417.90	Half-Life too short
T-127M	30.	57.60	3.5240E-05
XE-127	40.	202.04	2.2030E-08
TE-129	0.	459.00	Half-Life too short
TE-129M	17.	695.00	4.6301E-07
XE-129M	49.	196.56	1.9490E-06
I-130	0.	536.09	Half-Life too short
BA-131	41.	123.00	1.0940E-07
I-131	27.	364.40	1.3129E-07
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	40.	163.93	2.3554E-06
I-132	0.	667.69	Half-Life too short
TE-132	45.	220.16	6.0291E-06
BA-133	31.	302.04	4.1649E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	26.	01.00	2.2099E-06
XE-133M	0.	233.22	Half-Life too short
CS-134	19.	604.70	0.2770E-09
I-134	0.	004.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
Y-135M	0.	526.56	Half-Life too short

Sample ID : EFT-18020405

Acquisition date : 7-MAR-2005 11:50:22

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	13.	818.58	4.4892E-08
I-136	0.	1313.82	Half-Life too short
CS-137	26.	661.65	1.1896E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1428.58	Half-Life too short
CE-139	45.	165.85	1.1456E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	19.	537.32	1.5775E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	198.22	Half-Life too short
CE-141	51.	145.44	3.4952E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	37.	133.54	7.9592E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	38.	91.18	3.2438E-07
PM-148M	28.	558.27	1.3586E-08
EU-152	37.	344.27	3.1735E-08
EU-154	17.	1884.76	6.3887E-08
EU-156	19.	646.29	4.6688E-07
HF-181	19.	482.83	1.4142E-08
TA-182	9.	1221.42	4.2534E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.83	Half-Life too short
HG-203	48.	279.19	1.6526E-08
BI-207	28.	569.67	8.8826E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	55.	248.98	8.7169E-05
RA-226	48.	186.21	2.4827E-07
AC-228	34.	338.32	7.8388E-08
TH-228	33.	84.37	1.2152E-06
PA-234	0.	131.28	Half-Life too short
TH-234	38.	63.29	2.9432E-06
U-235	52.	143.76	8.5857E-08
ND-239	0.	186.13	Half-Life too short
AM-241	37.	59.54	2.1459E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT - 1D020405

Sample Location (Well Number): 1 Deep

1. Representative sample collected. Date/Time 2/4/05 / 1239

Sample collected by: Jay Marie Slaback / Jay Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Gullord / Jon Gullord Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Bennett / Russ Bennett Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 3/18/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected.  
William V. Lipton 48651 3/21/2005

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-1D020405
2 . Date Sampled	02/04/2005
3 . Time Sampled	12:39
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/21/2005
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.1 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.3 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-1D020405

Sample Location (Well Number): 1 Deep

1. Representative sample collected. Date/Time 2/4/05 / 1239

Sample collected by: Jay Marie Slaback / Jay Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Cavallaro / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name / Signature

Sample number: EFT-1D020405

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 3/18/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 140.27 keV peak unidentified, low Pu H/L 10.921,  
in ignore, Nelson Article 48057, 3/18/05  
No licensed radioactive material detected, Nelson Article 48057, 3/18/05



RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-1D020485

Sample End Time: 4-FEB-2005 12:39:00.00

REMARKS

14027 KeV peak unidentified, low FWHM (192),  
(an ignore, release by [signature] 3/18/2005)

PERFORMED BY:

[Signature]

SIGNATURE

REVIEWED BY:

[Signature] 3/18/2005

SIGNATURE/DATE

\*\*\*\*\*

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-10020405  
Sample collection start date: 4-FEB-2005 12:39:00.00  
Sample collection end date : 4-FEB-2005 12:39:00.00  
Type of sample : 1 L Mari. Liquid  
Sample quantity : 1.00000E+03 cc  
Sample geometry : NELL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 17-FEB-2005 13:14:44.02  
Preset live time : 0 00:00:00.00 Elapsed live time : 0 00:00:00.00  
Elapsed real time : 0 00:00:01.00 Percent dead time : 0.00 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00  
Kev/channel : 5.00590E-01 Zero offset: -2.65112E-01  
Daily cal date : 17-FEB-2005 11:14:19.35

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

\*\*\*\*\*

PK	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	140.27	36	63	0.99	280.75	276	9	2.00E-02	43.1	unidentified
2	0	511.19	136	84	2.65	1021.99	1014	23	7.50E-02	19.2	annihilation
3	0	556.68	56	31	2.27	1116.01	1111	14	3.12E-02	25.0	FWL
4	0	609.63	45	23	1.38	1219.16	1214	12	2.50E-02	26.3	Bi-214
5	0	1461.00	83	12	2.16	2921.50	2912	16	4.64E-02	14.4	K-40

Post-MID Peak Search Report

	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	148.27	36	63	0.92	288.75	276	9	43.1		
0	511.19	136	84	2.65	1021.99	1014	23	19.2		
0	550.60	56	31	2.27	1101.91	1111	14	25.0		
0	585.83	45	23	1.58	1170.16	1214	12	26.3		
0	1461.00	62	13	2.16	2921.50	2912	16	14.4		K-40

Sample ID : EFT-10020405

Acquisition date : 17-FEB-2005 10:14:44

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	83	10.67*	2.389E+00	4.919E-07	4.919E-07	14.37

Flag: "\*" = Keyline

Summary of Nuclide Activity

Sample ID : EFT-1D020405

Acquisition date : 17-FEB-2005 13:14:44

Total number of lines in spectrum 5  
 Number of unidentified lines 0  
 Number of lines tentatively identified by MID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma #Error	Flags
K-40	1.03E+05Y	1.00	4.919E-07	4.919E-07	0.707E-07	14.27	
Total Activity :			4.919E-07	4.919E-07			
Grand Total Activity :			4.919E-07	4.919E-07			

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	171.05	511.00*	100.00	1.000E+33	19.15	Decay
* Abundances Found = 100.00							
AS-76	26.32H	11.09	559.10*	44.70	1.568E-24	25.05	Decay, Abun.
			563.23	1.17	---	Not Found	---
			571.30	0.14	---	Not Found	---
			557.03	6.10	---	Not Found	---
			665.31	0.39	---	Not Found	---
			740.12	0.12	---	Not Found	---
			771.76	0.12	---	Not Found	---
			857.53	0.12	---	Not Found	---
			1125.37	0.14	---	Not Found	---
			1212.72	1.63	---	Not Found	---
			1216.02	3.64	---	Not Found	---
			1220.52	1.39	---	Not Found	---
			1439.13	0.33	---	Not Found	---
			1453.60	0.13	---	Not Found	---
			1707.67	0.33	---	Not Found	---
* Abundances Found = 73.70							
NO-99	66.02H	4.74	140.51	3.00	6.312E-06	43.10	Abun.
			181.06	6.20	---	Not Found	---
			366.43	1.37	---	Not Found	---
			739.56*	12.00	---	Not Found	---
			770.00	4.50	---	Not Found	---
* Abundances Found = 13.25							
TC-99M	6.02H	51.97	140.50*	89.07	4.442E+07	43.10	Decay
* Abundances Found = 100.00							
RU-103	39.35D	0.33	497.00*	39.00	---	Not Found	---
			610.33	5.60	3.457E-07	26.34	Abun.
* Abundances Found = 5.92							
BI-214	19.90M	943.25	609.31*	46.30	1.000E+35	26.34	Decay
			768.36	5.04	---	Not Found	---
			934.06	3.21	---	Not Found	---
			1120.29	15.10	---	Not Found	---
			1238.11	5.94	---	Not Found	---
			1377.67	4.11	---	Not Found	---
			1764.49	15.00	---	Not Found	---
* Abundances Found = 40.40 (Abn. Limit = 46.40%)							

Flag: "\*" = Keyline

Sample ID : EFT-10020405

Acquisition date : 17-FEB-2005 13:14:44

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	XErr	XEff	Flags
●	140.27	36	63	0.92	250.75	276	9	2.60E-02	43.1	6.62E+00	T
	511.19	136	64	2.25	1021.99	1014	23	7.56E-02	19.2	4.74E+00	T
0	550.68	56	31	2.27	1116.91	1111	14	3.12E-02	25.0	4.55E+00	T
0	609.83	45	23	1.38	1219.16	1214	12	2.50E-02	26.3	4.26E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Backgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.53	0.3886E-08
F-18	3.	511.26	Half-Life too short
NA-22	7.	1274.54	9.8777E-09
NA-24	8.	1368.53	Half-Life too short
MG-27	8.	1914.44	Half-Life too short
SI-35	8.	1672.52	Half-Life too short
SR-41	8.	1293.64	Half-Life too short
SC-44	10.	300.25	1.8400E-08
CR-51	33.	320.88	1.8843E-07
MN-54	16.	834.83	1.8838E-08
CO-56	21.	1258.25	2.3866E-08
MN-56	8.	1818.69	Half-Life too short
NI-56	42.	158.38	3.4754E-08
CO-57	31.	122.96	9.5613E-09
CO-58	18.	818.76	1.1219E-08
FE-59	9.	1899.22	1.9554E-08
CO-60	14.	1332.49	1.2278E-08
CU-64	8.	1345.98	Half-Life too short
NI-65	8.	1481.84	Half-Life too short
ZN-65	13.	1115.52	2.1744E-08
ZN-69M	8.	438.63	Half-Life too short
SE-75	46.	138.88	1.5891E-08
AS-76	6.	559.18	Half-Life too short
BR-82	20.	776.49	5.4896E-08
BR-83	8.	529.64	Half-Life too short
BR-84	8.	881.58	Half-Life too short
BR-85	8.	882.41	Half-Life too short
KR-85	37.	513.99	2.2979E-06
KR-85M	8.	151.18	Half-Life too short
SR-85	37.	513.99	1.1416E-08
RB-86	12.	1876.63	1.8542E-07
KR-87	8.	482.58	Half-Life too short
SR-87M	8.	388.48	Half-Life too short
KR-88	8.	196.32	Half-Life too short
RB-88	8.	1582.39	Half-Life too short
Y-88	5.	1836.81	1.8181E-08
KR-89	8.	228.98	Half-Life too short
RE-89	8.	1801.86	Half-Life too short
KR-90	8.	1118.69	Half-Life too short
RE-90	8.	831.69	Half-Life too short
RE-90M	8.	824.23	Half-Life too short
Y-90M	8.	882.51	Half-Life too short
SR-91	8.	1824.38	Half-Life too short
Y-91	9.	1884.98	3.6188E-06
Y-91M	8.	535.68	Half-Life too short
SR-92	8.	1383.94	Half-Life too short
Y-92	8.	984.48	Half-Life too short



Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
● 93	0.	590.20	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	21.	702.63	0.0090E-09
NB-95	12.	765.79	1.0075E-08
NE-95M	30.	235.60	3.0046E-07
ZP-95	11.	766.70	1.5705E-08
NB-97	0.	657.00	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	19.	730.58	1.0006E-06
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	392.81	Half-Life too short
RU-103	23.	497.68	1.1112E-08
TC-104	0.	307.00	Half-Life too short
RH-105	31.	316.90	1.6060E-05
RU-105	0.	724.50	Half-Life too short
RU-106	22.	621.84	0.0000E-00
CD-109	39.	88.03	3.0201E-07
AG-110M	15.	937.48	3.1051E-08
SN-113	27.	391.60	1.2561E-08
SN-117M	44.	156.56	1.7899E-08
SB-122	17.	563.93	2.9101E-07
SB-124	37.	602.71	1.2522E-08
SB-125	30.	427.89	2.0283E-08
TE-125M	33.	100.20	3.0110E-06
TE-127	0.	417.90	Half-Life too short
● 127M	29.	57.60	3.0966E-05
XE-127	45.	202.84	1.5163E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	20.	695.88	3.4850E-07
XE-129M	60.	106.56	5.3064E-07
I-130	0.	536.00	Half-Life too short
BA-131	32.	123.60	5.9304E-08
I-131	36.	364.40	3.2634E-08
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	51.	163.93	9.2290E-07
I-132	0.	667.60	Half-Life too short
TE-132	50.	228.16	1.5803E-07
BA-133	33.	302.84	4.2575E-08
BA-133M	26.	276.00	1.1246E-05
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	31.	61.00	2.3570E-07
XE-133M	47.	233.22	5.1189E-06
CS-134	35.	604.70	9.9292E-09
I-134	0.	884.89	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1268.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
● 135M	0.	526.56	Half-Life too short

Sample ID : EFT-1D880483

Acquisition date : 17-FEB-2005 13:14:44

Nuclide	Decayd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	20.	816.56	2.9736E-06
I-136	0.	1313.82	Half-Life too short
CS-137	20.	661.65	9.9869E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	250.31	Half-Life too short
SA-139	0.	1420.50	Half-Life too short
CE-139	20.	105.85	9.3568E-09
CS-139	0.	1203.23	Half-Life too short
SA-140	13.	537.32	5.1063E-06
LA-140	0.	1506.49	2.1012E-06
SA-141	0.	190.22	Half-Life too short
CE-141	38.	145.44	2.1850E-08
LA-141	0.	1354.52	Half-Life too short
SA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	40.	293.26	1.5193E-05
CE-144	47.	133.54	8.4943E-08
PR-144	0.	1409.15	Half-Life too short
ND-147	31.	91.10	9.4869E-08
PM-148M	17.	550.27	9.4829E-09
EU-152	35.	344.27	3.1004E-06
EU-154	8.	1004.76	4.5360E-08
EU-156	14.	646.29	1.7907E-07
HF-181	28.	482.83	1.2678E-08
TA-182	6.	1221.42	3.1486E-08
W-187	0.	625.81	Half-Life too short
RE-188	0.	155.83	Half-Life too short
HG-203	42.	279.19	1.3817E-08
BI-207	20.	569.67	9.3404E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	46.	240.98	2.6107E-06
RA-226	57.	186.21	2.6593E-07
AC-228	20.	338.32	6.4314E-08
TH-228	43.	84.87	1.3393E-06
PA-234	0.	131.20	Half-Life too short
TH-234	30.	63.29	1.5753E-06
U-235	46.	143.76	8.2022E-08
NP-239	38.	106.13	2.9711E-06
AM-241	26.	59.54	1.2195E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-2D020405

Sample Location (Well Number): 2 Deep

1. Representative sample collected. Date/Time 02/04/05 / 0944

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Don Caswell / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Burger / [Signature] Date: 2/21/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 3/21/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No Tritium detected,  
release of Lipton 48651 / 3/18/2005

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-2D020405
2 . Date Sampled	02/04/2005
3 . Time Sampled	09:44
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/21/2005
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.9 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.1 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

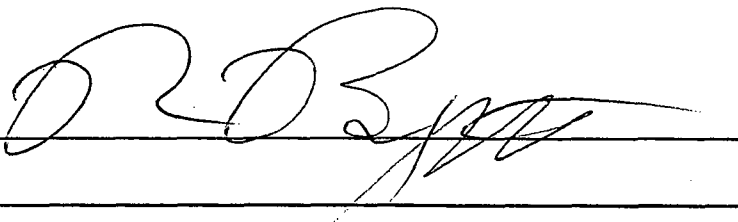
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.08\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date

2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-2D020405

Sample Location (Well Number): 2 Deep

1. Representative sample collected. Date/Time 02/04/05 / 0944

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Couillard / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

Sample number: EFT-20020405

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy J. Mes Date: 3/7/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton William V. Lipton Date: 3/18/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 20062 keV peak unidentified; high Pu H<sub>1</sub> (4.46), high  
error (51.4%) - (as 1900)  
No licensed radioactive material detected.  
William V. Lipton 98651 / 3/18/05

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-2D020405

Sample End Time: 4-FEB-2005 09:44:00.00

REMARKS 200.07 KeV peak unidentified, high FWHM (4.46) high  
error (51.4%) as ignore,  
redon V. Lipton 48651 3/18/05

PERFORMED BY:

*J. M. G.*

SIGNATURE

REVIEWED BY:

*redon V. Lipton 48651 3/18/05*

SIGNATURE/DATE

Sample ID : EFT-2D020405

Acquisition date : 7-MAR-2005 11:19:39

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-2D020405
Sample collection start date: 4-FEB-2005 09:44:00.00
Sample collection end date : 4-FEB-2005 09:44:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 11:19:39.75
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.12 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
Kev/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.68

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 7 rows of peak data with handwritten annotations.

Handwritten notes: TH 232, 51.4, annihilation, H4C, 82214, 1.77E+00, K40



Sample Title : EFT-20020405  
Decay Time = 31 01:35:39.75

Page : 1  
Acquisition Time = 7-MAR-2005 11:19:39.75

Post-NID Peak Search Report

I	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	140.16	66	81	1.21	200.60	274	14	31.4		
0	200.67	50	114	4.46	401.49	392	17	51.4		
0	511.44	133	73	2.57	1022.57	1013	16	16.7		
0	558.73	37	37	1.03	1117.09	1112	12	36.4		
0	610.24	36	36	0.58	1220.06	1214	14	40.5		
3	1460.88	73	3	3.16	2921.45	2913	15	14.1	1.77E+00	K-40
3	1461.89	12	3	2.34	2923.47	2913	15	82.6		

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	73	10.67*	2.389E+00	4.290E-07	4.290E-07	14.11

Flag: "\*" = Keyline

Sample ID : EFT-2D020405

Acquisition date : 7-MAR-2005 11:19:39

Total number of lines in spectrum 7  
 Number of unidentified lines 1  
 Number of lines tentatively identified by NID 6 85.71%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.290E-07	4.290E-07	0.605E-07	14.11	
Total Activity :			4.290E-07	4.290E-07			

Grand Total Activity : 4.290E-07 4.290E-07

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	407.79	511.00*	193.46	1.000E+35	16.66	Decay
% Abundances Found =			100.00				
AS-76	26.32H	28.34	559.10*	44.70	9.296E+00	36.37	Decay, Abun.
% Abundances Found =			73.70				
			563.23	1.17	---	Not Found	---
			571.30	0.14	---	Not Found	---
			657.03	6.10	---	Not Found	---
			665.31	0.39	---	Not Found	---
			740.12	0.12	---	Not Found	---
			771.76	0.12	---	Not Found	---
			867.63	0.12	---	Not Found	---
			1129.07	0.14	---	Not Found	---
			1212.72	1.63	---	Not Found	---
			1216.02	3.84	---	Not Found	---
			1228.52	1.39	---	Not Found	---
			1439.13	0.33	---	Not Found	---
			1453.60	0.13	---	Not Found	---
			1707.67	0.33	---	Not Found	---
MO-99	66.02H	11.30	140.51	3.80	1.090E-03	31.40	Decay, Abun.
% Abundances Found =			13.25				
			181.06	6.20	---	Not Found	---
			366.43	1.37	---	Not Found	---
			739.50*	12.00	---	Not Found	---
			778.00	4.50	---	Not Found	---
TC-99M	6.02H	123.09	140.50*	89.07	3.653E+29	31.40	Decay
% Abundances Found =			100.00				
RU-103	39.35D	0.79	497.00*	89.00	---	Not Found	---
% Abundances Found =			5.92				
			610.33	5.60	---	3.756E-07	40.48
TE-131M	30.00H	24.86	102.06	7.90	---	Not Found	---
% Abundances Found =			5.19				
			149.72	5.10	---	Not Found	---
			200.63	7.56	---	4.747E+00	51.35
			240.93	7.59	---	Not Found	---
			334.27	9.60	---	Not Found	---
			773.67*	38.20	---	Not Found	---
			782.49	7.79	---	Not Found	---
			793.75	13.90	---	Not Found	---
			822.78	6.12	---	Not Found	---
			852.21	20.70	---	Not Found	---
			1125.46	11.40	---	Not Found	---
			1206.60	9.00	---	Not Found	---
TE-134	41.00M	1070.59	79.45	21.00	---	Not Found	---
% Abundances Found =			21.90				
			100.89	10.00	---	Not Found	---
			201.24	0.70	---	1.000E+35	51.35
			210.47*	21.90	---	Not Found	---

Nuclide	Half-life	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
		Ratio				(uCi/cc)	%Error		
TF-134	41.80M	1070.59		277.95	21.30	---	Not Found	---	Decay, Abun.
				435.06	18.60	---	Not Found	---	
				461.00	10.00	---	Not Found	---	
				464.64	5.10	---	Not Found	---	
				565.99	10.90	---	Not Found	---	
				742.59	14.70	---	Not Found	---	
				767.20	30.00	---	Not Found	---	
			% Abundances Found =			4.60			
PM-148M	41.30D	0.75		288.11	12.56	---	Not Found	---	Abun.
				414.07	18.66	---	Not Found	---	
				432.78	5.35	---	Not Found	---	
				501.26	6.75	---	Not Found	---	
				550.27*	94.90	---	Not Found	---	
				599.74	12.54	---	Not Found	---	
				611.26	5.48	3.741E-07	40.48		
				629.97	89.00	---	Not Found	---	
				725.70	32.80	---	Not Found	---	
				915.33	17.17	---	Not Found	---	
% Abundances Found =			1.74						
BI-214	19.90M	2248.78		609.31*	46.30	1.000E+35	40.48	Decay	
				768.36	5.04	---	Not Found	---	
				934.06	3.21	---	Not Found	---	
				1120.29	15.10	---	Not Found	---	
				1238.11	5.94	---	Not Found	---	
				1377.67	4.11	---	Not Found	---	
				1764.49	15.80	---	Not Found	---	
% Abundances Found =			48.4	(Abn. Limit = 40.48%)					

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	XErr	XEff	Flags
0	140.16	66	81	1.21	280.60	274	14	3.66E-02	31.4	6.01E+00	T
0	200.67	50	114	4.46	401.49	392	17	2.76E-02	51.4	6.34E+00	T
0	511.44	133	73	2.57	1022.57	1013	16	7.41E-02	16.7	4.73E+00	T
0	550.73	37	37	1.03	1117.09	1112	12	2.06E-02	36.4	4.55E+00	T
0	610.24	36	36	0.58	1220.06	1214	14	1.97E-02	40.5	4.30E+00	T
3	1461.89	12	3	2.34	2923.47	2913	15	6.53E-03	82.6	2.39E+00	

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	24.	477.59	1.1330E-07
F-18	0.	511.00	Half-Life too short
NA-22	9.	1274.54	9.7954E-09
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	13.	889.25	1.2053E-08
CR-51	30.	320.00	1.6405E-07
MN-54	15.	834.83	9.8890E-09
CO-56	24.	1238.25	2.8556E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	46.	158.38	2.8089E-07
CO-57	44.	122.06	1.1810E-08
CO-58	8.	810.76	9.5729E-09
FE-59	10.	1099.22	2.6964E-08
CO-60	10.	1332.49	1.0389E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	7.	1115.52	1.7097E-08
ZN-69M	0.	438.63	Half-Life too short
SI-75	25.	136.00	1.3314E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	602.41	Half-Life too short
KR-85	58.	513.99	2.8395E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	58.	513.99	1.7052E-08
RB-86	10.	1076.63	3.4067E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	7.	1036.01	1.3057E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	17.	1204.90	5.9851E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
2	0.	934.46	Half-Life too short

Sample ID : EFT-2D020405

Acquisition date : 7-MAR-2005 11:19:39

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.20	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	20.	702.63	1.0326E-00
NB-95	15.	765.79	1.5609E-00
NB-95M	40.	235.69	1.3429E-05
ZR-95	16.	756.72	2.1978E-00
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	30.	497.00	1.7199E-00
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	19.	621.84	0.5290E-00
CD-109	34.	80.03	3.6970E-07
AG-110M	15.	937.40	3.3371E-00
SN-113	34.	391.69	1.5499E-00
SN-117M	40.	150.56	4.6304E-00
SB-122	0.	563.93	Half-Life too short
SB-124	23.	602.71	1.2426E-00
SB-125	30.	427.09	2.0461E-00
TE-125M	33.	109.20	4.7134E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	20.	57.60	3.4302E-05
XE-127	40.	202.84	2.2070E-00
TE-129	0.	459.60	Half-Life too short
TE-129M	19.	695.00	4.9371E-07
XE-129M	45.	196.56	1.9057E-06
I-130	0.	536.09	Half-Life too short
BA-131	40.	123.00	1.0775E-07
I-131	22.	364.40	1.2207E-07
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	50.	163.93	2.6260E-06
I-132	0.	667.69	Half-Life too short
TE-132	47.	220.16	7.1766E-06
BA-133	53.	302.84	5.3237E-00
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	29.	01.00	2.4733E-06
XE-133M	0.	233.22	Half-Life too short
CS-134	26.	604.70	9.4695E-09
I-134	0.	004.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short



Sample ID : EFT-2D020405

Acquisition date : 7-MAR-2005 11:19:39

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
C-136	17.	818.58	4.9363E-08
I-136	0.	1313.02	Half-Life too short
CS-137	19.	661.65	9.6680E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.58	Half-Life too short
CE-139	38.	165.85	1.0600E-08
CS-139	0.	1203.23	Half-Life too short
BA-140	25.	537.32	1.8048E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	38.	145.44	3.0683E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	36.	133.54	7.9173E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	38.	91.18	3.2630E-07
PM-148M	18.	558.27	1.3099E-08
EU-152	37.	344.27	3.1498E-08
EU-154	17.	1004.76	6.2439E-08
EU-156	15.	646.29	4.2171E-07
HF-181	22.	482.03	1.5306E-08
T-182	12.	1221.42	4.7906E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	44.	279.19	1.7401E-08
BI-207	23.	569.67	8.5743E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	43.	240.98	7.9563E-05
RA-226	47.	186.21	2.4599E-07
AC-228	32.	338.32	6.9005E-08
TH-228	44.	84.37	1.3771E-06
PA-234	0.	131.20	Half-Life too short
TH-234	35.	63.29	2.8645E-06
U-235	36.	143.76	7.1968E-08
NP-239	0.	106.13	Half-Life too short
AM-241	33.	59.54	2.0247E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-45020305

Sample Location (Well Number): 4 Shallow

1. Representative sample collected. Date/Time 2/3/05 / 1447

Sample collected by: Sy Marie Slaback / Amy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Cavillod / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Berger / [Signature] Date: 2/21/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William Klytzer / William J. [Signature] Date: 2/21/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-4S020305
2. Date Sampled	02/03/2005
3. Time Sampled	14:47
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	02/21/2005
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.3 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 2/2/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-45020305

Sample Location (Well Number): 4 Shallow

1. Representative sample collected. Date/Time 2/3/05 / 1447

Sample collected by: Joy Marie Stalock / Joy Marie Stalock Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Cawillack / Jon Cawillack Date: 2/16/05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / L. McCoy Date: 3/7/05  
Fermi 2 RP Printed Name Signature

Sample number: EFT-45020305

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 3/01/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 988.49 keV peak unidentified - low Fu HM (074) as ignore.  
No licensed radioactive material detected.  
William V. Lipton 48051 3/01/2005

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-46020305

Sample End Time: 3-FEB-2005 14:47:00.00

REMARKS 988.49 KeV peak unidentified - low FWHM (0.174);  
can ignore, William V. Lynn 48051 3/2/05

PERFORMED BY:

J. M. G.  
SIGNATURE

REVIEWED BY:

William V. Lynn 48051 3/2/05  
SIGNATURE/DATE

Sample ID : EFT-45020305

Acquisition date : 7-MAR-2005 10:48:46

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-45020305
Sample collection start date: 3-FEB-2005 14:47:00.00
Sample collection end date : 3-FEB-2005 14:47:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : N2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 10:48:46.22
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.13 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
KeV/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.68

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, XErr, Fit. Contains 7 rows of peak data with handwritten annotations.

Handwritten notes: 'approximate', '8.32E-01', 'K4C' with circles around specific data points in the table.

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	510.70	169	41	2.28	1021.25	1014	16	11.4		
0	550.39	81	19	1.45	1116.41	1111	11	15.3		
0	609.57	46	48	0.82	1210.73	1212	14	35.6		
0	980.49	12	5	0.74	1976.41	1971	9	41.8		
0	1120.73	22	6	1.30	2240.90	2234	11	29.8		
2	1460.25	53	3	2.07	2920.19	2914	15	10.4	0.32E-01	
2	1461.15	10	4	2.57	2922.01	2914	15	56.1		K-40



Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	18	10.67*	2.389E+00	1.045E-07	1.045E-07	56.10

Flag: "\*" = Keyline

Summary of Nuclide Activity

Sample ID : EFT-46020305

Acquisition date : 7-MAR-2005 10:40:46

Total number of lines in spectrum 7  
 Number of unidentified lines 2  
 Number of lines tentatively identified by NID 5 71.43%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma XError	Flags
K-40	1.00E+05Y	1.00	1.045E-07	1.045E-07	0.586E-07	56.10	
Total Activity :			1.045E-07	1.045E-07			
Grand Total Activity :			1.045E-07	1.045E-07			

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

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

Sample ID : EFT-48828305

Acquisition date : 7-MAR-2005 10:48:46

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	417.87	511.00*	100.00	1.000E+35	11.36	Decay
% Abundances Found = 100.00							
SC-46	83.83D	0.38	142.53	62.70	---	Not Found	---
			889.25*	99.98	---	Not Found	---
			1120.51	99.99	1.550E-08	29.80	
% Abundances Found = 38.07							
AS-76	26.32H	29.04	559.10*	44.70	3.289E+01	15.31	Decay, Abun.
			563.23	1.17	---	Not Found	---
			571.30	0.14	---	Not Found	---
			657.03	6.19	---	Not Found	---
			665.31	0.39	---	Not Found	---
			740.12	0.12	---	Not Found	---
			771.76	0.12	---	Not Found	---
			867.63	0.12	---	Not Found	---
			1129.87	0.14	---	Not Found	---
			1212.72	1.63	---	Not Found	---
			1216.02	3.84	---	Not Found	---
			1228.52	1.39	---	Not Found	---
			1439.13	0.33	---	Not Found	---
			1453.60	0.13	---	Not Found	---
			1787.67	0.33	---	Not Found	---
% Abundances Found = 73.70							
RU-103	39.35D	0.81	497.08*	89.00	---	Not Found	---
			610.33	5.60	4.910E-07	35.56	
% Abundances Found = 5.92							
BI-214	19.90M	2304.36	609.31*	46.30	1.000E+35	35.56	Decay
			768.36	5.04	---	Not Found	---
			934.06	3.21	---	Not Found	---
			1120.29	15.10	1.000E+35	29.80	
			1238.11	5.94	---	Not Found	---
			1377.67	4.11	---	Not Found	---
			1764.49	15.80	---	Not Found	---
% Abundances Found = 64.29 (Abn. Limit = 48.48%)							

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	510.78	169	41	2.28	1021.25	1014	16	9.41E-02	11.4	4.74E+00	T
0	550.39	81	19	1.45	1116.41	1111	11	4.49E-02	15.3	4.55E+00	T
0	609.57	46	48	0.82	1210.73	1212	14	2.55E-02	35.6	4.38E+00	T
0	900.49	12	5	0.74	1976.41	1971	9	6.93E-03	41.8	2.95E+00	
0	1120.73	22	6	1.30	2240.90	2234	11	1.22E-02	29.8	2.78E+00	T
2	1460.25	53	3	2.87	2920.19	2914	15	2.94E-02	10.4	2.39E+00	

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	10.	477.59	1.0024E-07
F-18	0.	511.00	Half-Life too short
NA-22	9.	1274.54	9.7689E-09
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	14.	889.25	1.2683E-08
CR-51	31.	320.88	1.6912E-07
MN-54	19.	834.83	1.1205E-08
CO-56	21.	1238.25	2.7077E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	45.	158.38	3.0174E-07
CO-57	35.	122.06	1.0680E-08
CO-58	10.	810.76	1.0343E-08
FE-59	12.	1099.22	2.8833E-08
CO-60	10.	1332.49	1.0391E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	12.	1115.52	2.2168E-08
ZN-69M	0.	438.63	Half-Life too short
S-75	36.	136.00	1.5921E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	43.	513.99	2.4639E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	43.	513.99	1.4916E-08
RB-86	14.	1076.63	3.9256E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	8.	1036.01	1.3898E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RB-90	0.	831.69	Half-Life too short
RB-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.38	Half-Life too short
Y-91	10.	1204.98	4.7769E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-46020305

Acquisition date : 7-MAR-2005 10:46:46

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	17.	702.63	0.3652E-09
NB-95	26.	765.79	2.0505E-08
NB-95M	54.	235.69	1.6453E-05
ZR-95	19.	756.72	2.4228E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	25.	497.88	1.6051E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	23.	621.84	9.2630E-08
CD-109	48.	88.03	4.3353E-07
AG-110M	13.	937.48	3.1240E-08
SN-113	42.	391.69	1.7165E-08
SN-117M	45.	158.56	4.6733E-08
SB-122	0.	563.93	Half-Life too short
SB-124	34.	602.71	1.4968E-08
SB-125	32.	427.89	2.9448E-08
TE-125M	31.	109.28	4.6773E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	27.	57.68	3.3662E-05
XE-127	48.	202.84	2.2315E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	24.	695.88	5.5625E-07
XE-129M	49.	196.56	2.1077E-06
I-130	0.	536.09	Half-Life too short
BA-131	35.	123.80	1.8647E-07
I-131	32.	364.48	1.5221E-07
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	44.	163.93	2.5845E-06
I-132	0.	667.69	Half-Life too short
TE-132	48.	228.16	8.5377E-06
BA-133	41.	302.84	4.7356E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.56	Half-Life too short
XE-133	33.	81.00	2.8832E-06
XE-133M	0.	233.22	Half-Life too short
CS-134	37.	604.70	1.1205E-08
I-134	0.	604.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : EFT-46020305

Acquisition date : 7-MAR-2005 10:48:46

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
C-136	10.	818.50	4.0991E-08
I-136	0.	1313.02	Half-Life too short
CS-137	19.	661.65	9.6594E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.06	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1428.50	Half-Life too short
CE-139	46.	165.85	1.1641E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	27.	537.32	1.9653E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	198.22	Half-Life too short
CE-141	44.	145.44	3.3438E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	8.	293.26	Half-Life too short
CE-144	53.	133.54	9.3991E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	29.	91.10	3.0255E-07
PM-148M	22.	558.27	1.4571E-08
EU-152	37.	344.27	3.1785E-08
EU-154	14.	1004.76	5.7542E-08
EU-156	14.	646.29	4.2697E-07
HF-181	22.	482.03	1.5472E-08
TO-182	6.	1221.42	3.5422E-08
W-187	0.	685.01	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	56.	279.19	1.9629E-08
BI-207	26.	569.67	9.0918E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	44.	240.98	9.3265E-05
RA-226	55.	186.21	2.6403E-07
AC-228	37.	338.32	7.3624E-08
TH-228	23.	84.37	1.0210E-06
PA-234	0.	131.20	Half-Life too short
TH-234	29.	63.29	2.6877E-06
U-235	48.	143.76	8.1746E-08
NP-239	0.	106.13	Half-Life too short
AM-241	25.	59.54	1.7910E-07

### FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-40020305

Sample Location (Well Number): 4 Deep

1. Representative sample collected. Date/Time 2/3/05 / 1331

Sample collected by: Joy Marie Sloback / Joy Marie Sloback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample ≥ 50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Covillone / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: [Signature] / [Signature] Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 3/10/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected.  
William V Lipton 4845 3/10/2005



Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-4D020305
2 . Date Sampled	02/03/2005
3 . Time Sampled	13:31
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

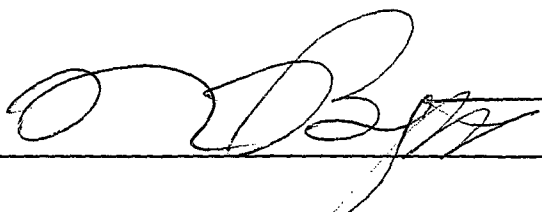
1 . Date Sample Counted	02/21/2005	
2 . Time Sample Counted	10:00	
3 . Background Inf.:		
Minutes Counted	10	min.
Background Count Rate (cpm)	6.8	cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)		
Gross Spike Count Rate (cpm)	3751.8	cpm
Net Spike Count Rate (cpm)	3745.0	cpm
H3 Spike Activity (dpm on count date)	9309.7	dpm
Counter Efficiency	0.4023	cpm/dpm
5 . Sample Info:		
Sample Gross Count Rate (cpm)	6.0	cpm
Sample Count Time (min.)	10.0	min.
Net Sample Count Rate (cpm)	0.0	cpm
6 . Critical Level:		
Critical Level Count Rate (cpm)	1.9	cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\frac{\text{(Bkg cpm)}}{\text{(Bkg min.)}} + \frac{\text{(Bkg cpm)}}{\text{(Smpl min.)}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.08\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date 2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-40020305

Sample Location (Well Number): 4 Deep

1. Representative sample collected. Date/Time 2/3/05 / 1331

Sample collected by: Jay Marie Slabick / Jay Marie Slabick Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Coultord / Janille Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / J. McCoy Date: 3/7/05  
Fermi 2 RP Printed Name Signature

Sample number: EFT-40020305

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy / [Signature] Date: 3/1/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 3/1/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton (845) 3/1/05  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-40020305

Sample End Time: 3-FEB-2005 13:31:00.00

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PERFORMED BY:

J.M.'J  
SIGNATURE

REVIEWED BY:

Nelson A. Taylor 3/1/05  
SIGNATURE/DATE

Sample ID : EFT-4D020305

Acquisition date : 7-MAR-2005 10:17:50

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-4D020305
Sample collection start date: 3-FEB-2005 13:31:00.00
Sample collection end date : 3-FEB-2005 13:31:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 10:17:50.98
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.14 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
Kev/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.68

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

Table with columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Includes handwritten annotations and circled values.

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	xErr	Fit	Nuclides
1	140.23	31	46	1.40	280.74	276	25	48.4	1.70E+00	
1	143.99	32	37	1.41	280.26	276	25	39.1		
0	352.19	38	60	1.41	704.29	698	11	42.3		
4	510.32	61	45	1.50	1020.32	1014	10	26.5	7.91E-01	
4	511.90	60	43	1.60	1023.64	1014	10	25.1		
0	558.89	34	36	0.96	1117.41	1111	9	36.3		
0	609.96	62	29	1.40	1219.50	1214	14	22.2		
0	912.12	11	11	1.39	1823.67	1817	9	62.4		
0	1460.60	66	3	2.14	2921.05	2913	14	13.7		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	66	10.67*	2.389E+00	3.889E-07	3.889E-07	13.65

Flag: "\*" = Keyline

Sample ID : EFT-4D020305

Acquisition date : 7-MAR-2005 10:17:50

Total number of lines in spectrum 9  
 Number of unidentified lines 1  
 Number of lines tentatively identified by NID 8 88.89%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma *Error	Flags
K-40	1.00E+05Y	1.00	3.889E-07	3.889E-07	0.531E-07	13.65	
Total Activity :			3.889E-07	3.889E-07			
Grand Total Activity :			3.889E-07	3.889E-07			

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

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



Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74H	418.28	511.00*	193.46	1.000E+35	26.51	Decay
% Abundances Found = 100.00							
AC-76	26.32H	29.87	559.10*	44.78	1.407E+01	36.29	Decay, Abun.
563.23 1.17 ---- Not Found ----							
571.30 0.14 ---- Not Found ----							
657.03 6.10 ---- Not Found ----							
665.31 0.39 ---- Not Found ----							
748.12 0.12 ---- Not Found ----							
771.76 0.12 ---- Not Found ----							
867.63 0.12 ---- Not Found ----							
1129.07 <0.14 ---- Not Found ----							
1212.72 1.63 ---- Not Found ----							
1216.02 3.04 ---- Not Found ----							
1228.52 1.39 ---- Not Found ----							
1439.13 0.33 ---- Not Found ----							
1453.60 0.13 ---- Not Found ----							
1787.67 0.33 ---- Not Found ----							
% Abundances Found = 73.70							
MO-99	66.02H	11.59	148.51	3.80	6.232E-04	40.40	Decay, Abun.
181.06 6.20 ---- Not Found ----							
366.43 1.37 ---- Not Found ----							
739.58* 12.80 ---- Not Found ----							
778.00 4.50 ---- Not Found ----							
% Abundances Found = 13.25							
TC-99M	6.02H	127.08	148.50*	89.07	1.555E+30	40.40	Decay
% Abundances Found = 100.00							
RU-103	39.35D	0.81	497.08*	89.00	6.629E-07	22.24	Abun.
610.33 5.60 ---- Not Found ----							
% Abundances Found = 5.92							
XE-127	36.41D	0.88	145.22	4.24	3.389E-07	39.08	Abun.
172.10 24.70 ---- Not Found ----							
282.84* 68.10 ---- Not Found ----							
374.96 17.40 ---- Not Found ----							
% Abundances Found = 3.70							
TE-133M	55.40M	826.55	168.87	11.50	1.000E+35	22.24	Decay, Abun.
261.55 15.70 ---- Not Found ----							
334.14 5.40 ---- Not Found ----							
647.40 29.30 ---- Not Found ----							
863.91 19.50 ---- Not Found ----							
912.58* 87.00 ---- Not Found ----							
914.72 16.50 ---- Not Found ----							
978.19 9.50 ---- Not Found ----							
% Abundances Found = 44.75							
SI-214	19.90M	2306.63	609.31*	46.30	1.000E+35	22.24	Decay
768.36 5.04 ---- Not Found ----							

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
BI-214	19.90M	2306.63	934.06	3.21	---	Not Found	Decay
			1120.29	15.10	---	Not Found	
			1238.11	5.94	---	Not Found	
			1377.67	4.11	---	Not Found	
			1764.49	15.80	---	Not Found	
% Abundances Found =				48.48	(Abn. Limit = 48.48%)		
PB-214	26.80M	1712.76	87.30	4.67	---	Not Found	Decay
			241.98	7.49	---	Not Found	
			295.21	19.20	---	Not Found	
			351.92*	37.20	1.000E+35	42.30	
			705.91	1.10	---	Not Found	
% Abundances Found =				53.40	(Abn. Limit = 37.20%)		
AC-228	6.13Y	0.01	129.08	2.80	---	Not Found	Abun.
			209.20	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	---	Not Found	
			911.07	27.70	1.980E-08	62.40	
			964.60	5.20	---	Not Found	
969.11	16.60	---	Not Found				
1588.00	3.50	---	Not Found				
% Abundances Found =				30.94			
U-235	9999.99Y	0.00	109.14	1.50	---	Not Found	Abun.
			143.76*	10.50	7.450E-08	39.88	
			163.35	4.70	---	Not Found	
			185.72	54.00	---	Not Found	
			202.12	1.00	---	Not Found	
205.31	4.70	---	Not Found				
% Abundances Found =				13.74			

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
1	140.23	31	46	1.40	280.74	278	25	1.71E-02	40.4	6.02E+00	T
1	143.99	32	37	1.41	288.26	276	25	1.77E-02	39.1	6.11E+00	T
3	352.19	30	60	1.41	704.29	698	11	2.14E-02	42.3	5.52E+00	T
4	510.32	61	45	1.50	1020.32	1014	10	3.39E-02	26.5	4.74E+00	T
4	511.98	60	43	1.60	1023.64	1014	10	3.70E-02	25.1	4.73E+00	
0	558.89	34	36	0.96	1117.41	1111	9	1.80E-02	36.3	4.55E+00	T
0	609.96	62	29	1.49	1219.50	1214	14	3.43E-02	22.2	4.30E+00	T
0	912.12	11	11	1.39	1823.67	1817	9	6.12E-03	62.4	3.05E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	21.	477.59	1.0820E-07
F-18	0.	511.00	Half-Life too short
NA-22	0.	1274.54	9.3931E-09
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	12.	609.25	1.1974E-08
CR-51	34.	320.00	1.7577E-07
MN-54	11.	834.83	0.7957E-09
CO-56	16.	1238.25	2.4051E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	40.	158.38	2.8689E-07
CO-57	33.	122.06	1.0310E-08
CO-58	11.	810.76	1.1092E-08
FE-59	17.	1099.22	3.4036E-08
CO-60	16.	1332.49	1.2979E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	15.	1115.52	2.3854E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	43.	136.00	1.7151E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	53.	513.99	2.7007E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	53.	513.99	1.6404E-08
RB-86	0.	1076.63	3.1834E-07
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	308.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1302.39	Half-Life too short
Y-88	5.	1036.01	1.1486E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	14.	1204.90	5.5675E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-4D020305

Acquisition date : 7-MAR-2005 10:17:50

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
SR-93	0.	266.90	Half-Life too short
NB-94	19.	702.63	8.6837E-09
NB-95	24.	765.79	1.9855E-08
NB-95M	47.	235.69	1.5578E-05
ZR-95	14.	756.72	2.0020E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	24.	497.00	1.5646E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	19.	621.84	8.6495E-08
CD-109	32.	88.03	3.5857E-07
AG-110M	11.	937.48	2.9390E-08
SN-113	24.	391.69	1.3309E-08
SN-117M	43.	158.56	4.6209E-08
SB-122	0.	563.93	Half-Life too short
SB-124	20.	602.71	1.1900E-08
SB-125	25.	427.89	2.6303E-08
TE-125M	45.	109.28	5.4908E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	28.	57.60	3.4114E-05
XE-127	52.	202.84	2.3289E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	21.	695.88	5.1987E-07
XE-129M	51.	198.56	2.1416E-06
I-130	0.	536.09	Half-Life too short
BA-131	40.	123.80	1.9641E-07
I-131	27.	364.48	1.4128E-07
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	52.	163.93	2.7905E-06
I-132	0.	667.69	Half-Life too short
TE-132	41.	220.16	8.0065E-06
BA-133	33.	302.84	4.3044E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	24.	81.00	2.5027E-06
XE-133M	0.	233.22	Half-Life too short
CS-134	22.	604.70	8.9130E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : EFT-4D020305

Acquisition date : 7-MAR-2005 10:17:50

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	18.	818.50	5.3095E-08
I-136	0.	1313.02	Half-Life too short
CS-137	25.	661.65	1.0060E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.06	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	52.	165.05	1.2343E-08
CS-139	0.	1203.23	Half-Life too short
BA-140	21.	537.32	1.7699E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	47.	145.44	3.4456E-08
LA-141	0.	1254.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	49.	133.54	9.0911E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	30.	91.10	3.0915E-07
PM-148M	23.	550.27	1.4702E-08
EU-152	36.	344.27	3.1346E-08
EU-154	12.	1004.76	5.5085E-08
EU-156	19.	646.29	4.9066E-07
HF-181	23.	402.03	1.5749E-08
TA-182	9.	1221.42	4.1250E-08
W-187	0.	605.01	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	51.	279.19	1.0063E-08
BI-207	25.	569.67	0.9157E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	230.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	53.	240.98	1.0270E-04
RA-226	52.	186.21	2.5019E-07
AC-228	40.	338.32	7.6410E-08
TH-228	26.	04.37	1.0070E-06
PA-234	0.	131.20	Half-Life too short
TH-234	27.	63.29	2.5904E-06
U-235	61.	143.76	9.1169E-08
NP-239	0.	106.13	Half-Life too short
AM-241	30.	59.54	1.9440E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-55020305

Sample Location (Well Number): 5 shallow

1. Representative sample collected. Date/Time 2/3/05 / 1000

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Guillard / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: [Signature] Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton Date: 3/2/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks no tritium detected,  
William V. Lipton 48451 3/2/2005

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-5S020305
2 . Date Sampled	02/03/2005
3 . Time Sampled	10:00
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/21/2005
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.0 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

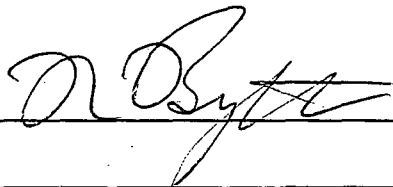
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician



Date

2/21/05



## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-55020305

Sample Location (Well Number): 5 Shallow

1. Representative sample collected. Date/Time 2/3/05 / 1000

Sample collected by: Joy Marie Staback / Joy Marie Staback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Guillot / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name Signature

Sample number: EFT-55020305

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy / [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William Lytle / [Signature] Date: 3/21/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected,  
release to system 48651 / 3/21/2005

RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-56020305

Sample End Time: 3-FEB-2005 10:00:00.00

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PERFORMED BY:

*J.M.G.*

\_\_\_\_\_  
SIGNATURE

REVIEWED BY:

*William J. Lynch / 3/2/2005*

\_\_\_\_\_  
SIGNATURE/DATE

Sample ID : EFT-56020305

Acquisition date : 17-FEB-2005 11:51:37

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-56020305
Sample collection start date: 3-FEB-2005 10:00:00.00
Sample collection end date : 3-FEB-2005 10:00:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : NELL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 17-FEB-2005 11:51:37.24
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.00 Percent dead time : 0.03 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
Kev/channel : 5.00590E-01 Zero offset: -2.65112E-01
Daily cal date : 17-FEB-2005 11:14:19.35

\*\*\*\*\* 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 : EFF04\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, XErr, Fit. Contains 5 rows of peak data.

Handwritten notes: P6714, 100, 1197, 72, HwC, K40, P=714

Post-NID Peak Search Report

	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	352.12	32	40	0.93	704.07	700	11	44.9		
0	511.06	140	35	2.31	1021.72	1012	17	12.2		
0	558.74	54	40	0.94	1117.04	1111	12	27.3		
0	1461.41	75	3	2.21	2922.32	2916	12	12.5		K-40
0	1764.57	21	3	1.19	3529.03	3523	11	26.5		

Nuclide Type: natural

Nuclide	Energy	Area	KAbn	KEff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma KError
K-40	1460.81	75	10.67*	2.388E+00	4.413E-07	4.413E-07	12.45

Flag: "\*" = Keyline

Summary of Nuclide Activity

Sample ID : EFT-55020305

Acquisition date : 17-FEB-2005 11:51:37

Total number of lines in spectrum 5  
 Number of unidentified lines 0  
 Number of lines tentatively identified by MID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma Error	Flags
K-40	1.00E+05Y	1.00	4.413E-07	4.413E-07	0.550E-07	12.45	
Total Activity :			4.413E-07	4.413E-07			
Grand Total Activity :			4.413E-07	4.413E-07			

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	104.86	511.00*	100.46	1.000E+35	12.20	Decay
* Abundances Found = 100.00							
AS-76	26.32H	12.85	559.10*	44.70	2.954E-04	27.32	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1120.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.64	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
* Abundances Found = 73.70							
BI-214	19.90M	1019.43	609.31*	46.30	----	Not Found	Decay, Abun.
			768.36	5.04	----	Not Found	----
			934.06	3.21	----	Not Found	----
			1120.29	15.10	----	Not Found	----
			1236.11	5.94	----	Not Found	----
			1377.67	4.11	----	Not Found	----
			1764.49	15.00	1.000E+35	26.49	
* Abundances Found = 16.54 (Abn. Limit = 40.48%)							
BS-214	26.80M	756.96	87.30	4.67	----	Not Found	Decay
			241.98	7.49	----	Not Found	----
			295.21	19.20	----	Not Found	----
			351.92*	37.20	1.000E+35	44.90	
			785.91	1.10	----	Not Found	----
* Abundances Found = 53.40 (Abn. Limit = 37.20%)							

Flag: "\*" = Keyline



It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	XErr	XEff	Flags
0	352.12	32	48	0.93	704.07	700	11	1.79E-02	44.9	5.52E+00	T
0	511.06	148	35	2.31	1021.72	1012	17	8.24E-02	12.2	4.74E+00	T
0	550.74	54	40	0.94	1117.04	1111	12	3.02E-02	27.3	4.55E+00	T
0	1764.57	21	3	1.19	3529.03	3523	11	1.10E-02	26.5	2.16E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Eckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	24.	477.59	9.0642E-03
F-18	0.	511.00	Half-Life too short
NA-22	10.	1274.54	1.0007E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
BR-41	0.	1293.64	Half-Life too short
SC-46	14.	800.05	1.0003E-00
CR-51	30.	320.00	1.0642E-07
MN-54	14.	804.83	9.4660E-09
CO-56	14.	1238.25	1.9417E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	54.	158.38	4.3620E-08
CO-57	40.	122.06	1.0843E-08
CO-58	7.	810.76	7.7232E-09
FE-59	16.	1099.22	2.5156E-08
CO-60	20.	1332.49	1.4063E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	18.	1115.52	2.4811E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	47.	136.00	1.6131E-08
AS-76	0.	559.10	Half-Life too short
BR-82	16.	776.49	8.2154E-06
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	892.41	Half-Life too short
KR-85	36.	513.99	2.2656E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	36.	513.99	1.1381E-08
RB-86	10.	1076.63	1.7740E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	5.	1836.01	1.0231E-08
KR-89	0.	220.90	Half-Life too short
RS-89	0.	1031.88	Half-Life too short
KR-90	0.	1118.69	Half-Life too short
RS-90	0.	831.69	Half-Life too short
RS-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	10.	1204.90	3.8122E-06
Y-91M	0.	555.68	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-56020305

Acquisition date : 17-FEB-2005 11:51:37

Nuclide	Bckgrnd Sps	Energy (keV)	MDA (uCi/cc)
136	13.	618.58	1.8097E-08
I-136	0.	1313.02	Half-Life too short
CS-137	16.	661.65	8.8377E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1428.58	Half-Life too short
CE-139	46.	165.65	1.0541E-08
CO-139	0.	1263.23	Half-Life too short
BA-140	15.	537.32	5.0183E-08
LA-140	7.	1596.49	3.5242E-08
BA-141	0.	190.22	Half-Life too short
CE-141	42.	145.44	2.2315E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	54.	133.54	9.1377E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	27.	91.10	9.5594E-08
PM-148M	21.	558.27	1.0606E-08
EU-152	37.	344.27	3.1472E-08
EU-154	21.	1004.76	6.9739E-08
EU-156	18.	646.29	2.1061E-07
HF-161	26.	482.03	1.2483E-08
Tl-162	18.	1221.42	3.9608E-08
W-167	0.	685.81	Half-Life too short
RE-168	0.	155.03	Half-Life too short
HG-203	36.	279.19	1.2254E-08
BI-207	20.	569.67	8.0329E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	52.	240.98	3.3581E-06
RA-226	47.	186.21	2.4583E-07
AC-228	24.	338.32	6.0323E-08
TH-228	37.	84.37	1.2581E-06
PA-234	0.	131.28	Half-Life too short
TH-234	43.	63.29	1.9094E-06
U-235	41.	143.76	7.6459E-08
NP-239	37.	106.13	2.7921E-06
AM-241	27.	59.54	1.8456E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-5D020205

Sample Location (Well Number): S Deep

1. Representative sample collected. Date/Time 2/2/05 / 1432

Sample collected by: Jay Marie Slaback / Jay Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Coulard / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Bunker / [Signature] Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. [Signature] Date: 2/1/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No Tritium detected near 4805 / 2/1/2005

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-5D020205
2 . Date Sampled	02/02/2005
3 . Time Sampled	14:32
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/21/2005
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	5.9 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

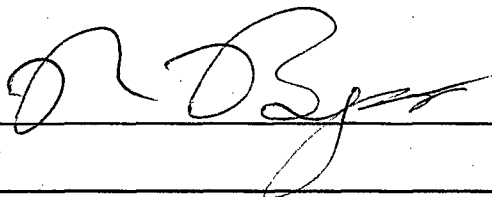
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician



Date

2/2/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT. SDO20205

Sample Location (Well Number): 5 Deep

1. Representative sample collected. Date/Time 2/2/05 / 1432

Sample collected by: Joy Marie Slaback / Amy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Carroll / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name Signature

Sample number: EFT-SDS20205

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. Mcay | [Signature] Date: 2/17/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipson | [Signature] Date: 3/21/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected,  
William V. Lipson (805) / 3/21/05

RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-5D020205

Sample End Time: 2-FEB-2005 14:32:00.00

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PERFORMED BY:

*J. McG*  
\_\_\_\_\_  
SIGNATURE

REVIEWED BY:

*William V. Jahn 48009 / 2/2/2005*  
\_\_\_\_\_  
SIGNATURE/DATE



Sample ID : EFT-5D020205

Acquisition date : 17-FEB-2005 15:07:49

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-5D020205
Sample collection start date: 2-FEB-2005 14:32:00.00
Sample collection end date : 2-FEB-2005 14:32:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 17-FEB-2005 15:07:49.10
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.14 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
KeV/channel : 5.00598E-01 Zero offset: -2.65112E-01
Daily cal date : 17-FEB-2005 11:14:19.35

\*\*\*\*\* 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 : EFFD4\_m2ll Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, XErr, Fit. Contains 8 rows of peak data.

Handwritten notes: P214, P214, P214, P214, P214, P214, P214, P214

Sample Title : EFT-50020205  
Decay Time = 15 00:35:49.10

Page : 1  
Acquisition Time = 17-FEB-2005 15:07:49.1

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
@	295.65	51	54	1.40	591.23	597	8	28.5		
@	352.04	101	53	1.27	703.92	699	10	16.7		
@	511.30	122	70	2.38	1022.22	1015	19	19.7		
@	550.69	51	22	1.66	1116.94	1111	11	22.5		
@	609.28	145	44	1.35	1218.05	1212	14	12.6		
@	1120.67	48	11	2.13	2240.64	2233	15	21.1		
@	1461.84	55	6	2.59	2921.57	2912	22	12.1		K-40
@	1764.07	32	11	2.00	3529.64	3520	14	28.1		

Isotope Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	95	10.67*	2.369E+00	5.590E-07	5.590E-07	12.07

Flag: "\*" = Keyline

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

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.86E+05Y	1.00	5.590E-07	5.590E-07	0.675E-07	12.07	
Total Activity :			5.590E-07	5.590E-07			

Grand Total Activity : 5.590E-07 5.590E-07

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

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

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
2	109.74M	197.29	511.00*	100.00	1.000E+35	19.74	Decay
* Abundances Found = 100.00							
SC-46	83.93D	0.13	142.53	62.70	---	Not Found	---
			339.25*	99.98	---	Not Found	---
			1120.51	99.99	2.923E-08	21.07	
* Abundances Found = 38.07							
AG-76	26.32M	13.71	559.10*	44.70	5.006E-04	22.40	Decay, Abun.
			563.23	1.17	---	Not Found	---
			571.38	0.14	---	Not Found	---
			657.03	5.10	---	Not Found	---
			665.31	0.39	---	Not Found	---
			740.12	0.12	---	Not Found	---
			771.76	0.12	---	Not Found	---
			867.63	0.12	---	Not Found	---
			1129.87	0.14	---	Not Found	---
			1212.72	1.63	---	Not Found	---
			1216.02	3.84	---	Not Found	---
			1228.52	1.39	---	Not Found	---
			1439.13	0.33	---	Not Found	---
			1453.60	0.13	---	Not Found	---
			1787.67	0.33	---	Not Found	---
* Abundances Found = 73.70							
F-183	39.35D	0.38	497.08*	89.00	---	Not Found	---
			610.33	5.60	1.159E-06	12.61	
* Abundances Found = 5.92							
XE-135	9.11M	39.61	249.79*	89.98	---	Not Found	---
			608.19	2.89	1.445E+06	12.61	
* Abundances Found = 3.11							
BI-214	19.90M	1087.95	609.31*	46.30	1.000E+35	12.61	Decay
			768.36	5.04	---	Not Found	---
			934.06	3.21	---	Not Found	---
			1120.29	15.10	1.000E+35	21.07	
			1238.11	5.94	---	Not Found	---
			1377.67	4.11	---	Not Found	---
			1764.49	15.88	1.000E+35	28.07	
* Abundances Found = 80.84 (Abn. Limit = 48.48%)							
PB-214	26.80M	807.87	87.30	4.67	---	Not Found	---
			241.98	7.49	---	Not Found	---
			295.21	19.20	1.000E+35	28.54	
			351.92*	37.20	1.000E+35	16.71	
			785.91	1.10	---	Not Found	---
* Abundances Found = 80.96 (Abn. Limit = 37.20%)							

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	295.65	51	54	1.40	591.23	587	8	2.04E-02	20.5	5.00E+00	T
0	352.04	101	53	1.27	703.92	699	10	5.61E-02	16.7	5.52E+00	T
0	511.30	122	70	2.38	1022.22	1015	19	6.00E-02	19.7	4.74E+00	T
0	550.69	51	22	1.63	1116.94	1111	11	2.05E-02	22.5	4.55E+00	T
0	609.20	143	44	1.35	1216.05	1212	14	0.00E-02	12.6	4.39E+00	T
0	1120.67	40	11	2.13	2240.64	2233	15	2.65E-02	21.1	2.70E+00	T
0	1764.07	32	11	2.00	3520.64	3520	14	1.77E-02	20.1	2.16E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	32.	477.59	1.0308E-07
F-18	0.	511.00	Half-Life too short
NA-22	10.	1274.54	1.0362E-08
NA-24	0.	1368.03	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-36	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	17.	889.25	1.1929E-08
CR-51	40.	320.00	1.2456E-07
MM-54	16.	834.03	1.0073E-08
CO-56	32.	1230.25	2.0253E-08
MM-56	0.	1010.69	Half-Life too short
NI-56	57.	150.30	4.9772E-08
CO-57	44.	122.06	1.1295E-08
CO-58	19.	810.76	1.1020E-08
FE-59	11.	1099.22	2.1696E-08
CO-60	14.	1332.49	1.2107E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1401.04	Half-Life too short
Z-65	10.	1115.52	1.9498E-08
Z-69M	0.	438.63	Half-Life too short
SE-75	56.	136.00	1.7510E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	39.	513.99	2.3425E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	39.	513.99	1.1084E-08
RB-86	7.	1076.63	1.5496E-07
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	300.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1302.39	Half-Life too short
Y-88	4.	1036.01	9.1440E-09
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RE-90	0.	831.69	Half-Life too short
RB-90M	0.	624.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	15.	1204.90	4.6426E-06
Y-91M	0.	555.60	Half-Life too short
Y-92	0.	1303.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-5D020205

Acquisition date : 17-FEB-2005 15:07:49

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.98	Half-Life too short
NR-94	12.	702.63	7.1653E-09
NR-95	25.	755.79	1.4515E-08
NR-95M	38.	235.69	5.5729E-07
ZR-95	11.	756.72	1.5722E-08
NR-97	0.	657.98	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
NO-99	15.	739.58	2.8415E-06
TC-99M	0.	140.58	Half-Life too short
TC-101	0.	506.81	Half-Life too short
RU-103	27.	497.03	1.2309E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.98	Half-Life too short
RU-105	0.	724.58	Half-Life too short
RU-106	17.	621.84	7.6371E-08
CO-109	43.	88.83	4.0098E-07
AG-110M	18.	937.48	3.4231E-08
SM-113	32.	391.69	1.3742E-08
SM-117M	57.	158.56	2.2238E-08
SB-122	27.	563.93	5.9789E-07
SB-124	19.	602.71	9.5423E-09
SB-125	38.	427.89	2.8338E-08
TE-125M	34.	109.28	3.9596E-06
TE-127	0.	417.98	Half-Life too short
TE-127M	37.	57.68	3.4813E-05
XE-127	48.	202.84	1.6214E-08
TE-129	0.	459.68	Half-Life too short
TE-129M	28.	695.88	3.6823E-07
XE-129M	66.	196.56	6.5182E-07
I-130	0.	536.89	Half-Life too short
BA-131	45.	123.88	7.7218E-08
I-131	42.	364.48	4.0675E-08
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	44.	163.93	9.6615E-07
I-132	0.	667.69	Half-Life too short
TE-132	45.	228.16	2.3198E-07
BA-133	33.	382.84	4.2824E-08
BA-133M	45.	276.89	2.9255E-05
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	33.	81.88	3.1563E-07
XE-133M	52.	233.22	1.0076E-05
CS-134	19.	684.78	8.1446E-09
I-134	0.	684.89	Half-Life too short
TE-134	0.	218.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1268.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short



Nuclide	Background Sum	Energy (keV)	MDA (uCi/cc)
CS-136	14.	818.59	1.9528E-08
I-136	0.	1313.02	Half-Life too short
CS-137	29.	661.65	1.1578E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.58	Half-Life too short
CE-139	48.	165.85	1.8925E-08
CS-139	0.	1268.23	Half-Life too short
BA-140	22.	537.32	< 7.2425E-08
LA-140	0.	1506.49	5.4988E-06
BA-141	0.	198.22	Half-Life too short
CE-141	52.	145.44	2.5312E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	43.	133.54	8.2437E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	38.	91.18	1.1911E-07
PM-148M	22.	558.27	1.8888E-08
EU-152	36.	344.27	3.1383E-08
EU-154	10.	1084.76	5.8878E-08
EU-156	26.	646.29	2.5861E-07
Y-181	22.	482.83	1.1681E-08
Y-182	14.	1221.42	4.5481E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.83	Half-Life too short
HG-203	47.	279.19	1.4889E-08
BI-207	32.	569.67	9.9656E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	74.	248.98	4.7664E-06
RA-226	58.	186.21	2.7111E-07
AC-228	42.	338.32	7.7841E-08
TH-228	35.	84.37	1.2259E-06
PA-234	0.	131.20	Half-Life too short
TH-234	33.	63.29	1.7434E-06
U-235	56.	143.76	8.7581E-08
NP-239	43.	186.13	3.9451E-06
AM-241	31.	59.54	1.9663E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-SD02020SD

Sample Location (Well Number): SD020

1. Representative sample collected. Date/Time 2/2/05 / 1500

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Galloway / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Burgess / [Signature] Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 3/1/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks no tritium detected within system (805) 3/1/2005

Tritium Activity Calculation

**Sample Information**

1 . Sample Location EFT-5D020205D  
 2 . Date Sampled 02/02/2005  
 3 . Time Sampled 15:00  
 4 . Sample Volume, (ml) 4 ml

**Instrument Count Data**

1 . Date Sample Counted 02/21/2005  
 2 . Time Sample Counted 10:00  
 3 . Background Inf.:  
     Minutes Counted 10 min.  
     Background Count Rate (cpm) 6.8 cpm  
 4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
     Gross Spike Count Rate (cpm) 3751.8 cpm  
     Net Spike Count Rate (cpm) 3745.0 cpm  
     H3 Spike Activity (dpm on count date) 9309.7 dpm  
     Counter Efficiency 0.4023 cpm/dpm  
 5 . Sample Info:  
     Sample Gross Count Rate (cpm) 6.3 cpm  
     Sample Count Time (min.) 10.0 min.  
     Net Sample Count Rate (cpm) 0.0 cpm  
 6 . Critical Level:  
     Critical Level Count Rate (cpm) 1.9 cpm

**Minimum Detectable Activity**

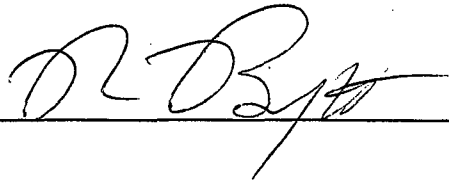
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician



Date

2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-SD020205 D

Sample Location (Well Number): 5 Deep

1. Representative sample collected. Date/Time 2/2/05 / 1500

Sample collected by: by Marie Staback / Amy Marie Staback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Couillard / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

Sample number: EFT-50020205D

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy | J. M. S. Date: 3-7-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lytle | William V. Lytle Date: 3/12/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 14618 KeV peak unidentified, see Fe 44/a.761  
can ignore, no traces of radioactive material detected,  
William V Lytle 48057 / 3/12/05

RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-5D020205D

Sample End Time: 2-FEB-2005 15:00:00.00

REMARKS 140.18 keV peak unidentified, low Fu HM (6.76)- (a)  
ignore,  
William V Litan 48651 / 3/11/05

PERFORMED BY:

*J.M'S*  
SIGNATURE

REVIEWED BY:

*William V Litan 48651 / 3/11/05*  
SIGNATURE/DATE

Sample ID : EFT-5D020205D

Acquisition date : 7-MAR-2005 09:27:47

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-5D020205D
Sample collection start date: 2-FEB-2005 15:00:00.00
Sample collection end date : 2-FEB-2005 15:00:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : M2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 09:27:47.44
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.11 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
Kev/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.60

\*\*\*\*\* 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 : EFFD4\_m2ll Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 6 rows of peak data with handwritten annotations.

Sample Title : EFT-5D020205D  
Decay Time = 32 10:27:47.44

Page : 1  
Acquisition Time = 7-MAR-2005 09:27:47.44

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	XErr	Fit	Nuclides
0	140.10	30	60	0.76	200.64	277	8	49.0		
0	511.25	150	44	2.07	1022.10	1014	16	12.0		
0	559.01	76	30	2.17	1117.66	1111	19	22.6		
0	610.01	63	45	1.00	1219.60	1212	10	20.0		
0	1461.03	74	0	1.76	2921.76	2913	15	14.2		K-40
0	1764.50	21	0	2.07	3529.33	3523	12	21.0		



Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.61	74	10.67*	2.389E+00	4.330E-07	4.330E-07	14.21

Flag: "\*" = Keyline

Summary of Nuclide Activity  
Sample ID : EFT-5D020205D

Page : 3  
Acquisition date : 7-MAR-2005 09:27:47

Total number of lines in spectrum : 6  
Number of unidentified lines : 0  
Number of lines tentatively identified by NID : 6 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.330E-07	4.330E-07	0.615E-07	14.21	
Total Activity :			4.330E-07	4.330E-07			

Grand Total Activity : 4.330E-07 4.330E-07

Flags: "K" = Keyline not found "M" = Manually accepted  
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
FS-253	109.74M	430.13	511.00*	193.46	1.000E+35	12.03	Decay
% Abundances Found = 100.00							
AS-76	26.32H	29.89	559.10*	44.70	5.589E+01	22.58	Decay, Abun.
563.23 1.17 --- Not Found ---							
571.30 0.14 --- Not Found ---							
657.03 6.10 --- Not Found ---							
665.31 0.39 --- Not Found ---							
740.12 0.12 --- Not Found ---							
771.76 0.12 --- Not Found ---							
867.63 0.12 --- Not Found ---							
1129.87 0.14 --- Not Found ---							
1212.72 1.63 --- Not Found ---							
1216.02 3.04 --- Not Found ---							
1220.52 1.39 --- Not Found ---							
1439.13 0.33 --- Not Found ---							
1453.60 0.13 --- Not Found ---							
1787.67 0.33 --- Not Found ---							
% Abundances Found = 73.70							
MO-99	66.02H	11.92	140.51	3.00	7.508E-04	49.01	Decay, Abun.
181.06 6.20 --- Not Found ---							
366.43 1.37 --- Not Found ---							
739.58* 12.00 --- Not Found ---							
770.00 4.50 --- Not Found ---							
% Abundances Found = 13.25							
TC-99M	6.02H	130.68	140.50*	89.07	1.811E+31	49.01	Decay
% Abundances Found = 100.00							
RU-103	39.35D	0.83	497.08*	89.00	---	---	Abun.
610.33 5.60 6.064E-07 27.97							
% Abundances Found = 5.92							
BI-214	19.90M	2372.00	609.31*	46.30	1.000E+35	27.97	Decay
768.36 5.04 --- Not Found ---							
934.06 3.21 --- Not Found ---							
1120.29 15.10 --- Not Found ---							
1238.11 5.94 --- Not Found ---							
1377.67 4.11 --- Not Found ---							
1764.49 15.00 1.000E+35 21.02							
% Abundances Found = 65.03 (Abn. Limit = 40.40%)							

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EFT-5D020205D

Page : 5  
Acquisition date : 7-MAR-2005 09:27:47

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	140.10	30	60	0.76	280.64	277	8	1.64E-02	49.0	6.01E+00	T
0	511.25	150	44	2.07	1022.10	1014	16	8.33E-02	12.8	4.74E+00	T
0	559.01	76	30	2.17	1117.66	1111	19	4.22E-02	22.6	4.55E+00	T
0	610.01	63	45	1.00	1219.60	1212	10	3.50E-02	20.0	4.30E+00	T
0	1764.50	21	0	2.07	3529.33	3523	12	1.17E-02	21.0	2.16E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	26.	477.59	1.1843E-07
F-18	0.	511.00	Half-Life too short
NA-22	5.	1274.54	7.7359E-09
NA-24	0.	1360.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	21.	889.25	1.5200E-08
CR-51	20.	320.00	1.6602E-07
MN-54	12.	834.83	8.9844E-09
CO-56	21.	1238.25	2.7317E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	46.	150.38	3.3064E-07
CO-57	49.	122.06	1.2440E-08
CO-58	20.	810.76	1.4371E-08
FE-59	14.	1099.22	3.1370E-08
CO-60	13.	1332.49	1.1624E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.04	Half-Life too short
ZN-65	9.	1115.52	1.9435E-08
ZN-69M	0.	430.63	Half-Life too short
SE-75	40.	136.00	1.6630E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	602.41	Half-Life too short
KR-85	46.	513.99	2.5341E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	46.	513.99	1.5493E-08
RB-86	6.	1076.63	2.9390E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	300.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1302.39	Half-Life too short
Y-88	2.	1036.01	0.1240E-09
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RB-90	0.	831.69	Half-Life too short
RB-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	11.	1204.90	4.9368E-06
Y-91M	0.	555.60	Half-Life too short
Y-92	0.	1303.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	16.	702.63	7.9709E-09
NB-95	14.	765.79	1.5890E-08
NB-95M	44.	235.69	1.7803E-05
ZR-95	15.	756.72	2.1747E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	23.	497.08	1.5661E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	19.	621.84	0.5105E-08
CD-109	42.	88.03	4.0826E-07
AG-110M	6.	937.48	2.2872E-08
SN-113	27.	391.69	1.4107E-08
SN-117M	49.	158.56	5.1105E-08
SB-122	0.	563.93	Half-Life too short
SB-124	20.	602.71	1.2024E-08
SB-125	31.	427.89	2.9228E-08
TE-125M	34.	109.28	4.9036E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	23.	57.60	3.1788E-05
XE-127	37.	202.84	2.0133E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	24.	695.88	5.6764E-07
XE-129M	60.	196.56	2.4766E-06
I-130	0.	536.09	Half-Life too short
BA-131	35.	123.88	1.9464E-07
I-131	33.	364.48	1.6803E-07
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	52.	163.93	2.9309E-06
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	38.	302.84	4.5390E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	30.	81.00	3.1494E-06
XE-133M	0.	233.22	Half-Life too short
CS-134	21.	604.70	0.6325E-09
I-134	0.	604.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : EFT-5D020205D

Acquisition date : 7-MAR-2005 09:27:47

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	13.	818.50	4.8243E-08
I-136	0.	1313.02	Half-Life too short
CS-137	21.	661.65	9.9670E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	50.	165.05	1.2182E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	23.	537.32	1.9114E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	198.22	Half-Life too short
CE-141	51.	145.44	3.6662E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	41.	133.54	8.3610E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	37.	91.10	3.6122E-07
PM-148M	27.	550.27	1.6109E-08
EU-152	40.	344.27	3.2779E-08
EU-154	13.	1004.76	5.6527E-08
EU-156	16.	646.29	4.7607E-07
H-181	28.	482.03	1.7291E-08
Tl-182	6.	1221.42	3.6618E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	47.	279.19	1.8325E-08
BI-207	26.	569.67	9.0435E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	44.	240.98	1.1208E-04
RA-226	53.	186.21	2.5909E-07
AC-228	30.	338.32	6.7356E-08
TH-228	45.	84.37	1.3905E-06
PA-234	0.	131.20	Half-Life too short
TH-234	34.	63.29	2.9433E-06
U-235	63.	143.76	9.2809E-08
NP-239	0.	106.13	Half-Life too short
AM-241	25.	59.54	1.7962E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-65020205

Sample Location (Well Number): 6 Shallow

1. Representative sample collected. Date/Time 2/2/05 / 1147

Sample collected by: Joy Marie Staback / Joy Marie Staback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Couillard / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Rogers / [Signature] Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate. NO TRITIUM DETECTED

Performed by: William V. Lipka / [Signature] Date: 3/2/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_



Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-6S020205
2. Date Sampled	02/02/2005
3. Time Sampled	11:47
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	02/21/2005
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	7.2 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.4 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

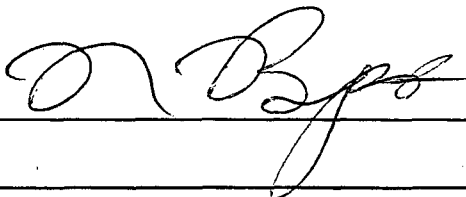
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date

2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-6S020205

Sample Location (Well Number): 6 shallow

1. Representative sample collected. Date/Time 2/02/05 / 1147

Sample collected by: Jay Marie Slaback / Jay Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: Jon Coitloch / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. ~~LLD validation~~

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name / Signature

Sample number: EFT-68020205

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy | [Signature] Date: 3-7-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lytton | [Signature] Date: 3/22/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 1766.22 keV peak unidentified; High CRE (57.2%),  
low FWHM (0.82) - insignificant.  
No licensed radioactive material detected.  
William V. Lytton 48051  
3/22/2005

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-66020205

Sample End Time: 2-FEB-2005 11:47:00.00

REMARKS 1766.22 keV peak unidentified high error (57.7%)  
low FWHM (0.82) - can ignore.

PERFORMED BY:

J. Mc G  
SIGNATURE

REVIEWED BY:

Michael V. Lyle 48651 / 3/22/05  
SIGNATURE/DATE

Sample ID : EFT-66020205

Acquisition date : 7-MAR-2005 15:10:45

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-66020205
Sample collection start date: 2-FEB-2005 11:47:00.00
Sample collection end date : 2-FEB-2005 11:47:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 15:10:45.63
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.14 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
Kev/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.68

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

\*\*\*\*\*

Table with columns: PK, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Includes handwritten annotations like 'TH-232', 'annihilation', 'K40', and 'unidentified'.

Sample Title : EFT-65020205  
Decay Time = 33 03:23:45.63

Page : 1  
Acquisition Time = 7-MAR-2005 15:10:45.63

Post-NID Peak Search Report

1	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	140.28	61	67	1.21	280.83	277	10	27.9		
0	510.77	140	55	2.32	1021.23	1013	18	14.9		
0	550.21	65	33	1.19	1116.05	1109	13	22.1		
0	1460.98	75	4	2.95	2921.67	2913	16	13.0		K-40
0	1766.62	15	15	0.62	3533.41	3522	14	57.7		

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	75	10.67*	2.389E+00	4.406E-07	4.406E-07	13.03

Flag: "\*" = Keyline

Total number of lines in spectrum 5  
Number of unidentified lines 1  
Number of lines tentatively identified by NID 4 80.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.406E-07	4.406E-07	0.574E-07	13.03	
Total Activity :			4.406E-07	4.406E-07			

Grand Total Activity : 4.406E-07 4.406E-07

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

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



Nuclide	Half-life	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
		Ratio	Ratio			(uCi/cc)	%Error	
F-18	109.74H	435.02		511.00*	193.46	1.000E+35	14.91	Decay
				% Abundances Found = 100.00				
AS-76	26.32H	30.23		559.10*	44.70	5.998E+01	22.07	Decay, Abun.
				563.23	1.17	---	Not Found	---
				571.30	0.14	---	Not Found	---
				657.03	6.10	---	Not Found	---
				665.31	0.39	---	Not Found	---
				740.12	0.12	---	Not Found	---
				771.76	0.12	---	Not Found	---
				867.63	0.12	---	Not Found	---
				1129.07	0.14	---	Not Found	---
				1212.72	1.63	---	Not Found	---
				1216.02	3.04	---	Not Found	---
				1220.52	1.39	---	Not Found	---
				1439.13	0.33	---	Not Found	---
				1453.60	0.13	---	Not Found	---
				1787.67	0.33	---	Not Found	---
				% Abundances Found = 73.70				
MO-99	66.02H	12.05		140.51	3.00	1.704E-03	27.80	Decay, Abun.
				181.06	6.20	---	Not Found	---
				366.43	1.37	---	Not Found	---
				739.50*	12.00	---	Not Found	---
				770.00	4.50	---	Not Found	---
				% Abundances Found = 13.25				
TC-99M	6.02H	132.17		140.50*	89.07	1.047E+32	27.80	Decay
				% Abundances Found = 100.00				

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	XErr	XEff	Flags
	140.28	61	67	1.21	280.63	277	10	3.40E-02	27.9	6.02E+00	T
	510.77	140	55	2.32	1021.23	1013	10	7.00E-02	14.9	4.74E+00	T
0	550.21	65	33	1.19	1116.05	1109	13	3.58E-02	22.1	4.55E+00	T
0	1766.62	15	15	2.82	3533.41	3522	14	8.56E-03	57.7	2.16E+00	

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	15.	477.59	9.2843E-08
F-18	0.	511.00	Half-Life too short
NA-22	11.	1274.54	1.1885E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	7.	889.25	9.5948E-09
CR-51	45.	320.88	2.0781E-07
MN-54	12.	834.83	9.1333E-09
CO-56	21.	1238.25	2.7417E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	45.	158.38	3.5006E-07
CO-57	33.	122.06	1.0329E-08
CO-58	18.	810.76	1.3732E-08
FE-59	14.	1099.22	3.1912E-08
CO-60	14.	1332.49	1.2262E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	12.	1115.52	2.2227E-08
ZN-69M	0.	438.63	Half-Life too short
GE-75	43.	136.80	1.7318E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	602.41	Half-Life too short
KR-85	46.	513.99	2.5372E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	46.	513.99	1.5573E-08
RB-86	14.	1076.63	4.2141E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	5.	1836.01	1.1544E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.80	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RB-90	0.	831.69	Half-Life too short
RB-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.38	Half-Life too short
Y-91	9.	1204.90	4.6281E-06
Y-91M	0.	555.68	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-65020205

Acquisition date : 7-MAR-2005 15:10:45

Nuclide	Bkgnd Sum	Energy (keV)	MDS (uCi/cc)
SB-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	19.	702.63	8.7727E-09
NB-95	14.	765.79	1.6271E-08
NB-95M	31.	235.69	1.6336E-05
ZR-95	17.	756.72	2.2892E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	24.	497.08	1.6003E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	20.	621.84	8.7706E-08
CD-109	34.	88.83	3.7237E-07
AG-110M	9.	937.40	2.7209E-08
SN-113	37.	391.69	1.6303E-08
SN-117M	46.	158.56	5.0666E-08
SB-122	0.	563.93	Half-Life too short
SB-124	27.	602.71	1.3685E-08
SB-125	33.	427.89	2.9745E-08
TE-125M	36.	109.28	5.0652E-06
TE-127	0.	417.90	Half-Life too short
T-127M	20.	57.60	2.9682E-05
XE-127	49.	202.84	2.3186E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	18.	695.88	5.0928E-07
XE-129M	46.	196.56	2.2488E-06
I-130	0.	536.09	Half-Life too short
BA-131	29.	123.80	1.8505E-07
I-131	35.	364.48	1.7898E-07
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	45.	163.93	2.8260E-06
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	37.	302.84	4.4980E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	34.	81.00	3.4931E-06
XE-133M	0.	233.22	Half-Life too short
CS-134	33.	604.70	1.0575E-08
I-134	0.	884.89	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
Y-135M	0.	526.56	Half-Life too short

Sample ID : EFT-66020205

Acquisition date : 7-MAR-2005 15:10:45

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	14.	816.50	5.0794E-08
I-136	0.	1313.02	Half-Life too short
CS-137	19.	661.65	9.6692E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.06	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	39.	165.05	1.0931E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	17.	537.32	1.7176E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	42.	145.44	3.3743E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	30.	133.54	7.3284E-08
PR-144	0.	1409.15	Half-Life too short
ND-147	39.	91.10	3.7698E-07
PM-148M	22.	550.27	1.4913E-08
EU-152	32.	344.27	2.9706E-08
EU-154	9.	1004.76	4.0985E-08
EU-156	14.	646.29	4.4481E-07
HF-181	25.	482.03	1.6591E-08
TA-182	10.	1221.42	4.3765E-08
W-187	0.	685.01	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	41.	279.19	1.7281E-08
BI-207	19.	569.67	7.0995E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	61.	240.98	1.3982E-04
RA-226	43.	186.21	2.3720E-07
AC-228	47.	338.32	0.2196E-08
TH-228	41.	84.37	1.3345E-06
PA-234	0.	131.20	Half-Life too short
TH-234	40.	63.29	3.1971E-06
U-235	46.	143.76	0.2156E-08
NP-239	0.	106.13	Half-Life too short
AM-241	27.	59.54	1.6389E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-6D020205

Sample Location (Well Number): 6 Deep

1. Representative sample collected. Date/Time 2/2/05 / 0903

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Cowlland / Xoculla Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Burger / Russ Burger Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate. No Tritium Detected

Performed by: William V. Lipton / William V. Lipton Date: 3/22/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1 . Sample Location	EFT-6D020205
2 . Date Sampled	02/02/2005
3 . Time Sampled	09:03
4 . Sample Volume, (ml)	4 ml

Instrument Count Data

1 . Date Sample Counted	02/21/2005
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.8 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

Minimum Detectable Activity

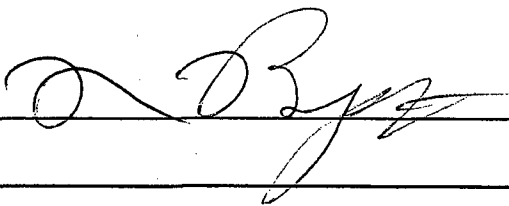
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician



Date

2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-6D020205

Sample Location (Well Number): 6D00

1. Representative sample collected. Date/Time 2/2/05 / 0903

Sample collected by: Joy Marie Staback / Joy Marie Staback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Couillard / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCay / [Signature] Date: 2/17/05  
Fermi 2 RP Printed Name Signature



Sample number: EFT-6D020205

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. Mcary [Signature] Date: 2/17/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 3/22/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 486051  
3/22/05

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-GD020205

Sample End Time: 2-FEB-2005 09:03:00.00

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PERFORMED BY:

*[Signature]*  
SIGNATURE

REVIEWED BY:

*[Signature]* / 3/22/05  
SIGNATURE/DATE

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	352.28	25	23	1.56	724.39	701	7	36.8		
0	511.10	127	62	2.16	1021.82	1014	20	17.4		
0	558.51	79	25	1.41	1116.57	1109	16	18.7		
0	609.74	44	30	1.43	1218.99	1214	12	29.1		
0	1119.40	34	3	4.60	2236.10	2231	13	28.5		
0	1461.00	69	11	3.40	2921.50	2914	15	16.1		K-40
0	1764.16	24	3	8.61	3526.81	3521	14	26.4		

lids Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	69	10.67*	2.389E+00	4.847E-07	4.847E-07	16.09

Flags: "w" = Keyline

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

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.047E-07	4.047E-07	0.651E-07	16.09	
Total Activity :			4.047E-07	4.047E-07			
Grand Total Activity :			4.047E-07	4.047E-07			

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

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

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
K-40	109.74M	200.69	511.20*	193.46	1.000E+35	17.35	Decay
			% Abundances Found = 100.00				
SC-46	63.63D	0.18	142.53	62.78	---	Not Found	Abun.
			869.25*	99.98	---	Not Found	
			1120.51	99.99	2.061E-08	20.52	
% Abundances Found = 38.07							
AS-76	26.32H	13.95	559.10*	44.70	9.182E-04	13.65	Decay, Abun.
			563.23	1.17	---	Not Found	
			571.30	0.14	---	Not Found	
			657.23	6.10	---	Not Found	
			665.31	0.39	---	Not Found	
			740.12	0.12	---	Not Found	
			771.76	0.12	---	Not Found	
			867.63	0.12	---	Not Found	
			1129.07	0.14	---	Not Found	
			1212.72	1.63	---	Not Found	
			1216.02	3.84	---	Not Found	
			1220.52	1.39	---	Not Found	
			1439.13	0.33	---	Not Found	
			1453.60	0.13	---	Not Found	
1787.67	0.33	---	Not Found				
% Abundances Found = 73.70							
K-90	32.32S	40004.91	121.82	32.00	---	Not Found	Decay, Abun.
			539.49	29.00	---	Not Found	
			1118.69*	37.00	1.000E+35	20.52	
% Abundances Found = 37.76							
RU-103	39.35D	0.39	497.88*	89.00	---	Not Found	Abun.
			610.33	5.60	3.523E-07	29.11	
% Abundances Found = 5.92							
BI-214	19.90M	1166.70	609.31*	46.30	1.000E+35	29.11	Decay
			760.36	5.04	---	Not Found	
			934.06	3.21	---	Not Found	
			1120.29	15.10	1.000E+35	20.52	
			1238.11	5.94	---	Not Found	
			1377.67	4.11	---	Not Found	
% Abundances Found = 80.84 (Abn. Limit = 48.48%)							
PE-214	26.89M	821.77	87.30	4.67	---	Not Found	Decay
			241.98	7.49	---	Not Found	
			295.21	19.20	---	Not Found	
			351.92*	37.20	1.000E+35	36.76	
			765.91	1.10	---	Not Found	
% Abundances Found = 53.48 (Abn. Limit = 37.20%)							

Fig: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EFT-6D020205

Page : 3  
Acquisition date : 17-FEB-2005 15:51:19

It	Energy	Area	Bkgrd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	352.28	25	23	1.56	704.39	701	7	1.42E-02	36.8	5.52E+00	T
0	511.10	127	62	2.16	1021.82	1014	20	7.00E-02	17.4	4.74E+00	T
0	558.51	79	25	1.41	1116.57	1109	16	4.38E-02	18.7	4.55E+00	T
0	609.74	44	30	1.43	1218.99	1214	12	2.44E-02	29.1	4.38E+00	T
0	1119.40	34	3	4.60	2238.10	2231	13	1.07E-02	20.5	2.78E+00	T
0	1764.46	24	3	0.61	3528.31	3521	14	1.32E-02	26.4	2.16E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	8.9715E-08
F-18	0.	511.00	Half-Life too short
NA-22	7.	1274.54	8.9670E-09
NA-24	0.	1368.03	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-36	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	11.	889.25	1.0886E-08
CR-51	28.	320.00	1.0729E-07
MN-54	11.	834.03	8.6179E-09
CO-56	13.	1238.25	1.9014E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	45.	158.38	4.6062E-08
CO-57	38.	122.06	1.0542E-08
CO-58	12.	810.76	9.7060E-09
FE-59	14.	1099.22	2.4111E-08
CO-60	12.	1332.49	1.1331E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1401.04	Half-Life too short
ZN-65	16.	1115.52	2.3790E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	40.	136.00	1.5155E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	43.	513.99	2.4622E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	43.	513.99	1.2525E-06
RB-86	13.	1076.63	2.1000E-07
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	300.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	4.	1036.01	9.7179E-09
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	9.	1204.90	3.7645E-06
Y-91M	0.	556.60	Half-Life too short
Y-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short



Sample ID : EFT-6D020205

Acquisition date : 17-FEB-2005 15:51:19

Nuclide	Background Sum	Energy (keV)	MDA (uCi/cc)
CS-136	17.	618.58	2.2913E-08
I-136	0.	1313.82	Half-Life too short
CS-137	16.	661.65	8.9498E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.85	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1428.58	Half-Life too short
CE-139	41.	165.85	1.0218E-08
CC-139	0.	1283.23	Half-Life too short
BA-140	19.	537.32	6.0764E-09
LA-140	7.	1596.49	5.7018E-08
BA-141	0.	198.22	Half-Life too short
CE-141	46.	145.44	2.3571E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	36.	133.54	7.5786E-08
FR-144	0.	1489.15	Half-Life too short
ND-147	27.	91.18	1.0427E-07
PM-148M	24.	558.27	1.1372E-08
EU-152	37.	344.27	3.1767E-08
EU-154	7.	1984.76	4.4225E-08
EU-156	15.	646.29	2.0461E-07
HF-181	24.	482.03	1.2181E-08
TA-182	18.	1221.42	3.9591E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	41.	279.19	1.3249E-08
BI-207	18.	569.67	7.6008E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	56.	248.98	4.3785E-08
RA-226	43.	186.21	2.3692E-07
AC-228	31.	338.32	6.7252E-08
TH-228	46.	84.37	1.3795E-06
PA-234	0.	131.28	Half-Life too short
TH-234	41.	63.29	1.9514E-06
U-235	37.	143.76	7.3851E-08
NP-239	29.	106.13	3.5418E-06
AM-241	22.	59.54	1.6997E-07

Sample ID : EFT-6D020203

Acquisition date : 17-FEB-2005 15:31:19

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CR-93	0.	598.28	Half-Life too short
Y-93	0.	266.98	Half-Life too short
NR-94	13.	782.63	7.2415E-09
NR-95	20.	765.79	1.3240E-08
NR-95M	42.	235.60	6.6393E-07
ZR-95	13.	756.72	1.7189E-08
NR-97	0.	657.98	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MC-99	11.	739.58	2.7160E-08
TC-99M	0.	140.59	Half-Life too short
TC-101	0.	300.81	Half-Life too short
RU-103	32.	497.88	1.3397E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.98	Half-Life too short
RU-105	0.	724.58	Half-Life too short
RU-106	18.	621.84	6.0911E-08
CD-109	37.	88.03	3.7553E-07
AG-110M	15.	937.46	3.1393E-08
SM-113	27.	391.69	1.2768E-08
SM-117M	47.	158.56	2.0571E-08
SB-122	16.	563.93	5.0877E-07
SB-124	25.	602.71	1.0773E-08
SB-125	29.	427.89	2.7966E-08
TE-125M	43.	109.28	4.4562E-06
TE-127	0.	417.98	Half-Life too short
TE-127M	21.	57.60	2.6896E-05
XE-127	51.	202.84	1.6031E-08
TE-129	0.	459.68	Half-Life too short
TE-129M	16.	695.86	3.3036E-07
XE-129M	37.	196.56	5.0642E-07
I-130	0.	536.09	Half-Life too short
BA-131	32.	123.88	6.7372E-08
I-131	29.	364.48	3.4920E-08
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	56.	163.93	1.0956E-06
I-132	0.	667.69	Half-Life too short
TE-132	43.	228.16	2.3865E-07
BA-133	23.	382.84	3.6084E-08
BA-133M	33.	276.09	2.8399E-05
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	21.	81.08	2.6606E-07
XE-133M	38.	233.22	9.5897E-06
CS-134	22.	604.78	8.6508E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1268.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
135M	0.	526.56	Half-Life too short

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-75020105

Sample Location (Well Number): 7 Shallow

1. Representative sample collected. Date/Time 02/01/05 / 1500

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Guillard / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Beyer / [Signature] Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate. No tritium detected

Performed by: Ross Beyer / [Signature] Date: 2/2/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate  
William V. Lipton / [Signature] 3/22/2005

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

Sample Information

1 . Sample Location	EFT-7S020105
2 . Date Sampled	02/01/2005
3 . Time Sampled	15:00
4 . Sample Volume, (ml)	4 ml

Instrument Count Data

1 . Date Sample Counted	02/21/2005
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.3 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.5 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm


Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician  Date 2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-75020105

Sample Location (Well Number): 7 Shallow

1. Representative sample collected. Date/Time 02/01/05 / 1500

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Couillard / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name Signature

Sample number: EFT 75020105

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. Mcay [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 3/22/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 48691  
3/22/05

\*\*\*\*\*

DETROIT EDISON FERMI-2 POWER PLANT

7-MAR-2005 14:07:10.14

\*\*\*\*\*

RADIATION PROTECTION DEPARTMENT

SAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-75020105

Sample End Time: 1-FEB-2005 15:00:00.00

REMARKS Account <sup>3.9.05</sup>  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PERFORMED BY:

J.M.G.  
SIGNATURE

REVIEWED BY:

Michael V. Lippman 48651 / 3/22/05  
SIGNATURE/DATE

Sample ID : EFT-76020185

Acquisition date : 7-MAR-2005 12:37:06

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-76020185
Sample collection start date: 1-FEB-2005 15:00:00.00
Sample collection end date : 1-FEB-2005 15:00:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+06 cc
Sample geometry : MLLL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 12:37:06.40
Preset live time : 0 00:00:00.00 Elapsed live time : 0 00:00:00.00
Elapsed real time : 0 00:00:01.14 Percent dead time : 0.00 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 10-MAR-2004 00:17:00.00
Kev/channel : 5.00507E-01 Zero offset: -2.04000E-01
Daily cal date : 7-MAR-2005 09:24:58.68

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

Start channel : 100 End channel : 4000
Height sensitivity : 5.00000 Steps sensitivity : 10.00000
Maximum number of iterations to resolve multiplets : 5

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

Energy tolerance : 1.250000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : decmaster.lib
Efficiency file : EFTD4\_mlll Efficiency at : Peak energy

Table with 11 columns: PK, It, Energy, Area, Brand, FWHM, Channel, Left, Pa, Cts/Sec, MEFF, Fit. Contains 6 rows of peak data with handwritten annotations on the right side.

Handwritten notes: 4000, 1000, 1000, 1000, 1000, 1000



Post-NID Peak Search Report

It	Energy	Area	Height	FWHM	Channel	Left	Fit	Right	Fit	Nuclides
0	514.15	105	45	2.00	1004.00	1004	10	10.4		
0	572.46	48	22	1.80	1117.04	1100	14	26.1		
0	612.21	22	22	2.00	1000.00	1000	10	24.0		
0	1120.60	16	11	1.46	2040.00	2036	0	44.0		
0	1401.12	27	7	2.00	2004.00	2004	12	10.5		<del>K-40</del>
0	1501.12	27	7	2.00	2004.00	2004	12	10.5		
0	1705.00	24	5	2.00	2000.00	2000	14	31.5		

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	67	10.67*	2.389E+00	3.972E-07	3.972E-07	14.47

Flags: "\*" = Keyline

Sample ID : EFT-76020105

Acquisition date : 7-MAR-2005 13:37:06

Total number of lines in spectrum 6  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 6 100.00%

Nuclide Type : natural

Nuclide	Ulife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1 Sigma Error	1-Sigma Error	Flags
K-40	1.00E+05Y	1.00	3.972E-07	3.972E-07	0.575E-07	14.47	
Total Activity :			3.972E-07	3.972E-07			
Grand Total Activity :			3.972E-07	3.972E-07			

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

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

Sample ID : EFT-76820105

Acquisition date : 7-MAR-2005 13:37:06

Nuclide	Half-life	Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	445.53	511.00*	193.46	1.000E+35	12.43	Decay
				% Abundances Found = 100.00			
GC-46	83.83D	0.41	142.53	62.70	---	Not Found	---
				809.25*	99.98	---	Not Found
				1120.51	99.99	1.137E-08	44.95
				% Abundances Found = 38.07			
AS-76	26.32H	30.95	559.18*	44.78	7.402E+01	26.13	Decay, Abun.
				563.23	1.17	---	Not Found
				571.30	0.14	---	Not Found
				637.83	0.10	---	Not Found
				665.31	0.39	---	Not Found
				748.12	0.12	---	Not Found
				771.76	0.12	---	Not Found
				867.63	0.12	---	Not Found
				1129.07	0.14	---	Not Found
				1212.72	1.63	---	Not Found
				1216.82	3.84	---	Not Found
				1228.52	1.25	---	Not Found
				1439.13	0.33	---	Not Found
				1453.60	0.13	---	Not Found
				1787.67	0.33	---	Not Found
				% Abundances Found = 73.70			
RU-102	20.35D	0.02	497.00*	80.00	---	Not Found	---
				512.23	3.60	6.200E-07	24.85
				% Abundances Found = 5.92			
PH-140H	41.30D	0.02	208.11	12.56	---	Not Found	---
				414.07	10.66	---	Not Found
				432.78	3.35	---	Not Found
				501.26	6.75	---	Not Found
				550.27*	94.90	---	Not Found
				599.74	12.54	---	Not Found
				611.26	5.48	6.160E-07	24.85
				629.97	80.00	---	Not Found
				725.70	32.80	---	Not Found
				915.33	17.17	---	Not Found
				1013.01	20.30	---	Not Found
				% Abundances Found = 1.74			
SI-214	19.90M	2456.89	609.31*	46.30	1.000E+35	24.85	Decay
				760.36	5.04	---	Not Found
				934.06	3.21	---	Not Found
				1120.29	15.10	1.000E+35	44.95
				1238.11	5.94	---	Not Found
				1377.67	4.11	---	Not Found
				1764.49	15.80	1.000E+35	31.55
				% Abundances Found = 80.84 (Abn. Limit = 40.40%)			

Rejected Report (continued)  
Sample ID : EFT-76888105

Page : 2  
Acquisition date : 7-MAR-2005 13:37:06

Flag: "\*" = Keyline

Sample ID : EFT-79020105

Acquisition date : 7-MAR-2005 13:37:06

It	Energy	Area	Wgt%	FWHM	Channel	Left	Pa	Chn/Sec	Net	Net%	Flags
0	511.12	105	45	0.00	1001.00	1010	15	0.000-00	12.4	4.74E+00	T
0	550.12	40	55	1.00	1117.04	1100	14	0.000-00	20.1	4.74E+00	T
0	640.01	05	03	0.00	1000.00	1011	10	0.100-00	24.0	4.70E+00	T
0	1100.00	10	11	1.40	0040.00	0000	0	0.000-00	44.0	0.70E+00	T
0	1700.01	04	7	0.04	0000.00	0000	14	1.04E-00	21.0	0.10E+00	T

Flags: "T" = Tentatively associated

\*\*\*\*\*  
 \* Detroit Edison Fermi 2 MDA Report, Generated 7-MAR-2005 14:07:15.45 \*  
 \*\*\*\*\*  
 \* Sample ID : EFT-76820105 \*  
 \*\*\*\*\*

Minimum Detectable Activity Report

Nuclide	Beqnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	26.	477.59	1.2498E-07
F-18	0.	511.00	Half-Life too short
NA-22	0.	1274.54	9.6176E-09
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1814.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	5.	889.25	8.3875E-09
CR-51	35.	320.00	1.0823E-07
MN-54	17.	834.03	1.0046E-08
CO-56	21.	1850.25	2.7601E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	50.	150.30	4.8254E-07
CO-57	40.	122.06	1.1248E-08
CO-58	20.	810.76	1.4468E-08
FE-59	13.	1009.22	3.1323E-08
CO-60	10.	1332.49	1.3703E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1401.64	Half-Life too short
ZN-65	10.	1115.52	2.6292E-08
ZN-69M	0.	430.63	Half-Life too short
SE-75	40.	136.00	1.6750E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	601.50	Half-Life too short
BR-85	0.	602.41	Half-Life too short
KR-85	40.	513.09	2.6007E-08
KR-85M	0.	151.10	Half-Life too short
BR-85	40.	513.09	1.6007E-08
IB-86	11.	1076.63	3.0007E-07
AR-87	0.	402.50	Half-Life too short
BR-87M	0.	600.40	Half-Life too short
AR-88	0.	196.02	Half-Life too short
IB-88	0.	1302.09	Half-Life too short
I-88	9.	1036.01	1.4450E-08
IR-89	0.	200.00	Half-Life too short
IB-89	0.	1031.00	Half-Life too short
IR-90	0.	1110.69	Half-Life too short

SR-90M	0.	824.23	Half-Life too short
Y-90M	0.	282.51	Half-Life too short
SR-91	0.	1024.38	Half-Life too short
Y-91	12.	1284.98	5.3859E-06
Y-91M	0.	555.68	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Minimum Detectable Activity Report (continued)

Sample ID : EFT-76020105

Acquisition date : 7-MAR-2005 13:37:06

Nuclide	Backgrd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	598.28	Half-Life too short
Y-93	0.	266.98	Half-Life too short
NB-94	28.	782.63	8.7799E-09
NB-95	18.	765.79	1.8229E-08
NB-95M	46.	235.69	2.2878E-05
ZR-95	0.	756.72	1.7915E-08
NB-97	0.	657.98	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	148.58	Half-Life too short
TC-101	0.	386.81	Half-Life too short
RU-103	31.	497.88	1.8362E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.98	Half-Life too short
RU-105	0.	724.58	Half-Life too short
RU-106	22.	621.84	9.1265E-08
CD-109	33.	88.83	3.7554E-07
AG-110M	18.	937.48	2.8175E-08
GM-113	36.	381.69	1.6382E-08
GM-117M	49.	158.56	5.4487E-08
SB-122	0.	523.93	Half-Life too short
SB-124	18.	682.71	1.1535E-08
SB-125	21.	427.89	2.4681E-08
TE-125M	28.	189.28	4.5882E-06
TE-127	0.	417.98	Half-Life too short
TE-127M	36.	57.68	3.8671E-05
XE-127	53.	282.84	2.4688E-08
TE-129	0.	459.68	Half-Life too short
TE-129M	22.	693.88	5.5499E-07
XE-129M	49.	188.58	2.4813E-06
I-130	0.	536.89	Half-Life too short
SA-131	46.	123.88	2.3688E-07
I-131	36.	364.48	1.9325E-07
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short



XE-130M	48.	000.00	Half-Life too short
TE-132	8.	000.10	Half-Life too short
BA-133	27.	000.04	3.9009E-00
BA-133M	8.	070.00	Half-Life too short
I-133	8.	000.00	Half-Life too short
TE-133M	8.	010.00	Half-Life too short
XE-133	44.	01.00	2.0011E-00
XE-133M	8.	000.00	Half-Life too short
CG-134	17.	004.70	7.04470E-00
I-134	8.	004.00	Half-Life too short
TE-134	8.	010.47	Half-Life too short
BA-135M	8.	000.24	Half-Life too short
I-135	8.	1000.41	Half-Life too short
XE-135	8.	049.70	Half-Life too short
XE-135M	8.	000.00	Half-Life too short

Nuclide	Background Sum	Energy (keV)	MDA (uCi/cc)
I-136	16.	818.88	5.8234E-88
I-136	0.	1313.88	Half-Life too short
CS-137	14.	661.65	8.3787E-89
XE-137	0.	458.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1488.58	Half-Life too short
CE-139	38.	165.85	1.8866E-88
CS-139	0.	1883.23	Half-Life too short
BA-140	24.	537.32	2.8881E-87
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	198.22	Half-Life too short
CE-141	36.	145.44	3.1851E-88
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	47.	133.24	8.9658E-88
PR-144	0.	1489.15	Half-Life too short
ND-147	35.	91.18	3.7579E-87
PM-148M	24.	558.27	1.5698E-88
EU-152	35.	344.27	3.8967E-88
EU-154	13.	1084.76	5.9791E-88
EU-156	19.	646.22	5.3427E-87
HF-181	29.	482.83	1.7979E-88
TO-182	18.	1221.42	4.8868E-88
W-187	0.	685.81	Half-Life too short
RE-188	0.	195.83	Half-Life too short
HG-203	47.	279.19	1.8611E-88
BI-207	21.	569.67	8.2488E-89
TL-208	0.	583.14	Half-Life too short
PR-212	0.	238.03	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PO-214	0.	451.92	Half-Life too short
RA-224	45.	248.98	1.4143E-84
RA-226	58.	186.81	2.5413E-87
AC-228	29.	338.32	6.6832E-88
TH-228	27.	84.37	1.8999E-86
PA-234	0.	131.28	Half-Life too short
TH-234	29.	83.29	2.8496E-86
U-235	34.	143.76	7.8154E-88
NP-239	0.	186.12	Half-Life too short
AM-241	31.	59.54	1.9847E-87

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-85021005

Sample Location (Well Number): 8 Shallow

1. Representative sample collected. Date/Time 2-10-05 / 0940

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02-17-2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Caswell / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Burger / [Signature] Date: 2/21/05  
Fermi 2 Chemistry Printed Name / Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate. Not Tritium Detected

Performed by: William V. Lipton / [Signature] Date: 3/10/05  
Fermi 2 Printed Name / Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-8S021005
2. Date Sampled	02/10/2005
3. Time Sampled	09:40
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	02/21/2005
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.3 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

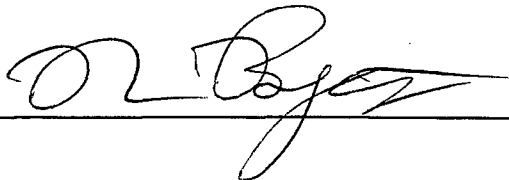
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician



Date

2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT- 85021005

Sample Location (Well Number): 8 Shallow

1. Representative sample collected. Date/Time 2-10-05 / 0940

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Couillard / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. ~~LLD validation~~

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name Signature

Sample number: EFT-85021005

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: C. McCoy [Signature] Date: 2-17-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 3/27/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 199.57 keV peak unidentified; high error  
(50.6%) - can disregard, no licensed radioactive  
material detected.

William V. Lipton 48951 3/27/05

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-65021005

Sample End Time: 10-FEB-2005 09:40:00.00

REMARKS 199.53 keV peak unidentified, high error (50%)  
(can disregard)  
William V. John 48651 / 3/12/2005

PERFORMED BY:

*J.M.G.*

SIGNATURE

REVIEWED BY:

*William V. John 48651 / 3/12/2005*

SIGNATURE/DATE

Sample ID : EFT-26021005

Acquisition date : 17-FEB-2005 11:20:47

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-26021005
Sample collection start date: 10-FEB-2005 09:40:00.00
Sample collection end date : 10-FEB-2005 09:40:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : M2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 17-FEB-2005 11:20:47.52
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.07 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
KeV/channel : 5.00590E-01 Zero offset: -2.65112E-01
Daily cal date : 17-FEB-2005 11:14:19.35

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 7 rows of peak data with handwritten annotations like 'unidentified', 'Pb214', 'annihilation', 'H2-Hechen', 'Pb-214', 'K40'.



Sample Title : EFT-86821025  
Decay Time = 7 01:49:47.52

Page : 1  
Acquisition Time = 17-FEB-2005 11:20:47.5

E

Post-MID Peak Search Report

It	Energy	Area	Bknd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	199.53	45	112	1.45	399.16	395	13	50.6		
0	352.61	32	47	1.50	705.04	700	8	41.0		
3	510.35	80	32	2.16	1020.31	1013	17	21.2	1.43E+00	
3	511.67	50	34	2.20	1022.95	1013	17	34.2		
0	550.20	93	18	1.81	1100.10	1107	18	14.9		
0	609.12	51	29	1.36	1217.73	1211	13	26.1		
0	1461.12	79	14	0.76	2921.73	2914	14	15.1		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	79	10.67*	2.389E+00	4.644E-07	4.644E-07	15.12

Flag: "\*" = Keyline

Summary of Nuclide Activity

Sample ID : EFT-06021005

Acquisition date : 17-FEB-2005 11:20:47

Total number of lines in spectrum 7  
 Number of unidentified lines 1  
 Number of lines tentatively identified by NID 6 85.71%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.644E-07	4.644E-07	0.702E-07	15.12	
Total Activity :			4.644E-07	4.644E-07			

Grand Total Activity : 4.644E-07 4.644E-07

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

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

Slide	Half-life	Ratio	Energy	%Abund	Activity 1-Sigma (uCi/cc)	%Error	Rejected by
F-18	109.74M	92.91	511.00*	193.46	1.223E+20	21.18	Decay
% Abundances Found =			100.00				
SE-75	119.78D	0.06	66.05	1.02	----	Not Found	----
			96.73	3.41	----	Not Found	----
			121.12	16.78	----	Not Found	----
			136.00*	59.20	----	Not Found	----
			196.60	1.45	7.702E-07	50.63	
			264.65	59.80	----	Not Found	----
			279.53	25.20	----	Not Found	----
			303.91	1.32	----	Not Found	----
			400.65	11.40	----	Not Found	----
% Abundances Found =			0.01				
AS-76	26.32H	6.46	559.10*	44.70	6.037E-06	14.88	Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.120	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.07	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.04	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found =			73.70				
RU-103	39.35D	0.18	497.08*	89.00	----	Not Found	----
			610.33	5.60	3.507E-07	26.13	
% Abundances Found =			5.92				
TE-131M	30.00H	5.66	102.06	7.90	----	Not Found	----
			149.72	5.10	----	Not Found	----
			200.63	7.56	7.191E-06	50.63	
			240.93	7.59	----	Not Found	----
			334.27	9.60	----	Not Found	----
			773.67*	30.20	----	Not Found	----
			782.49	7.79	----	Not Found	----
			793.75	13.90	----	Not Found	----
			822.78	6.12	----	Not Found	----
			852.21	20.70	----	Not Found	----
			1125.46	11.40	----	Not Found	----
			1206.60	9.00	----	Not Found	----
% Abundances Found =			5.19				
XE-135	9.11H	18.65	249.79*	89.90	----	Not Found	----
			608.19	2.80	2.473E-01	26.13	
% Abundances Found =			3.11				

Sample ID : EFT-86821005

Acquisition date : 17-FEB-2005 11:20:47

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	XError	
BI-214	19.90M	512.35	609.31*	46.30	1.000E+35	26.13	Decay
			768.36	5.04	---	Not Found	---
			934.06	3.21	---	Not Found	---
			1120.29	15.10	---	Not Found	---
			1238.11	5.94	---	Not Found	---
			1377.67	4.11	---	Not Found	---
			1764.49	15.80	---	Not Found	---
% Abundances Found =			40.48	(Abn. Limit = 40.48%)			
PB-214	26.80M	398.44	87.38	4.67	---	Not Found	Decay
			241.98	7.49	---	Not Found	---
			295.21	19.20	---	Not Found	---
			351.92*	37.20	1.000E+35	41.02	
			785.91	1.10	---	Not Found	---
			% Abundances Found =			53.40	(Abn. Limit = 37.20%)

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EFT-86821005

Page : 6  
Acquisition date : 17-FEB-2005 11:20:47

Id	Energy	Area	Bkgnd	FWHM	Channel	Left	Ps	Cts/Sec	%Err	%Eff	Flags
0	199.53	45	112	1.45	399.16	395	13	2.52E-02	58.6	6.35E+00	T
0	352.61	32	47	1.60	705.04	700	8	1.79E-02	41.0	5.52E+00	T
3	510.35	86	32	2.16	1020.31	1013	17	4.47E-02	21.2	4.74E+00	T
3	511.67	50	34	2.22	1022.05	1013	17	2.76E-02	34.2	4.73E+00	
0	558.28	93	18	1.81	1116.10	1107	18	5.17E-02	14.9	4.55E+00	T
0	600.12	51	27	1.36	1217.75	1211	13	2.81E-02	26.1	4.30E+00	T

Flags: "T" = Tentatively associated

Sample ID : EFT-86021005

Acquisition date : 17-FEB-2005 11:20:47

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	598.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	13.	782.63	7.3878E-09
NB-95	17.	765.79	1.0553E-08
NB-95M	42.	235.69	1.2636E-07
ZR-95	24.	756.72	2.0420E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	19.	739.58	4.2259E-07
TC-99M	0.	148.50	Half-Life too short
TC-101	0.	386.01	Half-Life too short
RU-103	14.	497.00	8.0329E-09
TC-104	0.	357.99	Half-Life too short
RH-105	34.	318.90	1.1394E-06
RU-105	0.	724.50	Half-Life too short
RU-106	16.	621.84	7.5194E-08
CD-109	28.	88.03	3.2600E-07
AG-110M	12.	937.48	2.7962E-08
SN-113	32.	391.69	1.3085E-08
SN-117M	45.	158.56	1.3319E-08
SB-122	17.	563.93	6.3120E-08
SB-124	26.	602.71	9.9144E-09
SB-125	24.	427.89	2.5550E-08
TE-125M	40.	109.28	3.0754E-06
TE-127	0.	417.99	Half-Life too short
TE-127M	31.	57.60	3.0817E-05
XE-127	51.	202.84	1.4373E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	13.	695.88	2.5395E-07
XE-129M	47.	196.56	2.9803E-07
I-130	0.	536.09	Half-Life too short
BA-131	42.	123.80	4.7167E-08
I-131	33.	364.48	1.8296E-08
TE-131	0.	149.72	Half-Life too short
TE-131M	11.	773.67	1.0238E-06
XE-131M	43.	163.93	5.9883E-07
I-132	0.	667.69	Half-Life too short
TE-132	41.	228.16	4.0951E-08
BA-133	47.	302.84	4.9924E-08
BA-133M	44.	276.09	9.6530E-07
I-133	17.	529.87	2.3681E-06
TE-133M	0.	912.58	Half-Life too short
XE-133	26.	81.00	1.0199E-07
XE-133M	31.	233.22	6.3960E-07
CS-134	20.	604.78	8.3226E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	42.	268.24	3.1130E-06
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : EFT-66821885

Acquisition date : 17-FEB-2005 11:20:47

Slide	Backgd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	14.	818.58	1.2799E-08
I-136	0.	1313.82	Half-Life too short
CS-137	13.	661.65	8.1824E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1433.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.58	Half-Life too short
CE-139	41.	165.85	9.7844E-09
CS-139	0.	1203.23	Half-Life too short
BA-140	25.	537.32	4.9578E-08
LA-140	5.	1596.49	1.7824E-07
BA-141	0.	198.22	Half-Life too short
CE-141	51.	145.44	2.1890E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	36.	293.26	6.5823E-07
CE-144	41.	133.54	7.9138E-08
FR-144	0.	1489.15	Half-Life too short
ND-147	38.	91.18	7.1992E-08
PM-148M	18.	558.27	8.7183E-09
EU-152	29.	344.27	2.8387E-08
EU-154	7.	1884.76	4.3281E-08
F-156	18.	646.29	1.5159E-07
HA-181	18.	482.83	9.2884E-09
TA-182	11.	1221.42	3.9993E-08
W-187	12.	685.81	3.3859E-06
RE-188	52.	155.83	5.8978E-05
HG-203	32.	279.19	1.8479E-08
BI-207	23.	569.67	8.5314E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	48.	248.98	7.8851E-07
RA-226	56.	186.21	2.6713E-07
AC-228	38.	338.32	7.3855E-06
TH-228	39.	84.37	1.2693E-06
PA-234	0.	131.28	Half-Life too short
TH-234	32.	63.29	1.3786E-06
U-235	48.	143.76	8.1787E-08
ND-239	32.	186.13	3.3118E-07
AM-241	26.	59.54	1.8248E-07



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG-10TC021105

Sample Location (Well Number): Nuclear Training Center - Background

1. Representative sample collected. Date/Time 02/11/05 / 1137

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples.

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Coulton / [Signature] Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Burgess / [Signature] Date: 2/21/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate. No Tritium detected.

Performed by: William Kipton / [Signature] Date: 3/1/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location	BKG-NTC021105
2. Date Sampled	02/11/2005
3. Time Sampled	11:37
4. Sample Volume, (ml)	4 ml

Instrument Count Data

1. Date Sample Counted	02/21/2005
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	7.8 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BKG - NTC021105

Sample Location (Well Number): Nuclear Training Center - Background

1. Representative sample collected. Date/Time 02/11/05 / 1137

Sample collected by: Joy Marie Slabick / Joy Marie Slabick Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Couillard / Lawler Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / J. McCoy Date: 3/7/05  
Fermi 2 RP Printed Name Signature

Sample number: B1C6-NTC021105

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. Mcay [Signature] Date: 3-7-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V Zitan [Signature] Date: 3/22/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 7126 keV peak unidentified - high FWHM (11.68) can  
disregard. 198.53 keV peak unidentified - high  
error (36.9%) can disregard. No licensed  
radioactive material detected.  
William V Zitan 48651 3/22/05

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

---

Sample ID Number: BKG-NTC021105

Sample End Time: 11-FEB-2005 11:37:00.00

REMARKS 71.26keV peak unidentified - high EV HM (11168) can be regarded,  
198.53keV peak unidentified - high ev (136,900) can  
be regarded. Telecom V. 2 Mar 48651

PERFORMED BY:

J.M.'g  
SIGNATURE

REVIEWED BY:

Melvin V. 2 Mar 48651 / 3/12/05  
SIGNATURE/DATE

Sample ID : BKG-NTC021105

Acquisition date : 7-MAR-2005 14:40:05

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: BKG-NTC021105
Sample collection start date: 11-FEB-2005 11:37:00.00
Sample collection end date : 11-FEB-2005 11:37:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : WELL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 14:40:05.99
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.13 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
Kev/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.68

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 7 rows of peak data. The FWHM value 11.68 is circled in the original image.

Handwritten notes: 'unidentified', 'Pb 214', 'annihilation', 'K40', 'P-214'

Sample Title : BKG-NTC021105  
Decay Time = 24 03:03:05.99

Page : 1  
Acquisition Time = 7-MAR-2005 14:40:05.99

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	71.26	148	166	11.68	142.94	126	35	29.8		
0	198.53	45	66	1.77	397.22	392	18	36.9		
0	352.60	27	25	1.72	705.10	700	9	38.0		
0	510.82	170	47	1.85	1021.33	1012	19	12.4		
0	558.77	64	33	0.88	1117.16	1118	13	22.4		
0	1460.91	91	7	1.97	2921.52	2914	15	12.4		K-40
0	1765.32	24	3	1.42	3538.88	3525	12	24.7		

Nuclide Types: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	+1-Sigma %Error
K-40	1460.81	91	10.67*	2.389E+00	5.337E-07	5.337E-07	12.40

Flag: "\*" = Keyline



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

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.337E-07	5.337E-07	0.662E-07	12.40	
Total Activity :			5.337E-07	5.337E-07			

Grand Total Activity : 5.337E-07 5.337E-07

Flags: "K" = Keyline not found "M" = Manually accepted  
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	316.73	511.00*	193.46	1.000E+35	12.41	Decay
% Abundances Found = 100.00							
SE-75	119.79D	0.20	66.05	1.02	---	Not Found	---
			96.73	3.41	---	Not Found	---
			121.12	16.70	---	Not Found	---
			136.00*	59.20	---	Not Found	---
			198.60	1.45	8.307E-07	36.94	
			264.65	59.00	---	Not Found	---
			279.53	25.20	---	Not Found	---
			303.91	1.32	---	Not Found	---
			400.65	11.40	---	Not Found	---
% Abundances Found = 0.81							
AS-76	26.32H	22.01	559.10*	44.70	1.902E-01	22.36	Decay, Abun.
			563.23	1.17	---	Not Found	---
			571.30	0.14	---	Not Found	---
			657.03	6.10	---	Not Found	---
			665.31	0.39	---	Not Found	---
			740.12	0.12	---	Not Found	---
			771.76	0.12	---	Not Found	---
			867.63	0.12	---	Not Found	---
			1129.07	0.14	---	Not Found	---
			1212.72	1.63	---	Not Found	---
			1216.02	3.04	---	Not Found	---
			1220.52	1.39	---	Not Found	---
			1439.13	0.33	---	Not Found	---
			1453.60	0.13	---	Not Found	---
			1707.67	0.33	---	Not Found	---
% Abundances Found = 73.70							
W-187	23.03H	24.31	72.06	11.90	2.073E+01	29.04	Decay, Abun.
			134.22	9.50	---	Not Found	---
			479.53	23.40	---	Not Found	---
			551.55	5.44	---	Not Found	---
			610.37	6.70	---	Not Found	---
			625.52	1.16	---	Not Found	---
			685.01*	29.20	---	Not Found	---
			745.21	0.32	---	Not Found	---
			772.07	4.40	---	Not Found	---
			864.55	0.36	---	Not Found	---
% Abundances Found = 12.80							
BI-214	19.90M	1746.64	609.31*	46.30	---	Not Found	Decay, Abun.
			760.36	5.04	---	Not Found	---
			934.06	3.21	---	Not Found	---
			1120.29	15.10	---	Not Found	---
			1230.11	5.94	---	Not Found	---
			1377.67	4.11	---	Not Found	---
			1764.49	15.00	1.000E+35	24.73	
% Abundances Found = 16.54 (Abn. Limit = 40.40%)							

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
PB-214	26.80M	1296.94	87.30	4.67	---	Not Found	---	Decay
			241.98	7.49	---	Not Found	---	
			295.21	19.20	---	Not Found	---	
			351.92*	37.20	1.000E+35	38.00		
			785.91	1.10	---	Not Found	---	
% Abundances Found =			53.40	(Abn. Limit =		37.20%)		

Flag: "\*" = Keyline

It	Energy	Area	Bkgrd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	71.26	148	166	11.68	142.94	126	35	0.22E-02	29.8	1.87E+00	T
0	198.53	45	66	1.77	397.22	392	10	2.49E-02	36.9	6.36E+00	T
0	352.60	27	25	1.72	785.10	780	9	1.52E-02	38.0	5.52E+00	T
0	510.02	170	47	1.85	1021.33	1012	19	9.42E-02	12.4	4.74E+00	T
0	558.77	64	33	0.80	1117.10	1110	13	3.53E-02	22.4	4.55E+00	T
0	1765.32	24	3	1.42	3530.00	3525	12	1.35E-02	24.7	2.16E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	20.	477.59	1.0970E-07
F-18	0.	511.00	Half-Life too short
NA-22	14.	1274.54	1.1929E-08
NA-24	0.	1360.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	10.	809.25	1.0276E-08
CR-51	33.	320.00	1.4394E-07
MN-54	12.	834.03	8.8017E-09
CO-56	14.	1238.25	2.1194E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	43.	150.30	1.2330E-07
CO-57	47.	122.06	1.1955E-08
CO-58	16.	810.76	1.1768E-08
FE-59	9.	1099.22	2.2926E-08
CO-60	11.	1332.49	1.0760E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.04	Half-Life too short
ZN-65	9.	1115.52	1.0677E-08
ZN-69M	0.	430.63	Half-Life too short
SE-75	42.	136.00	1.6153E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	40.	513.99	2.6009E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	40.	513.99	1.4520E-08
RB-86	14.	1076.63	2.9514E-07
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	308.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	2.	1036.01	7.7359E-09
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RB-90	0.	831.69	Half-Life too short
RB-90M	0.	024.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	13.	1204.90	4.0050E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1303.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : BKG-NTC921105

Acquisition date : 7-MAR-2005 14:40:05

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.20	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	21.	702.63	9.0750E-09
NB-95	13.	765.79	1.3030E-08
NB-95M	36.	235.69	3.1200E-06
ZR-95	10.	756.72	2.1620E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	23.	739.50	3.4170E-05
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.01	Half-Life too short
RU-103	24.	497.00	1.3671E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	21.	621.04	0.7730E-08
CD-109	30.	00.03	3.4259E-07
AG-110M	14.	937.40	3.1060E-08
SN-113	33.	391.69	1.4020E-08
SN-117M	44.	150.56	3.1200E-08
SB-122	24.	563.93	5.0501E-06
SB-124	27.	602.71	1.2262E-08
SB-125	24.	427.09	2.5924E-08
TE-125M	45.	109.20	5.0140E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	24.	57.60	3.0634E-05
XE-127	47.	202.04	1.9175E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	16.	695.00	3.9677E-07
XE-129M	42.	196.56	1.0607E-06
I-130	0.	536.09	Half-Life too short
BA-131	45.	123.00	1.3247E-07
I-131	27.	364.40	7.2499E-08
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	52.	163.93	1.7730E-06
I-132	0.	667.69	Half-Life too short
TE-132	53.	220.16	1.7251E-06
BA-133	34.	302.04	4.3373E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	19.	01.00	0.0995E-07
XE-133M	0.	233.22	Half-Life too short
CS-134	24.	604.70	9.0715E-09
I-134	0.	004.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
TE-135M	0.	526.56	Half-Life too short

Sample ID : BKG-NTC021105

Acquisition date : 7-MAR-2005 14:40:05

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	20.	810.50	3.7025E-08
I-136	0.	1313.02	Half-Life too short
CS-137	16.	661.65	8.9682E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.06	Half-Life too short
XE-138	0.	250.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	41.	165.05	1.0650E-08
CS-139	0.	1203.23	Half-Life too short
BA-140	14.	537.32	9.7501E-08
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	52.	145.44	3.0720E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	44.	133.54	8.5312E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	30.	91.10	1.0960E-07
PM-148M	18.	550.27	1.1650E-08
EU-152	41.	344.27	3.3258E-08
EU-154	15.	1004.76	5.9565E-08
EU-156	18.	646.29	3.3152E-07
WF-181	25.	402.03	1.4513E-08
TA-182	7.	1221.42	3.6794E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HO-203	34.	279.19	1.3022E-08
BI-207	20.	569.67	0.0722E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	230.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	34.	240.98	1.9076E-05
RA-226	55.	186.21	2.6453E-07
AC-228	49.	330.32	0.3546E-08
TH-228	41.	84.37	1.3237E-06
PA-234	0.	131.20	Half-Life too short
TH-234	38.	63.29	2.4152E-06
U-235	30.	143.76	7.3110E-08
NP-239	0.	106.13	Half-Life too short
AM-241	35.	59.54	2.0094E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG-PAPO21105

Sample Location (Well Number): POINT AOX DEWY ROAD - Background

1. Representative sample collected. Date/Time 02/11/05 / 1425

Sample collected by: Joy Marie Staback / Joy Marie Staback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Couillard / Jewell Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Buzay / [Signature] Date: 2/21/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate. No tritium detected

Performed by: William V. Lipton / [Signature] Date: 3/10/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_



Tritium Activity Calculation

**Sample Information**

1 . Sample Location	BKG-PAP021105
2 . Date Sampled	02/11/2005
3 . Time Sampled	14:25
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/21/2005
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.1 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.08\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date 2/21/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BKG-PAP021105

Sample Location (Well Number): Point Aux Peaux Road - Background

1. Representative sample collected. Date/Time 02-11-05 / 1425

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: Jon Carroll / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

Sample number: BIG - PAPOZHIOS

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy | [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton | [Signature] Date: 3/22/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 311.75 KeV peak unidentified, high error (54.6%) can  
disregard, 815.52 KeV peak unidentified - high  
error (38.7%) can disregard. No license &  
radioactive material detected.  
William V. Lipton 48651 / 3/22/05

RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: BKG-PAP021105

Sample End Time: 11-FEB-2005 14:25:00.00

REMARKS 311.75 KeV peak unidentified, high error (54.6%) - (a)  
2.35 repair 615.82 KeV peak unidentified, high error (38.3%) - (a)  
2.35 repair

PERFORMED BY:

*J.M.S.*  
SIGNATURE

REVIEWED BY:

*Melvin A. Latham 4/8/51/3/10/2005*  
SIGNATURE/DATE

Sample ID : BKG-P00001100

Acquisition Date : 7-APR-2005 14:00:00

Gamma Radiation Protection Corps Spectroscopy Report

\*\*\*\*\* Sample Description \*\*\*\*\*

Sample ID Number: BKG-P00001100
Sample collection start date: 11-FEB-2005 14:00:00.00
Sample collection end date: 11-FEB-2005 14:00:00.00
Type of sample: 1 L Heri. Liquid
Sample quantity: 1.00000E+02 cc
Sample geometry: WELL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number: DET 4 Acquire date: 7-APR-2005 14:00:00.00
Preset live time: 5.00000E+02 sec Preset live time: 5.00000E+02 sec
Elapsed real time: 5.00000E+02 sec Elapsed real time: 5.00000E+02 sec

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number: DET 4 Yearly cal date: 10-APR-2004 00:00:00.00
Kec/channel: 5.00000E-101 Net offset: 12.00000E-101
Daily cal date: 7-APR-2005 00:00:00.00

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

Start channel: 100 End channel: 4000
Height sensitivity: 5.000000 Steps sensitivity: 10.000000
Maximum number of iterations to resolve multiplets: 5

\*\*\*\*\* Peak Identification Parameters \*\*\*\*\*

Energy tolerance: 1.000000 Half-life ratio: 10.000000
Abundance limit: 70.000000 Library: geoaster.v10
Efficiency file: EFFD4\_mell Efficiency at: Peak Energy

Table with columns: PK, It, Energy, Area, Bkgnd, FWHM, Channel, Left, R, Cts/sec, Key, Fit. Contains 6 rows of peak data with handwritten annotations.

Handwritten notes: 'unidentified', 'annihilate', 'H2O', 'K40' with arrows pointing to specific peaks in the table.

Sample Title = EKO-D0P0021100  
Decay Time = 23 23:43:07.00

Page = 1  
Acquisition Time = 7-MAR-2005 14:00:07.00

Post-MID Peak Search Report

Energy	Area	Ekgrd	FWHM	Channel	Left	Pw	RETX	Fit	Nuclides
311.75	22	38	1.45	223.47	213	9	24.0		
510.00	81	27	2.00	1021.41	1017	14	18.0	1.70E+00	
512.00	43	39	2.00	1023.72	1017	14	41.0		
550.00	74	41	1.41	1117.74	1112	14	21.0		
810.00	17	6	1.00	1231.18	1224	13	38.0		
1461.16	78	17	2.00	2022.00	2015	15	10.0		K-40

Nuclide Type: natural

Nuclide	Energy	Area	Area	NET	NET/area	NET/area	NET/area
K-40	1462.01	72	12.07*	2.200E+00	4.575E-07	4.575E-07	12.06

Flag: "\*" = Keyline

Sample ID : BKG-PAP021105

Acquisition date : 7-MAR-2005 14:08:07

Total number of lines in spectrum 6  
 Number of unidentified lines 2  
 Number of lines tentatively identified by MIB 4 22.27%

Nuclide Type : natural

Nuclide	HLife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma Error	Flags
K-40	1.08E+05Y	1.00	4.575E-07	4.575E-07	8.757E-07	16.56	
Total Activity :			4.575E-07	4.575E-07			
Grand Total Activity :			4.575E-07	4.575E-07			

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

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



Sample ID : KKG-PAP021185

Acquisition date : 7-MAR-2005 14:00:07

Nuclide	Half-life	Ratio	Energy KeV	Abund	Activity 1-Sigma		Rejected by
					(uCi/gg)	%Error	
F-18	109.74M	314.91	511.06	100.00	1.000E+05	18.00	Decay
* Abundances Found = 100.00							

RB-76	26.28M	51.00	552.18	24.70	0.100E-01	21.01	Decay, Abun.
			552.18*	24.70	0.100E-01	21.01	Decay, Abun.
			563.23	1.17	---	Not Found	---
			571.30	0.14	---	Not Found	---
			657.03	6.10	---	Not Found	---
			665.31	0.30	---	Not Found	---
			740.12	0.12	---	Not Found	---
			771.76	0.12	---	Not Found	---
			867.63	0.12	---	Not Found	---
			1129.87	0.14	---	Not Found	---
			1212.72	1.03	---	Not Found	---
			1216.02	3.04	---	Not Found	---
			1220.52	1.39	---	Not Found	---
			1439.13	0.33	---	Not Found	---
			1453.60	0.13	---	Not Found	---
			1707.67	0.33	---	Not Found	---
* Abundances Found = 73.70							

LA-140	40.22H	14.32	380.77	20.00	--- <th>Not Found</th> <th>--- <th>Decay, Abun.</th> </th>	Not Found	--- <th>Decay, Abun.</th>	Decay, Abun.
			402.53	2.34	---	Not Found	---	
			487.03	45.00	---	Not Found	---	
			751.79	4.40	---	Not Found	---	
			815.05	23.00	6.664E-04	38.29		
			867.82	5.63	---	Not Found	---	
			919.63	2.00	---	Not Found	---	
			925.24	7.00	---	Not Found	---	
			1596.49*	95.49	---	Not Found	---	
* Abundances Found = 11.30								

Flag: "\*" = Keyline

It	Energy	Area	Skpnd	FWHM	Channel	Left	Fe	Off/deg	SE%	SE??	Flags
0	611.70	22	68	1.45	623.47	619	0	1.23E-02	54.2	5.77E+00	
0	722.22	21	77	2.20	734.44	730	4	8.37E-03	45.2	5.74E+00	T
0	722.80	43	78	2.20	735.03	731	4	8.37E-03	44.2	5.74E+00	
0	723.52	34	81	1.41	737.74	733	4	4.12E-02	21.0	4.55E+00	T
0	812.82	17	8	1.00	824.18	820	4	5.24E-02	22.2	3.48E+00	T

Flags: "T" = Tentatively associated

FINANCIAL DEFECTABLE ACTIVITY REPORT

ACCOUNT	DEFEND MEM	PROPERTY CRUI	HSA ACCT/NO
KT-17	W.	447.00	1.000000-07
KT-18	W.	514.00	Half-life too short
KT-19	H.	1074.00	1.001000-08
KT-20	W.	1000.00	Half-life too short
KT-21	W.	1014.44	Half-life too short
KT-22	W.	1040.40	Half-life too short
KT-23	W.	1004.00	Half-life too short
KT-24	H.	600.00	1.140000-08
KT-25	H.	600.00	1.000000-07
KT-26	H.	604.00	0.000000-00
KT-27	H.	1010.00	1.000000-07
KT-28	W.	100.00	1.000000-00
KT-29	N.	640.00	0.000000-00
KT-30	H.	1000.00	0.000000-00
KT-31	H.	1000.00	1.000000-08
KT-32	W.	1040.00	Half-life too short
KT-33	W.	1004.00	Half-life too short
KT-34	W.	1100.00	0.000000-00
KT-35	W.	100.00	1.000000-08
KT-36	W.	100.00	1.000000-00
KT-37	W.	100.00	1.000000-00
KT-38	W.	100.00	1.000000-00
KT-39	W.	100.00	1.000000-00
KT-40	W.	100.00	1.000000-00
KT-41	W.	100.00	1.000000-00
KT-42	W.	100.00	1.000000-00
KT-43	W.	100.00	1.000000-00
KT-44	W.	100.00	1.000000-00
KT-45	W.	100.00	1.000000-00
KT-46	W.	100.00	1.000000-00
KT-47	W.	100.00	1.000000-00
KT-48	W.	100.00	1.000000-00
KT-49	W.	100.00	1.000000-00
KT-50	W.	100.00	1.000000-00
KT-51	W.	100.00	1.000000-00
KT-52	W.	100.00	1.000000-00
KT-53	W.	100.00	1.000000-00
KT-54	W.	100.00	1.000000-00
KT-55	W.	100.00	1.000000-00
KT-56	W.	100.00	1.000000-00
KT-57	W.	100.00	1.000000-00
KT-58	W.	100.00	1.000000-00
KT-59	W.	100.00	1.000000-00
KT-60	W.	100.00	1.000000-00
KT-61	W.	100.00	1.000000-00
KT-62	W.	100.00	1.000000-00
KT-63	W.	100.00	1.000000-00
KT-64	W.	100.00	1.000000-00
KT-65	W.	100.00	1.000000-00
KT-66	W.	100.00	1.000000-00
KT-67	W.	100.00	1.000000-00
KT-68	W.	100.00	1.000000-00
KT-69	W.	100.00	1.000000-00
KT-70	W.	100.00	1.000000-00
KT-71	W.	100.00	1.000000-00
KT-72	W.	100.00	1.000000-00
KT-73	W.	100.00	1.000000-00
KT-74	W.	100.00	1.000000-00
KT-75	W.	100.00	1.000000-00
KT-76	W.	100.00	1.000000-00
KT-77	W.	100.00	1.000000-00
KT-78	W.	100.00	1.000000-00
KT-79	W.	100.00	1.000000-00
KT-80	W.	100.00	1.000000-00
KT-81	W.	100.00	1.000000-00
KT-82	W.	100.00	1.000000-00
KT-83	W.	100.00	1.000000-00
KT-84	W.	100.00	1.000000-00
KT-85	W.	100.00	1.000000-00
KT-86	W.	100.00	1.000000-00
KT-87	W.	100.00	1.000000-00
KT-88	W.	100.00	1.000000-00
KT-89	W.	100.00	1.000000-00
KT-90	W.	100.00	1.000000-00
KT-91	W.	100.00	1.000000-00
KT-92	W.	100.00	1.000000-00
KT-93	W.	100.00	1.000000-00
KT-94	W.	100.00	1.000000-00
KT-95	W.	100.00	1.000000-00
KT-96	W.	100.00	1.000000-00
KT-97	W.	100.00	1.000000-00
KT-98	W.	100.00	1.000000-00
KT-99	W.	100.00	1.000000-00
KT-100	W.	100.00	1.000000-00

Sample ID : BKG-PAP021105

Acquisition date : 7-MAR-2005 14:08:07

Nuclide	Background Sum	Energy (keV)	MDA (uCi/cc)
Y-88	0.	258.00	Half-Life too short
Y-88	0.	288.00	Half-Life too short
ZR-90	12.	782.00	7.47100E-02
ZR-90	17.	782.70	1.47000E-02
ZR-90M	40.	230.00	2.20000E-02
ZR-90	82.	782.70	2.24000E-02
ZR-90	0.	657.00	Half-Life too short
ZR-90	0.	742.00	Half-Life too short
ZO-90	24.	730.00	2.20000E-02
ZO-90M	0.	148.00	Half-Life too short
ZO-101	0.	600.01	Half-Life too short
ZU-100	20.	407.00	1.20000E-02
ZO-104	0.	337.70	Half-Life too short
ZU-100	0.	318.00	Half-Life too short
ZU-100	0.	724.00	Half-Life too short
ZU-100	22.	691.04	2.07400E-02
CB-100	28.	88.00	2.40770E-07
AG-110M	17.	907.40	2.43000E-02
GA-110	25.	301.00	1.20000E-02
GA-117M	42.	100.00	2.00000E-02
SB-100	10.	522.00	4.00000E-02
SB-104	21.	600.71	1.00100E-02
SB-100	24.	427.00	2.27000E-02
TE-100M	32.	100.00	4.50000E-02
TE-107	0.	417.00	Half-Life too short
TE-107M	32.	57.00	2.40000E-02
XE-107	54.	200.04	2.00000E-02
TE-100	0.	450.00	Half-Life too short
TE-100M	28.	600.00	4.41000E-07
XE-100M	37.	100.00	1.20000E-02
I-100	0.	300.00	Half-Life too short
BA-101	40.	100.00	1.01000E-07
I-101	20.	304.40	2.17700E-02
TE-101	0.	140.70	Half-Life too short
TE-101M	0.	772.07	Half-Life too short
XE-101M	40.	100.00	1.00000E-02
I-102	0.	207.00	Half-Life too short
TE-102	47.	200.10	1.00000E-02
BA-100	40.	300.04	4.00000E-02
BA-100M	0.	270.00	Half-Life too short
I-101	0.	200.07	Half-Life too short
TE-100M	0.	910.00	Half-Life too short
XE-102	20.	21.00	1.00000E-02
XE-100M	0.	200.00	Half-Life too short
CB-104	27.	604.70	2.00000E-02
I-104	0.	604.00	Half-Life too short
TE-104	0.	210.47	Half-Life too short
BA-100M	0.	200.04	Half-Life too short
I-100	0.	1000.41	Half-Life too short
XE-100	0.	240.70	Half-Life too short
XE-100M	0.	520.00	Half-Life too short

Sample ID : BKG-PAPER1100

Acquisition date : 7-MAR-2005 14:08:07

Nuclide	Refund Cm	Energy (keV)	MCA (dpm/ce)
OS-136	10.	818.50	3.50000E-08
I-138	0.	1313.00	Half-life too short
OS-137	10.	501.00	7.00000E-09
XE-137	0.	425.40	Half-life too short
OS-138	0.	1307.00	Half-life too short
XE-138	0.	255.20	Half-life too short
OS-139	0.	1328.00	Half-life too short
CE-139	40.	105.00	1.00000E-08
OS-140	0.	1383.00	Half-life too short
BA-140	20.	507.00	1.10000E-07
LA-140	0.	1300.40	Half-life too short
BA-141	0.	100.00	Half-life too short
CE-141	0.	145.44	3.00040E-08
LA-141	0.	1304.00	Half-life too short
BA-142	0.	205.10	Half-life too short
LA-142	0.	1341.47	Half-life too short
CE-143	0.	203.00	Half-life too short
CE-144	40.	103.04	2.00000E-08
BR-144	0.	1300.10	Half-life too short
ND-147	40.	01.10	2.10000E-07
DM-148M	20.	500.07	1.00000E-08
EU-152	40.	444.07	2.00000E-08
EU-154	0.	1004.70	4.10000E-08
EU-156	20.	040.00	2.40000E-07
MF-161	14.	400.00	1.11100E-08
TA-162	14.	1001.40	4.00100E-08
U-167	0.	000.01	Half-life too short
RE-168	0.	100.00	Half-life too short
NO-208	40.	070.10	1.00000E-08
BI-208	20.	000.07	0.07000E-08
TL-208	0.	000.14	Half-life too short
BB-212	0.	000.00	Half-life too short
BI-214	0.	000.01	Half-life too short
BB-214	0.	001.00	Half-life too short
BA-204	40.	040.00	0.40000E-08
BA-206	40.	100.01	0.01000E-07
AC-208	40.	000.00	0.10000E-08
TH-208	20.	04.07	1.00000E-08
BA-204	0.	101.00	Half-life too short
TH-204	20.	00.00	0.07000E-08
U-205	40.	140.70	0.00000E-08
ND-200	0.	100.10	Half-life too short
BR-241	40.	00.04	0.00000E-07

# FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG - RANGE021105

Sample Location (Well Number): RANGE - Background well

1. Representative sample collected. Date/Time 2/11/05 / 0953

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Coillard / Jon Coillard Date: 2-16-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ B... / Russ B... Date: 2/16/05  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate. No tritium detected.

Performed by: William V. Lytle / William V. Lytle Date: 3/12/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	BKG-RANGE021105
2 . Date Sampled	02/11/2005
3 . Time Sampled	09:53
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/21/2005
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.8 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3751.8 cpm
Net Spike Count Rate (cpm)	3745.0 cpm
H3 Spike Activity (dpm on count date)	9309.7 dpm
Counter Efficiency	0.4023 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.6 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.8 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

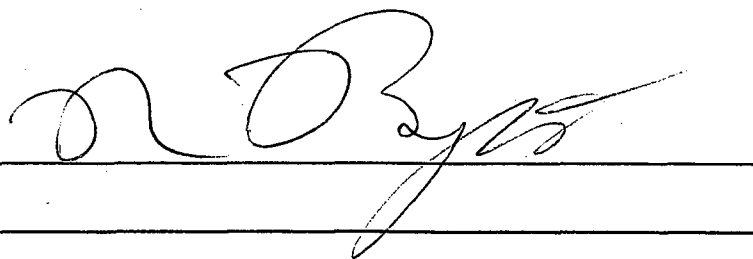
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date

2/24/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BKG-RANGE021105

Sample Location (Well Number): RANGE - Background well

1. Representative sample collected. Date/Time 2-11-05 / 0953

Sample collected by: Jay Marie Slabick / Jay Marie Slabick Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Cowlland / [Signature] Date: 2-16-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature



Sample number: BKG-RANGE 021105

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy | [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William K Lipton | [Signature] Date: 3/12/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 199.43 kd peak unidentified - high over (4.0%)  
(can disregard), NO licensed radioactive material  
detected, William V. Lipton 48651 / 3/12/05

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RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

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Sample ID Number: BKG-RANGE021105

Sample End Time: 11-FEB-2005 09:53:00.00

REMARKS 199.43 keV peak unidentified - high energy (4.6%),  
can disregard

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PERFORMED BY:

  
SIGNATURE

REVIEWED BY:

  
SIGNATURE/DATE

Sample ID : BKG-RANGE021105

Acquisition date : 7-MAR-2005 12:21:11

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: BKG-RANGE021105
Sample collection start date: 11-FEB-2005 09:53:00.00
Sample collection end date : 11-FEB-2005 09:53:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 12:21:11.39
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.16 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
Kev/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.68

\*\*\*\*\* 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 : EFFD4\_m2ll Efficiencies at : Peak energy

Table with columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: unidentified, Pb 214, Am 241, K-40

Post-NID Peak Search Report

I	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	σErr	Fit	Nuclides
0	199.43	50	90	1.92	399.03	391	12	42.6		
0	352.23	34	31	0.97	704.35	701	8	33.7		
0	511.35	141	52	2.59	1022.39	1016	15	14.5		
0	550.40	82	14	1.94	1116.44	1109	14	14.7		
0	1460.85	77	9	2.25	2921.40	2912	16	14.1		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	77	10.67*	2.369E+00	4.543E-07	4.543E-07	14.89

Flag: "\*" = Keyline

Total number of lines in spectrum 5  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.543E-07	4.543E-07	0.640E-07	14.09	
Total Activity :			4.543E-07	4.543E-07			
Grand Total Activity :			4.543E-07	4.543E-07			

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

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

Sample ID : BKG-RANGE021105

Acquisition date : 7-MAR-2005 12:21:11

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	316.41	511.00*	193.46	1.0000E+35	14.48	Decay
% Abundances Found = 100.00							
SE-75	119.78D	0.20	66.05	1.02	---	Not Found	---
			96.73	3.41	---	Not Found	---
			121.12	16.70	---	Not Found	---
			136.00*	59.20	---	Not Found	---
			198.65	1.45	9.294E-07	42.56	
			254.65	59.50	---	Not Found	---
			279.53	25.20	---	Not Found	---
			303.91	1.32	---	Not Found	---
			400.65	11.40	---	Not Found	---
% Abundances Found = 0.01							
AS-76	26.32H	21.99	559.10*	44.70	2.519E-01	14.69	Decay, Abun.
			563.23	1.17	---	Not Found	---
			571.30	0.14	---	Not Found	---
			657.03	6.10	---	Not Found	---
			665.31	0.39	---	Not Found	---
			740.12	0.12	---	Not Found	---
			771.76	0.12	---	Not Found	---
			867.63	0.12	---	Not Found	---
			1129.87	0.14	---	Not Found	---
			1212.72	1.63	---	Not Found	---
			1216.02	3.04	---	Not Found	---
			1220.52	1.39	---	Not Found	---
			1439.13	0.33	---	Not Found	---
			1453.60	0.13	---	Not Found	---
			1787.67	0.33	---	Not Found	---
% Abundances Found = 73.70							
TE-131M	30.00H	19.29	102.06	7.90	---	Not Found	---
			149.72	5.10	---	Not Found	---
			200.63	7.56	9.943E-02	42.56	
			240.93	7.59	---	Not Found	---
			334.27	9.60	---	Not Found	---
			773.67*	38.20	---	Not Found	---
			782.49	7.79	---	Not Found	---
			793.75	13.90	---	Not Found	---
			822.70	6.12	---	Not Found	---
			852.21	20.70	---	Not Found	---
			1125.46	11.40	---	Not Found	---
			1206.60	9.00	---	Not Found	---
% Abundances Found = 5.13							
PB-214	26.80M	1295.64	87.30	4.67	---	Not Found	---
			241.98	7.49	---	Not Found	---
			295.21	19.20	---	Not Found	---
			351.92*	37.20	1.0000E+35	33.68	
			705.91	1.10	---	Not Found	---
% Abundances Found = 53.40 (Abn. Limit = 37.20%)							

Flag: "\*" = Keyline



Unidentified Energy Lines  
Sample ID : BKG-RANGE021105

Page : 6  
Acquisition date : 7-MAR-2005 12:21:11

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	199.43	50	98	1.92	399.03	391	12	2.75E-02	42.6	6.35E+00	T
0	352.23	34	31	0.97	704.35	701	8	1.87E-02	33.7	5.52E+00	T
0	511.35	141	52	2.59	1022.39	1016	15	7.85E-02	14.5	4.74E+00	T
0	558.40	82	14	1.94	1116.44	1109	14	4.55E-02	14.7	4.55E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	22.	477.59	9.8476E-08
F-18	0.	511.00	Half-Life too short
NA-22	11.	1274.54	1.0784E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	11.	889.25	1.0553E-08
CR-51	34.	320.00	1.4542E-07
MN-54	14.	834.03	9.5964E-09
CO-56	17.	1230.25	2.3061E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	57.	158.30	1.4023E-07
CO-57	30.	122.06	1.0762E-08
CO-58	17.	810.76	1.2319E-08
FE-59	11.	1099.22	2.4554E-08
CO-60	15.	1332.49	1.2352E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1401.04	Half-Life too short
ZN-65	11.	1115.52	2.0095E-08
ZN-69M	0.	430.63	Half-Life too short
S-75	44.	136.00	1.6646E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	001.50	Half-Life too short
BR-85	0.	002.41	Half-Life too short
KR-85	41.	513.99	2.4034E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	41.	513.99	1.3415E-08
RB-86	11.	1076.63	2.7342E-07
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	300.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1302.39	Half-Life too short
Y-88	7.	1036.01	1.2500E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RB-90	0.	031.69	Half-Life too short
RB-90M	0.	024.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	19.	1204.90	5.6750E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1303.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EKG-RANGE021105

Acquisition date : 7-MAR-2005 12:21:11

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	598.28	Half-Life too short
Y-93	0.	266.98	Half-Life too short
NB-94	20.	782.63	8.9858E-09
NB-95	18.	765.79	1.5825E-08
NB-95M	64.	235.69	4.0436E-06
ZR-95	18.	756.72	2.1398E-08
NB-97	0.	657.98	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	12.	739.58	2.5212E-05
TC-99M	0.	148.58	Half-Life too short
TC-101	0.	386.81	Half-Life too short
RU-103	21.	497.88	1.2955E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.98	Half-Life too short
RU-105	0.	724.58	Half-Life too short
RU-106	28.	621.84	8.7208E-08
CD-109	37.	88.83	3.8014E-07
AG-110M	16.	937.48	3.3419E-08
SN-113	27.	391.69	1.3482E-08
SN-117M	68.	158.56	3.6054E-08
SB-122	22.	563.93	5.5877E-06
SB-124	21.	682.71	1.0989E-08
SB-125	28.	427.89	2.3820E-08
TE-125M	36.	189.28	4.5347E-06
TE-127	0.	417.98	Half-Life too short
TE-127M	28.	57.68	3.2722E-05
XE-127	51.	282.84	1.9793E-08
TE-129	0.	459.68	Half-Life too short
TE-129M	22.	695.88	4.5283E-07
XE-129M	51.	196.56	1.1732E-06
I-130	0.	536.89	Half-Life too short
BA-131	44.	123.88	1.3879E-07
I-131	22.	364.48	6.6951E-08
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	48.	163.93	1.7121E-06
I-132	0.	667.69	Half-Life too short
TE-132	58.	228.16	1.6788E-06
BA-133	41.	382.84	4.7817E-08
BA-133M	0.	276.89	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	32.	81.88	1.8271E-06
XE-133M	0.	233.22	Half-Life too short
CS-134	27.	684.78	9.5842E-09
I-134	0.	884.89	Half-Life too short
TE-134	0.	218.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1268.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : BKG-RANGE021105

Acquisition date : 7-MAR-2005 12:21:11

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
I-136	12.	810.50	3.0223E-08
I-136	0.	1313.02	Half-Life too short
CS-137	11.	661.65	7.5394E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	250.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	36.	165.05	1.0020E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	26.	537.32	1.2506E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	34.	145.44	2.5110E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	32.	133.54	7.3252E-08
PR-144	0.	1409.15	Half-Life too short
ND-147	41.	91.10	2.1078E-07
PM-140M	18.	550.27	1.1550E-08
EU-152	39.	344.27	3.2406E-08
EU-154	10.	1004.76	4.9407E-08
EU-156	25.	646.29	3.0529E-07
HF-181	49.	402.03	1.9450E-08
Ta-182	0.	1221.42	3.8009E-08
W-187	0.	605.01	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	44.	279.19	1.5572E-08
BI-207	21.	569.67	6.2464E-09
TL-208	0.	503.14	Half-Life too short
PB-212	0.	230.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	55.	240.98	2.3657E-05
RA-226	56.	106.21	2.6504E-07
AC-228	30.	330.32	7.4241E-08
TH-228	54.	84.37	1.5037E-06
PA-234	0.	131.20	Half-Life too short
TH-234	46.	63.29	2.6323E-06
U-235	33.	143.76	6.8007E-08
NP-239	0.	106.13	Half-Life too short
AM-241	29.	59.54	1.9265E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: FB 021605

Sample Location (Well Number): Field blank

1. Representative sample collected. Date/Time 2-16-05 / 1505

Sample collected by: Joy Marie Slabak / Joy Marie Slabak Date: 2-17-2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jon Cavillone / [Signature] Date: 2-17-05  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

~~Performed by: R. B. [Signature] / [Signature] Date: 2/2/05  
Fermi 2 Chemistry Printed Name Signature~~

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate. NO Tritium detected.

Performed by: William V. Lipton / William V. Lipton Date: 3/27/2005  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	FB-021605	
2 . Date Sampled	02/16/2005	
3 . Time Sampled	15:05	
4 . Sample Volume, (ml)	4	ml

**Instrument Count Data**

1 . Date Sample Counted	02/21/2005	
2 . Time Sample Counted	10:00	
3 . Background Inf.:		
Minutes Counted	10	min.
Background Count Rate (cpm)	6.8	cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)		
Gross Spike Count Rate (cpm)	3751.8	cpm
Net Spike Count Rate (cpm)	3745.0	cpm
H3 Spike Activity (dpm on count date)	9309.7	dpm
Counter Efficiency	0.4023	cpm/dpm
5 . Sample Info:		
Sample Gross Count Rate (cpm)	5.5	cpm
Sample Count Time (min.)	10.0	min.
Net Sample Count Rate (cpm)	0.0	cpm
6 . Critical Level:		
Critical Level Count Rate (cpm)	1.9	cpm

**Minimum Detectable Activity**

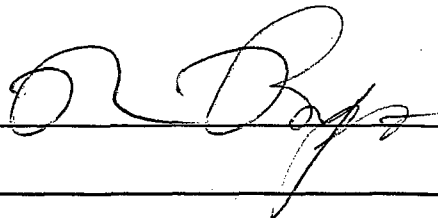
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.08\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date

2/16/05

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: FB-021605

Sample Location (Well Number): Field Blank

1. Representative sample collected. Date/Time 2-16-05 / 1505

Sample collected by: Joy Marie Saback / Joy Marie Saback Date: 02/17/2005  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Jim Cavillone / [Signature] Date: 3-17-05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD-validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: L. McCoy / [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

Sample number: FB-021605

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: L. McCoy [Signature] Date: 3/7/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 3/22/05  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 6602-66.67 KeV peaks unidentified, high level  
(37-482), low level regard. 142.98 KeV peak unidentified,  
high Fu HM (6.30) - low regard. No licensed  
radioactive material detected.  
William V. Lipton 48651 3/22/05



RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: FB-021605

Sample End Time: 16-FEB-2005 15:05:00.00

REMARKS 06.02 06.67 KeV peaks unidentified, high error (32-49%) - 10%  
d. regard. 142, 98 KeV peak unidentified, high FWHM (6.3%), 10%  
d. regard.

PERFORMED BY:

*J.M.G.*  
SIGNATURE

REVIEWED BY:

*William V. Lytle* 4865 / 3/22/05  
SIGNATURE/DATE

Sample ID : FB-021635

Acquisition date : 7-MAR-2005 15:41:17

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: FB-021635
Sample collection start date: 16-FEB-2005 15:05:00.00
Sample collection end date : 16-FEB-2005 15:05:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : WELL Operator: LKM

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 7-MAR-2005 15:41:17.67
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.12 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 12-APR-2004 09:17:00.00
Kev/channel : 5.00597E-01 Zero offset: -2.94036E-01
Daily cal date : 7-MAR-2005 09:24:50.68

\*\*\*\*\* 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 : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, XErr, Fit. Contains 9 rows of peak data with handwritten annotations.

Handwritten notes: 1.98E+00 unidentified, 24.5 unidentified, 10.3 Hz, 4.20E+04, 10.3 Hz, 4.20E+04, 11.9 Hz, 4.20E+04, 23.6 Hz, 4.20E+04, 0.02M

Sample Title : FE-921605  
Decay Time = 19 00:36:17.07

Page : 1  
Acquisition Time = 7-MAR-2005 15:41:17.07

Post-NID Peak Search Report

It	Energy	Area	Bkgrnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
2	66.02	27	52	1.36	132.47	129	14	48.0	1.98E+00	
2	66.67	43	53	1.24	133.78	129	14	32.0		
0	142.98	106	92	6.36	286.24	277	19	24.5		
0	511.69	159	55	2.76	1023.06	1015	17	13.6		
0	558.58	78	28	1.46	1116.76	1110	14	18.3		
0	610.39	24	49	0.78	1220.36	1215	11	63.0		
0	1120.90	17	10	1.48	2241.24	2235	11	43.6		
0	1460.75	97	8	2.85	2921.21	2913	15	11.9		K-40
0	1764.66	27	2	2.34	3529.50	3521	13	23.6		

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	97	10.67*	2.389E+00	5.684E-07	5.684E-07	11.91

Flag: "\*" = Keyline

Total number of lines in spectrum 9  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 9 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma XError	Flags
K-40	1.00E+05Y	1.00	5.684E-07	5.684E-07	0.677E-07	11.91	
Total Activity :			5.684E-07	5.684E-07			
Grand Total Activity :			5.684E-07	5.684E-07			

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

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

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
P-32	109.74M	249.70	511.00*	100.00	1.000E+35	13.60	Decay
% Abundances Found = 100.00							
SC-46	83.83D	0.23	142.53	62.70	4.077E-08	24.48	Abun.
			889.25*	99.98	----	Not Found	----
			1120.51	99.99	1.099E-08	43.56	
% Abundances Found = 61.94							
FE-59	44.63D	0.43	142.65	1.93	3.409E-06	24.48	Abun.
			192.34	3.11	----	Not Found	----
			1099.22*	56.50	----	Not Found	----
			1291.56	43.20	----	Not Found	----
% Abundances Found = 0.99							
SE-75	119.78D	0.16	66.05	1.02	3.302E-06	47.97	Abun.
			96.73	3.41	----	Not Found	----
			121.12	16.70	----	Not Found	----
			136.00*	59.20	----	Not Found	----
			190.60	1.45	----	Not Found	----
			264.65	59.80	----	Not Found	----
			279.53	25.20	----	Not Found	----
			303.91	1.32	----	Not Found	----
			400.65	11.40	----	Not Found	----
% Abundances Found = 0.57							
P-76	26.32H	17.36	559.10*	44.70	9.678E-03	10.31	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.07	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.04	----	Not Found	----
			1220.52	1.39	----	Not Found	----
			1430.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1707.67	0.33	----	Not Found	----
% Abundances Found = 73.70							
RU-103	39.35D	0.48	497.08*	89.00	----	Not Found	Abun.
			610.33	5.60	2.034E-07	62.97	
% Abundances Found = 5.92							
CS-136	13.16D	1.45	66.91	12.50	1.017E-06	32.03	Abun.
			86.29	6.30	----	Not Found	----
			153.22	7.46	----	Not Found	----
			163.09	4.61	----	Not Found	----
			176.55	13.56	----	Not Found	----
			273.65	12.66	----	Not Found	----

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
CS-136	13.16D	1.45	340.57	48.50	---	Not Found	Abun.
			610.50*	99.70	---	Not Found	
			1040.07	79.60	---	Not Found	
			1235.34	19.70	---	Not Found	
			% Abundances Found =			4.10	
PM-148M	41.30D	0.46	200.11	12.56	---	Not Found	Abun.
			414.07	10.66	---	Not Found	
			432.70	5.35	---	Not Found	
			501.20	6.75	---	Not Found	
			550.27*	94.90	---	Not Found	
			599.74	12.54	---	Not Found	
			611.26	5.40	2.046E-07	62.97	
			629.97	09.00	---	Not Found	
			725.70	32.00	---	Not Found	
915.33	17.17	---	Not Found				
1013.01	20.30	---	Not Found				
% Abundances Found =			1.74				
TA-182	114.74D	0.17	67.75	42.30	1.237E-07	32.03	Abun.
			100.10	14.10	---	Not Found	
			1109.05	16.30	---	Not Found	
			1221.42*	27.10	---	Not Found	
			1230.97	11.50	---	Not Found	
% Abundances Found =			30.01				
BI-214	19.90M	1377.45	609.31*	46.30	1.000E+35	62.97	Decay
			760.36	5.04	---	Not Found	
			934.06	3.21	---	Not Found	
			1120.29	15.10	1.000E+35	43.56	
			1238.11	5.94	---	Not Found	
			1377.67	4.11	---	Not Found	
			1764.49	15.00	1.000E+35	23.57	
% Abundances Found =			00.04	(Abn. Limit = 40.40%)			
U-235	9999.99Y	0.00	109.14	1.50	---	Not Found	Abun.
			143.76*	10.50	2.400E-07	24.40	
			163.35	4.70	---	Not Found	
			185.72	54.00	---	Not Found	
			202.12	1.00	---	Not Found	
			205.31	4.70	---	Not Found	
% Abundances Found =			13.74				

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
2	66.02	27	52	1.36	132.47	129	14	1.40E-02	48.0	1.32E+00	T
2	66.67	43	53	1.24	133.78	129	14	2.40E-02	32.0	1.39E+00	T
0	142.98	106	92	6.36	286.24	277	19	5.88E-02	24.5	6.08E+00	T
0	511.69	159	55	2.76	1023.06	1015	17	8.62E-02	13.6	4.73E+00	T
0	558.56	78	28	1.46	1116.76	1110	14	4.33E-02	18.3	4.55E+00	T
0	610.39	24	49	9.78	1220.36	1215	11	1.32E-02	63.0	4.36E+00	T
0	1120.90	17	10	1.48	2241.24	2235	11	9.65E-03	43.6	2.78E+00	T
0	1764.66	27	2	2.34	3529.50	3521	13	1.48E-02	23.6	2.16E+00	T

Flags: "T" = Tentatively associated



Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	1.0342E-07
F-18	0.	511.00	Half-Life too short
NA-22	10.	1274.54	1.0292E-06
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	12.	889.25	1.0626E-08
CR-51	24.	320.00	1.1051E-07
MN-54	15.	834.83	9.6205E-09
CO-56	20.	1230.25	2.3696E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	44.	158.38	6.9746E-08
CO-57	33.	122.06	1.0070E-08
CO-58	0.	810.76	0.5202E-09
FE-59	18.	1099.22	2.8001E-08
CO-60	14.	1332.49	1.2163E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.04	Half-Life too short
ZN-65	15.	1115.52	2.3001E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	44.	138.00	1.6110E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	57.	513.99	2.7992E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	57.	513.99	1.4011E-08
RB-86	10.	1076.63	2.1039E-07
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	380.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1362.39	Half-Life too short
Y-88	6.	1036.01	1.1335E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.80	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	15.	1004.90	4.8206E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1363.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : FR-021605

Acquisition date : 7-MAR-2005 15:41:17

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.20	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NR-94	17.	702.63	0.1804E-09
NR-95	14.	765.79	1.2150E-08
NR-95M	47.	235.69	1.3231E-06
ZR-95	14.	756.72	1.0177E-08
NR-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	13.	730.50	7.0305E-06
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	300.01	Half-Life too short
RU-103	26.	497.00	1.2924E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	17.	621.04	0.0700E-08
CD-109	40.	00.00	3.9000E-07
AG-110M	9.	937.40	2.5611E-08
SM-113	20.	391.69	1.3170E-08
SM-117M	44.	150.56	2.4132E-08
SB-122	23.	563.93	1.5511E-06
SB-124	24.	602.71	1.1124E-08
SB-125	36.	427.09	3.0746E-08
TE-125M	35.	109.20	4.2173E-06
T-127	0.	417.90	Half-Life too short
T-127M	36.	57.60	3.5605E-05
XE-127	36.	202.04	1.5360E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	22.	695.00	4.1051E-07
XE-129M	47.	196.56	7.6119E-07
I-130	0.	536.09	Half-Life too short
BA-131	31.	123.00	0.2277E-08
I-131	24.	364.40	4.4602E-08
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	44.	163.93	1.2232E-06
I-132	0.	667.69	Half-Life too short
TE-132	37.	200.16	4.9493E-07
BA-133	39.	302.04	4.6100E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	30.	01.00	5.6952E-07
XE-133M	49.	233.22	3.4725E-05
CS-134	21.	604.70	0.4656E-09
I-134	0.	004.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
T-135M	0.	526.56	Half-Life too short

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	28.	318.58	2.8297E-08
I-136	0.	1313.82	Half-Life too short
CS-137	28.	661.65	9.8581E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	250.31	Half-Life too short
BA-139	0.	1428.58	Half-Life too short
CE-139	49.	165.85	1.1268E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	23.	537.32	9.1794E-08
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	198.22	Half-Life too short
CE-141	55.	145.44	2.8214E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	53.	133.54	9.1300E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	34.	91.18	1.4508E-07
PM-148M	28.	558.27	1.1859E-08
EU-152	38.	344.27	3.2114E-08
EU-154	11.	1884.76	5.2758E-08
EU-156	13.	646.29	2.2928E-07
HF-181	27.	482.83	1.3684E-08
TA-182	16.	1221.42	4.9373E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.83	Half-Life too short
HG-203	62.	279.19	1.6984E-08
BI-207	36.	569.67	1.8498E-08
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	46.	240.98	8.2652E-08
RA-226	41.	186.21	2.3883E-07
AC-228	37.	338.32	7.3739E-08
TH-228	29.	84.37	1.1191E-06
PA-234	0.	131.28	Half-Life too short
TH-234	37.	63.29	2.8564E-06
U-235	51.	143.76	8.4188E-08
NP-239	46.	186.13	1.3215E-05
AM-241	58.	59.54	2.4563E-07

**September 2005**

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-18092005

Sample Location (Well Number): EFT-18

1. Representative sample collected. Date/Time 09/20/2005 1 1405

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/20/2005 Collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: D. HEMMELE / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: R. Bennett / [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 1/19/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location 1S0920005  
 2. Date Sampled 09/20/2005  
 3. Time Sampled 14:05  
 4. Sample Volume, (ml) 4 ml

**Instrument Count Data**

1. Date Sample Counted 11/22/2005  
 2. Time Sample Counted 00:10  
 3. Background Inf.:  
 Minutes Counted 10 min.  
 Background Count Rate (cpm) 9.0 cpm  
 4. Efficiency Inf.: (Daily Spike Source ID # 111)  
 Gross Spike Count Rate (cpm) 3569.5 cpm  
 Net Spike Count Rate (cpm) 3560.5 cpm  
 H3 Spike Activity (dpm on count date) 8923.8 dpm  
 Counter Efficiency 0.3990 cpm/dpm  
 5. Sample Info:  
 Sample Gross Count Rate (cpm) 7.7 cpm  
 Sample Count Time (min.) 10.0 min.  
 Net Sample Count Rate (cpm) 0.0 cpm  
 6. Critical Level:  
 Critical Level Count Rate (cpm) 2.2 cpm

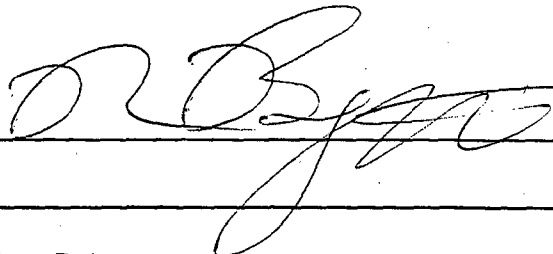
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-15092005

Sample Location (Well Number): EFT-15

1. Representative sample collected. Date/Time 09/20/2005 1 1405

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/20/2005 collected  
Printed Name / Signature 12/12/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMEL / Daniel K Hemmel Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: G. Green / [Signature] Date: 1/21/06  
Fermi 2 RP Printed Name Signature

William V Lipton / William V Lipton 1/17/2006

Sample number: EFT-18092005

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: G. LOVIN-GARCIA / [Signature] Date: 11/21/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Vinton / William V. Vinton Date: 1/13/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: FERMI 1 EFF SAMPLE EFT-15092005

Sample End Time: 21-NOV-2005 23:19:00.00

REMARKS UNIDENTIFIED PEAK @ 300.23 keV (same left hand peak as 350 keV peak)  
NEEDS EVAL. BY RAD. ENG. JUNE 29 11/10/05 (same rad. eng. as 11/10/05)  
NO LICENSEE CAPTIVE MATERIAL DETECTED.  
Melton L. Fyler 48651 / 11/10/05

PERFORMED BY:

*[Handwritten Signature]*  
 \_\_\_\_\_  
 SIGNATURE

REVIEWED BY:

*[Handwritten Signature]*  
 \_\_\_\_\_  
 SIGNATURE/DATE

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 23:10:37

## Fermi 2 Radiation Protection Gamma Spectroscopy Report

## \*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: FERMI 1 EFF SAMPLE EFT-18092005  
 Sample collection start date: 21-NOV-2005 23:10:00.00  
 Sample collection end date : 21-NOV-2005 23:10:00.00  
 Type of sample : 1 L Mari. Liquid  
 Sample quantity : 1.00000E+03 cc  
 Sample geometry : MELL Operator: GCG

## \*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 21-NOV-2005 23:10:37.24  
 Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00  
 Elapsed real time : 0 00:30:01.13 Percent dead time : 0.05 %

## \*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03  
 KeV/channel : 5.00489E-01 Zero offset: -2.63429E-04  
 Daily cal date : 21-NOV-2005 16:30:29.82

## \*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000  
 Abundance limit : 75.00000 Library : dacmaster.nlb  
 Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	352.19	56	31	2.18	703.84	695	34	3.12E-02	26.0	1.95E+00
2	3	360.23	34	28	2.19	719.91	695	34	1.86E-02	39.7	
3	0	510.74	174	64	2.58	1020.81	1011	24	9.66E-02	14.1	
4	0	558.81	83	39	1.93	1116.91	1107	21	4.61E-02	22.3	
5	0	609.69	54	23	2.26	1218.64	1213	11	2.90E-02	22.4	
6	0	1460.95	100	0	2.14	2921.63	2911	20	5.56E-02	10.0	
7	0	1764.70	40	0	1.67	3529.73	3522	14	2.22E-02	15.8	

*Handwritten notes:*  
 1, 95E+00  
 Pb-214  
 gamma rays  
 Bi-214  
 K-40  
 Bi-214

4

Post-MID Peak Search Report

IC	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	XErr	Fit	Nuclides
3	352.19	56	31	2.18	703.84	695	34	26.0	1.95E+00	<del>Bi-214</del>
3	360.23	34	28	2.19	719.91	695	34	39.7		
0	510.74	174	64	2.50	1020.81	1011	24	14.1		
0	558.81	83	39	1.93	1116.91	1107	21	22.3		
0	609.69	54	23	2.26	1218.64	1213	11	22.4		
0	1460.95	100	0	2.14	2921.63	2911	20	10.0		
0	1764.70	40	0	1.67	3529.73	3522	14	15.2		

~~Bi-214~~ JNR.  
 F-18 ANS.  
 PHOTO VIEWER  
 Bi-214  
 K-40  
 Bi-214

My MID back

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
F-18	511.00	174	193.46*	4.487E+00	3.006E-08	3.313E-08	14.87

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	100	10.67*	2.308E+00	6.097E-07	6.097E-07	10.00
BI-214	609.31	54	46.30*	4.162E+00	4.167E-08	6.898E-08	22.42
	768.36	-----	5.04	3.461E+00	-----	Line Not Found	-----
	934.06	-----	3.21	2.912E+00	-----	Line Not Found	-----
	1120.29	-----	15.10	2.695E+00	-----	Line Not Found	-----
	1238.11	-----	5.94	2.548E+00	-----	Line Not Found	-----
	1377.67	-----	4.11	2.302E+00	-----	Line Not Found	-----
	1764.49	40	15.00	2.004E+00	1.824E-07	3.006E-07	15.81
PB-214	87.30	-----	4.67	3.097E+00	-----	Line Not Found	-----
	241.98	-----	7.49	5.680E+00	-----	Line Not Found	-----
	295.21	-----	19.20	5.462E+00	-----	Line Not Found	-----
	351.92	56	37.20*	5.191E+00	4.361E-08	6.373E-08	25.96
	785.91	-----	1.10	3.389E+00	-----	Line Not Found	-----

Flag: "\*" = Keyline

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

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
F-18	109.74M	1.10	3.006E-08	3.313E-08	0.466E-08	14.07	
Total Activity :			3.006E-08	3.313E-08			

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	6.097E-07	6.097E-07	0.610E-07	10.00	
BI-214	19.90M	1.65	4.187E-08	6.998E-08	1.546E-08	22.42	A
PO-214	26.90M	1.46	4.361E-08	6.373E-08	1.654E-08	25.96	A
Total Activity :			6.952E-07	7.424E-07			

Grand Total Activity : 7.253E-07 7.755E-07

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

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

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 23:19:37

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-Life	Ratio			(uCi/cc)	%Error		
AS-76	26.32H	0.01	559.10*	44.70	6.500E-08	22.31	Abun.	
			563.23	1.17	---	Not Found	---	
			571.30	0.14	---	Not Found	---	
			657.03	6.10	---	Not Found	---	
			665.31	0.39	---	Not Found	---	
			740.12	0.12	---	Not Found	---	
			771.76	0.12	---	Not Found	---	
			867.63	0.12	---	Not Found	---	
			1129.87	0.14	---	Not Found	---	
			1212.72	1.63	---	Not Found	---	
			1216.02	3.04	---	Not Found	---	
			1229.52	1.39	---	Not Found	---	
			1439.13	0.33	---	Not Found	---	
			1453.60	0.13	---	Not Found	---	
			1707.67	0.33	---	Not Found	---	
% Abundances Found =			73.70					
RU-103	39.35D	0.00	497.00*	89.00	---	Not Found	---	Abun.
			610.33	5.60	3.462E-07	22.42		
% Abundances Found =			5.92					
TE-127	9.35H	0.03	360.30	0.13	7.651E-06	39.68	Abun.	
			417.90*	0.99	---	Not Found	---	
% Abundances Found =			11.61					
XE-135	9.11H	0.03	249.79*	89.90	---	Not Found	---	Abun.
			600.19	2.89	6.842E-07	22.42		
% Abundances Found =			3.11					
PM-140M	41.30D	0.00	200.11	12.56	---	Not Found	---	Abun.
			414.07	10.66	---	Not Found	---	
			432.70	5.35	---	Not Found	---	
			501.26	6.75	---	Not Found	---	
			550.27*	94.90	---	Not Found	---	
			599.74	12.54	---	Not Found	---	
			611.26	5.40	3.530E-07	22.42		
			629.97	89.00	---	Not Found	---	
			725.70	32.00	---	Not Found	---	
			915.33	17.17	---	Not Found	---	
			1013.01	20.30	---	Not Found	---	
			% Abundances Found =			1.74		

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : FERMI 1 EFF SAMP

Page : 5  
Acquisition date : 21-NOV-2005 23:10:37

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
	360.23	34	20	2.19	719.91	695	34	1.06E-02	39.7	5.16E+00	T
0	558.81	83	39	1.93	1116.91	1107	21	4.61E-02	22.3	4.31E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	7.8752E-08
NA-22	5.	1274.54	7.8844E-09
NA-24	9.	1368.53	1.8445E-08
MG-27	12.	1914.44	9.1820E-08
CL-38	5.	1642.42	3.6901E-08
AR-41	18.	1293.64	1.5140E-08
SC-46	18.	889.25	1.1200E-08
CR-51	34.	328.88	8.5407E-08
MN-54	19.	834.83	1.8715E-08
CO-56	15.	1238.25	1.8206E-08
MN-56	4.	1810.69	3.4558E-08
NI-56	67.	158.38	1.8896E-08
CO-57	45.	122.86	1.1358E-08
CO-58	16.	810.76	9.8466E-09
FE-59	15.	1099.22	2.8396E-08
CO-60	10.	1332.49	1.8587E-08
CU-64	9.	1345.98	3.3458E-06
NI-65	10.	1481.84	5.3845E-08
ZN-65	14.	1115.52	2.2133E-08
ZN-69M	36.	438.63	1.8213E-08
SE-75	44.	136.88	1.4813E-08
AS-76	75.	559.10	3.3774E-08
BR-82	13.	776.49	1.8376E-08
BR-83	22.	529.64	6.9852E-07
BR-84	13.	881.58	3.2858E-08
BR-85	19.	882.41	3.4518E-06
KR-85	52.	513.99	2.8297E-06
KR-85M	56.	151.18	1.2856E-08
SR-85	52.	513.99	1.2259E-08
RB-86	10.	1076.63	1.8974E-07
KR-87	27.	482.58	1.8838E-08
SR-87M	37.	388.48	1.1857E-08
KR-88	52.	196.32	3.6919E-08
RB-88	8.	1382.39	2.4854E-06
Y-88	5.	1836.81	9.7866E-09
KR-89	55.	228.98	3.6138E-07
RB-89	9.	1831.88	2.8877E-08
KR-90	17.	1118.69	2.8588E-06
RB-90	14.	831.69	2.6818E-07
RB-90M	21.	824.23	8.8836E-07
Y-90M	48.	282.51	9.5518E-09
SR-91	17.	1824.38	3.6913E-08
Y-91	18.	1284.98	3.3773E-06
Y-91M	35.	555.68	1.3589E-08
SR-92	6.	1383.94	1.8292E-08
Y-92	19.	934.46	8.8651E-08
SR-93	23.	598.28	4.2325E-08



Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 23:18:37

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
Y-93	46.	266.90	1.3558E-07
NB-94	20.	702.63	9.2694E-09
NB-95	16.	765.79	9.1643E-09
NB-95M	53.	235.69	3.8573E-08
ZR-95	12.	756.72	1.4355E-08
NB-97	9.	657.90	7.2928E-09
ZR-97	16.	743.36	9.3521E-09
MO-99	20.	739.58	7.7112E-08
TC-99M	71.	140.50	1.2398E-08
TC-101	40.	306.81	1.9926E-08
RU-103	19.	497.03	8.4778E-09
TC-104	42.	357.99	1.0415E-08
RH-105	39.	318.90	4.6747E-08
RU-105	21.	724.50	2.0971E-08
RU-106	19.	621.84	8.4405E-08
CD-109	36.	88.03	3.9271E-07
AG-110M	14.	937.48	3.0438E-08
SN-113	20.	391.69	1.2605E-08
SN-117M	63.	150.56	1.1244E-08
SB-122	10.	563.93	8.4748E-09
SB-124	25.	602.71	9.5776E-09
SB-125	26.	427.89	2.7727E-08
TE-125M	51.	109.28	4.1738E-06
TE-127	36.	417.90	9.6624E-07
TE-127M	33.	57.60	2.3752E-05
TE-127	43.	202.84	1.2234E-08
TE-129	22.	459.60	1.2769E-07
TE-129M	17.	695.88	2.6187E-07
XE-129M	54.	196.56	1.9264E-07
I-130	25.	536.09	9.1504E-09
BA-131	40.	123.80	3.1001E-08
I-131	40.	364.48	1.1572E-08
TE-131	50.	149.72	1.9242E-08
TE-131M	13.	773.67	2.2098E-08
XE-131M	36.	163.93	3.8096E-07
I-132	18.	667.69	9.3492E-09
TE-132	61.	228.16	1.1536E-08
BA-133	45.	302.84	5.2709E-08
BA-133M	49.	276.09	5.3191E-08
I-133	22.	529.87	9.8054E-09
TE-133M	19.	912.58	1.6349E-08
XE-133	36.	81.00	4.8515E-08
XE-133M	48.	233.22	8.9387E-08
CS-134	27.	604.70	9.8301E-09
I-134	10.	884.09	1.6500E-08
TE-134	71.	210.47	6.2251E-08
BA-135M	49.	268.24	5.9788E-08
I-135	10.	1260.41	3.7302E-08
XE-135	37.	249.79	9.3872E-09
XE-135M	20.	526.56	1.8570E-08
TE-136	13.	818.50	8.9943E-09

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 23:18:37

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
I-136	6.	1313.02	2.5727E-07
CS-137	23.	661.65	1.0902E-08
XE-137	18.	455.49	1.4150E-07
CS-138	9.	1435.86	1.9649E-08
XE-138	42.	258.31	5.5229E-08
BA-139	9.	1420.50	4.3548E-06
CE-139	53.	165.85	1.1067E-08
CS-139	18.	1203.23	3.9144E-07
BA-140	26.	537.32	3.5870E-08
LA-140	7.	1596.49	1.0942E-08
BA-141	59.	190.22	3.3106E-08
CE-141	50.	145.44	1.8559E-08
LA-141	14.	1354.52	4.9967E-07
BA-142	56.	255.12	1.3159E-07
LA-142	20.	641.17	1.8547E-08
CE-143	43.	293.26	2.1716E-08
CE-144	54.	133.54	9.0245E-08
PR-144	11.	1489.15	6.8867E-06
ND-147	40.	91.10	5.0805E-08
PM-148M	25.	550.27	9.5079E-09
EU-152	34.	344.27	3.2345E-08
EU-154	17.	1004.76	6.4593E-08
EU-156	16.	646.29	1.0964E-07
HF-181	28.	482.03	1.0704E-08
TA-182	8.	1221.42	3.4155E-08
W-187	18.	685.81	3.0188E-08
RE-188	46.	155.03	5.6469E-08
HG-203	48.	279.19	1.2283E-08
BI-207	27.	569.67	9.7109E-09
TL-208	30.	583.14	9.3625E-08
PB-212	56.	238.63	2.2500E-08
RA-224	49.	240.98	2.3527E-07
RA-226	55.	186.21	2.7761E-07
AC-228	47.	338.32	8.6839E-08
TH-228	38.	84.37	1.3611E-06
PA-234	48.	131.20	4.7099E-08
TH-234	45.	63.29	1.3003E-06
U-235	51.	143.76	8.6532E-08
NP-239	48.	106.13	5.2232E-08
AM-241	30.	59.54	1.7387E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-1D092005

Sample Location (Well Number): EFT-1D

1. Representative sample collected. Date/Time 09/20/2005 / 1540

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/20/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: R. Bengert / [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1 . Sample Location	EFT-1D092005
2 . Date Sampled	09/20/2005
3 . Time Sampled	15:40
4 . Sample Volume, (ml)	4 ml

Instrument Count Data

1 . Date Sample Counted	11/22/2005
2 . Time Sample Counted	00:10
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	9.0 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	8923.8 dpm
Counter Efficiency	0.3990 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.8 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.2 cpm

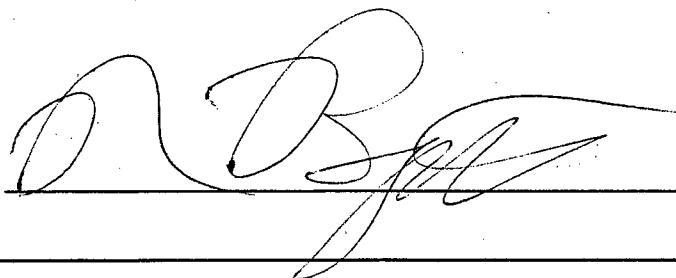
Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.25\text{E}-06 \text{ uCi/ml}$$

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-1D092005

Sample Location (Well Number): EFT-1D

1. Representative sample collected. Date/Time 09/20/2005 / 1540

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/20/2005 Collected  
Printed Name / Signature Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMELE / [Signature] Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: [Signature] / [Signature] Date: 11/2/05 <sup>11/5/05</sup> [Signature]  
Fermi 2 RP Printed Name Signature

William V. Lipton / [Signature] 11/3/2006

Sample number: EFT-1D092005

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: G. GOWIN-GARCA / [Signature] Date: 11/21/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lypton / [Signature] Date: 11/3/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: FERMI 1 EFF SAMPLE EFT-1D092005

Sample End Time: 21-NOV-2005 23:55:00.00

REMARKS ~~XETZ9M (PERM) will results for Eng. Exam~~ <sup>m11/12/05</sup> <sup>7-19</sup> Ar-Ju

No licensed radioactive material detected.

William V Lipton 48651 / 12/12/05

PERFORMED BY:

*[Handwritten Signature]*

SIGNATURE

REVIEWED BY:

*William V Lipton 48651 / 12/12/05*

SIGNATURE/DATE

Sample ID : FERMI 1 EFF SAMP.

Acquisition date : 21-NOV-2005 23:55:59

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: FERMI 1 EFF SAMPLE EFT-1D092005
Sample collection start date: 21-NOV-2005 23:55:00.00
Sample collection end date : 21-NOV-2005 23:55:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 ML
Sample geometry : MELL Operator: GCG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 21-NOV-2005 23:55:59.54
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.12 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00489E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.02

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 4 rows of peak data.

Handwritten notes: AC 228, anti 1/2 hr, RA 2/11, K40



4

Best-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	190.50	60	07	1.16	396.65	392	11	32.3		XE-129M
0	511.63	163	64	3.44	1022.50	1013	21	15.2		F-18
0	609.39	45	46	1.07	1210.03	1211	13	34.1		BI-214
0	1461.20	67	23	1.40	2922.13	2914	16	20.5		K-40

*By NID/KC*

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected	Decay Corr	1-Sigma
					uCi/ML	uCi/ML	
F-18	511.00	163	193.46*	4.483E+00	2.814E-08	3.109E-08	15.23
XE-129M	196.56	60	4.74*	6.034E+00	3.171E-07	3.174E-07	32.33

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected	Decay Corr	1-Sigma
					uCi/ML	uCi/ML	
K-40	1460.81	67	10.67*	2.388E+00	4.058E-07	4.058E-07	20.49
BI-214	609.31	45	46.30*	4.162E+00	3.529E-08	5.090E-08	34.12
	768.36	-----	5.04	3.461E+00	-----	Line Not Found	-----
	934.06	-----	3.21	2.912E+00	-----	Line Not Found	-----
	1120.29	-----	15.10	2.695E+00	-----	Line Not Found	-----
	1238.11	-----	5.94	2.540E+00	-----	Line Not Found	-----
	1377.67	-----	4.11	2.382E+00	-----	Line Not Found	-----
	1764.49	-----	15.80	2.084E+00	-----	Line Not Found	-----

Flag: "\*" = Keyline

Total number of lines in spectrum 4  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/ML	Decay Corr uCi/ML	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
F-18	109.74M	1.10	2.814E-08	3.109E-08	0.473E-08	15.23	
Xe-129M	8.89D	1.00	3.171E-07	3.174E-07	1.026E-07	32.33	
Total Activity :			3.453E-07	3.485E-07			

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/ML	Decay Corr uCi/ML	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.050E-07	4.050E-07	0.832E-07	20.49	
Bi-214	19.90M	1.67	3.529E-08	5.890E-08	2.010E-08	34.12	A
Total Activity :			4.411E-07	4.647E-07			

Grand Total Activity : 7.863E-07 8.132E-07

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

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

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 23:55:59

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/ML)	%Error	
SE-75	119.780	0.00	66.05	1.02	---	Not Found	Abun.
			96.73	3.41	---	Not Found	
			121.12	16.70	---	Not Found	
			136.00*	59.20	---	Not Found	
			198.60	1.45	1.037E-06	32.33	
			264.65	59.00	---	Not Found	
			279.53	25.20	---	Not Found	
			303.91	1.32	---	Not Found	
			400.65	11.40	---	Not Found	
			% Abundances Found =				
RU-103	39.350	0.00	497.00*	89.00	---	Not Found	Abun.
			610.33	5.60	2.919E-07	34.12	
			% Abundances Found =				
XE-135	9.11H	0.03	249.79*	89.90	---	Not Found	Abun.
			608.19	2.89	5.770E-07	34.12	
			% Abundances Found =				
PM-148M	41.300	0.00	208.11	12.56	---	Not Found	Abun.
			414.07	10.66	---	Not Found	
			432.78	5.35	---	Not Found	
			501.26	6.75	---	Not Found	
			550.27*	94.90	---	Not Found	
			599.74	12.54	---	Not Found	
			611.26	5.40	2.982E-07	34.12	
			629.97	89.00	---	Not Found	
			725.70	32.80	---	Not Found	
			915.33	17.17	---	Not Found	
1013.81	20.30	---	Not Found				
% Abundances Found =				1.74			

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : FERMI 1 EFF SAMP

Page : 5  
Acquisition date : 21-NOV-2005 23:55:59

None

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Naclide	Bckgnd Sum	Energy (keV)	MDA (uCi/ML)
BE-7	34.	477.59	9.3060E-08
HA-22	12.	1274.54	1.1321E-08
NA-24	11.	1369.53	1.1508E-08
MG-27	16.	1014.44	1.0794E-07
CL-38	2.	1642.42	2.7496E-08
AR-41	10.	1293.64	1.1783E-08
SC-46	11.	889.25	8.9271E-09
CR-51	48.	320.00	9.9906E-08
MN-54	17.	834.83	1.0359E-08
CO-56	11.	1238.25	1.5927E-08
MN-56	4.	1010.69	3.5684E-08
NI-56	56.	158.38	9.2705E-09
CO-57	43.	122.06	1.1074E-08
CO-58	11.	810.76	8.4806E-09
FE-59	10.	1099.22	1.7389E-08
CO-60	17.	1332.49	1.3402E-08
CU-64	6.	1345.90	2.8458E-06
NI-65	8.	1481.84	4.7751E-08
ZN-65	6.	1115.52	1.5042E-08
ZN-69M	36.	438.63	1.0269E-08
SE-75	58.	136.00	1.6761E-08
AS-76	64.	559.10	3.1226E-08
BR-82	20.	776.49	1.2308E-08
BR-83	22.	529.64	6.9163E-07
BR-84	17.	881.50	3.5962E-08
BR-85	24.	802.41	4.1862E-06
KR-85	62.	513.99	3.0758E-06
KR-85M	41.	151.18	1.1138E-08
SR-85	62.	513.99	1.3325E-08
RB-86	11.	1076.63	1.1315E-07
KR-87	37.	402.58	2.1811E-08
SR-87M	22.	388.40	9.5120E-09
KR-88	50.	196.32	3.6278E-08
RB-88	11.	1382.39	2.7522E-06
Y-88	5.	1836.01	9.7066E-09
KR-89	56.	220.90	3.9505E-07
RB-89	11.	1031.88	3.1600E-08
KR-90	19.	1118.69	4.8003E-06
RB-90	20.	831.69	3.4504E-07
RB-90M	14.	824.23	7.1109E-07
Y-90M	50.	202.51	9.7397E-09
SR-91	10.	1024.30	2.9493E-08
Y-91	12.	1204.90	3.6452E-06
Y-91M	34.	555.60	1.3472E-08
SR-92	11.	1383.94	1.3534E-08
Y-92	13.	934.46	7.6182E-08
SR-93	24.	590.28	4.4988E-08

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 23:55:59

Slide	Bkgnd Sum	Energy (keV)	MDA (uCi/ML)
Y-93	40.	266.90	1.2754E-07
NE-94	16.	702.63	8.5528E-09
NE-95	19.	765.79	9.9212E-09
NE-95M	54.	235.69	3.8964E-08
ZR-95	17.	756.72	1.6756E-08
NE-97	24.	657.90	1.1259E-08
ZR-97	19.	743.36	9.9420E-09
MO-99	18.	739.58	7.3215E-08
TC-99M	63.	140.50	1.1734E-08
TC-101	38.	306.81	1.9890E-08
RU-103	25.	497.08	9.7272E-09
TC-104	33.	357.99	1.6797E-08
RH-105	40.	318.90	4.7076E-08
RU-105	15.	724.50	1.7976E-08
RU-106	15.	621.84	7.5919E-08
CD-109	34.	88.03	3.8181E-07
AG-110M	16.	937.48	3.1856E-08
SN-113	39.	391.69	1.4634E-08
SN-117M	56.	158.56	1.0627E-08
SB-122	28.	563.93	1.3464E-08
SB-124	29.	602.71	1.0195E-08
SB-125	29.	427.89	2.9109E-08
TE-125M	47.	109.28	4.0113E-06
TE-127	47.	417.90	1.0929E-06
TE-127M	26.	57.60	2.1148E-05
XE-127	49.	202.84	1.2976E-08
TE-129	25.	459.60	1.3677E-07
TE-129M	22.	695.88	2.9111E-07
I-130	26.	536.09	9.3091E-09
BA-131	47.	123.00	3.3505E-08
I-131	30.	364.48	1.0069E-08
TE-131	50.	149.72	1.9442E-08
TE-131M	23.	773.67	2.8519E-08
XE-131M	48.	163.93	4.3590E-07
I-132	19.	667.69	9.5376E-09
TE-132	39.	228.16	9.3927E-09
BA-133	41.	302.84	5.0421E-08
BA-133M	41.	276.09	4.9033E-08
I-133	22.	529.87	9.7478E-09
TE-133M	26.	912.58	1.8943E-08
XE-133	38.	81.00	4.9667E-08
XE-133M	44.	233.22	8.5498E-08
CS-134	32.	604.70	1.0733E-08
I-134	21.	884.09	2.2608E-08
TE-134	50.	210.47	5.3356E-08
BA-135M	44.	268.24	5.6822E-08
I-135	8.	1260.41	3.3732E-08
XE-135	49.	249.79	1.0670E-08
XE-135M	17.	526.56	1.7528E-08
TE-136	13.	818.50	9.0697E-09
I-136	4.	1313.02	2.7425E-07

## Minimum Detectable Activity Report (continued)

Page : 3

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 23:55:59

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/ML)
CS-137	22.	661.65	1.0879E-08
XE-137	32.	455.49	1.9371E-07
CS-138	10.	1435.86	2.0177E-08
XE-138	38.	258.31	5.3531E-08
BA-139	6.	1420.50	3.6311E-06
CE-139	47.	165.85	1.0493E-08
CS-139	13.	1283.23	4.4928E-07
BA-140	22.	537.32	3.3819E-08
LA-140	13.	1596.49	1.3856E-08
BA-141	51.	190.22	3.1258E-08
CE-141	50.	145.44	1.8542E-08
LA-141	8.	1354.52	3.9959E-07
BA-142	36.	255.12	1.0969E-07
LA-142	18.	641.17	1.7617E-08
CE-143	57.	293.26	2.4942E-08
CE-144	45.	133.54	8.3272E-08
PR-144	9.	1489.15	6.5312E-06
ND-147	31.	91.10	4.5308E-08
PM-148M	18.	550.27	8.1767E-09
EU-152	24.	344.27	2.7434E-08
EU-154	9.	1004.76	4.9340E-08
EU-156	23.	646.29	1.3110E-07
HF-181	26.	482.03	1.0383E-08
TA-182	9.	1221.42	3.5711E-08
W-187	15.	685.81	2.7688E-08
RE-188	50.	155.03	5.9096E-08
HG-203	47.	279.19	1.2182E-08
BI-207	30.	569.67	1.0149E-08
TL-208	26.	583.14	9.4453E-08
PB-212	52.	238.63	2.1772E-08
PB-214	56.	351.92	4.3181E-08
RA-224	37.	240.98	2.0700E-07
RA-226	59.	186.21	2.0702E-07
AC-228	51.	338.32	8.9817E-08
TH-228	44.	84.37	1.4533E-06
PA-234	40.	131.20	4.3240E-08
TH-234	42.	63.29	1.2596E-06
U-235	40.	143.76	7.7195E-08
NP-239	45.	106.13	5.1040E-08
AM-241	38.	59.54	1.9382E-07



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-25093005

Sample Location (Well Number): EFT-25

1. Representative sample collected. Date/Time 09/30/2005 / 1008

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/30/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Bunyan / [Signature] Date: 11-23-05 Performed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 1/9/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

Sample Information

1 . Sample Location EFT-2S093005  
2 . Date Sampled 09/30/2005  
3 . Time Sampled 10:08  
4 . Sample Volume, (ml) 4 ml

Instrument Count Data

1 . Date Sample Counted 11/22/2005  
2 . Time Sample Counted 00:10  
3 . Background Inf.:  
Minutes Counted 10 min.  
Background Count Rate (cpm) 9.0 cpm  
4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
Gross Spike Count Rate (cpm) 3569.5 cpm  
Net Spike Count Rate (cpm) 3560.5 cpm  
H3 Spike Activity (dpm on count date) 8923.8 dpm  
Counter Efficiency 0.3990 cpm/dpm  
5 . Sample Info:  
Sample Gross Count Rate (cpm) 6.7 cpm  
Sample Count Time (min.) 10.0 min.  
Net Sample Count Rate (cpm) 0.0 cpm  
6 . Critical Level:  
Critical Level Count Rate (cpm) 2.2 cpm

Minimum Detectable Activity

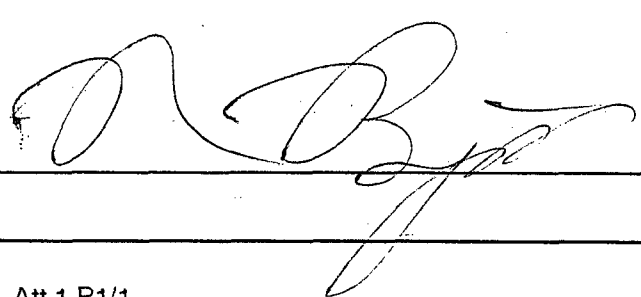
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician



Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-2S093005

Sample Location (Well Number): EFT-2S

1. Representative sample collected. Date/Time 09/30/2005 11008

Sample collected by: Joy Marie Slabak / Joy Marie Slabak Date: 09/30/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMELE / Daniel K Hemmelle Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: V. Lipton / William V. Lipton Date: 12-29-05  
Fermi 2 RP Printed Name Signature

William V. Lipton William V. Lipton 1/9/2006

Sample number: EFT-2S093005

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".

(Note disposition of unidentified peaks in "Remarks")

Performed by: V. PETERANO [Signature] Date: 12-29-08  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 1/9/2009  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 4865/1/9/2009

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT 26093005

Sample End Time: 30-SEP-2005 10:00:00.00

REMARKS No licensed radioactive material detected  
Nelson V. Zita 8/25/12/2005

PERFORMED BY:

[Signature]  
SIGNATURE

REVIEWED BY:

Nelson V. Zita 8/25/12/2005  
SIGNATURE/DATE

Sample ID : EFT 25093005

Acquisition date : 21-NOV-2005 17:42:09

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT 25093005
Sample collection start date: 30-SEP-2005 10:00:00.00
Sample collection end date : 30-SEP-2005 10:00:00.00
Type of sample : 2 L MARI. LIQUID
Sample quantity : 1.00000E+03 cc
Sample geometry : MALL Operator: UJP

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 21-NOV-2005 17:42:09.50
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.13 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00489E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.82

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_mall Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Rw, Cts/Sec, %Err, Fit. Contains 4 rows of peak data.

Handwritten notes: 'articulation', 'Kyo', 'By 21/4' written over the table data.

Sample Title : EFT 25093005  
Decay Time = 52 07:34:09.50

Page : 1  
Acquisition Time = 21-NOV-2005 17:42:09.1

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	510.87	144	46	2.61	1021.05	1014	15	13.1		<del>F-18</del>
0	558.96	33	38	1.16	1117.21	1110	12	41.6		<del>As-76</del>
0	1461.20	95	0	0.92	2922.14	2914	13	12.5		<del>K-40</del>
0	1763.92	17	10	0.92	3520.17	3520	14	45.9		<del>B-214</del>

~~F-18~~  
~~As-76~~  
~~K-40~~  
~~B-214~~  
MID/21000

Nuclide Line Activity Report  
Sample ID : EFT 26093005

Page : 2  
Acquisition date : 21-NOV-2005 17:42:01

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	85	10.67*	2.300E+00	5.201E-07	5.201E-07	12.53

Flag: "\*" = Keyline



Summary of Nuclide Activity

Sample ID : EFT 28093005

Acquisition date : 21-NOV-2005 17:42:09

Total number of lines in spectrum 4  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : natural

Nuclide	Half-life	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.201E-07	5.201E-07	0.651E-07	12.53	
Total Activity :			5.201E-07	5.201E-07			

Grand Total Activity : 5.201E-07 5.201E-07

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

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

Rejected Report  
Sample ID : EFT 25093005

Page : 4  
Acquisition date : 21-NOV-2005 17:42:05

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
F-18	109.74M	686.62	511.00*	193.46	1.0000E+35	13.13	Decay
% Abundances Found =				100.00			
AS-76	26.32H	47.71	559.10*	44.70	5.932E+06	41.57	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.04	----	Not Found	----
			1220.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found =				73.70			
BI-214	19.90M	3786.39	609.31*	46.30	----	Not Found	----
			760.36	5.04	----	Not Found	----
			934.06	3.21	----	Not Found	----
			1120.29	15.10	----	Not Found	----
			1230.11	5.94	----	Not Found	----
			1377.67	4.11	----	Not Found	----
			1764.49	15.00	1.0000E+35	45.92	
% Abundances Found =				16.54	(Abn. Limit = 40.40%)		

Flag: "\*" = Keyline

## Unidentified Energy Lines

Page : 5

Sample ID : EFT 28093005

Acquisition date : 21-NOV-2005 17:42:09

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	518.87	144	46	2.61	1021.05	1014	15	8.02E-02	13.1	4.49E+00	T
0	558.96	33	38	1.16	1117.21	1110	12	1.83E-02	41.6	4.31E+00	T
0	1763.92	17	10	0.92	3528.17	3520	14	9.66E-03	45.9	2.08E+00	T

Flags: "T" = Tentatively associated

\*\*\*\*\*  
 \* Detroit Edison Fermi 2 MDA Report, Generated 21-NOV-2005 10:12:19.07  
 \*\*\*\*\*  
 \* Sample ID : EFT 25093005  
 \*\*\*\*\*

Minimum Detectable Activity Report

Nuclide	Backgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	27.	477.59	1.6502E-07
F-19	0.	511.00	Half-Life too short
NA-22	0.	1274.54	9.6064E-09
NA-24	0.	1360.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	13.	809.25	1.5041E-08
CR-51	33.	320.08	3.1001E-07
MN-54	21.	834.83	1.2506E-08
CO-56	22.	1230.25	3.4070E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	51.	150.30	3.4119E-06
CO-57	31.	122.06	1.0972E-08
CO-58	21.	810.76	1.0435E-08
FE-59	10.	1099.22	4.9624E-08
CO-60	11.	1332.49	1.1308E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1401.04	Half-Life too short
ZN-65	14.	1115.52	2.5673E-08
ZN-69M	0.	430.63	Half-Life too short
SE-75	50.	136.00	2.2600E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	37.	513.99	2.4467E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	37.	513.99	1.0371E-08
RB-86	19.	1076.63	9.9714E-07
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	308.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1302.39	Half-Life too short
Y-88	5.	1036.01	1.3693E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RB-90	0.	831.69	Half-Life too short
RB-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	10.	1204.90	6.3111E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1303.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT 28893005

Acquisition date : 21-NOV-2005 17:42:09

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.25	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	14.	702.63	7.8831E-09
NB-95	19.	765.79	2.7690E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	13.	756.72	2.6421E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.01	Half-Life too short
RU-103	23.	497.00	2.3254E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	10.	621.04	9.2152E-08
CD-109	37.	80.03	4.2778E-07
AG-110M	11.	937.40	3.1606E-08
SN-113	37.	391.69	1.9421E-08
SN-117M	51.	150.56	1.4663E-07
SB-122	0.	563.93	Half-Life too short
SB-124	21.	602.71	1.6120E-08
SB-125	31.	427.09	3.1300E-08
TE-125M	60.	109.20	0.4519E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	36.	57.60	3.4662E-05
XE-127	54.	202.04	3.6723E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	16.	695.00	7.4413E-07
XE-129M	55.	196.56	1.1483E-05
I-130	0.	536.09	Half-Life too short
BA-131	37.	123.00	6.4860E-07
I-131	29.	364.40	9.0708E-07
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	51.	163.93	9.5463E-06
I-132	0.	667.69	Half-Life too short
TE-132	0.	220.16	Half-Life too short
BA-133	35.	302.04	4.7737E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	41.	81.00	5.1793E-05
XE-133M	0.	233.22	Half-Life too short
CS-134	15.	604.70	7.9103E-09
I-134	0.	004.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

## Minimum Detectable Activity Report (continued)

Page : 3

Sample ID : EFT 2S093005

Acquisition date : 21-NOV-2005 17:42:05

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	12.	818.50	1.3668E-07
I-136	0.	1313.02	Half-Life too short
CS-137	6.	661.65	6.1138E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	46.	165.85	1.3488E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	24.	537.32	5.9736E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	64.	145.44	6.3447E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	47.	133.54	9.6110E-08
PR-144	0.	1409.15	Half-Life too short
ND-147	40.	91.10	1.3763E-06
PM-148M	18.	550.27	1.9889E-08
EU-152	46.	344.27	3.7359E-08
EU-154	12.	1004.76	5.6341E-08
EU-156	19.	646.29	1.3111E-06
HF-181	24.	482.03	2.3651E-08
TA-182	10.	1221.42	5.1437E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	44.	279.19	2.5516E-08
BI-207	20.	569.67	8.4534E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	55.	106.21	2.7791E-07
AC-228	48.	338.32	8.8903E-08
TH-228	35.	84.37	1.3861E-06
PA-234	0.	131.20	Half-Life too short
TH-234	42.	63.29	5.6715E-06
U-235	57.	143.76	9.1387E-08
NP-239	0.	106.13	Half-Life too short
AM-241	39.	59.54	1.9786E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-2D093005

Sample Location (Well Number): EFT-2D

1. Representative sample collected. Date/Time 09/30/2005 1 1123

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/30/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: R Bennett / [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 1/9/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-2D093005
2. Date Sampled	09/30/2005
3. Time Sampled	11:23
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	11/22/2005
2. Time Sample Counted	00:10
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	9.0 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	8923.8 dpm
Counter Efficiency	0.3990 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	5.6 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.2 cpm

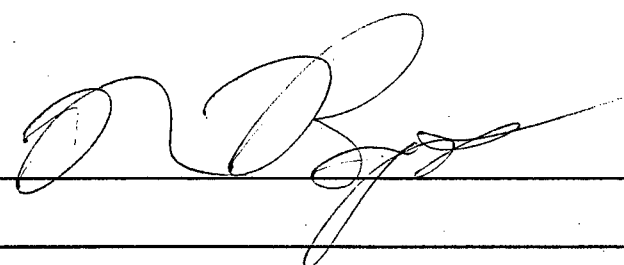
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-06 uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date NOV 23 2005



## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-2D093005

Sample Location (Well Number): EFT-2D

1. Representative sample collected. Date/Time 09/30/2005 1123

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/30/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMIGER / Daniel K Hemmiger Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: G. Lynn Gales / G. Lynn Gales Date: 11/22/05  
Fermi 2 RP Printed Name Signature 11/26

William V. Lipton / William V. Lipton 11/13/2006

Sample number: EFT-2D093005

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: G. GILVIN-GARZA / [Signature] Date: 4/22/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 1/13/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DETR0IT EDISON FERMI-2 POWER PLANT

22-NOV-2005 04:34:36.71

DETR0IT EDISON FERMI-2 POWER PLANT

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: FERMI 1 EFF SAMPLE EFT-2D093005

Sample End Time: 22-NOV-2005 04:04:00.00

REMARKS

*Passed.*  
*No licensed radioactive material detected*  
*measured N-17 with 4805/*  
*10/18/05.*

PERFORMED BY:



SIGNATURE

REVIEWED BY:

*measured N-17 with 4805/1*

SIGNATURE/DATE

*12/1/05*

PAGE \_\_\_\_\_ of \_\_\_\_\_

Sample ID Number: FERMI 1 EFF SAMPLE EFT-20093005  
 Sample collection start date: 22-NOV-2005 04:04:00.00  
 Sample collection end date : 22-NOV-2005 04:04:00.00  
 Type of sample : 1 L Mari. Liquid  
 Sample quantity : 1.00000E+03 cc  
 Sample geometry : MELL Operator: GCG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*  
 Detector number : DET 4 Acquire date : 22-NOV-2005 04:04:31.20  
 Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00  
 Elapsed real time : 0 00:30:01.14 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*  
 Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.00  
 Kev/channel : 5.00489E-01 Zero offset: -2.63429E-04  
 Daily cal date : 21-NOV-2005 16:30:29.02

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000  
 Abundance limit : 75.00000 Library : dacmaster.nlb  
 Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	511.42	161	48	2.36	1022.16	1014	20	0.96E-02	13.6	annihilate
2	0	558.67	33	30	0.81	1116.63	1112	9	1.81E-02	35.6	HWL
3	0	609.08	59	38	1.41	1217.41	1210	15	3.25E-02	26.3	HWL
4	0	1460.96	83	4	2.45	2921.65	2913	17	4.60E-02	12.4	KYC
5	0	1764.31	26	3	1.82	3520.95	3522	13	1.44E-02	24.2	HWL

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	511.42	161	48	2.36	1022.16	1014	20	13.6		F-18
0	558.67	33	30	0.81	1116.63	1112	9	35.6		AS-76
0	609.08	59	38	1.41	1217.41	1210	15	26.3		BI-214
0	1460.96	83	4	2.45	2921.65	2913	17	12.4		K-40
0	1764.31	26	3	1.82	3528.95	3522	13	24.2		BI-214

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
F-18	511.00	161	193.46*	4.484E+00	2.792E-08	3.075E-08	13.64

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	83	10.67*	2.300E+00	5.052E-07	5.052E-07	12.37
Bi-214	609.31	59	46.30*	4.163E+00	4.557E-08	7.482E-08	26.30
	768.36	-----	5.04	3.461E+00	-----	Line Not Found	-----
	934.06	-----	3.21	2.912E+00	-----	Line Not Found	-----
	1120.29	-----	15.10	2.695E+00	-----	Line Not Found	-----
	1238.11	-----	5.94	2.540E+00	-----	Line Not Found	-----
	1377.67	-----	4.11	2.382E+00	-----	Line Not Found	-----
	1764.49	26	15.00	2.004E+00	1.104E-07	1.944E-07	24.22

Flag: "\*" = Keyline

Summary of Nuclide Activity  
Sample ID : FERMI 1 EFF SAMP

Page : 3  
Acquisition date : 22-NOV-2005 04:04:31

Total number of lines in spectrum 5  
Number of unidentified lines 0

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
F-18	109.74M	1.10	2.792E-08	3.075E-08	0.419E-08	13.64	
Total Activity :			2.792E-08	3.075E-08			

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.052E-07	5.052E-07	0.625E-07	12.37	
SI-214	19.90M	1.64	4.557E-08	7.402E-08	1.967E-08	26.30	A
Total Activity :			5.508E-07	5.800E-07			

Grand Total Activity : 5.787E-07 6.107E-07

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

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



563.23	1.17	----	Not Found	----
571.30	0.14	----	Not Found	----
657.03	6.10	----	Not Found	----
665.31	0.39	----	Not Found	----
740.12	0.12	----	Not Found	----
771.76	0.12	----	Not Found	----
867.63	0.12	----	Not Found	----
1129.07	0.14	----	Not Found	----
1212.72	1.63	----	Not Found	----
1216.02	3.04	----	Not Found	----
1228.52	1.39	----	Not Found	----
1439.13	0.33	----	Not Found	----
1453.60	0.13	----	Not Found	----
1787.67	0.33	----	Not Found	----

% Abundances Found = 73.70

RU-103	39.35D	0.00	497.00*	09.00	----	Not Found	----	Abun.
			610.33	5.60	3.769E-07	26.30		
			% Abundances Found =		5.92			

XE-135	9.11H	0.03	249.79*	09.90	----	Not Found	----	Abun.
			608.19	2.89	7.446E-07	26.30		
			% Abundances Found =		3.11			

Flag: "\*" = Keyline

Flagset "T" = Tentatively associated



## Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	20.	477.59	7.3195E-08
NA-22	10.	1274.54	1.0476E-08
NA-24	15.	1360.53	1.3074E-08
MG-27	16.	1014.44	1.0344E-07
CL-38	7.	1642.42	4.2026E-08
AR-41	12.	1293.64	1.2607E-08
SC-46	10.	009.25	1.1197E-08
CR-51	35.	320.00	0.7056E-08
MN-54	13.	034.03	9.2716E-09
CO-56	24.	1230.25	2.2300E-08
MN-56	9.	1010.69	4.7136E-08
NI-56	42.	150.30	0.1660E-09
CO-57	42.	122.06	1.1003E-08
CO-58	16.	010.76	9.7792E-09
FE-59	13.	1099.22	1.0906E-08
CO-60	16.	1332.49	1.3005E-08
CU-64	7.	1345.90	3.1341E-06
NI-65	6.	1401.84	4.1194E-08
ZN-65	12.	1115.52	2.0961E-08
ZN-69M	25.	430.63	0.6796E-09
SE-75	41.	136.00	1.4250E-08
AS-76	56.	559.10	2.9300E-08
BR-82	22.	776.49	1.2921E-08
BR-83	27.	529.64	7.6241E-07
BR-84	17.	001.50	3.5511E-08
BR-85	24.	002.41	3.6770E-06
KR-85	45.	513.99	2.6309E-06
KR-85M	49.	151.10	1.2075E-08
SR-85	45.	513.99	1.1432E-08
RB-86	8.	1076.63	9.7000E-08
KR-87	30.	402.50	2.2009E-08
SR-87M	31.	300.40	1.0977E-08
KR-88	61.	196.32	3.9707E-08
RB-88	9.	1302.39	2.4591E-06
Y-88	4.	1036.01	0.9054E-09
KR-89	40.	220.90	3.3224E-07
RB-89	8.	1031.00	2.7054E-08
KR-90	24.	1110.69	2.0799E-06
RB-90	12.	031.69	2.4371E-07
RB-90M	9.	024.23	5.5430E-07
Y-90M	69.	202.51	1.1324E-08
SR-91	0.	1024.30	2.7109E-08
Y-91	14.	1204.90	3.9250E-06
Y-91M	26.	555.60	1.1939E-08
SR-92	11.	1303.94	1.3707E-08
Y-92	11.	934.46	7.0112E-08
SR-93	19.	590.28	3.0467E-08

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
---------	------------	--------------	--------------

Y-93	44.	266.90	1.3311E-07
NB-94	19.	702.63	9.0270E-09
NB-95	12.	765.79	8.0694E-09
NB-95M	52.	235.69	3.8122E-08
ZR-95	17.	756.72	1.6944E-08
NB-97	20.	657.90	1.0366E-08
Y-97	8.	743.36	6.8659E-09
Y-99	19.	739.58	7.5273E-08
TC-99M	64.	140.50	1.1803E-08
TC-101	33.	306.81	1.8214E-08
RU-103	33.	497.08	1.0880E-08
TC-104	28.	357.99	1.5371E-08
RH-105	31.	318.90	4.2354E-08
RU-105	21.	724.50	2.0983E-08
RU-106	23.	621.84	9.2769E-08
CD-109	37.	88.03	3.9513E-07
AG-110M	8.	937.48	2.4527E-09
SN-113	19.	391.69	1.0580E-08
SN-117M	42.	158.56	9.2860E-09
SB-122	29.	563.93	1.3675E-08
SB-124	31.	602.71	1.0428E-08
SB-125	29.	427.09	2.9095E-08
TE-125M	43.	109.28	3.0876E-06
TE-127	27.	417.90	8.5019E-07
TE-127M	26.	57.60	2.1481E-05
XE-127	67.	202.84	1.5001E-08
TE-129	21.	459.60	1.2498E-07
TE-129M	21.	695.88	2.0708E-07
XE-129M	65.	196.56	2.1090E-07
I-130	27.	536.09	9.3383E-09
BA-131	50.	123.88	3.4689E-08
I-131	43.	364.48	1.1960E-08
Y-131	40.	149.72	1.7395E-08
TE-131M	20.	773.67	2.6830E-08
XE-131M	53.	163.93	4.5278E-07
I-132	18.	667.69	9.2734E-09
TE-132	52.	228.16	1.0746E-08
BA-133	43.	302.84	5.1726E-08
BA-133M	61.	276.09	5.0912E-08
I-133	26.	529.87	1.0519E-08
TE-133M	16.	912.58	1.5028E-08
XE-133	38.	81.00	4.9853E-08
XE-133M	68.	233.22	1.0494E-07
CS-134	31.	604.70	1.0510E-08
I-134	11.	884.09	1.7062E-08
TE-134	59.	210.47	5.6799E-08
BA-135M	38.	268.24	5.3077E-08
I-135	8.	1260.41	3.3476E-08
XE-135	47.	249.79	1.0450E-08
XE-135M	24.	526.56	1.9999E-08
CS-136	11.	818.50	8.2260E-09

I-136	7.	1313.02	2.5831E-07
CS-137	11.	661.65	8.0124E-09
XE-137	17.	455.49	1.3512E-07
CS-138	9.	1435.86	1.9087E-08
XE-138	47.	258.31	5.7489E-08
BA-139	5.	1420.50	3.4032E-06
CE-139	56.	165.85	1.1380E-08
CS-139	9.	1283.23	3.7059E-07
BA-140	19.	537.32	3.1512E-08
LA-140	4.	1596.49	8.6183E-09
BA-141	49.	190.22	3.0244E-08
CE-141	62.	145.44	2.0444E-08
LA-141	13.	1354.52	4.7986E-07
BA-142	50.	255.12	1.2441E-07
LA-142	19.	641.17	1.8051E-08
CE-143	49.	293.26	2.3872E-08
CE-144	38.	133.54	7.6489E-08
PR-144	10.	1409.15	6.6990E-06
ND-147	42.	91.10	5.2175E-08
PM-148M	15.	550.27	7.4909E-09
EU-152	34.	344.27	3.2241E-08
EU-154	11.	1004.76	5.3702E-08
EU-156	21.	646.29	1.2376E-07
HF-181	28.	482.03	1.0742E-08
TA-182	18.	1221.42	4.7839E-08
W-187	27.	685.81	3.5067E-08
RE-188	45.	155.03	5.6254E-08
HG-203	52.	279.19	1.2736E-08
BI-207	15.	569.67	7.4045E-09
TL-208	34.	583.14	9.5841E-08
PB-212	49.	238.63	2.1238E-08
PB-214	74.	351.92	4.8457E-08
RA-224	51.	240.98	2.3960E-07
RA-226	48.	186.21	2.6075E-07
AC-228	45.	338.32	8.4696E-08
TH-228	34.	84.37	1.2944E-06
PA-234	38.	131.20	4.2457E-08
TH-234	27.	63.29	1.0336E-06
U-235	50.	143.76	8.6123E-08
NP-239	31.	106.13	4.3123E-08
AM-241	34.	59.54	1.8415E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-45692705

Sample Location (Well Number): EFT-4S

1. Representative sample collected. Date/Time 09/27/2005 / 1200

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 collected  
Printed Name / Signature 12/29/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Burgess / [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-C signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location	EFT-4S092705
2. Date Sampled	09/27/2005
3. Time Sampled	12:00
4. Sample Volume, (ml)	4 ml

Instrument Count Data

1. Date Sample Counted	11/22/2005
2. Time Sample Counted	00:10
3. Background Inf.:	
Minutes Counted	10.0 min.
Background Count Rate (cpm)	9.0 cpm
4. Efficiency Inf.: (Daily Spike Source ID #: 111)	
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	8923.8 dpm
Counter Efficiency	0.3990 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	8.3 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	0.2 cpm

Minimum Detectable Activity

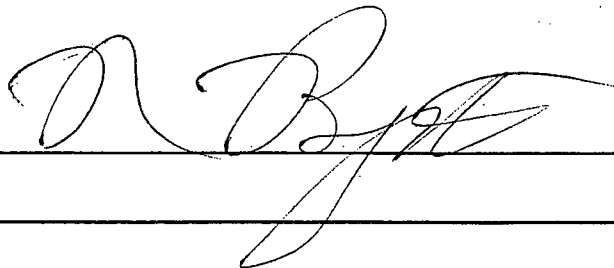
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-06 uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date **NOV 23 2005**



## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-48092705

Sample Location (Well Number): EFT-48

1. Representative sample collected. Date/Time 09/27/2005 11419

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMEL / D. K. Hemmel Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 RP Printed Name Signature

Sample number: EFT-48092705

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Albrecht | Andreas Heine Date: 11/27/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton | William V. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected  
William V. Lipton 48691 / 1/9/2006

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EF1 EFT 48092705

Sample End Time: 27-SEP-2005 14:19:00.00

REMARKS 70.75 keV peak unidentified, 41 Fe HM (698) - can ignore  
1203.96 keV peak unidentified, hi error (47.4%) - can ignore.  
No licensed radioactive material detected.  
William V. Latta 48051/120600

PERFORMED BY:

Andrew Hene  
 SIGNATURE

REVIEWED BY:

William V. Latta 48051/120600  
 SIGNATURE/DATE

Sample ID : EF1 EFT 48092705

Acquisition date : 27-NOV-2005 05:27:17

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EF1 EFT 48092705
Sample collection start date: 27-SEP-2005 14:19:00.00
Sample collection end date : 27-SEP-2005 14:19:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : BELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 27-NOV-2005 05:27:17.56
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.15 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Key/channel : 5.00563E-01 Zero offset: 7.09322E-02
Daily cal date : 26-NOV-2005 20:43:06.33

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 8 rows of peak data. Handwritten notes and a circled '6.90' are present on the right side of the table.

Handwritten notes: 'un identified', 'peaks', 'amplifier', 'K10', '8-214'

6

Post-NID Peak Search Report

	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	XErr	Fit	Nuclides
0	70.20	84	143	6.98	140.26	127	25	39.7		Bi-211
0	295.00	66	65	1.89	589.20	583	15	29.2		Pb-214
0	352.30	96	60	1.62	703.70	690	11	18.7		Pb-214
0	511.16	141	57	1.03	1021.09	1012	19	15.3		Annihilation
0	609.39	100	34	1.60	1217.65	1210	17	15.7		Bi-214
0	1203.96	10	11	1.20	2406.59	2399	15	47.4		Y-91
0	1460.79	97	4	2.60	2920.41	2912	16	11.2		K-40
0	1764.54	22	10	1.16	3520.27	3519	14	37.6		Bi-214

Bi-211  
Pb-214  
Pb-214  
Annihilation  
Bi-214  
Y-91  
K-40  
Bi-214  
my 10/10/05

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	97	10.67*	2.308E+00	5.907E-07	5.907E-07	11.16

Nuclide Type: fission

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
Y-91	1204.90	10	0.30*	2.597E+00	3.432E-06	7.048E-06	47.37

Flag: "\*" = Keyline

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

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.907E-07	5.907E-07	0.659E-07	11.16	
Total Activity :			5.907E-07	5.907E-07			

Nuclide Type : fission

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
Y-91	58.51D	2.05	3.432E-06	7.040E-06	3.335E-06	47.37	
Total Activity :			3.432E-06	7.040E-06			

Grand Total Activity : 4.023E-06 7.631E-06

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

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

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
F-18	109.74M	795.73	511.00*	193.46	1.000E+35	15.30	Decay
	% Abundances Found = 100.00						
RU-103	39.35D	1.54	497.00*	89.00	---- Not Found ----		Abun.
			610.33	5.60	2.025E-06	15.67	
	% Abundances Found = 5.92						
XE-135	9.11H	159.76	249.79*	89.90	---- Not Found ----		Decay, Abun.
			608.19	2.89	1.000E+35	15.67	
	% Abundances Found = 3.11						
SA-142	10.70M	8161.06	77.60	9.60	---- Not Found ----		Decay, Abun.
			231.52	10.10	---- Not Found ----		
			255.12*	18.00	---- Not Found ----		
			425.03	5.00	---- Not Found ----		
			894.90	11.00	---- Not Found ----		
			948.75	8.90	---- Not Found ----		
			1000.86	7.80	---- Not Found ----		
			1078.48	9.30	---- Not Found ----		
			1202.20	5.30	1.000E+35	47.37	
			1204.06	14.00	1.000E+35	47.37	
	% Abundances Found = 19.49						
CE-143	33.00H	44.10	57.36	11.00	---- Not Found ----		Decay, Abun.
			231.56	2.00	---- Not Found ----		
			293.26*	42.00	8.131E+05	29.25	
			490.36	2.00	---- Not Found ----		
			664.55	5.20	---- Not Found ----		
			721.96	5.10	---- Not Found ----		
	% Abundances Found = 61.67						
PM-140M	41.30D	1.47	200.11	12.56	---- Not Found ----		Abun.
			414.07	18.66	---- Not Found ----		
			432.78	5.35	---- Not Found ----		
			501.26	6.75	---- Not Found ----		
			550.27*	94.90	---- Not Found ----		
			599.74	12.54	---- Not Found ----		
			611.26	5.48	1.967E-06	15.67	
			629.97	89.00	---- Not Found ----		
			725.70	32.80	---- Not Found ----		
			915.33	17.17	---- Not Found ----		
			1013.81	20.30	---- Not Found ----		
	% Abundances Found = 1.74						
W-187	23.03H	61.07	72.06	11.90	1.554E+12	39.73	Decay, Abun.
			134.22	9.50	---- Not Found ----		
			479.53	23.40	---- Not Found ----		
			551.55	5.44	---- Not Found ----		
			610.37	6.70	---- Not Found ----		
			625.52	1.16	---- Not Found ----		
			685.81*	29.28	---- Not Found ----		
			745.21	0.32	---- Not Found ----		



Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
137	23.83H	61.07	772.07	4.40	----	Not Found	Decay, Abun.	
			864.55	0.36	----	Not Found		
			% Abundances Found =		12.86			
BI-214	19.90M	4308.11	609.31*	46.30	1.000E+35	15.67	Decay	
			768.36	5.04	----	Not Found		
			934.06	3.21	----	Not Found		
			1120.29	15.10	----	Not Found		
			1238.11	5.94	----	Not Found		
			1377.67	4.11	----	Not Found		
			1764.49	15.90	1.000E+35	37.61		
% Abundances Found :		65.03	(Abn. Limit = 48.40%)					
PB-214	26.90M	3250.33	87.30	4.67	----	Not Found	Decay	
			241.98	7.49	----	Not Found		
			295.21	19.20	1.000E+35	29.25		
			351.92*	37.20	1.000E+35	18.67		
			785.91	1.10	----	Not Found		
% Abundances Found =		80.96	(Abn. Limit = 37.20%)					

Flag: "\*" = Keyline

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	36.	477.59	2.8978E-07
F-18	0.	511.00	Half-Life too short
NA-22	13.	1274.54	1.2322E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
Cl-36	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	12.	803.25	1.5395E-08
CR-51	34.	320.00	3.8702E-07
MN-54	13.	834.83	1.0448E-08
CO-56	15.	1238.25	3.1169E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	52.	158.38	8.7960E-06
CO-57	43.	122.06	1.3006E-08
CO-58	15.	810.76	1.7386E-08
FE-59	16.	1099.22	5.3410E-08
CO-60	22.	1332.49	1.5519E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	14.	1115.52	2.5895E-08
ZN-69M	0.	430.63	Half-Life too short
SE-75	41.	136.00	2.0395E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	882.41	Half-Life too short
KR-85	39.	513.99	2.4944E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	39.	513.99	2.0441E-08
RE-86	12.	1076.63	1.1167E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RE-88	0.	1382.39	Half-Life too short
Y-88	2.	1036.01	1.0197E-08
KR-89	0.	220.90	Half-Life too short
RE-89	0.	1031.88	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RE-90	0.	831.69	Half-Life too short
RE-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short
SR-93	0.	590.28	Half-Life too short

Naclide	Backgnd Sum	Energy (keV)	MDA (uCi/cc)
93	0.	266.98	Half-Life too short
NB-94	23.	702.63	9.8341E-09
NB-95	16.	765.79	3.1012E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	14.	756.72	2.9693E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	22.	497.00	2.6460E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	26.	621.84	1.0890E-07
CD-109	36.	80.03	4.2707E-07
AG-110M	14.	937.48	3.5905E-08
SN-113	29.	391.69	1.8394E-08
SN-117M	51.	158.56	2.2425E-07
SB-122	0.	563.93	Half-Life too short
SB-124	24.	602.71	1.8806E-08
SB-125	32.	427.89	3.1642E-08
TE-125M	40.	109.28	7.7040E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	31.	57.60	3.3753E-05
-127	50.	202.84	4.1355E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	25.	695.88	1.0709E-06
XE-129M	62.	196.56	2.3230E-05
I-130	0.	536.09	Half-Life too short
BA-131	48.	123.80	1.2004E-06
I-131	36.	364.48	2.0537E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	53.	163.93	1.5831E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	42.	302.84	5.1020E-06
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	23.	604.70	9.7198E-09
I-134	0.	804.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short
CS-136	17.	818.50	2.4477E-07

Sample ID : EF1 EFT 49892785

Acquisition date : 27-NOV-2005 05:27:17

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
I-136	0.	1313.02	Half-Life too short
CS-137	20.	661.65	1.0487E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.06	Half-Life too short
XE-138	0.	250.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	55.	165.85	1.5260E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	24.	537.32	9.2783E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	48.	145.44	3.6037E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	55.	133.54	1.0578E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	27.	91.10	1.9618E-06
PM-148M	22.	550.27	2.4960E-08
EU-152	50.	344.27	3.0930E-08
EU-154	7.	1004.76	4.5045E-08
EU-156	19.	646.29	1.8048E-06
HF-181	23.	482.03	2.6416E-08
TA-182	12.	1221.42	5.8198E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	50.	279.19	3.0740E-08
BI-207	35.	569.67	1.0836E-08
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	51.	186.21	2.6796E-07
AC-228	41.	338.32	8.2640E-08
TH-228	45.	84.37	1.5517E-06
PA-234	0.	131.20	Half-Life too short
TH-234	34.	63.29	6.5555E-06
U-235	56.	143.76	9.0541E-08
NP-239	0.	106.13	Half-Life too short
AM-241	29.	59.54	1.7165E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-4D092705

Sample Location (Well Number): EFT-4D

1. Representative sample collected. Date/Time 09/27/2005 1 1200

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Truss Bunker [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Performed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Jint [Signature] Date: 12/19/2006  
Fermi 2 Printed Name Signature by 1/4/06  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location	EFT-4D092705
2. Date Sampled	09/27/2005
3. Time Sampled	12:00
4. Sample Volume, (ml)	4 ml

Instrument Count Data

1. Date Sample Counted	11/22/2005
2. Time Sample Counted	00:10
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	9.0 cpm
4. Efficiency Inf.:	(Daily Spike Source ID # 111)
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	8923.8 dpm
Counter Efficiency	0.3990 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.6 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.2 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl. min.})}}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.25\text{E}-06 \text{ uCi/ml}$$

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-4D092705

Sample Location (Well Number): EFT-4D

1. Representative sample collected. Date/Time 09/27/2005 1 1648

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: DANIEL KEMMEL / Daniel Kemmel Date: 11/18/05  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V. Lipton / William V. Lipton Date: 1/19/2006  
Fermi 2 RP Printed Name Signature

Sample number: EFT-40092705

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Alvarez | Andrew Date: 11/26/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton | William V. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 48651 / 1/9/2006



RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-4D092705 EF1

Sample End Time: 27-SEP-2005 16:48:00.00

REMARKS

*No licensed radioactive material detected  
within 48051 / 10/20/05*

PERFORMED BY:

*Andrew Hene*  
SIGNATURE

REVIEWED BY:

*William J. Hene 48051 / 10/20/05*  
SIGNATURE/DATE

Sample ID : EFT-4D092705 EF1

Acquisition date : 26-NOV-2005 22:50:58

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-4D092705 EF1
Sample collection start date: 27-SEP-2005 16:48:00.00
Sample collection end date : 27-SEP-2005 16:48:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : M2LL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 26-NOV-2005 22:50:58.46
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.10 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Key/channel : 5.00563E-01 Zero offset: 7.89322E-02
Daily cal date : 26-NOV-2005 20:43:06.33

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

\*\*\*\*\*

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 6 rows of peak data.

Handwritten notes: Pb-214 annihilation, H4C, Pb-214, 55.1, L40

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st-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	352.03	30	31	1.52	703.23	700	8	37.4		
0	511.67	124	60	3.09	1022.31	1014	15	16.3		
0	558.91	45	30	1.65	1116.73	1111	9	27.1		
0	609.55	48	25	1.41	1217.96	1213	10	24.6		
0	1120.34	16	13	1.41	2239.34	2233	12	55.1		
0	1461.17	54	0	1.75	2921.17	2915	14	19.3		

*PA-214*  
*Anti Peak*  
*As-76*  
*Bi-214*  
*Bi-214*  
*K-40*

*M. J. D. Kelly*

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	94	10.67%	2.308E+00	5.732E-07	5.732E-07	10.31

Flag: "x" = Keyline

Summary of Nuclide Activity.  
Sample ID : EFT-4D092705 EF1

Page : 3  
Acquisition date : 26-NOV-2005 22:50:56

Total number of lines in spectrum 6  
Number of unidentified lines 0  
Number of lines tentatively identified by MID 6 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.732E-07	5.732E-07	0.591E-07	10.31	
Total Activity :			5.732E-07	5.732E-07			

Grand Total Activity : 5.732E-07 5.732E-07

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

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

Nuclide	Half-life	Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	790.76	511.00*	193.46	1.000E+35	16.32	Decay
		% Abundances	Found = 100.00				
SC-46	83.83D	0.72	142.53	62.70	---- Not Found ----		Abun.
			889.25*	99.98	---- Not Found ----		
			1120.51	99.99	1.431E-08	55.13	
		% Abundances	Found = 38.07				
AS-76	26.32H	54.95	559.10*	44.70	1.211E+09	27.06	Decay, Abun.
			563.23	1.17	---- Not Found ----		
			571.30	0.14	---- Not Found ----		
			657.03	6.10	---- Not Found ----		
			665.31	0.39	---- Not Found ----		
			740.12	0.12	---- Not Found ----		
			771.76	0.12	---- Not Found ----		
			867.63	0.12	---- Not Found ----		
			1129.87	0.14	---- Not Found ----		
			1212.72	1.63	---- Not Found ----		
			1216.02	3.04	---- Not Found ----		
			1220.52	1.39	---- Not Found ----		
			1439.13	0.33	---- Not Found ----		
			1453.60	0.13	---- Not Found ----		
			1707.67	0.33	---- Not Found ----		
		% Abundances	Found = 73.70				
KR-90	32.32S	161097.75	121.82	32.00	---- Not Found ----		Decay, Abun.
			539.49	29.00	---- Not Found ----		
			1110.69*	37.00	1.000E+35	55.13	
		% Abundances	Found = 37.76				
RU-103	39.35D	1.53	497.08*	89.00	---- Not Found ----		Abun.
			610.33	5.60	9.027E-07	24.56	
		% Abundances	Found = 5.92				
XE-135	9.11H	150.76	249.79*	89.90	---- Not Found ----		Decay, Abun.
			600.19	2.09	1.000E+35	24.56	
		% Abundances	Found = 3.11				
PM-140M	41.30D	1.46	280.11	12.56	---- Not Found ----		Abun.
			414.07	10.66	---- Not Found ----		
			432.78	5.35	---- Not Found ----		
			501.26	6.75	---- Not Found ----		
			550.27*	94.90	---- Not Found ----		
			599.74	12.54	---- Not Found ----		
			611.26	5.40	8.774E-07	24.56	
			629.97	89.00	---- Not Found ----		
			725.70	32.00	---- Not Found ----		
			915.33	17.17	---- Not Found ----		
			1013.01	20.30	---- Not Found ----		
		% Abundances	Found = 1.74				
BI-214	19.90M	4360.70	609.31*	46.30	1.000E+35	24.56	Decay

Slide	Half-life	Half-Life Ratio	Energy	%Abund	Activity 1-Sigma		Rejected by		
					(uCi/cc)	%Error			
BI-214	19.96M	4360.70	760.36	5.04	---	Not Found	---	Decay	
			934.06	3.21	---	Not Found	---		
			1120.29	15.10	1.000E+35	55.13			
			1230.11	5.94	---	Not Found	---		
			1377.67	4.11	---	Not Found	---		
			1764.49	15.00	---	Not Found	---		
% Abundances Found =			64.29	(Abn. Limit = 48.48%)					
PB-214	26.88M	3237.90	87.30	4.67	---	Not Found	---	Decay	
			241.90	7.49	---	Not Found	---		
			295.21	19.20	---	Not Found	---		
			351.92*	37.20	1.000E+35	37.39			
			705.91	1.10	---	Not Found	---		
			% Abundances Found =			53.40	(Abn. Limit = 37.20%)		

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EFT-40092705 EF1

Page : 6  
Acquisition date : 26-NOV-2005 22:50:58

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flag
0	352.03	30	31	1.52	703.23	700	8	1.66E-02	37.4	5.19E+00	T
0	511.67	124	60	3.09	1022.31	1014	15	6.89E-02	16.3	4.48E+00	T
0	550.91	45	30	1.65	1116.73	1111	9	2.48E-02	27.1	4.31E+00	T
0	609.55	48	25	1.41	1217.96	1213	10	2.69E-02	24.6	4.16E+00	T
0	1120.34	16	13	1.41	2239.34	2233	12	8.67E-03	55.1	2.69E+00	T

Flags: "T" = Tentatively associated



Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	20.	477.59	1.0663E-07
F-18	0.	511.00	Half-Life too short
NA-22	8.	1274.54	9.8371E-09
NA-24	0.	1360.53	Half-Life too short
MO-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	13.	889.25	1.6121E-08
CR-51	39.	320.00	4.1071E-07
MN-54	19.	834.03	1.2325E-08
CO-56	15.	1238.25	3.1065E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	56.	158.38	8.7207E-06
CO-57	45.	122.06	1.3247E-08
CO-58	6.	810.76	1.1710E-08
FE-59	11.	1099.22	4.5629E-08
CO-60	15.	1332.49	1.2998E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1401.84	Half-Life too short
NI-65	10.	1115.52	2.9223E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	30.	136.00	1.9522E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	61.	513.99	3.0762E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	61.	513.99	2.5108E-08
RE-86	16.	1076.63	1.2304E-06
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RE-88	0.	1382.39	Half-Life too short
Y-88	2.	1836.01	1.0144E-08
KR-89	0.	220.90	Half-Life too short
RE-89	0.	1031.80	Half-Life too short
KR-90	0.	1118.69	Half-Life too short
RE-90	0.	831.69	Half-Life too short
RE-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	8.	1204.90	6.1713E-06
SR-91M	0.	555.60	Half-Life too short
SR-92	0.	1303.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-40092705 EF1

Acquisition date : 26-NOV-2005 22:50:58

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	598.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	23.	702.63	9.9439E-09
NB-95	12.	765.79	2.6360E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	13.	756.72	2.8997E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	30.	497.88	3.0490E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	14.	621.84	8.4631E-08
CD-109	36.	88.03	4.2869E-07
AG-110M	14.	937.48	3.6823E-08
SN-113	35.	391.69	1.9880E-08
SN-117M	56.	158.56	2.2841E-07
SB-122	0.	563.93	Half-Life too short
SB-124	33.	682.71	2.1490E-08
SB-125	28.	427.89	2.9754E-08
TE-125M	36.	109.28	7.3441E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	36.	57.60	3.6242E-05
XE-127	57.	202.84	4.3832E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	24.	695.88	1.0519E-06
XE-129M	48.	196.56	2.0160E-05
I-130	0.	536.89	Half-Life too short
BA-131	52.	123.80	1.2103E-06
I-131	32.	364.48	1.8879E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	40.	163.93	1.3622E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	43.	302.84	5.2336E-08
BA-133M	0.	276.89	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	25.	684.70	1.0125E-08
I-134	0.	884.89	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Isotope	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	20.	818.50	2.5819E-07
I-136	0.	1313.02	Half-Life too short
CS-137	21.	661.65	1.0589E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	51.	165.85	1.4730E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	15.	537.32	7.4812E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	47.	145.44	6.4903E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	44.	133.54	9.4035E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	39.	91.10	2.2476E-06
PM-148M	27.	550.27	2.6846E-08
EU-152	31.	344.27	3.1166E-08
EU-154	16.	1004.76	6.3389E-08
Y-156	12.	646.29	1.5514E-06
RF-181	26.	482.03	2.7827E-08
TA-182	10.	1221.42	5.4590E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	45.	279.19	2.9269E-08
BI-207	23.	569.67	8.9664E-09
TL-208	0.	583.14	Half-Life too short
PE-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PE-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	52.	186.21	2.7121E-07
AC-228	34.	338.32	7.5946E-08
TH-228	44.	84.37	1.5507E-06
PA-234	0.	131.20	Half-Life too short
TH-234	48.	63.29	7.6332E-06
U-235	42.	143.76	7.9370E-08
NP-239	0.	106.13	Half-Life too short
AM-241	39.	59.54	1.9702E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-55092805

Sample Location (Well Number): EFT-55

1. Representative sample collected. Date/Time 09/28/2005 / 1433

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/28/2005 collected  
Printed Name / Signature 12/29/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELG / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Berger / [Signature] Date: 11-23-05 signed  
Fermi 2 Chemistry Printed Name Signature 1-5-0 signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William R. Lipton / [Signature] Date: 1/19/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location EFT-5S092805  
2. Date Sampled 09/28/2005  
3. Time Sampled 14:33  
4. Sample Volume, (ml) 4 ml

**Instrument Count Data**

1. Date Sample Counted 11/22/2005  
2. Time Sample Counted 00:10  
3. Background Inf.:  
Minutes Counted 10 min.  
Background Count Rate (cpm) 9.0 cpm  
4. Efficiency Inf.: (Daily Spike Source ID # 111)  
Gross Spike Count Rate (cpm) 3569.5 cpm  
Net Spike Count Rate (cpm) 3560.5 cpm  
H3 Spike Activity (dpm on count date) 8923.8 dpm  
Counter Efficiency 0.3990 cpm/dpm  
5. Sample Info:  
Sample Gross Count Rate (cpm) 5.4 cpm  
Sample Count Time (min.) 10.0 min.  
Net Sample Count Rate (cpm) 0.0 cpm  
6. Critical Level:  
Critical Level Count Rate (cpm) 2.2 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date **NOV 23 2005**

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-58092805

Sample Location (Well Number): EFT-58

1. Representative sample collected. Date/Time 09/28/2005 1 1433

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/28/2005 collected  
Printed Name / Signature 12/14/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: DANIEL K. HEMMELE / D. Hemmelle Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V. Lipton / William V. Lipton Date: 1/19/2006  
Fermi 2 RP Printed Name Signature

Sample number: EFT-58092805

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: V. Peterson [Signature] Date: 12-29-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Linton [Signature] Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Linton 48691 / 1/9/2006

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT 55092805

Sample End Time: 20-SEP-2005 14:33:00.00

REMARKS No licensed radioactive material detected,  
wellson with 48615 / 10/12/05

PERFORMED BY:

*[Handwritten Signature]*  
SIGNATURE

REVIEWED BY:

*[Handwritten Signature]* 11-29-05  
SIGNATURE/DATE



Sample ID : EFT 59092805

Acquisition date : 21-NOV-2005 16:36:31

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT 59092805
Sample collection start date: 20-SEP-2005 14:33:00.00
Sample collection end date : 20-SEP-2005 14:33:00.00
Type of sample : 2 L MARL. LIQUID
Sample quantity : 1.00000E+03 cc
Sample geometry : PELL Operator: VJP

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 21-NOV-2005 16:36:31.16
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.12 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00489E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.82

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 10 rows of peak data with handwritten annotations on the right side.

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	1.5731E-07
F-18	0.	511.00	Half-Life too short
NA-22	11.	1274.54	1.1347E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1814.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	21.	889.25	1.8654E-08
CR-51	35.	320.00	3.3428E-07
MN-54	14.	834.83	1.0741E-08
CO-56	23.	1238.25	3.5386E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	53.	158.38	4.2249E-06
CO-57	61.	122.06	1.4959E-08
CO-58	13.	810.76	1.5385E-08
FE-59	13.	1099.22	4.4413E-08
CO-60	7.	1332.49	9.2884E-09
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
NI-65	0.	1115.52	2.8721E-08
NI-69M	0.	438.63	Half-Life too short
SE-75	49.	136.00	2.1183E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	882.41	Half-Life too short
KR-85	49.	513.99	2.7885E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	49.	513.99	2.1331E-08
RB-86	14.	1076.63	9.4242E-07
KR-87	0.	482.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	6.	1836.01	1.4843E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	14.	1204.90	7.3564E-06
Y-91M	0.	555.60	Half-Life too short
Y-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT 56092805

Acquisition date : 21-NOV-2005 16:36:31

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	17.	702.63	8.7033E-09
NB-95	16.	765.79	2.6828E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	20.	756.72	3.2960E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	148.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	33.	497.08	2.8206E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	319.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	26.	621.84	1.0848E-07
CD-109	38.	88.03	4.3303E-07
AG-110M	17.	937.48	3.7970E-08
SN-113	27.	391.69	1.7000E-08
SN-117M	53.	158.56	1.6262E-07
SB-122	0.	563.93	Half-Life too short
SB-124	34.	602.71	2.0323E-08
SB-125	33.	427.89	3.1974E-08
TE-125M	35.	109.28	6.6970E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	21.	57.60	2.7121E-05
XE-127	48.	202.84	3.5878E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	14.	695.88	7.2877E-07
XE-129M	60.	196.56	1.3794E-05
I-130	0.	536.09	Half-Life too short
BA-131	49.	123.80	8.1929E-07
I-131	37.	364.48	1.1826E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	49.	163.93	1.0396E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	44.	302.84	5.2676E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	33.	604.70	1.1411E-08
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Slide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	18.	818.50	1.7799E-07
I-136	0.	1313.02	Half-Life too short
CS-137	13.	661.65	8.4928E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	61.	165.85	1.5485E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	16.	537.32	5.5160E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	49.	145.44	5.8141E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	47.	133.54	9.6354E-08
FR-144	0.	1489.15	Half-Life too short
ND-147	42.	91.10	1.5790E-06
PM-148M	24.	550.27	2.3001E-08
EU-152	29.	344.27	3.0334E-08
EU-154	0.	1004.76	4.7365E-08
EU-156	22.	646.29	1.4954E-06
-181	22.	482.03	2.3415E-08
TA-182	0.	1221.42	4.0304E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	57.	279.19	2.9550E-08
BI-207	19.	569.67	8.3186E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	230.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	43.	186.21	2.4889E-07
AC-228	35.	338.32	7.7865E-08
TH-228	41.	84.37	1.4809E-06
PA-234	0.	131.20	Half-Life too short
TH-234	46.	63.29	6.2647E-06
U-235	60.	143.76	9.3428E-08
NP-239	0.	106.13	Half-Life too short
AM-241	32.	59.54	1.7914E-07

Sample Title : EFT 56092805  
Decay Time = 54 02:03:31.16

Page : 1  
Acquisition Time = 21-NOV-2005 16:36:31.1

6

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
1	65.44	24	32	1.37	130.75	128	10	44.9	3.36E+00	
1	66.69	36	28	1.12	133.25	128	10	31.9		
0	140.38	42	58	2.48	280.51	275	9	36.5		
0	295.93	34	49	1.16	591.39	587	9	41.1		
0	352.14	28	27	0.70	703.73	699	9	39.5		
0	511.50	141	75	2.35	1022.32	1015	20	17.6		
0	556.76	54	35	1.77	1116.00	1109	14	27.0		
0	609.70	33	23	1.10	1218.66	1215	8	31.2		
0	1119.02	39	0	3.88	2238.97	2232	15	16.0		
0	1461.26	71	15	1.37	2922.26	2914	16	17.2		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	71	10.67*	2.300E+00	4.337E-07	4.337E-07	17.22

Flag: "\*" = Keyline

Summary of Nuclide Activity

Sample ID : EFT 55092005

Acquisition date : 21-NOV-2005 16:36:31

Total number of lines in spectrum 10  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 10 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr. 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.337E-07	4.337E-07	0.747E-07	17.22	
Total Activity :			4.337E-07	4.337E-07			

Grand Total Activity : 4.337E-07 4.337E-07

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

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

Slide	Half-life	Ratio	Energy	%Abund	Activity 1-Sigma (uCi/cc)	%Error	Rejected by
F-18	109.74M	709.85	511.00*	193.46	1.000E+35	17.59	Decay
		% Abundances	Found = 100.00				
SC-46	83.83D	0.65	142.53	62.70	---- Not Found ----		Abun.
			889.25*	99.98	---- Not Found ----		
			1120.51	99.99	3.399E-08	16.01	
		% Abundances	Found = 30.07				
SE-75	119.78D	0.45	66.05	1.02	3.867E-06	44.95	Abun.
			96.73	3.41	---- Not Found ----		
			121.12	16.70	---- Not Found ----		
			136.00*	59.20	---- Not Found ----		
			190.60	1.45	---- Not Found ----		
			264.65	59.00	---- Not Found ----		
			279.53	25.20	---- Not Found ----		
			303.91	1.32	---- Not Found ----		
			400.65	11.40	---- Not Found ----		
		% Abundances	Found = 0.57				
AS-76	26.32H	49.33	559.10*	44.70	2.970E+07	26.95	Decay, Abun.
			563.23	1.17	---- Not Found ----		
			571.30	0.14	---- Not Found ----		
			657.03	6.10	---- Not Found ----		
			665.31	0.39	---- Not Found ----		
			740.12	0.12	---- Not Found ----		
			771.76	0.12	---- Not Found ----		
			867.63	0.12	---- Not Found ----		
			1129.87	0.14	---- Not Found ----		
			1212.72	1.63	---- Not Found ----		
			1216.02	3.84	---- Not Found ----		
			1220.52	1.39	---- Not Found ----		
			1439.13	0.33	---- Not Found ----		
			1453.60	0.13	---- Not Found ----		
			1787.67	0.33	---- Not Found ----		
		% Abundances	Found = 73.70				
KR-90	32.32S	144613.59	121.02	32.00	---- Not Found ----		Decay, Abun.
			539.49	29.00	---- Not Found ----		
			1110.69*	37.00	1.000E+35	16.01	
		% Abundances	Found = 37.76				
MO-99	66.02H	19.67	140.51	3.80	2.336E-01	36.54	Decay, Abun.
			181.06	6.20	---- Not Found ----		
			366.43	1.37	---- Not Found ----		
			739.58*	12.00	---- Not Found ----		
			770.00	4.50	---- Not Found ----		
		% Abundances	Found = 13.25				
TC-99M	6.02H	215.67	140.50*	89.07	1.000E+35	36.54	Decay
		% Abundances	Found = 100.00				
RU-103	39.35D	1.37	497.08*	89.00	---- Not Found ----		Abun.



Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
RU-103	39.35D	1.37	610.33	5.60	5.466E-07	31.17	Abun.	
	% Abundances Found =			5.92				
XE-135	9.11H	142.51	249.79*	89.90	---	Not Found	Decay, Abun.	
	% Abundances Found =			3.11	1.000E+35	31.17		
CS-136	13.16D	4.11	66.91	12.50	5.623E-06	31.81	Abun.	
			86.29	6.30	---	Not Found		---
			153.22	7.46	---	Not Found		---
			163.89	4.61	---	Not Found		---
			176.55	13.56	---	Not Found		---
			273.65	12.66	---	Not Found		---
			340.57	40.50	---	Not Found		---
			618.50*	99.70	---	Not Found		---
			1048.07	79.60	---	Not Found		---
			1235.34	19.70	---	Not Found		---
% Abundances Found =			4.10					
PM-148M	41.30D	1.31	288.11	12.56	---	Not Found	Abun.	
			414.07	18.66	---	Not Found		---
			432.78	5.35	---	Not Found		---
			501.26	6.75	---	Not Found		---
			550.27*	94.90	---	Not Found		---
			599.74	12.54	---	Not Found		---
			611.26	5.48	5.340E-07	31.17		
			629.97	89.00	---	Not Found		---
			725.70	32.00	---	Not Found		---
			915.33	17.17	---	Not Found		---
1013.81	20.30	---	Not Found	---				
% Abundances Found =			1.74					
TA-182	114.74D	0.47	67.75	42.30	1.334E-07	31.81	Abun.	
			100.10	14.10	---	Not Found		---
			1109.05	16.30	---	Not Found		---
			1221.42*	27.10	---	Not Found		---
			1230.97	11.50	---	Not Found		---
% Abundances Found =			38.01					
BI-214	19.90M	3914.50	609.31*	46.30	1.000E+35	31.17	Decay	
			768.36	5.04	---	Not Found		---
			934.06	3.21	---	Not Found		---
			1120.29	15.10	1.000E+35	16.01		
			1238.11	5.94	---	Not Found		---
			1377.67	4.11	---	Not Found		---
			1764.49	15.80	---	Not Found		---
% Abundances Found =			64.29	(Abn. Limit =	48.48%)			
PB-214	26.80M	2906.66	87.30	4.67	---	Not Found	Decay	
			241.98	7.49	---	Not Found		---
			295.21	19.20	1.000E+35	41.06		
			351.92*	37.20	1.000E+35	38.54		

Sample ID : EFT 58092005

Acquisition date : 21-NOV-2005 16:36:31

Isotope	Half-life	Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
PB-214	26.80M	2986.66	785.91	1.10	---	Not Found	Decay
% Abundances Found =				88.96	(Abn. Limit = 37.20%)		

Flags: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EFT 55092005

Page : 7  
Acquisition date : 21-NOV-2005 16:36:31

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
1	65.44	24	32	1.37	130.75	128	10	1.31E-02	44.9	1.22E+00	T
1	66.69	36	28	1.12	133.25	128	10	2.02E-02	31.8	1.34E+00	T
0	140.38	42	58	2.48	200.51	275	9	2.31E-02	36.5	5.86E+00	T
0	295.93	34	49	1.16	591.39	587	9	1.89E-02	41.1	5.46E+00	T
0	352.14	28	27	0.70	703.73	699	9	1.55E-02	38.5	5.19E+00	T
0	511.50	141	75	2.35	1022.32	1015	20	7.84E-02	17.6	4.48E+00	T
0	558.76	54	35	1.77	1116.00	1109	14	3.00E-02	27.0	4.31E+00	T
0	609.70	33	23	1.10	1218.66	1215	8	1.82E-02	31.2	4.16E+00	T
0	1119.82	39	0	3.80	2238.97	2232	15	2.17E-02	16.0	2.70E+00	T

Flags: "T" = Tentatively associated

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-5D092805

Sample Location (Well Number): EFT-5D

1. Representative sample collected. Date/Time 09/28/2005 1 1200

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/28/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMLE / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Berger / [Signature] Date: 11-23-05  
Fermi 2 Chemistry Printed Name Signature 1-5-06 signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location EFT5D092805  
 2. Date Sampled 09/28/2005  
 3. Time Sampled 12:00  
 4. Sample Volume, (ml) 4 ml

Instrument Count Data

1. Date Sample Counted 11/22/2005  
 2. Time Sample Counted 00:10  
 3. Background Inf.:  
    Minutes Counted 10  
    Background Count Rate (cpm) 9.0  
 4. Efficiency Inf.: (Daily Spike Source ID # 111)  
    Gross Spike Count Rate (cpm) 3569.5  
    Net Spike Count Rate (cpm) 3560.5  
    H3 Spike Activity (dpm on count date) 8923.8  
    Counter Efficiency 0.3990  
 5. Sample Info:  
    Sample Gross Count Rate (cpm) 7.5  
    Sample Count Time (min.) 10.0  
    Net Sample Count Rate (cpm) 0.0  
 6. Critical Level:  
    Critical Level Count Rate (cpm) 2.2

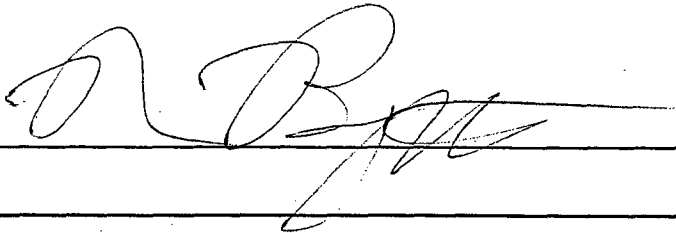
Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-5D092805

Sample Location (Well Number): EFT-5D

1. Representative sample collected. Date/Time 09/28/2005 1 1627

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/28/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: DANIEL K. HEMMELE / [Signature] Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 RP Printed Name Signature

Sample number: EFT-50092805

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: V. Petrucci | [Signature] Date: 12/29-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton | [Signature] Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton (800.51) 1/9/2006

RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT 5D092805

Sample End Time: 20-SEP-2005 16:27:00.00

REMARKS

*No licensed radioactive material detected.  
Nuclear Dept (805) 12/17/2007  
M. V. [Signature]*

PERFORMED BY:

*[Signature]*  
SIGNATURE

REVIEWED BY:

*Melvin N. Lipton 48651/10/2005*  
SIGNATURE/DATE



Sample ID : EFT 5D092005

Acquisition date : 21-NOV-2005 10:14:32

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT 5D092005
Sample collection start date: 20-SEP-2005 16:27:00.00
Sample collection end date : 20-SEP-2005 16:27:00.00
Type of sample : 2 L MARI. LIQUID
Sample quantity : 1.00000E+03 cc
Sample geometry : BELL Operator: VJP

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 21-NOV-2005 10:14:32.23
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.12 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00489E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.82

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 8 rows of peak data with handwritten annotations on the right side.

Ac 228
annihilation
H.C.
0.214
0.214
0.214
0.214
0.214
0.214
K40

Sample Title : EFT 5D092005  
Decay Time = 54 01:47:32.23

Page : 1  
Acquisition Time = 21-NOV-2005 18:14:32.2

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	304.92	36	30	1.52	769.27	764	10	34.0		<del>Xe-133</del>
0	511.09	164	41	2.64	1021.51	1013	10	12.0		<del>F-18</del>
0	550.34	40	29	1.98	1115.96	1109	11	26.5		<del>As-76</del>
0	609.97	23	31	0.57	1219.19	1213	9	49.5		<del>Bi-214</del>
0	729.38	23	10	1.02	1457.02	1450	12	33.2		<del>Te-129</del>
0	804.22	43	5	5.19	1607.66	1598	10	19.0		<del>Po-210</del>
0	1121.56	10	17	0.97	2242.45	2234	14	55.5		
0	1460.74	02	12	1.93	2921.21	2914	13	14.2		K-40

~~Xe-133~~  
~~F-18~~  
~~As-76~~  
~~Bi-214~~  
~~Te-129~~  
~~Po-210~~  
my DVX

Nuclide Line Activity Report  
Sample ID : EFT 5D092805

Page : 1  
Acquisition date : 21-NOV-2005 10:14:32

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	82	10.67*	2.300E+00	5.023E-07	5.023E-07	14.17

Flag: "\*" = Keyline

Summary of Nuclide Activity  
Sample ID : EFT 5D092005

Page : 3  
Acquisition date : 21-NOV-2005 18:14:32

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

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.50	5.023E-07	5.023E-07	0.712E-07	14.17	
Total Activity :			5.023E-07	5.023E-07			

Grand Total Activity : 5.023E-07 5.023E-07

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

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

Rejected Report  
 Sample ID : EFT 5D092905

Page :  
 Acquisition date : 21-NOV-2005 18:14:32

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	709.70	511.00*	100.00	1.000E+35	12.00	Decay
		% Abundances	Found =	100.00			
SC-46	83.83D	0.65	142.53	62.70	---- Not Found ----		Abun.
			889.25*	99.98	---- Not Found ----		
			1120.51	99.99	1.541E-08	55.52	
		% Abundances	Found =	38.07			
AS-76	26.32M	49.32	559.10*	44.70	2.605E+07	26.55	Decay, Abun.
			563.23	1.17	---- Not Found ----		
			571.30	0.14	---- Not Found ----		
			657.03	6.10	---- Not Found ----		
			665.31	0.39	---- Not Found ----		
			740.12	0.12	---- Not Found ----		
			771.76	0.12	---- Not Found ----		
			867.63	0.12	---- Not Found ----		
			1129.87	0.14	---- Not Found ----		
			1212.72	1.63	---- Not Found ----		
			1216.02	3.04	---- Not Found ----		
			1220.52	1.39	---- Not Found ----		
			1439.13	0.33	---- Not Found ----		
			1453.60	0.13	---- Not Found ----		
			1707.67	0.33	---- Not Found ----		
		% Abundances	Found =	73.70			
BR-85	2.87M	27165.17	802.41*	2.56	1.000E+35	19.04	Decay, Abun.
			924.63	1.63	---- Not Found ----		
		% Abundances	Found =	61.10			
RU-103	39.35D	1.37	497.00*	89.00	---- Not Found ----		Abun.
			610.33	5.60	3.775E-07	49.46	
		% Abundances	Found =	5.92			
TE-129M	33.60D	1.61	695.80*	3.30	---- Not Found ----		Abun.
			729.57	0.76	3.869E-06	33.15	
		% Abundances	Found =	10.72			
BA-133	10.50Y	0.01	79.62	2.55	---- Not Found ----		Abun.
			81.00	33.00	---- Not Found ----		
			276.40	6.90	---- Not Found ----		
			302.84*	17.00	---- Not Found ----		
			356.00	60.00	---- Not Found ----		
			383.85	8.70	1.229E-07	33.96	
		% Abundances	Found =	6.75			
XE-135	9.11H	142.49	249.79*	89.90	---- Not Found ----		Decay, Abun.
			600.19	2.89	1.000E+35	49.46	
		% Abundances	Found =	3.11			
PM-148M	41.30D	1.31	200.11	12.56	---- Not Found ----		Abun.
			414.07	10.66	---- Not Found ----		
			432.78	5.35	---- Not Found ----		

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
PM-148M	41.300	1.31	501.26	6.75	----	Not Found	----	Abun.
			550.27*	94.90	----	Not Found	----	
			599.74	12.54	----	Not Found	----	
			611.26	5.48	3.688E-07	49.46		
			629.97	89.00	----	Not Found	----	
			725.70	32.80	----	Not Found	----	
			915.33	17.17	----	Not Found	----	
			1013.01	20.30	----	Not Found	----	
% Abundances Found =			1.74					
BI-214	19.90M	3913.70	609.31*	46.30	1.000E+35	49.46	Decay	
			768.36	5.04	----	Not Found	----	
			934.06	3.21	----	Not Found	----	
			1120.29	15.10	1.000E+35	55.52		
			1238.11	5.94	----	Not Found	----	
			1377.67	4.11	----	Not Found	----	
			1764.49	15.80	----	Not Found	----	
			% Abundances Found =			64.29	(Abn. Limit = 48.48%)	

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EFT 5D092805

Page : 6  
Acquisition date : 21-NOV-2005 18:14:32

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	384.92	36	30	1.52	769.27	764	10	1.90E-02	34.0	5.07E+00	T
0	511.09	164	41	2.64	1021.51	1013	10	9.11E-02	12.0	4.49E+00	T
0	550.34	48	29	1.98	1115.96	1109	11	2.65E-02	26.5	4.31E+00	T
0	609.97	23	31	0.57	1219.19	1213	9	1.26E-02	49.5	4.16E+00	T
0	729.30	23	10	1.02	1457.02	1450	12	1.30E-02	33.2	3.64E+00	T
0	804.22	43	5	5.19	1607.66	1598	10	2.41E-02	19.0	3.32E+00	T
0	1121.56	18	17	0.97	2242.45	2234	14	9.82E-03	55.5	2.69E+00	T

Flags: "T" = Tentatively associated

\* Sample ID : EFT 50092805  
 \*\*\*\*\*

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	29.	477.59	1.7589E-07
F-18	0.	511.02	Half-Life too short
NA-22	11.	1274.54	1.1353E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	6.	809.25	1.0959E-08
CR-51	39.	320.00	3.5102E-07
MN-54	11.	534.83	9.7452E-09
CO-56	19.	1238.25	3.2400E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	52.	158.38	4.1805E-06
CO-57	52.	122.06	1.3922E-08
CO-58	17.	810.76	1.7130E-08
CO-59	12.	1099.22	4.2003E-08
CO-60	14.	1332.49	1.2502E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	14.	1115.52	2.5605E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	56.	136.00	2.2549E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	54.	513.99	2.9059E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	54.	513.99	2.2227E-08
RB-86	8.	1076.63	7.4661E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	2.	1036.01	9.9397E-09
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
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
RB-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	10.	1204.90	6.4915E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short



## Minimum Detectable Activity Report (continued)

Page :

Sample ID : EFT 5D092805

Acquisition date : 21-NOV-2005 18:14:32

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.20	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	21.	702.63	9.5763E-09
NB-95	14.	765.79	2.5246E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	12.	756.72	2.5719E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.01	Half-Life too short
RU-103	20.	497.00	2.6140E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	17.	621.04	0.8006E-08
CD-109	42.	88.03	4.5675E-07
AG-110M	15.	937.40	3.6612E-08
SN-113	34.	391.69	1.0970E-08
SN-117M	52.	150.56	1.6205E-07
SB-122	0.	563.93	Half-Life too short
SB-124	10.	602.71	1.5265E-08
SB-125	31.	427.09	3.1444E-08
TE-125M	49.	109.20	7.0500E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	32.	57.60	3.2003E-05
XE-127	52.	202.04	3.7375E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	27.	695.00	9.7950E-07
XE-129M	56.	196.56	1.3364E-05
I-130	0.	536.09	Half-Life too short
BA-131	44.	123.00	7.7051E-07
I-131	20.	364.40	1.0301E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	53.	163.93	1.0749E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	220.16	Half-Life too short
BA-133	35.	302.04	4.7677E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	01.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	25.	604.70	1.0060E-08
I-134	0.	004.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	10.	810.50	1.7974E-07
I-136	0.	1313.02	Half-Life too short
CS-137	20.	661.65	1.0344E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	44.	165.85	1.3367E-08
CS-139	0.	1203.23	Half-Life too short
BA-140	17.	537.32	5.6501E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	41.	145.44	5.3349E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	45.	133.54	9.4799E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	46.	91.10	1.6531E-06
Th-148M	25.	550.27	2.3398E-08
EU-152	26.	344.27	2.9018E-08
EU-154	14.	1004.76	5.9864E-08
EU-156	15.	646.29	1.2694E-06
HF-181	20.	482.03	2.2340E-08
TA-182	14.	1221.42	6.0556E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	56.	279.19	2.9442E-08
BI-207	21.	569.67	8.7190E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	51.	186.21	2.6696E-07
AC-228	33.	338.32	7.4899E-08
TH-228	41.	84.37	1.4768E-06
PA-234	0.	131.20	Half-Life too short
TH-234	42.	63.29	6.0173E-06
U-235	43.	143.76	0.0455E-08
NP-239	0.	106.13	Half-Life too short
AM-241	32.	59.54	1.7895E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-6S092705

Sample Location (Well Number): EFT-6S

1. Representative sample collected. Date/Time 09/27/2005 / 1200

Sample collected by: by Marie Slaback / by Marie Slaback Date: 09-27-2005 collected  
Printed Name / Signature 12-29-2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Burger [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 1/9/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-6S092705
2 . Date Sampled	09/27/2005
3 . Time Sampled	12:00
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	11/22/2005
2 . Time Sample Counted	00:10
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	9.0 cpm
4 . Efficiency Inf.: (Daily Spike Source ID #111)	
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	8923.8 dpm
Counter Efficiency	0.3990 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.5 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.2 cpm

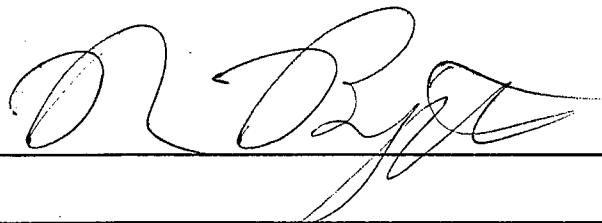
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.25\text{E}-06 \text{ uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date **NOV 23 2005**

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-6S092705

Sample Location (Well Number): EFT-6S

1. Representative sample collected. Date/Time 09/27/2005 1108

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 collected  
Printed Name / Signature 12/14/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K. HEMMEL / Dan K. Hemmel Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 RP Printed Name Signature

Sample number: EFT-69092705

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".

(Note disposition of unidentified peaks in "Remarks")

Performed by: V. PETRIANO [Signature] Date: 12-29-05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 1/9/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 486 51/1/9/06

RADIATION PROTECTION DEPARTMENT

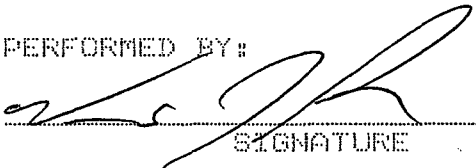
GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT 65092705

Sample End Time: 27-SEP-2005 11:00:00.00

REMARKS 896.11 KeV peak unidentified. Hi error (64.2%), ke  
FWHM (0.89); can ignore No licensed radioactive  
material detected.  
William N. Linton 4/6/05, 12/10/05

PERFORMED BY:  
  
 SIGNATURE

REVIEWED BY:  
William N. Linton 4/6/05, 12/10/05  
 SIGNATURE/DATE

Sample ID : EFT 69092705

Acquisition date : 21-NOV-2005 17:09:58

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT 69092705
Sample collection start date: 27-SEP-2005 11:08:00.00
Sample collection end date : 27-SEP-2005 11:08:00.00
Type of sample : 2 L MARI. LIQUID
Sample quantity : 1.000000E+03 cc
Sample geometry : M2LL Operator: VJP

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 21-NOV-2005 17:09:58.18
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.18 Percent dead time : 8.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00489E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.82

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m2ll Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: am, h, l, g, m; Big; unidentified; K40



Sample Title : EFT 68092705  
Decay Time = 55 06:01:58.18

Page : 1  
Acquisition Time = 21-NOV-2005 17:09:58.1

8

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	511.45	130	65	1.92	1022.22	1014	15	16.3		F-18
0	559.83	67	44	5.42	1118.95	1112	17	26.4		As-76
0	609.51	51	16	1.91	1218.28	1213	9	19.4		B-214
0	896.11	10	10	0.89	1791.44	1785	14	64.2		
0	1460.97	58	18	1.47	2921.67	2914	14	20.0		K-40

17/11/05

Nuclide Line Activity Report  
Sample ID : EFT 69092705

Page : 2  
Acquisition date : 21-NOV-2005 17:09:58

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	58	10.67*	2.308E+00	3.565E-07	3.565E-07	20.04

Flag: "\*" = Keyline

Summary of Nuclide Activity

Sample ID : EFT 68092705

Acquisition date : 21-NOV-2005 17:09:50

Total number of lines in spectrum 5  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : natural

Nuclide	Half-life	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	3.565E-07	3.565E-07	0.714E-07	20.04	
Total Activity :			3.565E-07	3.565E-07			

Grand Total Activity : 3.565E-07 3.565E-07

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	725.14	511.00*	193.46	1.000E+35	16.33	Decay
% Abundances Found = 100.00							
AS-76	26.32H	50.39	559.10*	44.70	7.664E+07	26.43	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.04	----	Not Found	----
			1220.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1707.67	0.33	----	Not Found	----
% Abundances Found = 73.70							
RB-88	17.80M	4470.62	898.02	14.00	1.000E+35	64.19	Decay, Abun.
			1332.39*	0.74	----	Not Found	----
			1836.01	21.40	----	Not Found	----
% Abundances Found = 38.74							
Y-88	106.60D	0.52	898.02	93.40	8.076E-09	64.19	Abun.
			1836.01*	99.38	----	Not Found	----
% Abundances Found = 48.45							
Y-92	3.54H	374.66	448.50	2.30	----	Not Found	Decay, Abun.
			561.10	2.40	1.000E+35	26.43	
			844.30	1.25	----	Not Found	----
			934.46*	13.90	----	Not Found	----
			1405.40	4.80	----	Not Found	----
% Abundances Found = 9.74							
RU-103	39.35D	1.40	497.00*	89.00	----	Not Found	Abun.
			610.33	5.60	8.710E-07	19.82	
% Abundances Found = 5.92							
XE-135	9.11H	145.59	249.79*	89.90	----	Not Found	Decay, Abun.
			608.19	2.89	1.000E+35	19.82	
% Abundances Found = 3.11							
BA-142	10.70M	7437.10	77.60	9.60	----	Not Found	Decay, Abun.
			231.52	10.10	----	Not Found	----
			255.12*	18.00	----	Not Found	----
			425.03	5.00	----	Not Found	----
			894.90	11.00	1.000E+35	64.19	
			948.75	8.90	----	Not Found	----
			1000.86	7.80	----	Not Found	----
			1070.40	9.30	----	Not Found	----

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity 1-Sigma		Rejected by
					(uCi/cc)	%Error	
BA-142	10.70M	7437.10	1202.20	5.30	----	Not Found	Decay, Abun.
			1204.06	14.00	----	Not Found	
			% Abundances Found = 11.11				
LA-142	95.40M	834.14	641.17*	52.50	----	Not Found	Decay, Abun.
			894.85	9.40	1.000E+35	64.19	
			1011.38	4.40	----	Not Found	
			1043.68	3.00	----	Not Found	
			1545.00	3.30	----	Not Found	
			1756.42	3.30	----	Not Found	
			1901.32	8.70	----	Not Found	
% Abundances Found = 11.11							
PM-148M	41.30D	1.34	288.11	12.56	----	Not Found	Abun.
			414.07	18.66	----	Not Found	
			432.78	5.35	----	Not Found	
			501.26	6.75	----	Not Found	
			550.27*	94.90	----	Not Found	
			599.74	12.54	----	Not Found	
			611.26	5.48	8.501E-07	19.82	
			629.97	89.00	----	Not Found	
			725.70	32.80	----	Not Found	
			915.33	17.17	----	Not Found	
1013.01	20.30	----	Not Found				
% Abundances Found = 1.74							
BI-214	19.90M	3998.04	609.31*	46.30	1.000E+35	19.82	Decay
			768.36	5.04	----	Not Found	
			934.06	3.21	----	Not Found	
			1120.29	15.10	----	Not Found	
			1238.11	5.94	----	Not Found	
			1377.67	4.11	----	Not Found	
			1764.49	15.80	----	Not Found	
% Abundances Found = 48.48 (Abn. Limit = 48.48%)							

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EFT 6S092705

Page : 6  
Acquisition date : 21-NOV-2005 17:09:58

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	511.45	130	65	1.92	1022.22	1014	15	7.20E-02	16.3	4.40E+00	T
0	559.83	67	44	5.42	1118.95	1112	17	3.70E-02	26.4	4.31E+00	T
0	609.51	51	16	1.91	1218.28	1213	9	2.84E-02	19.8	4.16E+00	T
0	896.11	10	10	0.89	1791.44	1785	10	5.81E-03	64.2	2.98E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	31.	477.59	1.8383E-07
F-18	0.	511.00	Half-Life too short
NA-22	14.	1274.54	1.2600E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	12.	889.25	1.4663E-08
CR-51	30.	320.00	3.5626E-07
MN-54	16.	834.83	1.1216E-08
CO-56	16.	1230.25	3.0246E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	43.	158.38	4.3870E-06
CO-57	41.	122.06	1.2559E-08
CO-58	10.	810.76	1.7720E-08
FE-59	14.	1099.22	4.6610E-08
CO-60	8.	1332.49	9.7660E-09
NI-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.04	Half-Life too short
ZN-65	9.	1115.52	2.1495E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	57.	136.00	2.2971E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	41.	513.99	2.5692E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	41.	513.99	1.9896E-08
RB-86	14.	1076.63	9.8955E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	6.	1036.01	1.4956E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	15.	1204.90	7.7865E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT 6S092705

Acquisition date : 21-NOV-2005 17:09:58

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.20	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	21.	702.63	9.5403E-09
NB-95	15.	765.79	2.6581E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	18.	756.72	3.1851E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	28.	497.08	2.6925E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	20.	621.84	9.6090E-08
CD-109	42.	88.03	4.5571E-07
AG-110M	8.	937.48	2.8428E-08
SN-113	33.	391.69	1.8934E-08
SN-117M	43.	158.56	1.5692E-07
SB-122	0.	563.93	Half-Life too short
SB-124	31.	602.71	1.9740E-08
SB-125	30.	427.89	3.1023E-08
TE-125M	38.	109.28	7.0583E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	39.	57.60	3.6556E-05
XE-127	53.	202.84	3.8519E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	21.	695.88	8.8395E-07
XE-129M	53.	196.56	1.4272E-05
I-130	0.	536.09	Half-Life too short
BA-131	32.	123.80	7.2312E-07
I-131	34.	364.48	1.2553E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	57.	163.93	1.1955E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	35.	302.84	4.7195E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	24.	604.70	9.8555E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short



## Minimum Detectable Activity Report (continued)

Page : 3

Sample ID : EFT 6S092705

Acquisition date : 21-NOV-2005 17:09:50

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	18.	818.50	1.9168E-07
I-136	0.	1313.02	Half-Life too short
CS-137	18.	661.65	9.9529E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	50.	165.85	1.4187E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	23.	537.32	6.8529E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	51.	145.44	6.8582E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	57.	133.54	1.0618E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	19.	91.10	1.1983E-06
PM-148M	13.	550.27	1.7978E-08
EU-152	40.	344.27	3.5140E-08
U-154	13.	1004.76	5.9195E-08
EU-156	18.	646.29	1.4616E-06
HF-181	26.	482.03	2.5630E-08
TA-182	12.	1221.42	5.6383E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	43.	279.19	2.6492E-08
BI-207	30.	569.67	1.0101E-08
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	49.	186.21	2.6270E-07
AC-228	47.	338.32	8.8037E-08
TH-228	35.	84.37	1.3884E-06
PA-234	0.	131.20	Half-Life too short
TH-234	26.	63.29	5.0082E-06
U-235	52.	143.76	8.7712E-08
NP-239	0.	106.13	Half-Life too short
AM-241	25.	59.54	1.6026E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-6D092705

Sample Location (Well Number): EFT-6D

1. Representative sample collected. Date/Time 09/27/2005 1 0917

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 Collected  
Printed Name / Signature 12/29/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / D. HEMMELE Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Berger / Russ Berger Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William K. Lipton / William K. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location EFT-6D092705  
2. Date Sampled 09/27/2005  
3. Time Sampled 09:17  
4. Sample Volume, (ml) 4 ml

**Instrument Count Data**

1. Date Sample Counted 11/22/2005  
2. Time Sample Counted 00:10  
3. Background Inf.:  
Minutes Counted 10 min.  
Background Count Rate (cpm) 9.0 cpm  
4. Efficiency Inf.: (Daily Spike Source ID # 111)  
Gross Spike Count Rate (cpm) 3569.5 cpm  
Net Spike Count Rate (cpm) 3560.5 cpm  
H3 Spike Activity (dpm on count date) 8923.8 dpm  
Counter Efficiency 0.3990 cpm/dpm  
5. Sample Info:  
Sample Gross Count Rate (cpm) 7.6 cpm  
Sample Count Time (min.) 10.0 min.  
Net Sample Count Rate (cpm) 0.0 cpm  
6. Critical Level:  
Critical Level Count Rate (cpm) 2.2 cpm

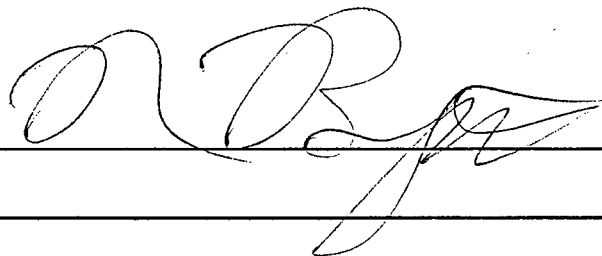
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl. min.})}}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.25\text{E-}06 \text{ uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-6D092705

Sample Location (Well Number): EFT-6D

1. Representative sample collected. Date/Time 09/27/2005 10917

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMELE / [Signature] Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 RP Printed Name / Signature

Sample number: EFT-60092705

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Above | Andrew Date: 11/29/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System.  
If so, verify the critical levels and LLDs and count sample in accordance  
with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton | William V. Lipton Date: 1/19/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 48051 / 1/19/2006  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EF1 EFT-6D092705

Sample End Time: 27-SEP-2005 09:17:00.00

REMARKS No license radioactive material detected  
medium isotope 48651 / 10/12/05

PERFORMED BY:

Andrew Lee

SIGNATURE

REVIEWED BY:

William J. Lynn 48651 /

SIGNATURE/DATE

12/9/2005

Sample ID : EF1 EFT-6D092705

Acquisition date : 27-NOV-2005 01:46:17

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EF1 EFT-6D092705
Sample collection start date: 27-SEP-2005 09:17:00.00
Sample collection end date : 27-SEP-2005 09:17:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : PELL Operator: AKU

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 27-NOV-2005 01:46:17.77
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.06 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
KeV/channel : 5.00563E-01 Zero offset: 7.89322E-02
Daily cal date : 26-NOV-2005 20:43:06.33

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 4 rows of peak data.

Handwritten notes: 'amplitude', '8/2/14', 'AKU', '240'

7

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	#Err	Fit	Nuclides
0	510.85	130	49	3.15	1020.67	1014	16	14.8		<i>Ar-228</i> <i>Bi-214</i> <i>Ac-228</i> <i>K-40</i>
0	610.25	45	53	0.72	1219.38	1211	19	41.1		
0	910.93	10	7	4.41	1820.54	1813	13	38.4		
0	1460.99	74	12	2.90	2920.80	2914	15	15.3		

*My Director*



Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	74	10.67*	2.300E+00	4.523E-07	4.523E-07	15.26

Flag: "\*" = Keyline

Summary of Nuclide Activity  
Sample ID : EF1 EFT-6D092705

Page : 3  
Acquisition date : 27-NOV-2005 01:46:17

Total number of lines in spectrum 4  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.523E-07	4.523E-07	0.690E-07	15.26	
Total Activity :			4.523E-07	4.523E-07			
Grand Total Activity :			4.523E-07	4.523E-07			

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	796.47	511.00*	100.00	1.000E+35	14.82	Decay
% Abundances Found = 100.00							
RU-103	39.35D	1.54	497.00*	09.00	---	Not Found	Abun.
			610.33	5.60	8.507E-07	41.06	
% Abundances Found = 5.92							
TE-133M	35.40M	1577.69	168.87	11.50	---	Not Found	Decay, Abun.
			261.55	15.70	---	Not Found	
			334.14	5.40	---	Not Found	
			647.48	29.30	---	Not Found	
			863.91	19.50	---	Not Found	
			912.55*	87.00	1.000E+35	38.39	
			914.72	16.50	---	Not Found	
			978.19	9.50	---	Not Found	
% Abundances Found = 44.75							
PM-140M	41.30D	1.47	288.11	12.56	---	Not Found	Abun.
			414.07	18.66	---	Not Found	
			432.78	5.35	---	Not Found	
			501.26	6.75	---	Not Found	
			550.27*	94.90	---	Not Found	
			599.74	12.54	---	Not Found	
			611.26	5.48	8.265E-07	41.06	
			629.97	89.00	---	Not Found	
			725.70	32.00	---	Not Found	
			915.33	17.17	---	Not Found	
			1013.81	20.30	---	Not Found	
% Abundances Found = 1.74							
BI-214	19.90M	4392.18	609.31*	46.30	1.000E+35	41.06	Decay
			768.36	5.04	---	Not Found	
			934.06	3.21	---	Not Found	
			1120.29	15.10	---	Not Found	
			1238.11	5.94	---	Not Found	
			1377.67	4.11	---	Not Found	
			1764.49	15.80	---	Not Found	
% Abundances Found = 48.48 (Abn. Limit = 48.48%)							
AC-228	6.13Y	0.03	129.00	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	---	Not Found	
			911.07	27.70	3.280E-08	38.39	
			964.60	5.20	---	Not Found	
			969.11	16.60	---	Not Found	
			1580.00	3.50	---	Not Found	
% Abundances Found = 30.94							

Tag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EF1 EFT-6D092795

Page : 6  
Acquisition date : 27-NOV-2005 01:46:17

It	Energy	Area	Bknd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	510.85	130	49	3.15	1020.67	1014	16	7.22E-02	14.8	4.49E+00	T
0	610.26	45	53	0.72	1219.38	1211	19	2.52E-02	41.1	4.16E+00	T
0	910.93	18	7	4.41	1820.54	1813	13	9.72E-03	38.4	2.95E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Naclide	Eckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	24.	477.59	1.7488E-07
F-18	0.	511.00	Half-Life too short
NA-22	6.	1274.54	9.0835E-09
NA-24	0.	1368.53	Half-Life too short
KO-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	11.	889.25	1.5239E-08
CR-51	42.	328.00	4.3017E-07
MN-54	15.	834.83	1.1210E-08
CO-56	13.	1238.25	2.9430E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	45.	158.38	8.3301E-06
CO-57	49.	122.06	1.3747E-08
CO-58	17.	810.76	1.0288E-08
FE-59	7.	1099.22	3.7920E-08
CO-60	20.	1332.49	1.4880E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
NI-65	13.	1115.52	2.4999E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	43.	136.00	2.0789E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	882.41	Half-Life too short
KR-85	33.	513.99	2.3263E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	33.	513.99	1.9074E-08
RB-86	0.	1076.63	9.4227E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	6.	1836.01	1.5477E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	13.	1204.90	7.6628E-06
Y-91M	0.	555.60	Half-Life too short
Y-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	24.	702.63	1.0186E-08
NB-95	0.	765.79	2.3259E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	23.	756.72	3.7368E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	300.01	Half-Life too short
RU-103	36.	497.08	3.3302E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	18.	621.04	9.4002E-08
CD-109	39.	88.03	4.4593E-07
AG-110M	13.	937.48	3.4984E-08
SN-113	35.	391.69	2.0070E-08
SN-117M	47.	158.56	2.1691E-07
SB-122	0.	563.93	Half-Life too short
SB-124	27.	602.71	1.9927E-08
SB-125	18.	427.09	2.4627E-08
TE-125M	47.	109.28	8.3324E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	34.	57.60	3.5462E-05
XE-127	54.	202.04	4.3244E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	15.	695.88	8.5663E-07
XE-129M	61.	196.56	2.3119E-05
I-130	0.	536.09	Half-Life too short
BA-131	40.	123.00	1.1070E-06
I-131	31.	364.48	1.9144E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	52.	163.93	1.5769E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	220.16	Half-Life too short
BA-133	36.	302.04	4.8337E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	27.	604.70	1.0462E-08
I-134	0.	804.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : EF1 EFT-6D092705

Acquisition date : 27-NOV-2005 01:46:17

Slide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	9.	818.50	1.8716E-07
I-136	0.	1313.02	Half-Life too short
CS-137	10.	661.65	9.9425E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.06	Half-Life too short
XE-138	0.	250.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	50.	165.05	1.4550E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	22.	537.32	8.9910E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	61.	145.44	7.4034E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	45.	133.54	9.6623E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	47.	91.10	2.5330E-06
PM-148M	24.	550.27	2.5644E-08
EU-152	32.	344.27	3.1551E-08
EU-154	12.	1004.76	5.5810E-08
EU-156	12.	646.29	1.5645E-06
F-181	10.	402.03	2.4064E-08
TA-182	11.	1221.42	5.6336E-08
W-187	0.	685.01	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	43.	279.19	2.8728E-08
BI-207	16.	569.67	7.6195E-09
TL-200	0.	503.14	Half-Life too short
PB-212	0.	230.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	52.	106.21	2.7059E-07
AC-228	47.	338.32	8.0731E-08
TH-228	45.	84.37	1.5546E-06
PA-234	0.	131.20	Half-Life too short
TH-234	28.	63.29	6.0433E-06
U-235	57.	143.76	9.1000E-08
NP-239	0.	106.13	Half-Life too short
AM-241	31.	59.54	1.7750E-07



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-6D092705D

Sample Location (Well Number): EFT-6D

1. Representative sample collected. Date/Time 09/27/2005 1 1200

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMEL / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/28/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: R. Bennett / [Signature] Date: 11-23-05 <sup>1-5-6</sup> Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-6 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lytkin / William V. Lytkin Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location	EFT-6D092705D
2. Date Sampled	09/27/2005
3. Time Sampled	12:00
4. Sample Volume, (ml)	4 ml

Instrument Count Data

1. Date Sample Counted	11/22/2005
2. Time Sample Counted	00:10
3. Background Inf.:	
Minutes Counted	1.10 min.
Background Count Rate (cpm)	19.0 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	8923.8 dpm
Counter Efficiency	0.3990 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.7 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.2 cpm

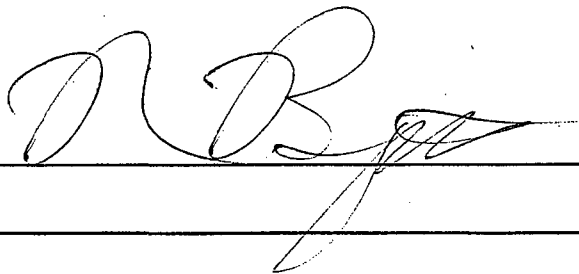
Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.25\text{E}-06 \text{ uCi/ml}$$

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date **NOV 23 2005**

Sample number: EFT-60092705D

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: G. Carlos Garcia / [Signature] Date: 1/22/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System.  
If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipka / [Signature] Date: 1/13/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-6D092705D

Sample Location (Well Number): EFT-6D

1. Representative sample collected. Date/Time 09/27/2005 10945

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/27/2005 collected / 12/14/2005 signed  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMELE / Daniel K Hemmelle Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: G. Collins Green / GCP Date: 11/22/05 11/23/05  
Fermi 2 RP Printed Name Signature

William W Lipton / William W Lipton 1/13/06

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: FERMI 1 EFF SAMPLE EFT-6D092705D

Sample End Time: 22-NOV-2005 03:16:00.00

REMARKS

*PASSED.*

*No increased radioactive material detected.  
see clean up file 11/13/2006  
48051*

PERFORMED BY:

*[Handwritten Signature]*

SIGNATURE

REVIEWED BY:

*[Handwritten Signature]* 11-29-05

SIGNATURE/DATE

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 22-NOV-2005 03:16:27

Fermi 2 Radiation Protection Gamma Spectroscopy Report

Sample Parameters

Sample ID Number: FERMI 1 EFF SAMPLE EFT-6D092705D
Sample collection start date: 22-NOV-2005 03:16:00.00
Sample collection end date : 22-NOV-2005 03:16:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: GCG

Acquisition Parameters

Detector number : DET 4 Acquire date : 22-NOV-2005 03:16:27.31
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.13 Percent dead time : 0.05 %

Calibration Parameters

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00409E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.02

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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: P6014 annihilation, HUL, P6014, K4U

1

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	352.49	31	48	1.18	794.45	698	18	48.3		<del>Pb-214</del>
0	511.15	163	48	2.08	1021.62	1012	21	13.1		<del>F-18</del>
0	558.53	64	21	1.72	1116.34	1112	18	18.6		<del>Pa-214</del>
0	609.85	74	30	1.88	1218.96	1212	17	28.6		<del>Bi-214</del>
0	1461.07	92	15	2.17	2921.07	2915	16	14.2		<del>K-40</del>

~~Pb-214~~  
~~F-18~~  
~~Pa-214~~  
~~Bi-214~~  
~~K-40~~  
 Mr. [Signature]

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
F-18	511.00	163	193.46*	4.485E+00	2.826E-08	3.112E-08	13.12

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	92	10.67*	2.308E+00	5.633E-07	5.633E-07	14.15
BI-214	609.31	74	46.30*	4.161E+00	5.743E-08	9.408E-08	20.60
	768.36	-----	5.04	3.461E+00	-----	Line Not Found	-----
	934.06	-----	3.21	2.912E+00	-----	Line Not Found	-----
	1120.29	-----	15.10	2.695E+00	-----	Line Not Found	-----
	1238.11	-----	5.94	2.548E+00	-----	Line Not Found	-----
	1377.67	-----	4.11	2.382E+00	-----	Line Not Found	-----
	1764.49	-----	15.00	2.084E+00	-----	Line Not Found	-----
PE-214	87.30	-----	4.67	3.097E+00	-----	Line Not Found	-----
	241.98	-----	7.49	5.680E+00	-----	Line Not Found	-----
	295.21	-----	19.20	5.462E+00	-----	Line Not Found	-----
	351.92	31	37.20*	5.190E+00	2.397E-08	3.488E-08	46.34
	785.91	-----	1.10	3.389E+00	-----	Line Not Found	-----

Flag: "\*" = Keyline



Total number of lines in spectrum 5  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
F-18	199.74M	1.10	2.826E-08	3.112E-08	0.408E-08	13.12	
Total Activity :			2.826E-08	3.112E-08			

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.633E-07	5.633E-07	0.797E-07	14.15	
EI-214	19.90M	1.64	5.743E-08	9.408E-08	1.938E-08	20.60	A
PB-214	26.80M	1.45	2.397E-08	3.488E-08	1.616E-08	46.34	A
Total Activity :			6.447E-07	6.922E-07			

Grand Total Activity : 6.730E-07 7.234E-07

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

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

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
AS-76	26.32H	0.01	559.10*	44.70	5.003E-08	10.63	Abun.	
			563.23	1.17	---	Not Found	---	
			571.30	0.14	---	Not Found	---	
			657.03	6.10	---	Not Found	---	
			665.31	0.39	---	Not Found	---	
			740.12	0.12	---	Not Found	---	
			771.76	0.12	---	Not Found	---	
			867.63	0.12	---	Not Found	---	
			1129.07	0.14	---	Not Found	---	
			1212.72	1.63	---	Not Found	---	
			1216.02	3.04	---	Not Found	---	
			1228.52	1.39	---	Not Found	---	
			1439.13	0.33	---	Not Found	---	
			1453.60	0.13	---	Not Found	---	
			1787.67	0.33	---	Not Found	---	
			% Abundances Found =				73.70	
RU-103	39.35D	0.00	497.00*	89.00	---	Not Found	---	Abun.
			610.33	5.60	4.749E-07	20.60		
% Abundances Found =				5.92				
XE-135	9.11H	0.03	249.79*	89.90	---	Not Found	---	Abun.
			600.19	2.89	9.383E-07	20.60		
% Abundances Found =				3.11				
PM-148M	41.30D	0.00	200.11	12.56	---	Not Found	---	Abun.
			414.07	10.66	---	Not Found	---	
			432.78	5.35	---	Not Found	---	
			501.26	6.75	---	Not Found	---	
			550.27*	94.90	---	Not Found	---	
			599.74	12.54	---	Not Found	---	
			611.26	5.40	4.853E-07	20.60		
			629.97	89.00	---	Not Found	---	
			725.70	32.00	---	Not Found	---	
			915.33	17.17	---	Not Found	---	
			1013.01	20.30	---	Not Found	---	
% Abundances Found =				1.74				

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : FERMI 1 EFF SAMP

Page : 5  
Acquisition date : 22-NOV-2005 03:16:27

	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	558.53	64	21	1.72	1116.34	1112	10	3.54E-02	10.6	4.31E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	31.	477.59	8.9879E-08
NA-22	11.	1274.54	1.0728E-08
NA-24	9.	1368.53	1.0531E-08
MG-27	16.	1014.44	1.0423E-07
CL-38	6.	1642.42	3.9515E-08
AR-41	13.	1293.64	1.3072E-08
SC-46	15.	889.25	1.0245E-08
CR-51	37.	320.08	8.8567E-08
MN-54	9.	834.83	7.8074E-09
CO-56	18.	1238.25	1.9704E-08
MN-56	2.	1010.69	2.6696E-08
NI-56	50.	158.38	8.8134E-09
CO-57	42.	122.06	1.0994E-08
CO-58	19.	810.76	1.0669E-08
FE-59	13.	1099.22	1.8703E-08
CO-60	13.	1332.49	1.1991E-08
CU-64	4.	1345.90	2.5465E-06
NI-65	8.	1481.84	4.8465E-08
ZN-65	9.	1115.52	1.7926E-08
ZN-69M	29.	438.63	9.2371E-09
SE-75	57.	136.00	1.6625E-08
AS-76	77.	559.10	3.4082E-08
BR-82	14.	776.49	1.0742E-08
BR-83	22.	529.64	6.9212E-07
BR-84	15.	881.50	3.3425E-08
BR-85	16.	802.41	3.0794E-06
KR-85	49.	513.99	2.7609E-06
KR-85M	50.	151.18	1.2229E-08
SR-85	49.	513.99	1.1961E-08
RB-86	11.	1076.63	1.1291E-07
KR-87	13.	402.58	1.3510E-08
SR-87M	30.	388.40	1.0895E-08
KR-88	60.	196.32	3.9230E-08
RB-88	4.	1382.39	1.6812E-06
Y-88	5.	1836.01	9.7175E-09
KR-89	48.	220.90	3.2846E-07
RB-89	13.	1031.88	3.4020E-08
KR-90	22.	1118.69	2.5365E-06
RB-90	18.	831.69	2.8563E-07
RB-90M	11.	824.23	5.8016E-07
Y-90M	64.	202.51	1.0970E-08
SR-91	11.	1024.30	3.0968E-08
Y-91	14.	1204.90	3.9258E-06
Y-91M	25.	555.60	1.1630E-08
SR-92	7.	1383.94	1.0986E-08
Y-92	15.	934.46	8.0383E-08
SR-93	18.	598.28	3.7356E-08

## Minimum Detectable Activity Report (continued)

Page : 2

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 22-NOV-2005 03:16:27

Isotope	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
Y-93	50.	266.90	1.4119E-07
NB-94	21.	702.63	9.5524E-09
NB-95	16.	765.79	9.3218E-09
NB-95M	41.	235.69	3.4343E-08
ZR-95	19.	756.72	1.7923E-08
NB-97	14.	657.90	8.8686E-09
ZR-97	20.	743.36	1.0189E-08
MO-99	13.	739.50	6.4420E-08
TC-99M	62.	140.50	1.1635E-08
TC-101	45.	306.81	2.0899E-08
RU-103	26.	497.08	9.8608E-09
TC-104	39.	357.99	1.7677E-08
RH-105	37.	318.90	4.5515E-08
RU-105	27.	724.50	2.3394E-08
RU-106	20.	621.84	8.7153E-08
CD-109	36.	88.03	3.9354E-07
AG-110M	19.	937.48	3.4481E-08
SN-113	31.	391.69	1.3081E-08
SN-117M	52.	158.56	1.0233E-08
SB-122	22.	563.93	1.2196E-08
SB-124	28.	602.71	1.0096E-08
SB-125	27.	427.89	2.8347E-08
TE-125M	37.	109.28	3.6313E-06
TE-127	34.	417.90	9.3485E-07
TE-127M	32.	57.60	2.3335E-05
XE-127	62.	202.84	1.4520E-08
TE-129	22.	459.60	1.2796E-07
TE-129M	28.	695.88	3.2637E-07
XE-129M	61.	196.56	2.0445E-07
I-130	18.	536.09	7.9453E-09
BA-131	43.	123.80	3.2390E-08
I-131	34.	364.48	1.0735E-08
TE-131	51.	149.72	1.9299E-08
TE-131M	12.	773.67	2.1627E-08
XE-131M	45.	163.93	4.2097E-07
I-132	21.	667.69	9.8777E-09
TE-132	58.	220.16	1.1306E-08
BA-133	44.	302.84	5.2415E-08
BA-133M	40.	276.09	4.8502E-08
I-133	24.	529.87	1.0052E-08
TE-133M	26.	912.58	1.8768E-08
XE-133	33.	81.00	4.6677E-08
XE-133M	59.	233.22	9.7087E-08
CS-134	19.	604.70	8.5012E-09
I-134	14.	804.09	1.8827E-08
TE-134	49.	210.47	5.2086E-08
BA-135M	48.	268.24	5.8975E-08
I-135	10.	1260.41	3.6597E-08
TE-135	54.	249.79	1.1149E-08
TE-135M	25.	526.56	2.0121E-08
CS-136	13.	818.50	8.8597E-09

## Minimum Detectable Activity Report (continued)

Page : 3

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 22-NOV-2005 03:16:27

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
I-136	10.	1313.02	2.9655E-07
CS-137	15.	661.65	9.2431E-09
XE-137	27.	455.49	1.6410E-07
CS-138	6.	1435.06	1.6494E-08
XE-138	41.	250.31	5.4095E-08
BA-139	11.	1428.50	4.6734E-06
CE-139	51.	165.95	1.0803E-08
CS-139	18.	1283.23	5.0008E-07
BA-140	19.	537.32	3.1335E-08
LA-140	7.	1596.49	1.0774E-08
BA-141	54.	190.22	3.1493E-08
CE-141	59.	145.44	2.0054E-08
LA-141	10.	1354.52	4.3731E-07
BA-142	34.	255.12	1.0365E-07
LA-142	20.	641.17	1.8316E-08
CE-143	53.	293.26	2.3971E-08
CE-144	48.	133.54	8.5009E-08
PR-144	9.	1489.15	6.3529E-06
ND-147	37.	91.10	4.8922E-08
PM-148M	19.	550.27	8.3891E-09
EU-152	35.	344.27	3.2821E-08
EU-154	9.	1004.76	5.0015E-08
EU-156	20.	646.29	1.2099E-07
HF-181	25.	482.03	1.0166E-08
TA-182	12.	1221.42	4.0994E-08
W-187	17.	685.81	2.9292E-08
RE-188	56.	155.03	6.2020E-08
HG-203	61.	279.19	1.3653E-08
BI-207	25.	569.67	9.2730E-09
TL-208	24.	583.14	8.1149E-08
PB-212	53.	238.63	2.1964E-08
RA-224	50.	240.98	2.3911E-07
RA-226	62.	186.21	2.9313E-07
AC-228	43.	338.32	8.2888E-08
TH-228	39.	84.37	1.3713E-06
PA-234	45.	131.20	4.5721E-08
TH-234	39.	63.29	1.2298E-06
U-235	51.	143.76	8.6644E-08
NP-239	38.	106.13	4.7383E-08
AM-241	43.	59.54	2.0711E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-73092205

Sample Location (Well Number): EFT-7B

1. Representative sample collected. Date/Time 09/22/2005 10922

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/22/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / D. Hemmelle Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: R. Berger / R. Berger Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location EFT-7S092205  
 2. Date Sampled 09/22/2005  
 3. Time Sampled 09:22  
 4. Sample Volume, (ml) 4

Instrument Count Data

1. Date Sample Counted 11/22/2005  
 2. Time Sample Counted 00:10  
 3. Background Inf. (Daily Spike Source ID # 111)  
 Minutes Counted 10 min.  
 Background Count Rate (cpm) 9.0 cpm  
 4. Efficiency Inf.: (Daily Spike Source ID # 111)  
 Gross Spike Count Rate (cpm) 3569.5 cpm  
 Net Spike Count Rate (cpm) 3560.5 cpm  
 H3 Spike Activity (dpm on count date) 8923.8 dpm  
 Counter Efficiency 0.3990 cpm/dpm  
 5. Sample Info:  
 Sample Gross Count Rate (cpm) 7.5 cpm  
 Sample Count Time (min.) 10.0 min.  
 Net Sample Count Rate (cpm) 0.0 cpm  
 6. Critical Level:  
 Critical Level Count Rate (cpm) 2.2 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.25\text{E}-06 \text{ uCi/ml}$$

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date NOV 23 2005



## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-7S092205

Sample Location (Well Number): EFT-7S

1. Representative sample collected. Date/Time 09/22/2005 10922

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/22/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K. HEMMELE / Dan K. Hemmelle Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William K. Lipton / William K. Lipton Date: 11/22/05  
Fermi 2 RP Printed Name Signature 1/13/06  
William K. Lipton / William K. Lipton 1/13/06

Sample number: EFT-78092205

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".

(Note disposition of unidentified peaks in "Remarks")

Performed by: G. LOVIN-GARCIA / [Signature] Date: 11/21/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 1/17/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: FERMI 1 EFF SAMPLE EFT-75092205

Sample End Time: 22-NOV-2005 05:52:00.00

REMARKS

*Pass*  
No licensed radioactive material detected.  
William V. Lytle 48651 12/2/05

PERFORMED BY:

*[Signature]*  
SIGNATURE

REVIEWED BY:

*William V. Lytle 48651 11/30/05*  
SIGNATURE/DATE

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 22-NOV-2005 05:52:36

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: FERMI 1 EFF SAMPLE EFT-75092205  
 Sample collection start date: 22-NOV-2005 05:52:00.00  
 Sample collection end date : 22-NOV-2005 05:52:00.00  
 Type of sample : 1 L Mari. Liquid  
 Sample quantity : 1.00000E+03 cc  
 Sample geometry : MELL Operator: GCS

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 22-NOV-2005 05:52:36.05  
 Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00  
 Elapsed real time : 0 00:30:01.14 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03  
 Key/channel : 5.00489E-01 Zero offset: -2.63429E-04  
 Daily cal date : 21-NOV-2005 16:30:29.82

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000  
 Abundance limit : 75.00000 Library : dacmaster.nlb  
 Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	511.70	189	55	2.73	1022.71	1014	23	1.05E-01	12.7	annihilation
2	0	558.81	70	36	1.69	1116.91	1108	18	3.89E-02	23.4	H <sup>21</sup>
3	0	609.94	26	38	1.42	1219.14	1213	11	1.45E-02	49.9	n-ga
4	0	1460.70	90	5	2.46	2921.30	2914	17	5.01E-02	11.8	R <sup>226</sup>
5	0	1764.63	25	3	2.03	3529.60	3522	14	1.37E-02	25.7	P <sup>214</sup>

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Best-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	XErr	Fit	Nuclides
0	511.70	109	55	2.73	1022.71	1014	23	12.7		F-18
0	558.81	70	36	1.69	1116.91	1108	18	23.4		As-76
0	609.94	26	30	1.42	1219.14	1213	11	49.9		Bi-214
0	1460.70	90	5	2.46	2921.30	2914	17	11.0		K-40
0	1764.63	25	3	2.03	3529.60	3522	14	25.7		Bi-214

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
F-18	511.00	189	193.46*	4.483E+00	3.272E-08	3.605E-08	12.68

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	90	10.67*	2.380E+00	5.500E-07	5.500E-07	11.79
Bi-214	609.31	26	46.30*	4.161E+00	2.036E-08	3.352E-08	49.89
	768.36	-----	5.04	3.461E+00	-----	Line Not Found	-----
	934.06	-----	3.21	2.912E+00	-----	Line Not Found	-----
	1120.29	-----	15.10	2.695E+00	-----	Line Not Found	-----
	1238.11	-----	5.94	2.548E+00	-----	Line Not Found	-----
	1377.67	-----	4.11	2.382E+00	-----	Line Not Found	-----
	1764.49	25	15.00	2.084E+00	1.128E-07	1.857E-07	25.65

Flag: "\*" = Keyline

Total number of lines in spectrum 5  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
F-18	109.74M	1.10	3.272E-08	3.605E-08	0.457E-08	12.68	
Total Activity :			3.272E-08	3.605E-08			

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.500E-07	5.500E-07	0.648E-07	11.79	
BI-214	19.90M	1.65	2.036E-08	3.352E-08	1.672E-08	49.89	A
Total Activity :			5.703E-07	5.835E-07			

Grand Total Activity : 6.031E-07 6.196E-07

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity 1-Sigma (uCi/cc)	%Error	Rejected by
AS-76	26.32H	0.01	559.10*	44.70	5.492E-08	23.39	Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.04	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found =				73.70			
RU-103	39.35D	0.00	497.00*	89.00	----	Not Found	Abun.
			610.33	5.60	1.604E-07	49.89	
			% Abundances Found =				5.92
XE-135	9.11H	0.03	249.79*	89.90	----	Not Found	Abun.
			608.19	2.89	3.327E-07	49.89	
			% Abundances Found =				3.11
PM-148M	41.30D	0.00	280.11	12.56	----	Not Found	Abun.
			414.07	10.66	----	Not Found	----
			432.78	5.35	----	Not Found	----
			501.26	6.75	----	Not Found	----
			550.27*	94.90	----	Not Found	----
			599.74	12.54	----	Not Found	----
			611.26	5.48	1.721E-07	49.89	
			629.97	89.00	----	Not Found	----
			725.70	32.00	----	Not Found	----
			915.33	17.17	----	Not Found	----
1013.81	20.30	----	Not Found	----			
% Abundances Found =				1.74			

Flag: "\*" = Keyline



Unidentified Energy Lines  
Sample ID : FERMI 1 EFF SAMP

Page : 5  
Acquisition date : 22-NOV-2005 05:52:36

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	550.81	70	36	1.69	1116.91	1100	18	3.89E-02	23.4	4.31E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	28.	477.59	8.5106E-08
NA-22	11.	1274.54	1.8723E-08
NA-24	12.	1368.53	1.2045E-08
MG-27	14.	1814.44	9.7690E-08
CL-38	5.	1642.42	3.7641E-08
AR-41	3.	1293.64	7.0848E-09
SC-46	15.	889.25	1.0343E-08
CR-51	42.	328.08	9.3975E-08
MN-54	10.	834.83	8.1068E-09
CO-56	12.	1238.25	1.6513E-08
MN-56	4.	1810.69	3.4599E-08
NI-56	54.	158.38	9.1171E-09
CO-57	46.	122.06	1.1469E-08
CO-58	11.	810.76	8.4578E-09
FE-59	17.	1099.22	2.1244E-08
CO-60	11.	1332.49	1.1250E-08
CU-64	4.	1345.90	2.5469E-06
NI-65	7.	1481.84	4.4017E-08
ZN-65	10.	1115.52	1.9198E-08
ZN-69M	30.	438.63	9.3570E-09
SE-75	38.	136.00	1.3930E-08
AS-76	74.	559.10	3.3442E-08
BR-82	10.	776.49	9.2002E-09
BR-83	20.	529.64	6.5691E-07
BR-84	19.	801.50	3.7577E-08
BR-85	20.	802.41	3.4833E-06
KR-85	62.	513.99	3.0592E-06
KR-85M	44.	151.18	1.1541E-08
SR-85	62.	513.99	1.3253E-08
RB-86	17.	1076.63	1.3656E-07
KR-87	42.	402.58	2.2884E-08
SR-87M	33.	388.40	1.1288E-08
KR-88	64.	196.32	4.0666E-08
RB-88	6.	1382.39	2.0401E-06
Y-88	3.	1836.01	7.9701E-09
KR-89	53.	220.90	3.5444E-07
RB-89	11.	1031.88	3.1297E-08
KR-90	19.	1118.69	2.8793E-06
RB-90	18.	831.69	2.9560E-07
RB-90M	13.	824.23	6.4691E-07
Y-90M	55.	202.51	1.0172E-08
SR-91	16.	1024.30	3.5828E-08
Y-91	12.	1204.90	3.5920E-06
Y-91M	23.	555.60	1.1256E-08
SR-92	6.	1383.94	1.0456E-08
Y-92	21.	934.46	9.3000E-08
SR-93	19.	590.28	3.9079E-08

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 22-NOV-2005 05:52:36

Slide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
Y-93	45.	266.90	1.3444E-07
NB-94	22.	702.63	9.6914E-09
NB-95	24.	765.79	1.1032E-08
NB-95M	44.	235.69	3.5224E-08
ZR-95	17.	756.72	1.6922E-08
NB-97	13.	657.90	8.6255E-09
ZR-97	19.	743.36	9.9829E-09
NO-99	17.	739.50	7.1207E-08
TC-99M	72.	140.50	1.2401E-08
TC-101	30.	306.01	1.9527E-08
RU-103	22.	497.00	9.0643E-09
TC-104	20.	357.99	1.5342E-08
RH-105	54.	310.90	5.4095E-08
RU-105	14.	724.50	1.7435E-08
RU-106	19.	621.84	8.5007E-08
CD-109	37.	80.03	3.9479E-07
AG-110M	19.	937.40	3.4620E-08
SN-113	22.	391.69	1.1219E-08
SN-117M	53.	150.56	1.0403E-08
SB-122	17.	563.93	1.0735E-08
SB-124	33.	602.71	1.0790E-08
SB-125	36.	427.09	3.2100E-08
TE-125M	43.	109.20	3.0853E-06
TE-127	21.	417.90	7.4795E-07
TE-127M	36.	57.60	2.4598E-05
XE-127	57.	202.04	1.3956E-08
TE-129	20.	459.60	1.2230E-07
TE-129M	14.	695.00	2.3867E-07
XE-129M	69.	196.56	2.1604E-07
I-130	20.	536.09	9.5017E-09
BA-131	50.	123.00	3.4736E-08
I-131	35.	364.40	1.0006E-08
TE-131	40.	149.72	1.7399E-08
TE-131M	11.	773.67	2.0541E-08
XE-131M	56.	163.93	4.6566E-07
I-132	17.	667.69	9.1430E-09
TE-132	52.	220.16	1.0720E-08
BA-133	37.	302.04	4.7921E-08
BA-133M	36.	276.09	4.6271E-08
I-133	20.	529.07	9.4305E-09
TE-133M	22.	912.50	1.7248E-08
XE-133	29.	81.00	4.3980E-08
XE-133M	39.	233.22	8.0746E-08
CS-134	24.	604.70	9.4335E-09
I-134	15.	804.09	1.9427E-08
TE-134	40.	210.47	5.2006E-08
BA-135M	43.	268.24	5.6370E-08
I-135	6.	1260.41	3.0772E-08
XE-135	35.	249.79	9.1091E-09
TE-135M	25.	526.56	2.0417E-08
TE-136	9.	010.50	7.6993E-09

## Minimum Detectable Activity Report (continued)

Page : 3

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 22-NOV-2005 05:52:36

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
I-136	11.	1313.02	3.2065E-07
CS-137	24.	661.65	1.1207E-08
XE-137	25.	455.49	1.6304E-07
CS-138	5.	1435.86	1.5210E-08
XE-138	42.	258.31	5.5103E-08
BA-139	8.	1420.50	4.0833E-06
CE-139	48.	165.85	1.0584E-08
CS-139	17.	1283.23	4.9225E-07
BA-140	25.	537.32	3.5486E-08
LA-140	5.	1596.49	9.1280E-09
BA-141	64.	190.22	3.4438E-08
CE-141	40.	145.44	1.6749E-08
LA-141	11.	1354.52	4.5526E-07
BA-142	46.	255.12	1.2001E-07
LA-142	22.	641.17	1.9333E-08
CE-143	44.	293.26	2.2086E-08
CE-144	52.	133.54	8.8478E-08
PR-144	9.	1489.15	6.4708E-06
ND-147	28.	91.10	4.3409E-08
PM-148M	29.	550.27	1.0115E-08
EU-152	42.	344.27	3.5666E-08
EU-154	9.	1004.76	4.9189E-08
EU-156	22.	646.29	1.2674E-07
HF-181	22.	482.03	9.7100E-09
TA-182	8.	1221.42	3.4529E-08
W-187	25.	685.81	3.4474E-08
RE-188	67.	155.03	6.7334E-08
MG-203	55.	279.19	1.3007E-08
BI-207	31.	569.67	1.0293E-08
TL-208	33.	583.14	9.7284E-08
PE-212	56.	238.63	2.2568E-08
PE-214	52.	351.92	4.1049E-08
RA-224	58.	240.98	2.5622E-07
RA-226	59.	186.21	2.8638E-07
AC-228	40.	338.32	8.0583E-08
TH-228	39.	84.37	1.3693E-06
PA-234	50.	131.20	4.8090E-08
TH-234	43.	63.29	1.2831E-06
U-235	53.	143.76	8.8112E-08
NP-239	46.	106.13	5.1343E-08
AM-241	32.	59.54	1.7941E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-8S093005

Sample Location (Well Number): EFT-8S

1. Representative sample collected. Date/Time 09/30/2005 1 1415

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/30/2005 Collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: R. Bury / [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-6 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-8S093005
2. Date Sampled	09/30/2005
3. Time Sampled	14:15
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	11/22/2005
2. Time Sample Counted	00:10
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	9.0 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	8923.8 dpm
Counter Efficiency	0.3990 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.6 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.2 cpm

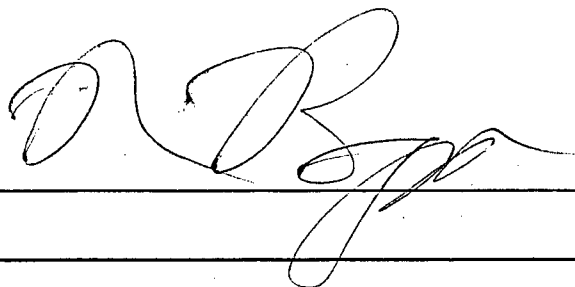
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date **NOV 23 2005**

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-8S093005

Sample Location (Well Number): EFT-8S

1. Representative sample collected. Date/Time 09/30/2005 1 1415

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/30/2005 collected / 12/14/2005 signed  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMELEI / Daniel K Hemmelei Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: G. G. [Signature] / [Signature] Date: 11/21/05 11/23/06  
Fermi 2 RP Printed Name Signature  
William V. Lytkin / William Lytkin 11/13/2006

Sample number: EFT-85093005

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".

(Note disposition of unidentified peaks in "Remarks")

Performed by: G. COLVIN GARCIA / [Signature] Date: 4/21/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V Lipton Date: 1/13/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: FERMI 1 EFF SAMPLE EFT-85093005

Sample End Time: 21-NOV-2005 22:42:00.00

REMARKS

*PASSED*

*No increase of radioactive material detected,  
William N. [unclear] 48651/*

*12/2/05*

PERFORMED BY:

*[Signature]*

SIGNATURE

REVIEWED BY:

*[Signature]*

*11-29-05*

SIGNATURE/DATE

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 22:43:00

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: FERMI 1 EFF SAMPLE EFT-85093005
Sample collection start date: 21-NOV-2005 22:42:00.00
Sample collection end date : 21-NOV-2005 22:42:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 ML
Sample geometry : M2LL Operator: GCG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 21-NOV-2005 22:43:00.73
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.15 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00489E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.82

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 6 rows of peak data with handwritten annotations on the right side.

Sample Title : FERMI 1 EFF SAMPLE EFT-09093005

Page : 1

Decay Time = 0 00:01:00.73

Acquisition Time = 21-NOV-2005 22:43:00:

3

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	510.94	172	44	3.29	1021.20	1012	16	11.5		F-18 <i>Att.</i>
0	558.66	61	27	1.96	1116.60	1111	11	21.0		<i>Photo Neutron R.</i>
0	609.63	97	41	2.14	1210.51	1209	19	19.0		BI-214 ✓
0	1120.72	30	16	2.30	2240.70	2234	15	33.6		BI-214 ✓
0	1460.01	77	10	1.55	2921.36	2915	13	14.1		K-40 ✓
0	1765.19	23	11	1.60	3530.71	3522	14	35.9		BI-214 ✓

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/ML	Decay Corr uCi/ML	1-Sigma %Error
F-18	511.00	172	193.46*	4.486E+00	2.969E-08	3.281E-08	11.54

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/ML	Decay Corr uCi/ML	1-Sigma %Error
K-40	1460.81	77	10.67*	2.308E+00	4.705E-07	4.705E-07	14.12
BI-214	609.31	97	46.30*	4.162E+00	7.593E-08	1.268E-07	18.95
	768.36	-----	5.04	3.461E+00	-----	Line Not Found	-----
	934.06	-----	3.21	2.912E+00	-----	Line Not Found	-----
	1120.29	30	15.10	2.694E+00	1.112E-07	1.857E-07	33.56
	1238.11	-----	5.94	2.548E+00	-----	Line Not Found	-----
	1377.67	-----	4.11	2.382E+00	-----	Line Not Found	-----
	1764.49	23	15.80	2.083E+00	1.068E-07	1.784E-07	35.93

Flag: "\*" = Keyline

Summary of Nuclide Activity  
Sample ID : FERMI 1 EFF SAMP

Page : 3  
Acquisition date : 21-NOV-2005 22:43:00

Total number of lines in spectrum 6  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 6 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/ML	Decay Corr uCi/ML	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
F-18	109.74M	1.10	2.969E-08	3.281E-08	0.378E-08	11.54	
Total Activity :			2.969E-08	3.281E-08			

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/ML	Decay Corr uCi/ML	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.705E-07	4.705E-07	0.664E-07	14.12	
BI-214	19.90M	1.67	7.593E-08	1.268E-07	0.240E-07	18.95	A
Total Activity :			5.464E-07	5.973E-07			

Grand Total Activity : 5.761E-07 6.301E-07

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

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

Rejected Report

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 22:43:00

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/ML)	1-Sigma %Error	Rejected by
SC-46	83.83D	0.00	142.53	62.70	---	Not Found	Abun.
			889.25*	99.98	---	Not Found	
			1120.51	99.99	1.600E-08	33.56	
			% Abundances Found =		38.07		
AS-76	26.32H	0.01	559.10*	44.70	4.773E-08	21.02	Abun.
			563.23	1.17	---	Not Found	
			571.30	0.14	---	Not Found	
			657.03	6.10	---	Not Found	
			665.31	0.39	---	Not Found	
			740.12	0.12	---	Not Found	
			771.76	0.12	---	Not Found	
			867.63	0.12	---	Not Found	
			1129.87	0.14	---	Not Found	
			1212.72	1.63	---	Not Found	
			1216.02	3.84	---	Not Found	
			1228.52	1.39	---	Not Found	
			1439.13	0.33	---	Not Found	
			1453.60	0.13	---	Not Found	
1787.67	0.33	---	Not Found				
% Abundances Found =		73.70					
RU-103	39.35D	0.00	497.00*	89.00	---	Not Found	Abun.
			610.33	5.60	6.279E-07	18.95	
% Abundances Found =		5.92					
XE-135	9.11H	0.03	249.79*	89.90	---	Not Found	Abun.
			608.19	2.89	1.241E-06	18.95	
% Abundances Found =		3.11					
PM-148M	41.30D	0.00	288.11	12.56	---	Not Found	Abun.
			414.07	18.66	---	Not Found	
			432.78	5.35	---	Not Found	
			501.26	6.75	---	Not Found	
			550.27*	94.90	---	Not Found	
			599.74	12.54	---	Not Found	
			611.26	5.48	6.417E-07	18.95	
			629.97	89.00	---	Not Found	
			725.70	32.80	---	Not Found	
			915.33	17.17	---	Not Found	
			1013.81	20.30	---	Not Found	
% Abundances Found =		1.74					

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : FERMI 1 EFF SAMP

Page : 5  
Acquisition date : 21-NOV-2005 22:43:00

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	558.66	61	27	1.96	1116.60	1111	11	3.38E-02	21.0	4.31E+00	T

Flags: "T" = Tentatively associated

\* \* \* \* \*  
 \* Detroit Edison Fermi 2 MDA Report, Generated 21-NOV-2005 23:13:00.07 \*  
 \* \* \* \* \*  
 \* Sample ID : FERMI 1 EFF SAMPLE EFT-05093005 \*  
 \* \* \* \* \*

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/ML)
BE-7	22.	477.59	7.5735E-08
NA-22	9.	1274.54	1.0235E-08
NA-24	10.	1368.53	1.0956E-08
MG-27	8.	1014.44	7.9304E-08
CL-38	7.	1642.42	4.3220E-08
AR-41	13.	1293.64	1.2978E-08
SC-46	14.	889.25	1.0070E-08
CR-51	51.	320.00	1.0256E-07
MN-54	21.	834.83	1.1204E-08
CO-56	18.	1238.25	1.9615E-08
MN-56	5.	1010.69	3.0782E-08
NI-56	47.	158.38	8.5300E-09
CO-57	57.	122.06	1.2595E-08
CO-58	17.	810.76	1.0012E-08
FE-59	11.	1099.22	1.7006E-08
CO-60	8.	1332.49	9.9156E-09
CU-64	8.	1345.90	3.2564E-06
NI-65	6.	1401.84	4.3160E-08
ZN-65	15.	1115.52	2.2400E-08
ZN-69M	31.	438.63	9.5633E-09
SE-75	43.	136.00	1.4666E-08
AS-76	75.	559.10	3.3709E-08
BR-82	14.	776.49	1.0539E-08
BR-83	26.	529.64	7.5164E-07
BR-84	20.	801.50	3.0765E-08
BR-85	10.	802.41	3.7003E-06
KR-85	53.	513.99	2.0404E-06
KR-85M	62.	151.10	1.3461E-08
SR-85	53.	513.99	1.2340E-08
RB-86	16.	1076.63	1.3174E-07
KR-87	33.	402.50	2.0711E-08
SR-87M	36.	300.40	1.1004E-08
KR-88	55.	196.32	3.7793E-08
RB-88	4.	1382.39	1.0060E-06
Y-88	3.	1036.01	7.9771E-09
KR-89	41.	220.90	3.4512E-07
RB-89	9.	1031.80	2.9664E-08
KR-90	29.	1110.69	5.0913E-06
RB-90	7.	831.69	2.2392E-07
RB-90M	12.	824.23	6.7565E-07
Y-90M	47.	202.51	9.4978E-09
SR-91	13.	1024.30	3.2695E-08
Y-91	13.	1204.90	3.7212E-06
Y-91M	26.	555.60	1.1999E-08
SR-92	8.	1383.94	1.2040E-08
Y-92	20.	934.46	9.1200E-08
CO-92	12.	500.00	3.7717E-08



## Minimum Detectable Activity Report (continued)

Page : 2

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV-2005 22:43:00

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/ML)
Y-93	39.	266.90	1.2615E-07
NE-94	23.	702.63	9.8513E-09
NE-95	16.	765.79	9.2451E-09
NE-95M	54.	235.69	3.8955E-08
ZR-95	11.	756.72	1.3958E-08
NE-97	11.	657.90	8.0452E-09
ZR-97	15.	743.36	8.9570E-09
MO-99	16.	739.58	6.8964E-08
TC-99M	75.	140.50	1.2732E-08
TC-101	46.	306.81	2.1595E-08
RU-103	28.	497.08	1.0174E-08
TC-104	31.	357.99	1.6387E-08
RH-105	40.	318.90	4.7497E-08
RU-105	17.	724.50	1.8883E-08
RU-106	25.	621.84	9.6047E-08
CD-109	43.	88.03	4.2641E-07
AG-110M	14.	937.48	2.9912E-08
SN-113	39.	391.69	1.4525E-08
SN-117M	49.	158.56	9.9731E-09
SB-122	20.	563.93	1.1545E-08
SB-124	28.	602.71	9.9530E-09
SB-125	36.	427.89	3.2370E-08
TE-125M	46.	109.28	3.9828E-06
TE-127	32.	417.90	9.0819E-07
TE-127M	39.	57.60	2.5536E-05
XE-127	47.	202.84	1.2731E-08
TE-129	28.	459.60	1.4444E-07
TE-129M	20.	695.88	2.7676E-07
XE-129M	59.	196.56	2.0160E-07
I-130	23.	536.09	8.7881E-09
BA-131	48.	123.80	3.3901E-08
I-131	39.	364.48	1.1438E-08
TE-131	60.	149.72	2.1217E-08
TE-131M	10.	773.67	1.9914E-08
XE-131M	40.	163.93	3.9970E-07
I-132	22.	667.69	1.0086E-08
TE-132	45.	228.16	1.0064E-08
BA-133	36.	302.84	4.7515E-08
BA-133M	42.	276.09	4.9787E-08
I-133	27.	529.07	1.0600E-08
TE-133M	27.	912.58	1.9024E-08
XE-133	32.	81.00	4.6472E-08
XE-133M	54.	233.22	9.4021E-08
CS-134	31.	604.70	1.0506E-08
TE-134	12.	884.09	1.7303E-08
TE-134	51.	210.47	5.3878E-08
BA-135M	37.	268.24	5.2544E-08
I-135	8.	1260.41	3.4473E-08
XE-135	51.	249.79	1.0818E-08
XE-135M	27.	526.56	2.1369E-08
CS-136	10.	818.50	8.0750E-09

## Minimum Detectable Activity Report (continued)

Page : 3

Sample ID : FERMI 1 EFF SAMP

Acquisition date : 21-NOV--2005 22:43:00

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/ML)
I-136	11.	1313.02	4.0155E-07
CS-137	16.	661.65	9.4524E-09
XE-137	26.	455.49	1.7898E-07
CS-138	5.	1435.86	1.4838E-08
XE-138	47.	258.31	5.9001E-08
BA-139	8.	1420.50	4.1624E-06
CE-139	51.	165.85	1.0816E-08
CS-139	11.	1283.23	4.2222E-07
BA-140	22.	537.32	3.3264E-08
LA-140	6.	1596.49	1.0301E-08
BA-141	69.	190.22	3.6002E-08
CE-141	60.	145.44	2.0131E-08
LA-141	9.	1354.52	4.1935E-07
BA-142	37.	255.12	1.1162E-07
LA-142	27.	641.17	2.1047E-08
CE-143	40.	293.26	2.1197E-08
CE-144	48.	133.54	8.5702E-08
PR-144	9.	1489.15	6.5785E-06
ND-147	40.	91.10	5.1106E-08
PM-148M	28.	550.27	1.0008E-08
EU-152	36.	344.27	3.3125E-08
EU-154	15.	1004.76	6.1754E-08
EU-156	24.	646.29	1.3277E-07
HF-181	33.	482.03	1.1634E-08
TA-182	8.	1221.42	3.3425E-08
W-187	21.	685.81	3.2078E-08
RE-188	40.	155.03	5.7671E-08
HG-203	45.	279.19	1.1902E-08
BI-207	23.	569.67	8.9549E-09
TL-208	33.	583.14	1.0665E-07
PE-212	55.	238.63	2.2274E-08
PE-214	84.	351.92	5.2083E-08
RA-224	55.	240.98	2.4841E-07
RA-226	57.	186.21	2.8120E-07
AC-228	41.	338.32	8.1647E-08
TH-228	48.	84.37	1.5195E-06
PA-234	54.	131.20	4.9632E-08
TH-234	44.	63.29	1.2925E-06
U-235	50.	143.76	8.6177E-08
NP-239	43.	106.13	4.9890E-08
AM-241	40.	59.54	1.9961E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-95092905

Sample Location (Well Number): EFT-95

1. Representative sample collected. Date/Time 09/29/2005 11200

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/29/2005 Collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / D. Hemmelle Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ros Baya / Ros Baya Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William K Lipton / William K Lipton Date: 1/9/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

Sample Information

1 . Sample Location EFT-9S092905  
 2 . Date Sampled 09/29/2005  
 3 . Time Sampled 12:00  
 4 . Sample Volume, (ml) 4 ml

Instrument Count Data

1 . Date Sample Counted 11/22/2005  
 2 . Time Sample Counted 00:10  
 3 . Background Inf.:  
 Minutes Counted 10 min.  
 Background Count Rate (cpm) 9.0 cpm  
 4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
 Gross Spike Count Rate (cpm) 3569.5 cpm  
 Net Spike Count Rate (cpm) 3560.5 cpm  
 H3 Spike Activity (dpm on count date) 8923.8 dpm  
 Counter Efficiency 0.3990 cpm/dpm  
 5 . Sample Info:  
 Sample Gross Count Rate (cpm) 8.3 cpm  
 Sample Count Time (min.) 10.0 min.  
 Net Sample Count Rate (cpm) 0.0 cpm  
 6 . Critical Level:  
 Critical Level Count Rate (cpm) 2.2 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-98092905

Sample Location (Well Number): EFT-98

1. Representative sample collected. Date/Time 09/29/2005 1 1623

Sample collected by: Joy Marie Slabick / Joy Marie Slabick Date: 09/29/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMEL / Daniel K Hemmel Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V Lipton / William V Lipton Date: 1/19/2006  
Fermi 2 RP Printed Name Signature

Sample number: EFT-95092905

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Abere 1. Andrew Date: 11/27/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton 1. William V. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No increased radioactive material detected,  
William V. Lipton 48651/1/9/2006

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EF1 EFT-98092905

Sample End Time: 29-SEP-2005 16:23:00.00

REMARKS No licensed radioactive material detected,  
William V. Jahn 48657 / 12/12/05

PERFORMED BY:

Andrew Stee  
SIGNATURE

REVIEWED BY:

William V. Jahn 48657 / 12/12/05  
SIGNATURE/DATE

Sample ID : EF1 EFT-98092905

Acquisition date : 27-NOV-2005 03:50:32

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EF1 EFT-98092905
Sample collection start date: 29-SEP-2005 16:23:00.00
Sample collection end date : 29-SEP-2005 16:23:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : PELL Operator: AKC

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 27-NOV-2005 03:50:32.77
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.10 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
KeV/channel : 5.00563E-01 Zero offset: 7.09322E-02
Daily cal date : 26-NOV-2005 20:43:06.33

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: 'emission list', 'H4C', 'BEG 11', 'PA 294', 'KLD'



7

Best-FIT Peak Search Report

It	Energy	Area	Skbgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	511.52	131	83	3.34	1022.01	1014	21	19.9		
0	559.14	50	39	1.82	1117.19	1108	14	30.0		
0	609.55	55	28	2.29	1217.97	1210	16	25.2		
0	1126.21	11	3	1.36	2251.07	2247	8	43.8		
0	1460.99	72	10	1.70	2920.21	2913	14	15.2		

~~Any Peak~~  
~~AJ 76~~  
~~Si 214~~  
~~K-40~~  
 My 12/10/2005

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	72	10.67*	2.300E+00	4.378E-07	4.378E-07	15.18

Flag: "\*" = Keyline

Total number of lines in spectrum 5  
Number of unidentified lines 0  
Number of lines tentatively identified by MID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.378E-07	4.378E-07	0.664E-07	15.19	
Total Activity :			4.378E-07	4.378E-07			
Grand Total Activity :			4.378E-07	4.378E-07			

Flags: "K" = Keyline not found "M" = Manually accepted  
"E" = Manually edited "G" = Nuclide specific abn. limit

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	767.47	511.00*	193.46	1.000E+35	19.94	Decay
			% Abundances Found = 100.00				
AS-76	26.32H	53.33	559.10*	44.70	4.401E+08	30.04	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.84	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
			% Abundances Found = 73.70				
Y-92	3.54H	396.53	448.50	2.30	----	Not Found	---- Decay, Abun.
			561.10	2.40	1.000E+35	30.04	
			844.30	1.25	----	Not Found	----
			934.46*	13.90	----	Not Found	----
			1405.40	4.80	----	Not Found	----
			% Abundances Found = 9.74				
RU-103	39.35D	1.49	497.08*	89.00	----	Not Found	---- Abun.
			610.33	5.60	9.991E-07	25.23	
			% Abundances Found = 5.92				
TE-131M	30.00H	46.79	102.06	7.90	----	Not Found	---- Decay, Abun.
			149.72	5.10	----	Not Found	----
			200.63	7.56	----	Not Found	----
			240.93	7.59	----	Not Found	----
			334.27	9.60	----	Not Found	----
			773.67*	38.20	----	Not Found	----
			782.49	7.79	----	Not Found	----
			793.75	13.90	----	Not Found	----
			822.70	6.12	----	Not Found	----
			852.21	20.70	----	Not Found	----
			1125.46	11.40	6.388E+06	43.78	
			1206.60	9.00	----	Not Found	----
			% Abundances Found = 7.83				
XE-135	9.11H	154.08	249.79*	89.90	----	Not Found	---- Decay, Abun.
			600.19	2.89	1.000E+35	25.23	
			% Abundances Found = 3.11				
PM-140M	41.30D	1.42	200.11	12.56	----	Not Found	---- Abun.
			414.07	10.66	----	Not Found	----
			432.78	5.35	----	Not Found	----

Slide	Half-life	Ratio	Energy	%Abund	Activity 1-Sigma (uCi/cc)	%Error	Rejected by
-148M	41.30D	1.42	501.26	6.75	---	---	Abun.
			550.27*	94.90	---	---	
			599.74	12.54	---	---	
			611.26	5.48	9.725E-07	25.23	
			629.97	89.00	---	---	
			725.70	32.80	---	---	
			915.33	17.17	---	---	
			1013.01	20.30	---	---	
% Abundances Found =				1.74			
DI 214	19.90M	423E.29	609.31*	46.30	1.000E+35	25.23	Decay
			768.36	5.04	---	---	
			934.06	3.21	---	---	
			1120.29	15.10	---	---	
			1238.11	5.94	---	---	
			1377.67	4.11	---	---	
			1764.49	15.80	---	---	
% Abundances Found =				48.48	(Abn. Limit =	48.48%)	

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EF1 EFT-95092905

Page : 6  
Acquisition date : 27-NOV-2005 03:50:32

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	511.52	131	83	3.84	1022.01	1014	21	7.25E-02	19.9	4.40E+00	T
0	559.14	50	39	1.82	1117.19	1108	14	2.77E-02	30.0	4.31E+00	T
0	609.55	55	28	2.29	1217.97	1210	16	3.07E-02	25.2	4.16E+00	T
0	1126.21	11	3	1.36	2251.07	2247	8	5.95E-03	43.8	2.69E+00	T

Flags: "T" = Tentatively associated

\*\*\*\*\*  
 \* Sample ID : EF1 EFT-95092905  
 \*\*\*\*\*

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	22.	477.59	1.6465E-07
F-18	0.	511.00	Half-Life too short
NA-22	6.	1274.54	9.9513E-09
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	10.	889.25	1.3960E-08
CR-51	41.	320.08	4.0062E-07
MN-54	11.	834.83	9.6330E-09
CO-56	15.	1238.25	3.0649E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	42.	158.38	6.2732E-06
CO-57	54.	122.06	1.4365E-08
CO-58	25.	810.76	2.1075E-08
FE-59	11.	1099.22	4.4696E-08
CO-60	8.	1332.49	1.0071E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
NI-65	16.	1115.52	2.7771E-08
SM-69M	0.	438.63	Half-Life too short
SE-75	46.	136.00	2.1239E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	601.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	46.	513.99	2.7017E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	46.	513.99	2.1643E-08
RB-86	13.	1076.63	1.0490E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	368.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	3.	1836.01	1.1657E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	15.	1204.90	7.9471E-06
Y-91M	0.	555.60	Half-Life too short
Y-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EF1 EFT-98092905

Acquisition date : 27-NOV-2005 03:50:32

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	16.	702.63	8.3531E-09
NB-95	14.	765.79	2.7832E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	24.	756.72	3.6922E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	386.81	Half-Life too short
RU-103	21.	497.98	2.4939E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	20.	621.84	9.7154E-08
CD-109	47.	88.03	4.8130E-07
AG-110M	15.	937.48	3.7113E-08
SN-113	36.	391.69	2.0057E-08
SN-117M	42.	158.56	1.8364E-07
SB-122	0.	563.93	Half-Life too short
SB-124	25.	602.71	1.8634E-08
SB-125	25.	427.89	2.8367E-08
TE-125M	38.	109.28	7.3265E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	31.	57.60	3.3647E-05
XE-127	52.	202.84	4.0688E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	16.	695.88	8.5639E-07
XE-129M	57.	196.56	1.8872E-05
I-130	0.	536.09	Half-Life too short
BA-131	56.	123.80	1.1317E-06
I-131	37.	364.48	1.7349E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	53.	163.93	1.3980E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	35.	302.84	4.7771E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	27.	604.70	1.0441E-08
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short



Sample ID : EF1 EFT-98892985

Acquisition date : 27-NOV-2005 03:50:32

Slide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	17.	818.50	2.2198E-07
I-136	0.	1313.02	Half-Life too short
CS-137	22.	661.65	1.0929E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	49.	165.85	1.4252E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	25.	537.32	8.5611E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	198.22	Half-Life too short
CE-141	62.	145.44	7.1038E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	46.	133.54	9.7010E-08
PR-144	0.	1409.15	Half-Life too short
ND-147	42.	91.10	2.0780E-06
PM-148M	26.	550.27	2.5503E-08
EU-152	34.	344.27	3.2463E-08
EU-154	8.	1004.76	4.7550E-08
EU-156	25.	646.29	1.9567E-06
F-181	18.	482.03	2.2819E-08
TA-182	12.	1221.42	5.8121E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HO-203	47.	279.19	2.0870E-08
BI-207	25.	569.67	9.3394E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	48.	186.21	2.6108E-07
AC-228	39.	338.32	8.1442E-08
TH-228	37.	84.37	1.4292E-06
PA-234	0.	131.20	Half-Life too short
TH-234	32.	63.29	6.0500E-06
U-235	52.	143.76	8.7403E-08
NP-239	0.	106.13	Half-Life too short
AM-241	26.	59.54	1.6480E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-10S092905

Sample Location (Well Number): EFT-10S

1. Representative sample collected. Date/Time 09/29/2005 1 1418

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/29/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HENEMELE / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: [Signature] / [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 Signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / [Signature] Date: [Signature] 1/19/2006  
Fermi 2 Printed Name Signature 12/19/2005  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-10S092905
2. Date Sampled	09/29/2005
3. Time Sampled	14:18
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	11/22/2005
2. Time Sample Counted	00:10
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	9.0 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	8923.8 dpm
Counter Efficiency	0.3990 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	8.3 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.2 cpm

**Minimum Detectable Activity**

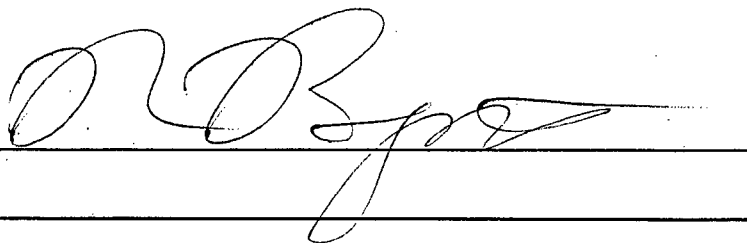
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician



Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-10S092905

Sample Location (Well Number): EFT-10S

1. Representative sample collected. Date/Time 09/29/2005 1 14/8

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/29/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMELE / [Signature] Date: SEALED 11/18/05  
Printed Name / Signature DATED 1/2/06 DWY

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 RP Printed Name Signature

Sample number: EFT-10S092905

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Albers | Andrew Stine Date: 11/27/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton | William V. Lipton Date: 1/19/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 48651 1/19/06  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EF1 EFT 10S092905

Sample End Time: 29-SEP-2005 14:18:00.00

REMARKS No licensed radioactive material detected,  
William V. Lipton 48651 / 10/27/05

PERFORMED BY:

Andrew Gere

SIGNATURE

REVIEWED BY:

William V. Lipton 48651 / 10/27/05

SIGNATURE/DATE

Sample ID : EF1 EFT 10609290

Acquisition date : 27-NOV-2005 04:36:59

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EF1 EFT 106092905
Sample collection start date: 29-SEP-2005 14:10:00.00
Sample collection end date : 29-SEP-2005 14:10:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : MELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 27-NOV-2005 04:36:59.77
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.11 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00563E-01 Zero offset: 7.09322E-02
Daily cal date : 26-NOV-2005 20:43:06.33

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, xErr, Fit. Contains 6 rows of peak data. Includes handwritten notes on the right side.

7

at-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	66.84	36	42	1.67	133.37	130	8	36.1		<i>Th-232</i>
0	351.89	41	35	1.90	702.97	697	10	31.2		<i>Pb-214</i>
0	518.83	104	95	2.42	1020.62	1012	18	24.1		<i>Rn-222</i>
0	559.06	61	42	1.86	1117.05	1110	14	25.7		<i>As-76</i>
0	609.61	51	26	1.13	1218.08	1214	11	23.8		<i>Bi-214</i>
0	1461.14	82	12	1.98	2921.10	2912	16	14.6		<i>K-40</i>

*Th-232*  
*Pb-214*  
*Rn-222*  
*As-76*  
*Bi-214*  
*K-40*  
 my 1/11/2005



Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected	Decay Corr	1-Sigma
					uCi/cc	uCi/cc	%Error
K-40	1460.81	82	10.67*	2.305E+00	4.981E-07	4.981E-07	14.59

Flag: "\*" = Keyline

Summary of Nuclide Activity  
Sample ID : EF1 EFT 10009290

Page : 3  
Acquisition date : 27-NOV-2005 04:36:59

Total number of lines in spectrum 6  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 6 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.981E-07	4.981E-07	8.727E-07	14.59	
Total Activity :			4.981E-07	4.981E-07			

Grand Total Activity : 4.981E-07 4.981E-07

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	769.04	511.00*	100.00	1.000E+35	24.05	Decay
% Abundances Found = 100.00							
SE-75	119.78D	0.49	66.05	1.02	5.452E-06	36.10	Abun.
			96.73	3.41	----	Not Found	----
			121.12	16.70	----	Not Found	----
			136.00*	59.20	----	Not Found	----
			198.60	1.45	----	Not Found	----
			264.65	59.80	----	Not Found	----
			279.53	25.20	----	Not Found	----
			303.91	1.32	----	Not Found	----
			400.65	11.40	----	Not Found	----
% Abundances Found = 0.57							
AS-76	26.32H	53.44	559.10*	44.70	5.855E+08	25.74	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.07	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.04	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found = 73.70							
RU-103	39.35D	1.49	497.08*	89.00	----	Not Found	Abun.
			610.33	5.60	9.161E-07	23.78	
% Abundances Found = 5.92							
XE-135	9.11H	154.40	249.79*	89.90	----	Not Found	Decay, Abun.
			600.19	2.89	1.000E+35	23.78	
% Abundances Found = 3.11							
CS-136	13.16D	4.45	66.91	12.50	6.944E-06	36.10	Abun.
			86.29	6.30	----	Not Found	----
			153.22	7.46	----	Not Found	----
			163.89	4.61	----	Not Found	----
			176.55	13.56	----	Not Found	----
			273.65	12.66	----	Not Found	----
			340.57	48.50	----	Not Found	----
			818.50*	99.70	----	Not Found	----
			1048.07	79.60	----	Not Found	----
			1235.34	19.70	----	Not Found	----
% Abundances Found = 4.10							
PM-148M	41.30D	1.42	288.11	12.56	----	Not Found	Abun.

Isotope	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
PM-148M	41.30D	1.42	414.07	18.66	----	Not Found	----	Abun.
			432.78	5.35	----	Not Found	----	
			501.26	6.75	----	Not Found	----	
			550.27*	94.90	----	Not Found	----	
			599.74	12.54	----	Not Found	----	
			611.26	5.48	8.916E-07	23.78		
			629.97	29.00	----	Not Found	----	
			725.78	32.80	----	Not Found	----	
			915.33	17.17	----	Not Found	----	
			1813.81	20.39	----	Not Found	----	
% Abundances Found =			1.74					
TA-182	114.74D	0.51	67.75	42.30	1.334E-07	36.10	Abun.	
			100.10	14.10	----	Not Found		----
			1109.05	16.30	----	Not Found		----
			1221.42*	27.10	----	Not Found		----
			1230.97	11.50	----	Not Found		----
			% Abundances Found =			38.01		
BI-214	19.90M	4240.90	609.31*	46.30	1.000E+35	23.78	Decay	
			768.36	5.04	----	Not Found		----
			934.06	3.21	----	Not Found		----
			1120.29	15.10	----	Not Found		----
			1238.11	5.94	----	Not Found		----
			1377.67	4.11	----	Not Found		----
			1764.49	15.80	----	Not Found		----
% Abundances Found =			48.48	(Abn. Limit = 48.48%)				
PB-214	26.80M	3149.03	87.30	4.67	----	Not Found	Decay	
			241.98	7.49	----	Not Found		----
			295.21	19.20	----	Not Found		----
			351.92*	37.20	1.000E+35	31.22		
			785.91	1.10	----	Not Found		----
% Abundances Found =			53.40	(Abn. Limit = 37.20%)				

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EF1 EFT 10009290

Page : 6  
Acquisition date : 27-NOV-2005 04:36:59

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	66.84	36	42	1.67	133.37	130	8	1.90E-02	36.1	1.35E+00	T
0	351.09	41	35	1.90	782.97	697	10	2.28E-02	31.2	5.19E+00	T
0	510.83	104	95	2.42	1020.62	1012	18	5.77E-02	24.1	4.49E+00	T
0	559.06	61	42	1.86	1117.05	1110	14	3.41E-02	25.7	4.31E+00	T
0	609.61	51	26	1.13	1218.08	1214	11	2.81E-02	23.9	4.16E+00	T

Flags: "T" = Tentatively associated

Sample ID : EF1 EFT 100092905

Minimum Detectable Activity Report

Nuclide	Rekgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	19.	477.59	1.5434E-07
F-18	0.	511.00	Half-Life too short
NA-22	5.	1274.54	0.4664E-09
NO-24	0.	1360.53	Half-Life too short
NO-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	21.	989.25	1.9621E-08
CR-51	33.	320.00	3.6280E-07
MN-54	15.	834.83	1.1100E-08
CO-56	25.	1238.25	3.8396E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	52.	158.38	6.9902E-06
CO-57	53.	122.06	1.4144E-08
CO-58	10.	810.76	1.3970E-08
FE-59	14.	1099.22	4.9033E-08
CO-60	17.	1332.49	1.3861E-08
CU-64	0.	1345.90	Half-Life too short
ZN-65	0.	1481.84	Half-Life too short
ZN-65	10.	1115.52	2.2200E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	64.	136.00	2.4712E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	52.	513.99	2.8537E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	52.	513.99	2.2890E-08
RB-86	15.	1076.63	1.1240E-06
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	308.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1302.39	Half-Life too short
Y-88	4.	1036.01	1.3010E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.00	Half-Life too short
KR-90	0.	1110.69	Half-Life too short
RB-90	0.	831.67	Half-Life too short
RB-90M	0.	824.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	13.	1204.90	7.5120E-06
SR-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EF1 EFT 10809290

Acquisition date : 27-NOV-2005 04:36:59

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.20	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	16.	702.63	8.4849E-09
NB-95	19.	765.79	3.1553E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	26.	756.72	3.8749E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	9.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.01	Half-Life too short
RJ-103	26.	497.00	2.7525E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RJ-105	0.	724.50	Half-Life too short
RJ-106	19.	621.04	9.5235E-08
CD-109	46.	88.03	4.7696E-07
AG-110M	12.	937.40	3.3910E-08
SN-113	32.	391.69	1.8884E-08
SN-117M	54.	150.56	2.0761E-07
SB-122	0.	563.93	Half-Life too short
SB-124	29.	602.71	1.9866E-08
SB-125	23.	427.09	2.7632E-08
TE-125M	41.	109.20	7.5025E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	20.	57.60	2.7460E-05
XE-127	53.	202.04	4.0902E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	10.	695.00	0.9909E-07
XE-129M	66.	196.56	2.0401E-05
I-130	0.	536.09	Half-Life too short
BA-131	34.	123.00	9.1004E-07
I-131	30.	364.40	1.7505E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	62.	163.93	1.5049E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	45.	302.04	5.3042E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	20.	604.70	1.0701E-08
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

## Minimum Detectable Activity Report (continued)

Page : 3

Sample ID : EF1 EFT 10809290

Acquisition date : 27-NOV-2005 04:36:59

Isotope	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	10.	810.50	2.2745E-07
I-136	0.	1313.02	Half-Life too short
CS-137	22.	661.65	1.0834E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	52.	165.85	1.4605E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	15.	537.32	6.7920E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	52.	145.44	6.5600E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	45.	133.54	9.6191E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	45.	91.10	2.1685E-06
PM-148M	26.	550.27	2.5531E-08
EU-152	35.	344.27	3.2965E-08
EU-154	11.	1004.76	5.4431E-08
U-156	15.	646.29	1.5640E-06
-101	24.	482.03	2.6367E-08
-102	8.	1221.42	4.9186E-08
w 07	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	47.	279.19	2.0997E-08
BI-207	19.	569.67	8.2573E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	605.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	69.	186.21	3.0757E-07
AC-228	38.	338.32	7.9772E-08
TH-228	31.	84.37	1.3033E-06
PA-234	0.	131.20	Half-Life too short
TH-234	39.	63.29	6.6106E-06
U-235	59.	143.76	9.2844E-08
NP-239	0.	106.13	Half-Life too short
AM-241	25.	59.54	1.6166E-07



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG-NTC 092105

Sample Location (Well Number): BKG-NTC

1. Representative sample collected. Date/Time 09/21/2005 1 1812

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/21/2005 collected  
Printed Name / Signature 12/29/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. HEMMELE / [Signature] Date: 11/19/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-6 signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: [Signature] Date: 1/19/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location	BKG-NTC 092105
2. Date Sampled	09/21/2005
3. Time Sampled	18:12
4. Sample Volume, (ml)	4

Instrument Count Data

1. Date Sample Counted	11/22/2005
2. Time Sample Counted	00:10
3. Background Inf.:	
Minutes Counted	10
Background Count Rate (cpm)	19.0
4. Efficiency Inf.:	(Daily Spike Source ID # 111)
Gross Spike Count Rate (cpm)	3569.5
Net Spike Count Rate (cpm)	3560.5
H3 Spike Activity (dpm on count date)	89238
Counter Efficiency	0.3990
5. Sample Info:	
Sample Gross Count Rate (cpm)	27.5
Sample Count Time (min.)	10:0
Net Sample Count Rate (cpm)	10:0
6. Critical Level:	
Critical Level Count Rate (cpm)	02:2

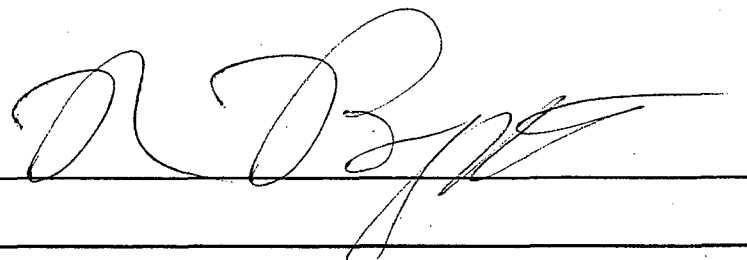
Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.25\text{E}06 \text{ uCi/ml}$$

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date **NOV 23 2005**

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BKG - NTC 092105

Sample Location (Well Number): BKG - NTC

1. Representative sample collected. Date/Time 09/21/2005 11812

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/21/2005 collected  
Printed Name / Signature Date: 12/14/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMEL / Daniel K Hemmel Date: 11/13/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: A. Carlos Garcia / ACG Date: 11/22/05  
Fermi 2 RP Printed Name Signature Date: 11/26

William K. Carter / William K. Carter 11/13/2006

Sample number: BKG - NTC092105

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: G. GWIN-GARCIA / [Signature] Date: 1/22/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton, William V. Lipton Date: 1/13/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: BKG-NTC092105

Sample End Time: 22-NOV-2005 04:46:00.00

REMARKS

*PASSED.*

*No licensed radioactive material detected,*

*Melvin V. J. [unclear] 48051*

*10/10/05*

PERFORMED BY:

SIGNATURE

REVIEWED BY:

*Melvin V. J. [unclear] 48051/10/10/05*

SIGNATURE/DATE

Sample ID : BKG-NTC092105

Acquisition date : 22-NOV-2005 04:46:24

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: BKG-NTC092105
Sample collection start date: 22-NOV-2005 04:46:00.00
Sample collection end date : 22-NOV-2005 04:46:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : MALL Operator: GCG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 22-NOV-2005 04:46:24.43
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.14 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
KeV/channel : 5.00489E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.02

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: 'gamma hitation', '21-11-05', 'GCG'

Sample Title : BK6-NTC092105  
Decay Time = 0 00:00:24.43

Page : 1  
Acquisition Time = 22-NOV-2005 04:46:24.4

3

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	511.38	110	78	2.23	1022.08	1015	14	19.8		F-18
0	558.91	54	29	1.67	1117.10	1111	11	24.0		As-76
0	609.94	50	42	1.84	1219.15	1210	14	31.1		Bi-214
0	1460.73	89	4	1.27	2921.20	2912	18	12.0		K-40
0	1764.76	29	4	1.71	3529.85	3522	14	23.0		Bi-214

*my 12/10/05*

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
F-18	511.00	110	193.46*	4.484E+00	1.096E-00	2.087E-00	19.70

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	09	10.67*	2.300E+00	5.404E-07	5.404E-07	12.01
BI-214	609.31	50	46.30*	4.161E+00	3.870E-00	6.320E-00	31.14
	768.36	-----	5.04	3.461E+00	-----	Line Not Found	-----
	934.06	-----	3.21	2.912E+00	-----	Line Not Found	-----
	1120.29	-----	15.10	2.695E+00	-----	Line Not Found	-----
	1238.11	-----	5.94	2.540E+00	-----	Line Not Found	-----
	1377.67	-----	4.11	2.302E+00	-----	Line Not Found	-----
	1764.49	29	15.00	2.003E+00	1.337E-07	2.106E-07	22.96

Flag: "\*" = Keyline



Total number of lines in spectrum 5  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma XError	Flags
F-18	109.74M	1.10	1.896E-08	2.087E-08	0.413E-08	19.78	
Total Activity :			1.896E-08	2.087E-08			

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma XError	Flags
K-40	1.00E+05Y	1.00	5.404E-07	5.404E-07	0.649E-07	12.01	
BI-214	19.90M	1.64	3.870E-08	6.328E-08	1.970E-08	31.14	A
Total Activity :			5.791E-07	6.037E-07			

Grand Total Activity : 5.980E-07 6.245E-07

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by	
AS-76	26.32H	0.01	559.10*	44.70	4.213E-08	24.01	Abun.	
			563.23	1.17	----	Not Found	----	
			571.30	0.14	----	Not Found	----	
			657.03	6.10	----	Not Found	----	
			665.31	0.39	----	Not Found	----	
			740.12	0.12	----	Not Found	----	
			771.76	0.12	----	Not Found	----	
			867.63	0.12	----	Not Found	----	
			1129.07	0.14	----	Not Found	----	
			1212.72	1.63	----	Not Found	----	
			1216.02	3.04	----	Not Found	----	
			1228.52	1.39	----	Not Found	----	
			1439.13	0.33	----	Not Found	----	
			1453.60	0.13	----	Not Found	----	
			1787.67	0.33	----	Not Found	----	
% Abundances Found =				73.70				
RU-103	39.35D	0.00	497.00*	89.00	----	Not Found	Abun.	
			610.33	5.60	3.200E-07	31.14		
% Abundances Found =				5.92				
XE-135	9.11H	0.03	249.79*	89.90	----	Not Found	Abun.	
			608.19	2.09	6.322E-07	31.14		
% Abundances Found =				3.11				
PM-148M	41.30D	0.00	288.11	12.56	----	Not Found	Abun.	
			414.07	18.66	----	Not Found	----	
			432.78	5.35	----	Not Found	----	
			501.26	6.75	----	Not Found	----	
			550.27*	94.90	----	Not Found	----	
			599.74	12.54	----	Not Found	----	
			611.26	5.48	3.270E-07	31.14		
			629.97	89.00	----	Not Found	----	
			725.70	32.80	----	Not Found	----	
			915.33	17.17	----	Not Found	----	
% Abundances Found =				1.74				

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
	550.91	54	29	1.67	1117.10	1111	11	2.90E-02	24.0	4.31E+00	T

Flags: "T" = Tentatively associated

\* Sample ID : BKG-NTC092105 \*

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	30.	477.59	8.7349E-08
NA-22	9.	1274.54	1.0235E-08
NA-24	7.	1368.53	9.6501E-09
MG-27	16.	1014.44	1.0305E-07
CL-38	1.	1642.42	2.2230E-08
AR-41	8.	1293.64	1.0585E-08
SD-46	14.	889.25	1.0162E-08
CR-51	29.	320.08	7.9312E-08
MN-54	23.	834.83	1.1765E-08
CO-56	23.	1230.25	2.2023E-08
MN-56	8.	1810.69	4.4861E-08
NI-56	64.	150.38	9.9229E-09
CO-57	51.	122.06	1.2026E-08
CO-58	20.	810.76	1.0881E-08
FE-59	9.	1099.22	1.5972E-08
CO-60	12.	1332.49	1.1448E-08
CU-64	8.	1345.90	3.2285E-06
NI-65	6.	1481.84	4.3041E-08
ZN-65	10.	1115.52	1.0817E-08
ZN-69M	38.	430.63	1.0507E-08
SE-75	50.	136.00	1.5718E-08
AS-76	69.	559.10	3.2411E-08
BR-82	19.	776.49	1.2208E-08
BR-83	10.	529.64	6.3609E-07
BR-84	21.	881.50	3.8841E-08
BR-85	20.	802.41	3.3559E-06
KR-85	49.	513.99	2.7494E-06
KR-85M	56.	151.18	1.2882E-08
SR-85	49.	513.99	1.1911E-08
RB-86	11.	1076.63	1.1371E-07
KR-87	32.	402.58	2.0112E-08
SR-87M	43.	388.40	1.2739E-08
KR-88	53.	196.32	3.7054E-08
RB-88	10.	1382.39	2.5830E-06
Y-88	3.	1836.01	8.0738E-09
KR-89	43.	220.90	3.0774E-07
RB-89	16.	1031.88	3.6192E-08
KR-90	20.	1118.69	2.3229E-06
RB-90	18.	831.69	2.0224E-07
RB-90M	24.	824.23	8.2825E-07
Y-90M	41.	202.51	8.9176E-09
SR-91	12.	1024.30	3.2094E-08
Y-91	16.	1204.90	4.0930E-06
Y-91M	27.	555.60	1.2099E-08
SR-92	8.	1383.94	1.2024E-08
Y-92	21.	934.46	9.4500E-08
SR-93	13.	590.28	3.2193E-08

Sample ID : BKG-NTC092105

Acquisition date : 22-NOV-2005 04:46:24

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
Y-93	36.	266.90	1.2114E-07
NB-94	16.	702.63	8.4845E-09
NB-95	22.	765.79	1.0654E-08
NB-95M	49.	235.69	3.7055E-08
ZR-95	10.	756.72	1.7322E-08
NB-97	15.	657.90	9.0910E-09
ZR-97	10.	743.36	7.6880E-09
MG-99	16.	739.58	6.9337E-08
TC-99M	57.	140.50	1.1177E-08
TC-101	36.	306.81	1.8684E-08
RU-103	22.	497.08	9.1448E-09
TC-104	41.	357.99	1.8061E-08
RH-105	31.	318.90	4.1859E-08
RU-105	16.	724.50	1.8276E-08
RU-106	25.	621.84	9.6286E-08
CD-109	30.	80.03	3.9952E-07
AG-110M	17.	937.40	3.2898E-08
SN-113	34.	391.69	1.3653E-08
SN-117M	64.	158.56	1.1330E-08
SB-122	20.	563.93	1.1741E-08
SB-124	24.	602.71	9.3172E-09
SB-125	27.	427.89	2.8298E-08
TE-125M	43.	109.28	3.8840E-06
TE-127	35.	417.90	9.5325E-07
TE-127M	27.	57.60	2.1611E-05
TE-127	39.	202.84	1.1713E-08
TE-129	41.	459.60	1.6929E-07
TE-129M	21.	695.88	2.8536E-07
XE-129M	54.	196.56	1.9299E-07
I-130	20.	536.09	8.2974E-09
BA-131	36.	123.80	2.9852E-08
I-131	33.	364.48	1.0576E-08
TE-131	52.	149.72	1.9520E-08
TE-131M	10.	773.67	2.5603E-08
XE-131M	46.	163.93	4.2530E-07
I-132	23.	667.69	1.0216E-08
TE-132	51.	228.16	1.0691E-08
BA-133	45.	302.84	5.2783E-08
BA-133M	57.	276.09	5.6943E-08
I-133	19.	529.87	9.0525E-09
TE-133M	19.	912.58	1.6274E-08
XE-133	32.	81.00	4.6414E-08
XE-133M	51.	233.22	9.1665E-08
CS-134	20.	604.70	8.6326E-09
I-134	18.	884.09	2.0906E-08
TE-134	51.	210.47	5.3205E-08
BA-135M	45.	268.24	5.7114E-08
I-135	13.	1260.41	4.1733E-08
XE-135	52.	249.79	1.0929E-08
XE-135M	20.	526.56	1.8211E-08
I-136	16.	818.50	9.9170E-09

Sample ID : BKG-NTC092105

Acquisition date : 22-NOV-2005 04:46:24

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
I-136	7.	1313.02	2.3897E-07
CS-137	17.	661.65	9.6380E-09
XE-137	27.	455.49	1.6191E-07
CS-138	6.	1435.86	1.6206E-08
XE-138	47.	258.31	5.7267E-08
BA-139	9.	1420.50	4.3219E-06
CE-139	46.	165.85	1.0357E-08
CS-139	18.	1283.23	3.0483E-07
BA-140	16.	537.32	2.8865E-08
LA-140	5.	1596.49	9.4060E-09
BA-141	52.	190.22	3.0993E-08
CE-141	52.	145.44	1.8774E-08
LA-141	7.	1354.52	3.6763E-07
BA-142	47.	255.12	1.2003E-07
LA-142	20.	641.17	1.8583E-08
CE-143	44.	293.26	2.2015E-08
CE-144	45.	133.54	8.2850E-08
PR-144	6.	1489.15	5.2999E-06
ND-147	33.	91.10	4.6609E-08
PM-148M	25.	550.27	9.4834E-09
EU-152	50.	344.27	3.8780E-08
EU-154	15.	1004.76	6.1111E-08
EU-156	18.	646.29	1.1565E-07
HF-181	33.	482.03	1.1569E-08
TA-182	7.	1221.42	3.1441E-08
W-187	15.	685.81	2.7698E-08
RE-188	49.	155.03	5.8180E-08
HG-203	55.	279.19	1.3026E-08
BI-207	21.	569.67	8.5968E-09
TL-208	23.	583.14	7.8818E-08
PB-212	67.	238.63	2.4567E-08
PB-214	51.	351.92	4.0728E-08
RA-224	66.	240.98	2.7028E-07
RA-226	54.	186.21	2.7552E-07
AC-228	35.	338.32	7.5866E-08
TH-228	51.	84.37	1.5575E-06
PA-234	40.	131.20	4.3211E-08
TH-234	42.	63.29	1.2689E-06
U-235	57.	143.76	9.0821E-08
NP-239	47.	106.13	5.1943E-08
AM-241	33.	59.54	1.8346E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG-RANGE 092105

Sample Location (Well Number): BKG-RANGE

1. Representative sample collected. Date/Time 09/21/2005 / 1704

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/21/2005 collected  
Printed Name / Signature 12/29/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMEL / Daniel K Hemmel Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: R. Bunge / R. Bunge Date: 11-23-05 analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-6 Signed.

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location	BKG-RANGE 092105
2. Date Sampled	09/21/2005
3. Time Sampled	17:04
4. Sample Volume, (ml)	4

Instrument Count Data

1. Date Sample Counted	11/22/2005
2. Time Sample Counted	00:10
3. Background Inf.:	
Minutes Counted	10.0 min.
Background Count Rate (cpm)	9.0 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3569.5 cpm
Net Spike Count Rate (cpm)	3560.5 cpm
H3 Spike Activity (dpm on count date)	89238 dpm
Counter Efficiency	0.3990 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.1 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.2 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician

Date **NOV 23 2005**



## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BK4 - RANGE 092105

Sample Location (Well Number): BK4 - RANGE

1. Representative sample collected. Date/Time 09/21/2005 1 1704

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 09/21/2005 collected  
Printed Name / Signature 12/14/2005 Signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: Daniel K Henneke / Dan Henneke Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: G. Castro Garcia / G. Castro Garcia Date: 11/22/05  
Fermi 2 RP Printed Name Signature

William V. Lipton / William V. Lipton 11/3/2006

Sample number: BK6-RANGE 092505 1 m 1/13/06

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: G. COLVIN-GARCIA / [Signature] Date: 1/12/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 1/13/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: BKG-RANGE092105

Sample End Time: 22-NOV-2005 05:17:00.00

REMARKS Co-60 IDENTIFIED - FAILED.

only one Co-60 peak found - not key line -  
Percent indicates

William V. Jtm 48451 / 12/2/005  
Percent - no licensed radioactive material detected  
William V. Jtm 48451 / 12/2/005

PERFORMED BY:  
[Signature]  
SIGNATURE

REVIEWED BY:  
William V. Jtm 48451 / 12/2/005  
SIGNATURE/DATE

Sample ID : EKG-RANGE092105

Acquisition date : 22-NOV-2005 05:17:35

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EKG-RANGE092105
Sample collection start date: 22-NOV-2005 05:17:00.00
Sample collection end date : 22-NOV-2005 05:17:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : M2LL Operator: GCG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 22-NOV-2005 05:17:35.42
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.15 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.0
Key/channel : 5.00409E-01 Zero offset: -2.63429E-04
Daily cal date : 21-NOV-2005 16:30:29.02

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m2ll Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 4 rows of peak data.

Handwritten notes: amthilapn, Ho, 6-6c, 1440

Peak-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	511.12	133	88	2.93	1021.55	1013	19	18.9		F-18
0	558.11	74	23	1.89	1115.50	1107	15	18.1		
0	1172.77	28	7	1.37	2344.91	2337	15	28.4		CO-60
0	1461.23	89	7	1.83	2922.20	2915	14	12.3		K-40

Handwritten notes: a vertical line grouping the first two rows, and a signature 'my (D) [unclear]' next to the last two rows.

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
F-18	511.00	133	193.46*	4.485E+00	2.293E-08	2.527E-08	18.90
CO-60	1173.22	28	100.00	2.639E+00	1.592E-08	1.592E-08	28.40
	1332.49	-----	100.00*	2.426E+00	-----	Line Not Found	-----

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	89	10.67*	2.308E+00	5.432E-07	5.432E-07	12.32

Flag: "\*" = Keyline

Total number of lines in spectrum 4  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
F-18	109.74M	1.10	2.293E-08	2.527E-08	0.477E-08	18.90	
CD-60	5.27Y	1.00	1.592E-08	1.592E-08	0.452E-08	28.40	KA
Total Activity :			3.885E-08	4.118E-08			

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.432E-07	5.432E-07	0.669E-07	12.32	
Total Activity :			5.432E-07	5.432E-07			

Grand Total Activity : 5.821E-07 5.844E-07

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

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

Sample ID : BKG-RANGE092105

Acquisition date : 22-NOV-2005 05:17:35

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
AS-76	26.32H	0.01	559.10*	44.70	5.821E-08	18.14	Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.84	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found =			73.70				

Flag: "\*" = Keyline



Unidentified Energy Lines  
Sample ID : BKG-RANGE092105

Page : 5  
Acquisition date : 22-NOV-2005 05:17:35

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	558.11	74	23	1.89	1115.50	1107	15	4.12E-02	18.1	4.31E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	7.8140E-08
NA-22	7.	1274.54	8.9757E-09
NA-24	8.	1368.53	1.0104E-08
MG-27	8.	1014.44	7.8181E-08
CL-38	10.	1642.42	4.9541E-08
AR-41	15.	1293.64	1.3827E-08
SC-46	15.	889.25	1.0464E-08
CR-51	40.	320.00	9.2079E-08
MN-54	22.	834.83	1.1531E-08
CO-56	16.	1238.25	1.8647E-08
MN-56	2.	1010.69	2.6712E-08
NI-56	49.	158.38	8.7418E-09
CO-57	42.	122.06	1.0928E-08
CO-58	13.	810.76	9.0603E-09
FE-59	7.	1099.22	1.4372E-08
CU-64	12.	1345.90	3.8806E-06
NI-65	6.	1481.84	4.2197E-08
ZN-65	7.	1115.52	1.6132E-08
ZN-69M	21.	438.63	8.0906E-09
SE-75	48.	136.00	1.5348E-08
AS-76	67.	559.10	3.1935E-08
BR-82	13.	776.49	1.0282E-08
BR-83	27.	529.64	7.5443E-07
BR-84	16.	881.50	3.4626E-08
BR-85	26.	802.41	3.9348E-06
KR-85	54.	513.99	2.8769E-06
KR-85M	44.	151.18	1.1439E-08
SR-85	54.	513.99	1.2463E-08
RB-86	7.	1076.63	9.1395E-08
KR-87	33.	402.58	2.0483E-08
SR-87M	25.	388.40	9.9885E-09
KR-88	54.	196.32	3.7477E-08
RB-88	5.	1382.39	1.8960E-06
Y-88	6.	1836.01	1.0447E-08
KR-89	60.	220.90	3.7550E-07
RB-89	7.	1031.88	2.6492E-08
KR-90	24.	1118.69	3.1792E-06
RB-90	20.	831.69	3.0899E-07
RB-90M	15.	824.23	6.9375E-07
Y-90M	56.	202.51	1.0322E-08
SR-91	8.	1024.30	2.7256E-08
Y-91	25.	1204.90	5.0051E-06
Y-91M	32.	555.60	1.3030E-08
SR-92	3.	1303.94	8.2945E-09
Y-92	8.	934.46	6.2977E-08
SR-93	19.	590.28	3.9355E-08
Y-93	46.	266.90	1.3594E-07

Isotope	Backgnd Sum	Energy (keV)	MDA (uCi/cc)
Bi-94	20.	702.63	9.3190E-09
Bi-95	19.	765.79	9.8714E-09
Bi-95M	50.	235.69	3.7398E-08
R-95	14.	756.72	1.5699E-08
Bi-97	20.	657.90	1.0375E-08
R-97	16.	743.36	9.1469E-09
Th-99	21.	739.58	7.8734E-08
C-99M	66.	140.50	1.2020E-08
C-101	31.	306.01	1.7766E-08
U-103	24.	497.08	9.5221E-09
C-104	32.	357.99	1.6277E-08
H-105	35.	318.90	4.4609E-08
U-105	19.	724.50	1.9931E-08
U-106	24.	621.84	9.4536E-08
D-109	36.	88.03	3.9363E-07
Th-110M	21.	937.48	3.5905E-08
N-113	37.	391.69	1.4153E-08
N-117M	51.	158.56	1.0130E-08
Bi-122	21.	563.93	1.1937E-08
Bi-124	27.	602.71	9.8303E-09
Bi-125	27.	427.89	2.8470E-08
Te-125M	45.	109.28	3.9577E-06
Te-127	22.	417.90	7.6945E-07
Te-127M	27.	57.60	2.1761E-05
Te-127	59.	202.84	1.4153E-08
Te-129	19.	459.60	1.2085E-07
Te-129M	20.	695.08	2.7653E-07
Te-129M	57.	196.56	1.9807E-07
I-130	15.	536.09	7.1648E-09
Pa-131	45.	123.80	3.2903E-08
I-131	43.	364.48	1.1910E-08
Te-131	36.	149.72	1.6457E-08
Te-131M	15.	773.67	2.3621E-08
Te-131M	46.	163.93	4.2409E-07
I-132	14.	667.69	8.2793E-09
Te-132	42.	228.16	9.7765E-09
Pa-133	33.	302.84	4.5848E-08
Pa-133M	44.	276.09	5.0900E-08
I-133	26.	529.87	1.0439E-08
Te-133M	23.	912.58	1.7586E-08
Te-133	42.	81.00	5.2420E-08
Te-133M	42.	233.22	8.4101E-08
Cs-134	23.	604.70	9.2272E-09
I-134	14.	884.09	1.8780E-08
Te-134	52.	210.47	5.3966E-08
Pa-135M	45.	268.24	5.7604E-08
I-135	6.	1260.41	3.0105E-08
Te-135	44.	249.79	1.0151E-08
Te-135M	26.	526.56	2.0709E-08
Cs-136	17.	818.50	1.0206E-08
I-136	10.	1313.02	3.0540E-07

## Minimum Detectable Activity Report (continued)

Page : 3

Sample ID : BKG-RANGE092105

Acquisition date : 22-NOV-2005 05:17:35

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-137	22.	661.65	1.0717E-08
XE-137	23.	455.49	1.5474E-07
CS-138	4.	1435.86	1.3939E-08
XE-138	50.	258.31	5.9500E-08
BA-139	6.	1420.50	3.6189E-06
CE-139	50.	165.85	1.0716E-08
CS-139	14.	1283.23	4.4984E-07
BA-140	21.	537.32	3.3181E-08
LA-140	11.	1596.49	1.2829E-08
BA-141	55.	190.22	3.2041E-08
CE-141	49.	145.44	1.8345E-08
LA-141	10.	1354.52	4.2084E-07
BA-142	40.	255.12	1.1178E-07
LA-142	21.	641.17	1.8744E-08
CE-143	52.	293.26	2.3739E-08
CE-144	49.	133.54	8.6650E-08
PR-144	4.	1409.15	4.8221E-06
ND-147	38.	91.10	4.9487E-08
PM-148M	22.	550.27	8.8970E-09
EU-152	49.	344.27	3.8389E-08
EU-154	17.	1004.76	6.4483E-08
EU-156	17.	646.29	1.1331E-07
HF-181	30.	482.83	1.1146E-08
TA-182	13.	1221.42	4.1805E-08
W-187	13.	685.81	2.5630E-08
RE-188	49.	155.03	5.8499E-08
HG-203	53.	279.19	1.2854E-08
BI-207	19.	569.67	8.2674E-09
TL-208	39.	583.14	1.0455E-07
PB-212	50.	238.63	2.1288E-08
BI-214	63.	609.31	5.0799E-08
PB-214	72.	351.92	4.7856E-08
RA-224	55.	240.98	2.4929E-07
RA-226	49.	186.21	2.6325E-07
AC-228	32.	338.32	7.2644E-08
TH-228	42.	84.37	1.4187E-06
PA-234	50.	131.20	4.9006E-08
TH-234	48.	63.29	1.3469E-06
U-235	38.	143.76	7.5743E-08
MP-239	41.	106.13	4.9813E-08
AM-241	39.	59.54	1.9751E-07

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EF1 BKGRANGE092105

Sample End Time: 21-SEP-2005 17:05:00.00

REMARKS 2nd Count  
No licensed radioactive material detected,  
see serial N/finder 48651  
12/12/05

PERFORMED BY:

Andrew Gere  
 SIGNATURE

REVIEWED BY:

William N/finder 48651  
 SIGNATURE DATE  
12/12/05

Sample ID : EF1 BKGRANGE0921

Acquisition date : 26-NOV-2005 22:01:52

Fermi 2 Radiation Protection Gamma Spectroscopy Report

Sample Parameters

Sample ID Number: EF1 BKGRANGE092105
Sample collection start date: 21-SEP-2005 17:05:00.00
Sample collection end date : 21-SEP-2005 17:05:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : PELL Operator: AKG

Acquisition Parameters

Detector number : DET 4 Acquire date : 26-NOV-2005 22:01:52.73
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.15 Percent dead time : 0.05 %

Calibration Parameters

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00563E-01 Zero offset: 7.09322E-02
Daily cal date : 26-NOV-2005 20:43:06.33

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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 11 rows of peak data with handwritten annotations on the right side.

Handwritten notes: TH030, AC 228, PB 214, PB 214 annihilation, Hv C, Pa 214, Bi 214, Bi 214

Sample ID : EF1 BKORANGE092105

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	20.	477.59	1.7467E-07
F-18	0.	511.00	Half-Life too short
NA-22	9.	1274.54	1.0392E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	16.	889.25	1.8449E-08
CR-51	52.	320.00	5.4202E-07
MN-54	9.	834.83	8.9162E-09
CO-56	20.	1238.25	3.7292E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	46.	122.06	1.3571E-08
CO-58	16.	810.76	1.8734E-08
FE-59	22.	1099.22	6.6890E-08
CO-60	13.	1332.49	1.2468E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	15.	1115.52	2.7372E-08
N-69M	0.	438.63	Half-Life too short
SE-75	35.	136.00	1.9504E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	801.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	43.	513.99	2.6139E-06
KR-85M	0.	151.10	Half-Life too short
SR-85	43.	513.99	2.2712E-08
RB-86	9.	1076.63	1.2251E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	5.	1836.01	1.4910E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	15.	1204.90	8.6808E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EF1 BKGRANGE0921

Acquisition date : 26-NOV-2005 22:01:52

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	25.	702.63	1.0327E-08
NB-95	18.	765.79	3.6410E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	13.	756.72	3.0704E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	31.	497.08	3.4199E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	22.	621.84	1.0299E-07
CD-109	46.	88.03	4.8504E-07
AG-110M	20.	937.48	4.2219E-08
SN-113	28.	391.69	1.8688E-08
SN-117M	60.	158.56	3.2135E-07
SB-122	0.	563.93	Half-Life too short
SB-124	29.	602.71	2.1973E-08
SB-125	33.	427.89	3.2473E-08
TE-125M	42.	109.28	8.3970E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	33.	57.60	3.6335E-05
XE-127	59.	202.84	4.9894E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	25.	695.88	1.2074E-06
XE-129M	49.	196.56	3.2227E-05
I-130	0.	536.09	Half-Life too short
BA-131	43.	123.00	1.5710E-06
I-131	30.	364.48	3.0356E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	52.	163.93	2.1731E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	49.	302.84	5.5570E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	22.	604.70	9.5525E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short



Sample ID : EF1 BKGRANGE0921

Acquisition date : 26-NOV-2005 22:01:52

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
S-136	10.	818.50	2.6647E-07
I-136	0.	1313.02	Half-Life too short
CS-137	11.	661.65	8.1238E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	47.	165.85	1.4548E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	18.	537.32	1.1029E-06
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	48.	145.44	7.4637E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	52.	133.54	1.0415E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	43.	91.10	3.4437E-06
PM-148M	19.	550.27	2.5500E-08
EU-152	29.	344.27	3.0168E-08
EU-154	16.	1004.76	6.3994E-08
EU-156	26.	646.29	2.8016E-06
HF-181	36.	482.03	3.5823E-08
A-182	13.	1221.42	6.2546E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	46.	279.19	3.2135E-08
BI-207	21.	569.67	8.6091E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	55.	186.21	2.7777E-07
AC-228	36.	338.32	7.8885E-08
TH-228	39.	84.37	1.4703E-06
PA-234	0.	131.20	Half-Life too short
TH-234	47.	63.29	8.9139E-06
U-235	52.	143.76	8.7706E-08
NP-239	0.	106.13	Half-Life too short
AM-241	34.	59.54	1.8483E-07

3

## Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	66.73	59	56	1.97	133.15	129	11	29.7		
0	198.63	37	52	1.18	396.70	393	7	36.5		
0	295.41	49	56	0.97	590.09	586	10	32.0		
0	352.08	95	26	1.14	703.34	696	13	15.2		
0	510.91	183	39	2.71	1020.79	1011	24	11.4		
0	560.57	41	62	1.78	1120.05	1109	19	51.5		
0	596.73	26	16	1.01	1192.34	1180	8	33.2		
0	609.31	80	24	1.77	1217.49	1211	12	16.6		
0	1120.71	27	4	0.82	2240.07	2236	8	22.9		
0	1460.89	69	6	1.52	2920.59	2914	13	14.3		K-40
0	1764.93	39	3	0.72	3529.04	3522	14	19.1		

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected	Decay Corr	1-Sigma
					uCi/cc	uCi/cc	%Error
K-40	1460.81	69	10.67*	2.300E+00	4.105E-07	4.105E-07	14.20

Flag: "\*" = Keyline

Summary of Nuclide Activity  
Sample ID : EF1 BKGRANGE0921

Page : 3  
Acquisition date : 26-NOV-2005 22:01:52

Total number of lines in spectrum. 11  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 11 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.185E-07	4.185E-07	0.598E-07	14.28	
Total Activity :			4.185E-07	4.185E-07			

Grand Total Activity : 4.185E-07 4.185E-07

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

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

Sample ID : EF1 BKGRANGE0921

Acquisition date : 26-NOV-2005 22:01:52

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
18	109.74M	868.89	511.00*	193.46	1.000E+35	11.43	Decay
		% Abundances	Found = 100.00				
SC-46	83.83D	0.79	142.53	62.70	---- Not Found ----		Abun.
			889.25*	99.98	---- Not Found ----		
			1120.51	99.99	2.624E-08	22.94	
		% Abundances	Found = 38.07				
SE-75	119.78D	0.55	66.05	1.02	9.458E-06	29.65	Abun.
			96.73	3.41	---- Not Found ----		
			121.12	16.70	---- Not Found ----		
			136.00*	59.20	---- Not Found ----		
			190.60	1.45	9.275E-07	36.51	
			264.65	59.00	---- Not Found ----		
			279.53	25.20	---- Not Found ----		
			303.91	1.32	---- Not Found ----		
			400.65	11.40	---- Not Found ----		
		% Abundances	Found = 1.38				
AS-76	26.32H	60.38	559.10*	44.70	4.773E+10	51.53	Decay, Abun.
			563.23	1.17	---- Not Found ----		
			571.30	0.14	---- Not Found ----		
			657.03	6.10	---- Not Found ----		
			665.31	0.39	---- Not Found ----		
			740.12	0.12	---- Not Found ----		
			771.76	0.12	---- Not Found ----		
			867.63	0.12	---- Not Found ----		
			1129.87	0.14	---- Not Found ----		
			1212.72	1.63	---- Not Found ----		
			1216.02	3.04	---- Not Found ----		
			1228.52	1.39	---- Not Found ----		
			1439.13	0.33	---- Not Found ----		
			1453.60	0.13	---- Not Found ----		
			1707.67	0.33	---- Not Found ----		
		% Abundances	Found = 73.70				
Y-92	3.54H	448.93	448.50	2.30	---- Not Found ----		Decay, Abun.
			561.10	2.40	1.000E+35	51.53	
			844.30	1.25	---- Not Found ----		
			934.46*	13.90	---- Not Found ----		
			1405.40	4.00	---- Not Found ----		
		% Abundances	Found = 9.74				
RU-103	39.35D	1.68	497.00*	89.00	---- Not Found ----		Abun.
			610.33	5.60	1.654E-06	16.58	
		% Abundances	Found = 5.92				
TE-131M	30.00H	52.97	102.06	7.90	---- Not Found ----		Decay, Abun.
			149.72	5.10	---- Not Found ----		
			200.63	7.56	1.072E+09	36.51	
			240.93	7.59	---- Not Found ----		
			334.27	9.60	---- Not Found ----		

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by		
	Half-life	Ratio			(uCi/cc)	%Error			
TE-131M	30.00H	52.97	773.67*	38.20	----	Not Found	----	Decay, Abun.	
			782.49	7.79	----	Not Found	----		
			793.75	13.90	----	Not Found	----		
			822.78	6.12	----	Not Found	----		
			852.21	20.70	----	Not Found	----		
			1125.46	11.40	----	Not Found	----		
			1206.60	9.80	----	Not Found	----		
			% Abundances Found =			5.19			
I-134	52.60M	1812.77	135.40	3.76	----	Not Found	----	Decay, Abun.	
			235.47	1.98	----	Not Found	----		
			405.45	7.38	----	Not Found	----		
			540.83	7.80	----	Not Found	----		
			595.36	11.40	1.000E+35	33.18			
			621.79	10.60	----	Not Found	----		
			677.34	8.50	----	Not Found	----		
			766.68	4.10	----	Not Found	----		
			847.03	95.41	----	Not Found	----		
			857.29	6.96	----	Not Found	----		
			884.09*	65.30	----	Not Found	----		
			947.86	4.04	----	Not Found	----		
			1072.55	15.30	----	Not Found	----		
			1136.16	9.70	----	Not Found	----		
1613.80	4.36	----	Not Found	----					
1806.84	5.70	----	Not Found	----					
% Abundances Found =			4.35						
XE-135	9.11H	174.45	249.79*	89.90	----	Not Found	----	Decay, Abun.	
			608.19	2.89	1.000E+35	16.58			
% Abundances Found =			3.11						
CS-136	13.16D	5.03	66.91	12.50	1.721E-05	29.65		Abun.	
			86.29	6.30	----	Not Found	----		
			153.22	7.46	----	Not Found	----		
			163.89	4.61	----	Not Found	----		
			176.55	13.56	----	Not Found	----		
			273.65	12.66	----	Not Found	----		
			340.57	48.50	----	Not Found	----		
			818.50*	99.70	----	Not Found	----		
1048.07	79.60	----	Not Found	----					
1235.34	19.70	----	Not Found	----					
% Abundances Found =			4.10						
PM-148M	41.30D	1.60	288.11	12.56	----	Not Found	----	Abun.	
			414.07	18.66	----	Not Found	----		
			432.78	5.35	----	Not Found	----		
			501.26	6.75	----	Not Found	----		
			550.27*	94.90	----	Not Found	----		
			599.74	12.54	----	Not Found	----		
			611.26	5.48	1.600E-06	16.58			
			629.97	89.00	----	Not Found	----		
725.70	32.80	----	Not Found	----					

Isotope	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
C-148M	41.300	1.60	915.33	17.17	----	Not Found	Abun.
			1013.01	20.30	----	Not Found	
			% Abundances Found =		1.74		
TA-182	114.740	0.50	67.75	42.30	2.319E-07	29.65	Abun.
			100.10	14.10	----	Not Found	
			1109.05	16.30	----	Not Found	
			1221.42*	27.10	----	Not Found	
			1230.97	11.50	----	Not Found	
% Abundances Found =		38.01					
BI-214	19.90M	4791.55	609.31*	46.30	1.000E+35	16.58	Decay
			768.36	5.04	----	Not Found	
			934.06	3.21	----	Not Found	
			1120.29	15.10	1.000E+35	22.94	
			1238.11	5.94	----	Not Found	
			1377.67	4.11	----	Not Found	
			1764.49	15.80	1.000E+35	19.11	
% Abundances Found =		80.84	(Abn. Limit = 48.48%)				
PB-214	26.00M	3557.91	87.30	4.67	----	Not Found	Decay
			241.90	7.49	----	Not Found	
			295.21	19.20	1.000E+35	32.00	
			351.92*	37.20	1.000E+35	15.16	
			705.91	1.10	----	Not Found	
% Abundances Found =		80.96	(Abn. Limit = 37.20%)				

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EF1 BKGRANGE0921

Page : 7  
Acquisition date : 26-NOV-2005 22:01:52

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	66.73	59	56	1.97	133.15	129	11	3.27E-02	29.7	1.34E+00	T
0	198.63	37	52	1.18	396.70	393	7	2.05E-02	36.5	6.03E+00	T
0	295.41	49	56	0.97	590.09	586	10	2.70E-02	32.0	5.46E+00	T
0	352.00	95	26	1.14	703.34	696	13	5.25E-02	15.2	5.19E+00	T
0	510.91	103	39	2.71	1020.79	1011	24	1.02E-01	11.4	4.49E+00	T
0	560.57	41	62	1.78	1120.05	1109	19	2.27E-02	51.5	4.30E+00	T
0	596.73	26	16	1.01	1192.34	1188	8	1.44E-02	33.2	4.19E+00	T
0	609.31	00	24	1.77	1217.49	1211	12	4.44E-02	16.6	4.16E+00	T
0	1120.71	27	4	0.82	2240.07	2236	0	1.51E-02	22.9	2.69E+00	T
0	1764.93	39	3	0.72	3529.04	3522	14	2.14E-02	19.1	2.00E+00	T

Flags: "T" = Tentatively associated



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG-PAP093005

Sample Location (Well Number): BKG-PAP

1. Representative sample collected. Date/Time 09/30/2005 / 1556

Sample collected by: Joy Marie Slabick / Joy Marie Slabick Date: 09/30/2005 collected  
Printed Name / Signature 12/29/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: D. Hemme / [Signature] Date: 11/18/2005 SEALED  
Printed Name / Signature 12/29/2005 SIGNED

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: R. Boyer / [Signature] Date: 11-23-05 Analyzed  
Fermi 2 Chemistry Printed Name Signature 1-5-06 signed

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 1/19/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location BKG-PAP 093005  
2. Date Sampled 09/30/2005  
3. Time Sampled 15:56  
4. Sample Volume, (ml) 4 ml

Instrument Count Data

1. Date Sample Counted 11/22/2005  
2. Time Sample Counted 00:10  
3. Background Inf.:  
Minutes Counted 10 min.  
Background Count Rate (cpm) 9.0 cpm  
4. Efficiency Inf.: (Daily Spike Source ID # 111)  
Gross Spike Count Rate (cpm) 3569.5 cpm  
Net Spike Count Rate (cpm) 3560.5 cpm  
H3 Spike Activity (dpm on count date) 8923.8 dpm  
Counter Efficiency 0.3990 cpm/dpm  
5. Sample Info:  
Sample Gross Count Rate (cpm) 7.8 cpm  
Sample Count Time (min.) 10.0 min.  
Net Sample Count Rate (cpm) 0.0 cpm  
6. Critical Level:  
Critical Level Count Rate (cpm) 2.2 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.25\text{E-06 uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date NOV 23 2005

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BKG-PAP093005

Sample Location (Well Number): BKG-PAP

1. Representative sample collected. Date/Time 09/30/2005 1 1556

Sample collected by: Joy Marie Slabank / Joy Marie Slabank Date: 09/30/2005 collected  
Printed Name / Signature 12/14/2005 signed

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: DANIEL K HEMMEL / [Signature] Date: 11/18/2005  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: William V. Lipton / [Signature] Date: 1/9/2006  
Fermi 2 RP Printed Name Signature

Sample number: BK6 - PAP093005

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Abere | Andrew Lee Date: 11/26/05  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lyton | William V. Lyton Date: 1/9/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lyton 48651 / 1/9/2006  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EF1 BKG-PAP093005

Sample End Time: 30-SEP-2005 15:56:00.00

REMARKS No licensed radioactive material detected,  
medium N. J. J. 4869 / 10/10/05

PERFORMED BY:

Andrew Lee  
SIGNATURE

REVIEWED BY:

William N. J. J. 4869 / 10/10/05  
SIGNATURE / DATE

Sample ID : EF1 BKG-PAP09300

Acquisition date : 26-NOV-2005 23:37:11

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EF1 BKG-PAP093005
Sample collection start date: 30-SEP-2005 15:56:00.00
Sample collection end date : 30-SEP-2005 15:56:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : MELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 26-NOV-2005 23:37:11.20
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.12 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 21-APR-2005 11:09:10.03
Kev/channel : 5.00563E-01 Zero offset: 7.09322E-02
Daily cal date : 26-NOV-2005 20:43:06.33

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: 2.60E+00, 1013, 1012, 114, 114, 1440

Sample Title : EF1 BKG-PAP093005

Page : 1

Decay Time = 57 07:41:11.20

Acquisition Time = 26-NOV-2005 23:37:11.2

0

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
2	510.88	71	21	2.12	1020.73	1013	21	22.7	2.68E+00	<del>RA-223 Ac. Peak</del> Bi-214 K-40 My 12/10/2005
2	511.52	58	10	1.75	1022.00	1013	21	25.2		
0	595.93	26	9	1.59	1190.84	1107	0	29.6		
0	609.48	40	28	0.73	1217.66	1209	14	32.2		
0	1460.97	87	7	2.02	2920.75	2914	14	12.5		

Nuclide Line Activity Report  
Sample ID : EF1 'BKG-PAP09300

Page : 2  
Acquisition date : 26-NOV-2005 23:37:11

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	87	10.67*	2.308E+00	5.294E-07	5.294E-07	12.54

Flag: "\*" = Keyline



Summary of Nuclide Activity  
Sample ID : EF1 BKG-PAP09300

Page : 3  
Acquisition date : 26-NOV-2005 23:37:11

Total number of lines in spectrum 5  
Number of unidentified lines 1  
Number of lines tentatively identified by NID 4 80.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.294E-07	5.294E-07	0.664E-07	12.54	
Total Activity :			5.294E-07	5.294E-07			

Grand Total Activity : 5.294E-07 5.294E-07

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	752.29	511.00*	193.46	1.000E+35	22.72	Decay
% Abundances Found = 100.00							
RU-103	39.35D	1.46	497.08*	89.00	---	Not Found	Abun.
			610.33	5.60	7.074E-07	32.21	
% Abundances Found = 5.92							
I-134	52.60M	1569.51	135.40	3.76	---	Not Found	Decay, Abun.
			235.47	1.95	---	Not Found	
			405.45	7.30	---	Not Found	
			540.03	7.00	---	Not Found	
			595.36	11.40	1.000E+35	28.59	
			621.79	10.60	---	Not Found	
			677.34	8.50	---	Not Found	
			766.68	4.10	---	Not Found	
			847.03	95.41	---	Not Found	
			857.29	6.96	---	Not Found	
			884.09*	65.30	---	Not Found	
			947.06	4.04	---	Not Found	
			1072.55	15.30	---	Not Found	
			1136.16	9.70	---	Not Found	
			1613.00	4.36	---	Not Found	
			1806.04	5.70	---	Not Found	
% Abundances Found = 4.35							
XE-135	9.11H	151.04	249.79*	89.90	---	Not Found	Decay, Abun.
			608.19	2.09	1.000E+35	32.21	
% Abundances Found = 3.11							
PM-148M	41.30D	1.39	288.11	12.56	---	Not Found	Abun.
			414.07	10.66	---	Not Found	
			432.78	5.35	---	Not Found	
			501.26	6.75	---	Not Found	
			550.27*	94.90	---	Not Found	
			599.74	12.54	---	Not Found	
			611.26	5.48	6.692E-07	32.21	
			629.97	89.00	---	Not Found	
			725.70	32.00	---	Not Found	
			915.33	17.17	---	Not Found	
			1013.81	20.30	---	Not Found	
% Abundances Found = 1.74							
BI-214	19.90M	4148.55	609.31*	46.30	1.000E+35	32.21	Decay
			768.36	5.04	---	Not Found	
			934.06	3.21	---	Not Found	
			1120.29	15.10	---	Not Found	
			1238.11	5.94	---	Not Found	
			1377.67	4.11	---	Not Found	
			1764.49	15.00	---	Not Found	
% Abundances Found = 48.48 (Abn. Limit = 48.48%)							

Rejected Report (continued)  
Sample ID : EF1 BK0-PAP09300

Page : 5  
Acquisition date : 26-NOV-2005 23:37:11

Flag: "\*" = Keyline

Unidentified Energy Lines  
Sample ID : EF1-BKG-PAP09300

Page : 6  
Acquisition date : 26-NOV-2005 23:37:11

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flag
2	510.88	71	21	2.12	1022.73	1013	21	3.95E-02	22.7	4.49E+00	T
2	511.52	58	18	1.75	1022.00	1013	21	3.24E-02	25.2	4.48E+00	
0	595.98	26	9	1.59	1190.84	1107	8	1.44E-02	28.6	4.20E+00	T
0	609.48	40	28	0.73	1217.66	1209	14	2.22E-02	32.2	4.16E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	25.	477.59	1.7117E-07
F-18	0.	511.00	Half-Life too short
NA-22	13.	1274.54	1.2109E-06
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1814.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	12.	889.25	1.5169E-08
CR-51	45.	320.00	4.0686E-07
MN-54	15.	834.83	1.0924E-08
CO-56	15.	1238.25	3.0472E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	55.	158.38	6.2022E-06
CO-57	47.	122.06	1.3355E-08
CO-58	18.	810.76	1.8225E-08
FE-59	0.	1099.22	3.7169E-08
CO-60	13.	1332.49	1.2301E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	11.	1115.52	2.3788E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	37.	136.00	1.9093E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	49.	513.99	2.7795E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	49.	513.99	2.1998E-08
RB-86	11.	1076.63	9.5137E-07
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	7.	1836.01	1.6296E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	5.	1204.90	4.8947E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EF1 BKG-PAP09300

Acquisition date : 26-NOV-2005 23:37:11

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	26.	702.63	1.0380E-00
NB-95	21.	765.79	3.2438E-00
NB-95M	0.	335.69	Half-Life too short
ZR-95	0.	756.72	2.3110E-00
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	25.	497.00	2.6361E-00
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	16.	621.04	0.7207E-00
CD-109	39.	00.03	4.4105E-07
AG-110M	15.	937.40	3.6610E-00
SN-113	34.	391.69	1.9414E-00
SN-117M	55.	150.56	1.9640E-07
SB-122	0.	563.93	Half-Life too short
SB-124	11.	602.71	1.3009E-00
SB-125	27.	427.09	2.9554E-00
TE-125M	30.	109.20	7.2694E-06
TE-127	0.	417.90	Half-Life too short
TE-127M	37.	57.60	3.5972E-05
XE-127	46.	202.04	3.7714E-00
TE-129	0.	459.60	Half-Life too short
TE-129M	21.	695.80	9.3664E-07
XE-129M	50.	196.56	1.6204E-05
I-130	0.	536.09	Half-Life too short
BA-131	40.	123.00	9.8261E-07
I-131	30.	364.40	1.4164E-06
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	45.	163.93	1.2096E-05
I-132	0.	667.69	Half-Life too short
TE-132	0.	220.16	Half-Life too short
BA-133	43.	302.04	5.1909E-00
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	01.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	10.	604.70	0.6420E-09
I-134	0.	004.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : EF1 BKG-PAP09300

Acquisition date : 26-NOV-2025 23:37:11

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	12.	818.50	1.8114E-07
I-136	0.	1313.02	Half-Life too short
CS-137	16.	661.65	9.4438E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	52.	165.85	1.4665E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	28.	537.32	8.3673E-07
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	50.	145.44	6.2808E-08
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	45.	133.54	9.5859E-08
PR-144	0.	1489.15	Half-Life too short
ND-147	51.	91.10	2.1287E-06
PM-148M	33.	558.27	2.8220E-08
EU-152	37.	344.27	3.3780E-08
EU-154	14.	1004.76	5.9707E-08
EU-156	18.	646.29	1.5979E-06
HF-161	28.	482.03	2.7558E-08
TA-162	16.	1221.42	6.5186E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	48.	279.19	2.8764E-08
BI-207	16.	569.67	7.6943E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	55.	186.21	2.7806E-07
AC-228	35.	338.32	7.7579E-08
TH-228	47.	84.37	1.5807E-06
PA-234	0.	131.20	Half-Life too short
TH-234	25.	63.29	5.2149E-06
U-235	57.	143.76	9.1375E-08
NP-239	0.	186.13	Half-Life too short
AM-241	29.	59.54	1.7274E-07

**February 2006**



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-15021506

Sample Location (Well Number): EFT-15

1. Representative sample collected. Date/Time 02/15/2006 1 1015

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Yovan / B Jester Date: 6-20-6  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-1S021506
2. Date Sampled	02/15/2006
3. Time Sampled	10:15
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	06/20/2006
2. Time Sample Counted	09:55
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.9 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3354.8 cpm
Net Spike Count Rate (cpm)	3347.9 cpm
H3 Spike Activity (dpm on count date)	8638.9 dpm
Counter Efficiency	0.3875 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	8.4 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.5 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.13\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician [Signature]

Date 6-28-6

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-18021506

Sample Location (Well Number): EFT-18

1. Representative sample collected. Date/Time 02/15/2006 1 1015

Sample collected by: Joy Marie Steback / Joy Marie Steback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Above / Andrew Hese Date: 6-2-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT-15021506

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".

(Note disposition of unidentified peaks in "Remarks")

Performed by: Above Andrew Yee Date: 6-2-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton William V. Lipton Date: 6/6/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks NO licensed radioactive material detected,  
William V. Lipton 6/6/06  
48051

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-15021506 EF1

Sample End Time: 15-FEB-2006 10:15:00.00

REMARKS

PERFORMED BY:

*Andrew Gere*  
SIGNATURE

REVIEWED BY:

*William J. (65) / 6/16/2006*  
SIGNATURE/DATE

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-15021506 EF1  
Sample collection start date: 15-FEB-2006 10:15:00.00  
Sample collection end date : 15-FEB-2006 10:15:00.00  
Type of sample : 1 L Mari. Liquid  
Sample quantity : 1.00000E+03 cc  
Sample geometry : MELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 2-JUN-2006 21:31:39.46  
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00  
Elapsed real time : 0 00:30:01.09 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.00  
KeV/channel : 5.00223E-01 Zero offset: 1.50957E-01  
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000  
Abundance limit : 75.00000 Library : dacmaster.nlb  
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

\*\*\*\*\*

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	499.95	26	15	1.29	999.46	994	9	1.42E-02	34.1	<i>Pa-214</i>
2	0	511.24	138	60	2.90	1022.05	1012	20	7.67E-02	16.2	<i>annihilation</i>
3	0	559.90	39	27	1.54	1117.39	1113	9	2.15E-02	29.2	<i>H<sub>2</sub></i>
4	0	610.55	44	37	1.14	1220.72	1211	20	2.47E-02	37.7	<i>Bi-214</i>
5	0	1236.87	20	8	4.89	2474.23	2465	16	1.11E-02	38.7	<i>Po-214</i>
6	0	1461.54	93	10	2.02	2924.12	2914	21	5.19E-02	13.5	<i>K-40</i>

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	499.95	26	15	1.29	999.46	994	9	34.1		
0	511.24	138	60	2.90	1022.05	1012	20	16.2		
0	558.90	39	27	1.54	1117.39	1113	9	29.2		
0	610.55	44	37	1.14	1220.72	1211	20	37.7		
0	1236.87	20	8	4.39	2474.23	2465	16	38.7		
0	1461.54	93	10	2.02	2924.12	2914	21	13.5		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sig %Error
K-40	1460.81	93	10.67*	2.308E+00	5.695E-07	5.695E-07	13.47

Flag: "\*" = Keyline



Total number of lines in spectrum 6  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 6 100.00%

Slide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.695E-07	5.695E-07	0.767E-07	13.47	
Total Activity :			5.695E-07	5.695E-07			

Grand Total Activity : 5.695E-07 5.695E-07

Flags: "K" = Keyline not found "M" = Manually accepted  
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	1410.35	511.00*	100.00	1.000E+35	16.17	Decay
% Abundances Found = 100.00							
CO-56	78.76D	1.36	846.75	99.96	---- Not Found ----	----	Abun.
			1037.82	14.03	---- Not Found ----	----	
			1238.25*	67.00	4.527E-08	38.73	
			1360.21	4.29	---- Not Found ----	----	
			1771.40	15.51	---- Not Found ----	----	
			2015.35	3.03	---- Not Found ----	----	
			2034.91	7.78	---- Not Found ----	----	
% Abundances Found = 31.66							
AS-76	26.32H	98.01	559.10*	44.70	9.580E+21	29.15	Decay, Abun.
			563.23	1.17	---- Not Found ----	----	
			571.30	0.14	---- Not Found ----	----	
			657.03	6.10	---- Not Found ----	----	
			665.31	0.39	---- Not Found ----	----	
			740.12	0.12	---- Not Found ----	----	
			771.76	0.12	---- Not Found ----	----	
			867.63	0.12	---- Not Found ----	----	
			1129.87	0.14	---- Not Found ----	----	
			1212.72	1.63	---- Not Found ----	----	
			1216.02	3.84	---- Not Found ----	----	
			1228.52	1.39	---- Not Found ----	----	
			1439.13	0.33	---- Not Found ----	----	
			1453.60	0.13	---- Not Found ----	----	
			1787.67	0.33	---- Not Found ----	----	
% Abundances Found = 73.70							
RU-103	39.35D	2.73	497.00*	89.00	---- Not Found ----	----	Abun.
			610.33	5.60	1.901E-06	37.75	
% Abundances Found = 5.92							
I-133	20.80H	124.02	529.67*	86.30	---- Not Found ----	----	Decay, Abun.
			706.58	1.49	---- Not Found ----	----	
			856.28	1.23	---- Not Found ----	----	
			875.33	4.47	---- Not Found ----	----	
			1236.41	1.49	1.700E+31	38.73	
			1298.22	2.33	---- Not Found ----	----	
% Abundances Found = 1.53							
CS-136	13.16D	8.17	66.91	12.50	---- Not Found ----	----	Abun.
			86.29	6.30	---- Not Found ----	----	
			153.22	7.46	---- Not Found ----	----	
			163.89	4.61	---- Not Found ----	----	
			176.55	13.56	---- Not Found ----	----	
			273.65	12.66	---- Not Found ----	----	
			340.57	46.50	---- Not Found ----	----	
			818.50*	99.70	---- Not Found ----	----	
			1048.07	79.60	---- Not Found ----	----	
			1235.34	19.70	1.719E-05	38.73	
% Abundances Found = 6.47							

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity 1-Sigma		Rejected by	
					(uCi/cc)	%Error		
PM-148M	41.30D	2.60	288.11	12.56	----	Not Found	----	Abun.
			414.07	10.66	----	Not Found	----	
			432.78	5.35	----	Not Found	----	
			501.26	6.75	7.652E-07	34.09		
			550.27*	94.90	----	Not Found	----	
			599.74	12.54	----	Not Found	----	
			611.26	5.48	1.777E-06	37.75		
			629.97	89.00	----	Not Found	----	
			725.70	32.80	----	Not Found	----	
			915.33	17.17	----	Not Found	----	
			1013.01	20.30	----	Not Found	----	
% Abundances Found =				3.88				
BI-214	19.90M	7777.47	609.31*	46.30	1.000E+35	37.75	Decay	
			768.36	5.04	----	Not Found	----	
			934.06	3.21	----	Not Found	----	
			1120.29	15.10	----	Not Found	----	
			1230.11	5.94	1.000E+35	38.73		
			1377.67	4.11	----	Not Found	----	
			1764.49	15.80	----	Not Found	----	
% Abundances Found =				54.70	(Abn. Limit = 48.48%)			

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	499.95	26	15	1.29	999.46	994	9	1.42E-02	34.1	4.53E+00	T
0	511.24	138	60	2.90	1022.05	1012	20	7.67E-02	16.2	4.49E+00	T
0	550.90	39	27	1.54	1117.39	1113	9	2.15E-02	29.2	4.31E+00	T
0	610.55	44	37	1.14	1220.72	1211	20	2.47E-02	37.7	4.16E+00	T
0	1236.87	20	8	4.89	2474.23	2465	16	1.11E-02	38.7	2.55E+00	T

Flags: "T" = Tentatively associated

\* Sample ID : EFT-15021506 EF1

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	25.	477.59	3.2611E-07
F-18	0.	511.00	Half-Life too short
NA-22	6.	1274.54	9.1733E-09
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	19.	889.25	2.7835E-08
CR-51	43.	320.08	1.3918E-06
MN-54	20.	834.83	1.3869E-08
CO-56	17.	1238.25	4.8932E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	46.	122.06	1.5082E-08
CO-58	15.	810.76	2.7355E-08
FE-59	15.	1099.22	1.0604E-07
CO-60	9.	1332.49	1.0667E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	7.	1115.52	2.2287E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	43.	136.00	2.7347E-08
SE-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	56.	513.99	2.9861E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	56.	513.99	4.0039E-08
RB-86	6.8	1076.63	4.7310E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	7.	1836.01	2.2981E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	10.	1204.90	1.2143E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
X-92	0.	934.46	Half-Life too short

Sample ID : EFT-19821506.EF1

Acquisition date : 2-JUN-2006 21:31:39

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	12.	702.63	7.3253E-09
NB-95	13.	765.79	7.1406E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	10.	756.72	4.3240E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	22.	497.08	6.0311E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	35.	621.84	1.3774E-07
CD-109	44.	88.03	5.0324E-07
AG-110M	14.	937.48	4.1426E-08
SN-113	36.	391.69	2.6882E-08
SN-117M	57.	158.56	2.5544E-06
SB-122	0.	563.93	Half-Life too short
SB-124	23.	602.71	3.1745E-08
SB-125	23.	427.89	2.8395E-08
TE-125M	40.	109.28	1.3480E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	23.	57.60	4.0043E-05
XE-127	58.	202.84	1.0842E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	19.	695.88	2.5034E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	44.	123.00	1.7990E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	54.	163.93	2.4714E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	39.	302.84	5.0108E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	91.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	20.	604.70	9.5534E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : EFT-15021506 EF1

Acquisition date : 2-JUN--2006 21:31:39

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	11.	818.50	2.4450E-06
CS-136	0.	1313.02	Half-Life too short
CS-137	17.	661.65	9.6622E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	51.	165.85	1.8599E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	23.	537.32	1.1483E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	59.	145.44	1.9790E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	49.	133.54	1.1251E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	48.	91.10	4.8985E-05
PM-148M	23.	550.27	5.4874E-08
EU-152	42.	344.27	3.6156E-08
EU-154	13.	1004.76	5.8201E-08
EU-156	15.	646.29	1.4654E-05
HF-181	22.	482.03	5.6193E-08
TA-182	21.	1221.42	9.9043E-08
U-187	0.	685.81	Half-Life too short
U-188	0.	155.83	Half-Life too short
HG-203	47.	279.19	6.0134E-08
BI-207	18.	569.67	8.1215E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	58.	186.21	2.8369E-07
AC-228	37.	338.32	8.0861E-08
TH-228	39.	84.37	1.5267E-06
PA-234	0.	131.20	Half-Life too short
TH-234	32.	63.29	2.4605E-05
U-235	45.	143.76	8.1648E-06
NP-239	0.	186.13	Half-Life too short
AM-241	39.	59.54	1.9608E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-1D021506

Sample Location (Well Number): EFT-1D

1. Representative sample collected. Date/Time 02/15/2006 1 0930

Sample collected by: Joy Marie Staback / Joy Marie Staback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. RENNIE / [Signature] Date: 6-22-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_



Tritium Activity Calculation

Sample Information

1 . Sample Location	EFT-1D021506
2 . Date Sampled	02/15/2006
3 . Time Sampled	09:30
4 . Sample Volume, (ml)	4 ml

Instrument Count Data

1 . Date Sample Counted	06/22/2006
2 . Time Sample Counted	12:33
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.3 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3287.2 cpm
Net Spike Count Rate (cpm)	3279.9 cpm
H3 Spike Activity (dpm on count date)	8636.3 dpm
Counter Efficiency	0.3798 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	8.9 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.6 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.18\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 6-22-06

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-1D021506

Sample Location (Well Number): EFT-1D

1. Representative sample collected. Date/Time 02/15/2006 1 0930

Sample collected by: Joy Marie Slabick / Joy Marie Slabick Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

**Note:** Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-20-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Albere / Albera Date: 6-2-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT-10021506

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Above , Andrew Hae Date: 6-2-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton , William V. Lipton Date: 6/6/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks NO licensed radioactive material detected.  
William V. Lipton William V. Lipton 48657  
6/6/06

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-1D021506 EF1

Sample End Time: 15-FEB-2006 09:30:00.00

REMARKS

PERFORMED BY:

*Andrew Gere*

SIGNATURE

REVIEWED BY:

*William White 48651/6/16/2006*

SIGNATURE/DATE

Sample ID : EFT-1D021506 EF1

Acquisition date : 2-JUN-2006 21:01:07

\*\*\*\*\*

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-1D021506 EF1
Sample collection start date: 15-FEB-2006 09:30:00.00
Sample collection end date : 15-FEB-2006 09:30:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : MELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 2-JUN-2006 21:01:07.48
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.09 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.00
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

\*\*\*\*\*

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: 'amplitude', '46', 'p274', '0.214', 'KTD'

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	511.41	175	52	3.35	1022.38	1014	19	12.4		
0	550.42	72	14	2.51	1116.42	1111	11	15.4		
0	661.30	23	5	1.04	1762.47	1757	10	27.6		
0	1120.09	10	13	2.03	2242.02	2235	15	46.4		
0	1461.12	70	13	2.91	2923.27	2916	17	16.8		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sig %Error
K-40	1460.81	70	10.67*	2.300E+00	4.255E-07	4.255E-07	16.78

Flag: "\*" = Keyline

Total number of lines in spectrum 5  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.255E-07	4.255E-07	0.714E-07	16.78	
Total Activity :			4.255E-07	4.255E-07			
Grand Total Activity :			4.255E-07	4.255E-07			

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

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



Nuclide	Half-life	Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	1410.48	511.00*	193.46	1.000E+35	12.43	Decay
% Abundances Found = 100.00							
SC-46	83.83D	1.28	142.53	62.70	----	Not Found	Abun.
			889.25*	99.98	----	Not Found	
			1120.51	99.99	2.497E-08	46.45	
% Abundances Found = 38.07							
AS-76	26.32H	98.02	559.10*	44.70	1.001E+22	15.41	Decay, Abun.
			563.23	1.17	----	Not Found	
			571.30	0.14	----	Not Found	
			657.03	6.10	----	Not Found	
			665.31	0.39	----	Not Found	
			740.12	0.12	----	Not Found	
			771.76	0.12	----	Not Found	
			867.63	0.12	----	Not Found	
			1129.87	0.14	----	Not Found	
			1212.72	1.63	----	Not Found	
			1216.02	3.04	----	Not Found	
			1228.52	1.39	----	Not Found	
			1439.13	0.33	----	Not Found	
			1453.60	0.13	----	Not Found	
			1787.67	0.33	----	Not Found	
% Abundances Found = 73.70							
BR-84	31.00M	4867.49	604.80	1.00	----	Not Found	Decay, Abun.
			736.50	1.31	----	Not Found	
			802.20	6.10	----	Not Found	
			881.50*	42.00	1.000E+35	27.58	
			1015.90	6.20	----	Not Found	
			1213.30	2.60	----	Not Found	
			1463.00	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 = 51.38							
BI-214	19.90M	7778.20	609.31*	46.30	----	Not Found	Decay, Abun.
			768.36	5.04	----	Not Found	
			934.06	3.21	----	Not Found	
			1120.29	15.10	1.000E+35	46.45	
			1238.11	5.94	----	Not Found	
			1377.67	4.11	----	Not Found	
			1764.49	15.00	----	Not Found	
% Abundances Found = 15.81 (Abn. Limit = 48.40%)							
PA-234	6.70H	335.04	63.00	3.26	----	Not Found	Decay, Abun.
			131.20*	20.40	----	Not Found	
			152.70	6.00	----	Not Found	
			226.40	6.00	----	Not Found	
			227.20	5.60	----	Not Found	

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity 1-Sigma (uCi/cc)	%Error	Rejected by	
PA-234	6.70H	385.04	569.50	11.00	----	Not Found	----	Decay, Abun.
			733.00	8.00	----	Not Found	----	
			831.60	5.60	----	Not Found	----	
			880.51	12.24	1.000E+35	27.50		
			883.24	12.00	1.000E+35	27.50		
			926.00	11.20	----	Not Found	----	
			926.72	9.00	----	Not Found	----	
			946.00	12.00	----	Not Found	----	
			949.00	8.16	----	Not Found	----	
% Abundances Found =				10.36				

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	511.41	175	52	3.35	1022.38	1014	19	9.74E-02	12.4	4.48E+00	T
0	558.42	72	14	2.51	1116.42	1111	11	4.01E-02	15.4	4.31E+00	T
0	881.30	23	5	1.04	1762.47	1757	10	1.28E-02	27.6	3.02E+00	T
0	1120.89	18	13	2.03	2242.02	2235	15	1.02E-02	46.4	2.69E+00	T

Flags: "T" = Tentatively associated

\* Sample ID : EFT-1D021506 EF1  
 \*\*\*\*\*

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	34.	477.59	3.7401E-07
F-18	0.	511.00	Half-Life too short
NA-22	12.	1274.54	1.2143E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	14.	889.25	2.4389E-08
CR-51	47.	320.08	1.4506E-06
MN-54	19.	834.83	1.3852E-08
CO-56	17.	1238.25	4.9369E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	45.	122.06	1.4900E-08
CO-58	18.	810.76	2.9666E-08
FE-59	13.	1099.22	9.9964E-08
CO-60	18.	1332.49	1.4276E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	5.	1115.52	1.8742E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	42.	136.00	2.6871E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	882.41	Half-Life too short
KR-85	62.	513.99	3.1282E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	62.	513.99	4.1950E-08
RB-86	5.	1076.63	4.2586E-06
KR-87	0.	482.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	7.	1836.01	2.2983E-08
KR-89	0.	220.98	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
KR-90	0.	1118.69	Half-Life too short
RB-90	0.	831.69	Half-Life too short
RB-90M	0.	624.23	Half-Life too short
Y-90M	0.	202.51	Half-Life too short
SR-91	0.	1024.38	Half-Life too short
Y-91	13.	1204.98	1.3574E-05
Y-91M	0.	555.68	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	8.	934.46	Half-Life too short

Sample ID : EFT-1D021506 EFl

Acquisition date : 2-JUN-2006 21:01:07

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	593.26	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	18.	702.63	8.8496E-09
NB-95	16.	765.79	7.7945E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	24.	756.72	6.2978E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	26.	497.00	6.4987E-09
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	20.	621.84	1.0632E-07
CD-109	39.	88.83	4.7831E-07
AG-110M	14.	937.48	4.0485E-08
SN-113	38.	391.69	2.7431E-08
SN-117M	53.	158.56	2.4861E-06
SB-122	0.	563.93	Half-Life too short
SB-124	24.	602.71	3.2011E-08
SB-125	33.	427.89	3.3112E-08
TE-125M	42.	109.28	1.3758E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	30.	57.60	4.5243E-05
XE-127	59.	202.84	1.0973E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	11.	695.88	1.9638E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	38.	123.80	1.6833E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	40.	163.93	2.1453E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	38.	302.84	4.9879E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	81.80	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	20.	604.70	9.6132E-09
I-134	0.	884.99	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Sample ID : EFT-1D021506 EF1

Acquisition date : 2-JUN-2006 21:01:07

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	13.	818.58	2.5796E-05
I-136	0.	1313.82	Half-Life too short
CS-137	19.	661.65	1.0171E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.58	Half-Life too short
CE-139	53.	165.85	1.8980E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	21.	537.32	1.1062E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	42.	145.44	1.6926E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	52.	133.54	1.1506E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	22.	91.10	3.4305E-05
PM-148M	18.	550.27	4.9423E-08
EU-152	29.	344.27	3.0676E-08
EU-154	12.	1004.76	5.7638E-08
EU-156	15.	646.29	1.4673E-05
HF-181	16.	482.03	4.9001E-08
TA-182	14.	1221.42	8.2436E-08
-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	58.	279.19	6.6236E-08
BI-207	18.	569.67	8.0464E-09
TL-208	0.	583.14	Half-Life too short
PE-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PE-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	65.	186.21	3.0052E-07
AC-228	30.	338.32	7.3335E-08
TH-228	35.	84.37	1.4633E-06
PA-234	0.	131.20	Half-Life too short
TH-234	46.	63.29	2.9127E-05
U-235	43.	143.76	8.0134E-08
NP-239	0.	106.13	Half-Life too short
AM-241	31.	59.54	1.7682E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-2D020906

Sample Location (Well Number): EFT-2D

1. Representative sample collected. Date/Time 02/09/2006 / 1420

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B J Estes / B J Estes Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76,000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Uozoni / [Signature] Date: 6-20-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: [Signature] Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-2D020906
2 . Date Sampled	02/09/2006
3 . Time Sampled	14:20
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

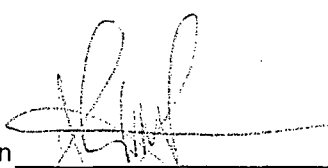
1 . Date Sample Counted	06/20/2006
2 . Time Sample Counted	09:25
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.9 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3354.8 cpm
Net Spike Count Rate (cpm)	3347.9 cpm
H3 Spike Activity (dpm on count date)	8638.9 dpm
Counter Efficiency	0.3875 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.0 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.1 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.13\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician  Date 6-20-06



## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-2D020906

Sample Location (Well Number): EFT-2D

1. Representative sample collected. Date/Time 02/09/2006 1 1420

Sample collected by: Jay Marie Slawick / Jay Marie Slawick Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Above / Andrew Yere Date: 6-2-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT-20020906

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks") 6-5-06

Performed by: Above Andrew H. Date: 6-2-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William Lipton William N Lipton Date: 6/15/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks Peak 511.82 same as 510.60.

1172 Peak 57% error - 1 P count.

Re-counted Sample 6-5-06  
6-5-06  
At 6-5-06

Percent OK

NO licensed radioactive material detected.

William Lipton 48091 6/15/06

\*\*\*\*\*

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-2D020906 EF1

Sample End Time: 9-FEB-2006 14:20:00.00

REMARKS

.....  
.....  
.....

PERFORMED BY:

*Andrew Gere*

SIGNATURE

REVIEWED BY:

*William V. Lipton 4/5/06 5/16/06*

SIGNATURE/DATE

Sample ID : EFT-2D020906 EF1

Acquisition date : 2-JUN-2006 22:03:43

\*\*\*\*\*

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-2D020906 EF1
Sample collection start date: 9-FEB-2006 14:20:00.00
Sample collection end date : 9-FEB-2006 14:20:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : WELL Operator: AKD

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 2-JUN-2006 22:03:43.09
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.07 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.00
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:26:16.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

\*\*\*\*\*

Table with columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 7 rows of peak data with handwritten annotations.

Handwritten notes: 7hr 230, 1.40E+00, 1012, 1012, 10, 3.96E-02, 24.5, 1012, 12, 1.99E-02, 36.1, 1012, 14, 8.60E-03, 57.0, 1012, 16, 4.15E-02, 15.5

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	66.83	60	65	1.13	132.11	125	12	38.2		
3	510.62	64	36	2.22	1020.77	1012	18	27.5	1.40E+00	
3	511.62	71	35	2.22	1023.21	1012	18	24.5		
0	558.82	49	19	1.41	1117.22	1113	9	21.9		
0	609.35	36	33	1.42	1210.31	1212	12	36.1		
0	1172.57	15	14	0.79	2345.48	2339	14	57.8		CO-60
0	1460.65	75	11	1.31	2922.32	2914	16	15.5		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sig %Error
K-40	1460.81	75	10.67*	2.308E+00	4.553E-07	4.553E-07	15.50

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
CO-60	1173.22	15	100.00	2.639E+00	8.810E-09	9.177E-09	57.04
	1332.49	-----	100.00*	2.426E+00	-----	Line Not Found	-----

Flag: "\*" = Keyline

Total number of lines in spectrum	7	
Number of unidentified lines	1	
Number of lines tentatively identified by NID	6	85.71%

Nuclide Type : natural

Nuclide	Half-life	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.553E-07	4.553E-07	0.706E-07	15.50	
Total Activity :			4.553E-07	4.553E-07			

Nuclide Type : activation

Nuclide	Half-life	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
CO-60	5.27Y	1.04	8.810E-09	9.177E-09	5.235E-09	57.04	KA
Total Activity :			8.810E-09	9.177E-09			

Grand Total Activity : 4.641E-07 4.645E-07

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

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

Sample ID : EFT-EDG26906 EF1

Acquisition date : 2-JUN-2006 22:03:43

Nuclide	Half-life	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
		Ratio				(uCi/cc)	%Error	
F-18	109.74M	1487.14		511.00*	193.46	1.000E+35	27.47	Decay
		% Abundances Found = 100.00						
SE-75	119.78D	0.95		66.05	1.02	1.301E-05	30.19	Abun.
				96.73	3.41	----	Not Found	----
				121.12	16.70	----	Not Found	----
				136.00*	59.20	----	Not Found	----
				198.60	1.45	----	Not Found	----
				264.65	59.80	----	Not Found	----
				279.53	25.20	----	Not Found	----
				303.91	1.32	----	Not Found	----
				400.65	11.40	----	Not Found	----
		% Abundances Found = 0.57						
AS-76	26.32H	103.34		559.10*	44.70	4.575E+23	21.09	Decay, Abun.
				563.23	1.17	----	Not Found	----
				571.30	0.14	----	Not Found	----
				657.03	6.10	----	Not Found	----
				665.31	0.39	----	Not Found	----
				740.12	0.12	----	Not Found	----
				771.76	0.12	----	Not Found	----
				867.63	0.12	----	Not Found	----
				1129.87	0.14	----	Not Found	----
				1212.72	1.63	----	Not Found	----
				1216.02	3.84	----	Not Found	----
				1228.52	1.39	----	Not Found	----
				1439.13	0.33	----	Not Found	----
				1453.60	0.13	----	Not Found	----
				1787.67	0.33	----	Not Found	----
		% Abundances Found = 73.70						
RU-103	39.35D	2.88		497.00*	89.00	----	Not Found	Abun.
				610.33	5.60	1.700E-06	36.15	
		% Abundances Found = 5.92						
XE-135	9.11H	298.57		249.79*	89.90	----	Not Found	Decay, Abun.
				608.19	2.89	1.000E+35	36.15	
		% Abundances Found = 3.11						
CS-136	13.16D	8.61		66.91	12.50	2.156E-04	30.19	Abun.
				86.29	6.30	----	Not Found	----
				153.22	7.46	----	Not Found	----
				163.89	4.61	----	Not Found	----
				176.55	13.56	----	Not Found	----
				273.65	12.66	----	Not Found	----
				340.57	46.50	----	Not Found	----
				618.50*	99.70	----	Not Found	----
				1048.07	79.60	----	Not Found	----
				1235.34	19.70	----	Not Found	----
		% Abundances Found = 4.10						
FM-146M	41.30D	2.74		268.11	12.56	----	Not Found	Abun.



Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
PM-148M	41.300	2.74	414.07	18.66	----	Not Found	----	Abun.
			432.78	5.35	----	Not Found	----	
			501.26	6.75	----	Not Found	----	
			550.27*	94.90	----	Not Found	----	
			599.74	12.54	----	Not Found	----	
			611.26	5.48	1.581E-06	36.15		
			629.97	89.00	----	Not Found	----	
			725.78	32.80	----	Not Found	----	
			915.33	17.17	----	Not Found	----	
			1013.81	20.30	----	Not Found	----	
% Abundances Found =				1.74				
TA-182	114.740	0.99	67.75	42.30	3.230E-07	30.19		Abun.
			100.10	14.10	----	Not Found	----	
			1109.05	16.30	----	Not Found	----	
			1221.42*	27.10	----	Not Found	----	
			1230.97	11.50	----	Not Found	----	
			% Abundances Found =				38.01	
BI-214	19.90M	8200.94	609.31*	46.30	1.000E+35	36.15		Decay
			768.36	5.04	----	Not Found	----	
			934.06	3.21	----	Not Found	----	
			1120.29	15.10	----	Not Found	----	
			1230.11	5.94	----	Not Found	----	
			1377.67	4.11	----	Not Found	----	
			1764.49	15.80	----	Not Found	----	
% Abundances Found =				48.48	(Abn. Limit = 48.48%)			

Flag: "\*" = Keyline

Sample ID : EFT-2D320905 EF1

Acquisition date : 2-JUN-2006 22:03:43

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	66.23	60	65	1.13	132.11	125	12	3.31E-02	30.2	1.30E+00	T
3	510.60	64	36	2.22	1020.77	1012	10	3.53E-02	27.5	4.49E+00	T
3	511.82	71	35	2.22	1023.21	1012	10	3.96E-02	24.5	4.48E+00	T
0	558.82	49	19	1.41	1117.22	1113	9	2.70E-02	21.9	4.31E+00	T
0	609.35	36	33	1.42	1210.31	1212	12	1.99E-02	36.1	4.16E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	22.	477.59	3.3550E-07
F-18	0.	511.00	Half-Life too short
NA-22	9.	1274.54	1.1055E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	15.	889.25	2.6316E-08
CR-51	38.	320.08	1.5328E-06
MN-54	17.	834.83	1.3117E-08
CO-56	20.	1238.25	5.6226E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	42.	122.06	1.4739E-08
CO-58	10.	810.76	2.4393E-08
FE-59	11.	1099.22	1.0288E-07
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	14.	1115.52	3.0084E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	63.	136.00	3.3663E-08
SE-76	0.	559.10	Half-Life too short
SE-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.58	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	52.	513.99	2.6895E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	52.	513.99	4.1203E-06
RB-86	9.	1076.63	6.8401E-06
KR-87	0.	482.58	Half-Life too short
SR-87M	0.	388.48	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	7.	1836.01	2.3810E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	18.	1204.90	1.2786E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short
SR-93	0.	590.28	Half-Life too short

Sample ID : EFT-2D020906 EF1

Acquisition date : 2-JUN-2006 22:03:43

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
I-136	0.	1313.02	Half-Life too short
CS-137	16.	661.65	9.5612E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	253.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	53.	185.85	1.9599E-06
CS-139	0.	1283.23	Half-Life too short
BA-140	19.	537.32	1.4764E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	44.	145.44	1.9610E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	42.	133.54	1.0625E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	0.	91.10	Half-Life too short
PM-148M	27.	550.27	6.5561E-08
EU-152	30.	344.27	3.0942E-08
EU-154	12.	1004.76	5.6308E-06
EU-156	15.	646.29	1.9181E-05
HF-181	20.	482.03	5.8627E-06
TA-182	14.	1221.42	8.6453E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	36.	279.19	5.7839E-08
BI-207	22.	569.67	8.9109E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	51.	166.21	2.6751E-07
AC-228	48.	338.32	9.1092E-08
TH-228	37.	84.37	1.5090E-06
PA-234	0.	131.20	Half-Life too short
TH-234	44.	63.29	3.3769E-05
U-235	42.	143.76	7.9477E-06
NP-239	0.	106.13	Half-Life too short
AM-241	30.	59.54	1.7463E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-2D020906 D

Sample Location (Well Number): EFT - 2D

1. Representative sample collected. Date/Time 02/09/2006 1 1450

Sample collected by: Joy Marie Sibank / Joy Marie Sibank Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Jean M. Yovan / JMY Date: 6-20-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-2D020906D
2 . Date Sampled	02/09/2006
3 . Time Sampled	14:50
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	06/20/2006
2 . Time Sample Counted	09:15
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.9 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3354.8 cpm
Net Spike Count Rate (cpm)	3347.9 cpm
H3 Spike Activity (dpm on count date)	8638.9 dpm
Counter Efficiency	0.3875 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	8.1 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.2 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.13\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 6-20-06

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-2D020906D

Sample Location (Well Number): EFT-2D

1. Representative sample collected. Date/Time 02/09/2006 1 1450

Sample collected by: Suzanne Stoback / Suzanne Stoback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Abercrombie / Andrew Abercrombie Date: 6-2-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT-2D020906.

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Abere / Andrew Jue Date: 6-2-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



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RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-20020906 EF1

Sample End Time: 9-FEB-2006 14:50:00.00

REMARKS

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.....

PERFORMED BY:

*Andrew Gere*

SIGNATURE

REVIEWED BY:

*Killian V. Lynn 4/8/06 5/16/06*

SIGNATURE/DATE

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-20020906 EF1
Sample collection start date: 9-FEB-2006 14:50:00.00
Sample collection end date : 9-FEB-2006 14:50:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : MALL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 2-JUN-2006 22:35:49.33
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.16 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:50:00.0
Key/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data with handwritten annotations on the right side.

Handwritten notes: 'Ac 228', 'antibiotic', 'the C', '214', 'L40'.

Decay Time = 113 07:48:49.33

Acquisition Time = 2-JUN-2006 22:35:49.33

Post-NID Peak Search Report

It	Energy	Area	Ekjnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	198.61	37	93	1.05	396.79	393	10	51.6		
0	511.41	118	86	2.53	1022.38	1012	19	21.0		
0	558.98	57	47	2.13	1117.54	1108	16	30.4		
0	609.95	49	19	3.43	1219.52	1209	19	25.6		
0	1461.43	100	8	2.37	2923.89	2916	20	12.5		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Er
K-40	1460.81	100	10.67*	2.308E+00	6.122E-07	6.122E-07	12.52

Flag: "\*" = Keyline

Total number of lines in spectrum 5  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma *Error	Flags
K-40	1.00E+05Y	1.00	6.122E-07	6.122E-07	0.767E-07	12.52	
Total Activity :			6.122E-07	6.122E-07			

Grand Total Activity : 6.122E-07 6.122E-07

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

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

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
F-18	109.74M	1487.16	511.00*	193.46	1.000E+35	21.00	Decay	
% Abundances Found =				100.00				
SE-75	119.78D	0.95	66.05	1.02	----	Not Found	----	Abun.
			96.73	3.41	----	Not Found	----	
			121.12	16.70	----	Not Found	----	
			136.00*	59.20	----	Not Found	----	
			198.60	1.45	1.239E-06	51.62		
			264.65	59.80	----	Not Found	----	
			279.53	25.20	----	Not Found	----	
			303.91	1.32	----	Not Found	----	
			400.65	11.40	----	Not Found	----	
% Abundances Found =				0.81				
AS-76	26.32H	103.34	559.10*	44.70	5.674E+23	30.41	Decay, Abun.	
			563.23	1.17	----	Not Found	----	
			571.30	0.14	----	Not Found	----	
			657.03	6.10	----	Not Found	----	
			665.31	0.39	----	Not Found	----	
			740.12	0.12	----	Not Found	----	
			771.76	0.12	----	Not Found	----	
			867.63	0.12	----	Not Found	----	
			1129.07	0.14	----	Not Found	----	
			1212.72	1.63	----	Not Found	----	
			1216.02	3.04	----	Not Found	----	
			1220.52	1.39	----	Not Found	----	
			1439.13	0.33	----	Not Found	----	
			1453.60	0.13	----	Not Found	----	
			1707.67	0.33	----	Not Found	----	
% Abundances Found =				73.70				
RU-103	39.35D	2.08	497.08*	89.00	----	Not Found	----	Abun.
			610.33	5.60	2.330E-06	25.62		
% Abundances Found =				5.92				
XE-135	9.11H	298.57	249.79*	89.90	----	Not Found	----	Decay, Abun.
			608.19	2.89	1.000E+35	25.62		
% Abundances Found =				3.11				
PM-148M	41.30D	2.74	280.11	12.56	----	Not Found	----	Abun.
			414.07	18.66	----	Not Found	----	
			432.78	5.35	----	Not Found	----	
			501.26	6.75	----	Not Found	----	
			550.27*	94.90	----	Not Found	----	
			599.74	12.54	----	Not Found	----	
			611.26	5.46	2.166E-06	25.62		
			629.97	89.00	----	Not Found	----	
			725.70	32.00	----	Not Found	----	
			915.33	17.17	----	Not Found	----	
			1013.01	20.30	----	Not Found	----	
% Abundances Found =				1.74				

Nuclide	Half-life	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
		Ratio				(uCi/cc)	%Error	
BI-214	19.90M	8201.05		609.31*	46.30	1.000E+35	25.62	Decay
				768.36	5.04	----	Not Found	----
				934.06	3.21	----	Not Found	----
				1120.29	15.10	----	Not Found	----
				1238.11	5.94	----	Not Found	----
				1377.67	4.11	----	Not Found	----
				1764.49	15.80	----	Not Found	----
% Abundances Found =				48.48	(Abn. Limit = 48.48%)			

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	198.61	37	93	1.05	396.79	393	10	2.00E-02	51.6	6.03E+00	T
0	511.41	118	86	2.53	1022.38	1012	19	6.53E-02	21.0	4.48E+00	T
0	558.90	57	47	2.13	1117.54	1108	16	3.14E-02	30.4	4.31E+00	T
0	609.95	49	19	3.43	1219.52	1209	19	2.73E-02	25.6	4.16E+00	T

Flags: "T" = Tentatively associated



\* Sample ID : EFT-2D020906 EF1

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	3.4105E-07
F-18	0.	511.00	Half-Life too short
NA-22	8.	1274.54	1.0342E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	15.	869.25	2.6492E-08
CR-51	36.	320.00	1.4840E-06
MN-54	11.	834.83	1.0751E-08
CO-56	19.	1238.25	5.5117E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	150.38	Half-Life too short
CO-57	51.	122.06	1.6095E-08
CO-58	16.	810.76	2.9917E-08
FE-59	8.	1099.22	9.1450E-08
CO-60	18.	1332.49	1.4306E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	7.	1115.52	2.3224E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	48.	136.00	2.9817E-08
A-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	53.	513.99	2.9010E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	53.	513.99	4.1370E-08
RB-86	17.	1076.63	9.2563E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	9.	1836.01	2.5723E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.38	Half-Life too short
Y-91	13.	1204.90	1.4461E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-2D022906 EF1

Acquisition date : 2-JUN-2006 22:35:49

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	598.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	24.	782.63	1.0145E-08
NB-95	11.	765.79	7.4108E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	20.	756.72	6.1799E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	19.	497.08	6.2420E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	18.	621.84	1.0236E-07
CD-109	54.	88.03	5.5685E-07
AG-110M	15.	937.48	4.2880E-08
SN-113	30.	391.69	2.5489E-08
SN-117M	54.	158.56	3.3703E-06
SB-122	0.	563.93	Half-Life too short
SB-124	19.	602.71	3.1445E-08
SB-125	20.	427.89	3.1135E-08
TE-125M	34.	109.20	1.3488E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	55.	57.60	6.1646E-05
XE-127	47.	202.84	1.0984E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	19.	695.88	2.8098E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	39.	123.80	2.4042E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	54.	163.93	3.4792E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	41.	302.84	5.1384E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	> Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	16.	604.70	8.6761E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	10.	818.50	3.1584E-06
I-136	0.	1313.02	Half-Life too short
I-137	21.	661.65	1.0540E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	47.	165.85	1.8526E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	25.	537.32	1.6590E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	42.	145.44	1.9164E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	42.	133.54	1.0583E-07
PR-144	0.	1469.15	Half-Life too short
ND-147	0.	91.10	Half-Life too short
PM-148M	13.	550.27	4.7236E-08
EU-152	43.	344.27	3.6436E-08
EU-154	13.	1004.76	5.8302E-08
EU-156	11.	646.29	1.6879E-05
HF-181	20.	482.03	6.9196E-08
TA-182	14.	1221.42	0.6453E-08
W-187	0.	605.01	Half-Life too short
Y-188	0.	155.03	Half-Life too short
BI-203	44.	279.19	6.3838E-08
BI-207	23.	569.67	9.0785E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	54.	106.21	2.7436E-07
AC-228	43.	338.32	8.6024E-08
TH-228	41.	84.37	1.5777E-06
PA-234	0.	131.20	Half-Life too short
TH-234	50.	63.29	3.8216E-05
U-235	45.	143.76	8.1383E-08
NP-239	0.	106.13	Half-Life too short
AM-241	55.	59.54	2.3073E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-4S021306

Sample Location (Well Number): EFT-4S

1. Representative sample collected. Date/Time 02/13/2006 / 1000

Sample collected by: Joy Marie Staback / Joy Marie Staback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Young / [Signature] Date: 6-20-6  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

Sample Information

1 . Sample Location	EFT-4S021306
2 . Date Sampled	02/13/2006
3 . Time Sampled	10:00
4 . Sample Volume, (ml)	4 ml

Instrument Count Data

1 . Date Sample Counted	06/20/2006
2 . Time Sample Counted	09:05
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.9 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3354.8 cpm
Net Spike Count Rate (cpm)	3347.9 cpm
H3 Spike Activity (dpm on count date)	8638.9 dpm
Counter Efficiency	0.3875 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	8.2 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.3 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.13\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date 6-20-6

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-45021306

Sample Location (Well Number): EFT-45

1. Representative sample collected. Date/Time 02/13/2006 1 1000

Sample collected by: Joy Marie Elshank / Joy Marie Slaback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jestas / B. Jestas Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Above / Andrew G. [Signature] Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT 45021306

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Alcure , Andrew Klee Date: 6-3-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton William V. Lipton Date: 6/5/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V Lipton 48651 / 6/5/2006

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-49021306 EF1

Sample End Time: 13-FEB-2006 10:00:00.00

REMARKS

PERFORMED BY:

*Andrew Lee*

SIGNATURE

REVIEWED BY:

*William N. Lytton 48651/6/5/2006*

SIGNATURE/DATE



Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-45021306 EF1
Sample collection start date: 13-FEB-2006 10:00:00.00
Sample collection end date : 13-FEB-2006 10:00:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : MELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 01:17:48.56
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.10 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.00
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 6 rows of peak data.

Handwritten notes: 74-230, 81214, 81214, 81214

## Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	XErr	Fit	Nuclides
0	67.05	50	39	0.84	133.75	131	8	26.9		
0	511.30	164	45	2.63	1022.16	1013	10	12.4		
0	558.56	73	12	1.08	1116.71	1111	12	15.1		
0	609.60	44	11	1.90	1218.82	1213	12	21.9		
0	1460.84	53	23	1.84	2922.70	2915	15	23.7		K-40
0	1764.29	28	0	1.08	3530.54	3523	15	18.9		

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sig %Error
K-40	1460.81	53	10.67*	2.300E+00	3.259E-07	3.259E-07	23.69

Flag: "\*" = Keyline

Total number of lines in spectrum 6  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 6 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	3.259E-07	3.259E-07	0.772E-07	23.69	
Total Activity :			3.259E-07	3.259E-07			

Grand Total Activity : 3.259E-07 3.259E-07

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

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

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
F-18	109.74M	1438.79	511.00*	193.46	1.000E+35	12.36	Decay
		% Abundances	Found = 100.00				
SE-75	119.78D	0.92	66.05	1.02	1.010E-05	26.95	Abun.
			96.73	3.41	----	Not Found	----
			121.12	16.70	----	Not Found	----
			136.00*	59.20	----	Not Found	----
			198.60	1.45	----	Not Found	----
			264.65	59.80	----	Not Found	----
			279.53	25.20	----	Not Found	----
			303.91	1.32	----	Not Found	----
			400.65	11.40	----	Not Found	----
		% Abundances	Found = 0.57				
AS-76	26.32H	99.98	559.10*	44.70	7.111E+22	15.10	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.07	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.04	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1707.67	0.33	----	Not Found	----
		% Abundances	Found = 73.70				
RU-103	39.35D	2.79	497.08*	89.00	----	Not Found	Abun.
			610.33	5.60	1.939E-06	21.87	
		% Abundances	Found = 5.92				
XE-135	9.11H	288.86	249.79*	89.90	----	Not Found	Decay, Abun.
			600.19	2.89	1.000E+35	21.87	
		% Abundances	Found = 3.11				
CS-136	13.16D	8.33	66.91	12.50	1.408E-04	26.95	Abun.
			86.29	6.30	----	Not Found	----
			153.22	7.46	----	Not Found	----
			163.69	4.61	----	Not Found	----
			176.55	13.56	----	Not Found	----
			273.65	12.66	----	Not Found	----
			340.57	48.50	----	Not Found	----
			810.50*	99.70	----	Not Found	----
			1040.07	79.60	----	Not Found	----
			1235.34	19.70	----	Not Found	----
		% Abundances	Found = 4.10				
PM-148M	41.30D	2.65	288.11	12.56	----	Not Found	Abun.

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
PM-148M	41.300	2.65	414.07	18.66	----	Not Found	----	Abun.
			432.78	5.35	----	Not Found	----	
			501.26	6.75	----	Not Found	----	
			550.27*	94.90	----	Not Found	----	
			599.74	12.54	----	Not Found	----	
			611.26	5.48	1.809E-06	21.87		
			629.97	89.00	----	Not Found	----	
			725.70	32.80	----	Not Found	----	
			915.33	17.17	----	Not Found	----	
			1013.81	20.30	----	Not Found	----	
% Abundances Found =			1.74					
TA-182	114.740	0.96	67.75	42.30	2.505E-07	26.95	Abun.	
			100.10	14.10	----	Not Found	----	
			1109.05	16.30	----	Not Found	----	
			1221.42*	27.10	----	Not Found	----	
			1230.97	11.50	----	Not Found	----	
% Abundances Found =			38.01					
BI-214	19.90M	7934.31	609.31*	46.30	1.000E+35	21.87	Decay	
			768.36	5.04	----	Not Found	----	
			934.06	3.21	----	Not Found	----	
			1120.29	15.10	----	Not Found	----	
			1238.11	5.94	----	Not Found	----	
			1377.67	4.11	----	Not Found	----	
			1764.49	15.80	1.000E+35	18.90		
% Abundances Found =			65.03	(Abn. Limit = 48.48%)				

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	67.05	50	39	0.84	133.75	131	8	2.77E-02	26.9	1.37E+00	T
0	511.30	164	45	2.63	1022.16	1013	10	9.12E-02	12.4	4.48E+00	
0	558.56	73	12	1.00	1116.71	1111	12	4.05E-02	15.1	4.31E+00	
0	609.60	44	11	1.90	1218.82	1213	12	2.42E-02	21.9	4.16E+00	T
0	1764.29	20	0	1.00	3530.54	3523	15	1.56E-02	18.9	2.08E+00	T

Flags: "T" = Tentatively associated

\* Sample ID : EFT-46021306 EF1

Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	25.	477.59	3.3484E-07
F-18	0.	511.00	Half-Life too short
NA-22	0.	1274.54	1.0315E-08
NA-24	0.	1368.53	Half-Life too short
NO-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	16.	809.25	2.6696E-08
CR-51	41.	328.88	1.4388E-06
MN-54	17.	834.83	1.3151E-08
CO-56	15.	1238.25	4.7824E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	49.	122.06	1.5600E-08
CO-58	18.	810.76	3.0300E-08
FE-59	9.	1099.22	9.0357E-08
CO-60	10.	1332.49	1.1380E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	12.	1115.52	2.8373E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	45.	136.00	2.8123E-08
AR-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	65.	513.99	3.1993E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	65.	513.99	4.3887E-08
RB-86	5.	1076.63	4.8013E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	4.	1836.81	1.8057E-08
KR-89	0.	228.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	17.	1204.90	1.5511E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short



Sample ID : EFT-48021306 EF1

Acquisition date : 3-JUN-2006 01:17:48

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	13.	702.63	7.7976E-09
NB-95	16.	765.79	8.1113E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	13.	756.72	4.9071E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	29.	497.08	7.0834E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	22.	621.84	1.1265E-07
CD-109	36.	88.03	4.6037E-07
AG-110M	27.	937.48	5.4961E-08
SN-113	33.	391.69	2.6258E-08
SN-117M	51.	158.56	2.7146E-06
SB-122	0.	563.93	Half-Life too short
SB-124	32.	602.71	3.7375E-08
SB-125	34.	427.89	3.3658E-08
TE-125M	42.	109.28	1.4197E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	28.	57.60	4.4199E-05
XE-127	66.	202.84	1.1988E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	19.	695.88	2.6167E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	40.	123.80	1.9600E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	41.	163.93	2.4712E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	35.	302.84	4.7707E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	25.	604.70	1.0675E-08
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	9.	818.58	2.5354E-06
I-136	0.	1313.02	Half-Life too short
I-137	31.	661.65	1.2591E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.58	Half-Life too short
CE-139	40.	165.85	1.6980E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	27.	537.32	1.3962E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	53.	145.44	1.9710E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	47.	133.54	1.1087E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	33.	91.10	4.7384E-05
PM-148M	23.	550.27	5.7926E-08
EU-152	31.	344.27	3.1664E-08
EU-154	21.	1004.76	7.2417E-08
EU-156	28.	646.29	2.1243E-05
HF-181	28.	482.03	6.4863E-08
TA-182	8.	1221.42	6.7586E-08
W-187	0.	685.81	Half-Life too short
F-188	0.	155.03	Half-Life too short
BI-203	39.	279.19	5.6724E-08
BI-207	27.	569.67	9.7624E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	61.	186.21	2.9055E-07
AC-228	39.	338.32	8.2176E-08
TH-228	38.	84.37	1.5893E-06
PA-234	0.	131.20	Half-Life too short
TH-234	38.	63.29	2.8224E-05
U-235	52.	143.76	8.7297E-08
NP-239	0.	106.13	Half-Life too short
AM-241	38.	59.54	1.9520E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-4D021306

Sample Location (Well Number): EFT-4D

1. Representative sample collected. Date/Time 02/13/2006 1 1125

Sample collected by: Joy Marie Staback / Joy Marie Staback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Jean M. York / [Signature] Date: 6-19-6  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-4D021306
2 . Date Sampled	02/13/2006
3 . Time Sampled	11:25
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	06/19/2006
2 . Time Sample Counted	19:10
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.5 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3346.6 cpm
Net Spike Count Rate (cpm)	3340.1 cpm
H3 Spike Activity (dpm on count date)	8640.3 dpm
Counter Efficiency	0.3866 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.5 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.10\text{E-06 uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 6-20-06

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-40021306

Sample Location (Well Number): EFT-4D

1. Representative sample collected. Date/Time 02/13/2006 / 1125

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 23/4/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
**Note:** Use new sample containers only

Sample sealed by: B J Estes / B J Estes Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Above / Andrew Lee Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT 4002306

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Abercrombie Abercrombie Date: 6-3-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton William V. Lipton Date: 6/5/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material <sup>on 6/5/2006</sup> detected, William V. Lipton 48657 / 6/5/2006

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT 4D021306 EF1

Sample End Time: 13-FEB-2006 11:25:00.00

REMARKS

PERFORMED BY:

*Andre Hara*

SIGNATURE

REVIEWED BY:

*Miriam Lopez 4869/6/5/2006*

SIGNATURE/DATE

Sample ID : EFT 4D021306 EF1

Acquisition date : 3-JUN-2006 01:49:35

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT 4D021306 EF1
Sample collection start date: 13-FEB-2006 11:25:00.00
Sample collection end date : 13-FEB-2006 11:25:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : P2LL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 01:49:56.79
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.09 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:56:00.0
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nib
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 4 rows of peak data.

Handwritten notes: A1226, H6C, P1214, K40



Decay Time = 109 14:24:56.79

Acquisition Time = 3-JUN-2006 01:49:56.79

### Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	200.13	69	130	2.99	399.82	388	20	43.1		
0	559.44	53	60	2.22	1118.47	1109	16	35.3		
0	609.41	56	31	1.27	1218.42	1211	14	25.2		
0	1461.13	82	16	1.68	2923.28	2914	16	15.5		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Er
K-40	1460.81	82	10.67*	2.300E+00	5.000E-07	5.000E-07	15.52

Flag: "\*" = Keyline

Total number of lines in spectrum 4  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : natural

Nuclide	HLife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.000E-07	5.000E-07	0.776E-07	15.52	
Total Activity :			5.000E-07	5.000E-07			
Grand Total Activity :			5.000E-07	5.000E-07			

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by	
SE-75	119.78D	0.92	66.05	1.02	---	Not Found	---	Abun.
			96.73	3.41	---	Not Found	---	
			121.12	16.70	---	Not Found	---	
			136.00*	59.20	---	Not Found	---	
			198.60	1.45	2.225E-06	43.10	---	
			264.65	59.00	---	Not Found	---	
			279.53	25.20	---	Not Found	---	
			303.91	1.32	---	Not Found	---	
			400.65	11.40	---	Not Found	---	
			% Abundances Found =			0.81		
AS-76	26.32H	99.95	559.10*	44.70	5.075E+22	35.33	Decay, Abun.	
			563.23	1.17	---	Not Found	---	
			571.30	0.14	---	Not Found	---	
			657.03	6.10	---	Not Found	---	
			665.31	0.39	---	Not Found	---	
			740.12	0.12	---	Not Found	---	
			771.76	0.12	---	Not Found	---	
			867.63	0.12	---	Not Found	---	
			1129.87	0.14	---	Not Found	---	
			1212.72	1.63	---	Not Found	---	
			1216.02	3.84	---	Not Found	---	
			1228.52	1.39	---	Not Found	---	
			1439.13	0.33	---	Not Found	---	
			1453.60	0.13	---	Not Found	---	
1787.67	0.33	---	Not Found	---				
% Abundances Found =			73.70					
Y-92	3.54H	743.13	448.50	2.30	---	Not Found	---	Decay, Abun.
			561.10	2.40	1.000E+35	35.33	---	
			844.30	1.25	---	Not Found	---	
			934.46*	13.90	---	Not Found	---	
			1405.40	4.80	---	Not Found	---	
% Abundances Found =			9.74					
RU-103	39.35D	2.79	497.08*	89.00	---	Not Found	---	Abun.
			610.33	5.60	2.473E-06	25.22	---	
% Abundances Found =			5.92					
TE-131M	30.00H	87.69	102.06	7.90	---	Not Found	---	Decay, Abun.
			149.72	5.10	---	Not Found	---	
			200.63	7.56	5.646E+19	43.10	---	
			240.93	7.59	---	Not Found	---	
			334.27	9.60	---	Not Found	---	
			773.67*	38.20	---	Not Found	---	
			782.49	7.79	---	Not Found	---	
			793.75	13.90	---	Not Found	---	
			822.70	6.12	---	Not Found	---	
			852.21	20.70	---	Not Found	---	
			1125.46	11.40	---	Not Found	---	
			1206.60	9.00	---	Not Found	---	
% Abundances Found =			5.19					

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by		
	Half-life	Ratio			(uCi/cc)	%Error			
TE-134	41.80M	3776.08	79.45	21.00	----	Not Found	----	Decay, Abun.	
			180.89	18.00	----	Not Found	----		
			201.24	8.70	1.000E+35	43.10			
			210.47*	21.90	----	Not Found	----		
			277.95	21.30	----	Not Found	----		
			435.06	18.60	----	Not Found	----		
			461.00	10.80	----	Not Found	----		
			464.64	5.10	----	Not Found	----		
			565.99	18.90	----	Not Found	----		
			742.59	14.70	----	Not Found	----		
			767.20	30.00	----	Not Found	----		
% Abundances Found =			4.60						
XE-135	9.11H	288.77	249.79*	89.90	----	Not Found	----	Decay, Abun.	
			608.19	2.89	1.000E+35	25.22			
			% Abundances Found =			3.11			
FM-148M	41.30D	2.65	288.11	12.56	----	Not Found	----	Abun.	
			414.07	18.66	----	Not Found	----		
			432.78	5.35	----	Not Found	----		
			501.26	6.75	----	Not Found	----		
			550.27*	94.90	----	Not Found	----		
			599.74	12.54	----	Not Found	----		
			611.26	5.48	2.307E-06	25.22			
			629.97	89.00	----	Not Found	----		
			725.70	32.80	----	Not Found	----		
			915.33	17.17	----	Not Found	----		
1013.81	20.30	----	Not Found	----					
% Abundances Found =			1.74						
BI-214	19.90M	7931.66	609.31*	46.30	1.000E+35	25.22	Decay		
			768.36	5.04	----	Not Found		----	
			934.06	3.21	----	Not Found		----	
			1120.29	15.10	----	Not Found		----	
			1238.11	5.94	----	Not Found		----	
			1377.67	4.11	----	Not Found		----	
			1764.49	15.80	----	Not Found		----	
			% Abundances Found =			48.48		(Abn. Limit = 48.48%)	
U-235	9999.99Y	0.00	109.14	1.50	----	Not Found	----	Abun.	
			143.76*	10.50	----	Not Found	----		
			163.35	4.70	----	Not Found	----		
			185.72	54.00	----	Not Found	----		
			202.12	1.00	1.711E-06	43.10			
			205.31	4.70	----	Not Found	----		
% Abundances Found =			1.31						

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	200.13	69	130	2.99	399.82	388	20	3.61E-02	43.1	6.02E+00	T
0	559.44	53	60	2.22	1118.47	1109	16	2.95E-02	35.3	4.31E+00	T
0	609.41	56	31	1.27	1218.42	1211	14	3.09E-02	25.2	4.16E+00	T

Flags: "T" = Tentatively associated

\* Sample ID : EFT 4D021306 EF1 \*

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	3.2044E-07
F-18	0.	511.00	Half-Life too short
NA-22	10.	1274.54	1.1508E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	15.	809.25	2.5751E-08
CR-51	37.	320.00	1.3812E-06
MN-54	13.	834.83	1.1527E-08
CO-56	16.	1238.25	4.9322E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	39.	122.06	1.4083E-08
CO-58	15.	810.76	2.7748E-08
FE-59	14.	1099.22	1.0774E-07
CO-60	12.	1332.49	1.2268E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	15.	1115.52	3.1109E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	41.	136.00	2.7113E-08
A-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	53.	513.99	2.8979E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	53.	513.99	3.9737E-08
RB-86	15.	1076.63	7.6387E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	7.	1836.01	2.3302E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	4.	1204.90	8.4789E-06
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT 4D021306 EF1

Acquisition date : 3-JUN-2006 01:49:56

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-92	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	21.	702.63	9.6040E-09
NB-95	15.	765.79	7.8220E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	22.	756.72	6.2723E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.50	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	35.	497.00	7.7829E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	16.	621.84	9.8170E-08
CD-109	38.	88.03	4.7374E-07
AG-110M	8.	937.48	3.1604E-08
SN-113	41.	391.69	2.8932E-08
SN-117M	53.	158.56	2.7613E-06
SB-122	0.	563.93	Half-Life too short
SB-124	18.	602.71	2.9337E-08
SB-125	27.	427.89	3.0741E-08
TE-125M	42.	109.28	1.4177E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	34.	57.60	4.8421E-05
XE-127	41.	202.84	9.6074E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	19.	695.88	2.6136E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	38.	123.00	1.8990E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	47.	163.93	2.6324E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	40.	302.84	5.1151E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	19.	604.70	9.4194E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short



Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	11.	818.50	2.6763E-06
CS-136	0.	1313.02	Half-Life too short
CS-137	18.	661.65	1.0005E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	53.	165.85	1.9168E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	28.	537.32	1.4266E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	55.	145.44	1.9954E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	50.	133.54	1.1338E-07
FR-144	0.	1489.15	Half-Life too short
ND-147	35.	91.10	4.8155E-05
PM-148M	30.	550.27	6.4438E-08
EU-152	46.	344.27	3.7768E-08
EU-154	10.	1004.76	5.2186E-08
EU-156	19.	646.29	1.7785E-05
HF-181	29.	482.03	6.5534E-08
TA-182	8.	1221.42	6.4898E-08
W-187	0.	685.81	Half-Life too short
W-188	0.	155.03	Half-Life too short
HG-203	46.	279.19	6.1592E-08
BI-207	23.	569.67	9.0781E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	51.	186.21	2.6721E-07
AC-228	34.	338.32	7.7489E-08
TH-228	38.	84.37	1.5121E-06
PA-234	0.	131.20	Half-Life too short
TH-234	40.	63.29	2.9066E-05
U-235	48.	143.76	8.3932E-08
NP-239	0.	106.13	Half-Life too short
AM-241	41.	59.54	2.0188E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-5S020806

Sample Location (Well Number): EFT-5S

1. Representative sample collected. Date/Time 02/08/2006 1 1620

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: JOHN M. GORAN / [Signature] Date: 6-19-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-5S020806
2 . Date Sampled	02/08/2006
3 . Time Sampled	16:20
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	06/19/2006
2 . Time Sample Counted	19:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.5 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3346.6 cpm
Net Spike Count Rate (cpm)	3340.1 cpm
H3 Spike Activity (dpm on count date)	8640.3 dpm
Counter Efficiency	0.3866 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	8.1 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.6 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

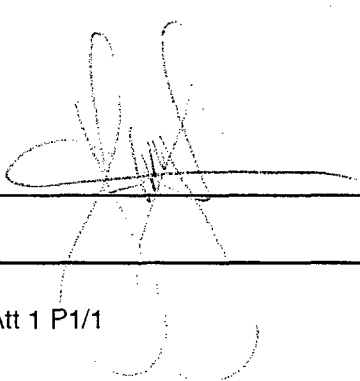
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3:3 \times \frac{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.10\text{E}-06 \text{ uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician \_\_\_\_\_



Date 6-20-6

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-58020806

Sample Location (Well Number): EFT-58

1. Representative sample collected. Date/Time 02/09/2006 1 1620

Sample collected by: Joy Marie Shabak / Joy Marie Shabak Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Abers / Andrew Yee Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT 5 S 020806

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".

(Note disposition of unidentified peaks in "Remarks")

Performed by: Abere, Andrew Lee Date: 6-3-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton William V. Lipton Date: 6/5/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 2 511 peaks  
No licensed radioactive material detected.  
William V. Lipton 4869 / 6/5/06

\*\*\*\*\*

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-55020806 EF1

Sample End Time: 8-FEB-2006 16:20:00.00

REMARKS

.....  
.....  
.....

PERFORMED BY:

*Andrew Vera*  
SIGNATURE

REVIEWED BY:

*William V. Fata 48657/6/5/06*  
SIGNATURE/DATE

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-SS020006 EF1
Sample collection start date: 8-FEB-2006 16:20:00.00
Sample collection end date : 8-FEB-2006 16:20:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : MELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 02:23:09.00
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.10 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.0
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 6 rows of peak data. Includes handwritten notes like 'Ac 228', 'Am 241', and '214'.

Handwritten notes: Ac 228, Am 241, 214, 140

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	198.98	47	74	1.57	397.52	391	11	38.5		
0	511.18	54	45	2.44	1021.93	1014	20	35.5	2.55E+00	
3	511.98	64	36	2.02	1023.37	1014	20	26.5		
0	559.07	76	24	1.67	1117.73	1112	11	17.2		
0	606.99	52	12	1.29	1217.60	1211	12	19.1		
0	1461.14	79	8	1.75	2923.30	2916	16	13.8		K-40



Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.51	79	10.67*	2.308E+00	4.817E-07	4.817E-07	13.81

Flag: "\*" = Keyline

Total number of lines in spectrum 6  
 Number of unidentified lines 1  
 Number of lines tentatively identified by NID 5 83.33%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.817E-07	4.817E-07	0.665E-07	13.81	
Total Activity :			4.817E-07	4.817E-07			
Grand Total Activity :			4.817E-07	4.817E-07			

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

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

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	1501.53	511.00*	193.46	1.000E+35	35.52	Decay
% Abundances Found = 100.00							
SE-75	119.78D	0.96	66.05	1.02	----	Not Found	----
			96.73	3.41	----	Not Found	----
			121.12	16.70	----	Not Found	----
			136.00*	59.20	----	Not Found	----
			198.60	1.45	1.561E-06	38.46	
			264.65	59.00	----	Not Found	----
			279.53	25.20	----	Not Found	----
			303.91	1.32	----	Not Found	----
			400.65	11.40	----	Not Found	----
% Abundances Found = 0.81							
AS-76	26.32H	104.34	559.10*	44.70	1.515E+24	17.16	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.84	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found = 73.70							
RU-103	39.35D	2.91	497.00*	89.00	----	Not Found	----
			610.33	5.60	2.532E-06	19.09	
% Abundances Found = 5.92							
TE-131M	30.00H	91.54	102.06	7.90	----	Not Found	----
			149.72	5.10	----	Not Found	----
			200.63	7.56	5.573E+20	38.46	
			240.93	7.59	----	Not Found	----
			334.27	9.60	----	Not Found	----
			773.67*	38.20	----	Not Found	----
			782.49	7.79	----	Not Found	----
			793.75	13.90	----	Not Found	----
			822.78	6.12	----	Not Found	----
			852.21	20.70	----	Not Found	----
			1125.46	11.40	----	Not Found	----
			1206.60	9.80	----	Not Found	----
% Abundances Found = 5.19							
XE-135	9.11H	301.46	249.79*	89.90	----	Not Found	----
			608.19	2.89	1.000E+35	19.09	
% Abundances Found = 3.11							

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
BI-214	19.98M	8200.31	609.31*	46.30	1.000E+35	19.09	Decay
			768.36	5.04	----	Not Found	----
			934.06	3.21	----	Not Found	----
			1120.29	15.10	----	Not Found	----
			1238.11	5.94	----	Not Found	----
			1377.67	4.11	----	Not Found	----
			1764.49	15.80	----	Not Found	----
% Abundances Found =			48.48	(Abn. Limit =	48.48%)		

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	198.98	47	74	1.57	397.52	391	11	2.60E-02	38.5	6.03E+00	T
3	511.18	54	45	2.44	1021.93	1014	20	3.00E-02	35.5	4.49E+00	
3	511.98	64	36	2.02	1023.37	1014	20	3.57E-02	26.5	4.40E+00	
0	559.07	76	24	1.67	1117.73	1112	11	4.20E-02	17.2	4.31E+00	T
0	608.99	52	12	1.29	1217.60	1211	12	2.91E-02	19.1	4.16E+00	T

Flags: "T" = Tentatively associated

Sample ID : EFT-55020006 EF1

Minimum Detectable Activity Report

Nuclide	Bckgrnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	19.	477.59	3.1627E-07
F-18	0.	511.00	Half-Life too short
NA-22	14.	1274.54	1.3134E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	0.	889.25	2.0316E-08
CR-51	36.	320.00	1.5251E-06
MN-54	22.	834.83	1.4611E-08
CO-56	16.	1230.25	5.1506E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	43.	122.06	1.4857E-08
CO-58	16.	810.76	2.9861E-08
FE-59	16.	1099.22	1.2197E-07
CO-60	13.	1332.49	1.2510E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	11.	1115.52	2.7766E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	58.	136.00	3.2744E-08
AS-76	0.	559.10	Half-Life too short
BR-78	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	73.	513.99	3.3759E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	73.	513.99	4.8696E-08
RB-86	11.	1076.63	7.9010E-06
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	6.	1836.01	2.1902E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	15.	1204.90	1.5520E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-55020806 EF1

Acquisition date : 3-JUN-2006 02:23:09

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NR-94	14.	702.63	7.9500E-09
NR-95	21.	765.79	1.0039E-07
NR-95M	0.	235.69	Half-Life too short
ZR-95	13.	756.72	5.2101E-08
NR-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	21.	497.08	6.6362E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	16.	621.84	9.8308E-08
CD-109	42.	88.03	4.9796E-07
AG-110M	15.	937.48	4.2933E-08
SN-113	29.	391.69	2.5229E-08
SN-117M	51.	150.56	3.4800E-06
SB-122	0.	563.93	Half-Life too short
SB-124	23.	602.71	3.4486E-08
SB-125	34.	427.89	3.4032E-08
TE-125M	35.	109.28	1.3756E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	37.	57.60	5.2034E-05
XE-127	56.	202.84	1.2234E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	21.	695.88	3.0120E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	47.	123.80	2.7914E-05
I-131	0.	<364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	43.	163.93	3.3559E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	36.	302.84	4.8705E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	15.	604.70	8.5472E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	260.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	12.	818.58	3.6561E-06
I-136	0.	1313.02	Half-Life too short
I-137	21.	661.65	1.6614E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.58	Half-Life too short
CE-139	34.	165.85	1.6014E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	26.	537.32	1.7970E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	198.22	Half-Life too short
CE-141	38.	145.44	1.8841E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	37.	133.54	1.0087E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	0.	91.10	Half-Life too short
PM-148M	16.	558.27	5.2776E-08
EU-152	32.	344.27	3.1896E-08
EU-154	13.	1004.76	5.9988E-08
EU-156	17.	646.29	2.1082E-05
HF-181	31.	482.03	7.3707E-08
TA-182	14.	1221.42	8.6558E-08
W-187	0.	685.81	Half-Life too short
Y-188	0.	155.03	Half-Life too short
BI-203	39.	279.19	6.0927E-08
BI-207	19.	569.67	8.2562E-09
TL-208	0.	583.14	Half-Life too short
PE-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PE-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	57.	186.21	2.8259E-07
AC-228	40.	338.32	8.3210E-08
TH-228	45.	84.37	1.6382E-06
PA-234	0.	131.20	Half-Life too short
TH-234	38.	63.29	3.2640E-05
U-235	40.	143.76	7.7119E-08
NP-239	0.	186.13	Half-Life too short
AM-241	38.	59.54	1.9433E-07



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-5D021006

Sample Location (Well Number): EFF-5D

1. Representative sample collected. Date/Time 02/10/2006 1 1355

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 2/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Yorkon / [Signature] Date: 6-19-6  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location EFT-5D021006  
 2 . Date Sampled 02/10/2006  
 3 . Time Sampled 13:55  
 4 . Sample Volume, (ml) 4 ml

**Instrument Count Data**


1 . Date Sample Counted 06/19/2006  
 2 . Time Sample Counted 18:50  
 3 . Background Inf.:  
     Minutes Counted 10 min.  
     Background Count Rate (cpm) 6.5 cpm  
 4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
     Gross Spike Count Rate (cpm) 3346.6 cpm  
     Net Spike Count Rate (cpm) 3340.1 cpm  
     H3 Spike Activity (dpm on count date) 8640.3 dpm  
     Counter Efficiency 0.3866 cpm/dpm  
 5 . Sample Info:  
     Sample Gross Count Rate (cpm) 7.5 cpm  
     Sample Count Time (min.) 10.0 min.  
     Net Sample Count Rate (cpm) 1.0 cpm  
 6 . Critical Level:  
     Critical Level Count Rate (cpm) 1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.10\text{E}-06 \text{ uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date 6-20-06

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-5D021006

Sample Location (Well Number): EFT-5D

1. Representative sample collected. Date/Time 02/10/2006 / 1355

Sample collected by: Joy Marie Stebbins / Joy Marie Stebbins Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Abere / Andrew Hene Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT 50 021006

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Above , Andrew Lee Date: 6-3-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 6/5/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 2 511 peaks.  
NO licensed radioactive material detected.  
William V Lipton 486 51 6/5/2006

\*\*\*\*\*

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-5D021006 EF1

Sample End Time: 10-FEB-2006 13:55:00.00

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PERFORMED BY:

Andrew Lee  
SIGNATURE

REVIEWED BY:

William V. Lita 48651/6/5/006  
SIGNATURE/DATE

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-5D021006 EF1
Sample collection start date: 10-FEB-2006 13:55:00.00
Sample collection end date : 10-FEB-2006 13:55:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 02:55:12.62
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.09 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:50:00.0
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m2ll Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 4 rows of peak data. Includes handwritten notes '2nd calculation' and 'H u C' near the 3rd and 4th rows.

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	510.38	54	46	2.44	1020.33	1011	20	34.9	6.65E-01	
3	511.02	67	37	2.12	1023.21	1011	20	26.2		
0	559.21	64	35	1.62	1110.00	1111	16	25.1		
0	1461.23	68	3	1.52	2923.48	2917	12	13.2		K-40

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sig %Er
K-40	1460.81	68	10.67*	2.308E+20	4.137E-07	4.137E-07	13.18

Flag: "\*" = Keyline



Total number of lines in spectrum 4  
Number of unidentified lines 1  
Number of lines tentatively identified by NID 3 75.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.137E-07	4.137E-07	0.545E-07	13.18	
Total Activity :			4.137E-07	4.137E-07			

Grand Total Activity : 4.137E-07 4.137E-07

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

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

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
	Half-life	Ratio			(uCi/cc)	%Error	
F-18	109.74H	1476.90	511.00*	193.46	1.000E+35	34.89	Decay
% Abundances Found =				100.00			
AS-76	26.32H	102.63	559.10*	44.70	3.925E+23	25.10	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.84	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1707.67	0.33	----	Not Found	----
% Abundances Found =				73.70			
Y-92	3.54H	763.07	448.50	2.30	----	Not Found	----
			561.10	2.40	1.000E+35	25.10	Decay, Abun.
			844.30	1.25	----	Not Found	----
			934.46*	13.90	----	Not Found	----
			1405.40	4.80	----	Not Found	----
% Abundances Found =				9.74			

Flag: "\*" = Keyline

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
3	510.38	54	46	2.44	1020.33	1011	20	3.02E-02	34.9	4.49E+00	T
3	511.02	67	37	2.12	1023.21	1011	20	3.71E-02	26.2	4.40E+00	
3	559.21	64	35	1.62	1118.00	1111	16	3.56E-02	25.1	4.31E+00	T

Flags: "T" = Tentatively associated

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	26.	477.59	3.5742E-07
F-18	0.	511.00	Half-Life too short
NA-22	9.	1274.54	1.0687E-08
NA-24	0.	1368.53	Half-Life too short
MO-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SD-46	15.	889.25	2.6211E-08
CR-51	37.	320.08	1.4791E-06
MN-54	19.	834.83	1.3779E-08
CO-56	9.	1238.25	4.0319E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	47.	122.06	1.5433E-08
CO-58	15.	910.76	2.8238E-08
FE-59	16.	1099.22	1.1954E-07
CO-60	14.	1332.49	1.2956E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	18.	1115.52	3.3831E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	46.	136.00	2.9009E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	882.41	Half-Life too short
KR-85	52.	513.99	2.8841E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	52.	513.99	4.0790E-08
RB-86	7.	1076.63	5.9509E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	4.	1836.01	1.8316E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	17.	1204.90	1.6027E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	598.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NR-94	22.	702.63	9.7249E-09
NR-95	18.	765.79	8.9316E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	19.	756.72	6.0477E-08
NB-97	0.	657.98	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	20.	497.08	2.3025E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.58	Half-Life too short
RU-106	16.	621.84	9.7995E-08
CD-109	45.	88.03	5.1091E-07
AG-110M	13.	937.48	4.0728E-08
SN-113	36.	391.69	2.7733E-08
SN-117M	42.	158.56	2.0854E-06
SB-122	0.	563.93	Half-Life too short
SB-124	25.	602.71	3.4583E-08
SB-125	35.	427.89	3.4401E-08
TE-125M	44.	109.28	1.4989E-05
TE-127	0.	417.98	Half-Life too short
TE-127M	33.	57.60	4.8582E-05
XE-127	49.	202.84	1.1070E-07
TE-129	0.	459.68	Half-Life too short
T-129M	20.	695.88	2.8351E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	47.	123.80	2.5064E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	49.	163.93	3.1684E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	46.	302.84	5.4411E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	24.	604.70	1.0473E-08
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	18.	818.50	3.9154E-06
I-136	0.	1313.02	Half-Life too short
CS-137	18.	661.65	1.0007E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	56.	165.85	1.9936E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	17.	537.32	1.3295E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	42.	145.44	1.8876E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	41.	133.54	1.0489E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	0.	91.10	Half-Life too short
PM-148M	17.	550.27	5.2343E-08
EU-152	34.	344.27	3.3038E-08
EU-154	13.	1004.76	5.9392E-08
EU-156	16.	646.29	1.8845E-05
HF-181	24.	482.03	6.2912E-08
TA-182	14.	1221.42	8.6046E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	53.	279.19	6.8443E-08
BI-207	23.	569.67	9.0536E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	50.	186.21	2.6578E-07
AC-228	42.	338.32	8.5719E-08
TH-228	40.	84.37	1.5593E-06
PA-234	0.	131.20	Half-Life too short
TH-234	47.	63.29	3.3769E-05
U-235	47.	143.76	8.3118E-08
NP-239	0.	106.13	Half-Life too short
AM-241	28.	59.54	1.6892E-07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-6S020806

Sample Location (Well Number): EFT-6S

1. Representative sample collected. Date/Time 02/08/2006 1 1155

Sample collected by: by Marie Slaback / by Marie Slaback Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: BJestes / BJestes Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Yonson / [Signature] Date: 6-19-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-6S020806
2 . Date Sampled	02/08/2006
3 . Time Sampled	11:55
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

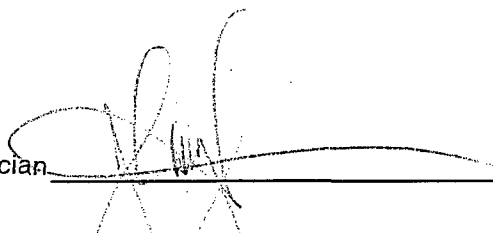
1 . Date Sample Counted	06/19/2006
2 . Time Sample Counted	20:10
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.5 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3346.6 cpm
Net Spike Count Rate (cpm)	3340.1 cpm
H3 Spike Activity (dpm on count date)	8640.3 dpm
Counter Efficiency	0.3866 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.6 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.1 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.10\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician  Date 6-20-06



## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-6S020806

Sample Location (Well Number): EFT-6S

1. Representative sample collected. Date/Time 02/03/2006 / 1155

Sample collected by: by Marie Slaback / Joy Marie Slaback Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Albere / Andrew Yee Date: 6-2-06  
Fermi 2 RP Printed Name Signature

Sample number: EFT-65020806

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Above / Archie Date: 6-2-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by:      /      Date:       
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks

Sample ID : BKG-RANGE021406

Acquisition date : 3-JUN-2006 03:27:22

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-137	25.	661.65	1.1569E-08
CS-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1489.50	Half-Life too short
CE-139	58.	165.85	2.0003E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	16.	537.32	1.0688E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	54.	145.44	1.9564E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	54.	133.54	1.1756E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	35.	91.10	4.5744E-05
PM-148M	25.	550.27	5.9104E-08
EU-152	29.	344.27	3.0556E-08
EU-154	12.	1004.76	5.7424E-08
EU-156	10.	646.29	1.3127E-05
HF-181	17.	482.03	5.1516E-08
TA-182	10.	1221.42	7.1830E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HS-203	46.	279.19	6.0668E-08
HS-207	19.	569.67	8.2262E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	49.	186.21	2.6341E-07
AC-228	32.	338.32	7.5376E-08
TH-228	44.	84.37	1.6169E-06
PA-234	0.	131.20	Half-Life too short
TH-234	42.	63.29	2.0991E-05
U-235	55.	143.76	8.9574E-06
NP-239	0.	106.13	Half-Life too short
AM-241	29.	59.54	1.7096E-07

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
NB-94	20.	702.63	9.3631E-09
NB-95	17.	765.79	8.2333E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	16.	756.72	5.4177E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	34.	497.08	7.5518E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	22.	621.84	1.1172E-07
CD-109	35.	88.03	4.5447E-07
AG-110M	0.	937.48	3.2445E-08
SN-113	37.	391.69	2.7532E-08
SN-117M	50.	158.56	2.5651E-06
SB-122	0.	563.93	Half-Life too short
SB-124	31.	602.71	3.6861E-08
SB-125	23.	427.89	2.8631E-08
TE-125M	33.	109.28	1.2486E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	31.	57.60	4.6137E-05
XE-127	40.	202.84	9.3401E-08
TE-129	0.	459.60	Half-Life too short
TE-129M	20.	695.88	2.6059E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	53.	123.80	2.1074E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	57.	163.93	2.7260E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	30.	302.84	4.4366E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	31.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	35.	604.70	1.2242E-08
I-134	0.	804.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short
CS-136	15.	816.50	2.9452E-06
I-136	0.	1313.02	Half-Life too short

\* Sample ID : BKG-RANGE021406 EF1

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	23.	477.59	3.2191E-07
F-18	0.	511.00	Half-Life too short
NA-22	0.	1274.54	1.0508E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1814.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	12.	889.25	2.3124E-08
CR-51	32.	320.08	1.2668E-06
MN-54	24.	834.83	1.5173E-08
CO-56	13.	1238.25	4.4928E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	36.	122.06	1.3478E-08
CO-58	13.	810.76	2.5975E-08
FE-59	7.	1099.22	7.7671E-08
CO-60	18.	1332.49	1.4441E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	9.	1115.52	2.4826E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	38.	136.00	2.6121E-08
SE-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	882.41	Half-Life too short
KR-85M	0.	151.18	Half-Life too short
RB-86	11.	1076.63	6.3669E-06
KR-87	0.	482.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	2.	1836.01	1.3823E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.38	Half-Life too short
Y-91	12.	1204.90	1.2924E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short

Sample ID : BKG-RANGE021406

Acquisition date : 3-JUN-2025 03:27:22

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
5	510.69	116	26	2.95	1020.95	1015	22	6.47E-02	13.7	4.49E+00	T
0	558.97	45	28	1.42	1117.53	1111	11	2.47E-02	27.3	4.31E+00	T
0	1764.71	29	0	1.89	3531.36	3522	16	1.61E-02	18.6	2.00E+00	T

Flags: "T" = Tentatively associated

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	1426.76	511.00*	100.00	1.000E+35	13.66	Decay
% Abundances Found = 100.00							
AS-76	26.32H	99.15	559.10*	44.70	2.433E+22	27.30	Decay, Abun.
			563.23	1.17	----	----	Not Found
			571.30	0.14	----	----	Not Found
			657.03	6.10	----	----	Not Found
			665.31	0.39	----	----	Not Found
			740.12	0.12	----	----	Not Found
			771.76	0.12	----	----	Not Found
			867.63	0.12	----	----	Not Found
			1129.07	0.14	----	----	Not Found
			1212.72	1.63	----	----	Not Found
			1216.02	3.84	----	----	Not Found
			1228.52	1.39	----	----	Not Found
			1439.13	0.33	----	----	Not Found
			1453.60	0.13	----	----	Not Found
			1787.67	0.33	----	----	Not Found
% Abundances Found = 73.70							
BI-214	19.90M	7867.96	609.31*	46.30	----	----	Decay, Abun.
			768.36	5.04	----	----	Not Found
			934.06	3.21	----	----	Not Found
			1120.29	15.10	----	----	Not Found
			1238.11	5.94	----	----	Not Found
			1377.67	4.11	----	----	Not Found
			1764.49	15.80	1.000E+35	18.57	
% Abundances Found = 16.54 (Abn. Limit = 40.40%)							

Flag: "\*" = Keyline

Total number of lines in spectrum 5  
 Number of unidentified lines 0  
 Number of lines tentatively identified by MID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.08E+05Y	1.00	4.322E-07	4.322E-07	0.574E-07	13.27	
Total Activity :			4.322E-07	4.322E-07			

Nuclide Type : fission gas

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
KR-85	10.72Y	1.02	2.043E-06	2.083E-06	1.433E-06	68.81	
Total Activity :			2.043E-06	2.083E-06			

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
SR-85	64.84D	3.20	0.850E-09	2.830E-08	1.947E-08	68.81	
Total Activity :			0.850E-09	2.830E-08			

Grand Total Activity : 2.484E-06 2.543E-06

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

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



Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
KR-40	1460.81	71	10.67*	2.308E+00	4.322E-07	4.322E-07	13.27

Nuclide Type: fission gas

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
KR-85	513.99	26	0.43*	4.481E+00	2.043E-06	2.083E-06	68.81

Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
SR-85	513.99	26	99.27*	4.481E+00	8.850E-09	2.630E-08	68.81

Flag: "\*" = Keyline

## Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
5	510.69	116	26	2.95	1020.95	1015	22	13.7	1.74E+00	
5	512.24	26	34	2.44	1024.05	1015	22	68.8		SR-85 KR-85
0	558.97	45	28	1.42	1117.53	1111	11	27.3		
0	1461.15	71	5	0.91	2923.33	2918	10	13.3		K-40
0	1764.71	29	0	1.09	3531.38	3522	16	18.6		

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: BKG-RANGE021406 EF1
Sample collection start date: 14-FEB-2006 10:10:00.00
Sample collection end date : 14-FEB-2006 10:10:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.000000E+03 cc
Sample geometry : MELL Operator: AKB

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 03:27:22.36
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.09 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:50:00.0
Key/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_mell Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Fw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data. The 'Left' column values are circled in the original image.

\*\*\*\*\*

RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: BKG-RANGE021406 EF1

Sample End Time: 14-FEB-2006 10:10:00.00

REMARKS

.....  
.....  
.....

PERFORMED BY:

*Andrew Gere*

SIGNATURE

REVIEWED BY:

*William J. Dutton #8657 / 6/5/2009*

SIGNATURE/DATE

Sample number: BKG-Range 021406

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Abere, Andre Gere Date: 6-3-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton William V. Lipton Date: 6/5/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks 2 511 Peaks  
No licensed radioactive material detected.  
William V. Lipton 48651/6/5/2006

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BKG - RANGE 021406

Sample Location (Well Number): BKG - RANGE

1. Representative sample collected. Date/Time 02/14/2006 | 1010

Sample collected by: Jay Marie Staback / Jay Marie Staback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Aberc / Aberc Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	BKG-RANGE021406
2 . Date Sampled	02/14/2006
3 . Time Sampled	10:10
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	06/19/2006
2 . Time Sample Counted	18:20
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.5 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3346.6 cpm
Net Spike Count Rate (cpm)	3340.1 cpm
H3 Spike Activity (dpm on count date)	8640.3 dpm
Counter Efficiency	0.3866 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	8.1 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.6 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

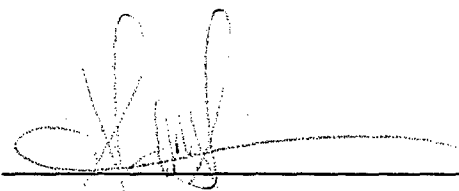
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.10\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician  Date 6-20-6

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG - RANGE 021406

Sample Location (Well Number): BKG - RANGE

1. Representative sample collected. Date/Time 02/14/2006 1 1010

Sample collected by: Joy Marie Stoback / Joy Marie Stoback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Upton / [Signature] Date: 6-19-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_



Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	10.	810.50	2.4779E-06
I-136	0.	1313.02	Half-Life too short
CS-137	14.	661.65	8.9271E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.06	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	37.	165.05	1.6262E-08
CS-139	0.	1203.23	Half-Life too short
BA-140	27.	537.32	1.3162E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	51.	145.44	1.8978E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	47.	133.54	1.0997E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	48.	91.10	5.2555E-05
PM-148M	28.	550.27	6.1156E-08
EU-152	30.	344.27	3.0955E-08
EU-154	9.	1004.76	5.0509E-08
EU-156	14.	646.29	1.5009E-05
HF-181	35.	482.03	7.0465E-08
TA-182	12.	1221.42	7.7595E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	39.	279.19	5.5964E-06
BI-207	18.	569.67	8.1971E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.90	Half-Life too short
RA-226	58.	106.21	2.8503E-07
AC-228	32.	338.32	7.5690E-08
TH-228	46.	84.37	1.6836E-06
PA-234	0.	131.20	Half-Life too short
TH-234	37.	63.29	2.7069E-05
U-235	53.	143.76	8.8120E-08
NP-239	0.	106.13	Half-Life too short
AM-241	27.	59.54	1.6708E-07

Sample ID : BKG-PAP021426 EF

Acquisition date : 3-JUN-2006 04:31:04

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.20	Half-Life too short
93	0.	266.90	Half-Life too short
NB-94	13.	702.63	7.0279E-09
NB-95	15.	765.79	7.6460E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	13.	756.72	4.9507E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.01	Half-Life too short
RU-103	20.	497.00	5.9519E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	19.	621.84	1.0445E-07
CD-109	31.	80.03	4.3040E-07
AG-110M	14.	937.40	4.0755E-08
SN-113	21.	391.69	2.0985E-08
SN-117M	57.	150.56	2.7059E-06
SB-122	0.	563.93	Half-Life too short
SB-124	21.	602.71	3.0904E-08
SB-125	31.	427.09	3.2237E-08
TE-125M	34.	109.20	1.2724E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	30.	57.60	4.5217E-05
127	53.	202.04	1.0675E-07
129	0.	459.60	Half-Life too short
TE-129M	25.	695.00	2.8863E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	44.	123.00	1.9166E-05
I-131	0.	364.40	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	37.	163.93	2.2209E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	220.16	Half-Life too short
BA-133	34.	302.04	4.7393E-06
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.07	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	29.	604.70	1.1237E-06
I-134	0.	604.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	266.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

\* Sample ID : BKG-PAP021406 EF1 \*

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SE-7	27.	477.59	3.4465E-07
F-18	0.	511.00	Half-Life too short
NA-22	12.	1274.54	1.2171E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	12.	889.25	2.3286E-08
CR-51	40.	320.00	1.3904E-06
MN-54	14.	834.83	1.1909E-08
CO-56	12.	1238.25	4.2283E-08
MN-56	0.	1010.69	Half-Life too short
NI-56	0.	156.38	Half-Life too short
CO-57	46.	122.06	1.5179E-08
CO-58	17.	810.76	2.8797E-08
FE-59	17.	1099.22	1.1658E-07
CO-60	11.	1332.49	1.1514E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	9.	1115.52	2.4293E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	46.	136.00	2.8437E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	51.	513.99	2.8684E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	51.	513.99	3.8916E-08
RB-86	11.	1076.63	6.2716E-06
KR-87	0.	402.50	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	7.	1836.01	2.2411E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	12.	1204.90	1.3216E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	66.52	69	73	3.39	132.68	126	16	3.62E-02	30.2	1.32E+00	T
0	511.02	140	44	2.59	1021.60	1014	17	7.60E-02	13.6	4.49E+00	T
0	558.59	77	16	2.16	1116.76	1108	15	4.29E-02	15.8	4.31E+00	T
0	611.54	56	35	6.56	1222.69	1213	20	3.13E-02	30.3	4.16E+00	T
1	1461.73	39	5	2.68	2924.49	2915	14	2.10E-02	26.8	2.31E+00	
0	1765.20	27	0	3.21	3532.37	3526	13	1.50E-02	19.2	2.08E+00	T

Flags: "T" = Tentatively associated

Nuclide	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	%Error		
FM-148M	41.38D	2.63	599.74	12.54	----	Not Found	----	Abun.
			611.26	5.48	2.295E-06	30.31		
			629.97	89.00	----	Not Found	----	
			725.70	32.80	----	Not Found	----	
			915.33	17.17	----	Not Found	----	
			1013.61	20.30	----	Not Found	----	
% Abundances Found =			1.74					
TA-182	114.74D	0.95	67.75	42.30	3.553E-07	30.17		Abun.
			100.10	14.10	----	Not Found	----	
			1169.05	16.30	----	Not Found	----	
			1221.42*	27.10	----	Not Found	----	
			1230.97	11.50	----	Not Found	----	
% Abundances Found =			30.01					
BI-214	19.90M	7058.35	609.31*	46.30	----	Not Found	----	Decay, Abun.
			760.36	5.04	----	Not Found	----	
			934.06	3.21	----	Not Found	----	
			1120.29	15.10	----	Not Found	----	
			1230.11	5.94	----	Not Found	----	
			1377.67	4.11	----	Not Found	----	
			1764.49	15.00	1.000E+35	19.24		
% Abundances Found =			16.54	(Abn. Limit = 40.40%)				

Flag: "\*" = Keyline

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	1425.01	511.00*	100.46	1.000E+35	13.59	Decay
% Abundances Found = 100.00							
SE-75	119.78D	0.91	66.05	1.02	1.433E-05	30.17	Abun.
			96.73	3.41	----	Not Found	----
			121.12	16.70	----	Not Found	----
			136.00*	59.20	----	Not Found	----
			198.60	1.45	----	Not Found	----
			264.65	59.60	----	Not Found	----
			279.53	25.20	----	Not Found	----
			303.91	1.32	----	Not Found	----
			400.65	11.40	----	Not Found	----
% Abundances Found = 0.57							
AS-76	26.32H	99.03	559.10*	44.70	3.079E+22	15.83	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.07	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.84	----	Not Found	----
			1220.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1707.67	0.33	----	Not Found	----
% Abundances Found = 73.70							
RU-103	39.35D	2.76	497.08*	09.00	----	Not Found	Abun.
			610.33	5.60	2.458E-06	30.31	
% Abundances Found = 5.92							
CS-136	13.16D	8.25	66.91	12.50	1.902E-04	30.17	Abun.
			86.29	6.30	----	Not Found	----
			153.22	7.46	----	Not Found	----
			163.09	4.61	----	Not Found	----
			176.55	13.56	----	Not Found	----
			273.65	12.66	----	Not Found	----
			340.57	48.50	----	Not Found	----
			618.50*	99.70	----	Not Found	----
			1048.07	79.60	----	Not Found	----
			1235.34	19.70	----	Not Found	----
% Abundances Found = 4.10							
PM-148M	41.30D	2.63	288.11	12.56	----	Not Found	Abun.
			414.07	10.66	----	Not Found	----
			432.78	5.35	----	Not Found	----
			501.26	6.75	----	Not Found	----
			550.27*	94.90	----	Not Found	----

Total number of lines in spectrum 7  
Number of unidentified lines 1  
Number of lines tentatively identified by NID 6 85.71%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	2.923E-07	2.923E-07	0.600E-07	23.27	
Total Activity :			2.923E-07	2.923E-07			
Grand Total Activity :			2.923E-07	2.923E-07			

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

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

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected	Decay Corr	1-Sigma
					uCi/cc	uCi/cc	%Error
K-40	1460.81	48	10.67*	2.308E+00	2.923E-07	2.923E-07	23.27

Flag: "\*" = Keyline



Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	XErr	Fit	Nuclides
0	66.52	69	73	3.39	132.68	126	16	30.2		
0	511.02	140	44	2.59	1021.60	1014	17	13.6		
0	556.59	77	16	2.16	1116.76	1108	15	15.0		
0	611.54	56	35	6.56	1222.69	1213	20	30.3		
1	1460.73	48	7	2.67	2922.49	2915	14	23.3	7.97E-01	K-40
1	1461.73	39	5	2.68	2924.49	2915	14	26.8		
0	1765.20	27	0	3.21	3532.37	3526	13	19.2		

Sample ID : BKG-PAP021406 EF

Acquisition date : 3-JUN-2006 04:31:04

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: BKG-PAP021406 EF1
Sample collection start date: 14-FEB-2006 14:25:00.00
Sample collection end date : 14-FEB-2006 14:25:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : WELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 04:31:04.48
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.12 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.0
KeV/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 7 rows of peak data with handwritten annotations on the right side.

Handwritten notes: 74-230 annihilate HWC on 214 K40 F214

\*\*\*\*\*

RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: BKG-PAP021406 EF1

Sample End Time: 14-FEB-2006 14:25:00.00

REMARKS

.....  
.....  
.....

PERFORMED BY:

*Andrew Shea*  
.....  
SIGNATURE

REVIEWED BY:

*Meltem Jira* 4869/6/5/2006  
.....  
SIGNATURE/DATE  
01/5/2006

Sample number: BKG-PAP 021406

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: A. Gere, Andrew Gere Date: 6-3-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipkin, William V. Lipkin Date: 6/5/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks (2) 1460 Peaks  
No licensed radioactive material detected.  
William V. Lipkin 48651 6/5/06

MS/02/06

# FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BKG - PAP 021406

Sample Location (Well Number): BKG - PAP

1. Representative sample collected. Date/Time 02/14/2006 1 1425

Sample collected by: Joy Marie Shuback / Joy Marie Shuback Date: 03/11/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Above / Andrew Jester Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	BKG-PAP021406
2 . Date Sampled	02/14/2006
3 . Time Sampled	14:25
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	06/19/2006
2 . Time Sample Counted	18:30
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.5 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3346.6 cpm
Net Spike Count Rate (cpm)	3340.1 cpm
H3 Spike Activity (dpm on count date)	8640.3 dpm
Counter Efficiency	0.3866 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.4 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.9 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.10\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date 6-20-6

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG - PAPO21406

Sample Location (Well Number): BKG - PAP

1. Representative sample collected. Date/Time 02/14/2006 / 1425

Sample collected by: Joy Marie Slabick / Joy Marie Slabick Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jastes / B Jastes Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76,000,70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. York / [Signature] Date: 6-19-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Sample ID : BK0-NTC021406 EF

Acquisition date : 3-JUN-2006 03:59:12

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	13.	816.50	2.7605E-06
I-136	0.	1313.02	Half-Life too short
CS-137	19.	661.65	1.0172E-08
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	250.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	51.	165.05	1.0702E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	29.	537.32	1.3500E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	49.	145.44	1.6528E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	51.	133.54	1.1498E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	42.	91.10	4.8871E-05
PM-148M	11.	550.27	4.1407E-08
EU-152	30.	344.27	3.1085E-08
EU-154	8.	1004.76	4.8061E-08
EU-156	16.	646.29	1.5655E-05
HF-181	26.	482.03	6.1075E-08
TA-182	15.	1221.42	8.6051E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	38.	279.19	5.5373E-08
BI-207	24.	569.67	9.1350E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	60.	106.21	2.8911E-07
AC-228	32.	330.32	7.5035E-08
TH-228	38.	84.37	1.5158E-06
PA-234	0.	131.20	Half-Life too short
TH-234	37.	63.29	2.7224E-05
U-235	56.	143.76	9.0121E-08
NP-239	0.	106.13	Half-Life too short
AM-241	42.	59.54	2.0441E-07



Sample ID : PKG-NTC021406 EF

Acquisition date : 3-JUN-2006 03:59:13

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
SR-93	0.	266.90	Half-Life too short
NR-94	25.	702.63	1.0292E-08
NR-95	12.	765.79	7.0224E-08
NR-95M	0.	235.69	Half-Life too short
ZR-95	17.	756.72	5.4646E-08
NR-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	23.	497.08	6.2291E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	21.	621.04	1.0850E-07
CD-109	49.	88.03	5.3175E-07
AG-110M	17.	937.48	4.4477E-08
SN-113	34.	391.69	2.6485E-08
SN-117M	45.	158.56	2.4122E-06
SB-122	0.	563.93	Half-Life too short
SB-124	22.	602.71	3.1515E-08
SB-125	26.	427.89	3.0019E-08
TE-125M	40.	109.28	1.3610E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	47.	57.60	5.5750E-05
TE-127	54.	202.84	1.0755E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	21.	695.88	2.6522E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	53.	123.00	2.0760E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	45.	163.93	2.4193E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	37.	302.84	4.8985E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	18.	604.70	9.1869E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

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\* Sample ID : BKG-NTC021406 EF1 \*

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Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	22.	477.59	3.1373E-07
F-18	0.	511.00	Half-Life too short
NA-22	6.	1274.54	9.3854E-09
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	13.	889.25	2.4186E-08
CR-51	38.	320.08	1.3519E-06
MN-54	24.	834.83	1.5200E-08
CO-56	17.	1238.25	5.0009E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	53.	122.06	1.6131E-08
CO-58	10.	810.76	2.9629E-08
FE-59	16.	1099.22	1.1344E-07
CO-60	15.	1332.49	1.3298E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	11.	1115.52	2.7304E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	48.	136.00	2.8887E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	54.	513.99	2.9413E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	54.	513.99	3.9871E-08
RB-86	11.	1076.63	6.3721E-06
KR-87	0.	482.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	3.	1636.01	1.6139E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.86	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	17.	1204.90	1.5254E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	511.15	133	63	2.37	1021.86	1013	16	7.38E-02	16.0	4.49E+00	T
0	559.12	62	32	1.77	1117.62	1110	14	3.47E-02	22.9	4.31E+00	T
0	609.57	46	27	1.96	1218.75	1213	11	2.53E-02	26.8	4.16E+00	T

Flags: "T" = Tentatively associated

Nuclide	Half-life	Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
BI-214	19.90M	7852.47	1238.11	5.94	---	Not Found	Decay
			1377.67	4.11	---	Not Found	---
			1764.49	15.80	---	Not Found	---
% Abundances Found =				48.48	(Abn. Limit = 48.48%)		

Flag: "\*" = Keyline

Nuclide	Half-life	Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74H	1423.95	511.00*	193.46	1.000E+35	16.01	Decay
% Abundances Found =			100.00				
AS-76	26.32H	98.95	559.10*	44.70	2.983E+22	22.89	Decay, Abun.
% Abundances Found =			73.70				
Y-92	3.54H	735.71	448.50	2.30	1.000E+35	22.69	Decay, Abun.
% Abundances Found =			9.74				
I-103	39.35D	2.76	497.08*	89.00	1.983E-06	26.79	Abun.
% Abundances Found =			5.92				
XE-135	9.11H	285.88	249.79*	89.90	1.000E+35	26.79	Decay, Abun.
% Abundances Found =			3.11				
PM-146M	41.30D	2.63	288.11	12.56	1.851E-06	26.79	Abun.
% Abundances Found =			1.74				
BI-214	19.90M	7852.47	609.31*	46.30	1.000E+35	26.79	Decay
% Abundances Found =			15.10				

Total number of lines in spectrum 4  
 Number of unidentified lines 0  
 Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.20E+05Y	1.00	4.423E-07	4.423E-07	0.840E-07	19.16	
Total Activity :			4.423E-07	4.423E-07			

Grand Total Activity : 4.423E-07 4.423E-07

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	73	10.67*	2.308E+00	4.423E-07	4.423E-07	19.16

Flag: "\*" = Keyline

Decay Time = 108 12:09:12.02

Acquisition Time = 3-JUN-2006 03:59:12.02

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	511.15	133	63	2.37	1021.86	1013	16	16.0		
0	559.12	62	32	1.77	1117.82	1110	14	22.9		
0	605.57	46	27	1.96	1218.75	1213	11	26.6		
0	1461.08	73	19	2.00	2923.18	2913	18	19.2		K-40



Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: BKG-NTC021406 EF1
Sample collection start date: 14-FEB-2006 15:50:00.00
Sample collection end date : 14-FEB-2006 15:50:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 03:59:12.02
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.13 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.0
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 4 rows of peak data.

Handwritten notes: annihilation, 214, K40

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RADIATION PROTECTION DEPARTMENT  
GAMMA SPECTROSCOPY ANALYSIS REPORT  
HIGH EFFICIENCY DETECTOR

Sample ID Number: BKG-NTC021406 EF1

Sample End Time: 14-FEB-2006 15:50:00.00

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PERFORMED BY:

*Andrew Yee*  
\_\_\_\_\_  
SIGNATURE

REVIEWED BY:

*Maureen Vintar 48651/6/15/2006*  
\_\_\_\_\_  
SIGNATURE/DATE

Sample number: BKG-NTC021406

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".

(Note disposition of unidentified peaks in "Remarks")

Performed by: Abere , Andrew Lee Date: 6-3-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton , William V. Lipton Date: 6/5/2006  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks No licensed radioactive material detected.  
William V. Lipton 48651 6/5/2006

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: BK6-NTC 021406

Sample Location (Well Number): BK6-NTC

1. Representative sample collected. Date/Time 02/14/2006 1 1550

Sample collected by: Joy Marie Slaback / Amy Main Slaback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Above / Andrew Jester Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	BKG-NTC021406
2 . Date Sampled	02/14/2006
3 . Time Sampled	15:50
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	06/19/2006
2 . Time Sample Counted	18:40
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.5 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111).	
Gross Spike Count Rate (cpm)	3346.6 cpm
Net Spike Count Rate (cpm)	3340.1 cpm
H3 Spike Activity (dpm on count date)	8640.3 dpm
Counter Efficiency	0.3866 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.3 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.8 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.10\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 0-20-6

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: BKG-NTC 021406

Sample Location (Well Number): BKG-NTC

1. Representative sample collected. Date/Time 02/14/2006 1 1550

Sample collected by: Joy Marie Stelzack / Joy Marie Stelzack Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jestes / B Jestes Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76,000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Yonon / [Signature] Date: 6-19-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	20.	818.50	4.3101E-06
CS-136	0.	1313.02	Half-Life too short
CS-137	12.	661.65	8.2228E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	256.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	54.	165.85	1.9740E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	17.	537.32	1.4171E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	59.	145.44	2.2552E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	54.	133.54	1.1912E-07
FR-144	0.	1489.15	Half-Life too short
ND-147	0.	91.10	Half-Life too short
PM-148M	23.	550.27	6.1295E-08
EU-152	41.	344.27	3.5835E-08
EU-154	9.	1004.76	4.9521E-08
EU-156	17.	646.29	2.0092E-05
HF-181	30.	482.03	7.0965E-08
TA-182	11.	1221.42	7.7126E-08
RE-187	0.	605.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	54.	279.19	7.0280E-08
BI-207	23.	569.67	8.9697E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	65.	186.21	2.9916E-07
AC-226	47.	338.32	8.9689E-08
TH-228	39.	84.37	1.5457E-06
PA-234	0.	131.20	Half-Life too short
TH-234	53.	63.29	3.7000E-05
U-235	48.	143.76	8.4176E-08
NP-239	0.	106.13	Half-Life too short
AM-241	43.	59.54	2.0680E-07

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	16.	702.63	8.5267E-09
NB-95	26.	765.79	1.0771E-07
NB-95M	0.	235.69	Half-Life too short
ZR-95	14.	756.72	5.2045E-08
NB-97	0.	657.98	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	39.	497.08	8.7440E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.98	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	16.	621.84	9.8899E-08
CD-109	39.	88.03	4.8415E-07
AG-110M	8.	937.48	3.2774E-08
SN-113	28.	391.69	2.4910E-08
SN-117M	54.	158.56	3.3911E-06
SB-122	0.	563.93	Half-Life too short
SB-124	30.	602.71	3.8391E-08
SB-125	28.	427.89	3.0962E-08
TE-125M	39.	109.28	1.4381E-05
TE-127	0.	417.98	Half-Life too short
TE-127M	42.	57.60	5.4530E-05
XE-127	59.	202.84	1.2287E-07
TE-129	0.	459.68	Half-Life too short
TE-129M	18.	695.88	2.7600E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	36.	123.80	2.3485E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	51.	163.93	3.4235E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	29.	302.84	4.4152E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	33.	604.70	1.1955E-08
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short



\*\*\*\*\* Sample ID : EFT-109020906 EF1 \*\*\*\*\*

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	22.	477.59	3.3327E-07
F-18	0.	511.00	Half-Life too short
NA-22	14.	1274.54	1.3278E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	16.	889.25	2.7004E-08
CR-51	35.	320.08	1.4743E-06
MN-54	20.	834.83	1.4297E-08
CO-56	19.	1238.25	5.4556E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	39.	122.06	1.4169E-08
CO-58	21.	810.76	3.3283E-08
FE-59	17.	1099.22	1.2420E-07
CO-60	12.	1332.49	1.2286E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	11.	1115.52	2.7678E-08
ZN-69M	0.	438.63	Half-Life too short
AS-75	47.	136.00	2.9513E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	50.	513.99	2.8396E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	50.	513.99	4.0579E-08
RB-86	11.	1076.63	7.7663E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	5.	1836.81	2.1065E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1824.38	Half-Life too short
Y-91	13.	1204.90	1.4496E-05
Y-91M	0.	555.68	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

Sample ID : EFT-105020906 EF

Acquisition date : 2-JUN-2006 23:36:50

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	511.30	129	63	1.72	1022.17	1014	10	7.17E-02	16.9	4.48E+00	T
0	550.62	63	32	1.71	1117.22	1111	12	3.51E-02	21.5	4.31E+00	T

Flags: "T" = Tentatively associated

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	1489.86	511.00	*193.46	1.000E+35	16.90	Decay
% Abundances Found =			100.00				
AS-76	26.32H	103.53	559.10*	44.70	7.217E+23	21.52	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.04	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found =			73.70				

Flag: "\*" = Keyline

Total number of lines in spectrum 3  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 3 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	5.610E-07	5.610E-07	0.505E-07	10.43	
Total Activity :			5.610E-07	5.610E-07			

Grand Total Activity : 5.610E-07 5.610E-07

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

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

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	92	10.67*	2.302E+00	5.610E-07	5.610E-07	10.43

Flags "\*" = Keyline



Sample ID : EFT-10S020906 EF

Acquisition date : 2-JUN-2006 23:36:50

\*\*\*\*\*

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-10S020906 EF1
Sample collection start date: 9-FEB-2006 10:55:00.00
Sample collection end date : 9-FEB-2006 10:55:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : MELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 2-JUN-2006 23:36:50.32
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.21 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.00
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

\*\*\*\*\*

Table with columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Includes handwritten annotations: 'Annihilation', 'H4C', 'K40'.

\*\*\*\*\*

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-10S020906 EF1

Sample End Time: 9-FEB-2006 10:55:00.00

REMARKS

.....

.....

.....

PERFORMED BY:

*Andrew Yee*  
.....  
SIGNATURE

REVIEWED BY:

*William N. Sifton 86 91/0/5/2006*  
.....  
SIGNATURE/DATE



Sample number: EFT-105020906

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Abere , Andrew Yee Date: 6-2-06  
Fermi 2 RP Printed Name Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 6/5/06  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-10S020906

Sample Location (Well Number): EFT-10S

1. Representative sample collected. Date/Time 02/09/2006 1 1055

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Abere / Andrew Steere Date: 6-2006  
Fermi 2 RP Printed Name Signature

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-10S020906
2 . Date Sampled	02/09/2006
3 . Time Sampled	10:55
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	06/19/2006
2 . Time Sample Counted	18:10
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.5 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3346.6 cpm
Net Spike Count Rate (cpm)	3340.1 cpm
H3 Spike Activity (dpm on count date)	8640.3 dpm
Counter Efficiency	0.3866 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.5 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.10\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 6-20-06

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-10S020906

Sample Location (Well Number): EFT-10S

1. Representative sample collected. Date/Time 02/09/2006 1 1055

Sample collected by: Jay Marie Slabek / Jay Marie Slabek Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Yocom / [Signature] Date: 6-19-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Nuclide	Bkgnd Sum	Energy (keV)	RDA (uCi/cc)
CS-137	12.	661.65	8.2813E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1428.50	Half-Life too short
CE-139	50.	165.85	1.8993E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	30.	537.32	1.7854E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	39.	145.44	1.2557E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	52.	133.54	1.1700E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	0.	91.10	Half-Life too short
PM-148M	21.	550.27	5.8096E-08
EU-152	31.	344.27	3.1354E-08
EU-154	9.	1004.76	5.0911E-08
EU-156	16.	646.29	1.9717E-05
HF-181	24.	482.03	6.4609E-08
TA-182	7.	1221.42	6.4930E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	55.	279.19	7.0346E-08
BI-207	26.	569.67	9.5244E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	53.	106.21	2.7320E-07
AC-228	40.	338.32	8.3861E-08
TH-228	44.	84.37	1.6284E-06
PA-234	0.	131.20	Half-Life too short
TH-234	32.	63.29	2.9074E-05
U-235	42.	143.76	7.9546E-08
NP-239	0.	106.13	Half-Life too short
AM-241	40.	59.54	1.9830E-07

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
NB-94	26.	702.63	1.0520E-08
BR-95	13.	765.79	7.0178E-08
BR-95M	0.	235.69	Half-Life too short
ZR-95	19.	756.72	6.1232E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	31.	497.08	7.7781E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	34.	621.84	1.3679E-07
CD-109	29.	88.03	4.2330E-07
AG-110M	12.	937.48	3.9221E-08
SN-113	34.	391.69	2.7068E-08
SN-117M	50.	158.56	3.2576E-06
SB-122	0.	563.93	Half-Life too short
SB-124	26.	602.71	3.5656E-08
SB-125	31.	427.89	3.2441E-08
TE-125M	50.	109.28	1.6080E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	44.	57.60	5.5444E-05
XE-127	55.	202.84	1.1832E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	16.	695.88	2.6103E-06
TE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	39.	123.80	2.4085E-05
I-131	0.	364.46	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	56.	163.93	3.5545E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	36.	302.84	4.8379E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	20.	604.70	9.5960E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short
CS-136	15.	818.50	3.7747E-06
I-136	0.	1313.02	Half-Life too short

\* Sample ID : EFT-95820906 EF1

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	24.	477.59	3.4835E-07
F-18	0.	511.00	Half-Life too short
NA-22	15.	1274.54	1.3391E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	12.	889.25	2.4137E-08
CR-51	40.	320.08	1.5623E-06
MN-54	17.	834.83	1.3095E-08
CO-56	14.	1238.25	4.7227E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	41.	122.06	1.4490E-08
CO-58	10.	810.76	2.4164E-08
FE-59	21.	1099.22	1.3546E-07
CO-60	16.	1332.49	1.3905E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	18.	1115.52	3.4129E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	44.	136.00	2.8583E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	882.41	Half-Life too short
KR-85M	0.	151.18	Half-Life too short
RB-86	10.	1076.63	7.2538E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	4.	1836.01	1.9424E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	15.	1204.90	1.5256E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.92	Half-Life too short

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
4	510.86	100	20	2.60	1021.29	1014	16	5.90E-02	15.5	4.49E+00	T
0	558.79	71	23	1.94	1117.17	1110	13	3.96E-02	10.2	4.31E+00	T
0	1154.07	12	10	1.75	2300.44	2301	10	6.59E-03	57.8	2.66E+00	T

Flags: "T" = Tentatively associated



Nuclide	Half-Life		Energy	XAbund	Activity 1-Sigma		Rejected by	
	Half-life	Ratio			(uCi/cc)	XError		
F-18	109.74M	1487.37	511.00*	193.46	1.000E+35	15.46	Decay	
				% Abundances Found = 100.00				
AS-76	26.32H	103.36	559.10*	44.70	7.214E+23	18.20	Decay, Abun.	
			563.23	1.17	----	Not Found	----	
			571.30	0.14	----	Not Found	----	
			657.03	6.10	----	Not Found	----	
			665.31	0.39	----	Not Found	----	
			740.12	0.12	----	Not Found	----	
			771.76	0.12	----	Not Found	----	
			867.63	0.12	----	Not Found	----	
			1129.07	0.14	----	Not Found	----	
			1212.72	1.63	----	Not Found	----	
			1216.02	3.84	----	Not Found	----	
			1228.52	1.39	----	Not Found	----	
			1439.13	0.33	----	Not Found	----	
			1453.60	0.13	----	Not Found	----	
			1787.67	0.33	----	Not Found	----	
				% Abundances Found = 73.70				
EU-156	15.19D	7.46	88.96	9.00	----	Not Found	----	Abun.
			646.29*	7.10	----	Not Found	----	
			723.47	6.00	----	Not Found	----	
			811.77	10.40	----	Not Found	----	
			1065.14	5.20	----	Not Found	----	
			1153.47	7.20	1.640E-05	57.79		
			1154.09	5.30	2.220E-05	57.79		
			1230.71	0.90	----	Not Found	----	
			1242.42	6.80	----	Not Found	----	
				% Abundances Found = 18.97				

Flag: "\*" = Keyline

Total number of lines in spectrum 5  
 Number of unidentified lines 0  
 Number of lines tentatively identified by MID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.159E-07	4.159E-07	0.720E-07	17.30	
Total Activity :			4.159E-07	4.159E-07			

Nuclide Type : fission gas

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
KR-05	10.72Y	1.02	2.805E-06	2.862E-06	0.907E-06	31.69	
Total Activity :			2.805E-06	2.862E-06			

Nuclide Type : activation

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
SR-05	64.84D	3.36	1.215E-08	4.002E-08	1.294E-08	31.69	
Total Activity :			1.215E-08	4.002E-08			

Grand Total Activity : 3.233E-06 3.319E-06

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

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

## Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	68	10.67*	2.308E+00	4.159E-07	4.159E-07	17.38

## Nuclide Type: fission gas

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
KR-85	513.99	36	0.43*	4.479E+00	2.805E-06	2.862E-06	31.69

## Nuclide Type: activation

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
SR-85	513.99	36	99.27*	4.479E+00	1.215E-08	4.082E-08	31.69

Flag: "\*" = Keyline

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
4	510.86	108	28	2.68	1021.29	1014	16	15.5	9.36E-01	0
4	512.92	36	16	1.94	1025.40	1014	16	31.7		SR-85 KR-85
0	558.79	71	23	1.94	1117.17	1110	13	10.2		
0	1154.07	12	10	1.75	2308.44	2301	10	57.0		
0	1461.41	68	15	1.48	2923.84	2916	15	17.3		K-40

Sample ID : EFT-98020906 EF1

Acquisition date : 3-JUN-2006 00:00:55

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-98020906 EF1
Sample collection start date: 9-FEB-2006 16:00:00.00
Sample collection end date : 9-FEB-2006 16:00:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 00:00:55.96
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.10 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:56:00.00
KeV/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:26:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m2ll Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, XErr, Fit. Contains 5 rows of peak data with handwritten annotations like 'annihilator', 'beta', and 'kyo'.

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-9S020906
2. Date Sampled	02/09/2006
3. Time Sampled	16:00
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	06/20/2006
2. Time Sample Counted	10:05
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.9 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3354.8 cpm
Net Spike Count Rate (cpm)	3347.9 cpm
H3 Spike Activity (dpm on count date)	8638.9 dpm
Counter Efficiency	0.3875 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	8.4 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.5 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.13\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician 

Date 6-20-6

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-95020966

Sample Location (Well Number): EFT-95'

1. Representative sample collected. Date/Time 02/09/2006 1 1600

Sample collected by: Jay Marie Slaback / Jay Marie Slaback Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: JENNIFER YOUNG / [Signature] Date: 6-20-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-98020906 EF1

Sample End Time: 9-FEB-2006 16:00:00.00

REMARKS

PERFORMED BY:

*Andrew Lee*

SIGNATURE

REVIEWED BY:

*Adrian V. Lopez 48651 / 6/5/2006*

SIGNATURE / DATE



## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-95020906

Sample Location (Well Number): EFT-98

1. Representative sample collected. Date/Time 02/09/2006 / 1 1600

Sample collected by: Joz Mary Slabank / Joz Mary Slabank Date: 02/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Above / Andrew Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Sample ID : EFT-79820906 EF1

Acquisition date : 3-JUN-2006 00:45:18

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	9.	818.50	3.1218E-06
I-136	0.	1313.82	Half-Life too short
CS-137	18.	661.65	9.8752E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	258.31	Half-Life too short
BA-139	0.	1428.58	Half-Life too short
CE-139	49.	165.85	1.8934E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	17.	537.32	1.4323E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	198.22	Half-Life too short
CE-141	42.	145.44	1.9228E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	57.	133.54	1.2217E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	0.	91.10	Half-Life too short
FM-148M	14.	558.27	4.8855E-08
EU-152	41.	344.27	3.5678E-08
EU-154	14.	1084.76	6.8292E-08
EU-156	18.	646.29	2.1896E-05
HF-181	31.	482.83	7.1975E-08
TA-182	11.	1221.42	7.6425E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.83	Half-Life too short
HG-203	61.	279.19	7.4513E-08
BI-207	28.	569.67	8.5442E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	238.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	248.98	Half-Life too short
RA-226	61.	186.21	2.9821E-07
AC-228	27.	338.32	6.9988E-08
TH-228	41.	84.37	1.5778E-06
PA-234	0.	131.28	Half-Life too short
TH-234	42.	63.29	3.3137E-05
U-235	47.	143.76	8.3895E-06
NP-239	0.	186.13	Half-Life too short
AM-241	37.	59.54	1.9286E-07

Sample ID : EFT-78020906 EF1

Acquisition date : 3-JUN-2006 00:45:10

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
93	0.	590.28	Half-Life too short
93	0.	266.90	Half-Life too short
NB-94	23.	702.63	9.9107E-09
NB-95	22.	765.79	1.0111E-07
NB-95M	0.	235.69	Half-Life too short
ZR-95	21.	756.72	6.3559E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	28.	497.08	7.5133E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	310.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	23.	621.84	1.1389E-07
CD-109	42.	80.03	4.9945E-07
AG-110M	10.	937.40	3.5826E-08
SN-113	32.	391.69	2.6235E-08
SN-117M	63.	150.56	3.6792E-06
SB-122	0.	563.93	Half-Life too short
SB-124	27.	602.71	3.6226E-08
SB-125	29.	427.89	3.1343E-08
TE-125M	38.	109.28	1.4264E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	28.	57.60	4.5750E-05
-127	56.	202.84	1.2005E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	22.	695.88	3.0212E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	73.	123.00	3.2633E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	61.	163.93	3.7556E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	220.16	Half-Life too short
BA-133	43.	302.84	5.2562E-06
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.50	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	23.	604.70	1.0100E-06
I-134	0.	804.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

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\* Sample ID : EFT-76020906 EF1 \*

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Minimum Detectable Activity Report

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	29.	477.59	3.8089E-07
F-18	0.	511.00	Half-Life too short
NA-22	10.	1274.54	1.1291E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	14.	889.25	2.5858E-08
CR-51	37.	320.08	1.5249E-06
MN-54	17.	834.83	1.3186E-08
CO-56	16.	1238.25	5.1620E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	62.	122.06	1.7595E-08
CO-58	14.	810.76	2.8212E-08
FE-59	15.	1099.22	1.1834E-07
CO-60	16.	1332.49	1.3566E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	15.	1115.52	3.1306E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	41.	136.00	2.7809E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	49.	513.99	2.8185E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	49.	513.99	4.0329E-08
RB-86	11.	1076.63	7.6816E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.48	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	8.	1836.01	2.5094E-08
KR-89	0.	220.98	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.38	Half-Life too short
Y-91	12.	1204.98	1.3941E-05
Y-91M	0.	555.68	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	511.63	117	69	2.53	1022.83	1015	17	6.49E-02	10.3	4.48E+00	T
0	558.53	63	29	1.83	1116.64	1109	13	3.50E-02	21.7	4.31E+00	T
0	609.99	69	44	1.52	1219.60	1212	16	3.85E-02	24.5	4.16E+00	T
0	1764.67	35	4	2.32	3531.30	3523	14	1.95E-02	20.4	2.08E+00	T

Flags: "T" = Tentatively associated

Nuclide	Half-life	Half-Life		Energy	%Abund	Activity 1-Sigma		Rejected by
		Ratio				(uCi/cc)	%Error	
BI-214	19.90M	8224.64		609.31*	46.30	1.000E+35	24.52	Decay
				768.36	5.04	----	Not Found	----
				934.06	3.21	----	Not Found	----
				1120.29	15.10	----	Not Found	----
				1238.11	5.94	----	Not Found	----
				1377.67	4.11	----	Not Found	----
				1764.49	15.80	1.000E+35	22.40	
% Abundances Found =				65.03	(Abn. Limit =	48.48%)		

Flag: "\*" = Keyline

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	1423.95	511.00*	193.46	1.000E+35	16.01	Decay
				% Abundances Found = 100.00			
AS-76	26.32H	96.95	559.10*	44.70	2.963E+22	22.89	Decay, Abun.
				563.23	1.17	----	Not Found
				571.30	0.14	----	Not Found
				657.03	6.10	----	Not Found
				665.31	0.39	----	Not Found
				740.12	0.12	----	Not Found
				771.75	0.12	----	Not Found
				867.63	0.12	----	Not Found
				1129.07	0.14	----	Not Found
				1212.72	1.63	----	Not Found
				1216.02	3.84	----	Not Found
				1228.52	1.39	----	Not Found
				1439.13	0.33	----	Not Found
				1453.60	0.13	----	Not Found
				1707.67	0.33	----	Not Found
				% Abundances Found = 73.70			
Y-92	3.54H	735.71	448.50	2.30	----	----	Decay, Abun.
				561.10	2.40	1.000E+35	22.69
				844.30	1.25	----	Not Found
				934.46*	13.90	----	Not Found
				1405.40	4.80	----	Not Found
				% Abundances Found = 9.74			
I-103	39.35D	2.76	497.08*	89.00	----	----	Abun.
				610.33	5.60	1.903E-06	26.79
				% Abundances Found = 5.92			
XE-135	9.11H	285.88	249.79*	89.90	----	----	Decay, Abun.
				688.19	2.89	1.000E+35	26.79
				% Abundances Found = 3.11			
PM-146M	41.30D	2.63	288.11	12.56	----	----	Abun.
				414.07	10.66	----	Not Found
				432.78	5.35	----	Not Found
				501.26	6.75	----	Not Found
				550.27*	94.90	----	Not Found
				599.74	12.54	----	Not Found
				611.26	5.40	1.851E-06	26.79
				629.97	89.00	----	Not Found
				725.70	32.80	----	Not Found
				915.33	17.17	----	Not Found
				1013.01	20.30	----	Not Found
				% Abundances Found = 1.74			
BI-214	19.90M	7852.47	609.31*	46.30	1.000E+35	26.79	Decay
				768.36	5.04	----	Not Found
				934.06	3.21	----	Not Found
				1120.29	15.10	----	Not Found

Total number of lines in spectrum 5  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.093E-07	4.093E-07	0.900E-07	22.17	
Total Activity :			4.093E-07	4.093E-07			
Grand Total Activity :			4.093E-07	4.093E-07			

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

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



Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	67	10.67*	2.387E+00	4.093E-07	4.093E-07	22.17

Flag: "\*" = Keyline

Post-MID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	XErr	Fit	Nuclides
0	511.63	117	69	2.53	1022.83	1015	17	18.3		
0	550.53	63	29	1.83	1116.64	1109	13	21.7		
0	609.99	69	44	1.52	1219.60	1212	16	24.5		
0	1461.99	67	28	2.21	2925.01	2915	17	22.2		K-40
0	1764.67	35	4	2.32	3531.30	3523	14	20.4		

Sample ID : EFT-79020906 EF1

Acquisition date : 3-JUN-2006 00:45:18

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-79020906 EF1
Sample collection start date: 9-FEB-2006 09:10:00.00
Sample collection end date : 9-FEB-2006 09:10:00.00
Type of sample : 1 LOMari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : MELL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 3-JUN-2006 00:45:18.09
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.15 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.0
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

Table with 11 columns: Pk, It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: annihilation, HWC, P=214, KYU, 02/214

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RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-76020906 EF1

Sample End Time: 9-FEB-2006 09:10:00.00

REMARKS

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.....

.....

PERFORMED BY:

*Andrea Yee*

SIGNATURE

REVIEWED BY:

*Michael Linton / 48691 / 6/5/2006*

SIGNATURE/DATE

Sample number: EPT 75020906

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Abere / Andrew Hara Date: 6-3-06  
Fermi 2 RP      Printed Name                      Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2      Printed Name                      Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-7S020906

Sample Location (Well Number): EFT-7S1

1. Representative sample collected. Date/Time 02/09/2006 1 0910

Sample collected by: Joy Marie Staback / Joy Marie Staback Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Albere / Andre Stee Date: 6-3-06  
Fermi 2 RP Printed Name Signature

Tritium Activity Calculation

Sample Information

1. Sample Location	EFT-7S020906
2. Date Sampled	02/09/2006
3. Time Sampled	09:10
4. Sample Volume, (ml)	4 ml

Instrument Count Data

1. Date Sample Counted	06/19/2006
2. Time Sample Counted	18:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.5 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3346.6 cpm
Net Spike Count Rate (cpm)	3340.1 cpm
H3 Spike Activity (dpm on count date)	8640.3 dpm
Counter Efficiency	0.3866 cpm/dpm
5. Sample Info.:	
Sample Gross Count Rate (cpm)	8.2 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.7 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smp l min.})}} = 1.10\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician [Signature]

Date 2 6-20-06

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-7S 020906

Sample Location (Well Number): EFT-7S

1. Representative sample collected. Date/Time 02/09/2006 1 0910

Sample collected by: Joy Marie Slaback / Joy Marie Slaback Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: John M. Yorum / [Signature] Date: 6-14-06  
Fermi 2 Chemistry Printed Name / Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_



Sample ID : EFT-6D020806 EF1

Acquisition date : 2-JUN-2006 20:28:34

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
Fr-136	13.	818.50	3.7400E-06
Fr-136	0.	1313.02	Half-Life too short
Cs-137	27.	661.65	1.1844E-08
Xe-137	0.	455.49	Half-Life too short
Cs-138	0.	1435.86	Half-Life too short
Xe-138	0.	258.31	Half-Life too short
Ba-139	0.	1420.50	Half-Life too short
Ce-139	49.	165.85	1.8965E-08
Cs-139	0.	1283.23	Half-Life too short
Ba-140	23.	537.32	1.6984E-05
La-140	0.	1596.49	Half-Life too short
Ba-141	0.	190.22	Half-Life too short
Ce-141	48.	145.44	2.0940E-07
La-141	0.	1354.52	Half-Life too short
Ba-142	0.	255.12	Half-Life too short
La-142	0.	641.17	Half-Life too short
Ce-143	0.	293.26	Half-Life too short
Ce-144	42.	133.54	1.0643E-07
Pr-144	0.	1489.15	Half-Life too short
Nd-147	0.	91.10	Half-Life too short
Pm-148M	22.	550.27	6.0573E-08
Eu-152	24.	344.27	2.7881E-08
Eu-154	9.	1004.76	5.1230E-08
Eu-156	19.	646.29	2.1982E-05
Hf-181	41.	482.03	8.3062E-08
Ta-182	10.	1221.42	7.6102E-08
Fr-187	0.	685.81	Half-Life too short
Rn-188	0.	155.03	Half-Life too short
Hg-203	33.	279.19	5.6625E-08
Bi-207	36.	569.67	1.1060E-08
Tl-208	0.	583.14	Half-Life too short
Pb-212	0.	238.63	Half-Life too short
Bi-214	0.	609.31	Half-Life too short
Pb-214	0.	351.92	Half-Life too short
Ra-224	0.	240.98	Half-Life too short
Ra-226	56.	186.21	2.7894E-07
Ac-228	34.	338.32	7.7657E-08
Th-228	48.	84.37	1.6888E-06
Pa-234	0.	131.20	Half-Life too short
Th-234	33.	63.29	3.0486E-05
U-235	45.	143.76	8.1770E-08
Np-239	0.	106.13	Half-Life too short
Am-241	39.	59.54	1.9705E-07

Sample ID : EFT-6D020806 EF1

Acquisition date : 2-JUN-2006 20:28:34

Nuclide	Bkgnd Sum	Energy (keV)	MDA (uCi/cc)
SR-93	0.	590.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	19.	702.63	9.0105E-09
NB-95	16.	765.79	8.8286E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	10.	756.72	4.7405E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	140.50	Half-Life too short
TC-101	0.	306.81	Half-Life too short
RU-103	21.	497.06	6.7191E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.50	Half-Life too short
RU-106	15.	621.84	9.4616E-08
CD-109	39.	88.03	4.7993E-07
AG-110M	18.	937.48	4.6138E-08
SN-113	36.	391.69	2.7848E-08
SN-117M	42.	158.56	3.1879E-06
SB-122	0.	563.93	Half-Life too short
SB-124	17.	602.71	3.0251E-08
SB-125	31.	427.89	3.2389E-08
TE-125M	40.	109.28	1.4677E-05
TE-127	0.	417.90	Half-Life too short
TE-127M	36.	57.60	5.1210E-05
XE-127	52.	202.84	1.1784E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	22.	695.88	3.1183E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	51.	123.80	2.8935E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	51.	163.93	3.6067E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	32.	302.84	4.6057E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	22.	604.70	9.9597E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	26.	477.59	3.6568E-07
F-18	0.	511.00	Half-Life too short
NA-22	14.	1274.54	1.2956E-08
NA-24	0.	1368.53	Half-Life too short
MG-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	14.	889.25	2.6063E-08
CR-51	43.	320.00	1.6671E-06
MN-54	15.	834.83	1.2695E-08
CO-56	16.	1230.25	5.1819E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	46.	122.06	1.5312E-08
CO-58	12.	810.76	2.6909E-08
FE-59	14.	1099.22	1.1554E-07
CO-60	16.	1332.49	1.3876E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	14.	1115.52	3.0194E-08
ZN-69M	0.	438.63	Half-Life too short
AS-75	53.	136.00	3.1192E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	802.41	Half-Life too short
KR-85	69.	513.99	3.2963E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	69.	513.99	4.7552E-08
RB-86	13.	1076.63	8.4940E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	6.	1836.01	2.1974E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1624.30	Half-Life too short
Y-91	11.	1204.90	1.3494E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	511.70	170	35	2.10	1022.96	1014	20	9.42E-02	11.5	4.48E+00	T
0	558.43	70	17	1.78	1116.44	1112	9	3.87E-02	16.2	4.31E+00	T

Flags: "T" = Tentatively associated

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
F-18	109.74M	1501.63	511.00	*193.46	1.000E+35	11.50	Decay
% Abundances Found = 100.00							
AS-76	26.32H	104.35	559.10*	44.70	1.402E+24	16.21	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.07	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.84	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found = 73.70							

Flag: "\*" = Keyline

Total number of lines in spectrum 3  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 3 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	3.516E-07	3.516E-07	0.816E-07	23.21	
Total Activity :			3.516E-07	3.516E-07			
Grand Total Activity :			3.516E-07	3.516E-07			

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

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

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	58	10.67*	2.307E+00	3.516E-07	3.516E-07	23.21

Flag: "\*" = Keyline

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	511.70	170	35	2.10	1022.96	1014	20	11.5		
0	558.43	70	17	1.78	1116.44	1112	9	16.2		
0	1461.72	58	25	2.35	2924.47	2914	16	23.2		K-40



Sample ID : EFT-6D020806 EF1

Acquisition date : 2-JUN-2006 20:28:34

\*\*\*\*\*

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-6D020806 EF1
Sample collection start date: 8-FEB-2006 10:15:00.00
Sample collection end date : 8-FEB-2006 10:15:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 2-JUN-2006 20:28:34.90
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.11 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.0
Kev/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:28:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m211 Efficiencies at : Peak energy

\*\*\*\*\*

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 3 rows of peak data.

Amplitude
He C
K40

RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-6D020806 EF1

Sample End Time: 8-FEB-2006 10:15:00.00

REMARKS

PERFORMED BY:

*Andrew Stee*

SIGNATURE

REVIEWED BY:

*William V. Linton 48851 / 6/5/2006*

SIGNATURE/DATE

Sample number: EFT-6D020806

4. Sample counted in accordance with 65.000.115 "Operation of the Gamma Spectroscopy System".  
(Note disposition of unidentified peaks in "Remarks")

Performed by: Alere / Adrian Hure Date: 6-2-06  
Fermi 2 RP      Printed Name                      Signature

\* Note: Samples may be counted on Chemistry's Gamma Spectroscopy System. If so, verify the critical levels and LLDs and count sample in accordance with the applicable procedure.

5. Gamma spectrometry evaluation reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2      Printed Name                      Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, intrinsic printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## FERMI 1 GROUND WATER MONITORING GAMMA ISOTPIC ANALYSIS CHECKLIST

Sample number: EFT-6D02B06

Sample Location (Well Number): EFT-6D

1. Representative sample collected. Date/Time 02/08/2006 1 1015

Sample collected by: Jay Marie Slabick / Jay Marie Slabick Date: 02/04/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Sample container sealed adequately to resist tampering.

Note: Use new sample containers only

Sample sealed by: B Jester / B Jester Date: 3-23-06  
Printed Name / Signature

Note: Sample containers may simply be sealed with red duct tape and initialed by the individual performing the function

3. LLD validation

LLD and Critical Level determinations within 30 days of gamma spectrometry assay; acceptable LLDs shown for radionuclides detected by gamma spectrometry.

Fermi 2 RP Gamma Scintillation Detector # 4

Performed by: Albere / Andrew Mee Date: 6-2-06  
Fermi 2 RP Printed Name Signature

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-6D020806
2. Date Sampled	02/08/2006
3. Time Sampled	10:15
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	06/20/2006
2. Time Sample Counted	08:55
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	6.9 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3354.8 cpm
Net Spike Count Rate (cpm)	3347.9 cpm
H3 Spike Activity (dpm on count date)	8638.9 dpm
Counter Efficiency	0.3875 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	7.4 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.5 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	1.9 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.13\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician [Signature]

Date 6-70-6

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-60 020300

Sample Location (Well Number): EFT-60

1. Representative sample collected. Date/Time 02/03/2006 1015

Sample collected by: by Marie Slaback / Marie Slaback Date: 03/14/2006  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: B. Jester / B. Jester Date: 3-23-06  
Printed Name / Signature

3. Sample counted in accordance with 76,000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: JAN M. YOKO / [Signature] Date: 6-20-06  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Sample ID : EFT-65020006 EF1

Acquisition date : 2-JUN-2006 19:54:56

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
CS-136	12.	818.50	3.5867E-06
I-136	0.	1313.02	Half-Life too short
CS-137	13.	661.65	8.5905E-09
XE-137	0.	455.49	Half-Life too short
CS-138	0.	1435.86	Half-Life too short
XE-138	0.	250.31	Half-Life too short
BA-139	0.	1420.50	Half-Life too short
CE-139	55.	165.85	1.9976E-08
CS-139	0.	1283.23	Half-Life too short
BA-140	30.	537.32	1.8965E-05
LA-140	0.	1596.49	Half-Life too short
BA-141	0.	190.22	Half-Life too short
CE-141	51.	145.44	2.1450E-07
LA-141	0.	1354.52	Half-Life too short
BA-142	0.	255.12	Half-Life too short
LA-142	0.	641.17	Half-Life too short
CE-143	0.	293.26	Half-Life too short
CE-144	39.	133.54	1.0240E-07
PR-144	0.	1489.15	Half-Life too short
ND-147	0.	91.10	Half-Life too short
PM-148M	17.	550.27	5.4281E-08
EU-152	40.	344.27	3.5590E-08
EU-154	10.	1004.76	5.1940E-08
EU-156	20.	646.29	2.2639E-05
HF-181	24.	482.03	6.5716E-08
TA-182	13.	1221.42	8.3105E-08
W-187	0.	685.81	Half-Life too short
RE-188	0.	155.03	Half-Life too short
HG-203	60.	279.19	7.4702E-08
BI-207	20.	569.67	8.5350E-09
TL-208	0.	583.14	Half-Life too short
PB-212	0.	230.63	Half-Life too short
BI-214	0.	609.31	Half-Life too short
PB-214	0.	351.92	Half-Life too short
RA-224	0.	240.98	Half-Life too short
RA-226	67.	186.21	3.0350E-07
AC-228	34.	338.32	7.7272E-08
TH-228	39.	84.37	1.5424E-06
PA-234	0.	131.20	Half-Life too short
TH-234	39.	63.29	3.2694E-05
U-235	55.	143.76	8.9298E-08
NP-239	0.	106.13	Half-Life too short
AM-241	43.	59.54	2.0672E-07

Sample ID : EFT-66920806 EF1

Acquisition date : 2-JUN-2006 19:54:56

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
-93	0.	598.28	Half-Life too short
Y-93	0.	266.90	Half-Life too short
NB-94	22.	702.63	9.6838E-09
NB-95	16.	765.79	8.8125E-08
NB-95M	0.	235.69	Half-Life too short
ZR-95	8.	756.72	4.2526E-08
NB-97	0.	657.90	Half-Life too short
ZR-97	0.	743.36	Half-Life too short
MO-99	0.	739.58	Half-Life too short
TC-99M	0.	148.50	Half-Life too short
TC-101	0.	386.81	Half-Life too short
RU-103	14.	497.08	5.6203E-08
TC-104	0.	357.99	Half-Life too short
RH-105	0.	318.90	Half-Life too short
RU-105	0.	724.58	Half-Life too short
RU-106	22.	621.84	1.1193E-07
CD-109	49.	88.03	5.3749E-07
AG-110M	12.	937.48	3.9329E-08
SN-113	38.	391.69	2.8545E-08
SN-117M	51.	158.56	3.4519E-06
SB-122	0.	563.93	Half-Life too short
SB-124	23.	602.71	3.4543E-08
SB-125	31.	427.89	3.2432E-08
TE-125M	44.	109.28	1.5406E-05
TE-127	0.	417.90	Half-Life too short
-127M	38.	57.60	4.6737E-05
-127	47.	202.84	1.1205E-07
TE-129	0.	459.60	Half-Life too short
TE-129M	22.	695.88	3.1111E-06
XE-129M	0.	196.56	Half-Life too short
I-130	0.	536.09	Half-Life too short
BA-131	45.	123.80	2.7187E-05
I-131	0.	364.48	Half-Life too short
TE-131	0.	149.72	Half-Life too short
TE-131M	0.	773.67	Half-Life too short
XE-131M	54.	163.93	3.7105E-04
I-132	0.	667.69	Half-Life too short
TE-132	0.	228.16	Half-Life too short
BA-133	31.	302.84	4.5132E-08
BA-133M	0.	276.09	Half-Life too short
I-133	0.	529.87	Half-Life too short
TE-133M	0.	912.58	Half-Life too short
XE-133	0.	81.00	Half-Life too short
XE-133M	0.	233.22	Half-Life too short
CS-134	20.	604.70	9.5834E-09
I-134	0.	884.09	Half-Life too short
TE-134	0.	210.47	Half-Life too short
BA-135M	0.	268.24	Half-Life too short
I-135	0.	1260.41	Half-Life too short
XE-135	0.	249.79	Half-Life too short
XE-135M	0.	526.56	Half-Life too short



\* Sample ID : EFT-68020306 EF1 \*

Minimum Detectable Activity Report

Nuclide	Bckgnd Sum	Energy (keV)	MDA (uCi/cc)
BE-7	22.	477.59	3.3993E-07
F-18	0.	511.00	Half-Life too short
NA-22	12.	1274.54	1.2452E-08
NA-24	0.	1368.53	Half-Life too short
MO-27	0.	1014.44	Half-Life too short
CL-38	0.	1642.42	Half-Life too short
AR-41	0.	1293.64	Half-Life too short
SC-46	18.	889.25	2.8896E-08
CR-51	32.	320.08	1.4582E-06
MN-54	14.	834.83	1.2106E-08
CO-56	17.	1238.25	5.3035E-08
MN-56	0.	1810.69	Half-Life too short
NI-56	0.	158.38	Half-Life too short
CO-57	48.	122.06	1.5635E-08
CO-58	17.	810.76	3.0581E-08
FE-59	17.	1099.22	1.2515E-07
CO-60	16.	1332.49	1.3875E-08
CU-64	0.	1345.90	Half-Life too short
NI-65	0.	1481.84	Half-Life too short
ZN-65	10.	1115.52	2.6168E-08
ZN-69M	0.	438.63	Half-Life too short
SE-75	53.	136.00	3.1208E-08
AS-76	0.	559.10	Half-Life too short
BR-82	0.	776.49	Half-Life too short
BR-83	0.	529.64	Half-Life too short
BR-84	0.	881.50	Half-Life too short
BR-85	0.	882.41	Half-Life too short
KR-85	52.	513.99	2.8730E-06
KR-85M	0.	151.18	Half-Life too short
SR-85	52.	513.99	4.1405E-08
RB-86	9.	1076.63	7.2300E-06
KR-87	0.	402.58	Half-Life too short
SR-87M	0.	388.40	Half-Life too short
KR-88	0.	196.32	Half-Life too short
RB-88	0.	1382.39	Half-Life too short
Y-88	7.	1836.01	2.3040E-08
KR-89	0.	220.90	Half-Life too short
RB-89	0.	1031.88	Half-Life too short
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	0.	202.51	Half-Life too short
SR-91	0.	1024.30	Half-Life too short
Y-91	11.	1204.90	1.3479E-05
Y-91M	0.	555.60	Half-Life too short
SR-92	0.	1383.94	Half-Life too short
Y-92	0.	934.46	Half-Life too short

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	%Eff	Flags
0	199.17	25	67	1.10	397.91	394	8	1.39E-02	60.7	6.03E+00	T
0	511.43	131	55	2.70	1022.43	1015	17	7.29E-02	15.6	4.40E+00	T
0	558.90	83	40	1.85	1117.38	1109	18	4.60E-02	21.1	4.31E+00	T
0	1764.05	30	0	0.96	3530.07	3523	13	1.67E-02	10.3	2.00E+00	T

Flags: "T" = Tentatively associated

Flag: "x" = Keyline

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity (uCi/cc)	1-Sigma %Error	Rejected by
E-18	109.74M	1500.41	511.00*	193.46	1.000E+35	15.62	Decay
% Abundances Found = 100.00							
SE-75	119.78D	0.95	66.05	1.02	----	Not Found	----
			96.73	3.41	----	Not Found	----
			121.12	16.70	----	Not Found	----
			136.00*	59.20	----	Not Found	----
			198.60	1.45	8.351E-07	60.73	
			264.65	59.80	----	Not Found	----
			279.53	25.20	----	Not Found	----
			303.91	1.32	----	Not Found	----
			400.65	11.40	----	Not Found	----
% Abundances Found = 0.01							
AS-76	26.32H	104.26	559.10*	44.70	1.573E+24	21.00	Decay, Abun.
			563.23	1.17	----	Not Found	----
			571.30	0.14	----	Not Found	----
			657.03	6.10	----	Not Found	----
			665.31	0.39	----	Not Found	----
			740.12	0.12	----	Not Found	----
			771.76	0.12	----	Not Found	----
			867.63	0.12	----	Not Found	----
			1129.87	0.14	----	Not Found	----
			1212.72	1.63	----	Not Found	----
			1216.02	3.84	----	Not Found	----
			1228.52	1.39	----	Not Found	----
			1439.13	0.33	----	Not Found	----
			1453.60	0.13	----	Not Found	----
			1787.67	0.33	----	Not Found	----
% Abundances Found = 73.70							
TE-131M	30.00H	91.47	102.06	7.90	----	Not Found	----
			149.72	5.10	----	Not Found	----
			200.63	7.56	2.844E+20	60.73	
			240.93	7.59	----	Not Found	----
			334.27	9.60	----	Not Found	----
			773.67*	30.20	----	Not Found	----
			782.49	7.79	----	Not Found	----
			793.75	13.90	----	Not Found	----
			822.78	6.12	----	Not Found	----
			852.21	20.70	----	Not Found	----
			1125.46	11.40	----	Not Found	----
			1206.60	9.80	----	Not Found	----
% Abundances Found = 5.19							
BI-214	19.90M	8274.12	609.31*	46.30	----	Not Found	----
			768.36	5.04	----	Not Found	----
			934.06	3.21	----	Not Found	----
			1120.29	15.10	----	Not Found	----
			1238.11	5.94	----	Not Found	----
			1377.67	4.11	----	Not Found	----
			1764.49	15.80	1.000E+35	10.26	
% Abundances Found = 16.54 (Abn. Limit = 48.40%)							

Total number of lines in spectrum 5  
Number of unidentified lines 0  
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : natural

Nuclide	Hlife	Decay	Uncorrected uCi/cc	Decay Corr uCi/cc	Decay Corr 1-Sigma Error	1-Sigma %Error	Flags
K-40	1.00E+05Y	1.00	4.132E-07	4.132E-07	0.775E-07	18.75	
Total Activity :			4.132E-07	4.132E-07			
Grand Total Activity :			4.132E-07	4.132E-07			

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

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

Nuclide Type: natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected uCi/cc	Decay Corr uCi/cc	1-Sigma %Error
K-40	1460.81	68	10.67*	2.308E+00	4.132E-07	4.132E-07	10.75

Flag: "\*" = Keyline

## Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	199.17	25	67	1.18	397.91	394	0	60.7		
0	511.43	131	55	2.78	1022.43	1015	17	15.6		
0	558.98	83	40	1.85	1117.38	1109	18	21.1		
0	1461.10	68	20	1.16	2923.23	2915	14	18.8		K-40
0	1764.05	30	0	0.96	3530.07	3523	13	18.3		

Sample ID : EFT-6S020806 EF1

Acquisition date : 2-JUN-2006 19:54:56

Fermi 2 Radiation Protection Gamma Spectroscopy Report

\*\*\*\*\* Sample Parameters \*\*\*\*\*

Sample ID Number: EFT-6S020806 EF1
Sample collection start date: 8-FEB-2006 11:55:00.00
Sample collection end date : 8-FEB-2006 11:55:00.00
Type of sample : 1 L Mari. Liquid
Sample quantity : 1.00000E+03 cc
Sample geometry : M2LL Operator: AKG

\*\*\*\*\* Acquisition Parameters \*\*\*\*\*

Detector number : DET 4 Acquire date : 2-JUN-2006 19:54:56.36
Preset live time : 0 00:30:00.00 Elapsed live time : 0 00:30:00.00
Elapsed real time : 0 00:30:01.09 Percent dead time : 0.05 %

\*\*\*\*\* Calibration Parameters \*\*\*\*\*

Detector number : DET 4 Yearly cal date : 26-APR-2006 11:58:00.0
Key/channel : 5.00223E-01 Zero offset: 1.50957E-01
Daily cal date : 2-JUN-2006 09:20:10.79

\*\*\*\*\* 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 : 2.00000 Half-life ratio : 10.00000
Abundance limit : 75.00000 Library : dacmaster.nlb
Efficiency file : EFFD4\_m2ll Efficiencies at : Peak energy

Table with 11 columns: Pk It, Energy, Area, Bkgnd, FWHM, Channel, Left, Pw, Cts/Sec, %Err, Fit. Contains 5 rows of peak data.

Handwritten notes: AC208, Am-241, Pu-239, KYC, Pu-239



RADIATION PROTECTION DEPARTMENT

GAMMA SPECTROSCOPY ANALYSIS REPORT

HIGH EFFICIENCY DETECTOR

Sample ID Number: EFT-6S020006 EF1

Sample End Time: 0-FEB-2006 11:55:00.00

REMARKS

PERFORMED BY:

*Andrew Stone*

SIGNATURE

REVIEWED BY:

*Nelson V. Stone 4865 / 6/5/06*

SIGNATURE/DATE

**June 2006**

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-15060906

Sample Location (Well Number): EFT-15

1. Representative sample collected. Date/Time 06/09/06 / 1002

Sample collected by: Jay Slaback / Jay Marc Slaback <sup>Collection</sup> Date: 06/09/06  
Printed Name / Signature <sub>Signed 02/01/07</sub>

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Frailing / Christopher Frailing Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Berger [Signature] Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton [Signature] Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected. William V. Lipton 48651 2/15/07

Tritium Activity Calculation

Sample Information

1. Sample Location	EFT-1S060906
2. Date Sampled	06/09/2006
3. Time Sampled	10:02
4. Sample Volume, (ml)	4 ml

Instrument Count Data

1. Date Sample Counted	02/02/2007
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	7.5 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.1 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-06 uCi/ml}$$

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date

2-5-7

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT- 1D 06 09 06

Sample Location (Well Number): EFT-1D

1. Representative sample collected. Date/Time 06/09/06 / 0840

Sample collected by: Jay Sloback / Jay Sloback Collector Date: 06/09/06  
Printed Name / Signature Signed: 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Friling / Christopher A. Friling Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Binger Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton Date: 2/1/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No Tritium detected. William V. Lipton 48651 2/1/07

Tritium Activity Calculation

WR EFT 04-052  
pg 2 of 2

**Sample Information**

1. Sample Location	EFT-1D060906
2. Date Sampled	06/09/2006
3. Time Sampled	08:40
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	02/02/2007
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	8.0 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.6 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date 2/5/7

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-25060606

Sample Location (Well Number): EFT-25

1. Representative sample collected. Date/Time 06/06/06 / 1130

Sample collected by: Joy Slaback / Joy Slaback <sup>Collection</sup> Date: 06/06/06  
Printed Name / Signature <sub>Signed 02/01/07</sub>

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Freiling / Clifton A. J. J. Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Brown / [Signature] Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected, Nelson V. Lipton 48661 2/15/07

Tritium Activity Calculation

WR EFT 04-002

pg 2 of 2

**Sample Information**

1 . Sample Location	EFT-2S060606
2 . Date Sampled	06/06/2006
3 . Time Sampled	11:30
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/02/2007
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.4 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

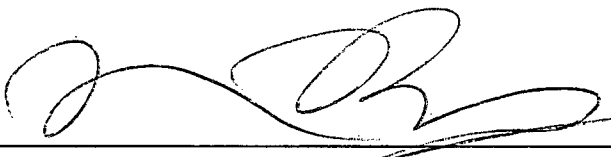
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} < \text{MDA}$$

Technician \_\_\_\_\_



Date

2-5-7



### FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-2D060606

Sample Location (Well Number): EFT-2D

1. Representative sample collected. Date/Time 06/06/06 / 1452

Sample collected by: Jay Slabick / Jay Slabick Date: 06/06/06  
Printed Name / Signature <sup>Collection</sup> Signed 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample ≥ 50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Friling / Christy A. Friling Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Bogen / [Signature] Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected. William V. Lipton 2/15/07

Tritium Activity Calculation

WR EFT 04-052  
pg 2 of 2

Sample Information

1 . Sample Location EFT-2D060606  
 2 . Date Sampled 06/06/2006  
 3 . Time Sampled 14:52  
 4 . Sample Volume, (ml) 4 ml

Instrument Count Data

1 . Date Sample Counted 02/02/2007  
 2 . Time Sample Counted 10:00  
 3 . Background Inf.:  
     Minutes Counted 10 min.  
     Background Count Rate (cpm) 7.4 cpm  
 4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
     Gross Spike Count Rate (cpm) 3388.1 cpm  
     Net Spike Count Rate (cpm) 3380.7 cpm  
     H3 Spike Activity (dpm on count date) 8340.7 dpm  
     Counter Efficiency 0.4053 cpm/dpm  
 5 . Sample Info:  
     Sample Gross Count Rate (cpm) 8.9 cpm  
     Sample Count Time (min.) 10.0 min.  
     Net Sample Count Rate (cpm) 1.5 cpm  
 6 . Critical Level:  
     Critical Level Count Rate (cpm) 2.0 cpm

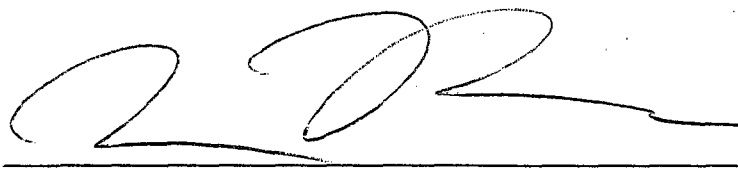
Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 dpm/uCi x Sample Volume}} < \text{MDA}$$

Technician  Date 2-5-7

### FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-45 061206

Sample Location (Well Number): EFT-45

1. Representative sample collected. Date/Time 06/12/06 1 14 22

Sample collected by: Joy Slebeck / Joy Marie Slebeck Collection Date: 06/12/06  
Printed Name / Signature Signed: 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample ≥ 50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christophe Friling / Christophe Friling Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Bapat Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipka / William V. Lipka Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected. William V Lipka 48651 2/15/07

Tritium Activity Calculation

WR E F I 04-050  
Pg 2 of 2

Sample Information

1 . Sample Location EFT-4S061206  
 2 . Date Sampled 06/12/2006  
 3 . Time Sampled 14:22  
 4 . Sample Volume, (ml) 4 ml

Instrument Count Data

1 . Date Sample Counted 02/02/2007  
 2 . Time Sample Counted 10:00  
 3 . Background Inf.:  
     Minutes Counted 10 min.  
     Background Count Rate (cpm) 7.4 cpm  
 4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
     Gross Spike Count Rate (cpm) 3388.1 cpm  
     Net Spike Count Rate (cpm) 3380.7 cpm  
     H3 Spike Activity (dpm on count date) 8340.7 dpm  
     Counter Efficiency 0.4053 cpm/dpm  
 5 . Sample Info:  
     Sample Gross Count Rate (cpm) 7.3 cpm  
     Sample Count Time (min.) 10.0 min.  
     Net Sample Count Rate (cpm) 0.0 cpm  
 6 . Critical Level:  
     Critical Level Count Rate (cpm) 2.0 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 dpm/uCi x Sample Volume}} < \text{MDA}$$

Technician 

Date 2-5-07

### FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-4D061206

Sample Location (Well Number): EFT-4D

1. Representative sample collected. Date/Time 06/12/06 / 0958

Sample collected by: Jay Slabach / Jay Marie Slabach Date: 06/12/06  
Printed Name / Signature Signed: 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample ≥ 50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Freiling / Christopher Freiling Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Bryan Date: 2-5-07  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lynton Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected in well EFT-4D (605) 2/15/07

**Sample Information**

1 . Sample Location	EFT-4D061206
2 . Date Sampled	06/12/2006
3 . Time Sampled	09:58
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/02/2007
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.3 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

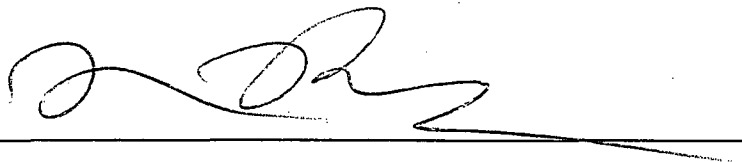
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 dpm/uCi x Sample Volume}} < \text{MDA}$$

Technician \_\_\_\_\_



Date

2-5-7

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-55060806

Sample Location (Well Number): EFT-55

1. Representative sample collected. Date/Time 06/08/06 / 1442

Sample collected by: Jay Slaback / Jay Slaback <sup>Collection</sup> Date: 06/08/06  
Printed Name / Signature signed 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Frilingi / Chris A.F. Jr Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Boyer Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lytas Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected. William V. Lytas 48651 2/15/07

Tritium Activity Calculation

WR EPI 04-052  
pg 2 of 2

**Sample Information**

1. Sample Location	EFT-5S060806
2. Date Sampled	06/08/2006
3. Time Sampled	14:42
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	02/02/2007
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	7.8 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.4 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-06 uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 dpm/uCi x Sample Volume}} < \text{MDA}$$

Technician  Date 2-5-7



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-5D060 806

Sample Location (Well Number): EFT-5D

1. Representative sample collected. Date/Time 06/08/06 / 1616

Sample collected by: Joy Sleback / Joy Marie Sleback Date: 06/08/06  
Printed Name / Signature Signed 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only.

Sample sealed by: Christopher Friling / Christopher A. Friling Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Bryan Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Linton Date: 7/15/00  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks NO tritium detected when V Linton 48657 07/15/00

Tritium Activity Calculation

WE EFT 09-052  
pg 2 of 2

**Sample Information**

1 . Sample Location	EFT-5D060806
2 . Date Sampled	06/08/2006
3 . Time Sampled	16:16
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/02/2007	
2 . Time Sample Counted	10:00	
3 . Background Inf.:		
Minutes Counted	10	min.
Background Count Rate (cpm)	7.4	cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)		
Gross Spike Count Rate (cpm)	3388.1	cpm
Net Spike Count Rate (cpm)	3380.7	cpm
H3 Spike Activity (dpm on count date)	8340.7	dpm
Counter Efficiency	0.4053	cpm/dpm
5 . Sample Info:		
Sample Gross Count Rate (cpm)	7.8	cpm
Sample Count Time (min.)	10.0	min.
Net Sample Count Rate (cpm)	0.4	cpm
6 . Critical Level:		
Critical Level Count Rate (cpm)	2.0	cpm

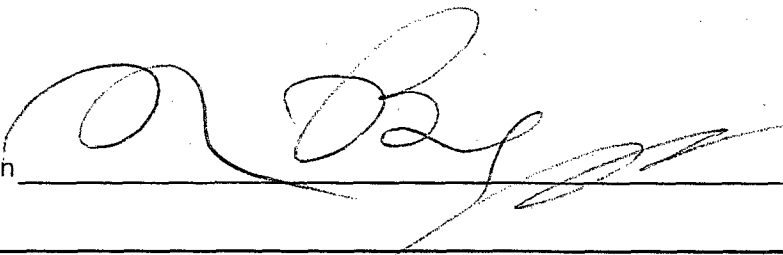
**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 dpm/uCi x Sample Volume}} < \text{MDA}$$

Technician  Date 2-5-7

### FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-65061206

Sample Location (Well Number): EFT-65

1. Representative sample collected. Date/Time 06/12/06 1515

Sample collected by: Joy Slaback / Joy Marie Slaback Date: 06/12/06  
Printed Name / Signature Collection Date: 06/12/06  
Signed: 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample ≥ 50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Freiling / Christopher Freiling Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Bays / Russ Bays Date: 2-57  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lytton / William V. Lytton Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected. William V. Lytton 48651 2/15/07

Tritium Activity Calculation

WR EFl-04-050  
PS 2 of 2

**Sample Information**

1 . Sample Location	EFT-6S061206
2 . Date Sampled	06/12/2006
3 . Time Sampled	15:15
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	02/02/2007	
2 . Time Sample Counted	10:00	
3 . Background Inf.:		
Minutes Counted	10	min.
Background Count Rate (cpm)	7.4	cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)		
Gross Spike Count Rate (cpm)	3388.1	cpm
Net Spike Count Rate (cpm)	3380.7	cpm
H3 Spike Activity (dpm on count date)	8340.7	dpm
Counter Efficiency	0.4053	cpm/dpm
5 . Sample Info:		
Sample Gross Count Rate (cpm)	7.2	cpm
Sample Count Time (min.)	10.0	min.
Net Sample Count Rate (cpm)	0.0	cpm
6 . Critical Level:		
Critical Level Count Rate (cpm)	2.0	cpm

**Minimum Detectable Activity**

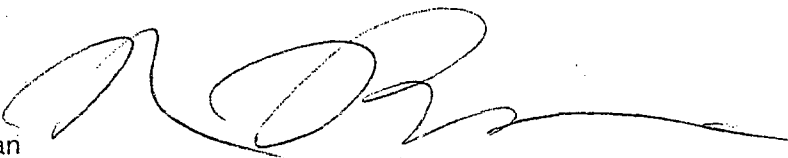
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 dpm/uCi x Sample Volume}} < \text{MDA}$$

Technician



Date

2-5-7

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-CD060706

Sample Location (Well Number): EFT-CD

1. Representative sample collected. Date/Time 06/07/06 / 105Z

Sample collected by: Jay Slabick / Jay Slabick Date: 06/07/06  
Printed Name / Signature Collection  
Signed 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples.

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Friling / Chris Friling Date: 08/07/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Ross Byers / [Signature] Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected. William V Lipton 2/15/07

Tritium Activity Calculation

WR EF1 04-052  
pg 2 of 2

**Sample Information**

1 . Sample Location	EFT-6D060706
2 . Date Sampled	06/07/2006
3 . Time Sampled	10:52
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

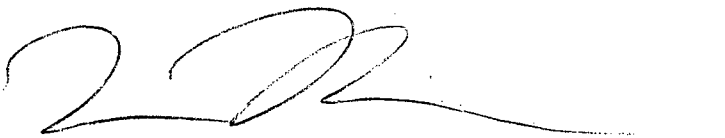
1 . Date Sample Counted	02/02/2007
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.7 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.3 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date 2-5-7

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-75060806

Sample Location (Well Number): EFT-7S

1. Representative sample collected. Date/Time 06/08/06 / 0912

Sample collected by: Jay Slaback / Jay Slaback Date: 06/08/06  
Printed Name / Signature Collection  
Date: 06/08/06  
Sign: 02/01/06

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Freiling / Chris Freiling Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Burger / Russ Burger Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Linton / William V. Linton Date: 2/15/07  
Fermi 2 Printed Name Signature 2/15/07  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks NA Tritium detected  $< 100$  dpm/l (Linton 2/15/07)

WR EFT 04-052  
pg 2 of 2

Tritium Activity Calculation

Sample Information

1 . Sample Location	EFT-7S060806
2 . Date Sampled	06/08/2006
3 . Time Sampled	09:12
4 . Sample Volume, (ml)	4 ml

Instrument Count Data

1 . Date Sample Counted	02/02/2007
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.0 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

Minimum Detectable Activity

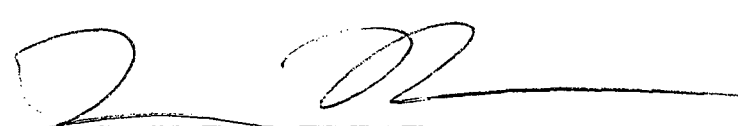
$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 dpm/uCi x Sample Volume}} < \text{MDA}$$

Technician



Date

2-5-7



## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-95660706

Sample Location (Well Number): EFT-95

1. Representative sample collected. Date/Time 06/07/06 / 0842

Sample collected by: Jay Steback / Jay Steback / Jay Steback / Jay Steback  
Printed Name / Signature / Signature / Signature  
Collection Date: 06/07/06  
Signed: 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Frilling / Christopher Frilling / Christopher Frilling / Christopher Frilling  
Printed Name / Signature / Signature / Signature  
Date: 08/02/06

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Boyer / Russ Boyer / Russ Boyer / Russ Boyer  
Fermi 2 Chemistry Printed Name / Signature / Signature / Signature  
Date: 2-5-7

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William V. Lipton / William V. Lipton / William V. Lipton / William V. Lipton  
Fermi 2 Printed Name / Signature / Signature / Signature  
Radiation Protection Supervision/Delegate  
Date: 2/15/2007

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks No tritium detected, William V. Lipton 4845/2100M

Tritium Activity Calculation

Sample Information

1. Sample Location	EFT-9S060706
2. Date Sampled	06/07/2006
3. Time Sampled	08:42
4. Sample Volume, (ml)	4 ml

Instrument Count Data


1. Date Sample Counted	02/02/2007
2. Time Sample Counted	10:00
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.1 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-06 uCi/ml}$$

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} < \text{MDA}$$

Technician 

Date 2-5-7

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-105 06 0806

Sample Location (Well Number): EFT-105

1. Representative sample collected. Date/Time 06/08/06 / 1032

Sample collected by: Jay Slabick / Jay Mann Slabick Collection Date: 06/08/06  
Printed Name / Signature Signed 02/01/07

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: Christopher Friling / Christopher A Friling Date: 08/02/06  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: Russ Buzoni / Russ Buzoni Date: 2-5-7  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: William Vinter / William Vinter Date: 2/15/07  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks 16 tritium detected from 1-2 Jan 48657 2/15/07

WR EPI 04-052  
Pg 2 of 3

Tritium Activity Calculation

Sample Information

1 . Sample Location	EFT-10S060806
2 . Date Sampled	06/08/2006
3 . Time Sampled	10:32
4 . Sample Volume, (ml)	4 ml

Instrument Count Data

1 . Date Sample Counted	02/02/2007
2 . Time Sample Counted	10:00
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.4 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3388.1 cpm
Net Spike Count Rate (cpm)	3380.7 cpm
H3 Spike Activity (dpm on count date)	8340.7 dpm
Counter Efficiency	0.4053 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.5 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.1 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

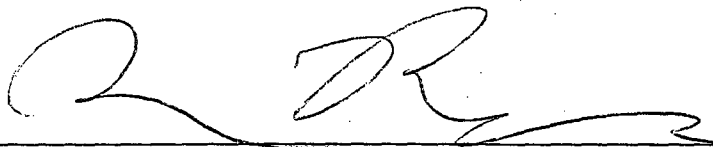
Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 dpm/uCi x Sample Volume}} < \text{MDA}$$

Technician  Date 2-5-7

**December 2006**

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-95121206

Sample Location (Well Number): EFT-95

1. Representative sample collected. Date/Time 12/12/06 1 11:10

Sample collected by: J. Slaback <sup>2ms</sup> <sub>12/12/06</sub> / J. Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / J. Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / D. Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-95121206
2 . Date Sampled	12/12/2006
3 . Time Sampled	11:10
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	04/19/2007
2 . Time Sample Counted	16:27
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.7 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3407.6 cpm
Net Spike Count Rate (cpm)	3399.9 cpm
H3 Spike Activity (dpm on count date)	8243.8 dpm
Counter Efficiency	0.4124 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.6 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician

*Handwritten signature*

Date

APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-95121200D

Sample Location (Well Number): EFT-95

1. Representative sample collected. Date/Time 12/12/06 11:47

Sample collected by: J. Slaback / J. Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / J. Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / D. Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_



Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-95121206D
2 . Date Sampled	12/12/2006
3 . Time Sampled	11:47
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	04/19/2007
2 . Time Sample Counted	16:37
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.7 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3407.6 cpm
Net Spike Count Rate (cpm)	3399.9 cpm
H3 Spike Activity (dpm on count date)	8243.8 dpm
Counter Efficiency	0.4124 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.0 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician

*Om / Jwan*

Date APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-85 121206

Sample Location (Well Number): EFT-85

1. Representative sample collected. Date/Time 12/12/06 1 1448

Sample collected by: J. Slaback / J. Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / J. Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / D. Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

Sample Information

1. Sample Location EFT-85121206  
2. Date Sampled 12/12/2006  
3. Time Sampled 14:48  
4. Sample Volume, (ml) 4 ml

Instrument Count Data

1. Date Sample Counted 04/19/2007  
2. Time Sample Counted 16:47  
3. Background Inf.:  
Minutes Counted 10 min.  
Background Count Rate (cpm) 7.7 cpm  
4. Efficiency Inf.: (Daily Spike Source ID # 111)  
Gross Spike Count Rate (cpm) 3407.6 cpm  
Net Spike Count Rate (cpm) 3399.9 cpm  
H3 Spike Activity (dpm on count date) 8243.8 dpm  
Counter Efficiency 0.4124 cpm/dpm  
5. Sample Info:  
Sample Gross Count Rate (cpm) 7.0 cpm  
Sample Count Time (min.) 10.0 min.  
Net Sample Count Rate (cpm) 0.0 cpm  
6. Critical Level:  
Critical Level Count Rate (cpm) 2.0 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E}-06 \text{ uCi/ml}$$

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician

*M. J. Howard*

Date

APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-6D121306

Sample Location (Well Number): EFT-6D

1. Representative sample collected. Date/Time 12/13/06 1 1042

Sample collected by: J. Slaback / [Signature] Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / [Signature] Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / [Signature] Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location EFT-6D121306  
2 . Date Sampled 12/13/2006  
3 . Time Sampled 10:42  
4 . Sample Volume, (ml) 4 ml

**Instrument Count Data**

1 . Date Sample Counted 04/19/2007  
2 . Time Sample Counted 16:57  
3 . Background Inf.:  
Minutes Counted 10 min.  
Background Count Rate (cpm) 7.7 cpm  
4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
Gross Spike Count Rate (cpm) 3407.6 cpm  
Net Spike Count Rate (cpm) 3399.9 cpm  
H3 Spike Activity (dpm on count date) 8243.8 dpm  
Counter Efficiency 0.4124 cpm/dpm  
5 . Sample Info:  
Sample Gross Count Rate (cpm) 7.1 cpm  
Sample Count Time (min.) 10.0 min.  
Net Sample Count Rate (cpm) 0.0 cpm  
6 . Critical Level:  
Critical Level Count Rate (cpm) 2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-}06 \text{ uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician am / jw Date APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-65 121306

Sample Location (Well Number): EFT-65

1. Representative sample collected. Date/Time 12/13/06 1 1348

Sample collected by: J. Slaback / J. Marie Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only.

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / M. Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1. Sample Location	EFT-65121306
2. Date Sampled	12/13/2006
3. Time Sampled	13:48
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

1. Date Sample Counted	04/19/2007
2. Time Sample Counted	17:07
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.7 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3407.6 cpm
Net Spike Count Rate (cpm)	3399.9 cpm
H3 Spike Activity (dpm on count date)	8243.8 dpm
Counter Efficiency	0.4124 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	6.6 cpm
Sample Count Time (min.)	10:0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician

*[Handwritten Signature]*

APR 20 2007  
Date

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-55 121306

Sample Location (Well Number): EFT-55

1. Representative sample collected. Date/Time 12/13/06 1 1511

Sample collected by: J. Slaback / Jay Main Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / Amithwan Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_



Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-5S121306
2 . Date Sampled	12/13/2006
3 . Time Sampled	15:11
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	04/19/2007
2 . Time Sample Counted	17:17
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.7 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3407.6 cpm
Net Spike Count Rate (cpm)	3399.9 cpm
H3 Spike Activity (dpm on count date)	8243.8 dpm
Counter Efficiency	0.4124 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	7.0 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician \_\_\_\_\_

*Am / J. Ward*

APR 20 2007  
Date \_\_\_\_\_

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-50 121406

Sample Location (Well Number): EFT-50

1. Representative sample collected. Date/Time 12/14/06 1 1103

Sample collected by: J. Slaback / Jennifer Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / D. Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-5D121406
2 . Date Sampled	12/14/2006
3 . Time Sampled	11:03
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	04/19/2007
2 . Time Sample Counted	17:27
3 . Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.7 cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3407.6 cpm
Net Spike Count Rate (cpm)	3399.9 cpm
H3 Spike Activity (dpm on count date)	8243.8 dpm
Counter Efficiency	0.4124 cpm/dpm
5 . Sample Info:	
Sample Gross Count Rate (cpm)	6.5 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6 . Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-06 uCi/ml}$$

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician

*M. Swane*

Date

4.20.07

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-45 121406

Sample Location (Well Number): EFT-45

1. Representative sample collected. Date/Time 12/14/06 1 1335

Sample collected by: J. Slaback / Jerry Max Slaback Date: 02/07/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jenny Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / DM Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

Sample Information

1 . Sample Location EFT-4S121406  
 2 . Date Sampled 12/14/2006  
 3 . Time Sampled 13:35  
 4 . Sample Volume, (ml) 4 ml

Instrument Count Data

1 . Date Sample Counted 04/19/2007  
 2 . Time Sample Counted 17:37  
 3 . Background Inf.:  
     Minutes Counted 10 min.  
     Background Count Rate (cpm) 7.7 cpm  
 4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
     Gross Spike Count Rate (cpm) 3407.6 cpm  
     Net Spike Count Rate (cpm) 3399.9 cpm  
     H3 Spike Activity (dpm on count date) 8243.8 dpm  
     Counter Efficiency 0.4124 cpm/dpm  
 5 . Sample Info:  
     Sample Gross Count Rate (cpm) 9.1 cpm  
     Sample Count Time (min.) 10.0 min.  
     Net Sample Count Rate (cpm) 1.4 cpm  
 6 . Critical Level:  
     Critical Level Count Rate (cpm) 2.0 cpm

Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician M. J. [Signature]

Date APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-4D 121406

Sample Location (Well Number): EFT-4D

1. Representative sample collected. Date/Time 12/14/06 1 1537

Sample collected by: J. Slaback / Joy Marie Slaback Date: 12/14/06  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / M Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

### Tritium Activity Calculation

#### Sample Information

1. Sample Location	EFT-4D121406
2. Date Sampled	12/14/2006
3. Time Sampled	15:27
4. Sample Volume, (ml)	4 ml

#### Instrument Count Data

1. Date Sample Counted	04/19/2007
2. Time Sample Counted	17:47
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.7 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3407.6 cpm
Net Spike Count Rate (cpm)	3399.9 cpm
H3 Spike Activity (dpm on count date)	8243.8 dpm
Counter Efficiency	0.4124 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	7.1 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	0.0 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

#### Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

$\div \text{Efficiency} \times 2.22\text{E}6 \text{ dpm/uCi} \times \text{Sample Volume}$

#### Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

APR 20 2007

Technician *am/...* Date \_\_\_\_\_

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-25 121406

Sample Location (Well Number): EFT-25

1. Representative sample collected. Date/Time 12/14/06 1 1635

Sample collected by: J. Slaback / Joy Marie Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / Am [Signature] Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_



Tritium Activity Calculation

**Sample Information**

1 . Sample Location EFT-2S121406  
 2 . Date Sampled 12/14/2006  
 3 . Time Sampled 16:35  
 4 . Sample Volume, (ml) 4 ml

**Instrument Count Data**

1 . Date Sample Counted 04/19/2007  
 2 . Time Sample Counted 17:57  
 3 . Background Inf.:  
     Minutes Counted 10 min.  
     Background Count Rate (cpm) 7.7 cpm  
 4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
     Gross Spike Count Rate (cpm) 3407.6 cpm  
     Net Spike Count Rate (cpm) 3399.9 cpm  
     H3 Spike Activity (dpm on count date) 8243.8 dpm  
     Counter Efficiency 0.4124 cpm/dpm  
 5 . Sample Info:  
     Sample Gross Count Rate (cpm) 7.6 cpm  
     Sample Count Time (min.) 10.0 min.  
     Net Sample Count Rate (cpm) 0.0 cpm  
 6 . Critical Level:  
     Critical Level Count Rate (cpm) 2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician *am / pward* Date APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-15 121506

Sample Location (Well Number): EFT-15

1. Representative sample collected. Date/Time 12/15/06 1 0859

Sample collected by: J. Slaback / Jay Marie Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / M Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

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1. Sample Location	EFT-15121506
2. Date Sampled	12/15/2006
3. Time Sampled	08:59
4. Sample Volume, (ml)	4 ml

**Instrument Count Data**

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1. Date Sample Counted	04/19/2007
2. Time Sample Counted	18:07
3. Background Inf.:	
Minutes Counted	10 min.
Background Count Rate (cpm)	7.7 cpm
4. Efficiency Inf.: (Daily Spike Source ID # 111)	
Gross Spike Count Rate (cpm)	3407.6 cpm
Net Spike Count Rate (cpm)	3399.9 cpm
H3 Spike Activity (dpm on count date)	8243.8 dpm
Counter Efficiency	0.4124 cpm/dpm
5. Sample Info:	
Sample Gross Count Rate (cpm)	8.8 cpm
Sample Count Time (min.)	10.0 min.
Net Sample Count Rate (cpm)	1.1 cpm
6. Critical Level:	
Critical Level Count Rate (cpm)	2.0 cpm

**Minimum Detectable Activity**

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$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

---

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician                     *M. J. [Signature]*                    

Date                     APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-105121506

Sample Location (Well Number): EFT-105

1. Representative sample collected. Date/Time 12/15/06 1 1432

Sample collected by: J. Slaback / Jay Mann Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / M. Johnson Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location	EFT-10S121506
2 . Date Sampled	12/15/2006
3 . Time Sampled	14:32
4 . Sample Volume, (ml)	4 ml

**Instrument Count Data**

1 . Date Sample Counted	04/19/2007	
2 . Time Sample Counted	18:17	
3 . Background Inf.:		
Minutes Counted	10	min.
Background Count Rate (cpm)	7.7	cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)		
Gross Spike Count Rate (cpm)	3407.6	cpm
Net Spike Count Rate (cpm)	3399.9	cpm
H3 Spike Activity (dpm on count date)	8243.8	dpm
Counter Efficiency	0.4124	cpm/dpm
5 . Sample Info:		
Sample Gross Count Rate (cpm)	6.6	cpm
Sample Count Time (min.)	10.0	min.
Net Sample Count Rate (cpm)	0.0	cpm
6 . Critical Level:		
Critical Level Count Rate (cpm)	2.0	cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician                     *am/down*                    

Date                     APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-1D 121806

Sample Location (Well Number): EFT-1D

1. Representative sample collected. Date/Time 12/18/06 1 10/2

Sample collected by: J. Slaback / Jay Main Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only.

Sample sealed by: J. Southard / Jennifer Southard Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / DM Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location EFT-1D121806  
2 . Date Sampled 12/18/2006  
3 . Time Sampled 10:12  
4 . Sample Volume, (ml) 4 ml

**Instrument Count Data**

1 . Date Sample Counted 04/19/2007  
2 . Time Sample Counted 18:17  
3 . Background Inf.:  
Minutes Counted 10 min.  
Background Count Rate (cpm) 7.7 cpm  
4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
Gross Spike Count Rate (cpm) 3407.6 cpm  
Net Spike Count Rate (cpm) 3399.9 cpm  
H3 Spike Activity (dpm on count date) 8243.8 dpm  
Counter Efficiency 0.4124 cpm/dpm  
5 . Sample Info:  
Sample Gross Count Rate (cpm) 7.6 cpm  
Sample Count Time (min.) 10.0 min.  
Net Sample Count Rate (cpm) 0.0 cpm  
6 . Critical Level:  
Critical Level Count Rate (cpm) 2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency x 2.22E6 uCi/ml x Sample Volume}} < \text{MDA}$$

Technician                     *AM / Muehl*                     Date                     APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-2D 121806

Sample Location (Well Number): EFT-2D

1. Representative sample collected. Date/Time 12/17/06 1 1132

Sample collected by: J. Slaback / Joy Marie Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq 50$  milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / M Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_



# Tritium Activity Calculation

## Sample Information

1 . Sample Location	EFT-2D121806
2 . Date Sampled	12/18/2006
3 . Time Sampled	11:32
4 . Sample Volume, (ml)	4 ml

## Instrument Count Data

1 . Date Sample Counted	04/19/2007	
2 . Time Sample Counted	18:27	
3 . Background Inf.:		
Minutes Counted	10	min.
Background Count Rate (cpm)	7.7	cpm
4 . Efficiency Inf.: (Daily Spike Source ID # 111)		
Gross Spike Count Rate (cpm)	3407.6	cpm
Net Spike Count Rate (cpm)	3399.9	cpm
H3 Spike Activity (dpm on count date)	8243.8	dpm
Counter Efficiency	0.4124	cpm/dpm
5 . Sample Info:		
Sample Gross Count Rate (cpm)	8.9	cpm
Sample Count Time (min.)	10.0	min.
Net Sample Count Rate (cpm)	1.2	cpm
6 . Critical Level:		
Critical Level Count Rate (cpm)	2.0	cpm

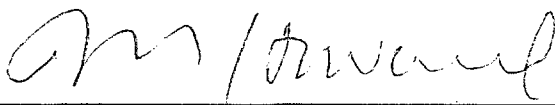
## Minimum Detectable Activity

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \frac{\sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}}}{\text{Efficiency} \times 2.22\text{E6 dpm/uCi} \times \text{Sample Volume}} = 1.12\text{E-06 uCi/ml}$$

## Sample Activity

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E6 uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician



Date

APR 20 2007

## FERMI 1 GROUND WATER MONITORING TRITIUM ANALYSIS CHECKLIST

Sample number: EFT-75 121800

Sample Location (Well Number): EFT-75

1. Representative sample collected. Date/Time 12/18/06 1 1452

Sample collected by: J. Slaback / Joy Marie Slaback Date: 02/01/07  
Printed Name / Signature

Note: Qualified Fermi 1 Personnel or other qualified individual will obtain samples

2. Prepare sample  $\geq$  50 milliliters. Seal sample adequately to resist tampering.  
Note: Use new sample containers only

Sample sealed by: J. Southward / Jennifer Southward Date: 2/2/07  
Printed Name / Signature

3. Sample counted in accordance with 76.000.70 or 79 "Operation of the Packard TRICARB 1000 or 2100TR".

Performed by: D. Howard / M. Howard Date: APR 20 2007  
Fermi 2 Chemistry Printed Name Signature

4. Tritium analysis printout reviewed by Radiation Protection Supervision or delegate.

Performed by: \_\_\_\_\_ / \_\_\_\_\_ Date: \_\_\_\_\_  
Fermi 2 Printed Name Signature  
Radiation Protection Supervision/Delegate

Note: Return sample, analysis printout, and completed form to Fermi 1 Radiological Engineer

Remarks \_\_\_\_\_  
\_\_\_\_\_

Tritium Activity Calculation

**Sample Information**

1 . Sample Location EFT-7S121806  
 2 . Date Sampled 12/18/2006  
 3 . Time Sampled 14:52  
 4 . Sample Volume, (ml) 4 ml

**Instrument Count Data**

1 . Date Sample Counted 04/19/2007  
 2 . Time Sample Counted 18:37  
 3 . Background Inf.:  
     Minutes Counted 10 min.  
     Background Count Rate (cpm) 7.7 cpm  
 4 . Efficiency Inf.: (Daily Spike Source ID # 111)  
     Gross Spike Count Rate (cpm) 3407.6 cpm  
     Net Spike Count Rate (cpm) 3399.9 cpm  
     H3 Spike Activity (dpm on count date) 8243.8 dpm  
     Counter Efficiency 0.4124 cpm/dpm  
 5 . Sample Info:  
     Sample Gross Count Rate (cpm) 6.2 cpm  
     Sample Count Time (min.) 10.0 min.  
     Net Sample Count Rate (cpm) 0.0 cpm  
 6 . Critical Level:  
     Critical Level Count Rate (cpm) 2.0 cpm

**Minimum Detectable Activity**

$$\text{Minimum Detectable Activity (uCi/ml)} = 3.3 \times \sqrt{\frac{(\text{Bkg cpm})}{(\text{Bkg min.})} + \frac{(\text{Bkg cpm})}{(\text{Smpl min.})}} = 1.12\text{E-}06 \text{ uCi/ml}$$

Efficiency x 2.22E6 dpm/uCi x Sample Volume

**Sample Activity**

$$\text{Sample Activity (uCi/ml)} = \frac{\text{Sample Net cpm}}{\text{Efficiency} \times 2.22\text{E}6 \text{ uCi/ml} \times \text{Sample Volume}} < \text{MDA}$$

Technician

*Am Howard*

Date APR 20 2007

## **Data Validation Report**

MEMORANDUM

Project # 023-8793

November 28, 2006

TO: Enrico Fermi 1 Power Plant, License Termination Plan, Detroit, MI

FROM: Tom Stapp, Golder Associates Inc., Project Chemist

RE: ENRICO FERMI 2 LABORATORY RADIOCHEMISTRY DATA  
VALIDATION SUMMARY

**INTRODUCTION**

This memo presents the results of data validation and a technical review performed on the radiochemistry data provided from the Fermi 2 Radiation Protection Department (EF2) laboratory of Detroit, Michigan. Sample identification and the analyses requested are provided as an attachment to the data validation checklist (Attachment 3). The following table presents sample sets collected for the specified well and period indicated.

Sample ID	Collection Dates				
	April-May 2004	July-Aug. 2004	Oct.-Nov. 2004	February 2005	November 2005
EFT-1S	X	X	X	X	X
EFT-1D	X	X		X	X
EFT-2S	X	X	X		X
EFT-2D	X	X	X	X	X
EFT-4S	X	X	X	X	X
EFT-4D	X	X	X	X	X
EFT-5S	X	X	X	X	X
EFT-5D	X	X	X	X	X
EFT-6S		X	X	X	X
EFT-6D		X	X	X	X
EFT-7S	X	X	X	X	X
EFT-8S		X	X	X	X
EFT-9S			X		X
EFT-10S					X
Bkgd-NTC		X		X	X
Bkgd-PAP		X	X	X	X
Bkgd-Range		X	X	X	X
FIELD BLANK		X		X	

Ten percent (10%) of data submitted was subject to a "full" validation by Golder personnel, where information and raw data sufficient to complete the validation was provided. Samples selected for full validation were identified through a random number generator program, and are listed in Table 2.0. The full validation was performed in significant accordance with validation guidelines found in 'Data Validation Procedure for Radiochemical Analyses' (BHI, 2000) and applicable reference method requirements as appropriate. Attachments 1 through 3 of this report provide the following information as indicated:

- Attachment 1. Glossary of Data Reporting Qualifiers
- Attachment 2. Data Qualification Summary
- Attachment 3. Annotated Laboratory Reports with Checklist and Supporting Documentation

## MAJOR DEFICIENCIES

There were no major deficiencies identified in this data set.

## DATA QUALITY OBJECTIVES

As stated in Section 4.1.3 of the 'Work Plan for Groundwater Characterization', data quality objectives included data representativeness and data completeness. Data representativeness is defined by the selection of sampling locations, depths, and intervals as specified in the Work Plan as well as presentation of sample results with appropriate units. Sample collection details specified in the Work Plan are not subject to this data validation exercise. Data completeness is defined by goals for precision and accuracy. The following section presents a summary of the data quality in terms of the referenced validation criteria.

### **Tritium Analysis (Inclusive dates: April-May 2004, July-August 2004, October-November 2004, February 2005, September 2005)**

Precision. Goals for precision were met associated with comparable results in 'Field Duplicate' samples, however 'laboratory sample duplicate criteria' was not presented and has not been evaluated. Consistent source check data for tritium efficiency and background count data during the periods of analysis have been reviewed and are acceptable.

Accuracy. Goals for accuracy could not be completed. 'Laboratory control samples and matrix spike criteria data' was not presented and has not been evaluated. However, daily source check standards exhibited acceptable performance based upon control charts for the periods of analysis.

Sample Result Verification. All sample results were supported in the raw data. Recalculation of sample MDA was performed on a random sample list and the reported result met the MDA. See Table 2.1 in Appendix 3.

Representativeness. All sample results are presented in equivalent units of measure.

Detection Limits. Detection limit goals have not been specified, however MDA's and reporting limits reflect low activity, appropriate to Field Blank and background well sample results.

**Gamma Spectroscopy Analysis (Inclusive dates: April-May 2004, July-August 2004, October-November 2004, February 2005, September 2005)**

Precision. Goals for precision were met associated with 'Field Duplicates', however 'laboratory sample duplicate criteria' was not presented and has not been evaluated.

Accuracy. Goals for accuracy could not be completed. 'Laboratory control samples and matrix spike criteria data' was not presented and has not been evaluated.

Sample Result Verification. All sample results were supported in the raw data. Sample MDAs could not be re-calculated for verification due to insufficient Quality Control or raw data records.

Representativeness. All sample results are presented in equivalent units of measure.

Detection Limits. Detection limit goals have not been specified, however MDA's and reporting limits reflect low activity, appropriate to Field Blank and background well sample results.

#### **COMPLETENESS AND USABILITY STATEMENT**

**Completeness.** The data package was complete for all requested analyses, however specific quality control data has not been included for review or data validation exercise. A total of 79 samples were reviewed and a total of 10 samples validated in this data package with a total of 158 determinations reported, all of which were deemed valid. This results in a completeness of 100 percent, which meets normal work plan objectives of 90 percent.

The analytical data represented by analysis of 79 water samples in this sample delivery group are acceptable for their intended use. Validated and annotated laboratory report sheets are included in Attachment 3.

#### **REFERENCES**

BHI 2000, Data Validation Procedure for Radiochemical Analyses, BHI-01433, Rev.0.  
Bechtel Hanford Incorporated, Richland, Washington.

**ATTACHMENT 1**

**GLOSSARY OF DATA REPORTING QUALIFIERS**



## GLOSSARY OF RADIOCHEMISTRY DATA REPORTING QUALIFIERS.

- U - Indicates the constituent was analyzed for, but was not detected at a concentration above the minimum detectable activity (MDA). The concentration reported is the sample result corrected for sample aliquot size, dilution factors and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.
- UJ - Indicates the constituent was analyzed for and was not detected at a concentration above the MDA. Due to a quality control deficiency identified during data validation, the result reported may not accurately reflect the sample concentration. The associated data should be considered usable for decision making purposes.
- J - Indicates the constituent was analyzed for and detected. The concentration reported is qualified as estimated due to a quality control deficiency identified during data validation. The associated data should be considered usable for decision making purposes.
- UR - Indicates the constituent was analyzed for and not detected. The concentration reported is qualified as unusable due to a quality control deficiency identified during data validation. The associated data should be considered unusable for decision making purposes.
- R - Indicates the constituent was analyzed for and detected. The concentration reported is qualified as unusable due to a quality control deficiency identified during data validation. The associated data should be considered unusable for decision making purposes.

**ATTACHMENT 2**

**DATA QUALIFICATION SUMMARY**

### DATA QUALIFICATION SUMMARY

SDG: E Fermi 2 Lab Data	PROJECT: 023-8793	DATE: 11/22/2006	By: Tom Stapp	PAGE 1 OF 1
COMMENTS:				
COMPOUND/ ANALYTE	QUALIFIER	SAMPLES AFFECTED	REASON	VALUE
No data qualified.				

**ATTACHMENT 3**

**ANNOTATED LABORATORY REPORTS, CHECKLIST  
AND SUPPORTING DOCUMENTATION**

RADIOCHEMISTRY DATA ASSESSMENT SUMMARY

PROJECT: FERM1 1/EFT	SITE: ENRICO FERMI 1
LABORATORY: EF2 RAD Protect. Dept.	SDG: — NA — *
SAMPLES/MATRIX/ANALYSES: TRITIUM / GAMMA Spectroscopy	
Multiple Samples: Collected 2-01-05 — 2-16-05	
* Refer to Holding Time Tables for Sample List.	

DATA ASSESSMENT SUMMARY

Review Item	Gross Alpha/Beta	Sr-90	Tc-99	Alpha Spec.	Gamma Spec.	Tritium Rn-222	Ra-226 (Lucas)	Fluor. Uranium
1. Data completeness					X	O		
2. Holding Times					O	O		
3. Calibration					X	O		
4. Blanks					O	O		
5. Duplicates					O	O		
6. Gravimetric Yield					I	I		
7. Spike Recovery					X	O		
8. Tracer Recovery					X	O		
9. LCS					X	X		
10. Result Verification					X	O		
11. Other QC FIELD BLANK					O	O		
12. Field Duplicates					X	X		
13. Overall Assessment					O	O		

O = Data had no problems <sup>or</sup> qualified due to minor problems.  
M = Data qualified due to major problems.  
Z = Data unacceptable.  
X = Problems but do not affect data.

Comments: See appropriate review item in following pages for problem explanations. Qualifications are not applied.

Validated by: Sam Supp Date: Nov. 17, 2006  
Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

RADIOCHEMISTRY DATA ASSESSMENT SUMMARY

Acceptable  
Yes No

1. Data package completeness (check if present) . . . . .  No

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Case narrative                | <input checked="" type="checkbox"/> NA Tracer recovery                    |
| <input checked="" type="checkbox"/> Chain of Custody              | <input checked="" type="checkbox"/> NA Chemical recovery                  |
| <input checked="" type="checkbox"/> Sample results/MDA/LLD/errors | <input checked="" type="checkbox"/> Detector/Cell ID                      |
| <input checked="" type="checkbox"/> Blank results                 | <input checked="" type="checkbox"/> Detector/Cell calibration/efficiency  |
| <input checked="" type="checkbox"/> Duplicate results             | <input checked="" type="checkbox"/> Detector/Cell background per analysis |
| <input checked="" type="checkbox"/> Spike results                 | <input checked="" type="checkbox"/> Detector/Cell control checks/charts   |
| <input checked="" type="checkbox"/> LCS results                   | <input checked="" type="checkbox"/> HV Plateau Determination              |

Comments: ① Chain of Custody for sample sets (4/2004, 7/2004, 10/2004, 2/2005 & 9/2005) not provided - Lab. Contacted.  
② Package QC information requested from Lab but not available @ time of Reporting.

2. Holding Times . . . . .

See HOLD TIME Summary pages for H3 & Gamma analyses. No exceedances.

3. Calibration . . . . .

① TRITIUM - Daily efficiency checks, Certificate of NIST Standard, Control charts 7/2004, 8/2004, 1/2005, 2/2005, 11/2005 within 2σ limits.  
② GAMMA - Detectors & Geometry but Stud. response & detector effic. missing. - Qualif. NOT APPLIED.

4. Blanks . . . . .

Laboratory Method Blank data not provided for ① H3 and ② GAMMA. Background counts are low associated with all samples tested and there are no detects. No qualification applied.

5. Duplicates . . . . .

Laboratory duplicate sample data not provided for ① H3 and ② GAMMA. ① All sample results are ND and RPD is not applicable ② Recounts on some samples indicate Key-Line detections (Natural Isotopes) are reproducible. No qualification applied.

RADIOCHEMISTRY DATA ASSESSMENT SUMMARY

6. Gravimetric Yield . . . . . NA  
Not Applicable

7. Spike Recovery . . . . . — ✓  
Sample matrix spikes not provided for GAMMA.  
H3 daily spikes acceptable.

8. Tracer Recovery . . . . . NA  
Not Applicable for H3 ≠ Gamma analyses

9. Laboratory Control Sample (LCS) . . . . . — ✓  
Lab Control data not provided

10. Sample/MDA/LLD Result Verification . . . . . — ✓  
See Table 1.1 for H3 MDA recalculation.  
Gamma efficiencies missing.

11. Other QC . . . . . ✓  
FIELD BLANKS required @ 5% frequency. Associated  
results (H3 ≠ Gamma) for NTC, PAP, and Range Field  
blank data is acceptable.

RADIOCHEMISTRY DATA ASSESSMENT SUMMARY

12. Field Duplicates . . . . . ✓

H3- "EFT-2D" for April-May 2004 collection period and  
"EFT-6D" " July-Aug. 2004 " " . Associated  
results are ND for all. No Qualif applied.

GAMMA - Same samples as indicated. All results are  
ND for CoC - Noqualif. applied.

13. Overall Assessment/Comments:

① Field duplicates for 2 of 5 sampling periods only. Work  
plan requires ~~20%~~<sup>5%</sup> sample collection for FIELD Dups.  
(ie # 1 FDup. per 20 samples collected). Qualif. is  
not applied in accordance with D.V. guidelines.



TABLE 1.1  
 EFermi 2 Lab / Tritium Details and Holding Time  
 April - May 2004

Sample #	Smpl ID	Collect Date	Collect Time	Tritium	Analysis Date	DAYS	Result	Bkgd Count rate	Counter Efficiency	MDA	SPK SOURCE ID#	COUNT TIME
	EFT-1D	5/11/2004	1100	X	7/9/2004	59	ND	9.2	0.421	1.20E-06	111	10
	EFT-1S	5/17/2004	1445	X	7/9/2004	53	ND	9.2	0.421	1.20E-06	111	10
	EFT-2D	5/13/2004	1115	X	7/9/2004	57	ND	9.2	0.421	1.20E-06	111	10
	EFT-2D Duplicate	5/13/2004	1130	X	7/9/2004	57	ND	9.2	0.421	1.20E-06	111	10
	EFT-2S	5/13/2004	1150	X	7/9/2004	57	ND	9.2	0.421	1.20E-06	111	10
	EFT-4D	4/30/2004	1200	X	7/9/2004	70	ND	9.2	0.421	1.20E-06	111	10
	EFT-4S	5/7/2004	0948	X	7/9/2004	63	ND	9.2	0.421	1.20E-06	111	10
	EFT-5D	4/30/2004	0927	X	7/9/2004	70	ND	9.2	0.421	1.20E-06	111	10
	EFT-5S	4/29/2004	1630	X	7/9/2004	71	ND	9.2	0.421	1.20E-06	111	10
	EFT-7S	5/17/2004	1350	X	7/9/2004	53	ND	9.2	0.421	1.20E-06	111	10

TABLE 1.2  
 EFermi 2 Lab / Tritium Details and Holding Time  
 June - July 2004

Sample #	Smpl ID	Collect Date	Collect Time	Tritium	Analysis Date	DAYS	Bkgd Counter			SPK SOURCE	COUNT TIME	
							Result	Count rate	Efficiency			MDA
	EFT-1D	7/28/2004	1105	X	8/25/2004	28	ND	7.4	0.3209	1.41E-06	111	10
	EFT-1S	7/28/2004	1418	X	8/25/2004	28	ND	7.4	0.3209	1.41E-06	111	10
	EFT-2D	8/4/2004	1110	X	8/25/2004	21	ND	7.4	0.3209	1.41E-06	111	10
	EFT-2S	8/4/2004	0922	X	8/25/2004	21	ND	7.4	0.3209	1.41E-06	111	10
	EFT-4D	8/3/2004	1056	X	8/25/2004	22	ND	7.9	0.3405	1.37E-06	111	10
	EFT-4S	8/3/2004	1423	X	8/25/2004	22	ND	7.4	0.3209	1.41E-06	111	10
	EFT-5D	8/2/2004	1545	X	8/25/2004	23	ND	7.4	0.3209	1.41E-06	111	10
	EFT-5S	8/2/2004	1115	X	8/25/2004	23	ND	7.4	0.3209	1.41E-06	111	10
	EFT-6D	7/30/2004	1042	X	8/25/2004	26	ND	7.4	0.3209	1.41E-06	111	10
	EFT-6D Duplicate	7/30/2004	1059	X	8/25/2004	26	ND	7.4	0.3209	1.41E-06	111	10
	EFT-6S	7/30/2004	1420	X	8/25/2004	26	ND	7.4	0.3209	1.41E-06	111	10
	EFT-7S	8/5/2004	1055	X	8/25/2004	20	ND	7.4	0.3209	1.41E-06	111	10
	EFT-8S	8/5/2004	1625	X	8/25/2004	20	ND	7.4	0.3209	1.41E-06	111	10
	Field Blank	8/18/2004	1440	X	8/25/2004	7	ND	7.4	0.3209	1.41E-06	111	10
BKG NTC	Nuclear Training Center B	8/6/2004	0957	X	8/25/2004	19	ND	7.4	0.3209	1.41E-06	111	10
BKG-PAP	Point AuxPeaux Rd. Bkgn	8/6/2004	1523	X	8/25/2004	19	ND	7.4	0.3209	1.41E-06	111	10
BKG Range	Range - Bkgrnd Well	8/6/2004	1237	X	8/25/2004	19	ND	7.4	0.3209	1.41E-06	111	10

EFermi 2 Lab / Tritium Details and Holding Time  
Oct - Nov 2004

Sample #	Smpl ID	Collect Date	Collect Time	Tritium	Analysis		Bkgd Counter				SPK	COUNT
					Date	DAYS	Result	Count rate	Efficiency	MDA	SOURCE	TIME
											ID#	
	EFT-1S	11/25/2004	0918	X	1/5/2005	41	ND	7.9	0.3837	1.22E-06	111	10
	EFT-2D	10/26/2004	1418	X	1/5/2005	71	ND	7.9	0.3837	1.22E-06	111	10
	EFT-2D	11/23/2004	1030	X	1/5/2005	43	ND	7.9	0.3837	1.22E-06	111	10
	EFT-2S	10/26/2004	1020	X	1/5/2005	71	ND	7.9	0.3837	1.22E-06	111	10
	EFT-4D	10/20/2004	1443	X	1/5/2005	77	ND	7.9	0.3837	1.22E-06	111	10
	EFT-4S	10/25/2004	1122	X	1/5/2005	72	ND	7.9	0.3837	1.22E-06	111	10
	EFT-5D	10/20/2004	1105	X	1/5/2005	77	ND	7.9	0.3837	1.22E-06	111	10
	EFT-5S	10/20/2004	0920	X	1/5/2005	77	ND	7.9	0.3837	1.22E-06	111	10
	EFT-6D	10/19/2004	1342	X	1/5/2005	78	ND	7.9	0.3837	1.22E-06	111	10
	EFT-6D	10/19/2004	1400	X	1/5/2005	78	ND	7.9	0.3837	1.22E-06	111	10
	EFT-6S	10/19/2004	1522	X	1/5/2005	78	ND	7.9	0.3837	1.22E-06	111	10
	EFT-7S	11/1/2004	1052	X	1/5/2005	65	ND	7.9	0.3837	1.22E-06	111	10
	EFT-8S	11/22/2004	0930	X	1/5/2005	44	ND	7.9	0.3837	1.22E-06	111	10
	EFT-9S	8/6/2004	1100	X	1/5/2005	152	ND	7.9	0.3837	1.22E-06	111	10
	EFT-9S	10/28/2004	1100	X	1/5/2005	69	ND	7.9	0.3837	1.22E-06	111	10
	NOC Background	11/23/2004	1350	X	1/5/2005	43	ND	7.9	0.3837	1.22E-06	111	10
BKG-PAP	Point AuxPeaux Rd. Bkgn	11/22/2004	1425	X	1/5/2005	44	ND	7.9	0.3837	1.22E-06	111	10
BKG Range	Shooting Range Bkgrnd	11/1/2004	0902	X	1/5/2005	65	ND	7.9	0.3837	1.22E-06	111	10

EFermi 2 Lab / Tritium Details and Holding Time for  
February 2005

Sample #	Smpl ID	Collect Date	Collect Time	Tritium	Analysis		Result	Bkgd Count rate	Counter Efficiency	MDA	SPK SOURCE	COUNT TIME
					Date	DAYS						
	EFT-1D	2/4/2005	1239	X	2/21/2005	17	ND	6.8	0.4023	1.08E-06	111	10
	EFT-1S	2/4/2005	1335	X	2/21/2005	17	ND	6.8	0.4023	1.08E-06	111	10
	EFT-2D	2/4/2005	0944	X	2/21/2005	17	ND	6.8	0.4023	1.08E-06	111	10
	EFT-4D	2/3/2005	1331	X	2/21/2005	18	ND	6.8	0.4023	1.08E-06	111	10
	EFT-4S	2/3/2005	1447	X	2/21/2005	18	ND	6.8	0.4023	1.08E-06	111	10
	EFT-5D	2/2/2005	1432	X	2/21/2005	19	ND	6.8	0.4023	1.08E-06	111	10
	EFT-5D	2/2/2005	1500	X	2/21/2005	19	ND	6.8	0.4023	1.08E-06	111	10
	EFT-5S	2/3/2005	1000	X	2/21/2005	18	ND	6.8	0.4023	1.08E-06	111	10
EFT-6D020205	EFT-6D	2/2/2005	0903	X	2/21/2005	19	ND	6.8	0.4023	1.08E-06	111	10
EFT-6S020205	EFT-6S	2/2/2005	1147	X	2/21/2005	19	ND	6.8	0.4023	1.08E-06	111	10
EFT-7S020105	EFT-7S	2/1/2005	1500	X	2/21/2005	20	ND	6.8	0.4023	1.08E-06	111	10
EFT-8S021005	EFT-8S	2/10/2005	0940	X	2/21/2005	11	ND	6.8	0.4023	1.08E-06	111	10
FB021605	Field Blank	2/16/2005	1505	X	2/21/2005	5	ND	6.8	0.4023	1.08E-06	111	10
BKG NTC 021105	Nuclear Training Center B	2/11/2005	1137	X	2/21/2005	10	ND	6.8	0.4023	1.08E-06	111	10
BKG-PAP 021105	Point AuxPeaux Rd. Bkgn	2/11/2005	1425	X	2/21/2005	10	ND	6.8	0.4023	1.08E-06	111	10
BKG Range021105	Range - Bkgrnd Well	2/11/2005	0953	X	2/21/2005	10	ND	6.8	0.4023	1.08E-06	111	10

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TABLE 1.5  
 EFermi 2 Lab / Tritium Details and Holding Time  
 for September 2005

Project #023-8793

Sample #	Smpl ID	Collect Date	Collect Time	Tritium	Analysis Date	DAYS	Result	Bkgd Count rate	Counter Efficiency	MDA	SPK SOURCE	COUNT TIME
											ID#	
	EFT-10S	9/29/2005	1418	X	11/22/2005	54	ND	9	0.399	1.25E-06	111	10
	EFT-1D	9/20/2005	1540	X	11/22/2005	63	ND	9	0.399	1.25E-06	111	10
	EFT-1S	9/20/2005	1405	X	11/22/2005	63	ND	9	0.399	1.25E-06	111	10
	EFT-2D	9/30/2005	1123	X	11/22/2005	53	ND	9	0.399	1.25E-06	111	10
	EFT-2S	9/30/2005	1008	X	11/22/2005	53	ND	9	0.399	1.25E-06	111	10
	EFT-4D	9/27/2005	1200	X	11/22/2005	56	ND	9	0.399	1.25E-06	111	10
	EFT-4S	9/27/2005	1200	X	11/22/2005	56	ND	9	0.399	1.25E-06	111	10
	EFT-5D	9/28/2005	1200	X	11/22/2005	55	ND	9	0.399	1.25E-06	111	10
	EFT-5S	9/28/2005	1433	X	11/22/2005	55	ND	9	0.399	1.25E-06	111	10
	EFT-6D	9/27/2005	0917	X	11/22/2005	56	ND	9	0.399	1.25E-06	111	10
	EFT-6D	9/27/2005	1200	X	11/22/2005	56	ND	9	0.399	1.25E-06	111	10
	EFT-6S	9/27/2005	1200	X	11/22/2005	56	ND	9	0.399	1.25E-06	111	10
	EFT-7S	9/22/2005	0922	X	11/22/2005	61	ND	9	0.399	1.25E-06	111	10
	EFT-8S	9/30/2005	1415	X	11/22/2005	53	ND	9	0.399	1.25E-06	111	10
	EFT-9S	9/29/2005	1200	X	11/22/2005	54	ND	9	0.399	1.25E-06	111	10
BKG NTC	Nuclear Training Center B	9/21/2005	1812	X	11/22/2005	62	ND	9	0.399	1.25E-06	111	10
BKG-PAP	Point AuxPeaux Rd. Bkgnd	9/30/2005	1556	X	11/22/2005	53	ND	9	0.399	1.25E-06	111	10
BKG Range	Range - Bkgrnd Well	9/21/2005	1704	X	11/22/2005	62	ND	9	0.399	1.25E-06	111	10

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TABLE 1.6  
EFermi 2 / Gamma Spectroscopy Details and Holding Time  
April - May 2004 Collection

Project #023-8793

Sample #	Smpl ID	Collect Date	Collect Time	Gamma Spec	Analysis		Result	Detector #	Geometry Marinelli	COUNT		ICAL
					Date	DAYS				TIME	Bckgrnd	
	EFT-1D	5/11/2004	1100	X	7/8/2004	58	ND	4	M2LL	30	min	4/12/2004
	EFT-1S	5/17/2004	1445	X	7/8/2004	52	ND	4	M2LL	30	min	
	EFT-2D	5/13/2004	1115	X	7/8/2004	56	ND	4	M2LL	30		
	EFT-2D Duplicate	5/13/2004	1130	X	7/8/2004	56	ND	4	M2LL	30		
	EFT-2S	5/13/2004	1150	X	7/8/2004	56	ND	4	M2LL	30		
	EFT-4D	4/30/2004	1200	X	7/7/2004	68	ND	4	M2LL	30		
	EFT-4S	5/7/2004	0948	X	7/8/2004	62	ND	4	M2LL	30		
	EFT-5D	4/30/2004	0927	X	7/8/2004	69	ND	4	M2LL	30		
	EFT-5S	4/29/2004	1630	X	7/8/2004	70	ND	4	M2LL	30		
	EFT-7S	5/17/2004	1350	X	7/8/2004	52	ND	4	M2LL	30		

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TABLE 1.7  
EFermi 2 / Gamma Spectroscopy Details and Holding Time  
July - Aug. 2004 Collection

Project #023-8793

Sample #	Smpl ID	Collect Date	Collect Time	Gamma Spec	Analysis		Geometry				COUNT TIME	Bckgrnd	ICAL
					Date	DAYS	Result	Detector #	Marinelli				
	EFT-1D	7/28/2004	1105	X	8/17/2004	20	ND	4	M2LL	30		4/12/2004	
	EFT-1S	7/28/2004	1418	X	8/17/2004	20	ND	4	M2LL	30			
	EFT-6D	7/30/2004	1042	X	8/19/2004	20	ND	4	M2LL	30			
	EFT-6D Duplicate	7/30/2004	1059	X	8/19/2004	20	ND	4	M2LL	30	RECOUNTED		
	EFT-6S	7/30/2004	1420	X	8/19/2004	20	ND	4	M2LL	30			
	EFT-5S	8/2/2004	1115	X	8/19/2004	17	ND	4	M2LL	30			
	EFT-5D	8/2/2004	1545	X	8/19/2004	17	ND	4	M2LL	30			
	EFT-4D	8/3/2004	1056	X	8/18/2004	15	ND	4	M2LL	30	RECOUNTED		
	EFT-4S	8/3/2004	1423	X	8/18/2004	15	ND	4	M2LL	30			
	EFT-2S	8/4/2004	0922	X	8/18/2004	14	ND	4	M2LL	30			
	EFT-2D	8/4/2004	1110	X	8/18/2004	14	ND	4	M2LL	30			
	EFT-7S	8/5/2004	1055	X	8/19/2004	14	ND	4	M2LL	30			
	EFT-8S	8/5/2004	1625	X	8/18/2004	13	ND	4	M2LL	30			
BKG NTC	Nuclear Training Center Background	8/6/2004	0957	X	8/19/2004	13	ND	4	M2LL	30			
	EFT-9S	8/6/2004	1100	X	12/29/2004	145	ND	4	M2LL	30			
BKG Range	Range - Bkgrnd Well	8/6/2004	1237	X	8/19/2004	13	ND	4	M2LL	30			
BKG-PAP	Point AuxPeaux Rd. Bkgnd	8/6/2004	1523	X	8/19/2004	13	ND	4	M2LL	30			
	Field Blank	8/18/2004	1440	X	8/19/2004	1	ND	4	M2LL	30		↓	

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TABEL 1.8  
 EFermi 2 Lab / Gamma Spectroscopy Details and Holding Time  
 Oct - Nov. 2004 Collection

Project #023-8793

Sample #	Smpl ID	Collect Date	Collect Time	Gamma Spec	Analysis		Result	Detector #	Geometry COUNT			ICAL
					Date	DAYS			Marinelli	TIME	Bkgnd	
	EFT-6D	10/19/2004	1342	X	12/29/2004	71	ND	4	M2LL	30		4/12/2004
	EFT-6D	10/19/2004	1400	X	12/29/2004	71	ND	4	M2LL	30		
	EFT-6S	10/19/2004	1522	X	12/28/2004	70	ND	4	M2LL	30		
	EFT-5S	10/20/2004	0920	X	12/28/2004	69	ND	4	M2LL	30		
	EFT-5D	10/20/2004	1105	X	12/28/2004	69	ND	4	M2LL	30		
	EFT-4D	10/20/2004	1443	X	12/28/2004	69	ND	4	M2LL	30		
	EFT-4S	10/25/2004	1122	X	12/28/2004	64	ND	4	M2LL	30		
	EFT-2S	10/26/2004	1020	X	12/28/2004	63	ND	4	M2LL	30		
	EFT-2D	10/26/2004	1418	X	12/28/2004	63	ND	4	M2LL	30		
	EFT-9S	10/28/2004	1100	X	12/29/2004	62	ND	4	M2LL	30		
BKG Range	Shooting Range Bkgnd	11/1/2004	0902	X	12/29/2004	58	ND	4	M2LL	30		
	EFT-7S	11/1/2004	1052	X	12/29/2004	58	ND	4	M2LL	30		
	EFT-8S	11/22/2004	0930	X	12/29/2004	37	ND	4	M2LL	30		
BKG-PAP	Point AuxPeaux Rd. Bkgnd	11/22/2004	1425	X	12/29/2004	37	ND	4	M2LL	30		
	EFT-2D	11/23/2004	1030	X	12/28/2004	35	ND	4	M2LL	30		
	NOC Background	11/23/2004	1350	X	12/29/2004	36	ND	4	M2LL	30		
	EFT-1S	11/25/2004	0918	X	12/28/2004	33	ND	4	M2LL	30		



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TABLE 1.9  
 EFermi 2 Lab / Gamma Spectroscopy Details and Holding Time  
 February 2005 Collection

Project #023-8793

Sample #	Smpl ID	Collect Date	Collect Time	Gamma Spec	Analysis Date	DAYS	Result	Detector #	Geometry COUNT			
									Marinelli	TIME	Bckgrnd	ICAL
EFT-7S020105	EFT-7S	2/1/2005	1500	X	3/7/2005	34	ND	4	M2LL	30		4/12/2004
EFT-6D020205	EFT-6D	2/2/2005	0903	X	2/17/2005	15	ND	4	NA	NA		
EFT-6S020205	EFT-6S	2/2/2005	1147	X	3/7/2005	33	ND	4	M2LL	30		
	EFT-5D	2/2/2005	1432	X	2/17/2005	15	ND	4	M2LL	30		
	EFT-5D	2/2/2005	1500	X	3/7/2005	33	ND	4	M2LL	30		
	EFT-5S	2/3/2005	1000	X	2/17/2005	14	ND	4	M2LL	30		
	EFT-4D	2/3/2005	1331	X	3/7/2005	32	ND	4	M2LL	30		
	EFT-4S	2/3/2005	1447	X	3/7/2005	32	ND	4	M2LL	30		
	EFT-2D	2/4/2005	0944	X	3/7/2005	31	ND	4	M2LL	30		
	EFT-1D	2/4/2005	1239	X	2/17/2005	13	ND	4	M2LL	30		
	EFT-1S	2/4/2005	1335	X	3/7/2005	31	ND	4	M2LL	30		
EFT-8S021005	EFT-8S	2/10/2005	0940	X	2/17/2005	7	ND	4	M2LL	30		
BKG Range021105	Range - Bkgrnd Well	2/11/2005	0953	X	3/7/2005	24	ND	4	M2LL	30		
BKG NTC 021105	Nuclear Training Center Background	2/11/2005	1137	X	3/7/2005	24	ND	4	M2LL	30		
BKG-PAP 021105	Point AuxPeaux Rd. Bkgnd	2/11/2005	1425	X	3/7/2005	24	ND	4	M2LL	30		
FB021605	Field Blank	2/16/2005	1505	X	3/17/2005	29	ND	4	M2LL	30		

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TABLE 1.10  
 EFermi 2 Lab / Gamma Spectroscopy Details and Holding Time  
 September 2005 Collection

Project #023-8793

Sample #	Smpl ID	Collect Date	Collect Time	Gamma Spec	Analysis		Result	Detector #	Geometry COUNT			
					Date	DAYS			Marinelli	TIME	Bkgnd	ICAL
	EFT-1S	9/20/2005	1405	X	11/21/2005	62	ND	4	M2LL	30		4/21/2005
	EFT-1D	9/20/2005	1540	X	11/21/2005	62	ND	4	M2LL	30		
BKG Range	Range - Bkgnd Well	9/21/2005	1704	X	11/26/2005	66	ND	4	M2LL	30		
BKG NTC	Nuclear Training Center Background	9/21/2005	1812	X	11/22/2005	62	ND	4	M2LL	30		
	EFT-7S	9/22/2005	0922	X	11/22/2005	61	ND	4	M2LL	30		
	EFT-6D	9/27/2005	0917	X	11/27/2005	61	ND	4	M2LL	30		
	EFT-6D	9/27/2005	0954	X	11/22/2005	56	ND	4	M2LL	30		
	EFT-6S	9/27/2005	1108	X	11/21/2005	55	ND	4	M2LL	30		
	EFT-4S	9/27/2005	1419	X	11/27/2005	61	ND	4	M2LL	30		
	EFT-4D	9/27/2005	1648	X	11/26/2005	60	ND	4	M2LL	30		
	EFT-5S	9/28/2005	1433	X	11/21/2005	54	ND	4	M2LL	30		
	EFT-5D	9/28/2005	1627	X	11/21/2005	54	ND	4	M2LL	30		
	EFT-10S	9/29/2005	1418	X	11/27/2005	59	ND	4	M2LL	30		
	EFT-9S	9/29/2005	1623	X	11/27/2005	59	ND	4	M2LL	30		
	EFT-2S	9/30/2005	1008	X	11/21/2005	52	ND	4	M2LL	30		
	EFT-2D	9/30/2005	1123	X	11/22/2005	53	ND	4	M2LL	30		
	EFT-8S	9/30/2005	1415	X	11/21/2005	52	ND	4	M2LL	30		
BKG-PAP	Point AuxPeaux Rd. Bkgnd	9/30/2005	1556	X	11/26/2005	57	ND	4	M2LL	30		

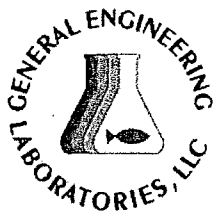


**APPENDIX F**

**GROUNDWATER LABORATORY ANALYTICAL**

**AND DATA VALIDATION REPORT**

**June 2006**



**GENERAL ENGINEERING LABORATORIES, LLC**

a Member of THE GEL GROUP, INC.

*Meeting Today's Needs with a Vision for Tomorrow*

September 11, 2006

Lynne Goodman  
Detroit Edison Company-Fermi 1  
110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166

Re: Fermi 1 Radiochemistry Waters  
Work Order: 168394

Dear Lynne Goodman:

General Engineering Laboratories, LLC (GEL) appreciates the opportunity to provide the following analytical results for the sample(s) we received on August 02, 2006. This data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4433.

Sincerely,

  
Cheryl Duffy  
Project Manager

Enclosures

Page: \_\_\_\_\_ of \_\_\_\_\_  
 Project #: \_\_\_\_\_  
 GEL Quote #: \_\_\_\_\_  
 COC Number <sup>(1)</sup>: \_\_\_\_\_  
 PO Number: \_\_\_\_\_

## GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC  
 2040 Savage Road  
 Charleston, SC 29407  
 Phone: (843) 556-8171  
 Fax: (843) 766-1178

168394 /

Client Name: DTE Energy Phone # 734-586-1205 Sample Analysis Requested <sup>(5)</sup> (Fill in the number of containers for each test)

Project/Site Name: Fermi 1 Fax # 734-586-1776 Should this sample be considered:

Address: 6400 N Dixie Highway Newport WI 48166

Collected by: J. Slayback Send Results To: Lynn Goodman

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hh:mm)	QC Code ( <sup>6</sup> )	Field Filtered ( <sup>7</sup> )	Sample Matrix ( <sup>8</sup> )	Radioactive	TSCA Regulated	Total number of containers													Comments Note: extra sample is required for sample specific QC			
									<-- Preservative Type (6)															
EFT-25060606	06-06-06	1130																						3188.7g
EFT-2D060606	06-06-06	1452																						3511.5g
EFT-85060606	06-06-06	1625																						2891.1g
EFT-95060706	06-07-06	0847																						3283.5g
EFT-6D060706	06-07-06	1052																						3633.4g
EFT-75060806	06-08-06	0912																						3507.2g
EFT-105060806	06-08-06	1032																						3576.4g
EFT-55060806	06-08-06	1442																						3799.9g
EFT-5D060806	06-08-06	1616																						3681.6g
EFT-1D060906	06-09-06	0840																						3849.5g

TAT Requested: Normal: \_\_\_\_\_ Rush: \_\_\_\_\_ Specify: \_\_\_\_\_ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: Are there any known hazards applicable to these samples? If so, please list the hazards  
Analyze for H-3, Co60, Cs137, Tc99, Sr90, Ra<sup>226</sup>, Ra<sup>228</sup>, Na<sup>22</sup>, U chain to Environmental levels

Chain of Custody Signatures						Sample Shipping and Delivery Details:					
Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time	GEL PM:			Date Shipped:		
	8-1-06	1630		8/2/06	0900						
						Method of Shipment:			Airbill #:		
						Airbill #:			Airbill #:		

- 1.) Chain of Custody Number = Client Determined
- 2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
- 3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
- 4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
- 5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
- 6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexamethylenetetramine, T = Sodium Thiosulfate. If no preservative is added = leave field blank

*For Lab Receiving Use Only*

Custody Seal Intact?  
 YES  NO

Cooler Temp:  
28

WHITE = LABORATORY      YELLOW = FILE      PINK = CLIENT

Page: \_\_\_\_\_ of \_\_\_\_\_  
 Project #: \_\_\_\_\_  
 GEL Quote #: \_\_\_\_\_  
 COC Number <sup>(1)</sup>: \_\_\_\_\_  
 PO Number: \_\_\_\_\_

## GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC  
 2040 Savage Road  
 Charleston, SC 29407  
 Phone: (843) 556-8171  
 Fax: (843) 766-1178

Client Name: DTE Energy Phone #: 734-586-1205

Sample Analysis Requested <sup>(5)</sup> (Fill in the number of containers for each test)

Project/Site Name: Ferri Fax #: 734-586-1776

Should this sample be considered:

Address: 6400 N. Dixie Highway Newport NJ 08146

Collected by: J Slayback Send Results To: Hynde Goodman

← Preservative Type (6)

**Comments**  
 Note: extra sample is required for sample specific QC

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code <sup>(4)</sup>	Field Filtered <sup>(4)</sup>	Sample Matrix <sup>(4)</sup>	Radioactive	TSCA Regulated	Total number of containers									
• EFT-15060906-T	06-09-06	1002															155.4g
• EFT-4D061206-T	06-12-06	0958															161.2g
• EFT-4D061206-T Dup	06-12-06	1108															171.1g
• EFT-4S061206-T	06-12-06	1422															164.1g
• EFT-6S061206-T	06-12-06	1515															164.8g
• BKG-NTC061306-T	06-13-06	0927															166.1g
• BKG-PAP061306-T	06-13-06	1207															187.0g
• BKG-RANGE061306-T	06-13-06	1425															166.5g

TAT Requested: Normal: \_\_\_\_\_ Rush: \_\_\_\_\_ Specify: \_\_\_\_\_ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: Are there any known hazards applicable to these samples? If so, please list the hazards  
Analysis for H-3, Cs-137, Co-60, Na-22, Tc-99, Sr-90, Ra-226, Ra-228, U isotopes at Environmental levels

Chain of Custody Signatures					
Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
<u>J Slayback</u>	<u>8-1-06</u>	<u>1630</u>	<u>L Gallie</u>	<u>8/2/06</u>	<u>0900</u>

Sample Shipping and Delivery Details	
GEL PM: _____	
Method of Shipment: _____	Date Shipped: _____
Airbill #: _____	
Airbill #: _____	

1.) Chain of Custody Number = Client Determined  
 2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite  
 3.) Field Filtered: For liquid matrices, indicate with a -Y- for yes the sample was field filtered or -N- for sample was not field filtered.  
 4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal  
 5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).  
 6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

*For Lab Receiving Use Only*

Custody Seal Intact?  
 YES      NO

Cooler Temp:  
 \_\_\_\_\_ C

WHITE = LABORATORY      YELLOW = FILE      PINK = CLIENT



# SAMPLE RECEIPT & REVIEW FORM

PM use only

Client: <u>DTE ENERGY</u>	SDG/ARCOC/Work Order: <u>168394</u>
Date Received: <u>8/2/2006</u>	PM(A) Review (ensure non-conforming items are resolved prior to signing):
Received By: <u>L. Jallie</u>	<i>[Signature]</i>

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: seals broken damaged container leaking container other (describe)
2 Samples requiring cold preservation within (4 +/- 2 C)? Record preservation method.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Coolant / ice bags blue ice dry ice <u>none</u> other (describe) <u>28c</u>
3 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: seals broken damaged container leaking container other (describe)
5 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's, containers affected and observed pH:
6 VOA vials free of headspace (defined as < 6mm bubble)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected:
7 Are Encore containers present? (If yes, immediately deliver to VOA laboratory)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	id's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected:
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected: <u>There are 2 samples Per I.D. 1 Gallon Jug c/ 250 ml Amber glass</u>
12 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

14 Air Bill ,Tracking #'s, & Additional Comments	Fed Ex 8582 5656 6415-28c 8582 5656 6404-28c	8582 5656 6490-29c 8582 5656 6426-28c
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Suspected Hazard Information	Non-Regulated	Regulated	High Level	RSO RAD Receipt # _____ *If > x2 area background is observed on samples identified as "non-regulated/non-radioactive", contact the Radiation Safety group for further investigation.
A Radiological Classification?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Maximum Counts Observed*: <u>40cpm</u>
B PCB Regulated?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:
C Shipped as DOT Hazardous Material? If yes, contact Waste Manager or ESH Manager.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hazard Class Shipped: UN#:

PM (or PMA) review of Hazard classification:	Initials <u>LD</u>	Date: <u>8/2/06</u>
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**GENERAL ENGINEERING LABORATORIES, LLC**

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

**Certificate of Analysis Report  
for**

ROIT001 Detroit Edison Company

Client SDG: 168394 GEL Work Order: 168394

**The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance criteria
- \*\* Analyte is a surrogate compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.
- UI Gamma Spectroscopy--Uncertain identification
- ND The analyte concentration is not detected above the detection limit.

The above sample is reported on an "as received" basis.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, LLC standard operating procedures. Please direct any questions to your Project Manager, Cheryl Duffy.

Reviewed by



# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID:	EFT-2S060606	Project:	ROIT00306
Sample ID:	168394001	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	06-JUN-06 11:30		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	3.05				percent		JXG1 09/03/06	0850	556620	1
Uranium-233/234		1.56	+/-0.667	0.596	1.00	pCi/L					
Uranium-235/236	U	0.281	+/-0.318	0.443	1.00	pCi/L					
Uranium-238		1.39	+/-0.612	0.478	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	7.00	+/-3.71	7.50	20.0	pCi/L		JPH1 08/25/06	2351	555098	2
Americium-241	U	0.706	+/-6.00	10.8	25.0	pCi/L					
Antimony-124	U	-1.63	+/-5.15	9.21	5.00	pCi/L					
Antimony-125	U	0.382	+/-2.96	5.39	10.0	pCi/L					
Barium-133	U	-1.63	+/-1.42	2.25	5.00	pCi/L					
Barium-140	U	203	+/-287	488	30.0	pCi/L					
Beryllium-7	U	11.1	+/-21.6	40.0	50.0	pCi/L					
Bismuth-212	U	3.26	+/-8.89	16.2	50.0	pCi/L					
Bismuth-214	UI	0.00	+/-2.26	4.50	10.0	pCi/L					
Cerium-139	U	0.601	+/-1.45	2.53	5.00	pCi/L					
Cerium-141	U	5.19	+/-8.95	15.8	10.0	pCi/L					
Cerium-144	U	5.91	+/-8.39	14.9	50.0	pCi/L					
Cesium-134	U	0.444	+/-1.16	2.12	5.00	pCi/L					
Cesium-136	U	21.9	+/-93.8	168	15.0	pCi/L					
Cesium-137	U	0.186	+/-1.07	1.93	5.00	pCi/L					
Chromium-51	U	75.1	+/-63.3	113	50.0	pCi/L					
Cobalt-56	U	0.636	+/-2.01	3.65	5.00	pCi/L					
Cobalt-57	U	0.249	+/-1.09	1.91	5.00	pCi/L					
Cobalt-58	U	-0.675	+/-2.11	3.65	10.0	pCi/L					
Cobalt-60	U	0.031	+/-1.15	2.12	5.00	pCi/L					
Europium-152	U	-0.861	+/-3.18	5.30	20.0	pCi/L					
Europium-154	U	0.429	+/-2.94	5.53	20.0	pCi/L					
Europium-155	U	0.550	+/-3.97	6.99	20.0	pCi/L					
Iridium-192	U	-0.448	+/-2.07	3.47	10.0	pCi/L					
Iron-59	U	0.541	+/-6.56	11.6	10.0	pCi/L					
Lead-210	U	198	+/-196	332	750	pCi/L					
Lead-212	U	0.375	+/-4.51	4.00	15.0	pCi/L					
Lead-214	U	4.14	+/-2.38	4.35	10.0	pCi/L					
Manganese-54	U	0.0215	+/-1.08	1.93	5.00	pCi/L					
Mercury-203	U	1.30	+/-3.61	6.23	5.00	pCi/L					
Neodymium-147	U	486	+/-1010	1860	100	pCi/L					
Neptunium-239	U	1.24	+/-6.82	12.0	25.0	pCi/L					

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-2S060606  
 Sample ID: 168394001

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
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### Rad Gamma Spec Analysis

*Gammascpec, Gamma, Liquid (Standard List)*

Niobium-94	U	-0.316	+/-1.05	1.59	5.00	pCi/L						
Niobium-95	U	0.996	+/-4.52	8.19	5.00	pCi/L						
Potassium-40	U	15.6	+/-24.9	18.8	100	pCi/L						
Promethium-144	U	-0.276	+/-1.11	1.93	5.00	pCi/L						
Promethium-146	U	-0.586	+/-1.34	2.37	5.00	pCi/L						
Ruthenium-106	U	-0.234	+/-10.4	18.6	50.0	pCi/L						
Silver-110m	U	-0.496	+/-1.18	2.05	5.00	pCi/L						
Sodium-22	U	0.156	+/-1.09	2.05	5.00	pCi/L						
Thallium-208	U	0.430	+/-2.39	2.46	10.0	pCi/L						
Thorium-230	UI	0.00	+/-2.26	4.50	20.0	pCi/L						
Thorium-234	U	23.4	+/-84.4	81.9	250	pCi/L						
Tin-113	U	1.63	+/-2.83	3.64	10.0	pCi/L						
Uranium-235	U	4.39	+/-7.50	13.2	50.0	pCi/L						
Uranium-238	U	23.4	+/-84.4	81.9	250	pCi/L						
Yttrium-88	U	-0.464	+/-1.79	3.21	10.0	pCi/L						
Zinc-65	U	-1.31	+/-2.81	4.71	10.0	pCi/L						
Zirconium-95	U	-3.6	+/-3.95	6.55	10.0	pCi/L						

### Rad Gas Flow Proportional Counting

*GFPC, Ra228, Liquid*

Radium-228	U	0.686	+/-0.742	1.23	3.00	pCi/L		AXD1	09/06/06	1554	557085	3
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*GFPC, Sr89&Sr90, Liquid*

Strontium-89	U	-3.42	+/-1.17	2.39	2.00	pCi/L		BXF1	08/23/06	2252	557661	4
Strontium-90	U	0.968	+/-0.983	1.83	2.00	pCi/L						

### Rad Liquid Scintillation Analysis

*LSC, Tritium Dist, Liquid*

Tritium	U	65.7	+/-273	487	700	pCi/L		DFA1	08/23/06	0548	557040	5
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*Liquid Scint Tc99, Liquid*

Technetium-99	U	13.1	+/-17.9	30.3	50.0	pCi/L		EGD1	08/23/06	1256	557039	6
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### Rad Radium-226

*Lucas Cell, Ra226, liquid*

Radium-226	U	1.15	+/-0.920	1.38	1.00	pCi/L		DXM	09/02/06	0815	558843	7
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The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

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Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-2S060606  
Sample ID: 168394001

Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			94	(25%-125%)
Uranium-232	Alphaspec U, Liquid			94	(25%-125%)
Uranium-232	Alphaspec U, Liquid			94	(25%-125%)
Uranium-232	Alphaspec U, Liquid			94	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			73	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			93	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			98	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			99	(15%-125%)

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 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID:	EFT-2D060606	Project:	ROIT00306
Sample ID:	168394002	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	06-JUN-06 14:52		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	-0.879				percent		JXG1 09/01/06	0736	556620	1
Uranium-233/234		0.983	+/-0.526	0.421	1.00	pCi/L					
Uranium-235/236	U	-0.0204	+/-0.172	0.408	1.00	pCi/L					
Uranium-238	U	0.364	+/-0.335	0.421	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	6.83	+/-7.52	8.13	20.0	pCi/L		JPH1 08/25/06	2351	555098	2
Americium-241	U	-25.3	+/-8.18	11.4	25.0	pCi/L					
Antimony-124	U	2.54	+/-5.86	11.1	5.00	pCi/L					
Antimony-125	U	-1.77	+/-3.35	5.53	10.0	pCi/L					
Barium-133	U	0.473	+/-1.66	2.50	5.00	pCi/L					
Barium-140	U	74.3	+/-279	503	30.0	pCi/L					
Beryllium-7	U	14.2	+/-24.7	45.2	50.0	pCi/L					
Bismuth-212	U	4.91	+/-9.22	16.8	50.0	pCi/L					
Bismuth-214	U	1.97	+/-5.21	4.87	10.0	pCi/L					
Cerium-139	U	0.177	+/-1.57	2.71	5.00	pCi/L					
Cerium-141	U	1.54	+/-13.1	17.0	10.0	pCi/L					
Cerium-144	U	4.89	+/-9.45	16.6	50.0	pCi/L					
Cesium-134	U	-0.0882	+/-1.23	2.16	5.00	pCi/L					
Cesium-136	U	-16	+/-92.8	162	15.0	pCi/L					
Cesium-137	U	0.176	+/-2.33	1.72	5.00	pCi/L					
Chromium-51	U	-31.9	+/-69.0	115	50.0	pCi/L					
Cobalt-56	U	0.279	+/-2.01	3.58	5.00	pCi/L					
Cobalt-57	U	-0.132	+/-1.23	2.12	5.00	pCi/L					
Cobalt-58	U	1.02	+/-2.23	4.04	10.0	pCi/L					
Cobalt-60	U	-0.304	+/-1.09	1.88	5.00	pCi/L					
Europium-152	U	-3.87	+/-3.32	5.37	20.0	pCi/L					
Europium-154	U	0.780	+/-3.14	5.63	20.0	pCi/L					
Europium-155	U	0.925	+/-4.38	7.66	20.0	pCi/L					
Iridium-192	U	1.30	+/-2.28	3.97	10.0	pCi/L					
Iron-59	U	-5.34	+/-6.42	10.6	10.0	pCi/L					
Lead-210	U	81.3	+/-193	306	750	pCi/L					
Lead-212	U	1.86	+/-3.83	4.32	15.0	pCi/L					
Lead-214	U	2.66	+/-3.98	4.63	10.0	pCi/L					
Manganese-54	U	-0.198	+/-1.14	1.99	5.00	pCi/L					
Mercury-203	U	1.57	+/-3.91	6.74	5.00	pCi/L					
Neodymium-147	U	652	+/-1110	2030	100	pCi/L					
Neptunium-239	U	-3.57	+/-7.80	13.4	25.0	pCi/L					

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## Certificate of Analysis

Company : Detroit Edison Company–Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-2D060606      Project: ROIT00306  
 Sample ID: 168394002                      Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	0.503	+/-0.995	1.81	5.00	pCi/L					
Niobium-95	U	-0.471	+/-4.91	8.65	5.00	pCi/L					
Potassium-40	UI	0.00	+/-22.9	17.4	100	pCi/L					
Promethium-144	U	0.269	+/-1.12	2.01	5.00	pCi/L					
Promethium-146	U	-0.122	+/-1.74	2.56	5.00	pCi/L					
Ruthenium-106	U	-6.6	+/-11.2	19.4	50.0	pCi/L					
Silver-110m	U	-0.178	+/-1.36	2.08	5.00	pCi/L					
Sodium-22	U	0.291	+/-1.16	2.09	5.00	pCi/L					
Thallium-208	UI	0.00	+/-1.25	2.42	10.0	pCi/L					
Thorium-230	U	1.97	+/-5.21	3.76	20.0	pCi/L					
Thorium-234	U	26.4	+/-67.4	107	250	pCi/L					
Tin-113	U	0.511	+/-2.29	3.92	10.0	pCi/L					
Uranium-235	U	1.27	+/-10.8	14.4	50.0	pCi/L					
Uranium-238	U	26.4	+/-67.4	107	250	pCi/L					
Yttrium-88	U	-0.127	+/-1.79	3.27	10.0	pCi/L					
Zinc-65	U	-1.07	+/-2.90	4.96	10.0	pCi/L					
Zirconium-95	U	0.249	+/-4.01	7.16	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	-1.0	+/-0.466	1.25	3.00	pCi/L		AXD1 09/06/06 1555 557085			3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-4.49	+/-1.18	2.46	2.00	pCi/L		BXF1 08/23/06 2252 557661			4
Strontium-90	U	1.41	+/-1.00	1.79	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	360	+/-298	485	700	pCi/L		DFA1 08/23/06 0604 557040			5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	12.0	+/-17.7	30.0	50.0	pCi/L		EGD1 08/23/06 1312 557039			6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		1.03	+/-0.382	0.345	1.00	pCi/L		DXM 09/02/06 0815 558843			7

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

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Address : 110 AIB  
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Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-2D060606  
Sample ID: 168394002  
Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
5	EPA 906.0 Modified											
6	DOE EML HASL-300, Tc-02-RC Modified											
7	EPA 903.1 Modified											

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery %	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			93	(25%-125%)
Uranium-232	Alphaspec U, Liquid			93	(25%-125%)
Uranium-232	Alphaspec U, Liquid			93	(25%-125%)
Uranium-232	Alphaspec U, Liquid			93	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			86	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			98	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			98	(25%-125%)
Technetium-99	Liquid Scint Te99, Liquid			100	(15%-125%)

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID:	EFT-8S060606	Project:	ROIT00306
Sample ID:	168394003	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	06-JUN-06 16:25		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>												
<i>Alphaspec U, Liquid</i>												
Pct Uranium-235		2.67				percent		JXG1	09/01/06	0736	556620	1
Uranium-233/234		4.89	+/-1.04	0.351	1.00	pCi/L						
Uranium-235/236		0.709	+/-0.440	0.213	1.00	pCi/L						
Uranium-238		4.02	+/-0.941	0.172	1.00	pCi/L						
<b>Rad Gamma Spec Analysis</b>												
<i>Gammasespec, Gamma, Liquid (Standard List)</i>												
Actinium-228	U	3.65	+/-3.49	6.55	20.0	pCi/L		JPH1	08/25/06	2352	555098	2
Americium-241	U	-1.45	+/-3.42	5.70	25.0	pCi/L						
Antimony-124	U	1.31	+/-4.51	8.57	5.00	pCi/L						
Antimony-125	U	-0.679	+/-3.01	5.10	10.0	pCi/L						
Barium-133	U	0.0387	+/-1.34	2.31	5.00	pCi/L						
Barium-140	U	326	+/-286	481	30.0	pCi/L						
Beryllium-7	U	-0.801	+/-22.7	38.7	50.0	pCi/L						
Bismuth-212	U	-1.31	+/-8.91	15.8	50.0	pCi/L						
Bismuth-214	U	1.65	+/-1.96	3.64	10.0	pCi/L						
Cerium-139	U	-0.0364	+/-1.24	2.22	5.00	pCi/L						
Cerium-141	U	-1.9	+/-7.78	13.9	10.0	pCi/L						
Cerium-144	U	2.56	+/-8.09	13.3	50.0	pCi/L						
Cesium-134	U	0.905	+/-1.20	2.22	5.00	pCi/L						
Cesium-136	U	-18.5	+/-83.4	145	15.0	pCi/L						
Cesium-137	U	0.328	+/-0.962	1.77	5.00	pCi/L						
Chromium-51	U	10.5	+/-58.0	101	50.0	pCi/L						
Cobalt-56	U	1.04	+/-1.94	3.55	5.00	pCi/L						
Cobalt-57	U	1.21	+/-1.03	1.73	5.00	pCi/L						
Cobalt-58	U	1.15	+/-2.10	3.84	10.0	pCi/L						
Cobalt-60	U	0.459	+/-0.893	1.66	5.00	pCi/L						
Europium-152	U	-1.38	+/-2.97	5.05	20.0	pCi/L						
Europium-154	U	-0.595	+/-2.63	4.53	20.0	pCi/L						
Europium-155	U	4.30	+/-4.21	5.91	20.0	pCi/L						
Iridium-192	U	-1.57	+/-1.94	3.26	10.0	pCi/L						
Iron-59	U	6.32	+/-6.65	9.95	10.0	pCi/L						
Lead-210	UI	0.00	+/-67.9	118	750	pCi/L						
Lead-212	UI	0.00	+/-4.95	3.03	15.0	pCi/L						
Lead-214	U	0.744	+/-2.17	3.80	10.0	pCi/L						
Manganese-54	U	-0.352	+/-1.32	2.02	5.00	pCi/L						
Mercury-203	U	0.224	+/-3.32	5.80	5.00	pCi/L						
Neodymium-147	U	701	+/-853	1800	100	pCi/L						
Neptunium-239	U	0.564	+/-6.49	10.7	25.0	pCi/L						



# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 – (843) 556-8171 – www.gel.com

## Certificate of Analysis

Company : Detroit Edison Company–Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-8S060606      Project: ROIT00306  
 Sample ID: 168394003                  Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
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**Rad Gamma Spec Analysis**

*Gammascpec, Gamma, Liquid (Standard List)*

Niobium-94	U	-0.0119	+/-0.906	1.62	5.00	pCi/L					
Niobium-95	U	2.00	+/-4.48	8.20	5.00	pCi/L					
Potassium-40	UI	0.00	+/-24.4	14.3	100	pCi/L					
Promethium-144	U	0.116	+/-1.02	1.84	5.00	pCi/L					
Promethium-146	U	-0.271	+/-1.31	2.22	5.00	pCi/L					
Ruthenium-106	U	-3.42	+/-9.54	16.9	50.0	pCi/L					
Silver-110m	U	-0.574	+/-1.06	1.86	5.00	pCi/L					
Sodium-22	U	-0.229	+/-0.973	1.68	5.00	pCi/L					
Thallium-208	UI	0.00	+/-1.34	2.51	10.0	pCi/L					
Thorium-230	U	1.65	+/-1.96	3.64	20.0	pCi/L					
Thorium-234	UI	0.00	+/-42.6	64.5	250	pCi/L					
Tin-113	U	-1.84	+/-1.97	3.24	10.0	pCi/L					
Uranium-235	U	6.48	+/-6.65	12.1	50.0	pCi/L					
Uranium-238	UI	0.00	+/-42.6	64.5	250	pCi/L					
Yttrium-88	U	1.03	+/-1.65	3.20	10.0	pCi/L					
Zinc-65	U	1.48	+/-2.30	4.25	10.0	pCi/L					
Zirconium-95	U	-2.78	+/-3.85	6.60	10.0	pCi/L					

**Rad Gas Flow Proportional Counting**

*GFPC, Ra228, Liquid*

Radium-228	U	0.803	+/-0.630	0.963	3.00	pCi/L		AXD1 09/06/06 1555 557085	3
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*GFPC, Sr89&Sr90, Liquid*

Strontium-89	U	-8.65	+/-2.83	5.23	2.00	pCi/L		BXF1 08/20/06 2225 557661	4
Strontium-90	U	1.13	+/-2.05	3.97	2.00	pCi/L			

**Rad Liquid Scintillation Analysis**

*LSC, Tritium Dist, Liquid*

Tritium	U	230	+/-286	483	700	pCi/L		DFA1 08/23/06 0621 557040	5
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*Liquid Scint Tc99, Liquid*

Technetium-99	U	14.4	+/-18.1	30.5	50.0	pCi/L		EGD1 08/23/06 1329 557039	6
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**Rad Radium-226**

*Lucas Cell, Ra226, liquid*

Radium-226	U	0.226	+/-0.304	0.522	1.00	pCi/L		DXM 08/30/06 2125 558843	7
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**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-8S060606  
Sample ID: 168394003

Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			98	(25%-125%)
Uranium-232	Alphaspec U, Liquid			98	(25%-125%)
Uranium-232	Alphaspec U, Liquid			98	(25%-125%)
Uranium-232	Alphaspec U, Liquid			98	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			84	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			42	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			101	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			98	(15%-125%)

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID:	EFT-9S060706	Project:	ROIT00306
Sample ID:	168394004	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	07-JUN-06 08:42		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	1.58				percent		JXG1 09/01/06	0736	556620	1
Uranium-233/234		9.71	+/-2.39	1.15	1.00	pCi/L					
Uranium-235/236	U	0.654	+/-0.833	1.36	1.00	pCi/L					
Uranium-238		6.33	+/-1.94	1.10	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	-0.0311	+/-5.32	4.06	20.0	pCi/L		JPH1 08/26/06	0101	555098	2
Americium-241	UI	0.00	+/-5.46	4.66	25.0	pCi/L					
Antimony-124	U	-1.23	+/-6.37	6.19	5.00	pCi/L					
Antimony-125	U	1.43	+/-5.35	3.10	10.0	pCi/L					
Barium-133	U	-2.36	+/-1.59	1.44	5.00	pCi/L					
Barium-140	U	246	+/-277	269	30.0	pCi/L					
Beryllium-7	U	-2.41	+/-23.7	22.9	50.0	pCi/L					
Bismuth-212	U	6.90	+/-9.26	9.56	50.0	pCi/L					
Bismuth-214	U	1.01	+/-3.82	2.29	10.0	pCi/L					
Cerium-139	U	-0.395	+/-1.54	1.45	5.00	pCi/L					
Cerium-141	U	3.92	+/-9.82	9.14	10.0	pCi/L					
Cerium-144	U	-3.48	+/-9.25	8.72	50.0	pCi/L					
Cesium-134	U	0.0234	+/-2.20	1.18	5.00	pCi/L					
Cesium-136	U	-9.76	+/-96.7	93.8	15.0	pCi/L					
Cesium-137	U	-0.704	+/-1.15	1.05	5.00	pCi/L					
Chromium-51	U	-11.2	+/-76.2	64.5	50.0	pCi/L					
Cobalt-56	U	0.600	+/-2.15	2.16	5.00	pCi/L					
Cobalt-57	U	-0.194	+/-1.15	1.09	5.00	pCi/L					
Cobalt-58	U	0.561	+/-2.54	2.21	10.0	pCi/L					
Cobalt-60	U	-0.248	+/-1.22	0.978	5.00	pCi/L					
Europium-152	U	0.0945	+/-3.29	3.23	20.0	pCi/L					
Europium-154	U	-0.62	+/-3.09	2.93	20.0	pCi/L					
Europium-155	U	-3.67	+/-4.05	3.78	20.0	pCi/L					
Iridium-192	U	0.203	+/-2.26	2.23	10.0	pCi/L					
Iron-59	U	0.408	+/-6.92	6.77	10.0	pCi/L					
Lead-210	U	-39.8	+/-168	119	750	pCi/L					
Lead-212	UI	0.00	+/-5.20	2.83	15.0	pCi/L					
Lead-214	U	1.89	+/-2.38	2.40	10.0	pCi/L					
Manganese-54	U	0.579	+/-1.24	1.26	5.00	pCi/L					
Mercury-203	UI	0.00	+/-7.32	3.56	5.00	pCi/L					
Neodymium-147	U	-302	+/-1060	1010	100	pCi/L					
Neptunium-239	U	-3.58	+/-7.34	6.93	25.0	pCi/L					

# GENERAL ENGINEERING LABORATORIES, LLC

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-9S060706  
 Sample ID: 168394004

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	0.230	+/-1.02	1.03	5.00	pCi/L					
Niobium-95	U	2.04	+/-4.94	5.02	5.00	pCi/L					
Potassium-40	U	8.46	+/-24.1	10.9	100	pCi/L					
Promethium-144	U	-0.00673	+/-1.19	1.19	5.00	pCi/L					
Promethium-146	U	0.0797	+/-1.43	1.39	5.00	pCi/L					
Ruthenium-106	U	-5.06	+/-11.6	10.8	50.0	pCi/L					
Silver-110m	U	0.573	+/-1.25	1.23	5.00	pCi/L					
Sodium-22	U	-0.236	+/-1.14	1.08	5.00	pCi/L					
Thallium-208	UI	0.00	+/-2.62	1.56	10.0	pCi/L					
Thorium-230	U	1.01	+/-3.82	2.29	20.0	pCi/L					
Thorium-234	UI	0.00	+/-81.5	50.4	250	pCi/L					
Tin-113	U	0.286	+/-2.88	2.14	10.0	pCi/L					
Uranium-235	UI	0.00	+/-11.2	7.83	50.0	pCi/L					
Uranium-238	UI	0.00	+/-81.5	50.4	250	pCi/L					
Yttrium-88	U	0.766	+/-2.17	2.20	10.0	pCi/L					
Zinc-65	U	-1.14	+/-2.72	2.56	10.0	pCi/L					
Zirconium-95	U	-3.47	+/-4.01	3.75	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	0.189	+/-0.837	1.53	3.00	pCi/L		AXD1 09/06/06	1555	557085	3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-2.61	+/-1.17	2.31	2.00	pCi/L		BXF1 08/23/06	2252	557661	4
Strontium-90	U	0.626	+/-0.986	1.90	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	115	+/-275	482	700	pCi/L		DFA1 08/23/06	0637	557040	5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	14.3	+/-17.9	30.1	50.0	pCi/L		EGD1 08/23/06	1345	557039	6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		0.538	+/-0.305	0.414	1.00	pCi/L		DXM 08/30/06	2015	558843	7

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**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gei.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-9S060706  
Sample ID: 168394004

Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			43	(25%-125%)
Uranium-232	Alphaspec U, Liquid			43	(25%-125%)
Uranium-232	Alphaspec U, Liquid			43	(25%-125%)
Uranium-232	Alphaspec U, Liquid			43	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			80	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			93	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			97	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			100	(15%-125%)

# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID:	EFT-6D060706	Project:	ROIT00306
Sample ID:	168394005	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	07-JUN-06 10:52		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	16.2				percent		JXG1 09/01/06	0858	556620	1
Uranium-233/234		1.28	+/-0.608	0.226	1.00	pCi/L					
Uranium-235/236	U	0.164	+/-0.261	0.446	1.00	pCi/L					
Uranium-238	U	0.132	+/-0.212	0.361	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	5.60	+/-4.22	7.94	20.0	pCi/L		JPH1 08/25/06	2352	555098	2
Americium-241	U	2.04	+/-5.97	10.7	25.0	pCi/L					
Antimony-124	U	7.15	+/-12.0	11.5	5.00	pCi/L					
Antimony-125	U	-0.137	+/-2.81	5.01	10.0	pCi/L					
Barium-133	U	-1.21	+/-1.33	2.29	5.00	pCi/L					
Barium-140	U	219	+/-248	462	30.0	pCi/L					
Beryllium-7	U	0.813	+/-22.5	40.0	50.0	pCi/L					
Bismuth-212	U	3.77	+/-9.25	16.6	50.0	pCi/L					
Bismuth-214	UI	0.00	+/-2.23	4.39	10.0	pCi/L					
Cerium-139	U	-0.975	+/-1.40	2.35	5.00	pCi/L					
Cerium-141	U	4.86	+/-8.48	14.9	10.0	pCi/L					
Cerium-144	U	3.92	+/-8.28	14.5	50.0	pCi/L					
Cesium-134	U	0.523	+/-1.87	2.05	5.00	pCi/L					
Cesium-136	U	-74.7	+/-82.0	139	15.0	pCi/L					
Cesium-137	U	1.02	+/-0.963	1.83	5.00	pCi/L					
Chromium-51	U	10.4	+/-60.9	103	50.0	pCi/L					
Cobalt-56	U	-0.16	+/-1.99	3.44	5.00	pCi/L					
Cobalt-57	U	0.512	+/-1.10	1.94	5.00	pCi/L					
Cobalt-58	U	-0.0901	+/-2.08	3.62	10.0	pCi/L					
Cobalt-60	U	0.657	+/-1.12	2.13	5.00	pCi/L					
Europium-152	U	0.633	+/-2.99	5.43	20.0	pCi/L					
Europium-154	U	-0.45	+/-3.42	5.31	20.0	pCi/L					
Europium-155	U	1.62	+/-3.93	6.94	20.0	pCi/L					
Iridium-192	U	-0.52	+/-2.06	3.41	10.0	pCi/L					
Iron-59	U	-1.76	+/-6.42	11.5	10.0	pCi/L					
Lead-210	U	161	+/-180	302	750	pCi/L					
Lead-212	U	1.03	+/-4.03	4.01	15.0	pCi/L					
Lead-214	U	3.07	+/-2.18	4.13	10.0	pCi/L					
Manganese-54	U	0.227	+/-1.17	2.07	5.00	pCi/L					
Mercury-203	U	1.06	+/-3.40	5.80	5.00	pCi/L					
Neodymium-147	U	-835	+/-931	1570	100	pCi/L					
Neptunium-239	U	-7.44	+/-6.85	11.5	25.0	pCi/L					

# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.geel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-6D060706  
 Sample ID: 168394005

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	0.164	+/-0.960	1.70	5.00	pCi/L					
Niobium-95	U	-0.365	+/-4.36	7.60	5.00	pCi/L					
Potassium-40	UI	0.00	+/-12.6	26.3	100	pCi/L					
Promethium-144	U	0.468	+/-1.13	2.03	5.00	pCi/L					
Promethium-146	U	0.443	+/-1.29	2.34	5.00	pCi/L					
Ruthenium-106	U	-4.23	+/-10.6	18.2	50.0	pCi/L					
Silver-110m	UI	0.00	+/-1.04	1.94	5.00	pCi/L					
Sodium-22	U	-0.158	+/-1.27	1.97	5.00	pCi/L					
Thallium-208	U	1.39	+/-1.20	2.24	10.0	pCi/L					
Thorium-230	UI	0.00	+/-2.23	4.39	20.0	pCi/L					
Thorium-234	UI	0.00	+/-56.8	96.4	250	pCi/L					
Tin-113	U	-0.263	+/-1.91	3.40	10.0	pCi/L					
Uranium-235	U	3.25	+/-7.13	12.5	50.0	pCi/L					
Uranium-238	UI	0.00	+/-56.8	96.4	250	pCi/L					
Yttrium-88	U	1.36	+/-1.86	3.56	10.0	pCi/L					
Zinc-65	U	-0.229	+/-2.68	4.84	10.0	pCi/L					
Zirconium-95	U	-1.21	+/-3.98	6.82	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	0.453	+/-0.618	1.06	3.00	pCi/L		AXD1 09/06/06 1555	557085		3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-3.03	+/-0.928	2.00	2.00	pCi/L		BXF1 08/23/06 2252	557661		4
Strontium-90	U	0.929	+/-0.945	1.75	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	116	+/-277	485	700	pCi/L		DFA1 08/23/06 1245	557040		5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	10.1	+/-17.8	30.3	50.0	pCi/L		EGD1 08/23/06 1401	557039		6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		0.767	+/-0.320	0.314	1.00	pCi/L		DXM 08/30/06 2015	558843		7

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-6D060706  
Sample ID: 168394005

Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			67	(25%-125%)
Uranium-232	Alphaspec U, Liquid			67	(25%-125%)
Uranium-232	Alphaspec U, Liquid			67	(25%-125%)
Uranium-232	Alphaspec U, Liquid			67	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			80	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			93	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			96	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			99	(15%-125%)



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**Certificate of Analysis**

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-7S060806      Project: ROIT00306  
 Sample ID: 168394006      Client ID: ROIT001  
 Matrix: Ground Water  
 Collect Date: 08-JUN-06 09:12  
 Receive Date: 02-AUG-06  
 Collector: Client

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235		1.93				percent		JXG1 09/01/06	0858	556620	1
Uranium-233/234		3.33	+/-0.932	0.204	1.00	pCi/L					
Uranium-235/236		0.336	+/-0.329	0.252	1.00	pCi/L					
Uranium-238		2.65	+/-0.831	0.204	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasesc, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	1.33	+/-7.22	7.80	20.0	pCi/L		JPH1 08/25/06	2353	555098	2
Americium-241	U	0.160	+/-6.66	10.6	25.0	pCi/L					
Antimony-124	U	0.907	+/-4.97	9.41	5.00	pCi/L					
Antimony-125	U	-1.57	+/-2.83	4.86	10.0	pCi/L					
Barium-133	U	-0.274	+/-1.32	2.32	5.00	pCi/L					
Barium-140	U	-131	+/-233	396	30.0	pCi/L					
Beryllium-7	U	-6.82	+/-21.7	37.5	50.0	pCi/L					
Bismuth-212	U	-0.607	+/-8.35	14.4	50.0	pCi/L					
Bismuth-214	UI	0.00	+/-2.22	4.37	10.0	pCi/L					
Cerium-139	U	0.439	+/-1.42	2.44	5.00	pCi/L					
Cerium-141	U	3.15	+/-8.76	15.1	10.0	pCi/L					
Cerium-144	U	4.17	+/-8.59	14.9	50.0	pCi/L					
Cesium-134	U	0.998	+/-0.958	2.10	5.00	pCi/L					
Cesium-136	U	18.7	+/-73.4	135	15.0	pCi/L					
Cesium-137	U	-0.0143	+/-1.08	1.87	5.00	pCi/L					
Chromium-51	U	-6.61	+/-56.2	99.8	50.0	pCi/L					
Cobalt-56	U	-0.663	+/-1.81	3.22	5.00	pCi/L					
Cobalt-57	U	0.0289	+/-1.08	1.86	5.00	pCi/L					
Cobalt-58	U	0.357	+/-1.81	3.35	10.0	pCi/L					
Cobalt-60	U	1.06	+/-1.03	2.01	5.00	pCi/L					
Europium-152	U	-0.88	+/-2.92	5.14	20.0	pCi/L					
Europium-154	U	0.679	+/-2.91	5.32	20.0	pCi/L					
Europium-155	U	3.27	+/-3.98	7.04	20.0	pCi/L					
Iridium-192	U	-0.714	+/-1.93	3.39	10.0	pCi/L					
Iron-59	U	-0.0987	+/-6.90	10.7	10.0	pCi/L					
Lead-210	U	263	+/-333	281	750	pCi/L					
Lead-212	U	1.47	+/-4.09	3.99	15.0	pCi/L					
Lead-214	U	0.102	+/-4.11	4.22	10.0	pCi/L					
Manganese-54	U	0.305	+/-1.25	2.02	5.00	pCi/L					
Mercury-203	U	1.69	+/-3.28	5.59	5.00	pCi/L					
Neodymium-147	U	360	+/-879	1580	100	pCi/L					
Neptunium-239	U	-0.403	+/-6.89	11.9	25.0	pCi/L					

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-7S060806  
 Sample ID: 168394006

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>												
<i>Gammascpec, Gamma, Liquid (Standard List)</i>												
Niobium-94	U	-0.338	+/-0.925	1.56	5.00	pCi/L						
Niobium-95	U	3.18	+/-4.67	8.38	5.00	pCi/L						
Potassium-40	UI	0.00	+/-13.2	27.4	100	pCi/L						
Promethium-144	U	-0.612	+/-1.14	1.91	5.00	pCi/L						
Promethium-146	U	0.451	+/-1.29	2.32	5.00	pCi/L						
Ruthenium-106	U	0.134	+/-10.6	18.4	50.0	pCi/L						
Silver-110m	U	-0.518	+/-1.22	2.07	5.00	pCi/L						
Sodium-22	U	0.251	+/-1.08	1.97	5.00	pCi/L						
Thallium-208	U	0.298	+/-2.01	2.30	10.0	pCi/L						
Thorium-230	UI	0.00	+/-2.22	4.37	20.0	pCi/L						
Thorium-234	U	72.9	+/-131	83.6	250	pCi/L						
Tin-113	U	1.71	+/-2.00	3.67	10.0	pCi/L						
Uranium-235	U	6.60	+/-8.50	13.3	50.0	pCi/L						
Uranium-238	U	72.9	+/-131	83.6	250	pCi/L						
Yttrium-88	U	0.00473	+/-1.68	3.11	10.0	pCi/L						
Zinc-65	U	-2.77	+/-2.58	4.25	10.0	pCi/L						
Zirconium-95	U	2.21	+/-3.85	6.90	10.0	pCi/L						
<b>Rad Gas Flow Proportional Counting</b>												
<i>GFPC, Ra228, Liquid</i>												
Radium-228	U	-1.31	+/-0.891	1.91	3.00	pCi/L		AXD1	09/06/06	1555	557085	3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>												
Strontium-89	U	-2.45	+/-1.14	2.24	2.00	pCi/L		BXF1	08/23/06	2252	557661	4
Strontium-90	U	0.505	+/-0.906	1.76	2.00	pCi/L						
<b>Rad Liquid Scintillation Analysis</b>												
<i>LSC, Tritium Dist, Liquid</i>												
Tritium	U	19.1	+/-379	688	700	pCi/L		DFA1	08/23/06	1302	557040	5
<i>Liquid Scint Tc99, Liquid</i>												
Technetium-99	U	0.350	+/-17.9	31.0	50.0	pCi/L		EGD1	08/23/06	1417	557039	6
<b>Rad Radium-226</b>												
<i>Lucas Cell, Ra226, liquid</i>												
Radium-226		0.629	+/-0.308	0.377	1.00	pCi/L		DXM	08/30/06	2015	558843	7

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-7S060806  
Sample ID: 168394006

Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
5	EPA 906.0 Modified											
6	DOE EML HASL-300, Tc-02-RC Modified											
7	EPA 903.1 Modified											

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			71	(25%-125%)
Uranium-232	Alphaspec U, Liquid			71	(25%-125%)
Uranium-232	Alphaspec U, Liquid			71	(25%-125%)
Uranium-232	Alphaspec U, Liquid			71	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			83	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			92	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			97	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			97	(15%-125%)

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID:	EFT-10S060806	Project:	ROIT00306
Sample ID:	168394007	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	08-JUN-06 10:32		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	0.948				percent		JXG1 09/01/06	0858	556620	1
Uranium-233/234		1.02	+/-0.467	0.324	1.00	pCi/L					
Uranium-235/236	U	0.0499	+/-0.132	0.315	1.00	pCi/L					
Uranium-238		0.811	+/-0.418	0.324	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammaspec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	6.48	+/-4.48	8.71	20.0	pCi/L		JPH1 08/25/06	2353	555098	2
Americium-241	U	1.10	+/-2.03	3.43	25.0	pCi/L					
Antimony-124	U	0.599	+/-5.26	9.93	5.00	pCi/L					
Antimony-125	U	1.67	+/-3.08	5.63	10.0	pCi/L					
Barium-133	U	-0.663	+/-1.48	2.43	5.00	pCi/L					
Barium-140	U	-11.4	+/-255	451	30.0	pCi/L					
Beryllium-7	U	9.34	+/-22.6	41.1	50.0	pCi/L					
Bismuth-212	U	2.27	+/-9.90	17.4	50.0	pCi/L					
Bismuth-214	U	0.429	+/-3.89	4.81	10.0	pCi/L					
Cerium-139	U	-0.0306	+/-1.38	2.17	5.00	pCi/L					
Cerium-141	U	1.30	+/-7.64	13.5	10.0	pCi/L					
Cerium-144	U	4.68	+/-7.32	13.2	50.0	pCi/L					
Cesium-134	U	1.32	+/-1.29	2.39	5.00	pCi/L					
Cesium-136	U	25.9	+/-89.1	164	15.0	pCi/L					
Cesium-137	U	-0.234	+/-1.22	2.12	5.00	pCi/L					
Chromium-51	U	19.3	+/-56.8	97.8	50.0	pCi/L					
Cobalt-56	U	0.291	+/-2.23	3.88	5.00	pCi/L					
Cobalt-57	U	0.138	+/-0.921	1.65	5.00	pCi/L					
Cobalt-58	U	-0.0653	+/-2.41	4.15	10.0	pCi/L					
Cobalt-60	U	0.611	+/-1.33	2.39	5.00	pCi/L					
Europium-152	U	0.954	+/-3.30	5.62	20.0	pCi/L					
Europium-154	U	-0.957	+/-3.44	5.99	20.0	pCi/L					
Europium-155	U	1.49	+/-3.10	5.63	20.0	pCi/L					
Iridium-192	U	-0.951	+/-2.01	3.33	10.0	pCi/L					
Iron-59	U	-0.584	+/-7.12	12.7	10.0	pCi/L					
Lead-210	UI	0.00	+/-24.9	46.8	750	pCi/L					
Lead-212	U	2.37	+/-3.96	3.77	15.0	pCi/L					
Lead-214	U	0.879	+/-4.51	4.52	10.0	pCi/L					
Manganese-54	U	-0.938	+/-1.37	2.24	5.00	pCi/L					
Mercury-203	U	5.53	+/-3.29	5.97	5.00	pCi/L					
Neodymium-147	U	337	+/-996	1800	100	pCi/L					
Neptunium-239	U	-1.03	+/-5.72	10.2	25.0	pCi/L					

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-10S060806  
 Sample ID: 168394007

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>GammaSpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	-0.578	+/-1.06	1.78	5.00	pCi/L					
Niobium-95	U	-3.46	+/-5.23	8.67	5.00	pCi/L					
Potassium-40	UI	0.00	+/-16.2	34.2	100	pCi/L					
Promethium-144	U	0.770	+/-1.26	2.27	5.00	pCi/L					
Promethium-146	U	0.0579	+/-1.38	2.48	5.00	pCi/L					
Ruthenium-106	U	1.16	+/-11.3	19.9	50.0	pCi/L					
Silver-110m	U	0.517	+/-1.33	2.37	5.00	pCi/L					
Sodium-22	U	-0.356	+/-1.27	2.22	5.00	pCi/L					
Thallium-208	U	0.164	+/-1.98	2.45	10.0	pCi/L					
Thorium-230	U	0.429	+/-3.89	3.85	20.0	pCi/L					
Thorium-234	U	1.27	+/-33.0	45.5	250	pCi/L					
Tin-113	U	-0.448	+/-2.15	3.56	10.0	pCi/L					
Uranium-235	U	6.68	+/-6.56	11.9	50.0	pCi/L					
Uranium-238	U	1.27	+/-33.0	45.5	250	pCi/L					
Yttrium-88	U	1.37	+/-1.96	3.86	10.0	pCi/L					
Zinc-65	U	-0.674	+/-2.94	5.20	10.0	pCi/L					
Zirconium-95	U	0.282	+/-4.67	8.12	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	0.431	+/-0.665	1.16	3.00	pCi/L		AXD1 09/06/06	1556	557085	3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-1.1	+/-1.05	1.97	2.00	pCi/L		BXF1 08/23/06	2252	557661	4
Strontium-90	U	0.604	+/-0.773	1.47	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	155	+/-281	487	700	pCi/L		DFA1 08/23/06	1318	557040	5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	-7.29	+/-17.4	30.7	50.0	pCi/L		EGD1 08/23/06	1433	557039	6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		1.93	+/-0.502	0.446	1.00	pCi/L		DXM 08/30/06	2015	558843	7

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
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6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-10S060806  
Sample ID: 168394007  
Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			97	(25%-125%)
Uranium-232	Alphaspec U, Liquid			97	(25%-125%)
Uranium-232	Alphaspec U, Liquid			97	(25%-125%)
Uranium-232	Alphaspec U, Liquid			97	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			84	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			98	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			103	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			98	(15%-125%)

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID:	EFT-5S060806	Project:	ROIT00306
Sample ID:	168394008	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	08-JUN-06 14:42		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235		2.81				percent		JXG1 09/01/06	0858	556620	1
Uranium-233/234		3.67	+/-0.917	0.360	1.00	pCi/L					
Uranium-235/236		0.492	+/-0.379	0.349	1.00	pCi/L					
Uranium-238		2.65	+/-0.774	0.177	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	4.55	+/-7.02	8.10	20.0	pCi/L		JPH1 08/25/06	2353	555098	2
Americium-241	U	7.10	+/-8.91	15.1	25.0	pCi/L					
Antimony-124	U	5.38	+/-4.98	10.5	5.00	pCi/L					
Antimony-125	U	0.266	+/-2.95	5.31	10.0	pCi/L					
Barium-133	U	-0.633	+/-1.39	2.47	5.00	pCi/L					
Barium-140	U	140	+/-255	466	30.0	pCi/L					
Beryllium-7	U	-20.8	+/-21.1	35.5	50.0	pCi/L					
Bismuth-212	U	6.64	+/-10.5	15.6	50.0	pCi/L					
Bismuth-214	UI	0.00	+/-2.39	4.61	10.0	pCi/L					
Cerium-139	U	0.126	+/-1.52	2.64	5.00	pCi/L					
Cerium-141	U	-0.384	+/-9.08	15.8	10.0	pCi/L					
Cerium-144	U	-0.842	+/-9.07	15.8	50.0	pCi/L					
Cesium-134	U	0.0192	+/-1.27	2.21	5.00	pCi/L					
Cesium-136	U	-11.5	+/-77.0	139	15.0	pCi/L					
Cesium-137	U	-0.297	+/-1.08	1.87	5.00	pCi/L					
Chromium-51	U	-4.98	+/-61.2	103	50.0	pCi/L					
Cobalt-56	U	-0.0967	+/-1.95	3.37	5.00	pCi/L					
Cobalt-57	U	0.162	+/-1.15	2.03	5.00	pCi/L					
Cobalt-58	U	3.41	+/-4.18	3.64	10.0	pCi/L					
Cobalt-60	U	-0.304	+/-1.12	1.98	5.00	pCi/L					
Europium-152	U	1.53	+/-3.41	5.86	20.0	pCi/L					
Europium-154	U	-2.92	+/-3.03	4.97	20.0	pCi/L					
Europium-155	U	-3.19	+/-4.24	7.33	20.0	pCi/L					
Iridium-192	U	0.375	+/-2.08	3.55	10.0	pCi/L					
Iron-59	U	-5.07	+/-7.88	11.5	10.0	pCi/L					
Lead-210	U	309	+/-346	553	750	pCi/L					
Lead-212	UI	0.00	+/-2.35	4.26	15.0	pCi/L					
Lead-214	U	0.160	+/-3.73	4.34	10.0	pCi/L					
Manganese-54	U	0.629	+/-1.23	2.22	5.00	pCi/L					
Mercury-203	U	-2.18	+/-3.66	6.04	5.00	pCi/L					
Neodymium-147	U	-768	+/-910	1540	100	pCi/L					
Neptunium-239	U	0.385	+/-7.26	12.8	25.0	pCi/L					

# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-5S060806  
 Sample ID: 168394008

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammaspec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	-0.18	+/-0.976	1.69	5.00	pCi/L					
Niobium-95	U	2.55	+/-4.72	8.55	5.00	pCi/L					
Potassium-40	UI	0.00	+/-13.8	28.3	100	pCi/L					
Promethium-144	U	0.185	+/-1.10	1.95	5.00	pCi/L					
Promethium-146	U	0.733	+/-1.42	2.59	5.00	pCi/L					
Ruthenium-106	U	-1.66	+/-10.7	18.7	50.0	pCi/L					
Silver-110m	U	-0.268	+/-1.22	2.12	5.00	pCi/L					
Sodium-22	U	-1.07	+/-1.12	1.84	5.00	pCi/L					
Thallium-208	UI	0.00	+/-2.37	2.54	10.0	pCi/L					
Thorium-230	UI	0.00	+/-2.39	4.61	20.0	pCi/L					
Thorium-234	UI	0.00	+/-148	122	250	pCi/L					
Tin-113	U	0.755	+/-1.95	3.58	10.0	pCi/L					
Uranium-235	U	5.14	+/-7.92	14.1	50.0	pCi/L					
Uranium-238	UI	0.00	+/-148	122	250	pCi/L					
Yttrium-88	U	0.0508	+/-1.74	3.29	10.0	pCi/L					
Zinc-65	U	-1.74	+/-2.51	4.29	10.0	pCi/L					
Zirconium-95	U	0.706	+/-3.66	6.55	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	0.362	+/-0.631	1.12	3.00	pCi/L		AXD1 09/06/06 1556 557085			3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-2.7	+/-1.18	2.35	2.00	pCi/L		BXF1 08/23/06 2252 557661			4
Strontium-90	U	0.733	+/-0.874	1.65	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	52.7	+/-275	492	700	pCi/L		DFA1 08/23/06 0729 557040			5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	1.61	+/-17.4	30.1	50.0	pCi/L		EGD1 08/23/06 1450 557039			6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		0.480	+/-0.254	0.271	1.00	pCi/L		DXM 08/30/06 2200 558843			7

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**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	



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## Certificate of Analysis

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6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-5S060806  
Sample ID: 168394008

Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			82	(25%-125%)
Uranium-232	Alphaspec U, Liquid			82	(25%-125%)
Uranium-232	Alphaspec U, Liquid			82	(25%-125%)
Uranium-232	Alphaspec U, Liquid			82	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			81	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			88	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			105	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			100	(15%-125%)

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID:	EFT-5D060806	Project:	ROIT00306
Sample ID:	168394009	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	08-JUN-06 16:16		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235		11.3				percent		JXG1 09/01/06	0858	556620	1
Pct Uranium-235	U	13.2				percent		DDR1 09/06/06	1231	565138	2
Uranium-233/234	U	0.069	+/-0.275	0.735	1.00	pCi/L					
Uranium-235/236	U	0.328	+/-0.455	0.492	1.00	pCi/L					
Uranium-238	U	0.334	+/-0.459	0.735	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	1.20	+/-8.07	8.91	20.0	pCi/L		JPH1 08/25/06	2354	555098	3
Americium-241	U	4.05	+/-6.56	10.6	25.0	pCi/L					
Antimony-124	U	-1.49	+/-6.59	11.9	5.00	pCi/L					
Antimony-125	U	-0.0785	+/-3.35	5.74	10.0	pCi/L					
Barium-133	U	-1.21	+/-1.79	2.61	5.00	pCi/L					
Barium-140	U	3.05	+/-257	463	30.0	pCi/L					
Beryllium-7	U	20.2	+/-24.3	43.5	50.0	pCi/L					
Bismuth-212	U	-1.56	+/-9.81	17.2	50.0	pCi/L					
Bismuth-214	U	1.89	+/-5.85	4.85	10.0	pCi/L					
Cerium-139	U	-0.332	+/-1.53	2.53	5.00	pCi/L					
Cerium-141	U	-2.11	+/-9.15	15.2	10.0	pCi/L					
Cerium-144	U	2.10	+/-9.30	15.8	50.0	pCi/L					
Cesium-134	U	0.302	+/-1.35	2.40	5.00	pCi/L					
Cesium-136	U	19.4	+/-85.0	158	15.0	pCi/L					
Cesium-137	U	0.706	+/-1.16	2.14	5.00	pCi/L					
Chromium-51	U	46.3	+/-67.9	109	50.0	pCi/L					
Cobalt-56	U	1.56	+/-2.25	4.13	5.00	pCi/L					
Cobalt-57	U	-0.044	+/-1.12	1.89	5.00	pCi/L					
Cobalt-58	U	1.60	+/-2.90	4.61	10.0	pCi/L					
Cobalt-60	U	0.485	+/-1.26	2.34	5.00	pCi/L					
Europium-152	U	0.568	+/-3.38	5.90	20.0	pCi/L					
Europium-154	U	0.948	+/-3.53	6.48	20.0	pCi/L					
Europium-155	U	0.859	+/-4.13	7.10	20.0	pCi/L					
Iridium-192	U	-0.789	+/-2.20	3.78	10.0	pCi/L					
Iron-59	U	11.3	+/-8.69	11.5	10.0	pCi/L					
Lead-210	UI	0.00	+/-333	277	750	pCi/L					
Lead-212	U	2.59	+/-4.18	3.63	15.0	pCi/L					
Lead-214	U	0.863	+/-5.70	4.67	10.0	pCi/L					
Manganese-54	U	0.881	+/-1.43	2.32	5.00	pCi/L					
Mercury-203	U	-3.35	+/-3.57	6.03	5.00	pCi/L					
Neodymium-147	U	-861	+/-940	1610	100	pCi/L					

# GENERAL ENGINEERING LABORATORIES, LLC

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-5D060806  
 Sample ID: 168394009

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>GammaSpec, Gamma, Liquid (Standard List)</i>											
Neptunium-239	U	2.41	+/-7.30	12.5	25.0	pCi/L					
Niobium-94	UI	0.00	+/-3.07	1.99	5.00	pCi/L					
Niobium-95	U	-0.261	+/-5.77	8.78	5.00	pCi/L					
Potassium-40	UI	0.00	+/-15.1	30.6	100	pCi/L					
Promethium-144	U	-0.359	+/-1.50	2.25	5.00	pCi/L					
Promethium-146	U	-0.882	+/-1.83	2.64	5.00	pCi/L					
Ruthenium-106	U	1.67	+/-11.7	21.1	50.0	pCi/L					
Silver-110m	U	-0.43	+/-1.31	2.29	5.00	pCi/L					
Sodium-22	U	0.351	+/-1.31	2.40	5.00	pCi/L					
Thallium-208	U	1.55	+/-1.32	2.49	10.0	pCi/L					
Thorium-230	U	1.89	+/-5.85	4.19	20.0	pCi/L					
Thorium-234	U	56.8	+/-95.5	82.9	250	pCi/L					
Tin-113	U	0.875	+/-2.22	3.90	10.0	pCi/L					
Uranium-235	U	3.29	+/-8.98	13.6	50.0	pCi/L					
Uranium-238	U	56.8	+/-95.5	82.9	250	pCi/L					
Yttrium-88	U	-0.937	+/-2.49	3.70	10.0	pCi/L					
Zinc-65	U	-1.79	+/-2.77	4.77	10.0	pCi/L					
Zirconium-95	U	1.26	+/-4.12	7.45	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228		1.26	+/-0.815	1.19	3.00	pCi/L		AXD1 09/06/06	1556	557085	4
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-3.12	+/-1.34	2.62	2.00	pCi/L		BXF1 08/23/06	2301	557661	5
Strontium-90	U	1.00	+/-0.964	1.78	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	-25.4	+/-268	493	700	pCi/L		DFA1 08/23/06	0745	557040	6
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	3.89	+/-17.5	30.1	50.0	pCi/L		EGD1 08/23/06	1506	557039	7
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		2.30	+/-0.551	0.464	1.00	pCi/L		DXM 08/30/06	2050	558843	8

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**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 901.1	

# GENERAL ENGINEERING LABORATORIES, LLC

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-5D060806      Project: ROIT00306  
Sample ID: 168394009                      Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
4	EPA 904.0 Modified										
5	EPA 905.0 Modified										
6	EPA 906.0 Modified										
7	DOE EML HASL-300, Tc-02-RC Modified										
8	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			1 *	(25%-125%)
Uranium-232	Alphaspec U, Liquid			93	(25%-125%)
Uranium-232	Alphaspec U, Liquid			93	(25%-125%)
Uranium-232	Alphaspec U, Liquid			93	(25%-125%)
Uranium-232	Alphaspec U, Liquid			93	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			71	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			91	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			96	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			100	(15%-125%)

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID:	EFT-1D060906	Project:	ROIT00306
Sample ID:	168394010	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	09-JUN-06 08:40		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	1.38				percent		JXG1 09/03/06	0850	556620	1
Uranium-233/234		1.67	+/-0.632	0.433	1.00	pCi/L					
Uranium-235/236	U	0.127	+/-0.204	0.347	1.00	pCi/L					
Uranium-238		1.41	+/-0.577	0.386	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	6.12	+/-5.44	10.5	20.0	pCi/L		JPH1 08/25/06	2354	555098	2
Americium-241	U	3.31	+/-2.64	4.36	25.0	pCi/L					
Antimony-124	U	-0.796	+/-6.79	12.1	5.00	pCi/L					
Antimony-125	U	-0.108	+/-3.57	6.33	10.0	pCi/L					
Barium-133	U	-0.17	+/-1.60	2.85	5.00	pCi/L					
Barium-140	U	-33.1	+/-310	541	30.0	pCi/L					
Beryllium-7	U	19.6	+/-28.5	51.9	50.0	pCi/L					
Bismuth-212	U	-5.49	+/-12.5	21.1	50.0	pCi/L					
Bismuth-214	U	3.33	+/-6.13	5.69	10.0	pCi/L					
Cerium-139	U	-0.031	+/-1.58	2.41	5.00	pCi/L					
Cerium-141	U	5.42	+/-13.8	13.1	10.0	pCi/L					
Cerium-144	U	-2.07	+/-8.36	14.3	50.0	pCi/L					
Cesium-134	U	1.27	+/-1.85	3.32	5.00	pCi/L					
Cesium-136	U	53.7	+/-112	208	15.0	pCi/L					
Cesium-137	U	0.542	+/-1.58	2.80	5.00	pCi/L					
Chromium-51	U	16.4	+/-64.4	116	50.0	pCi/L					
Cobalt-56	U	3.50	+/-2.85	5.30	5.00	pCi/L					
Cobalt-57	U	-0.223	+/-1.05	1.80	5.00	pCi/L					
Cobalt-58	U	0.0605	+/-3.02	5.22	10.0	pCi/L					
Cobalt-60	U	0.181	+/-1.62	2.93	5.00	pCi/L					
Europium-152	U	1.32	+/-3.40	6.17	20.0	pCi/L					
Europium-154	U	-3.35	+/-4.48	7.57	20.0	pCi/L					
Europium-155	U	0.789	+/-3.61	6.30	20.0	pCi/L					
Iridium-192	U	0.418	+/-2.22	4.00	10.0	pCi/L					
Iron-59	U	7.93	+/-8.89	17.0	10.0	pCi/L					
Lead-210	U	4.83	+/-54.4	43.2	750	pCi/L					
Lead-212	U	2.18	+/-3.96	4.37	15.0	pCi/L					
Lead-214	U	2.96	+/-2.62	4.86	10.0	pCi/L					
Manganese-54	U	0.020	+/-1.73	2.98	5.00	pCi/L					
Mercury-203	U	1.64	+/-3.79	6.46	5.00	pCi/L					
Neodymium-147	U	-205	+/-1070	1870	100	pCi/L					
Neptunium-239	U	-2.72	+/-6.70	11.4	25.0	pCi/L					

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-1D060906      Project: ROIT00306  
 Sample ID: 168394010                  Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	-0.239	+/-1.44	2.47	5.00	pCi/L					
Niobium-95	U	-2.57	+/-6.83	11.5	5.00	pCi/L					
Potassium-40	U	23.3	+/-19.0	26.9	100	pCi/L					
Promethium-144	U	0.184	+/-1.63	2.84	5.00	pCi/L					
Promethium-146	U	-0.721	+/-1.70	2.95	5.00	pCi/L					
Ruthenium-106	U	2.32	+/-14.4	25.3	50.0	pCi/L					
Silver-110m	U	-0.524	+/-1.71	2.93	5.00	pCi/L					
Sodium-22	U	-1.24	+/-1.66	2.80	5.00	pCi/L					
Thallium-208	UI	0.00	+/-4.59	3.21	10.0	pCi/L					
Thorium-230	U	3.33	+/-6.13	5.69	20.0	pCi/L					
Thorium-234	U	16.2	+/-49.4	40.1	250	pCi/L					
Tin-113	U	-0.658	+/-2.26	3.97	10.0	pCi/L					
Uranium-235	U	4.74	+/-12.1	13.4	50.0	pCi/L					
Uranium-238	U	16.2	+/-49.4	40.1	250	pCi/L					
Yttrium-88	U	1.23	+/-2.30	4.54	10.0	pCi/L					
Zinc-65	U	-1.67	+/-3.71	6.49	10.0	pCi/L					
Zirconium-95	U	-1.74	+/-5.36	9.12	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228		4.10	+/-1.08	1.07	3.00	pCi/L		AXD1 09/06/06 1556 557085			3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-3.62	+/-1.72	3.22	2.00	pCi/L		BXF1 08/23/06 2301 557661			4
Strontium-90	U	0.840	+/-0.862	1.60	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	375	+/-300	487	700	pCi/L		DFA1 08/23/06 0802 557040			5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	-1.96	+/-17.4	30.3	50.0	pCi/L		EGD1 08/23/06 1522 557039			6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		0.914	+/-0.373	0.434	1.00	pCi/L		DXM 08/30/06 2050 558843			7

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-1D060906  
Sample ID: 168394010

Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			95	(25%-125%)
Uranium-232	Alphaspec U, Liquid			95	(25%-125%)
Uranium-232	Alphaspec U, Liquid			95	(25%-125%)
Uranium-232	Alphaspec U, Liquid			95	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			83	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			92	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			92	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			99	(15%-125%)

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**Certificate of Analysis**

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-1S060906-T  
 Sample ID: 168394011  
 Matrix: Ground Water  
 Collect Date: 09-JUN-06 10:02  
 Receive Date: 02-AUG-06  
 Collector: Client

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
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**Rad Alpha Spec Analysis**

*Alphaspec U, Liquid*

Pct Uranium-235	U	-0.596				percent		JXG1 09/03/06 0850 556620		1	
Uranium-233/234		1.78	+/-0.745	0.438	1.00	pCi/L					
Uranium-235/236	U	-0.0235	+/-0.046	0.469	1.00	pCi/L					
Uranium-238		0.617	+/-0.472	0.555	1.00	pCi/L					

**Rad Gamma Spec Analysis**

*Gammasespec, Gamma, Liquid (Standard List)*

Actinium-228	U	2.24	+/-10.6	10.6	20.0	pCi/L		JPH1 08/26/06 0110 555098		2	
Americium-241	U	8.06	+/-13.0	12.9	25.0	pCi/L					
Antimony-124	U	-0.844	+/-6.57	11.8	5.00	pCi/L					
Antimony-125	U	-0.00838	+/-3.89	6.54	10.0	pCi/L					
Barium-133	U	-0.139	+/-1.83	3.09	5.00	pCi/L					
Barium-140	U	18.9	+/-271	488	30.0	pCi/L					
Beryllium-7	U	23.5	+/-27.1	50.5	50.0	pCi/L					
Bismuth-212	U	8.31	+/-10.1	18.7	50.0	pCi/L					
Bismuth-214	U	2.33	+/-6.27	4.54	10.0	pCi/L					
Cerium-139	U	-1.49	+/-1.76	3.02	5.00	pCi/L					
Cerium-141	U	0.551	+/-16.7	18.4	10.0	pCi/L					
Cerium-144	U	-6.65	+/-10.5	18.3	50.0	pCi/L					
Cesium-134	U	0.726	+/-1.50	2.72	5.00	pCi/L					
Cesium-136	U	-97.2	+/-96.7	155	15.0	pCi/L					
Cesium-137	U	-0.21	+/-1.32	2.32	5.00	pCi/L					
Chromium-51	U	110	+/-99.3	121	50.0	pCi/L					
Cobalt-56	U	-0.821	+/-2.23	3.83	5.00	pCi/L					
Cobalt-57	U	-0.341	+/-1.34	2.36	5.00	pCi/L					
Cobalt-58	U	1.00	+/-2.42	4.38	10.0	pCi/L					
Cobalt-60	U	-0.762	+/-1.27	2.21	5.00	pCi/L					
Europium-152	U	3.17	+/-3.99	7.00	20.0	pCi/L					
Europium-154	U	3.21	+/-3.44	6.77	20.0	pCi/L					
Europium-155	U	1.40	+/-4.80	8.61	20.0	pCi/L					
Iridium-192	U	-1.08	+/-3.01	4.49	10.0	pCi/L					
Iron-59	U	-4.07	+/-7.67	12.8	10.0	pCi/L					
Lead-210	U	205	+/-271	430	750	pCi/L					
Lead-212	UI	0.00	+/-2.84	5.11	15.0	pCi/L					
Lead-214	UI	0.00	+/-3.19	5.87	10.0	pCi/L					
Manganese-54	U	0.649	+/-1.46	2.63	5.00	pCi/L					
Mercury-203	U	1.55	+/-4.74	7.37	5.00	pCi/L					
Neodymium-147	U	-19.1	+/-1050	1880	100	pCi/L					
Neptunium-239	U	-2.96	+/-8.34	14.7	25.0	pCi/L					



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## Certificate of Analysis

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 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-1S060906-T  
 Sample ID: 168394011

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	-0.251	+/-1.25	1.91	5.00	pCi/L					
Niobium-95	U	1.96	+/-5.22	9.43	5.00	pCi/L					
Potassium-40	UI	0.00	+/-19.3	41.4	100	pCi/L					
Promethium-144	U	0.0864	+/-1.41	2.50	5.00	pCi/L					
Promethium-146	U	1.63	+/-1.82	3.18	5.00	pCi/L					
Ruthenium-106	U	-0.00623	+/-12.2	21.8	50.0	pCi/L					
Silver-110m	U	-0.43	+/-1.40	2.45	5.00	pCi/L					
Sodium-22	U	1.19	+/-1.27	2.51	5.00	pCi/L					
Thallium-208	U	0.103	+/-2.88	3.00	10.0	pCi/L					
Thorium-230	U	2.33	+/-6.27	6.15	20.0	pCi/L					
Thorium-234	U	45.2	+/-105	114	250	pCi/L					
Tin-113	U	2.46	+/-2.64	4.64	10.0	pCi/L					
Uranium-235	U	1.95	+/-14.1	16.7	50.0	pCi/L					
Uranium-238	U	45.2	+/-105	114	250	pCi/L					
Yttrium-88	U	0.571	+/-1.93	3.64	10.0	pCi/L					
Zinc-65	U	-1.49	+/-3.13	5.23	10.0	pCi/L					
Zirconium-95	U	-2.19	+/-4.52	7.76	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228		1.75	+/-0.890	1.21	3.00	pCi/L		AXD1 09/06/06 1556	557085		3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	0.321	+/-1.36	2.37	2.00	pCi/L		BXF1 08/23/06 2301	557661		4
Strontium-90	U	0.391	+/-0.930	1.84	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	192	+/-283	485	700	pCi/L		DFA1 08/23/06 0818	557040		5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	0.334	+/-17.0	29.5	50.0	pCi/L		EGD1 08/23/06 1538	557039		6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		0.621	+/-0.296	0.366	1.00	pCi/L		DXM 08/30/06 2125	558843		7

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

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**Certificate of Analysis**

Company : Detroit Edison Company–Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-1S060906-T      Project: ROIT00306  
 Sample ID: 168394011      Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			77	(25%-125%)
Uranium-232	Alphaspec U, Liquid			77	(25%-125%)
Uranium-232	Alphaspec U, Liquid			77	(25%-125%)
Uranium-232	Alphaspec U, Liquid			77	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			74	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			89	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			99	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			102	(15%-125%)

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-4D061206-T  
 Sample ID: 168394012  
 Matrix: Ground Water  
 Collect Date: 12-JUN-06 09:58  
 Receive Date: 02-AUG-06  
 Collector: Client

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	3.98				percent		JXG1 09/01/06	0858	556620	1
Uranium-233/234	U	0.302	+/-0.265	0.303	1.00	pCi/L					
Uranium-235/236	U	0.0515	+/-0.136	0.325	1.00	pCi/L					
Uranium-238	U	0.193	+/-0.218	0.303	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	1.56	+/-6.23	12.0	20.0	pCi/L		JPH1 08/28/06	0140	555098	2
Americium-241	U	-10.1	+/-15.5	18.7	25.0	pCi/L					
Antimony-124	U	2.25	+/-8.10	17.2	5.00	pCi/L					
Antimony-125	U	4.55	+/-5.34	10.6	10.0	pCi/L					
Barium-133	U	-0.816	+/-2.72	4.06	5.00	pCi/L					
Barium-140	U	-12.6	+/-364	678	30.0	pCi/L					
Beryllium-7	U	-7.93	+/-35.3	64.8	50.0	pCi/L					
Bismuth-212	U	9.42	+/-15.4	30.3	50.0	pCi/L					
Bismuth-214	UI	0.00	+/-6.40	5.91	10.0	pCi/L					
Cerium-139	U	-0.567	+/-2.49	4.33	5.00	pCi/L					
Cerium-141	U	14.9	+/-17.7	22.7	10.0	pCi/L					
Cerium-144	U	6.10	+/-14.4	26.1	50.0	pCi/L					
Cesium-134	U	-2.29	+/-2.29	3.70	5.00	pCi/L					
Cesium-136	U	-5.68	+/-105	198	15.0	pCi/L					
Cesium-137	U	0.486	+/-1.74	3.35	5.00	pCi/L					
Chromium-51	U	33.1	+/-105	187	50.0	pCi/L					
Cobalt-56	U	1.77	+/-3.36	6.63	5.00	pCi/L					
Cobalt-57	U	-0.269	+/-2.11	3.33	5.00	pCi/L					
Cobalt-58	U	-3.0	+/-3.40	5.57	10.0	pCi/L					
Cobalt-60	U	-0.0658	+/-1.89	3.68	5.00	pCi/L					
Europium-152	U	-2.23	+/-5.75	9.65	20.0	pCi/L					
Europium-154	U	-1.2	+/-5.00	9.48	20.0	pCi/L					
Europium-155	U	-2.62	+/-6.96	12.2	20.0	pCi/L					
Iridium-192	U	1.59	+/-3.60	6.50	10.0	pCi/L					
Iron-59	U	-3.73	+/-10.9	19.0	10.0	pCi/L					
Lead-210	U	247	+/-326	573	750	pCi/L					
Lead-212	U	1.97	+/-5.93	6.30	15.0	pCi/L					
Lead-214	U	2.86	+/-7.53	8.53	10.0	pCi/L					
Manganese-54	U	0.370	+/-2.15	4.04	5.00	pCi/L					
Mercury-203	U	5.54	+/-5.57	10.5	5.00	pCi/L					
Neodymium-147	U	944	+/-1320	2660	100	pCi/L					
Neptunium-239	U	-4.57	+/-12.4	21.7	25.0	pCi/L					

# GENERAL ENGINEERING LABORATORIES, LLC

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-4D061206-T      Project: ROIT00306  
 Sample ID: 168394012                      Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	1.13	+/-1.48	3.02	5.00	pCi/L					
Niobium-95	U	2.29	+/-8.12	15.4	5.00	pCi/L					
Potassium-40	U	17.8	+/-44.7	32.1	100	pCi/L					
Promethium-144	U	-0.525	+/-2.07	3.71	5.00	pCi/L					
Promethium-146	U	0.923	+/-2.56	4.87	5.00	pCi/L					
Ruthenium-106	U	-4.81	+/-19.2	34.6	50.0	pCi/L					
Silver-110m	U	1.07	+/-2.05	4.02	5.00	pCi/L					
Sodium-22	U	-0.445	+/-1.85	3.50	5.00	pCi/L					
Thallium-208	U	3.71	+/-2.29	4.75	10.0	pCi/L					
Thorium-230	UI	0.00	+/-6.40	5.91	20.0	pCi/L					
Thorium-234	UI	0.00	+/-144	144	250	pCi/L					
Tin-113	U	1.06	+/-3.52	6.31	10.0	pCi/L					
Uranium-235	U	13.3	+/-15.9	20.3	50.0	pCi/L					
Uranium-238	UI	0.00	+/-144	144	250	pCi/L					
Yttrium-88	U	1.94	+/-3.16	6.93	10.0	pCi/L					
Zinc-65	U	2.85	+/-5.19	9.93	10.0	pCi/L					
Zirconium-95	U	8.12	+/-11.0	13.5	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228		1.74	+/-0.893	1.25	3.00	pCi/L		AXD1 09/06/06	1556	557085	3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-6.47	+/-1.04	2.39	2.00	pCi/L		BXF1 08/23/06	2301	557661	4
Strontium-90		1.60	+/-0.932	1.60	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	27.0	+/-269	485	700	pCi/L		DFA1 08/23/06	0834	557040	5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	7.43	+/-17.6	30.0	50.0	pCi/L		EGD1 08/23/06	1555	557039	6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		1.64	+/-0.465	0.408	1.00	pCi/L		DXM 08/30/06	2125	558843	7

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

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Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-4D061206-T  
Sample ID: 168394012  
Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			90	(25%-125%)
Uranium-232	Alphaspec U, Liquid			90	(25%-125%)
Uranium-232	Alphaspec U, Liquid			90	(25%-125%)
Uranium-232	Alphaspec U, Liquid			90	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			77	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			96	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			101	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			100	(15%-125%)

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**Certificate of Analysis**

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
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 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID:	EFT-4D061206-T DUP	Project:	ROIT00306
Sample ID:	168394013	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	12-JUN-06 11:08		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	0.00				percent		JXG1 09/01/06	1048	556620	1
Uranium-233/234	U	-0.0572	+/-0.147	0.502	1.00	pCi/L					
Uranium-235/236	U	0.00	+/-0.151	0.231	1.00	pCi/L					
Uranium-238	U	-0.0298	+/-0.0414	0.344	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	3.74	+/-7.60	14.4	20.0	pCi/L		JPH1 08/28/06	0125	555098	2
Americium-241	U	-3.4	+/-12.1	19.0	25.0	pCi/L					
Antimony-124	U	-3.34	+/-11.7	17.5	5.00	pCi/L					
Antimony-125	U	-3.78	+/-5.61	9.36	10.0	pCi/L					
Barium-133	U	-1.99	+/-2.63	4.41	5.00	pCi/L					
Barium-140	U	-120	+/-405	731	30.0	pCi/L					
Beryllium-7	U	-16.7	+/-37.9	64.2	50.0	pCi/L					
Bismuth-212	U	14.4	+/-15.1	30.2	50.0	pCi/L					
Bismuth-214	U	4.33	+/-3.82	7.59	10.0	pCi/L					
Cerium-139	U	-0.219	+/-2.95	4.96	5.00	pCi/L					
Cerium-141	U	7.75	+/-35.4	24.8	10.0	pCi/L					
Cerium-144	U	8.75	+/-16.1	28.4	50.0	pCi/L					
Cesium-134	U	0.934	+/-2.19	4.18	5.00	pCi/L					
Cesium-136	U	19.9	+/-126	245	15.0	pCi/L					
Cesium-137	U	0.588	+/-1.87	3.55	5.00	pCi/L					
Chromium-51	U	38.2	+/-94.0	173	50.0	pCi/L					
Cobalt-56	U	0.684	+/-3.28	6.18	5.00	pCi/L					
Cobalt-57	U	2.47	+/-2.12	3.85	5.00	pCi/L					
Cobalt-58	U	-1.19	+/-3.67	6.49	10.0	pCi/L					
Cobalt-60	U	1.30	+/-1.74	3.72	5.00	pCi/L					
Europium-152	U	2.75	+/-5.65	10.4	20.0	pCi/L					
Europium-154	U	-2.28	+/-5.38	9.63	20.0	pCi/L					
Europium-155	U	2.55	+/-7.63	13.4	20.0	pCi/L					
Iridium-192	U	-0.523	+/-3.52	6.23	10.0	pCi/L					
Iron-59	U	4.40	+/-10.4	20.8	10.0	pCi/L					
Lead-210	U	310	+/-354	606	750	pCi/L					
Lead-212	U	5.15	+/-4.00	7.58	15.0	pCi/L					
Lead-214	U	3.82	+/-4.14	7.81	10.0	pCi/L					
Manganese-54	U	-1.63	+/-2.15	3.60	5.00	pCi/L					
Mercury-203	U	1.22	+/-5.86	10.6	5.00	pCi/L					
Neodymium-147	U	-980	+/-1560	2740	100	pCi/L					
Neptunium-239	U	1.48	+/-12.6	21.9	25.0	pCi/L					

# GENERAL ENGINEERING LABORATORIES, LLC

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-4D061206-T DUP  
 Sample ID: 168394013

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	-1.05	+/-2.08	3.07	5.00	pCi/L					
Niobium-95	U	0.589	+/-8.89	14.3	5.00	pCi/L					
Potassium-40	U	24.9	+/-23.9	45.5	100	pCi/L					
Promethium-144	U	-0.0563	+/-2.08	3.80	5.00	pCi/L					
Promethium-146	U	2.34	+/-2.02	4.29	5.00	pCi/L					
Ruthenium-106	U	1.01	+/-19.6	36.2	50.0	pCi/L					
Silver-110m	U	-1.05	+/-2.09	3.67	5.00	pCi/L					
Sodium-22	U	-0.841	+/-1.99	3.56	5.00	pCi/L					
Thallium-208	U	1.56	+/-3.15	4.47	10.0	pCi/L					
Thorium-230	U	4.33	+/-3.82	7.59	20.0	pCi/L					
Thorium-234	U	42.6	+/-128	157	250	pCi/L					
Tin-113	U	0.305	+/-3.97	7.05	10.0	pCi/L					
Uranium-235	U	12.3	+/-21.9	26.0	50.0	pCi/L					
Uranium-238	U	42.6	+/-128	157	250	pCi/L					
Yttrium-88	U	-3.78	+/-3.17	4.90	10.0	pCi/L					
Zinc-65	U	1.63	+/-4.66	9.20	10.0	pCi/L					
Zirconium-95	U	-0.769	+/-6.52	11.9	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	1.03	+/-0.880	1.39	3.00	pCi/L		AXD1 08/25/06 1717 557086			3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-2.9	+/-1.46	2.75	2.00	pCi/L		BXF1 08/23/06 2301 557661			4
Strontium-90	U	0.492	+/-0.766	1.49	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	142	+/-278	484	700	pCi/L		DFA1 08/23/06 0851 557040			5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	7.58	+/-17.9	30.6	50.0	pCi/L		EGD1 08/23/06 1611 557039			6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		0.935	+/-0.345	0.348	1.00	pCi/L		DXM 08/30/06 2235 558843			7

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**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

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**Certificate of Analysis**

Company : Detroit Edison Company–Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-4D061206-T DUP      Project: ROIT00306  
 Sample ID: 168394013      Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			97	(25%-125%)
Uranium-232	Alphaspec U, Liquid			97	(25%-125%)
Uranium-232	Alphaspec U, Liquid			97	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			84	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			96	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			97	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			98	(15%-125%)



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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID:	EFT-4S061206-T	Project:	ROIT00306
Sample ID:	168394014	Client ID:	ROIT001
Matrix:	Ground Water		
Collect Date:	12-JUN-06 14:22		
Receive Date:	02-AUG-06		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	0.149				percent		JXG1 09/01/06	1048	556620	1
Uranium-233/234		3.89	+/-1.03	0.550	1.00	pCi/L					
Uranium-235/236	U	0.0269	+/-0.256	0.652	1.00	pCi/L					
Uranium-238		2.81	+/-0.867	0.416	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	2.69	+/-11.0	15.7	20.0	pCi/L		JPH1 08/28/06	0141	555098	2
Americium-241	U	21.3	+/-16.2	24.5	25.0	pCi/L					
Antimony-124	U	4.82	+/-9.07	18.3	5.00	pCi/L					
Antimony-125	U	2.41	+/-5.32	10.2	10.0	pCi/L					
Barium-133	U	1.46	+/-2.48	4.35	5.00	pCi/L					
Barium-140	U	-180	+/-349	611	30.0	pCi/L					
Beryllium-7	U	-28.4	+/-41.1	71.0	50.0	pCi/L					
Bismuth-212	U	5.41	+/-15.5	29.3	50.0	pCi/L					
Bismuth-214	U	1.84	+/-4.13	7.73	10.0	pCi/L					
Cerium-139	U	-0.915	+/-2.61	4.52	5.00	pCi/L					
Cerium-141	U	-1.99	+/-14.5	25.5	10.0	pCi/L					
Cerium-144	U	2.11	+/-21.9	27.8	50.0	pCi/L					
Cesium-134	U	0.395	+/-1.99	3.74	5.00	pCi/L					
Cesium-136	U	21.1	+/-157	265	15.0	pCi/L					
Cesium-137	U	0.0429	+/-2.01	3.67	5.00	pCi/L					
Chromium-51	U	73.5	+/-101	185	50.0	pCi/L					
Cobalt-56	U	3.07	+/-3.62	7.20	5.00	pCi/L					
Cobalt-57	U	-0.896	+/-2.02	3.53	5.00	pCi/L					
Cobalt-58	U	0.259	+/-3.29	6.12	10.0	pCi/L					
Cobalt-60	U	1.22	+/-2.09	4.29	5.00	pCi/L					
Europium-152	U	-2.58	+/-5.68	9.43	20.0	pCi/L					
Europium-154	U	2.89	+/-5.18	10.8	20.0	pCi/L					
Europium-155	U	3.22	+/-7.38	13.6	20.0	pCi/L					
Iridium-192	U	-1.84	+/-3.50	5.80	10.0	pCi/L					
Iron-59	U	-2.15	+/-11.3	20.9	10.0	pCi/L					
Lead-210	U	575	+/-618	1040	750	pCi/L					
Lead-212	U	7.19	+/-4.15	7.86	15.0	pCi/L					
Lead-214	U	7.15	+/-7.71	9.01	10.0	pCi/L					
Manganese-54	U	0.357	+/-2.14	3.95	5.00	pCi/L					
Mercury-203	U	1.51	+/-6.26	11.1	5.00	pCi/L					
Neodymium-147	U	-436	+/-1350	2420	100	pCi/L					
Neptunium-239	U	5.11	+/-13.0	23.8	25.0	pCi/L					

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**Certificate of Analysis**

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-4S061206-T      Project: ROIT00306  
 Sample ID: 168394014                      Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	0.467	+/-1.81	3.36	5.00	pCi/L					
Niobium-95	U	-2.91	+/-8.50	14.7	5.00	pCi/L					
Potassium-40	U	30.2	+/-23.6	50.6	100	pCi/L					
Promethium-144	U	-1.98	+/-2.03	3.28	5.00	pCi/L					
Promethium-146	U	1.06	+/-2.18	4.23	5.00	pCi/L					
Ruthenium-106	U	-13.8	+/-18.6	31.3	50.0	pCi/L					
Silver-110m	U	-0.0511	+/-2.21	4.01	5.00	pCi/L					
Sodium-22	U	1.06	+/-1.91	3.98	5.00	pCi/L					
Thallium-208	U	3.02	+/-2.14	4.39	10.0	pCi/L					
Thorium-230	U	1.84	+/-4.12	7.73	20.0	pCi/L					
Thorium-234	U	50.6	+/-151	209	250	pCi/L					
Tin-113	U	1.58	+/-3.60	6.88	10.0	pCi/L					
Uranium-235	U	2.47	+/-13.1	23.5	50.0	pCi/L					
Uranium-238	U	50.6	+/-151	209	250	pCi/L					
Yttrium-88	U	-1.4	+/-2.95	5.40	10.0	pCi/L					
Zinc-65	U	3.96	+/-4.73	9.90	10.0	pCi/L					
Zirconium-95	U	-2.34	+/-6.29	11.0	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	0.0096	+/-0.658	1.28	3.00	pCi/L		AXD1 08/25/06 1717	557086	3	
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-1.04	+/-1.11	2.07	2.00	pCi/L		BXF1 08/23/06 2301	557661	4	
Strontium-90	U	-0.0839	+/-0.769	1.63	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	219	+/-286	485	700	pCi/L		DFA1 08/23/06 0907	557040	5	
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	7.37	+/-17.4	29.8	50.0	pCi/L		EGD1 08/23/06 1627	557039	6	
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226	U	0.358	+/-0.291	0.445	1.00	pCi/L		DXM 08/30/06 2125	558843	7	

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

# GENERAL ENGINEERING LABORATORIES, LLC

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## Certificate of Analysis

Company : Detroit Edison Company--Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-4S061206-T  
Sample ID: 168394014  
Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			90	(25%-125%)
Uranium-232	Alphaspec U, Liquid			90	(25%-125%)
Uranium-232	Alphaspec U, Liquid			90	(25%-125%)
Uranium-232	Alphaspec U, Liquid			90	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			101	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			91	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			96	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			101	(15%-125%)

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2040 Savage Road Charleston SC 29407 – (843) 556-8171 – www.gel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-6S061206-T  
 Sample ID: 168394015  
 Matrix: Ground Water  
 Collect Date: 12-JUN-06 15:15  
 Receive Date: 02-AUG-06  
 Collector: Client

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235		9.09				percent		JXG1 09/01/06	1048	556620	1
Pct Uranium-235	U	0.00				percent		DDR1 09/06/06	1231	565138	2
Uranium-233/234		3.87	+/-1.99	1.26	1.00	pCi/L					
Uranium-235/236	U	0.00	+/-0.635	0.971	1.00	pCi/L					
Uranium-238		2.10	+/-1.45	0.786	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammaspec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	9.86	+/-9.54	17.3	20.0	pCi/L		JPH1 08/28/06	0125	555098	3
Americium-241	U	7.18	+/-14.0	22.5	25.0	pCi/L					
Antimony-124	U	-2.27	+/-8.76	16.5	5.00	pCi/L					
Antimony-125	U	7.13	+/-8.98	10.5	10.0	pCi/L					
Barium-133	U	-1.98	+/-3.06	5.07	5.00	pCi/L					
Barium-140	U	39.9	+/-472	874	30.0	pCi/L					
Beryllium-7	U	-11.6	+/-44.6	81.2	50.0	pCi/L					
Bismuth-212	U	6.34	+/-15.7	30.3	50.0	pCi/L					
Bismuth-214	U	9.57	+/-4.92	10.1	10.0	pCi/L					
Cerium-139	U	-1.18	+/-2.95	5.16	5.00	pCi/L					
Cerium-141	U	14.5	+/-107	30.1	10.0	pCi/L					
Cerium-144	U	27.9	+/-17.7	33.8	50.0	pCi/L					
Cesium-134	U	-0.878	+/-2.81	4.29	5.00	pCi/L					
Cesium-136	U	-94.5	+/-138	228	15.0	pCi/L					
Cesium-137	U	-1.86	+/-2.06	3.46	5.00	pCi/L					
Chromium-51	U	-147	+/-122	195	50.0	pCi/L					
Cobalt-56	U	1.59	+/-4.04	7.67	5.00	pCi/L					
Cobalt-57	U	-1.66	+/-2.28	3.99	5.00	pCi/L					
Cobalt-58	U	-3.45	+/-3.89	6.39	10.0	pCi/L					
Cobalt-60	U	-0.252	+/-1.98	3.78	5.00	pCi/L					
Europium-152	U	-0.524	+/-6.28	10.9	20.0	pCi/L					
Europium-154	U	1.13	+/-6.86	11.9	20.0	pCi/L					
Europium-155	U	3.73	+/-7.96	14.7	20.0	pCi/L					
Iridium-192	U	4.14	+/-4.28	7.95	10.0	pCi/L					
Iron-59	U	2.79	+/-12.9	24.1	10.0	pCi/L					
Lead-210	U	89.9	+/-469	744	750	pCi/L					
Lead-212	U	2.03	+/-6.49	8.73	15.0	pCi/L					
Lead-214	U	0.477	+/-8.83	10.0	10.0	pCi/L					
Manganese-54	U	-0.0265	+/-2.18	4.02	5.00	pCi/L					
Mercury-203	U	-3.03	+/-8.01	12.1	5.00	pCi/L					
Neodymium-147	U	-1240	+/-1700	2960	100	pCi/L					

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: EFT-6S061206-T  
 Sample ID: 168394015  
 Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Neptunium-239	U	-2.89	+/-14.1	25.2	25.0	pCi/L					
Niobium-94	U	0.831	+/-1.91	3.64	5.00	pCi/L					
Niobium-95	U	0.689	+/-9.07	16.7	5.00	pCi/L					
Potassium-40	U	34.9	+/-27.3	57.6	100	pCi/L					
Promethium-144	U	0.0655	+/-2.05	3.80	5.00	pCi/L					
Promethium-146	U	-0.601	+/-3.08	5.22	5.00	pCi/L					
Ruthenium-106	U	5.73	+/-19.0	36.4	50.0	pCi/L					
Silver-110m	U	0.755	+/-2.20	4.23	5.00	pCi/L					
Sodium-22	U	0.382	+/-2.53	4.37	5.00	pCi/L					
Thallium-208	U	2.07	+/-2.57	4.99	10.0	pCi/L					
Thorium-230	U	9.57	+/-4.91	10.1	20.0	pCi/L					
Thorium-234	U	82.7	+/-147	173	250	pCi/L					
Tin-113	U	0.860	+/-4.45	7.83	10.0	pCi/L					
Uranium-235	U	15.3	+/-17.8	27.9	50.0	pCi/L					
Uranium-238	U	82.7	+/-147	173	250	pCi/L					
Yttrium-88	U	0.784	+/-2.96	6.18	10.0	pCi/L					
Zinc-65	U	0.386	+/-5.30	8.68	10.0	pCi/L					
Zirconium-95	U	-1.61	+/-6.92	12.5	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	0.841	+/-0.696	1.08	3.00	pCi/L		AXD1 08/25/06 1717 557086			4
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-2.35	+/-1.20	2.35	2.00	pCi/L		BXF1 08/23/06 2301 557661			5
Strontium-90	U	0.826	+/-0.927	1.74	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	282	+/-291	484	700	pCi/L		DFA1 08/23/06 0923 557040			6
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	11.4	+/-17.9	30.3	50.0	pCi/L		EGD1 08/23/06 1643 557039			7
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		0.331	+/-0.229	0.305	1.00	pCi/L		DXM 08/30/06 2125 558843			8

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**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 901.1	

**GENERAL ENGINEERING LABORATORIES, LLC**  
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**Certificate of Analysis**

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: EFT-6S061206-T      Project: ROIT00306  
 Sample ID: 168394015                      Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
4	EPA 904.0 Modified										
5	EPA 905.0 Modified										
6	EPA 906.0 Modified										
7	DOE EML HASL-300, Tc-02-RC Modified										
8	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			1*	(25%-125%)
Uranium-232	Alphaspec U, Liquid			47	(25%-125%)
Uranium-232	Alphaspec U, Liquid			47	(25%-125%)
Uranium-232	Alphaspec U, Liquid			47	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			92	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			82	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			98	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			99	(15%-125%)

# GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 – (843) 556-8171 – www.geel.com

## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: BKG-NTC061306-T  
 Sample ID: 168394016  
 Matrix: Ground Water  
 Collect Date: 13-JUN-06 09:27  
 Receive Date: 02-AUG-06  
 Collector: Client

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	1.07				percent		JXG1 09/01/06	1048	556620	1
Uranium-233/234		1.03	+/-0.507	0.399	1.00	pCi/L					
Uranium-235/236	U	0.021	+/-0.159	0.458	1.00	pCi/L					
Uranium-238		0.303	+/-0.266	0.182	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	1.73	+/-9.13	15.4	20.0	pCi/L		JPH1 08/28/06	0141	555098	2
Americium-241	U	-9.03	+/-12.2	18.5	25.0	pCi/L					
Antimony-124	U	7.94	+/-10.3	22.3	5.00	pCi/L					
Antimony-125	U	0.578	+/-5.32	9.56	10.0	pCi/L					
Barium-133	U	0.146	+/-2.58	4.60	5.00	pCi/L					
Barium-140	U	-3.66	+/-374	695	30.0	pCi/L					
Beryllium-7	U	3.20	+/-42.2	66.3	50.0	pCi/L					
Bismuth-212	U	5.94	+/-15.9	30.4	50.0	pCi/L					
Bismuth-214	U	1.59	+/-7.21	8.69	10.0	pCi/L					
Cerium-139	U	-0.121	+/-2.53	4.29	5.00	pCi/L					
Cerium-141	U	6.23	+/-14.2	24.9	10.0	pCi/L					
Cerium-144	U	-2.03	+/-14.9	25.5	50.0	pCi/L					
Cesium-134	U	1.96	+/-2.12	4.33	5.00	pCi/L					
Cesium-136	U	217	+/-150	273	15.0	pCi/L					
Cesium-137	U	0.192	+/-1.97	3.67	5.00	pCi/L					
Chromium-51	U	-89.3	+/-98.6	165	50.0	pCi/L					
Cobalt-56	U	0.763	+/-4.66	7.47	5.00	pCi/L					
Cobalt-57	U	1.17	+/-2.25	3.55	5.00	pCi/L					
Cobalt-58	U	1.24	+/-3.05	6.05	10.0	pCi/L					
Cobalt-60	U	-0.419	+/-2.96	4.60	5.00	pCi/L					
Europium-152	U	-4.83	+/-5.65	9.40	20.0	pCi/L					
Europium-154	U	-0.628	+/-5.77	10.8	20.0	pCi/L					
Europium-155	U	3.91	+/-7.39	13.2	20.0	pCi/L					
Iridium-192	U	0.0277	+/-3.40	6.10	10.0	pCi/L					
Iron-59	U	-4.8	+/-10.8	19.4	10.0	pCi/L					
Lead-210	U	219	+/-325	553	750	pCi/L					
Lead-212	U	0.488	+/-5.76	7.29	15.0	pCi/L					
Lead-214	U	0.313	+/-4.25	7.58	10.0	pCi/L					
Manganese-54	U	-0.673	+/-2.33	4.10	5.00	pCi/L					
Mercury-203	U	-0.773	+/-5.51	9.81	5.00	pCi/L					
Neodymium-147	U	-818	+/-1340	2370	100	pCi/L					
Neptunium-239	U	8.15	+/-12.7	22.7	25.0	pCi/L					

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: BKG-NTC061306-T  
 Sample ID: 168394016

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammaspec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	-0.725	+/-1.74	3.06	5.00	pCi/L					
Niobium-95	U	-0.427	+/-8.39	15.3	5.00	pCi/L					
Potassium-40	U	24.5	+/-25.4	52.0	100	pCi/L					
Promethium-144	U	0.725	+/-2.25	3.78	5.00	pCi/L					
Promethium-146	U	-0.74	+/-2.57	4.43	5.00	pCi/L					
Ruthenium-106	U	-3.67	+/-21.4	38.7	50.0	pCi/L					
Silver-110m	U	0.575	+/-2.26	4.26	5.00	pCi/L					
Sodium-22	U	-0.218	+/-2.13	3.99	5.00	pCi/L					
Thallium-208	U	0.857	+/-2.69	4.45	10.0	pCi/L					
Thorium-230	U	1.59	+/-7.21	8.69	20.0	pCi/L					
Thorium-234	U	44.0	+/-130	170	250	pCi/L					
Tin-113	U	1.28	+/-3.80	6.91	10.0	pCi/L					
Uranium-235	U	-12.9	+/-15.2	21.7	50.0	pCi/L					
Uranium-238	U	44.0	+/-130	170	250	pCi/L					
Yttrium-88	U	1.27	+/-3.25	6.84	10.0	pCi/L					
Zinc-65	U	-1.76	+/-4.92	8.91	10.0	pCi/L					
Zirconium-95	U	-3.46	+/-6.79	11.8	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	0.726	+/-0.728	1.18	3.00	pCi/L		AXD1 08/25/06 1717 557086		3	
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-2.72	+/-1.17	2.30	2.00	pCi/L		BXF1 08/23/06 2301 557661		4	
Strontium-90	U	-0.909	+/-1.08	2.35	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	89.8	+/-272	482	700	pCi/L		DFA1 08/23/06 0939 557040		5	
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	8.30	+/-19.6	33.5	50.0	pCi/L		EGD1 08/23/06 1659 557039		6	
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		0.573	+/-0.289	0.349	1.00	pCi/L		DXM 08/30/06 2200 558843		7	

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**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	



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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: BKG-NTC061306-T  
Sample ID: 168394016

Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			101	(25%-125%)
Uranium-232	Alphaspec U, Liquid			101	(25%-125%)
Uranium-232	Alphaspec U, Liquid			101	(25%-125%)
Uranium-232	Alphaspec U, Liquid			101	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			91	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			91	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			99	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			89	(15%-125%)

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**Certificate of Analysis**

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: BKG-PAP061306-T  
 Sample ID: 168394017  
 Matrix: Ground Water  
 Collect Date: 13-JUN-06 12:07  
 Receive Date: 02-AUG-06  
 Collector: Client

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	1.38				percent		JXG1 09/01/06	1048	556620	1
Uranium-233/234		2.82	+/-0.949	0.586	1.00	pCi/L					
Uranium-235/236	U	0.270	+/-0.336	0.469	1.00	pCi/L					
Uranium-238		2.99	+/-0.973	0.555	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammasespec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	7.35	+/-7.10	13.3	20.0	pCi/L		JPH1 08/28/06	0125	555098	2
Americium-241	U	-1.47	+/-10.4	18.8	25.0	pCi/L					
Antimony-124	U	-0.708	+/-11.4	18.5	5.00	pCi/L					
Antimony-125	U	1.80	+/-5.36	10.1	10.0	pCi/L					
Barium-133	U	-0.00468	+/-2.09	3.89	5.00	pCi/L					
Barium-140	U	72.4	+/-308	586	30.0	pCi/L					
Beryllium-7	U	-5.27	+/-36.3	65.9	50.0	pCi/L					
Bismuth-212	U	8.67	+/-13.6	26.9	50.0	pCi/L					
Bismuth-214	U	4.35	+/-7.11	8.12	10.0	pCi/L					
Cerium-139	U	0.383	+/-2.24	3.96	5.00	pCi/L					
Cerium-141	U	2.92	+/-13.1	23.3	10.0	pCi/L					
Cerium-144	U	5.19	+/-14.8	26.5	50.0	pCi/L					
Cesium-134	U	1.94	+/-2.26	4.47	5.00	pCi/L					
Cesium-136	U	17.6	+/-107	211	15.0	pCi/L					
Cesium-137	U	-0.273	+/-2.00	3.58	5.00	pCi/L					
Chromium-51	U	24.4	+/-93.3	164	50.0	pCi/L					
Cobalt-56	U	1.38	+/-2.91	6.36	5.00	pCi/L					
Cobalt-57	U	-0.217	+/-1.73	3.05	5.00	pCi/L					
Cobalt-58	U	1.63	+/-3.12	6.16	10.0	pCi/L					
Cobalt-60	U	0.120	+/-1.96	3.36	5.00	pCi/L					
Europium-152	U	-2.99	+/-5.00	8.85	20.0	pCi/L					
Europium-154	U	1.87	+/-4.94	10.1	20.0	pCi/L					
Europium-155	U	-1.34	+/-6.92	12.2	20.0	pCi/L					
Iridium-192	U	0.0702	+/-3.35	5.79	10.0	pCi/L					
Iron-59	U	1.05	+/-9.41	18.5	10.0	pCi/L					
Lead-210	U	262	+/-313	549	750	pCi/L					
Lead-212	UI	0.00	+/-6.68	7.32	15.0	pCi/L					
Lead-214	U	2.04	+/-4.45	6.74	10.0	pCi/L					
Manganese-54	U	-0.712	+/-1.74	3.02	5.00	pCi/L					
Mercury-203	U	3.37	+/-5.50	9.93	5.00	pCi/L					
Neodymium-147	U	-155	+/-1110	2030	100	pCi/L					
Neptunium-239	U	9.85	+/-10.9	20.3	25.0	pCi/L					

# GENERAL ENGINEERING LABORATORIES, LLC

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: BKG-PAP061306-T  
 Sample ID: 168394017

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	0.910	+/-1.60	3.09	5.00	pCi/L					
Niobium-95	U	9.13	+/-7.95	15.0	5.00	pCi/L					
Potassium-40	U	6.91	+/-22.7	39.4	100	pCi/L					
Promethium-144	U	3.17	+/-2.00	4.17	5.00	pCi/L					
Promethium-146	U	1.85	+/-2.20	4.36	5.00	pCi/L					
Ruthenium-106	U	-5.44	+/-19.2	34.0	50.0	pCi/L					
Silver-110m	U	0.193	+/-2.12	3.90	5.00	pCi/L					
Sodium-22	U	0.684	+/-1.82	3.71	5.00	pCi/L					
Thallium-208	U	0.0761	+/-3.66	4.36	10.0	pCi/L					
Thorium-230	U	4.35	+/-7.11	6.80	20.0	pCi/L					
Thorium-234	U	39.0	+/-148	160	250	pCi/L					
Tin-113	U	-0.538	+/-3.24	5.90	10.0	pCi/L					
Uranium-235	U	7.54	+/-12.3	22.4	50.0	pCi/L					
Uranium-238	U	39.0	+/-148	160	250	pCi/L					
Yttrium-88	U	-0.838	+/-2.76	5.06	10.0	pCi/L					
Zinc-65	U	-2.54	+/-4.00	7.01	10.0	pCi/L					
Zirconium-95	U	0.168	+/-6.20	11.4	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	0.985	+/-0.802	1.26	3.00	pCi/L		AXD1 08/25/06 1717 557086			3
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	0.287	+/-1.32	2.29	2.00	pCi/L		BXF1 08/23/06 2301 557661			4
Strontium-90	U	0.0186	+/-1.15	2.34	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	38.5	+/-270	485	700	pCi/L		DFA1 08/23/06 0956 557040			5
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	7.99	+/-18.9	32.3	50.0	pCi/L		EGD1 08/23/06 1715 557039			6
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226	U	0.408	+/-0.283	0.412	1.00	pCi/L		DXM 08/30/06 2200 558843			7

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

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## Certificate of Analysis

Company : Detroit Edison Company--Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: BKG-PAP061306-T  
Sample ID: 168394017  
Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			84	(25%-125%)
Uranium-232	Alphaspec U, Liquid			84	(25%-125%)
Uranium-232	Alphaspec U, Liquid			84	(25%-125%)
Uranium-232	Alphaspec U, Liquid			84	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			97	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			91	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			99	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			93	(15%-125%)

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
 Address : 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: **Fermi 1 Radiochemistry Waters**

Report Date: September 12, 2006

Client Sample ID: BKG-RANGE061306-T  
 Sample ID: 168394018  
 Matrix: Ground Water  
 Collect Date: 13-JUN-06 14:25  
 Receive Date: 02-AUG-06  
 Collector: Client

Project: ROIT00306  
 Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Alpha Spec Analysis</b>											
<i>Alphaspec U, Liquid</i>											
Pct Uranium-235	U	1.78				percent		JXG1 09/01/06	1048	556620	1
Uranium-233/234		1.16	+/-0.530	0.297	1.00	pCi/L					
Uranium-235/236	U	0.135	+/-0.215	0.367	1.00	pCi/L					
Uranium-238		1.16	+/-0.530	0.297	1.00	pCi/L					
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Actinium-228	U	5.15	+/-7.00	13.9	20.0	pCi/L		JPH1 08/28/06	0126	555098	2
Americium-241	U	-5.09	+/-12.0	18.9	25.0	pCi/L					
Antimony-124	U	2.65	+/-9.41	19.0	5.00	pCi/L					
Antimony-125	U	4.73	+/-4.73	9.27	10.0	pCi/L					
Barium-133	U	-0.789	+/-2.26	3.52	5.00	pCi/L					
Barium-140	U	-160	+/-309	533	30.0	pCi/L					
Beryllium-7	U	57.2	+/-49.3	62.6	50.0	pCi/L					
Bismuth-212	U	-7.99	+/-17.2	24.9	50.0	pCi/L					
Bismuth-214	U	4.95	+/-3.83	7.51	10.0	pCi/L					
Cerium-139	U	0.903	+/-2.44	4.30	5.00	pCi/L					
Cerium-141	U	7.84	+/-14.2	25.3	10.0	pCi/L					
Cerium-144	U	1.19	+/-13.8	24.2	50.0	pCi/L					
Cesium-134	U	0.126	+/-2.04	3.68	5.00	pCi/L					
Cesium-136	U	35.7	+/-122	210	15.0	pCi/L					
Cesium-137	U	0.280	+/-1.90	3.45	5.00	pCi/L					
Chromium-51	U	-13.8	+/-85.7	155	50.0	pCi/L					
Cobalt-56	U	-0.396	+/-2.68	5.04	5.00	pCi/L					
Cobalt-57	U	0.840	+/-1.79	3.22	5.00	pCi/L					
Cobalt-58	U	3.46	+/-3.32	6.88	10.0	pCi/L					
Cobalt-60	U	-1.08	+/-2.02	3.48	5.00	pCi/L					
Europium-152	U	-0.365	+/-5.04	9.16	20.0	pCi/L					
Europium-154	U	2.15	+/-5.90	10.2	20.0	pCi/L					
Europium-155	U	3.10	+/-6.64	12.0	20.0	pCi/L					
Iridium-192	U	-0.542	+/-3.02	5.48	10.0	pCi/L					
Iron-59	U	4.40	+/-11.2	15.2	10.0	pCi/L					
Lead-210	U	258	+/-308	532	750	pCi/L					
Lead-212	U	0.880	+/-6.08	7.19	15.0	pCi/L					
Lead-214	U	3.20	+/-10.0	7.24	10.0	pCi/L					
Manganese-54	U	1.10	+/-2.28	3.97	5.00	pCi/L					
Mercury-203	U	5.48	+/-5.54	10.1	5.00	pCi/L					
Neodymium-147	U	1250	+/-1230	2430	100	pCi/L					
Neptunium-239	U	2.86	+/-11.9	21.2	25.0	pCi/L					

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## Certificate of Analysis

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 6400 N. Dixie HWY.  
 Newport, Michigan 48166  
 Contact: Lynne Goodman  
 Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: BKG-RANGE061306-T      Project: ROIT00306  
 Sample ID: 168394018                              Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Gamma Spec Analysis</b>											
<i>Gammascpec, Gamma, Liquid (Standard List)</i>											
Niobium-94	U	-0.922	+/-1.73	2.91	5.00	pCi/L					
Niobium-95	U	3.59	+/-7.33	13.8	5.00	pCi/L					
Potassium-40	U	18.9	+/-21.9	44.1	100	pCi/L					
Promethium-144	U	0.785	+/-2.08	3.82	5.00	pCi/L					
Promethium-146	U	1.13	+/-2.44	4.55	5.00	pCi/L					
Ruthenium-106	U	11.7	+/-16.3	31.7	50.0	pCi/L					
Silver-110m	U	-0.951	+/-2.18	3.73	5.00	pCi/L					
Sodium-22	U	0.806	+/-2.18	3.79	5.00	pCi/L					
Thallium-208	U	0.481	+/-1.99	3.66	10.0	pCi/L					
Thorium-230	U	4.95	+/-3.83	7.51	20.0	pCi/L					
Thorium-234	U	175	+/-103	181	250	pCi/L					
Tin-113	U	-2.22	+/-3.01	5.18	10.0	pCi/L					
Uranium-235	U	6.12	+/-13.2	23.5	50.0	pCi/L					
Uranium-238	U	175	+/-103	181	250	pCi/L					
Yttrium-88	U	0.624	+/-2.48	5.20	10.0	pCi/L					
Zinc-65	U	-2.16	+/-4.26	7.48	10.0	pCi/L					
Zirconium-95	U	0.590	+/-6.05	11.0	10.0	pCi/L					
<b>Rad Gas Flow Proportional Counting</b>											
<i>GFPC, Ra228, Liquid</i>											
Radium-228	U	-0.136	+/-0.450	0.837	3.00	pCi/L		AXD1 08/28/06 1826 557086		3	
<i>GFPC, Sr89&amp;Sr90, Liquid</i>											
Strontium-89	U	-4.65	+/-1.02	2.01	2.00	pCi/L		BXF1 08/24/06 2310 557661		4	
Strontium-90	U	1.13	+/-1.12	2.11	2.00	pCi/L					
<b>Rad Liquid Scintillation Analysis</b>											
<i>LSC, Tritium Dist, Liquid</i>											
Tritium	U	116	+/-277	485	700	pCi/L		DFA1 08/23/06 1012 557040		5	
<i>Liquid Scint Tc99, Liquid</i>											
Technetium-99	U	1.30	+/-17.2	29.7	50.0	pCi/L		EGD1 08/23/06 1732 557039		6	
<b>Rad Radium-226</b>											
<i>Lucas Cell, Ra226, liquid</i>											
Radium-226		1.42	+/-0.644	0.792	1.00	pCi/L		DXM 08/30/06 2315 558843		7	

2

**The following Analytical Methods were performed**

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	EPA 901.1	
3	EPA 904.0 Modified	
4	EPA 905.0 Modified	

# GENERAL ENGINEERING LABORATORIES, LLC

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## Certificate of Analysis

Company : Detroit Edison Company-Fermi 1  
Address : 110 AIB  
6400 N. Dixie HWY.  
Newport, Michigan 48166  
Contact: Lynne Goodman  
Project: Fermi 1 Radiochemistry Waters

Report Date: September 12, 2006

Client Sample ID: BKG-RANGE061306-T  
Sample ID: 168394018  
Project: ROIT00306  
Client ID: ROIT001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
5	EPA 906.0 Modified										
6	DOE EML HASL-300, Tc-02-RC Modified										
7	EPA 903.1 Modified										

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232	Alphaspec U, Liquid			102	(25%-125%)
Uranium-232	Alphaspec U, Liquid			102	(25%-125%)
Uranium-232	Alphaspec U, Liquid			102	(25%-125%)
Radium-228	GFPC, Ra228, Liquid			82	(15%-125%)
Strontium-89	GFPC, Sr89&Sr90, Liquid			95	(25%-125%)
Strontium-90	GFPC, Sr89&Sr90, Liquid			97	(25%-125%)
Technetium-99	Liquid Scint Tc99, Liquid			101	(15%-125%)

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**QC Summary**

Report Date: September 12, 2006  
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Detroit Edison Company-Fermi 1  
 110 AIB  
 6400 N. Dixie HWY.  
 Newport, Michigan

Contact: Lynne Goodman  
 Workorder: 168394

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Alpha Spec</b>											
Batch	556620										
QC1201155334	168394001	DUP									
Pct Uranium-235	U	3.05	U	-0.982	percent	390			JXG1	09/01/06	10:48
Uranium-233/234		1.56		1.92	pCi/L	21*		(0%-20%)			
		+/-0.667		+/-0.730							
Uranium-235/236	U	0.281	U	-0.0951	pCi/L	405*		(0%-20%)			
		+/-0.318		+/-0.0834							
Uranium-238		1.39		1.52	pCi/L	9		(0%-20%)			
		+/-0.612		+/-0.692							
QC1201155336	LCS										
Pct Uranium-235				0.484	percent						
Uranium-233/234				24.0	pCi/L			(75%-125%)			
				+/-2.84							
Uranium-235/236				0.914	pCi/L			(75%-125%)			
				+/-0.635							
Uranium-238	26.1			29.2	pCi/L		112	(75%-125%)			
				+/-3.12							
QC1201155333	MB										
Pct Uranium-235			U	-36.8	percent						
Uranium-233/234			U	-0.112	pCi/L						
				+/-0.172							
Uranium-235/236			U	0.0237	pCi/L						
				+/-0.180							
Uranium-238			U	-0.0137	pCi/L						
				+/-0.152							
QC1201155335	168394001	MS									
Pct Uranium-235	U	3.05		0.956	percent						
Uranium-233/234		1.56		25.8	pCi/L			(75%-125%)			
		+/-0.667		+/-2.55							
Uranium-235/236	U	0.281		1.67	pCi/L			(75%-125%)			
		+/-0.318		+/-0.722							
Uranium-238	26.1	1.39		26.9	pCi/L		98	(75%-125%)			
		+/-0.612		+/-2.59							
Batch	565138										
QC1201175351	168394009	DUP									
Pct Uranium-235	U	13.2	U	0.00	percent				DDR1	09/06/06	12:31
Uranium-233/234	U	0.069	U	0.213	pCi/L	102*		(0%-20%)			
		+/-0.275		+/-0.400							
Uranium-235/236	U	0.328	U	0.00	pCi/L	0		(0%-20%)			
		+/-0.455		+/-0.340							
Uranium-238	U	0.334	U	0.00	pCi/L	0		(0%-20%)			
		+/-0.459		+/-0.275							
QC1201175353	LCS										
Pct Uranium-235				1.15	percent						



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## QC Summary

Workorder: 168394

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Parname	NOM	Sample	Qual	QC	Units	RPD %	REC%	Range	Anlst	Date	Time
<b>Rad Alpha Spec</b>											
Batch	565138										
Uranium-233/234				72.3 +/-6.46	pCi/L			(75%-125%)			
Uranium-235/236				5.15 +/-1.93	pCi/L			(75%-125%)	DDR1	09/06/06	12:31
Uranium-238	65.2			68.8 +/-6.30	pCi/L		106	(75%-125%)			
QC1201175350	MB										
Pct Uranium-235			U	82.9	percent					09/06/06	17:18
Uranium-233/234			U	-0.089 +/-0.318	pCi/L						
Uranium-235/236			U	-0.0539 +/-0.106	pCi/L						
Uranium-238			U	-0.00173 +/-0.294	pCi/L						
QC1201175352	168394009 MS										
Pct Uranium-235		U	13.2	0.651	percent					09/06/06	12:31
Uranium-233/234		U	0.069 +/-0.275	61.2 +/-6.52	pCi/L			(75%-125%)			
Uranium-235/236		U	0.328 +/-0.455	2.68 +/-1.52	pCi/L			(75%-125%)			
Uranium-238	65.2	U	0.334 +/-0.459	63.6 +/-6.64	pCi/L		98	(75%-125%)			
<b>Rad Gamma Spec</b>											
Batch	555098										
QC1201151754	168394001 DUP										
Actinium-228		U	7.00 +/-3.71	4.78 +/-6.33	pCi/L	38*		(0%-20%)	JPH1	08/28/06	01:42
Americium-241		U	0.706 +/-6.00	-24.7 +/-14.6	pCi/L	212*		(0%-20%)			
Antimony-124		U	-1.63 +/-5.15	4.79 +/-9.13	pCi/L	406*		(0%-20%)			
Antimony-125		U	0.382 +/-2.96	-0.186 +/-6.35	pCi/L	578*		(0%-20%)			
Barium-133		U	-1.63 +/-1.42	-1.65 +/-2.76	pCi/L	1		(0%-20%)			
Barium-140		U	203 +/-287	-193 +/-469	pCi/L	8260*		(0%-20%)			
Beryllium-7		U	11.1 +/-21.6	-15.4 +/-40.7	pCi/L	1240*		(0%-20%)			
Bismuth-212		U	3.26 +/-8.89	0.675 +/-14.9	pCi/L	131*		(0%-20%)			
Bismuth-214		UI	0.00 +/-2.26	2.05 +/-5.27	pCi/L	93*		(0%-20%)			
Cerium-139		U	0.601 +/-1.45	0.980 +/-2.79	pCi/L	48*		(0%-20%)			
Cerium-141		U	5.19 +/-8.95	1.86 +/-27.2	pCi/L	95*		(0%-20%)			
Cerium-144		U	5.91	-7.86	pCi/L	1410*		(0%-20%)			

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## QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 555098											
Cesium-134	U	+/-8.39 0.444	U	+/-16.1 -0.181	pCi/L	476*		(0%-20%)	JPH1	08/28/06	01:42
Cesium-136	U	+/-1.16 21.9	U	+/-2.31 69.9	pCi/L	105*		(0%-20%)			
Cesium-137	U	+/-93.8 0.186	U	+/-191 0.324	pCi/L	54*		(0%-20%)			
Chromium-51	U	+/-1.07 75.1	U	+/-2.07 96.7	pCi/L	25*		(0%-20%)			
Cobalt-56	U	+/-63.3 0.636	U	+/-124 -0.0549	pCi/L	238*		(0%-20%)			
Cobalt-57	U	+/-2.01 0.249	U	+/-3.40 -1.47	pCi/L	282*		(0%-20%)			
Cobalt-58	U	+/-1.09 -0.675	UI	+/-2.42 0.00	pCi/L	231*		(0%-20%)			
Cobalt-60	U	+/-2.11 0.031	U	+/-3.88 0.745	pCi/L	184*		(0%-20%)			
Europium-152	U	+/-1.15 -0.861	U	+/-2.12 1.85	pCi/L	549*		(0%-20%)			
Europium-154	U	+/-3.18 0.429	U	+/-5.74 1.68	pCi/L	119*		(0%-20%)			
Europium-155	U	+/-2.94 0.550	U	+/-4.92 -1.49	pCi/L	434*		(0%-20%)			
Iridium-192	U	+/-3.97 -0.448	U	+/-7.55 -0.146	pCi/L	102*		(0%-20%)			
Iron-59	U	+/-2.07 0.541	U	+/-4.13 0.463	pCi/L	16		(0%-20%)			
Lead-210	U	+/-6.56 198	U	+/-11.2 393	pCi/L	66*		(0%-20%)			
Lead-212	U	+/-196 0.375	U	+/-342 2.04	pCi/L	138*		(0%-20%)			
Lead-214	U	+/-4.51 4.14	U	+/-6.15 0.646	pCi/L	146*		(0%-20%)			
Manganese-54	U	+/-2.38 0.0215	U	+/-4.37 -1.21	pCi/L	207*		(0%-20%)			
Mercury-203	U	+/-1.08 1.30	U	+/-2.01 3.99	pCi/L	102*		(0%-20%)			
Neodymium-147	U	+/-3.61 486	U	+/-6.96 79.6	pCi/L	144*		(0%-20%)			
Neptunium-239	U	+/-1010 1.24	U	+/-2080 -13	pCi/L	242*		(0%-20%)			
Niobium-94	U	+/-6.82 -0.316	U	+/-13.7 -0.302	pCi/L	5		(0%-20%)			
Niobium-95	U	+/-1.05 0.996	U	+/-1.61 -0.702	pCi/L	1160*		(0%-20%)			
Potassium-40	U	+/-4.52 15.6	U	+/-8.47 7.10	pCi/L	75*		(0%-20%)			
		+/-24.9		+/-35.0							

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## QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gamma Spec</b>											
Batch	555098										
Promethium-144	U	-0.276	U	0.945	pCi/L	365*		(0%-20%)			
		+/-1.11		+/-2.02							
Promethium-146	U	-0.586	U	-0.587	pCi/L	0		(0%-20%)	JPH1	08/28/06	01:42
		+/-1.34		+/-2.68							
Ruthenium-106	U	-0.234	U	-13.4	pCi/L	193*		(0%-20%)			
		+/-10.4		+/-18.8							
Silver-110m	U	-0.496	U	0.475	pCi/L	9520*		(0%-20%)			
		+/-1.18		+/-2.34							
Sodium-22	U	0.156	U	0.618	pCi/L	119*		(0%-20%)			
		+/-1.09		+/-1.82							
Thallium-208	U	0.430	U	2.63	pCi/L	144*		(0%-20%)			
		+/-2.39		+/-2.23							
Thorium-230	UI	0.00	U	2.05	pCi/L	93*		(0%-20%)			
		+/-2.26		+/-5.27							
Thorium-234	U	23.4	U	141	pCi/L	143*		(0%-20%)			
		+/-84.4		+/-156							
Tin-113	U	1.63	U	-1.31	pCi/L	1820*		(0%-20%)			
		+/-2.83		+/-3.78							
Uranium-235	U	4.39	U	5.68	pCi/L	26*		(0%-20%)			
		+/-7.50		+/-21.0							
Uranium-238	U	23.4	U	141	pCi/L	143*		(0%-20%)			
		+/-84.4		+/-156							
Yttrium-88	U	-0.464	U	1.05	pCi/L	515*		(0%-20%)			
		+/-1.79		+/-2.78							
Zinc-65	U	-1.31	U	-3.16	pCi/L	83*		(0%-20%)			
		+/-2.81		+/-4.80							
Zirconium-95	U	-3.6	U	9.52	pCi/L	443*		(0%-20%)			
		+/-3.95		+/-22.9							
QC1201151756	LCS										
Actinium-228				52.8	pCi/L					08/28/06	16:00
				+/-57.1							
Americium-241	1140			1320	pCi/L		116	(75%-125%)			
				+/-185							
Antimony-124			U	-7.02	pCi/L						
				+/-16.4							
Antimony-125			U	-10.7	pCi/L						
				+/-28.1							
Barium-133			U	-10.1	pCi/L						
				+/-15.3							
Barium-140			U	48.8	pCi/L						
				+/-78.6							
Beryllium-7			U	-36.9	pCi/L						
				+/-100							
Bismuth-212			U	3.43	pCi/L						
				+/-78.3							
Bismuth-214			U	-4.14	pCi/L						
				+/-20.8							
Cerium-139				190	pCi/L						

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## QC Summary

Workorder: 168394

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec Batch 555098											
Cerium-141			U	+/-24.7 4.89	pCi/L				JPH1	08/28/06	16:00
Cerium-144			U	+/-20.9 30.2	pCi/L						
Cesium-134			U	+/-81.2 0.903	pCi/L						
Cesium-136			U	+/-11.0 -6.83	pCi/L						
Cesium-137	465			+/-32.1 513	pCi/L		110	(75%-125%)			
Chromium-51			U	+/-47.1 -23.4	pCi/L						
Cobalt-56			U	+/-107 -2.18	pCi/L						
Cobalt-57				+/-12.5 221	pCi/L						
Cobalt-58			U	+/-24.8 -3.7	pCi/L						
Cobalt-60	707			+/-13.0 711	pCi/L		101	(75%-125%)			
Europium-152			U	+/-58.1 -28.4	pCi/L						
Europium-154			U	+/-29.6 -0.195	pCi/L						
Europium-155			U	+/-21.4 25.5	pCi/L						
Iridium-192			U	+/-41.6 3.10	pCi/L						
Iron-59			U	+/-10.1 -6.32	pCi/L						
Lead-210			U	+/-26.4 172	pCi/L						
Lead-212			U	+/-1290 12.1	pCi/L						
Lead-214			U	+/-24.5 18.5	pCi/L						
Manganese-54			U	+/-25.6 1.48	pCi/L						
Mercury-203				+/-10.6 22.5	pCi/L						
Neodymium-147			U	+/-21.6 7.79	pCi/L						
Neptunium-239			U	+/-161 -8.87	pCi/L						
Niobium-94			U	+/-87.1 0.109	pCi/L						
				+/-9.37							

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## QC Summary

Workorder: 168394

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gamma Spec</b>											
Batch	555098										
Niobium-95			U	12.3 +/-12.3	pCi/L						
Potassium-40			U	-17.6 +/-100	pCi/L				JPH1	08/28/06	16:00
Promethium-144			U	4.55 +/-9.84	pCi/L						
Promethium-146			U	5.41 +/-13.7	pCi/L						
Ruthenium-106			U	39.4 +/-92.0	pCi/L						
Silver-110m			U	-11.3 +/-13.3	pCi/L						
Sodium-22			U	-0.144 +/-7.66	pCi/L						
Thallium-208			U	1.44 +/-11.2	pCi/L						
Thorium-230			U	-4.14 +/-20.8	pCi/L						
Thorium-234			U	-909 +/-581	pCi/L						
113				260 +/-32.2	pCi/L						
Uranium-235			U	-7.72 +/-70.0	pCi/L						
Uranium-238			U	-909 +/-581	pCi/L						
Yttrium-88				377 +/-40.3	pCi/L						
Zinc-65			U	18.8 +/-30.3	pCi/L						
Zirconium-95			U	3.28 +/-19.1	pCi/L						
QC1201151753	MB										
Actinium-228			U	4.99 +/-9.79	pCi/L					08/28/06	01:26
Americium-241			U	-1.82 +/-19.0	pCi/L						
Antimony-124			U	1.23 +/-4.58	pCi/L						
Antimony-125			U	3.40 +/-4.96	pCi/L						
Barium-133			U	-3.7 +/-2.63	pCi/L						
Barium-140			U	7.05 +/-12.4	pCi/L						
Beryllium-7			U	11.2 +/-17.0	pCi/L						
Bismuth-212			U	-5.69	pCi/L						

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**QC Summary**

Workorder: 168394

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	555098										
Bismuth-214			U	+/-15.8 0.875	pCi/L				JPH1	08/28/06	01:26
Cerium-139			U	+/-6.87 0.858	pCi/L						
Cerium-141			U	+/-1.96 -0.974	pCi/L						
Cerium-144			U	+/-3.70 4.17	pCi/L						
Cesium-134			U	+/-17.8 0.955	pCi/L						
Cesium-136			U	+/-2.16 0.383	pCi/L						
Cesium-137			U	+/-5.11 0.914	pCi/L						
Chromium-51			U	+/-1.98 -0.0211	pCi/L						
Cobalt-56			U	+/-22.2 0.803	pCi/L						
Cobalt-57			U	+/-1.99 -0.546	pCi/L						
Cobalt-58			U	+/-1.81 1.00	pCi/L						
Cobalt-60			U	+/-1.83 0.0786	pCi/L						
Europium-152			U	+/-1.89 4.80	pCi/L						
Europium-154			U	+/-5.21 0.037	pCi/L						
Europium-155			U	+/-5.64 -2.04	pCi/L						
Iridium-192			U	+/-7.82 -0.72	pCi/L						
Iron-59			U	+/-2.13 0.053	pCi/L						
Lead-210			U	+/-4.34 36.2	pCi/L						
Lead-212			UI	+/-733 0.00	pCi/L						
Lead-214			U	+/-6.77 2.51	pCi/L						
Manganese-54			U	+/-5.26 -0.861	pCi/L						
Mercury-203			U	+/-1.80 1.74	pCi/L						
Neodymium-147			U	+/-3.83 -5.63	pCi/L						
				+/-30.1							

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## QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gamma Spec</b>											
Batch	555098										
Neptunium-239			U	8.28 +/-13.5	pCi/L						
Niobium-94			U	0.0979 +/-1.77	pCi/L				JPH1	08/28/06	01:26
Niobium-95			U	2.66 +/-2.44	pCi/L						
Potassium-40			U	14.9 +/-23.4	pCi/L						
Promethium-144			U	0.963 +/-1.77	pCi/L						
Promethium-146			U	-2.28 +/-2.45	pCi/L						
Ruthenium-106			U	10.3 +/-16.5	pCi/L						
Silver-110m			U	-0.0882 +/-1.80	pCi/L						
Sodium-22			U	0.0195 +/-2.02	pCi/L						
Thallium-208			U	1.94 +/-2.13	pCi/L						
Uranium-230			U	0.875 +/-6.87	pCi/L						
Thorium-234			U	120 +/-189	pCi/L						
Tin-113			U	0.593 +/-2.55	pCi/L						
Uranium-235			U	2.44 +/-14.7	pCi/L						
Uranium-238			U	120 +/-189	pCi/L						
Yttrium-88			U	1.18 +/-5.82	pCi/L						
Zinc-65			U	-0.902 +/-3.54	pCi/L						
Zirconium-95			U	-0.733 +/-3.45	pCi/L						
QC1201151755 168394001 MS											
Actinium-228		U	7.00	U	534					08/28/06	00:27
			+/-3.71		+/-503						
Americium-241	4540	U	0.706		4530		100	(75%-125%)			
			+/-6.00		+/-1250						
Antimony-124		U	-1.63	U	-61.9						
			+/-5.15		+/-447						
Antimony-125		U	0.382	U	35.3						
			+/-2.96		+/-268						
Barium-133		U	-1.63	U	-160						
			+/-1.42		+/-127						
Barium-140		U	203	U	14600						

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**QC Summary**

Workorder: 168394

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gamma Spec</b>											
Batch	555098										
Beryllium-7		+/-287		+/-25100							
	U	11.1	U	-850	pCi/L				JPH1	08/28/06	00:27
		+/-21.6		+/-2610							
Bismuth-212		3.26	U	299	pCi/L						
		+/-8.89		+/-980							
Bismuth-214		0.00	U	206	pCi/L						
	UI	+/-2.26		+/-404							
Cerium-139		0.601	U	1160	pCi/L						
		+/-1.45		+/-244							
Cerium-141		5.19	U	129	pCi/L						
		+/-8.95		+/-741							
Cerium-144		5.91	U	212	pCi/L						
		+/-8.39		+/-1050							
Cesium-134		0.444	U	55.3	pCi/L						
		+/-1.16		+/-147							
Cesium-136		21.9	U	-7160	pCi/L						
		+/-93.8		+/-12900							
Cesium-137	1870	0.186	U	2090	pCi/L		112	(75%-125%)			
		+/-1.07		+/-350							
Chromium-51		75.1	U	1650	pCi/L						
		+/-63.3		+/-5810							
Cobalt-56		0.636	U	111	pCi/L						
		+/-2.01		+/-234							
Cobalt-57		0.249	U	989	pCi/L						
		+/-1.09		+/-188							
Cobalt-58		-0.675	U	201	pCi/L						
		+/-2.11		+/-231							
Cobalt-60	2900	0.031	U	2980	pCi/L		103	(75%-125%)			
		+/-1.15		+/-474							
Europium-152		-0.861	U	11.3	pCi/L						
		+/-3.18		+/-322							
Europium-154		0.429	U	77.2	pCi/L						
		+/-2.94		+/-304							
Europium-155		0.550	U	-49.9	pCi/L						
		+/-3.97		+/-344							
Iridium-192		-0.448	U	10.6	pCi/L						
		+/-2.07		+/-222							
Iron-59		0.541	U	1380	pCi/L						
		+/-6.56		+/-832							
Lead-210		198	U	233	pCi/L						
		+/-196		+/-19200							
Lead-212		0.375	U	82.9	pCi/L						
		+/-4.51		+/-282							
Lead-214		4.14	U	117	pCi/L						
		+/-2.38		+/-192							
Manganese-54		0.0215	U	65.6	pCi/L						
		+/-1.08		+/-199							



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## QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gamma Spec</b>											
Batch	555098										
Mercury-203	U	1.30	U	319	pCi/L						
		+/-3.61		+/-619							
Neodymium-147	U	486	U	77400	pCi/L				JPH1	08/28/06	00:27
		+/-1010		+/-1.230E+05							
Neptunium-239	U	1.24	U	471	pCi/L						
		+/-6.82		+/-603							
Niobium-94	U	-0.316	U	1.21	pCi/L						
		+/-1.05		+/-90.5							
Niobium-95	U	0.996	U	-167	pCi/L						
		+/-4.52		+/-525							
Potassium-40	U	15.6	U	490	pCi/L						
		+/-24.9		+/-1450							
Promethium-144	U	-0.276	U	9.75	pCi/L						
		+/-1.11		+/-129							
Promethium-146	U	-0.586	U	140	pCi/L						
		+/-1.34		+/-203							
Ruthenium-106	U	-0.234	U	31.4	pCi/L						
		+/-10.4		+/-1200							
Silver-110m	U	-0.496	U	-21.3	pCi/L						
		+/-1.18		+/-174							
ium-22	U	0.156	U	28.6	pCi/L						
		+/-1.09		+/-113							
Thallium-208	U	0.430	U	11.0	pCi/L						
		+/-2.39		+/-128							
Thorium-230	UI	0.00	U	206	pCi/L						
		+/-2.26		+/-404							
Thorium-234	U	23.4	U	1350	pCi/L						
		+/-84.4		+/-4630							
Tin-113	U	1.63		1580	pCi/L						
		+/-2.83		+/-409							
Uranium-235	U	4.39	U	492	pCi/L						
		+/-7.50		+/-592							
Uranium-238	U	23.4	U	1350	pCi/L						
		+/-84.4		+/-4630							
Yttrium-88	U	-0.464		2200	pCi/L						
		+/-1.79		+/-505							
Zinc-65	U	-1.31	U	270	pCi/L						
		+/-2.81		+/-424							
Zirconium-95	U	-3.6	U	33.8	pCi/L						
		+/-3.95		+/-439							
<b>Rad Gas Flow</b>											
Batch	557085										
QC1201156517	168394008 DUP										
Radium-228	U	0.362	U	1.19	pCi/L	0		(0%-20%)	AXD1	09/06/06	15:54
		+/-0.631		+/-0.805							
QC1201156519	LCS										
Radium-228	29.0			27.1	pCi/L		94	(75%-125%)		09/06/06	17:39
				+/-3.74							

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**QC Summary**

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Rad Gas Flow</b>											
Batch	557085										
QC1201156516 MB											
Radium-228			U	0.544 +/-0.588	pCi/L				AXD1	09/06/06	15:54
QC1201156518 168394008 MS											
Radium-228	29.7	U	0.362 +/-0.631	25.3 +/-3.64	pCi/L		85	(75%-125%)		09/06/06	17:39
Batch	557086										
QC1201156521 168394018 DUP											
Radium-228		U	-0.136 +/-0.450	0.882 +/-0.924	pCi/L	0		(0%-20%)	AXD1	08/25/06	18:22
QC1201156523 LCS											
Radium-228	12.9			11.3 +/-1.70	pCi/L		88	(75%-125%)		08/25/06	18:56
QC1201156520 MB											
Radium-228		U		-0.157 +/-0.334	pCi/L					08/25/06	17:17
QC1201156522 168394018 MS											
Radium-228	119	U	-0.136 +/-0.450	113 +/-15.4	pCi/L		95	(75%-125%)		08/25/06	18:22
Batch	557661										
QC1201157818 168394001 DUP											
Strontium-89		U	-3.42 +/-1.17	-5.25 +/-1.78	pCi/L	0		(0%-20%)	BXF1	08/20/06	22:25
Strontium-90		U	0.968 +/-0.983	1.04 +/-3.45	pCi/L	0		(0%-20%)			
QC1201157820 LCS											
Strontium-89	14800			11900 +/-55.1	pCi/L		80	(75%-125%)		08/25/06	22:45
Strontium-90	261			198 +/-12.8	pCi/L		76	(75%-125%)			
QC1201157817 MB											
Strontium-89		U		-0.532 +/-0.383	pCi/L					08/24/06	23:16
Strontium-90		U		-0.418 +/-0.780	pCi/L						
QC1201157819 168394001 MS											
Strontium-89	39400	U	-3.42 +/-1.17	20200 +/-112	pCi/L		51*	(75%-125%)		08/25/06	22:45
Strontium-90	263	U	0.968 +/-0.983	123 +/-9.83	pCi/L		47*	(75%-125%)			
<b>Rad Liquid Scintillation</b>											
Batch	557039										
QC1201156368 168394007 DUP											
Technetium-99		U	-7.29 +/-17.4	3.18 +/-17.0	pCi/L	0		(0%-20%)	EGD1	08/23/06	18:04
QC1201156370 LCS											
Technetium-99	1180			1030 +/-39.3	pCi/L		87	(75%-125%)		08/23/06	18:36

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## QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD %	REC %	Range	Anlst	Date	Time
<b>Rad Liquid Scintillation</b>											
Batch	557039										
QC1201156367 MB											
Technetium-99			U	5.82 +/-17.5	pCi/L				EGD1	08/23/06	17:48
QC1201156369 168394007 MS	1180	U	-7.29 +/-17.4	1050 +/-40.1	pCi/L		89	(75%-125%)		08/23/06	18:20
Batch	557040										
QC1201156372 168394003 DUP		U	230 +/-286	65.2 +/-271	pCi/L	0		(0%-20%)	DFA1	08/23/06	10:44
Tritium											
QC1201156374 LCS	2730			3230 +/-475	pCi/L		119	(75%-125%)		08/23/06	11:17
Tritium											
QC1201156371 MB			U	-24.8 +/-261	pCi/L					08/23/06	10:28
Tritium											
QC1201156373 168394003 MS	2760	U	230 +/-286	3020 +/-469	pCi/L		110	(75%-125%)		08/23/06	11:01
Tritium											
<b>Rad Ra-226</b>											
Batch	558843										
QC1201160689 168394016 DUP				0.573 +/-0.289	0.603 +/-0.321	pCi/L	5	(0%-20%)	DXM2	08/30/06	22:00
Radium-226											
QC1201160691 LCS	25.4			29.5 +/-1.81	pCi/L		116	(75%-125%)		08/30/06	22:35
Radium-226											
QC1201160688 MB			U	0.368 +/-0.282	pCi/L					08/30/06	22:00
Radium-226											
QC1201160690 168394016 MS	127		0.573 +/-0.289	128 +/-7.95	pCi/L		100	(75%-125%)		08/30/06	22:35
Radium-226											

**Notes:**

The Qualifiers in this report are defined as follows:

- \* A quality control analyte recovery is outside of specified acceptance criteria
- < Result is less than value reported
- > Result is greater than value reported
- A The TIC is a suspected aldol-condensation product
- B Target analyte was detected in the associated blank
- BD Results are either below the MDC or tracer recovery is low
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of the sample
- H Analytical holding time was exceeded

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## QC Summary

Workorder: 168394

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J	.	Value is estimated									
N/A		Spike recovery limits do not apply. Sample concentration exceeds spike concentration by 4X or more									
R	.	Sample results are rejected									
U	.	Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.									
UI	.	Gamma Spectroscopy--Uncertain identification									
X	.	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier									
Y	.	QC Samples were not spiked with this compound									
^	.	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL									
h	.	Preparation or preservation holding time was exceeded									

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**Data Validation Report**

MEMORANDUM

Project # 023-8793

November 28, 2006

TO: Enrico Fermi 1 Power Plant, License Termination Plan, Detroit, MI

FROM: Tom Stapp, Golder Associates Inc., Project Chemist

RE: GEL RADIOCHEMISTRY DATA VALIDATION SUMMARY

INTRODUCTION

This memo presents the results of data validation performed on radiochemistry data for Sample Delivery Group (SDG) No. 168394 prepared by General Engineering Laboratories, LLC, Charleston, South Carolina. Sample identification and the analyses requested are provided as an attachment to the data validation checklist (Attachment 3) and in the following table.

Sample ID	Collection Dates	Analyses Requested
		1) Liquid Scintillation
EFT-1S	June 9, 2006	2) Alpha Spectroscopy
EFT-1D	June 9, 2006	3) Gamma Spectroscopy
EFT-2S	June 6, 2006	4) Gas Proportional Counting
EFT-2D	June 6, 2006	(Ra-228, Sr-89/90)
EFT-4S	June 12, 2006	5) Radon Emmanation (Ra-226)
EFT-4D	June 12, 2006	
EFT-5S	June 8, 2006	
EFT-5D	June 8, 2006	
EFT-6S	June 12, 2006	
EFT-6D	June 7, 2006	
EFT-7S	June 8, 2006	
EFT-8S	June 6, 2006	
EFT-9S	June 7, 2006	
EFT-10S	June 8, 2006	
Bkgd-NTC	June 13, 2006	
Bkgd-PAP	June 13, 2006	
Bkgd-Range	June 13, 2006	

Validation was performed in significant accordance with validation guidelines found in 'Data Validation Procedure for Radiochemical Analyses' (BHI, 2000) and applicable reference method requirements as appropriate. Attachments 1 through 3 of this report provide the following information as indicated:

Attachment 1. Glossary of Data Reporting Qualifiers

Attachment 2. Summary of Data Qualifications

Attachment 3. Annotated Laboratory Reports with Checklist and Supporting Documentation

## MAJOR DEFICIENCIES

There were no major deficiencies identified in this data set.

## DATA QUALITY OBJECTIVES

As stated in Section 4.1.3 of the 'Work Plan for Groundwater Characterization', data quality objectives included data representativeness and data completeness. Data representativeness is defined by the selection of sampling locations, depths, and intervals as specified in the Work Plan as well as presentation of sample results with appropriate units. Sample collection details specified in the Work Plan are not subject to this data validation exercise. Data completeness is defined by goals for precision and accuracy.

Samples were validated in accordance with Work Plan objectives, with the exception of achieving a goal for ten percent (10%) "full" validation services on selected samples. Full validation, including recalculation of sample minimum detectable activities (MDAs), could not be completed due to limited quality control data and raw data associated with the level of data package elements requested. The following sections present a summary of the data quality in terms of the referenced validation criteria.

### Liquid Scintillation Analysis (Tritium, Technetium-99)

Precision. Goals for precision were met.

Accuracy. Goals for accuracy were met.

Sample Result Verification. Verification of results could not be completed since raw data was not included with the data package at the level of deliverable requested.

Representativeness. All sample results are presented in equivalent units of measure.

Detection Limits. Detection limit goals have not been specified, however MDA's and reporting limits reflect low or non-detect activity, appropriate to Field Blank and background well sample results.

### Alpha Spectroscopy Analysis (Uranium Isotopes)

Precision. Goals for precision were met with the exception of out of limit 'relative percent difference' (RPD) associated with U-233/234 in sample EFT-2S. Attachment 2 provides a summary of qualification applied, and Attachment 3 provides annotated laboratory report sheets with supporting documentation.

Accuracy. Goals for accuracy were met. However tracer recovery associated with selected isotopes were below laboratory quality control limits in samples EFT-5D and EFT-6S. Attachment 2 provides a summary of qualification applied, and Attachment 3 provides annotated laboratory report sheets with supporting documentation.

Sample Result Verification. Verification of results could not be completed since raw data was not included with the data package at the level of deliverable requested.

Representativeness. All sample results are presented in equivalent units of measure.

Detection Limits. Detection limit goals have not been specified, however MDA's and reporting limits reflect low or non-detect activity, appropriate to Field Blank and background well sample results.

### **Gamma Spectroscopy Analysis**

Precision. Goals for precision were met.

Accuracy. Goals for accuracy were met.

Sample Result Verification. Verification of results could not be completed since raw data was not included with the data package at the level of deliverable requested.

Representativeness. All sample results are presented in equivalent units of measure.

Detection Limits. Detection limit goals have not been specified, however MDA's and reporting limits reflect low or non-detect activity, appropriate to Field Blank and background well sample results.

### **Gas Flow Proportional Counting (Ra-228, Sr-89/90)**

Precision. Goals for precision were met.

Accuracy. Goals for accuracy were met, with the exception of out of limit matrix spike recoveries associated with Strontium-89 and Strontium-90 in sample EFT-2S. Attachment 2 provides a summary of qualification applied, and Attachment 3 provides annotated laboratory report sheets with supporting documentation.

Sample Result Verification. Verification of results could not be completed since raw data was not included with the data package at the level of deliverable requested.

Representativeness. All sample results are presented in equivalent units of measure.



Detection Limits. Detection limit goals have not been specified, however MDA's and reporting limits reflect low or non-detect activity, appropriate to Field Blank and background well sample results.

#### **Radon Emmanation and Lucas Cell Phosphor Detection (Ra-226)**

Precision. Goals for precision were met.

Accuracy. Goals for accuracy were met.

Sample Result Verification. Verification of results could not be completed since raw data was not included with the data package at the level of deliverable requested.

Representativeness. All sample results are presented in equivalent units of measure.

Detection Limits. Detection limit goals have not been specified, however MDA's and reporting limits reflect low or non-detect activity, appropriate to Field Blank and background well sample results.

#### **COMPLETENESS AND USABILITY STATEMENT**

**Completeness.** The data package was complete for all requested analyses. A total of 18 samples were validated in this data package with a comprehensive gamma scan and 162 additional analyte determinations reported, all of which were deemed valid. This results in a completeness of 100 percent, which meets normal work plan objectives of 90 percent.

The analytical data represented by analysis of 18 water samples in this sample delivery group are acceptable for their intended use. Validated and annotated laboratory report sheets are included in Attachment 3.

#### **REFERENCES**

BHI 2000, Data Validation Procedure for Radiochemical Analyses, BHI-01433, Rev.0.  
Bechtel Hanford Incorporated, Richland, Washington.

**ATTACHMENT 1**

**GLOSSARY OF DATA REPORTING QUALIFIERS**

## GLOSSARY OF RADIOCHEMISTRY DATA REPORTING QUALIFIERS.

- U - Indicates the constituent was analyzed for, but was not detected at a concentration above the minimum detectable activity (MDA). The concentration reported is the sample result corrected for sample aliquot size, dilution factors and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.
- UJ - Indicates the constituent was analyzed for and was not detected at a concentration above the MDA. Due to a quality control deficiency identified during data validation, the result reported may not accurately reflect the sample concentration. The associated data should be considered usable for decision making purposes.
- J - Indicates the constituent was analyzed for and detected. The concentration reported is qualified as estimated due to a quality control deficiency identified during data validation. The associated data should be considered usable for decision making purposes.
- UR - Indicates the constituent was analyzed for and not detected. The concentration reported is qualified as unusable due to a quality control deficiency identified during data validation. The associated data should be considered unusable for decision making purposes.
- R - Indicates the constituent was analyzed for and detected. The concentration reported is qualified as unusable due to a quality control deficiency identified during data validation. The associated data should be considered unusable for decision making purposes.

**ATTACHMENT 2**

**DATA QUALIFICATION SUMMARY**

### DATA QUALIFICATION SUMMARY

SDG: 168394	PROJECT: 023-8793.0006	DATE: 11/23/06	By: Tom Stapp	PAGE 1 OF 1
<b>COMMENTS:</b>				
COMPOUND/ANALYTE	QUALIFIER	SAMPLES AFFECTED	REASON	VALUE REPORTED
U-233/234	J/UJ	EFT-2S	Sample duplicate RPD out of 20% maximum limit	21%
Sr-89, Sr-90	J/UJ	EFT-2S	Matrix Spike recovery below 75% limit	54% 47%
U-233/234, U-235/236, U-238	J/UJ	EFT-5D, EFT-6S	Tracer recovery below 25% limit	1%

**ATTACHMENT 3**

**ANNOTATED LABORATORY REPORTS, CHECKLIST  
AND SUPPORTING DOCUMENTATION**

RADIOCHEMISTRY DATA ASSESSMENT SUMMARY

PROJECT: #023-8793	SITE: E.FERMI 1 Plant / Detroit
LABORATORY: General Engr. Lab	SDG: # 168394
SAMPLES/MATRIX/ANALYSES: See HOLD TIME Table attached.	

\* Notes: (1) H<sub>3</sub> & Tc-99 by Liquid Scintillation (2) Alpha Spec for all U isotopes (3) See reportsheets for list (4) Gas Flow proportional count.

\*Note (4) DATA ASSESSMENT SUMMARY (4) (1) (2) (3) (1) (5)

Review Item	R <sub>2</sub> -228 Gross Alpha/ Beta	Sr-90	Tc-99	Alpha Spec. (U, Pu, Am)	Gamma Spec.	Tritium Rn-222	Ra-226 (Lucas)	Fluor. Uranium
1. Data completeness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
2. Holding Times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
3. Calibration	-	-	-	-	-	-	-	
4. Blanks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
5. Duplicates 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
6. Gravimetric Yield	-	-	-	-	-	-	-	
7. Spike Recovery 2	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
8. Tracer Recovery 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
9. LCS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
10. Result Verification	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
11. Other QC	-	-	-	-	-	-	-	
12. Field Duplicates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
13. Overall Assessment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

O = Data had no problems/ qualified due to minor problems.  
M = Data qualified due to major problems.  
Z = Data unacceptable.  
X = Problems but do not affect data.

Comments: 1 - U-234/235 RPD out, Sample EFT-2S result qualif (J/UJ).  
2 - Mtx Spike recovery ↓ assoc. Sr-89 and Sr-90 results qualified (S/UJ) on Sample EFT-2S only.  
3 - Tracer recovery ↓ assoc. w/ samples EFT-5D and EFT-6S. All U-isotopes qualif. (J/UJ).

Validated by: John Buff

Date: Nov. 23, 2006

Reviewed by: \_\_\_\_\_

Date: \_\_\_\_\_

RADIOCHEMISTRY DATA ASSESSMENT SUMMARY

Acceptable  
Yes  No

1. Data package completeness (check if present) . . . . .

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Case narrative                | <input checked="" type="checkbox"/> Tracer recovery Note ② ≠ ④ |
| <input checked="" type="checkbox"/> Chain of Custody              | <input checked="" type="checkbox"/> Chemical recovery ①        |
| <input checked="" type="checkbox"/> Sample results/MDA/LLD/errors | <input checked="" type="checkbox"/> Detector/Cell ID ②         |
| <input checked="" type="checkbox"/> Blank results                 | <input type="checkbox"/> Detector/Cell calibration/efficiency  |
| <input checked="" type="checkbox"/> Duplicate results             | <input type="checkbox"/> Detector/Cell background per analysis |
| <input checked="" type="checkbox"/> Spike results                 | <input type="checkbox"/> Detector/Cell control checks/charts   |
| <input checked="" type="checkbox"/> LCS results                   | <input type="checkbox"/> HV Plateau Determination              |

Comments: ② Alpha Spec - U ✓ ① Liquid Scint. ✓ ④ Ra-228, Sr-90 ✓  
 ③ Raw data not provided @ level of Data Package requested.  
 This QC element not evaluated.

2. Holding Times . . . . .

- ① Tritium-Tc-99 ✓ ② U-isotopes ✓ ③ Gamma Spec ✓  
 ④ Ra-228, Sr-90 ✓ ⑤ Ra-226 ✓

3. Calibration . . . . . NA

Raw data not evaluated

4. Blanks . . . . .

- ① H3/Tc-99 ✓ ② Alpha Spec ✓ ③ GAMMA ✓  
 ④ Ra-228, Sr-89/90 ✓ ⑤ Ra-226 OK ✓

5. Duplicates . . . . .

- ② U-233/234 out of limit (21%) Sample 25 (Qualif. 5/17).  
 ① Sample 8s (H3), 10S (Tc99) OK. ③ All U No Qualif.  
 ④ All isotopes non-detect ✓ ⑤ Ra-226 - Sample Bkg NTC  
 used for Dup - BPD OK ✓



RADIOCHEMISTRY DATA ASSESSMENT SUMMARY

6. Gravimetric Yield . . . . . NA

Not applicable

7. Spike Recovery . . . . . NA

- ① Sample 88 (H3), 105 (Tc99) ✓
- ② Smp1 2S ✓
- ③ Smp1 2S ✓
- ④ Ra-228 smp. 2S ✓, Sr-89/90 out of limit - Assoc. results qualif. (5/ut).
- ⑤ Mtx Spk on NTC-Background - No Qualif. applied ✓

8. Tracer Recovery . . . . . NA

- ② Alpha Spec Tracer recov. below limit on Samples EFT-5D and EFT-6S. Assoc. results qualif. (5/ut).
- ① Tc-99 ✓
- ④ Ra-228 ✓, Sr-89/90 ✓

9. Laboratory Control Sample (LCS) . . . . . NA

- ① H3/Tc99 recovery OK ✓
- ② Alpha Spec ✓
- ③ Smp1 2S ✓
- ④ Sample 2S: Ra-228 ✓, Sr-89/90 ✓

10. Sample/MDA/LLD Result Verification \* . . . . . NA

- ① H3/Tc99 MDA ✓
- ② U-isotopes MDA ✓
- ③ GAMMA MDA ✓
- ④ Ra-228 MDA ✓, Sr-89/90 MDA ✓

\* MDA values are not recalculated due to Level of Data Package requested.

11. Other QC . . . . . NA

RADIOCHEMISTRY DATA ASSESSMENT SUMMARY

12. Field Duplicates

① H3/TC99 ✓    ② U-isotopes ✓    ③ GAMMA ✓    ④ Ra-228 ✓  
Dr 89/90 within ± RL ✓

13. Overall Assessment/Comments:

HOLDING TIME SUMMARY  
June, 2006 Sample Collection

Gamma Spectroscopy					
Smpl ID	Collect Date	Collect Time	Analysis Date	DAYS	Status
EFT-1D	6/9/2006	0840	8/25/2006	77	Accept
EFT-1S	6/9/2006	1002	8/26/2006	78	Accept
EFT-2S	6/6/2006	1130	8/25/2006	80	Accept
EFT-2D	6/6/2006	1452	8/25/2006	80	Accept
EFT-4D	6/12/2006	0958	8/28/2006	77	Accept
EFT-4D Duplicate	6/12/2006	1108	8/28/2006	77	Accept
EFT-4S	6/12/2006	1422	8/28/2006	77	Accept
EFT-5S	6/8/2006	1442	8/25/2006	78	Accept
EFT-5D	6/8/2006	1616	8/25/2006	78	Accept
EFT-6S	6/12/2006	1515	8/28/2006	77	Accept
EFT-6D	6/7/2006	1052	8/25/2006	79	Accept
EFT-7S	6/8/2006	0912	8/25/2006	78	Accept
EFT-8S	6/6/2006	1625	8/25/2006	80	Accept
EFT-9S	6/7/2006	842	8/26/2006	80	Accept
EFT-10S	6/8/2006	1032	8/25/2006	78	Accept
BKG NTC	6/13/2006	0927	8/28/2006	76	Accept
BKG PAP	6/13/2006	1207	8/28/2006	76	Accept
BKG RANGE	6/13/2006	1425	8/28/2006	76	Accept
Alpha Spectroscopy/ U isotopes					
Smpl ID	Collect Date	Collect Time	Analysis Date	DAYS	Status
EFT-1D	6/9/2006	0840	9/3/2006	86	Accept
EFT-1S	6/9/2006	1002	9/3/2006	86	Accept
EFT-2S	6/6/2006	1130	9/3/2006	89	Accept
EFT-2D	6/6/2006	1452	9/1/2006	87	Accept
EFT-4D	6/12/2006	0958	9/1/2006	81	Accept
EFT-4D Duplicate	6/12/2006	1108	9/1/2006	81	Accept
EFT-4S	6/12/2006	1422	9/1/2006	81	Accept
EFT-5S	6/8/2006	1442	9/1/2006	85	Accept
EFT-5D	6/8/2006	1616	9/6/2006	90	Accept
EFT-6S	6/12/2006	1515	9/6/2006	86	Accept
EFT-6D	6/7/2006	1052	9/1/2006	86	Accept
EFT-7S	6/8/2006	0912	9/1/2006	85	Accept
EFT-8S	6/6/2006	1625	9/1/2006	87	Accept
EFT-9S	6/7/2006	842	9/1/2006	86	Accept
EFT-10S	6/8/2006	1032	9/1/2006	85	Accept
BKG NTC	6/13/2006	0927	9/1/2006	80	Accept
BKG PAP	6/13/2006	1207	9/1/2006	80	Accept
BKG RANGE	6/13/2006	1425	9/1/2006	80	Accept

HOLDING TIME SUMMARY  
June, 2006 Sample Collection

GFPC - Ra-228					
Smpl ID	Collect Date	Collect Time	Analysis Date	DAYS	Status
EFT-1D	6/9/2006	0840	9/6/2006	89	Accept
EFT-1S	6/9/2006	1002	9/6/2006	89	Accept
EFT-2S	6/6/2006	1130	9/6/2006	92	Accept
EFT-2D	6/6/2006	1452	9/6/2006	92	Accept
EFT-4D	6/12/2006	0958	9/6/2006	86	Accept
EFT-4D Duplicate	6/12/2006	1108	8/25/2006	74	Accept
EFT-4S	6/12/2006	1422	8/25/2006	74	Accept
EFT-5S	6/8/2006	1442	9/6/2006	90	Accept
EFT-5D	6/8/2006	1616	9/6/2006	90	Accept
EFT-6S	6/12/2006	1515	8/25/2006	74	Accept
EFT-6D	6/7/2006	1052	9/6/2006	91	Accept
EFT-7S	6/8/2006	0912	9/6/2006	90	Accept
EFT-8S	6/6/2006	1625	9/6/2006	92	Accept
EFT-9S	6/7/2006	842	9/6/2006	91	Accept
EFT-10S	6/8/2006	1032	9/6/2006	90	Accept
BKG NTC	6/13/2006	0927	8/25/2006	73	Accept
BKG PAP	6/13/2006	1207	8/25/2006	73	Accept
BKG RANGE	6/13/2006	1425	8/28/2006	76	Accept
GFPC - Sr-89 & Sr-90					
Smpl ID	Collect Date	Collect Time	Analysis Date	DAYS	Status
EFT-1D	6/9/2006	0840	8/23/2006	75	Accept
EFT-1S	6/9/2006	1002	8/23/2006	75	Accept
EFT-2S	6/6/2006	1130	8/23/2006	78	Accept
EFT-2D	6/6/2006	1452	8/23/2006	78	Accept
EFT-4D	6/12/2006	0958	8/23/2006	72	Accept
EFT-4D Duplicate	6/12/2006	1108	8/23/2006	72	Accept
EFT-4S	6/12/2006	1422	8/23/2006	72	Accept
EFT-5S	6/8/2006	1442	8/23/2006	76	Accept
EFT-5D	6/8/2006	1616	8/23/2006	76	Accept
EFT-6S	6/12/2006	1515	8/23/2006	72	Accept
EFT-6D	6/7/2006	1052	8/23/2006	77	Accept
EFT-7S	6/8/2006	0912	8/23/2006	76	Accept
EFT-8S	6/6/2006	1625	8/20/2006	75	Accept
EFT-9S	6/7/2006	842	8/23/2006	77	Accept
EFT-10S	6/8/2006	1032	8/23/2006	76	Accept
BKG NTC	6/13/2006	0927	8/23/2006	71	Accept
BKG PAP	6/13/2006	1207	8/23/2006	71	Accept
BKG RANGE	6/13/2006	1425	8/24/2006	72	Accept

HOLDING TIME SUMMARY  
June, 2006 Sample Collection

LIQUID SCINTILLATION - TRITIUM & Tc-99					
Smpl ID	Collect Date	Collect Time	Analysis Date	DAYS	Status
EFT-1D	6/9/2006	0840	8/23/2006	75	Accept
EFT-1S	6/9/2006	1002	8/23/2006	75	Accept
EFT-2S	6/6/2006	1130	8/23/2006	78	Accept
EFT-2D	6/6/2006	1452	8/23/2006	78	Accept
EFT-4D	6/12/2006	0958	8/23/2006	72	Accept
EFT-4D Duplicate	6/12/2006	1108	8/23/2006	72	Accept
EFT-4S	6/12/2006	1422	8/23/2006	72	Accept
EFT-5S	6/8/2006	1442	8/23/2006	76	Accept
EFT-5D	6/8/2006	1616	8/23/2006	76	Accept
EFT-6S	6/12/2006	1515	8/23/2006	72	Accept
EFT-6D	6/7/2006	1052	8/23/2006	77	Accept
EFT-7S	6/8/2006	0912	8/23/2006	76	Accept
EFT-8S	6/6/2006	1625	8/23/2006	78	Accept
EFT-9S	6/7/2006	842	8/23/2006	77	Accept
EFT-10S	6/8/2006	1032	8/23/2006	76	Accept
BKG NTC	6/13/2006	0927	8/23/2006	71	Accept
BKG PAP	6/13/2006	1207	8/23/2006	71	Accept
BKG RANGE	6/13/2006	1425	8/23/2006	71	Accept
RADON EMMANATION - Ra-226					
Smpl ID	Collect Date	Collect Time	Analysis Date	DAYS	Status
EFT-1D	6/9/2006	0840	8/30/2006	82	Accept
EFT-1S	6/9/2006	1002	8/30/2006	82	Accept
EFT-2S	6/6/2006	1130	9/2/2006	88	Accept
EFT-2D	6/6/2006	1452	9/2/2006	88	Accept
EFT-4D	6/12/2006	0958	8/30/2006	79	Accept
EFT-4D Duplicate	6/12/2006	1108	8/30/2006	79	Accept
EFT-4S	6/12/2006	1422	8/30/2006	79	Accept
EFT-5S	6/8/2006	1442	8/30/2006	83	Accept
EFT-5D	6/8/2006	1616	8/30/2006	83	Accept
EFT-6S	6/12/2006	1515	8/30/2006	79	Accept
EFT-6D	6/7/2006	1052	8/30/2006	84	Accept
EFT-7S	6/8/2006	0912	8/30/2006	83	Accept
EFT-8S	6/6/2006	1625	8/30/2006	85	Accept
EFT-9S	6/7/2006	842	8/30/2006	84	Accept
EFT-10S	6/8/2006	1032	8/30/2006	83	Accept
BKG NTC	6/13/2006	0927	8/30/2006	78	Accept
BKG PAP	6/13/2006	1207	8/30/2006	78	Accept
BKG RANGE	6/13/2006	1425	8/30/2006	78	Accept

**APPENDIX G**  
**REMP WELL SURVEY**  
**AND WATER LEVEL DATA**

## ENRICO FERMI II POWER PLANT

## GROUNDWATER LEVEL MONITORING

DATE	2-02-05	3-7-05	4-4-05	5-2-05	6-3-05	7-2-05	8-4-05	8-29-05
W-1	569.07	569.68	569.63	569.64	568.68	567.92	568.23	567.57
W-2	568.12	570.16	569.86	569.91	568.51	567.55	567.51	566.73
W-3/R-2	565.82	566.87	567.22	567.45	567.02	566.67	566.59	566.00
W-4/C-C	573.88	576.38	575.91	576.56	573.26	571.16	571.51	568.87
W-5	574.86	574.91	574.53	574.56	574.28	573.95	574.36	573.98
LAKE	572.84	573.05	573.17	573.08	573.39	572.35	572.66	572.46
DATE	9-30-05	11-01-05	12-2-05	NEW YEAR 1-9-06	2-09-06	3-7-06	4-10-06	5-2-06
W-1	566.92	566.23	565.82	567.13	568.84	568.43	569.06	568.81
W-2	565.48	564.47	564.49	565.84	568.13	567.41	569.30	568.66
W-3/R-2	565.29	564.47	564.12	564.15	565.12	565.27	565.84	565.39
W-4/C-C	567.26	566.03	565.95	572.63	575.61	574.36	575.89	574.76
W-5	573.81	573.49	573.75	574.46	574.61	NOT ACCESSIBLE	574.35	574.04
LAKE	572.06	571.57	568.82	571.31	572.37	572.25	572.71	572.69
DATE	6-7-06	7-6-06	8-1-06	9-5-06	10-5-06	10-31-06	12-6-06	NEW YEAR 1-4-07
W-1	569.39	568.52	568.11	567.78	567.58	568.33	569.34	569.90
W-2	569.11	567.86	567.03	566.59	566.21	567.61	568.21	570.85
W-3/R-2	566.40	566.19	565.91	565.48	565.22	565.47	566.10	566.74
W-4/C-C	574.23	571.98	570.53	569.91	570.91	574.86	575.67	576.05
W-5	574.39	574.16	574.16	574.12	574.21	574.38	574.54	574.47
LAKE	572.86	572.90	572.98	572.65	572.33	572.73	572.02	572.93

ENBRICO FERMI II POWER PLANT

GROUND WATER LEVEL MONITORING

DATE →	2/5/07	3/7/07	4/4/07	5/7/07					
W-1	569.49	569.22	569.48	569.99					
W-2	569.70	570.61	571.72	572.05					
W-3/R-2	567.52	567.82	568.27	568.51					
W-4/C-C	575.24	575.60	575.92	575.11					
W-5	574.41	574.45	574.40	574.39					
LAKE	572.45	572.76	571.21	573.80					

DATE →									
W-1									
W-2									
W-3/R-2									
W-4/C-C									
W-5									
LAKE									

DATE →									
W-1	581.88								
W-2	580.21								
W-3/R-2	581.87								
W-4/C-C	579.16								
W-5	585.61								
LAKE	585.89								

TOP OF CASING

GAGE MARK ON TABLE