



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 13, 1979

NOTE TO: B. K. Grimes, NRR, TMI-2

R. H. Vollmer, NRR, TMI-2

FROM: F. J. Miraglia, Jr., Coordinator, Team B

Attachment 1 is information B. Grimes requested of S. Bland on April 12, 1979.

Attachment 2 is information R. Vollmer requested of R. Emch on April 13, 1979.

A handwritten signature in black ink, appearing to read "F. J. Miraglia, Jr.", written in a cursive style.

F. J. Miraglia, Jr.
Coordinator
Team B

Attachments:
As Stated

cc: see attached distribution list

7909100062

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ATTACHMENT 1

STORAGE OF LIQUID RADWASTE IN TANKCARS

B. Grimes requested on 04/12/79 that we provide an isotopic breakdown of the dose rates from a 30,000-gallon railroad tankcar containing liquid radwaste. We had sent him the dose rates on 04/11/79. The dose rate at contact was 40 R/hr as calculated by ORNL (D. Bartine). Grimes also requested that we provide the dose rates for a 10,000-gallon tankcar.

We contacted ORNL but learned that today (04/13/79) is a state holiday in Tennessee and ORNL was not working. Therefore, we calculated the dose rates by hand in order to provide a timely response to the site. We will follow-up on this on Monday (04/16/79) and contact ORNL again.

We calculated 7 R/hr at one meter from the 30,000-gallon tank and 4 R/hr at one meter from the 10,000-gallon tank. We were unsure of the dimensions of a 10,000-gallon tankcar; 4 R/hr is for a tank assumed to be 10 feet in diameter and 17 feet long. A tank 8 feet in diameter would give a dose rate of about 3 R/hr at one meter.

The isotopic distribution for the 7 R/hr dose rate is given below:

<u>NUCLIDE</u>	<u>CONCENTRATION</u> <u>µCi/cc</u>	<u>% OF DOSE RATE</u> <u>DUE TO NUCLIDE</u>
I-131	100	82
I-133	5	9
Xe-133	4	0.25
CS-134	0.4	0.5
CS-136	0.8	4
CS-137	1.4	3
La-140	1.6	1

This work was done by R. Ench and F. Akstulewicz.

ATTACHMENT 2

RESPONSE TO REQUEST OF R. VOLLMER CONCERNING
TRANSURANIC CONCENTRATIONS IN COOLANT

On Friday afternoon (04/13/79), R. Vollmer requested that we provide information to him on transuranic contamination of the primary coolant at PWRs other than TMI-2.

Turkey Point has reported the following measurements of transuranics in the primary coolant.

Pu-238	$5(+1.6) \times 10^{-9} \text{ } \mu\text{Ci/gm}$
Pu-239 and Pu-240	$4.3 \times 10^{-9} \text{ } \mu\text{Ci/gm}$

Indian Point 1 and 2 has reported these measurements of transuranics in 1975:

Pu + Am ²⁴¹ + Cm ²⁴²	$10^{-9}-10^{-7} \text{ } \mu\text{Ci/gm}$
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We called Duke Power Company today. Robert Gill informed us that the MDA for gross alpha measurements in the primary coolant at Oconee is $4 \times 10^{-6} \text{ } \mu\text{Ci/cc}$. Oconee measurements of gross alpha in the primary coolant have always been less than $4 \times 10^{-6} \text{ } \mu\text{Ci/cc}$.

Generic calculations for a straight tube steam generator plant were done during the GESMO study. The calculated uranium concentrations in primary coolant were:

U-235	$2 \times 10^{-12} \text{ } \mu\text{Ci/cc}$
U-237	$3.8 \times 10^{-5} \text{ } \mu\text{Ci/cc}$
U-238	$2 \times 10^{-11} \text{ } \mu\text{Ci/cc}$

Note that U-237 has a 6.8 day half-life. Thus, U-237 has a very high specific activity.

Printouts of calculated primary coolant concentrations for Davis-Besse and GESMO are attached.

We have estimated the concentrations of uranium in water which correspond to 10 ppb:

10 ppb - U-235	2×10^{-8} $\mu\text{Ci/gm}$
10 ppb - U-237	$8 \times 10^{+2}$ $\mu\text{Ci/gm}$
10 ppb - U-238	3×10^{-9} $\mu\text{Ci/gm}$

Without knowing the isotopic content of the uranium, it is impossible to supply better correlations between ppb and $\mu\text{Ci/gm}$.

When LACBWR had fuel problems in 1976-1977, they measured 6×10^{-5} $\mu\text{Ci/gm}$ of gross alpha radioactivity in the primary coolant.

ANNUAL REL

NUCLIDE	HALF-LIFE (DAYS)	CONCENTRATION		ANNUAL REL (CURIES)	ANNUAL REL (CURIES)
		PRIMARY (PPM)	SECONDARY (PPM)		
Y 91	5.88E-11	1.74E-10	2.28E-10	1.05E-11	0.00E-12
ZR 93	5.08E-12	1.71E-11	4.01E-11	1.32E-11	2.01E-11
ZR 94	6.50E-11	1.03E-08	4.43E-12	1.56E-08	3.37E-08
NB 92	1.02E-11	1.42E-12	7.02E-11	0.00000	0.00000
NB 93	4.07E-03	1.34E-02	6.12E-12	2.26E-11	3.00E-11
NB 94	7.30E-00	1.06E-12	3.01E-10	1.38E-12	2.52E-15
NB 95	3.50E-11	3.27E-05	1.02E-11	3.04E-05	7.44E-08
NB 96	9.58E-01	5.12E-05	2.23E-11	1.87E-10	1.67E-08
NB 97	5.00E-02	2.54E-06	1.11E-12	0.0	4.18E-14
NO 93	3.29E-06	1.09E-02	2.04E-12	1.03E-10	3.55E-10
NO 93M	2.84E-01	1.32E-06	2.16E-11	2.34E-15	5.59E-12
NO 90	2.79E-00	1.15E-02	1.71E-06	0.00000	0.00000
NO101	1.01E-02	1.26E-05	7.35E-12	0.0	9.02E-27
TC 90M	2.50E-01	1.09E-02	1.63E-06	0.00000	0.00000
TC 90	7.67E-07	1.09E-06	2.12E-09	1.02E-09	2.60E-10
TC101	9.72E-03	2.07E-05	2.12E-11	0.0	1.75E-25
CD115	2.23E-00	2.34E-11	3.71E-17	3.07E-15	7.12E-18
CD119	6.94E-03	5.65E-13	2.37E-19	0.0	6.11E-02
IN110M	1.25E-02	1.56E-12	4.69E-19	0.0	1.27E-25
IN119	1.06E-03	1.10E-11	4.07E-18	0.0	7.19E-31
SN117M	1.00E-01	5.77E-06	2.51E-10	3.15E-07	1.10E-06
SN119M	2.50E-02	2.72E-07	1.18E-13	3.34E-10	4.01E-11
SN121M	2.78E-04	1.54E-09	6.09E-16	2.06E-12	3.78E-11
SN121	1.13E-00	3.01E-05	3.63E-11	5.07E-10	3.55E-01
SN123M	2.74E-02	3.07E-07	1.32E-13	0.0	1.61E-11
SN123	1.24E-02	2.28E-09	3.00E-15	9.64E-12	1.03E-11
SN125M	6.74E-03	7.39E-05	3.10E-12	0.0	0.0
SN125	9.40E-00	1.93E-07	5.39E-12	7.34E-11	3.04E-11
SB124	6.00E-01	2.64E-05	1.15E-10	2.75E-11	4.00E-11
SB125	9.86E-02	2.78E-07	1.21E-13	3.57E-10	6.61E-11
SB126M	1.32E-02	5.11E-11	2.18E-17	0.0	1.30E-27
SB126	1.25E-01	3.16E-09	1.38E-15	1.57E-12	6.00E-11
TE125M	5.00E-01	4.88E-08	2.13E-18	7.90E-11	1.23E-11
TA182	1.15E-02	4.80E-08	2.09E-18	5.55E-11	1.12E-11
W181	1.00E-02	1.57E-06	6.62E-13	1.83E-09	3.66E-26
W185	7.50E-01	3.27E-08	1.42E-10	3.54E-07	7.52E-00
W187	9.96E-11	2.13E-02	9.25E-00	0.00000	0.00000
TL207	3.53E-03	3.36E-17	1.46E-23	7.46E-21	1.73E-27
TL208	2.15E-03	2.95E-13	1.28E-19	6.74E-20	4.07E-21
TL209	1.53E-03	2.02E-19	1.05E-25	1.80E-22	5.00E-25
PB209	1.37E-01	1.10E-17	4.79E-28	4.55E-21	0.0
PB210	7.67E-03	1.61E-18	7.03E-25	0.0	0.0
PB211	2.51E-02	3.34E-17	1.47E-23	7.80E-21	1.73E-27
PB212	4.02E-01	3.88E-13	3.86E-19	0.0	0.0
PB214	1.86E-02	2.51E-14	1.09E-20	2.97E-18	3.23E-21
BI211	1.09E-03	3.39E-17	1.47E-23	2.94E-21	1.73E-27
BI212	4.21E-02	2.22E-13	8.34E-19	1.80E-19	1.35E-21
BI213	3.24E-02	1.10E-17	4.79E-28	4.55E-21	2.47E-21
BI214	1.37E-02	2.04E-14	1.06E-20	2.97E-18	3.23E-21
PO211	6.02E-06	1.02E-10	4.42E-24	2.36E-23	3.19E-21

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NUCLID	HALF-LIFE (DAYS)	CONSTANT CONCENTRATION			
		REACTOR (%TICOR CI/ML)	REACTOR (%ICOR CI/ML)	REACTOR (%ICOR CI/ML)	REACTOR (%ICOR CI/ML)
PO212	3.47E-10	5.26E-13	7.29E-16	1.20E-15	2.64
PO213	4.46E-11	1.08E-17	4.68E-20	8.34E-21	2.02
PO214	2.31E-10	7.68E-18	1.74E-20	2.97E-18	3.23
PO215	2.08E-10	3.53E-17	4.73E-20	7.88E-21	1.73
PO216	1.74E-06	1.64E-12	3.88E-10	2.06E-17	4.73
PO218	2.12E-03	2.60E-14	1.09E-20	2.97E-19	3.23
AT217	4.70E-07	4.10E-17	4.79E-20	2.55E-21	2.07
RN218	4.63E-05	3.53E-17	4.73E-20	7.88E-21	1.73
RN220	6.48E-08	1.64E-12	3.78E-10	2.06E-17	4.73
RN222	3.87E 00	7.61E-18	7.58E-21	0.0	0.0
FR221	3.33E-03	1.10E-17	4.79E-20	2.55E-21	2.07
FR223	1.53E-07	1.14E-19	4.96E-26	1.55E-27	2.75
RA224	3.64E 00	3.08E-18	1.34E-20	0.0	0.0
RA226	5.84E 05	9.01E-20	3.92E-24	0.0	0.0
AC227	7.89E 03	8.13E-18	3.54E-20	0.0	0.0
AC228	2.55E-01	3.05E-23	1.33E-20	4.21E-24	0.0
TH228	4.98E 02	3.09E-18	1.34E-20	4.84E-17	7.5
TH229	2.67E 06	1.09E-18	4.79E-20	1.42E-21	0.0
TH230	2.92E 07	1.89E-16	8.24E-23	2.63E-19	4.51
TH231	1.07E 00	1.62E-11	7.06E-18	0.0	0.0
TH232	5.15E 12	4.53E-22	1.97E-28	6.22E-25	1.07
TH233	1.53E-07	2.84E-18	1.23E-20	0.0	3.3
TH234	2.41E 01	1.83E-11	6.22E-18	1.84E-18	3.4
PA231	1.14E 07	3.18E-16	1.35E-22	4.14E-19	7.6
PA232	1.32E 00	9.88E-12	4.30E-18	0.0	0.0
PA233	2.74E 01	1.27E-11	5.51E-18	1.74E-18	3.0
PA234	8.13E-08	1.83E-11	6.22E-18	1.86E-18	3.4
PA238	2.61E-01	2.73E-13	1.14E-19	1.84E-17	0.0
U232	2.63E 08	1.92E-13	8.36E-20	2.64E-18	4.4
U233	5.92E 07	1.35E-15	5.87E-22	1.76E-18	3.2
U234	9.02E 07	2.95E-11	1.28E-17	3.70E-18	6.7
U235	2.59E 11	7.47E-13	3.34E-10	9.97E-18	1.8
U236	4.73E 00	9.46E-12	4.34E-18	1.20E-18	2.3
U237	4.75E 00	8.06E-05	3.51E-11	2.10E-08	1.3
U238	1.64E 12	1.83E-11	6.24E-18	1.84E-18	3.4
U239	1.63E-02	7.98E-05	3.12E-11	0.0	3.5
NP236	9.17E-01	2.37E-10	1.03E-14	0.0	7.3
NP237	7.82E 00	1.82E-11	6.19E-18	1.42E-18	3.4
NP238	2.18E 00	4.80E-05	1.79E-11	1.43E-09	3.1
NP239	9.35E 00	1.92E-03	8.36E-10	0.00000	0
PU236	1.04E 03	2.91E-11	1.27E-17	3.75E-18	4.0
PU238	3.25E 18	1.69E-07	7.34E-14	2.24E-10	4.7
PU239	8.91E 06	1.36E-08	5.91E-15	1.88E-11	3.3
PU240	2.47E 06	3.91E-08	6.32E-15	2.81E-11	4.5
PU241	5.33E 03	4.88E-06	1.95E-12	5.21E-09	1.7
PU242	1.34E 09	8.12E-11	3.07E-17	1.18E-17	2.1
PU243	2.87E-01	8.11E-05	4.14E-12	7.99E-14	4.0
AM241	1.58E 05	3.44E-09	4.29E-16	2.37E-12	3.6
AM242M	3.55E 00	2.87E-10	7.25E-17	2.14E-13	3.5
AM242	6.67E-01	1.77E-06	7.70E-13	1.57E-12	3.4

DAVIS RESSE P/S 9-5-78

LYONS EFFLUENT (

ANNUAL DISE

NUCLIDE	HALF-LIFE (DAYS)	COOLANT CONCENTRATION		ANNUAL DISE	
		PRIMARY (MICRO CI/ML)	SECONDARY (MICRO CI/ML)	BORN IN (CURIES)	FLOO DRA- (CURIES)
AM243	2.79E 06	2.05E-09	8.98E-16	2.67E-12	4.90E-12
AM244	1.81E-02	1.89E-06	4.41E-13	0.0	6.14E-20
CM242	1.63E 02	1.50E-06	6.54E-13	1.81E-09	3.58E-09
CM243	1.17E 04	1.58E-10	4.87E-17	2.05E-13	3.76E-14
CM244	6.61E 03	4.19E-07	2.49E-13	8.02E-10	1.07E-09
CM245	3.02E 04	1.29E-10	5.61E-17	1.67E-13	3.07E-13
CM246	1.72E 04	6.73E-11	2.93E-17	8.75E-14	1.60E-13
FISSION PRODU. IS					
ZN 72	1.98E 00	1.90E-09	8.28E-16	3.64E-14	1.00E-12
GA 72	3.87E-01	2.17E-09	9.85E-14	8.07E-14	1.95E-12
GA 73	2.00E-01	1.37E-09	5.95E-14	6.14E-20	0.0
GA 74	5.89E-03	1.94E-10	8.07E-17	0.0	0.0
GE 75	5.69E-02	2.34E-09	1.01E-15	4.88E-35	0.0
AS 74	1.10E 00	9.11E-10	3.96E-16	5.51E-15	3.58E-13
GE 77	4.71E-01	4.84E-08	2.12E-14	5.09E-15	5.84E-12
AS 77	1.61E 00	2.13E-07	9.29E-14	4.37E-12	1.80E-10
SE 77M	2.03E-04	4.40E-10	2.79E-16	1.31E-14	4.21E-13
SE 78	6.12E-02	7.14E-09	3.09E-14	5.88E-32	0.0
AS 78	4.37E-02	1.37E-07	5.95E-14	5.32E-30	0.0
AS 79	6.25E-03	1.59E-08	6.63E-15	0.0	0.0
SE 79M	2.71E-03	2.27E-08	9.59E-15	0.0	0.0
SE 79	2.37E 07	1.82E-11	7.90E-18	2.36E-18	4.33E-14
BR 80M	1.82E-01	4.78E-07	2.08E-13	2.80E-17	4.45E-11
BR 80	1.22E-02	2.86E-05	1.22E-11	3.00E-17	4.91E-11
SE 81M	3.94E-02	7.87E-08	1.50E-14	0.0	1.07E-14
SE 81	1.29E-02	1.25E-07	4.34E-14	0.0	1.59E-14
BR 82M	4.24E-03	1.86E-09	5.99E-12	0.0	0.0
-- --	2.79E 06	1.89E-06	6.19E-10	8.00E-00	0.00001

AUGLIDE	WALE-1.1PE (1/2/7)	CONPLANT CONCENTRATIONS		ANNUAL ME	
		PRIMARY (1/2/7) (1/2/7)	SECONDARY (1/2/7) (1/2/7)	(MIN) MS (1/2/7)	FLOW (DRA) (1/2/7)
Y 91	5.00E-01	7.00E-11	7.00E-10	1.10E-10	4.00E-01
ZH 93	5.00E-06	2.10E-12	7.00E-14	1.13E-10	2.40E-10
ZH 95	5.50E-01	3.20E-06	1.15E-17	1.27E-10	6.22E-11
NB 92	1.02E-01	4.10E-06	1.00E-10	3.00E-04	3.97E-01
NB 93M	4.97E-03	3.10E-09	1.04E-15	2.30E-13	4.20E-13
NB 94	7.30E-09	2.35E-13	8.22E-20	1.25E-17	3.19E-17
NB 95	3.50E-01	7.52E-06	2.03E-12	2.05E-10	9.65E-11
NB 96	9.50E-01	1.27E-05	4.00E-12	2.30E-17	4.00E-17
NB 97	5.00E-02	8.33E-07	2.41E-13	0.0	0.0
MO 93	3.29E-06	8.00E-06	1.55E-10	1.07E-11	1.07E-11
MO 93M	2.20E-11	4.42E-07	5.75E-12	2.44E-33	6.01E-11
MO 99	2.79E-00	3.47E-03	4.30E-07	0.00000	0.00000
MO101	1.01E-02	2.30E-06	1.99E-12	0.0	0.0
TC 99M	2.50E-01	3.20E-03	3.95E-07	0.00000	0.00000
TC 99	7.67E-07	6.20E-08	1.20E-10	1.40E-11	8.44E-11
TC101	9.72E-03	8.43E-06	5.72E-12	0.0	0.0
CD115	2.23E-00	2.00E-11	7.27E-18	0.0	0.0
CD119	6.94E-03	1.96E-13	6.00E-20	0.0	0.0
IN119M	1.25E-02	5.37E-13	1.06E-19	0.0	0.0
IN119	1.46E-03	3.05E-12	1.10E-18	0.0	0.0
SN117M	1.40E-01	1.33E-08	4.66E-11	1.67E-09	1.81E-09
SN119M	2.50E-02	6.17E-08	2.10E-10	3.01E-12	6.26E-11
SN121M	2.70E-04	3.59E-10	1.20E-16	1.90E-14	4.88E-11
SN121	1.13E-00	2.25E-05	7.67E-12	4.31E-16	1.49E-11
SN123M	2.70E-02	1.05E-07	3.00E-14	0.0	0.0
SN123	1.25E-02	1.88E-09	6.50E-16	8.45E-14	2.10E-11
SN125M	4.74E-03	2.57E-06	6.73E-15	0.0	0.0
SN125	9.40E-00	4.47E-06	1.50E-18	2.60E-13	4.20E-11
SB124	6.00E-01	4.33E-09	1.52E-15	1.63E-13	5.30E-11
SB125	9.86E-02	6.10E-08	2.10E-14	3.23E-12	6.10E-11
SB126M	1.32E-02	6.41E-12	2.21E-18	0.0	0.0
SB126	1.25E-01	2.65E-10	9.27E-17	2.80E-15	2.73E-11
TE125M	9.86E-01	1.08E-08	3.79E-15	7.82E-13	1.57E-11
TA102	1.15E-02	4.32E-09	1.51E-15	1.91E-13	5.09E-11
#101	1.40E-02	3.56E-07	1.23E-13	1.63E-11	4.72E-11
#105	7.50E-01	7.44E-05	2.01E-11	3.00E-09	9.66E-11
#107	9.96E-01	5.85E-03	2.05E-09	0.00000	0.00000
TL207	3.33E-03	6.31E-17	2.21E-23	1.61E-22	1.00E-11
TL208	2.15E-03	1.91E-13	6.09E-20	7.00E-21	1.90E-11
TL209	1.53E-03	5.22E-20	1.63E-26	6.17E-25	5.37E-11
PB209	1.37E-01	2.38E-18	8.32E-25	2.01E-23	2.44E-11
PB210	7.67E-03	4.30E-15	1.54E-24	0.0	0.0
PB211	2.51E-02	6.40E-17	2.23E-23	1.61E-22	1.00E-11
PB212	4.42E-01	6.00E-13	2.10E-19	2.07E-20	9.0
PB214	1.06E-02	1.06E-13	3.73E-20	4.20E-20	6.20E-11
01211	1.49E-03	4.38E-17	2.23E-23	1.61E-22	1.00E-11
01212	4.21E-02	5.34E-13	1.67E-19	2.07E-20	5.51E-11
01213	3.26E-02	2.37E-18	6.32E-25	2.01E-23	2.44E-11
01214	1.37E-02	1.02E-13	3.50E-20	4.20E-20	6.20E-11
PO211	6.02E-06	1.91E-19	6.70E-26	4.00E-25	3.20E-11

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68840-U02-1-TNFU-OLD

LIQUID EFFLUENT

NUCLIDE	HALF-LIFE (DAYS)	COOLANT CONCENTRATIONS		ANNUAL RE	
		PRIMARY (MICRO CI/ML)	SECONDARY (MICRO CI/ML)	FUNDS RB (CI/HR)	PLUM DMS (L/HR)
PL212	4.47E-12	3.42E-15	1.41E-14	1.32E-21	3.53E-20
PL213	4.86E-11	2.32E-14	6.15E-25	2.74E-23	2.39E-22
PU214	2.31E-09	1.02E-13	3.58E-21	4.26E-20	6.24E-18
PU215	2.08E-06	6.61E-17	4.60E-24	1.41E-22	1.08E-21
PU216	1.78E-06	1.36E-12	2.03E-14	2.07E-20	1.09E-18
PU218	2.12E-03	1.12E-13	3.82E-20	4.26E-20	6.24E-18
AT217	3.70E-07	2.37E-16	8.52E-25	2.61E-25	2.40E-22
RN219	4.63E-05	6.81E-17	6.66E-24	1.61E-22	1.04E-21
KN220	6.44E-14	1.56E-17	2.61E-14	2.07E-20	1.00E-18
RN222	3.82E-00	1.13E-13	2.57E-20	0.0	0.0
FR221	3.33E-03	2.37E-18	6.32E-25	2.61E-23	2.40E-22
FR223	1.53E-02	1.57E-19	5.49E-26	6.04E-24	2.10E-23
RA224	3.46E-00	1.71E-14	5.47E-21	0.0	0.0
RA226	5.84E-05	2.51E-19	6.78E-26	0.0	0.0
AC227	7.09E-03	1.12E-17	3.92E-24	0.0	0.0
AC228	2.55E-01	3.01E-23	1.04E-29	1.66E-27	4.11E-27
TH228	6.98E-02	1.70E-14	5.97E-21	6.47E-19	0.0
TH229	2.67E-06	4.14E-19	1.45E-25	0.0	0.0
TH230	2.92E-07	6.47E-16	2.27E-22	3.71E-20	6.91E-20
TH231	1.07E-00	2.56E-11	6.97E-18	1.32E-16	0.0
TH232	5.15E-12	4.90E-22	1.72E-28	2.25E-26	6.76E-26
TH233	1.53E-02	1.73E-14	5.96E-21	0.0	0.0
TH234	2.41E-01	2.26E-11	7.92E-16	1.20E-15	3.05E-15
PA231	1.19E-07	5.21E-16	1.62E-22	2.86E-20	7.11E-20
PA232	1.32E-00	6.69E-12	2.34E-18	9.29E-22	0.0
PA233	2.74E-01	7.93E-12	2.76E-16	4.51E-16	1.06E-15
PA234M	6.13E-04	2.20E-11	7.92E-18	1.20E-15	3.07E-15
PA234	2.81E-01	1.00E-13	3.50E-20	1.20E-16	3.07E-16
U232	2.63E-06	9.82E-14	3.44E-20	5.50E-16	1.35E-17
U233	5.92E-07	2.42E-15	6.47E-22	1.26E-19	3.29E-19
U234	9.02E-07	7.40E-11	2.59E-17	3.93E-15	1.00E-14
U235	2.59E-11	2.49E-12	6.73E-19	1.32E-16	3.39E-16
U236	6.73E-09	1.18E-11	4.14E-18	6.27E-16	1.60E-15
U237	6.75E-00	3.84E-05	1.34E-11	1.11E-10	3.13E-09
U238	1.65E-12	4.27E-11	7.45E-14	1.20E-15	3.08E-15
U239	1.43E-02	6.65E-05	2.30E-11	0.0	0.0
NP236	9.17E-01	6.20E-11	2.17E-17	3.66E-23	0.0
NP237	7.92E-08	4.77E-12	3.07E-18	4.62E-16	1.21E-15
NP238	2.10E-00	9.97E-06	3.49E-12	1.09E-13	2.65E-10
NP239	2.35E-00	1.20E-03	4.34E-10	3.04E-11	3.41E-08
PU236	1.04E-03	6.50E-12	2.27E-16	3.40E-16	6.84E-16
PU238	3.25E-04	4.88E-08	1.71E-14	2.64E-12	6.71E-12
PU239	8.91E-06	1.77E-08	6.20E-15	9.56E-13	2.44E-12
PU240	2.47E-06	1.72E-06	3.41E-15	9.11E-13	2.33E-12
PU241	5.33E-03	6.49E-06	1.01E-12	1.53E-10	3.92E-10
PU242	1.38E-08	2.55E-11	6.93E-18	1.35E-15	3.46E-15
PU243	2.07E-01	2.89E-06	1.61E-12	0.0	9.25E-17
AM241	1.58E-05	3.37E-09	5.51E-16	1.04E-13	2.22E-13
AM242M	5.55E-04	3.69E-10	5.23E-17	7.92E-15	2.03E-14
AM242	6.67E-01	6.66E-07	3.62E-13	7.92E-15	7.94E-13

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GES-U-102-1-THRU-010

LIQUID EFFLUENTS

NUCLIDE	HALF-LIFE (DAYS)	COOLANT CONCENTRATIONS				ANNUAL REL	
		PRIMARY (MICRO CI/ML)	SECONDARY (MICRO CI/ML)	HUMAN HB (CURIES)	FLOOR DRAIN (CURIES)		
AM243	2,79E-06	2,49E-10	8,70E-17	1,32E-14	3,38E-14		
AM246	1,61E-02	9,94E-09	3,45E-14	0,0	0,0		
CM242	1,63E-02	5,00E-07	1,75E-13	2,35E-11	6,89E-11		
CM243	1,17E-04	2,89E-11	1,01E-17	1,53E-15	3,92E-15		
CM246	6,61E-03	2,50E-08	8,75E-14	1,32E-12	3,59E-12		
CM245	3,02E-06	2,44E-12	1,03E-14	1,58E-16	4,00E-16		
CM246	1,72E-06	4,49E-13	1,57E-19	2,38E-17	6,10E-17		
FISSELE PRODUCT							
ZN 72	1,94E-00	1,04E-09	3,64E-16	6,02E-18	2,59E-14		
GA 72	5,87E-01	1,13E-09	4,04E-16	8,64E-18	3,42E-14		
GA 73	2,04E-01	1,14E-09	4,09E-16	0,0	2,93E-20		
GA 76	5,49E-03	1,79E-10	8,05E-17	0,0	0,0		
GL 75	5,89E-02	2,50E-09	8,71E-16	0,0	9,99E-36		
AS 76	1,10E-00	2,76E-10	9,65E-17	4,11E-21	1,72E-15		
GL 77	1,71E-01	4,17E-08	1,46E-14	1,23E-26	5,02E-13		
AS 77	1,61E-00	1,61E-07	5,43E-14	2,03E-16	2,90E-12		
SE 77M	2,03E-04	4,62E-10	1,69E-16	6,09E-19	8,71E-15		
GE 76	8,12E-02	7,17E-08	2,50E-14	0,0	9,44E-33		
AS 78	6,32E-02	1,34E-07	4,68E-14	0,0	1,01E-30		
AS 79	6,25E-03	1,42E-06	6,51E-15	0,0	0,0		
SE 79M	2,71E-03	2,75E-08	9,40E-15	0,0	0,0		
SE 79	2,57E-07	1,59E-11	4,86E-18	7,38E-16	1,49E-15		
BR 80M	1,42E-01	5,13E-07	1,79E-13	0,0	2,31E-17		
BR 80	1,22E-02	2,03E-05	9,88E-12	0,0	2,48E-17		
SE 81M	3,96E-02	3,47E-08	1,21E-14	0,0	0,0		
SE 81	1,29E-02	1,59E-07	6,80E-14	0,0	0,0		
BR 82M	4,24E-03	6,38E-06	2,12E-12	0,0	0,0		
BR 82	1,47E-00	4,44E-04	1,55E-10	2,02E-12	5,93E-08		
SE 83	1,74E-02	1,64E-07	5,67E-14	0,0	0,0		
BR 83	1,00E-01	1,56E-02	4,88E-04	4,0	0,00000		
BR 83M	1,17E-03	3,11E-05	1,08E-11	0,0	0,0		
BR 84	2,21E-02	7,78E-03	2,89E-09	0,0	0,0		
RD 86	1,79E-01	1,40E-04	6,24E-11	3,58E-07	1,81E-08		
BR 87	1,43E-13	8,48E-12	2,52E-16	4,30E-14	8,81E-14		
BR 87M	1,10E-01	1,11E-11	3,89E-18	0,0	7,98E-27		
BR 88	1,24E-02	9,77E-01	2,23E-07	0,0	0,00000		
BR 89	1,07E-02	3,71E-07	3,42E-08	0,0	0,0		
BR 89	5,20E-01	6,87E-04	2,41E-18	2,52E-08	8,63E-06		
BR 90	1,03E-04	1,02E-05	6,36E-12	9,62E-10	2,47E-09		
Y 90M	1,29E-01	4,19E-11	2,48E-16	0,0	2,53E-25		
Y 96	2,67E-10	3,44E-05	4,21E-09	0,00000	0,00000		
BR 91	1,03E-01	1,48E-03	2,19E-14	0,0	0,0		