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Kerr-McGee Nuclear Corporation
ATTN: Mr. W. J. Shelley, Director
Regulation and Control
Kerr-McGee Center
Oklahoma City, Oklahoma 73125

Gentlemen:

This is in reference to the NRC commitment contained in our May 20, 1977 letter to supply you with procedures for calculating organ dose estimates upon receipt of this information from Oak Ridge National Laboratory. We have learned that ORNL uses "The AIRDOS-II Computer Code for Estimating Radiation Doses to Man from Airborne Radionuclides in Areas Surrounding Nuclear Facilities, ORNL-5245" which combines meteorological input with dose conversion computations to obtain the estimated doses.

We have estimated that contributions to radiation doses for the radionuclides of interest (U-238, U-235, U-234, Th-230, Ra-226) due to exposure from particulate fallout on the ground, from inhalation of resuspended particulates, and from immersion in air are negligible compared with doses from inhalation of airborne particulates and ingestion of radioactive materials due to particulate deposition. Consequently, in the interest of simplifying the calculations, we are forwarding copies of material extracted from ORNL-4992, "A Methodology for Calculating Radiation Doses from Radioactivity Released to the Environment." This material will permit you to calculate the desired dose estimates by hand from previously used Chi/Q values and your revised effluent estimates.

8512200275 770602
PDR ADOCK 04008027
C PDR

OFFICE →						
SURNAME →						
DATE →						

-2-

If you have any questions concerning the calculation procedures or need further information, please contact me at 301-427-4103.

Sincerely,

Original Signed by

J. E. Rothfleisch
Fuel Processing & Fabrication Branch
Division of Fuel Cycle and
Material Safety

Enclosure:
Extracts from "A Methodology for
Calculating Radiation Doses from
Radioactivity Released to the
Environment"

OFFICE	FCPF <i>for</i>	FCPF <i>for</i>				
SURNAME	J Rothfleisch:lse	LC Rouse				
DATE	6/02/77	6/2/77				

A Methodology for Calculating Radiation Doses from Radioactivity Released to the Environment

U.S. NUCLEAR REGULATORY
COMMISSION
MAY 21 1970
LIBRARY
WASHINGTON, D. C. 20555

Environmental Sciences Division Publication No. 660

OAK RIDGE NATIONAL LABORATORY
OPERATED BY UNION CARBIDE CORPORATION FOR THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

TABLE 4-8 INREM SAMPLE PROBLEM II

Internal dose calculations for ^{60}Co in liquid effluents at a concentration of $1 \times 10^{-10} \mu\text{Ci}/\text{cm}^3$ or in gaseous effluents at $1 \times 10^{-15} \mu\text{Ci}/\text{cm}^3$. A deposition velocity of 10^{-2} m/sec was assumed in calculating ground deposition of radioactivity from the air.

- a. Inhalation of radioactive material (50-year whole-body dose commitment)

$$1.0 \times 10^{-15} \mu\text{Ci}/\text{cm}^3 \times 20 \text{ m}^3/\text{day} \times 10^6 \text{ cm}^3/\text{m}^3 \times 365 \text{ days/yr} \\ \times 5.97 \times 10^{-3} \text{ rem}/\mu\text{Ci} \text{ (Table 4-2)} \times 10^3 \text{ mrem/rem} = 4.36 \\ \times 10^{-5} \text{ mrem/yr.}$$

- b. Ingestion of water that contains radioactive material

$$1.0 \times 10^{-10} \mu\text{Ci}/\text{cm}^3 \times 10^3 \text{ cm}^3/\text{liter} \times 1.2 \text{ liters/day} \\ \times 365 \text{ days/yr} \times 4.48 \times 10^{-3} \text{ rem}/\mu\text{Ci} \text{ (Table 4-3)} \\ \times 10^3 \text{ mrem/rem} = 1.96 \times 10^{-4} \text{ mrem/yr.}$$

- c. Ingestion of fish

$$1.0 \times 10^{-10} \mu\text{Ci}/\text{cm}^3 \times 1 \text{ cm}^3/\text{g} \times 2.0 \times 10^3 \text{ (freshwater} \\ \text{bioaccumulation factor from Table 4-12A)} \times 20 \text{ g/day} \\ \times 365 \text{ days/yr} \times 4.48 \times 10^{-3} \text{ rem}/\mu\text{Ci} \text{ (Table 4-3)} \\ \times 10^3 \text{ mrem/rem} = 6.54 \times 10^{-5} \text{ mrem/yr.}$$

- d. Ingestion of terrestrial food

1. Above-surface crops

$$1.0 \times 10^{-15} \mu\text{Ci}/\text{cm}^3 \times 10^{-2} \text{ m/sec} \times 3.15 \times 10^7 \text{ sec/yr} \\ \times 1.19 \frac{\mu\text{Ci}/\text{day}}{\mu\text{Ci}/\text{m}^2\text{-day}} \text{ (Table 2-8)} \times 4.48 \times 10^{-3} \text{ rem}/\mu\text{Ci} \\ \text{ (Table 4-3)} \times 10^3 \text{ mrem/rem} \times 10^6 \text{ cm}^3/\text{m}^3 = 1.68 \times \\ 10^{-3} \text{ mrem/yr.}$$

TABLE 4-8 (CONTINUED)

2. Milk

$$\begin{aligned}
 &1.0 \times 10^{-15} \text{ } \mu\text{Ci}/\text{cm}^3 \times 10^{-2} \text{ m/sec} \times 3.15 \times 10^7 \text{ sec/yr} \\
 &\times 0.113 \frac{\mu\text{Ci/day}}{\mu\text{Ci}/\text{m}^2\text{-day}} \text{ (Table 2-8)} \times 4.48 \times 10^{-3} \text{ rem}/\mu\text{Ci} \\
 &\text{(Table 4-3)} \times 10^3 \text{ mrem/rem} \times 10^6 \text{ cm}^3/\text{m}^3 = 1.59 \times 10^{-4} \\
 &\text{mrem/yr.}
 \end{aligned}$$

3. Beef

$$\begin{aligned}
 &1.0 \times 10^{-15} \text{ } \mu\text{Ci}/\text{cm}^3 \times 10^{-2} \text{ m/sec} \times 3.15 \times 10^7 \text{ sec/yr} \\
 &\times 0.743 \frac{\mu\text{Ci/day}}{\mu\text{Ci}/\text{m}^2\text{-day}} \text{ (Table 2-8)} \times 4.48 \times 10^{-3} \text{ rem}/\mu\text{Ci} \\
 &\text{(Table 4-3)} \times 10^3 \text{ mrem/rem} \times 10^6 \text{ cm}^3/\text{m}^3 = 1.05 \times 10^{-3} \\
 &\text{mrem/yr.}
 \end{aligned}$$

USE TOTAL ONLY FROM
TABLE 2-8 TO OBTAIN
TOTAL DOSE FROM INGESTION
OF TERRESTRIAL FOOD.

DOSE COMMITMENT (REMS) FROM INHALATION OF RADIONUCLIDES

NUMBER OF THE REFERENCE EVENT = 1.
 AGE OF THE INDIVIDUAL AT TIME OF EVENT = 21.000 YEARS.
 TIME AFTER EVENT WHEN INTAKE BEGINS = 0.0 YEARS.
 TIME AFTER EVENT WHEN INTAKE ENDS = 0.003 YEARS.
 DURATION OF THE INTAKE PERIOD = 0.003 YEARS.
 TIME AFTER EVENT WHEN DOSE INTEGRATION BEGINS = 0.0 YEARS.
 TIME AFTER EVENT WHEN DOSE INTEGRATION ENDS = 50.000 YEARS.
 DURATION OF DOSE INTEGRATION = 50.000 YEARS.

NO.	NUCLIDE	TOTAL BODY	BONE	MUSCLE	THYROID	LIVER	KIDNEYS	SPLEEN	TESTES	OVARIES
1	H-3*	1.077E-04	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
2	BE-7	3.756E-04	3.417E-04	NO DATA	NO DATA	7.760E-04	8.135E-04	1.436E-04	NO DATA	NO DATA
3	C-14	4.240E-04	2.262E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
4	F-18	5.451E-05	4.573E-04	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
5	NA-22	1.382E-02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
6	NA-24	1.272E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
7	SI-31	4.621E-05	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	4.043E-05	2.376E-05
8	P-32	6.144E-03	1.653E-01	NO DATA	NO DATA	9.519E-03	NO DATA	NO DATA	NO DATA	NO DATA
9	S-35	1.948E-03	4.462E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	7.682E-03	NO DATA
10	CL-36	5.921E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
11	CL-38	4.696E-05	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
12	K-42	6.533E-04	NO DATA	9.960E-04	NO DATA	5.044E-04	NO DATA	1.143E-03	NO DATA	NO DATA
13	CA-45	8.023E-03	3.647E-01	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
14	CA-47	3.950E-03	6.665E-02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
15	SC-46	7.486E-03	1.131E-02	NO DATA	NO DATA	2.759E-02	2.443E-02	NO DATA	NO DATA	NO DATA
16	SC-47	2.110E-04	1.444E-03	NO DATA	NO DATA	1.123E-03	8.062E-04	NO DATA	NO DATA	NO DATA
17	SC-48	9.789E-04	1.424E-03	NO DATA	NO DATA	3.225E-03	1.869E-03	NO DATA	NO DATA	NO DATA
18	V-48	6.000E-03	7.237E-03	NO DATA	NO DATA	1.017E-02	2.257E-02	1.218E-02	NO DATA	NO DATA
19	CR-51	1.741E-04	NO DATA	NO DATA	1.883E-04	NO DATA	5.303E-05	NO DATA	NO DATA	NO DATA
20	MN-52	2.770E-03	NO DATA	NO DATA	NO DATA	1.304E-02	NO DATA	NO DATA	NO DATA	NO DATA
21	MN-54	2.595E-03	NO DATA	NO DATA	NO DATA	1.596E-02	NO DATA	NO DATA	NO DATA	NO DATA
22	MN-56	6.565E-05	NO DATA	NO DATA	NO DATA	4.315E-04	NO DATA	NO DATA	NO DATA	NO DATA
23	FE-55	9.453E-04	1.358E-03	NO DATA	NO DATA	4.125E-03	NO DATA	7.593E-03	NO DATA	NO DATA
24	FE-59	1.086E-02	NO DATA	NO DATA	NO DATA	3.020E-02	NO DATA	4.176E-02	NO DATA	NO DATA
25	CO-57	3.468E-04	NO DATA	NO DATA	NO DATA	4.204E-04	8.051E-05	1.155E-04	NO DATA	NO DATA
26	CO-58M	1.534E-05	NO DATA	NO DATA	NO DATA	1.882E-05	3.471E-06	4.859E-06	NO DATA	NO DATA
27	CO-58	2.146E-03	NO DATA	NO DATA	NO DATA	2.100E-03	3.612E-04	5.056E-04	NO DATA	NO DATA
28	CO-60	5.968E-03	NO DATA	NO DATA	NO DATA	5.898E-03	1.040E-03	1.456E-03	NO DATA	NO DATA
29	NI-59	2.151E-03	1.290E-02	NO DATA	NO DATA	4.979E-03	NO DATA	NO DATA	NO DATA	NO DATA
30	NI-63	5.734E-03	1.794E-01	NO DATA	NO DATA	1.336E-02	NO DATA	NO DATA	NO DATA	NO DATA
31	NI-65	6.450E-05	1.221E-03	NO DATA	NO DATA	1.707E-04	NO DATA	NO DATA	NO DATA	NO DATA
32	CU-64	5.410E-05	NO DATA	NO DATA	NO DATA	1.302E-04	4.236E-04	1.047E-03	NO DATA	NO DATA
33	ZN-65	1.950E-02	8.110E-04	1.534E-02	NO DATA	4.695E-02	2.999E-02	NO DATA	3.246E-03	4.556E-03
34	ZN-69M	1.166E-04	5.739E-04	8.162E-05	NO DATA	1.375E-03	7.992E-04	NO DATA	1.234E-04	2.742E-04
35	ZN-69	4.184E-04	3.223E-05	2.929E-06	NO DATA	6.317E-05	3.905E-05	NO DATA	4.596E-06	1.404E-05
36	GA-72	2.544E-04	1.143E-03	NO DATA	NO DATA	1.583E-03	5.979E-04	5.871E-04	NO DATA	NO DATA
37	GE-71	2.504E-06	NO DATA	NO DATA	NO DATA	9.916E-06	1.173E-04	NO DATA	NO DATA	NO DATA
38	AS-73	1.035E-03	NO DATA	NO DATA	NO DATA	9.474E-04	1.591E-03	NO DATA	NO DATA	NO DATA

*One or more parameters taken from a source other than ICRP Publication 2.

TABLE 4-2 (continued)

NO.	NUCLIDE	TOTAL BODY	BONE	MUSCLE	THYROID	LIVER	KIDNEYS	SPLEEN	TESTES	OVARIES
198	RA-223	6.919E-01	6.800E-00	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
199	RA-224	2.677E-01	2.134E-00	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
200	RA-226	4.146E-01	4.028E-02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
201	RA-228	2.215E-01	1.667E-02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
202	AC-227	2.760E-02	4.990E-03	NO DATA	NO DATA	6.594E-02	2.395E-02	NO DATA	NO DATA	NO DATA
203	AC-228	1.565E-02	2.112E-01	NO DATA	NO DATA	8.160E-02	1.048E-02	NO DATA	NO DATA	NO DATA
204	TH-227	9.632E-01	3.433E-01	NO DATA	NO DATA	4.839E-01	2.742E-00	NO DATA	NO DATA	NO DATA
205	TH-228	4.160E-01	1.267E-03	NO DATA	NO DATA	1.668E-01	9.276E-01	NO DATA	NO DATA	NO DATA
206	TH-230	1.425E-02	5.253E-03	NO DATA	NO DATA	2.348E-02	1.126E-03	NO DATA	NO DATA	NO DATA
207	TH-231	5.041E-05	1.129E-03	NO DATA	NO DATA	7.381E-05	3.660E-04	NO DATA	NO DATA	NO DATA
208	TH-232	1.841E-02	5.910E-03	NO DATA	NO DATA	2.005E-02	9.636E-03	NO DATA	NO DATA	NO DATA
209	TH-234	5.740E-03	2.044E-01	NO DATA	NO DATA	9.351E-03	5.299E-02	NO DATA	NO DATA	NO DATA
210	PA-230	2.687E-01	6.525E-00	NO DATA	NO DATA	NO DATA	1.297E-00	NO DATA	NO DATA	NO DATA
211	PA-231	3.989E-02	1.003E-04	NO DATA	NO DATA	4.013E-02	2.162E-03	NO DATA	NO DATA	NO DATA
212	PA-233	2.295E-03	1.294E-02	NO DATA	NO DATA	2.764E-03	1.004E-02	NO DATA	NO DATA	NO DATA
213	PA-234*	8.062E-05	3.870E-04	NO DATA	NO DATA	9.259E-05	3.352E-04	NO DATA	NO DATA	NO DATA
214	U-230	1.576E-00	1.029E-01	NO DATA	NO DATA	NO DATA	2.083E-01	NO DATA	NO DATA	NO DATA
215	U-232	7.329E-00	1.055E-02	NO DATA	NO DATA	NO DATA	1.129E-01	NO DATA	NO DATA	NO DATA
216	U-233	1.309E-00	2.195E-01	NO DATA	NO DATA	NO DATA	5.130E-00	NO DATA	NO DATA	NO DATA
217	U-234	1.334E-00	2.111E-01	NO DATA	NO DATA	NO DATA	5.028E-00	NO DATA	NO DATA	NO DATA
218	U-235	1.204E-00	2.023E-01	NO DATA	NO DATA	NO DATA	4.720E-00	NO DATA	NO DATA	NO DATA
219	U-236	1.230E-00	2.023E-01	NO DATA	NO DATA	NO DATA	4.822E-00	NO DATA	NO DATA	NO DATA
220	U-237	2.839E-04	7.569E-04	NO DATA	NO DATA	NO DATA	3.570E-03	NO DATA	NO DATA	NO DATA
221	U-238	1.171E-00	1.935E-01	NO DATA	NO DATA	NO DATA	4.412E-00	NO DATA	NO DATA	NO DATA
222	NP-237	1.386E-02	3.344E-03	NO DATA	NO DATA	3.097E-02	1.030E-03	NO DATA	NO DATA	NO DATA
223	NP-239	1.769E-04	2.630E-03	NO DATA	NO DATA	2.873E-04	8.965E-04	NO DATA	NO DATA	NO DATA
224	PU-236	9.113E-01	3.220E-03	NO DATA	NO DATA	2.799E-02	2.091E-02	NO DATA	NO DATA	NO DATA
225	PU-238	1.435E-02	5.705E-03	NO DATA	NO DATA	8.164E-02	6.087E-02	NO DATA	NO DATA	NO DATA
226	PU-239	1.592E-02	6.559E-03	NO DATA	NO DATA	8.962E-02	6.764E-02	NO DATA	NO DATA	NO DATA
227	PU-240	1.590E-02	6.551E-03	NO DATA	NO DATA	8.962E-02	6.764E-02	NO DATA	NO DATA	NO DATA
228	PU-241	2.546E-00	1.240E-02	NO DATA	NO DATA	6.410E-00	1.219E-01	NO DATA	NO DATA	NO DATA
229	PU-242	1.534E-02	6.080E-03	NO DATA	NO DATA	8.623E-02	6.509E-02	NO DATA	NO DATA	NO DATA
230	PU-243	2.014E-05	8.711E-04	NO DATA	NO DATA	8.519E-05	9.401E-05	NO DATA	NO DATA	NO DATA
231	PU-244	1.757E-02	7.102E-03	NO DATA	NO DATA	NO DATA	7.454E-02	NO DATA	NO DATA	NO DATA
232	AM-241	1.356E-02	2.069E-03	NO DATA	NO DATA	7.174E-02	1.016E-03	NO DATA	NO DATA	NO DATA
233	AM-242M	1.371E-02	2.084E-03	NO DATA	NO DATA	6.994E-02	1.007E-03	NO DATA	NO DATA	NO DATA
234	AM-242	1.173E-02	1.478E-01	NO DATA	NO DATA	1.594E-01	8.005E-02	NO DATA	NO DATA	NO DATA
235	AM-243	1.325E-02	2.064E-03	NO DATA	NO DATA	6.977E-02	9.593E-02	NO DATA	NO DATA	NO DATA
236	AM-244	2.085E-04	2.985E-03	NO DATA	NO DATA	1.366E-03	1.451E-03	NO DATA	NO DATA	NO DATA
237	CM-242	3.380E-00	5.092E-01	NO DATA	NO DATA	5.189E-01	1.538E-01	NO DATA	NO DATA	NO DATA
238	CM-243	1.027E-02	1.771E-03	NO DATA	NO DATA	6.426E-02	4.791E-02	NO DATA	NO DATA	NO DATA
239	CM-244	7.450E-01	1.236E-03	NO DATA	NO DATA	5.419E-02	3.476E-02	NO DATA	NO DATA	NO DATA
240	CM-245	1.441E-02	2.551E-03	NO DATA	NO DATA	7.136E-02	6.725E-02	NO DATA	NO DATA	NO DATA
241	CM-246	1.441E-02	2.548E-03	NO DATA	NO DATA	7.136E-02	6.725E-02	NO DATA	NO DATA	NO DATA
242	CM-247	1.415E-02	2.462E-03	NO DATA	NO DATA	7.009E-02	6.605E-02	NO DATA	NO DATA	NO DATA
243	CM-248	1.167E-03	2.047E-04	NO DATA	NO DATA	5.776E-03	5.444E-03	NO DATA	NO DATA	NO DATA
244	CM-249	5.989E-05	9.329E-04	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
245	BK-249	2.875E-01	1.210E-01	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
246	BK-250	1.999E-03	8.137E-02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
247	CF-249	1.742E-02	7.038E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
248	CF-250	5.527E-01	2.211E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
249	CF-251	1.738E-02	6.902E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
250	CF-252	4.359E-01	1.829E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA

*One or more parameters taken from a source other than ICRP Publication 2

LUNGS

G.I. TRACT

NO.	NUCLIDE	SOLUBLE	INSOLUBLE	SOLUBLE	INSOLUBLE
154	YB-175	NO DATA	5.448E-03	1.067E-02	1.067E-02
155	LU-177	NO DATA	9.433E-03	1.067E-02	1.067E-02
156	HF-181	NO DATA	8.835E-02	1.067E-02	2.134E-02
157	TA-182	NO DATA	2.972E-01	2.372E-02	3.049E-02
158	W-181	NO DATA	5.150E-02	2.668E-03	3.557E-03
159	W-185	NO DATA	5.871E-02	7.115E-03	1.067E-02
160	W-187	NO DATA	3.998E-03	1.067E-02	2.134E-02
161	W-188*	NO DATA	3.585E-01	3.049E-02	4.269E-02
162	RE-183	NO DATA	4.158E-02	2.134E-03	4.269E-03
163	RE-186	NO DATA	1.245E-02	1.067E-02	2.668E-02
164	RE-187	NO DATA	1.315E-02	3.557E-04	1.067E-03
165	RE-188	NO DATA	5.496E-03	2.134E-02	3.557E-02
166	OS-185	NO DATA	1.409E-01	1.067E-02	2.134E-02
167	OS-191M	NO DATA	6.874E-04	3.557E-04	5.336E-04
168	OS-191	NO DATA	1.552E-02	5.336E-03	7.115E-03
169	OS-193	NO DATA	4.477E-03	2.134E-02	2.372E-02
170	IR-190	NO DATA	1.599E-02	5.336E-03	7.115E-03
171	IR-192	NO DATA	2.527E-01	2.372E-02	3.557E-02
172	IR-194	NO DATA	5.348E-03	2.668E-02	4.269E-02
173	PT-191	NO DATA	8.312E-03	7.115E-03	1.067E-02
174	PT-193M	NO DATA	9.693E-04	1.067E-03	1.067E-03
175	PT-193	NO DATA	2.087E-02	5.336E-04	7.115E-04
176	PT-197M	NO DATA	2.381E-04	1.067E-03	1.067E-03
177	PT-197	NO DATA	1.639E-03	7.115E-03	1.067E-02
178	AU-196	NO DATA	1.029E-02	5.336E-03	7.115E-03
179	AU-198	NO DATA	1.064E-02	2.134E-02	2.668E-02
180	AU-199	NO DATA	3.656E-03	5.336E-03	7.115E-03
181	HG-197M	NO DATA	1.817E-03	5.336E-02	7.115E-02
182	HG-197	NO DATA	1.258E-03	5.336E-04	2.372E-03
183	HG-203	NO DATA	5.163E-02	2.134E-03	1.067E-02
184	TL-200	3.634E-05	1.846E-03	2.372E-03	5.336E-03
185	TL-201	5.101E-05	3.218E-03	3.049E-03	7.115E-03
186	TL-202	2.295E-04	2.698E-02	7.115E-03	2.134E-02
187	TL-204	3.188E-04	2.478E-01	1.067E-02	2.134E-02
188	PB-203	NO DATA	1.836E-03	2.372E-03	3.557E-03
189	PB-204M*	NO DATA	2.535E-04	2.134E-02	2.668E-02
190	PB-210	NO DATA	2.703E-01	5.336E-03	7.115E-03
191	PB-212	NO DATA	3.333E-01	2.134E-03	7.115E-03
192	BI-206	NO DATA	4.453E-02	2.668E-02	3.049E-02
193	BI-207	NO DATA	4.751E-01	2.134E-02	2.134E-02
194	BI-210	NO DATA	1.146E-00	2.372E-02	3.049E-02
195	BI-212	NO DATA	3.192E-02	2.668E-03	3.557E-03
196	PO-210	NO DATA	3.238E-01	3.049E-02	4.269E-02
197	AT-211	NO DATA	1.672E-01	1.067E-03	2.134E-02
198	RA-223	NO DATA	2.671E-01	2.134E-01	3.049E-01
199	RA-224	NO DATA	9.062E-00	1.067E-01	2.372E-01
200	RA-226	NO DATA	1.209E-02	2.134E-02	3.557E-02
201	RA-228	NO DATA	1.675E-02	2.668E-02	5.336E-02
202	AC-227	NO DATA	2.491E-02	3.049E-03	4.269E-03
203	AC-228	NO DATA	3.803E-01	1.067E-02	1.067E-02
204	TH-227	NO DATA	3.829E-01	5.336E-02	7.115E-02

*One or more parameters taken from a source other than ICRP Publication 2.

TABLE 4-2 (continued)

NO.	NUCLIDE	LUNGS		G.I. TRACT	
		SOLUBLE	INSOLUBLE	SOLUBLE	INSOLUBLE
205	TH-228	NO DATA	1.037E 03	7.115E-02	1.067E-01
206	TH-230	NO DATA	6.419E 02	3.049E-02	3.557E-02
207	TH-231	NO DATA	1.077E-03	4.269E-03	5.336E-03
208	TH-232	NO DATA	6.152E 02	2.668E-02	3.049E-02
209	TH-234	NO DATA	1.955E-01	5.336E-02	7.115E-02
210	PA-230	NO DATA	8.479E 00	4.269E-03	5.336E-03
211	PA-231	NO DATA	5.936E 01	3.557E-02	4.269E-02
212	PA-233	NO DATA	3.678E-02	7.115E-03	1.067E-02
213	PA-234*	NO DATA	1.515E-03	NO DATA	NO DATA
214	U-230	NO DATA	5.684E 01	2.134E-01	2.668E-01
215	U-232	NO DATA	2.298E 02	3.557E-02	4.269E-02
216	U-233	NO DATA	5.497E 01	3.049E-02	3.557E-02
217	U-234	NO DATA	5.387E 01	3.049E-02	3.557E-02
218	U-235	NO DATA	5.057E 01	3.557E-02	4.269E-02
219	U-236	NO DATA	5.167E 01	3.049E-02	3.557E-02
220	U-237	NO DATA	7.084E-03	NO DATA	NO DATA
221	U-238	NO DATA	4.727E 01	2.668E-02	3.557E-02
222	NP-237	NO DATA	5.387E 01	3.049E-02	4.269E-02
223	NP-239	NO DATA	3.350E-03	7.115E-03	1.067E-02
224	PU-236	NO DATA	6.683E 02	NO DATA	NO DATA
225	PU-238	NO DATA	1.885E 02	3.557E-02	4.269E-02
226	PU-239	NO DATA	1.772E 02	3.557E-02	4.269E-02
227	PU-240	NO DATA	1.772E 02	3.557E-02	4.269E-02
228	PU-241	NO DATA	1.647E-01	7.115E-04	1.067E-03
229	PU-242	NO DATA	1.705E 02	3.049E-02	4.269E-02
230	PU-243	NO DATA	3.618E-04	3.557E-03	2.668E-03
231	PU-244	NO DATA	1.953E 02	1.067E-01	1.067E-01
232	AM-241	NO DATA	6.262E 01	3.557E-02	4.269E-02
233	AM-242M	NO DATA	2.490E 01	1.067E-02	1.067E-02
234	AM-242	NO DATA	1.379E-01	7.115E-03	1.067E-02
235	AM-243	NO DATA	5.936E 01	3.557E-02	4.269E-02
236	AM-244	NO DATA	2.653E-04	2.134E-04	2.668E-04
237	CM-242	NO DATA	4.047E 01	4.269E-02	5.336E-02
238	CM-243	NO DATA	6.529E 01	4.269E-02	5.336E-02
239	CM-244	NO DATA	6.479E 01	3.557E-02	4.269E-02
240	CM-245	NO DATA	6.046E 01	3.557E-02	4.269E-02
241	CM-246	NO DATA	6.156E 01	3.557E-02	4.269E-02
242	CM-247	NO DATA	6.046E 01	4.269E-02	5.336E-02
243	CM-248	NO DATA	4.983E 02	7.115E-01	1.067E 00
244	CM-249	NO DATA	1.249E-04	4.269E-04	5.336E-04
245	BK-249	NO DATA	5.365E-02	2.134E-03	2.134E-03
246	BK-250	NO DATA	2.820E-03	4.269E-03	5.336E-03
247	CF-249	NO DATA	6.591E 01	4.269E-02	5.336E-02
248	CF-250	NO DATA	6.602E 01	3.557E-02	5.336E-02
249	CF-251	NO DATA	6.483E 01	3.557E-02	4.269E-02
250	CF-252	NO DATA	2.008E 02	1.067E-01	2.134E-01
251	CF-253	NO DATA	8.460E 00	7.115E-03	7.115E-03
252	CF-254	NO DATA	1.329E 03	7.115E 00	1.067E 01
253	ES-253	NO DATA	1.068E 01	4.269E-02	5.336E-02
254	ES-254M	NO DATA	1.099E 00	5.336E-02	7.115E-02
255	ES-254	NO DATA	6.068E 01	7.115E-02	7.115E-02

*One or more parameters taken from a source other than ICRP Publication 2.

TABLE 4-3 INREM DOSE ESTIMATES FOR INGESTION OF A UNIT (1 μCi) OF EACH RADIONUCLIDE

DOSE COMMITMENT (REMS) FROM INGESTION OF RADIONUCLIDES

NUMBER OF THE REFERENCE EVENT = 1.
 AGE OF THE INDIVIDUAL AT TIME OF EVENT = 21.000 YEARS.
 TIME AFTER EVENT WHEN INTAKE BEGINS = 0.0 YEARS.
 TIME AFTER EVENT WHEN INTAKE ENDS = 0.003 YEARS.
 DURATION OF THE INTAKE PERIOD = 0.003 YEARS.
 TIME AFTER EVENT WHEN DOSE INTEGRATION BEGINS = 0.0 YEARS.
 TIME AFTER EVENT WHEN DOSE INTEGRATION ENDS = 50.000 YEARS.
 DURATION OF DOSE INTEGRATION = 50.000 YEARS.

NO.	NUCLIDE	TOTAL BODY	BONE	MUSCLE	THYROID	LIVER	KIDNEYS	SPLEEN	TESTES	OVARIES
1	H-3*	6.156E-05	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
2	BE-7	3.005E-06	2.734E-06	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
3	C-14	5.654E-04	2.827E-03	NO DATA	NO DATA	6.208E-06	6.508E-06	1.149E-06	NO DATA	NO DATA
4	F-18	7.268E-05	4.573E-04	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
5	NA-22	1.843E-02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
6	NA-24	1.656E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
7	SI-31	5.776E-05	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
8	P-32	7.315E-03	1.938E-01	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	5.113E-05	2.973E-05
9	S-35	2.597E-03	6.693E-03	NO DATA	NO DATA	1.190E-02	NO DATA	NO DATA	NO DATA	NO DATA
10	CL-36	7.894E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	1.015E-02	NO DATA
11	CL-38	6.261E-05	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
12	K-42	8.711E-04	NO DATA	1.321E-03	NO DATA	6.725E-04	NO DATA	NO DATA	NO DATA	NO DATA
13	CA-45	8.752E-03	3.938E-01	NO DATA	NO DATA	NO DATA	NO DATA	1.524E-03	NO DATA	NO DATA
14	CA-47	4.309E-03	7.203E-02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
15	SC-46	2.994E-06	4.523E-06	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
16	SC-47	8.439E-08	5.777E-07	NO DATA	NO DATA	1.035E-05	9.772E-06	NO DATA	NO DATA	NO DATA
17	SC-48	3.916E-07	5.696E-07	NO DATA	NO DATA	4.210E-07	3.225E-07	NO DATA	NO DATA	NO DATA
18	V-48	4.615E-04	5.066E-04	NO DATA	NO DATA	1.209E-06	7.476E-07	NO DATA	NO DATA	NO DATA
19	CR-51	3.481E-06	NO DATA	NO DATA	NO DATA	6.099E-04	1.806E-03	9.371E-04	NO DATA	NO DATA
20	MN-52	9.235E-04	NO DATA	NO DATA	3.685E-06	NO DATA	1.614E-06	NO DATA	NO DATA	NO DATA
21	MN-54	8.650E-04	NO DATA	NO DATA	NO DATA	3.725E-03	NO DATA	NO DATA	NO DATA	NO DATA
22	MN-56	2.188E-05	NO DATA	NO DATA	NO DATA	4.561E-03	NO DATA	NO DATA	NO DATA	NO DATA
23	FE-55	3.151E-04	4.526E-04	NO DATA	NO DATA	1.233E-04	NO DATA	NO DATA	NO DATA	NO DATA
24	FE-59	3.621E-03	NO DATA	NO DATA	NO DATA	1.341E-03	NO DATA	2.464E-03	NO DATA	NO DATA
25	CO-57	2.601E-04	NO DATA	NO DATA	NO DATA	9.816E-03	NO DATA	1.392E-02	NO DATA	NO DATA
26	CO-58M	1.151E-09	NO DATA	NO DATA	NO DATA	1.471E-04	6.668E-03	8.496E-03	NO DATA	NO DATA
27	CO-58	1.609E-03	NO DATA	NO DATA	NO DATA	6.580E-06	2.603E-06	3.643E-06	NO DATA	NO DATA
28	CO-60	4.476E-03	NO DATA	NO DATA	NO DATA	7.351E-04	2.789E-04	3.792E-04	NO DATA	NO DATA
29	NI-59	1.613E-03	9.674E-03	NO DATA	NO DATA	2.064E-03	7.798E-04	1.092E-03	NO DATA	NO DATA
30	NI-63	4.301E-03	1.346E-01	NO DATA	NO DATA	3.320E-03	NO DATA	NO DATA	NO DATA	NO DATA
31	NI-65	4.837E-05	9.156E-04	NO DATA	NO DATA	8.909E-03	NO DATA	NO DATA	NO DATA	NO DATA
32	CU-64	3.884E-05	NO DATA	NO DATA	NO DATA	1.138E-04	NO DATA	NO DATA	NO DATA	NO DATA
33	ZN-65	6.500E-03	3.041E-03	5.113E-03	NO DATA	8.683E-05	2.118E-04	6.977E-04	NO DATA	NO DATA
34	ZN-69M	3.886E-05	1.913E-04	2.721E-05	NO DATA	1.494E-02	9.997E-03	NO DATA	1.182E-03	1.015E-03
35	ZN-69	1.395E-06	1.074E-05	9.762E-07	NO DATA	4.376E-04	2.664E-04	NO DATA	4.113E-05	9.139E-05
36	GA-72	1.018E-06	4.573E-06	NO DATA	NO DATA	2.010E-05	1.302E-05	NO DATA	2.197E-06	9.001E-06
37	GE-71	9.432E-08	NO DATA	NO DATA	NO DATA	6.284E-06	2.392E-06	2.340E-06	NO DATA	NO DATA
38	AS-73	1.150E-04	NO DATA	NO DATA	NO DATA	3.966E-07	4.397E-06	NO DATA	NO DATA	NO DATA
						4.066E-04	1.768E-04	NO DATA	NO DATA	NO DATA

*One or more parameters taken from a source other than ICRP Publication 2.

TABLE 4-3 (continued)

NO.	NUCLIDE	TOTAL BODY	BONE	MUSCLE	THYROID	LIVER	KIDNEYS	SPLEEN	TESTES	CVARIES
198	RA-223	5.189E-01	5.145E 00	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
199	RA-224	2.023E-01	1.601E 00	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
200	RA-226	3.110E 01	3.021E 02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
201	RA-228	1.662E 01	1.250E 02	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
202	AC-227	1.104E-01	1.871E 00	NO DATA	NO DATA	2.536E-01	7.984E-02	NO DATA	NO DATA	NO DATA
203	AC-228	6.261E-06	7.922E-05	NO DATA	NO DATA	3.139E-05	3.493E-06	NO DATA	NO DATA	NO DATA
204	TH-227	3.853E-04	1.335E-02	NO DATA	NO DATA	2.419E-04	1.371E-03	NO DATA	NO DATA	NO DATA
205	TH-228	1.664E-02	4.927E-01	NO DATA	NO DATA	8.341E-03	4.638E-02	NO DATA	NO DATA	NO DATA
206	TH-230	5.701E-02	2.043E 00	NO DATA	NO DATA	1.174E-01	5.641E-01	NO DATA	NO DATA	NO DATA
207	TH-231	2.017E-08	4.392E-07	NO DATA	NO DATA	3.690E-08	1.830E-07	NO DATA	NO DATA	NO DATA
208	TH-232	7.364E-02	2.298E 00	NO DATA	NO DATA	1.003E-01	4.818E 00	NO DATA	NO DATA	NO DATA
209	TH-234	2.296E-06	7.948E-05	NO DATA	NO DATA	4.675E-06	2.649E-05	NO DATA	NO DATA	NO DATA
210	PA-230	1.075E-04	2.669E-03	NO DATA	NO DATA	NO DATA	5.189E-04	NO DATA	NO DATA	NO DATA
211	PA-231	1.595E-01	4.104E 00	NO DATA	NO DATA	1.243E-01	8.648E-01	NO DATA	NO DATA	NO DATA
212	PA-233	9.180E-07	5.293E-06	NO DATA	NO DATA	1.063E-06	4.016E-06	NO DATA	NO DATA	NO DATA
213	PA-234*	3.225E-08	1.563E-07	NO DATA	NO DATA	3.561E-08	1.341E-07	NO DATA	NO DATA	NO DATA
214	U-230	6.303E-02	4.542E-01	NO DATA	NO DATA	NO DATA	8.183E-01	NO DATA	NO DATA	NO DATA
215	U-232	2.932E-01	4.146E 00	NO DATA	NO DATA	NO DATA	4.434E-01	NO DATA	NO DATA	NO DATA
216	U-233	5.235E-02	8.638E-01	NO DATA	NO DATA	NO DATA	2.015E-01	NO DATA	NO DATA	NO DATA
217	U-234	5.130E-02	8.292E-01	NO DATA	NO DATA	NO DATA	1.575E-01	NO DATA	NO DATA	NO DATA
218	U-235	4.816E-02	7.947E-01	NO DATA	NO DATA	NO DATA	1.854E-01	NO DATA	NO DATA	NO DATA
219	U-236	4.921E-02	7.947E-01	NO DATA	NO DATA	NO DATA	1.854E-01	NO DATA	NO DATA	NO DATA
220	U-237	1.092E-05	2.973E-05	NO DATA	NO DATA	NO DATA	1.403E-04	NO DATA	NO DATA	NO DATA
221	U-238	4.502E-02	7.601E-01	NO DATA	NO DATA	NO DATA	1.735E-01	NO DATA	NO DATA	NO DATA
222	NP-237	5.542E-02	1.368E 00	NO DATA	NO DATA	1.191E-01	4.122E-01	NO DATA	NO DATA	NO DATA
223	NP-239	7.075E-08	1.076E-06	NO DATA	NO DATA	1.105E-07	3.584E-07	NO DATA	NO DATA	NO DATA
224	PU-236	1.094E-02	3.863E-01	NO DATA	NO DATA	3.315E-02	2.509E-02	NO DATA	NO DATA	NO DATA
225	PU-238	1.722E-02	6.846E-01	NO DATA	NO DATA	9.608E-02	7.305E-02	NO DATA	NO DATA	NO DATA
226	PU-239	1.911E-02	7.871E-01	NO DATA	NO DATA	1.061E-01	8.117E-02	NO DATA	NO DATA	NO DATA
227	PU-240	1.908E-02	7.861E-01	NO DATA	NO DATA	1.061E-01	8.117E-02	NO DATA	NO DATA	NO DATA
228	PU-241	3.055E-04	1.488E-02	NO DATA	NO DATA	7.590E-04	1.463E-03	NO DATA	NO DATA	NO DATA
229	PU-242	1.841E-02	7.296E-01	NO DATA	NO DATA	1.021E-01	7.811E-02	NO DATA	NO DATA	NO DATA
230	PU-243	2.417E-09	1.045E-07	NO DATA	NO DATA	1.009E-08	1.128E-08	NO DATA	NO DATA	NO DATA
231	PU-244	2.109E-02	8.522E-01	NO DATA	NO DATA	NO DATA	8.544E-02	NO DATA	NO DATA	NO DATA
232	AM-241	5.422E-02	8.211E-01	NO DATA	NO DATA	2.853E-01	4.065E-01	NO DATA	NO DATA	NO DATA
233	AM-242	5.485E-02	8.270E-01	NO DATA	NO DATA	2.782E-01	4.025E-01	NO DATA	NO DATA	NO DATA
234	AM-243	5.693E-06	5.866E-05	NO DATA	NO DATA	6.341E-05	3.202E-05	NO DATA	NO DATA	NO DATA
235	AM-244	5.300E-02	8.189E-01	NO DATA	NO DATA	2.775E-02	3.597E-01	NO DATA	NO DATA	NO DATA
236	AM-246	8.338E-08	1.184E-06	NO DATA	NO DATA	9.432E-07	9.804E-07	NO DATA	NO DATA	NO DATA
237	CM-242	1.352E-03	2.037E-02	NO DATA	NO DATA	2.075E-02	6.191E-03	NO DATA	NO DATA	NO DATA
238	CM-243	4.104E-02	7.083E-01	NO DATA	NO DATA	2.570E-01	1.916E-01	NO DATA	NO DATA	NO DATA
239	CM-244	2.980E-02	5.025E-01	NO DATA	NO DATA	2.168E-02	1.391E-01	NO DATA	NO DATA	NO DATA
240	CM-245	5.765E-02	1.020E 00	NO DATA	NO DATA	2.854E-01	2.690E-01	NO DATA	NO DATA	NO DATA
241	CM-246	5.765E-02	1.015E 00	NO DATA	NO DATA	2.854E-01	2.690E-01	NO DATA	NO DATA	NO DATA
242	CM-247	5.662E-02	9.850E-01	NO DATA	NO DATA	2.803E-01	2.642E-01	NO DATA	NO DATA	NO DATA
243	CM-248	4.666E-01	8.190E 00	NO DATA	NO DATA	2.311E 00	2.170E 00	NO DATA	NO DATA	NO DATA
244	CM-249	2.396E-08	3.732E-07	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
245	CK-249	3.449E-05	1.452E-03	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
246	CK-250	2.399E-07	9.765E-06	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
247	CF-249	2.090E-02	8.445E-01	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
248	CF-250	6.632E-03	2.653E-01	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
249	CF-251	2.085E-02	8.282E-01	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
250	CF-252	5.231E-03	2.195E-01	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA

*One or more parameters taken from a source other than ICRP Publication 2.

TABLE 4-3 (continued)

NO.	NUCLIDE	LUNGS		G.I. TRACT	
		SOLUBLE	INSOLUBLE	SOLUBLE	INSOLUBLE
154	YB-175	N3 DATA	N3 DATA	1.940E-02	1.940E-02
155	LU-177	N3 DATA	N3 DATA	1.940E-02	1.940E-02
156	HF-181	N3 DATA	N3 DATA	2.772E-02	2.772E-02
157	TA-182	N3 DATA	N3 DATA	4.851E-02	4.851E-02
158	W-181	N3 DATA	N3 DATA	4.851E-03	6.468E-03
159	W-185	N3 DATA	N3 DATA	1.940E-02	1.940E-02
160	W-187	N3 DATA	N3 DATA	2.772E-02	3.234E-02
161	W-188*	N3 DATA	N3 DATA	6.468E-02	6.468E-02
162	RE-183	N3 DATA	N3 DATA	3.234E-03	6.468E-03
163	RE-186	N3 DATA	N3 DATA	2.126E-02	3.881E-02
164	RE-187	N3 DATA	N3 DATA	6.468E-04	9.702E-04
165	RE-188	N3 DATA	N3 DATA	3.234E-02	6.468E-02
166	OS-185	N3 DATA	N3 DATA	2.772E-02	2.772E-02
167	OS-191M	N3 DATA	N3 DATA	6.468E-04	9.702E-04
168	OS-191	N3 DATA	N3 DATA	9.702E-03	9.702E-03
169	OS-193	N3 DATA	N3 DATA	3.234E-02	3.881E-02
170	IR-190	N3 DATA	N3 DATA	9.702E-03	9.702E-03
171	IR-192	N3 DATA	N3 DATA	4.851E-02	4.851E-02
172	IR-194	N3 DATA	N3 DATA	6.468E-02	6.468E-02
173	PT-191	N3 DATA	N3 DATA	1.940E-02	1.940E-02
174	PT-193M	N3 DATA	N3 DATA	1.940E-03	1.940E-03
175	PT-193	N3 DATA	N3 DATA	9.702E-04	9.702E-04
176	PT-197M	N3 DATA	N3 DATA	1.940E-03	2.156E-03
177	PT-197	N3 DATA	N3 DATA	1.940E-02	1.940E-02
178	AU-196	N3 DATA	N3 DATA	9.702E-03	1.940E-02
179	AU-198	N3 DATA	N3 DATA	3.881E-02	3.881E-02
180	AU-199	N3 DATA	N3 DATA	9.702E-03	9.702E-03
181	HG-197M	N3 DATA	N3 DATA	9.702E-04	3.881E-03
182	HG-197	N3 DATA	N3 DATA	4.851E-03	1.940E-02
183	HG-203	N3 DATA	N3 DATA	4.851E-03	9.702E-03
184	TL-200	3.384E-05	3.384E-05	9.702E-03	9.702E-03
185	TL-201	4.745E-05	4.745E-05	6.468E-03	2.772E-02
186	TL-202	2.137E-04	2.137E-04	1.940E-02	3.234E-02
187	TL-204	2.968E-04	2.968E-04	1.940E-02	3.234E-02
188	PB-203	N3 DATA	N3 DATA	4.851E-03	4.851E-03
189	PB-204M*	N3 DATA	N3 DATA	4.851E-02	4.851E-02
190	PB-210	N3 DATA	N3 DATA	9.702E-03	9.702E-03
191	PB-212	N3 DATA	N3 DATA	2.772E-03	9.702E-03
192	BI-206	N3 DATA	N3 DATA	4.851E-02	4.851E-02
193	BI-207	N3 DATA	N3 DATA	3.234E-02	3.234E-02
194	BI-210	N3 DATA	N3 DATA	4.851E-02	4.851E-02
195	BI-212	N3 DATA	N3 DATA	4.851E-03	4.851E-03
196	PO-210	N3 DATA	N3 DATA	6.468E-02	6.468E-02
197	AT-211	N3 DATA	N3 DATA	2.772E-03	2.772E-02
198	RA-223	N3 DATA	N3 DATA	3.234E-01	4.851E-01
199	RA-224	N3 DATA	N3 DATA	2.772E-01	3.881E-01
200	RA-226	N3 DATA	N3 DATA	3.881E-02	6.468E-02
201	RA-228	N3 DATA	N3 DATA	4.851E-02	6.468E-02
202	AC-227	N3 DATA	N3 DATA	6.468E-03	6.468E-03
203	AC-228	N3 DATA	N3 DATA	2.156E-02	4.156E-02
204	TH-227	N3 DATA	N3 DATA	9.702E-02	9.702E-02

*One or more parameters taken from a source other than ICRP Publication 2.

TABLE 4-3 (continued)

NO.	NUCLIDE	LUNGS		G.I. TRACT	
		SOLUBLE	INSOLUBLE	SOLUBLE	INSOLUBLE
205	TH-228	NJ DATA	NJ DATA	1.940E-01	1.940E-01
206	TH-230	NJ DATA	NJ DATA	6.468E-02	6.468E-02
207	TH-231	NJ DATA	NJ DATA	9.702E-03	9.702E-03
208	TH-232	NJ DATA	NJ DATA	4.851E-02	4.851E-02
209	TH-234	NJ DATA	NJ DATA	9.702E-02	9.702E-02
210	PA-230	NJ DATA	NJ DATA	9.702E-03	9.702E-03
211	PA-231	NJ DATA	NJ DATA	6.468E-02	6.468E-02
212	PA-233	NJ DATA	NJ DATA	1.940E-02	1.940E-02
213	PA-234*	NJ DATA	NJ DATA	NO DATA	NO DATA
214	U-230	NJ DATA	NJ DATA	3.881E-01	3.881E-01
215	U-232	NJ DATA	NJ DATA	6.468E-02	6.468E-02
216	U-233	NJ DATA	NJ DATA	6.468E-02	6.468E-02
217	U-234	NJ DATA	NJ DATA	6.468E-02	6.468E-02
218	U-235	NJ DATA	NJ DATA	6.468E-02	6.468E-02
219	U-236	NJ DATA	NJ DATA	6.468E-02	6.468E-02
220	U-237	NJ DATA	NJ DATA	6.468E-02	6.468E-02
221	U-238	NJ DATA	NJ DATA	NO DATA	NO DATA
222	NP-237	NJ DATA	NJ DATA	4.851E-02	4.851E-02
223	NP-239	NJ DATA	NJ DATA	6.468E-02	6.468E-02
224	PU-236	NJ DATA	NJ DATA	1.940E-02	1.940E-02
225	PU-238	NJ DATA	NJ DATA	NO DATA	NO DATA
226	PU-239	NJ DATA	NJ DATA	6.468E-02	6.468E-02
227	PU-240	NJ DATA	NJ DATA	6.468E-02	6.468E-02
228	PU-241	NJ DATA	NJ DATA	1.940E-03	1.940E-03
229	PU-242	NJ DATA	NJ DATA	6.468E-02	6.468E-02
230	PU-243	NJ DATA	NJ DATA	6.468E-03	6.468E-03
231	PU-244	NJ DATA	NJ DATA	1.940E-01	1.940E-01
232	AM-241	NJ DATA	NJ DATA	6.468E-02	6.468E-02
233	AM-242M	NJ DATA	NJ DATA	2.156E-02	2.156E-02
234	AM-242	NJ DATA	NJ DATA	1.940E-02	1.940E-02
235	AM-243	NJ DATA	NJ DATA	6.468E-02	6.468E-02
236	AM-244	NJ DATA	NJ DATA	3.881E-04	3.881E-04
237	CM-242	NJ DATA	NJ DATA	9.702E-02	9.702E-02
238	CM-243	NJ DATA	NJ DATA	9.702E-02	9.702E-02
239	CM-244	NJ DATA	NJ DATA	9.702E-02	9.702E-02
240	CM-245	NJ DATA	NJ DATA	6.468E-02	6.468E-02
241	CM-246	NJ DATA	NJ DATA	6.468E-02	6.468E-02
242	CM-247	NJ DATA	NJ DATA	9.702E-02	9.702E-02
243	CM-248	NJ DATA	NJ DATA	1.940E-00	1.940E-00
244	CM-249	NJ DATA	NJ DATA	9.702E-04	9.702E-04
245	BK-249	NJ DATA	NJ DATA	3.234E-03	3.234E-03
246	BK-250	NJ DATA	NJ DATA	9.702E-03	9.702E-03
247	CF-249	NJ DATA	NJ DATA	9.702E-02	9.702E-02
248	CF-250	NJ DATA	NJ DATA	6.468E-02	6.468E-02
249	CF-251	NJ DATA	NJ DATA	6.468E-02	6.468E-02
250	CF-252	NJ DATA	NJ DATA	2.772E-01	2.772E-01
251	CF-253	NJ DATA	NJ DATA	1.940E-02	1.940E-02
252	CF-254	NJ DATA	NJ DATA	1.940E-01	1.940E-01
253	ES-253	NJ DATA	NJ DATA	9.702E-02	9.702E-02
254	ES-254M	NJ DATA	NJ DATA	9.702E-02	9.702E-02
255	ES-254	NJ DATA	NJ DATA	1.940E-01	1.940E-01

*One or more parameters taken from a source other than ICRP Publication 2.

TABLE 2-8 RADIONUCLIDE INTAKE RATES ($\mu\text{Ci/day}$) FOR STANDARD MAN CALCULATED WITH THE TERMOD COMPUTER CODE ASSUMING A CONTINUOUS UNIT DEPOSITION ($1 \mu\text{Ci/m}^2$) ON THE LANDSCAPE PER DAY

Radionuclide	Intake ($\mu\text{Ci/day}$)			
	Above Surface Food ^a	Milk ^b	Beef ^c	Total
²⁶ Al	1.20	0.18	0.11	1.49
⁴⁹ V	1.16	0.288	0.09	1.47
⁴⁸ Sc	0.145	$< 10^{-3}$	0.001	0.146
⁵⁴ Mn	1.15	0.033	0.028	1.21
⁵⁵ Fe	1.19	0.16	2.05	3.4
⁵⁸ Co	1.01	0.112	0.62	1.74
⁶⁰ Co	1.19	0.113	0.743	2.05
⁶⁵ Zn	1.14	4.88	0.97	6.99
⁸⁸ Rb	0.004	0.002	$< 10^{-3}$	0.006
⁸⁹ Rb	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
⁸⁹ Sr	0.956	0.21	0.005	1.17
⁹⁰ Sr	1.20	0.295	0.04	1.54
⁹¹ Sr	0.035	0.004	$< 10^{-3}$	0.039
⁹⁰ Y	0.202	$< 10^{-3}$	$< 10^{-3}$	0.20
⁹¹ Y	0.975	$< 10^{-3}$	0.04	1.01
⁹⁵ Zr	0.994	$< 10^{-3}$	0.355	1.35
⁹⁵ Nb	0.868	0.24	1.31	2.42
⁹⁹ Mo	0.209	0.163	0.001	0.37
⁹⁹ Tc	1.20	9.0	0.07	10.27
¹⁰³ Ru	0.900	$< 10^{-3}$	2.24	3.14
¹⁰⁶ Ru	1.16	$< 10^{-3}$	14.92	16.08
^{110m} Ag	1.14	6.3	0.145	7.59
¹²⁵ Sb	1.18	0.198	0.195	1.57
^{125m} Te	0.975	0.11	7.5	8.58
¹²⁷ Te	0.034	0.002	0.003	0.039
^{127m} Te	1.07	0.12	14.5	15.69
¹²⁹ Te	0.004	$< 10^{-3}$	$< 10^{-3}$	0.005

TABLE 2-8 (CONTINUED)

Radionuclide	Intake ($\mu\text{Ci/day}$)			
	Above Surface Food ^a	Milk ^b	Beef ^c	Total
^{129m}Te	0.856	0.095	0.10	1.05
^{132}Te	0.239	0.025	0.02	0.28
$^{129}\text{I}^d$	1.20	3.6	2.83	7.63
$^{130}\text{I}^d$	0.045	0.023	$< 10^{-3}$	0.063
$^{131}\text{I}^d$	0.454	1.13	0.02	1.60
$^{132}\text{I}^d$	0.235	0.173	0.022	0.43
$^{133}\text{I}^d$	0.072	0.04	0.002	0.11
^{134}I	0.003	0.001	$< 10^{-3}$	0.004
^{135}I	0.025	0.01	$< 10^{-3}$	0.03
^{134}Cs	1.18	1.85	0.195	3.23
^{137}Cs	1.20	2.08	0.26	3.54
^{138}Cs	0.002	0.001	$< 10^{-3}$	0.003
^{140}Ba	0.589	0.04	0.006	0.63
^{140}La	0.135	$< 10^{-3}$	$< 10^{-3}$	0.135
^{141}Ce	0.850	$< 10^{-3}$	0.01	0.86
^{144}Ce	1.15	0.002	0.04	1.19
^{147}Pm	1.19	$< 10^{-3}$	0.24	1.43
^{154}Eu	1.20	$< 10^{-3}$	0.3	1.50
^{155}Eu	1.17	$< 10^{-3}$	0.218	1.39
^{187}W	0.084	0.003	$< 10^{-3}$	0.09
^{202}Tl	0.573	1.42	0.07	2.06
^{210}Pb	1.20	0.09	0.02	1.31
^{210}Bi	0.328	0.02	0.001	0.35
^{210}Po	1.09	0.36	2.53	3.98
^{222}Rn	0.267	0.57	0.006	0.84
^{226}Ra	1.20	2.37	2.44	6.01
^{228}Th	1.18	$< 10^{-3}$	0.01	1.19
^{230}Th	1.20	0.001	0.014	1.21
^{231}Th	0.089	$< 10^{-3}$	$< 10^{-3}$	0.09

TABLE 2-8 (CONTINUED)

Radionuclide	Intake ($\mu\text{Ci/day}$)			
	Above Surface Food ^a	Milk ^b	Beef ^c	Total
²³² Th	1.20	0.002	0.03	1.23
²³⁴ Th	0.775	$< 10^{-3}$	0.001	0.78
²³⁴ Pa	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
²³² U	1.20	0.08	0.023	1.30
²³³ U	1.20	0.08	0.023	1.30
²³⁴ U	1.20	0.08	0.023	1.30
²³⁵ U	1.20	0.08	0.023	1.30
²³⁶ U	1.20	0.08	0.023	1.30
²³⁷ U	0.419	0.02	$< 10^{-3}$	0.44
²³⁸ U	1.20	0.08	0.023	1.30
²³⁷ Np	1.20	0.001	0.014	1.22
²³⁸ Np	0.163	$< 10^{-3}$	$< 10^{-3}$	0.16
²³⁶ Pu	1.19	0.001	0.003	1.19
²³⁸ Pu	1.20	0.001	0.004	1.21
²³⁹ Pu	1.20	0.001	0.004	1.21
²⁴⁰ Pu	1.20	0.001	0.004	1.21
²⁴¹ Pu	1.20	0.001	0.004	1.21
²⁴² Pu	1.20	0.001	0.004	1.21
²⁴¹ Am	1.20	0.001	0.014	1.21
²⁴² Am	1.20	0.001	0.014	1.21
²⁴³ Am	1.20	0.001	0.012	1.21
²⁴² Cm	1.11	$< 10^{-3}$	0.05	1.16
²⁴³ Cm	1.20	0.001	0.013	1.21
²⁴⁴ Cm	1.20	0.001	0.012	1.21

^a0.25 kg/day intake.

^b1.0 liter/day.

^c0.3 kg/day.

^dFor calculation of dose to child's thyroid, the daily intake is assumed to be 10 times less than that of an adult for above-surface food and beef and equal to that of an adult for milk.

FROM Kerr McGee Nuclear Corp.		DATE OF DOCUMENT May 31, 1977		DATE RECEIVED June 2, 1977		NO 6586	
		LTR <input checked="" type="checkbox"/> MEMO		REP.		OTHER	
TO JE Rothfleisch		ORIG. 1		CC		OTHER	
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		Rothfleisch h (adv. cy of drawing)					
		reg file cy					
ENCLOSURES		FDR (ltr. attachment & drawing					
		LPDR " "					
		IE (2) " " & 1 drawing					
REMARKS ** additional drawings issued when available							
						6586 eeb	

U. S. NUCLEAR REGULATORY COMMISSION

MAIL CONTROL FORM

FORM NRC 326
(1-75)



KERR-McGEE NUCLEAR CORPORATION

KERR-McGEE CENTER • OKLAHOMA CITY, OKLAHOMA 73125

May 31, 1977

Docket

40-8027

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. J. E. Rothfleisch
Fuel Processing and Fabrication Branch
Division of Fuel Cycle and Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555



Dear Mr. Rothfleisch:

Please refer to our transmittal of January 11, 1977, concerning leakage of raffinate pond #2, in which we stated our intention to plug back several existing monitor wells surrounding pond #2.

This is to inform you that well modifications were made during the period 3-28-77 thru 4-5-77. Attached are four copies each of a revised monitor well location map and well summary table. Monitoring of all wells will continue at the specified frequency with a summary of 1977 data to be issued next January.

A copy of this transmittal has been forwarded directly to Dr. D. L. Warner in Rolla, Missouri. Please let us know if you have any further questions.

Very truly yours,

W. J. Shelley
W. J. Shelley, Director
Regulation and Control

WJS:ml

Attachment



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