Appendix B #2

North Anna LADTAP II Calculations - MEI and Population

Purpose: Use LADTAP II code (Strenge al 1986) and input parameters supplied by the Applicant as part of their Early Site Permit Environmental Report (Dominion 2003) to estimate doses to the maximally exposed individual from the liquid effluent pathway. Then compare these estimates to those performed by the Applicant and to the 10 CFR Part 50, Appendix I limits and to 40 CFR Part 190. Population doses were calculated for radioactive liquid effluents.

Scope: Doses to the maximally exposed individual will be calculated for the following:

- Total Body Dose – for all exposure pathways (i.e., drinking water, fish consumption, shoreline usage, swimming exposure, boating). Dose will be total for all pathways then the highest value for either the adult, teen, child, or infant will be compared to the 3 mrem/y per reactor limit in 10 CFR 50, Appendix I.

- Organ Dose - for all exposure pathways (i.e., fish consumption, shoreline usage, swimming exposure, boating). Dose will be total for each organ for all pathways then the highest value for either the adult, teen, child, or infant will be compared to the 10 mrem/y per reactor limit in 10 CFR 50, Appendix I.

- Thyroid Dose - for all exposure pathways (i.e., fish consumption, shoreline usage, swimming exposure, boating). Dose will be total for all pathways then the highest value for either the adult, teen, child, or infant will be compared to the 75 mrem/y in 40 CFR Part 190.

The input parameters used by the Applicant will be reviewed for appropriateness. If appropriate they will be used as inputs into LADTAPII for the staff's independent calculation. Default values from Regulatory Guide 1.109 will be used when input parameters are not available or the Applicant's parameter are determined not be appropriate.

The Applicant calculated collective total body doses within 50 miles of the proposed ESP site for the liquid pathway as shown in Table 5.4-12 of Dominion (2003).

Resources Used: Used a PC-version of LADTAPII code - NRCDOSE version 2.3.5 obtained through the Oak Ridge Radiation Safety Information Computational Center (RSICC). The code was written by Chesapeake Nuclear Company.

Input Parameters

- LAPTAPII runs (see c:\nrcdose\north anna\north anna_popul.lnp; c:\nrcdose\north anna\north anna_popul_other.lnp)
- Liquid effluent source term (Ci/y) – Table 5.4-6 of ER
- Other input parameters from Table 5.4-1 and Table 5.4-2 of ER
- Actual input parameters used (see table below)

B-2

Parameter	Dominion value	Staff value	Comments (appropriateness of value)
Source term (Ci/y)	Table 5.4-6 of ER	Table 5.4-6 of ER Note – the LADTAP program only accepts 34 radionuclides so the major contributors to dose were chosen. They were: H-3 3.1e+3 Na-24 3.1e-3 Cr-51 8.4e-3 Mn-54 2.8e-3 Mn-56 4.2e-3 Fe-55 6.4e-3 Fe-59 2.0e-4 Co-57 7.9e-5 Co-58 3.4e-3 Co-60 1.0e-2 Zn-65 4.1e-4 Rb-88 2.7e-4 Sr-89 1.2e-4 Sr-90 3.8e-5 Nb-95 1.9e-3 Mo-99 9.1e-4 Tc-99m 8.8e-4 Ru-103 4.9e-3 Ru-106 7.4e-2 Ag-110m 1.1e-3 Sb-124 6.8e-4 I-131 1.4e-2 I-132 2.8e-3 I-133 1.1e-2 I-134 1.9e-3 I-135 8.2e-3 Cs-134 9.9e-3 Cs-136 6.3e-4 Cs-137 1.3e-2 Cs-138 2.1e-4 Ba-140 5.5e-3 La-140 7.4e-3 Ce-141 1.3e-4 Ce-144 3.2e-3	The Applicant's liquid effluent source term represents the bounding source term based on the plant parameter envelope approach and is appropriate to use. Due to code limitations all the radionuclides listed in Table 5.4-6 could not inputed into the code. The major dose contributors were used. A separate LADTAP run was made with the remaining radionuclides to determine if they contribute significantly to dose (see run "north anna_popul_other.lnp"
Discharge flow rate (cfs)	From Table 5.4-5 (100 gpm in 10,000 gpm dilution) = 22 cfs	22 cfs (10,000 gpm)	Site-specific value from ER (Table 5.4-5) based on PPE approach - appropriate to use
Source term multiplier	1	1	Appropriate to use - the source term represents the release from one proposed ESP unit or plant. For some reactor designs a unit or plant is comprised of several reactors or modules (e.g., PBMR, IRIS).
Site population	0	0	Not included
Site type	Fresh water	Fresh water	Site-specific value from ER -

Parameter	Dominion value	Staff value	Comments (appropriateness of value)
			appropriate to use.
Reconcentration model	None	None	Site-specific value from ER
Effluent discharge rate from impoundment system to receiving water body	Not applicable if no reconcentration model chosen	Not applicable if no reconcentration model chosen	Site-specific value from ER
Impoundment total volume	Not applicable if no reconcentration model chosen	Not applicable if no reconcentration model chosen	Site-specific value from ER (Table 5.4-1)
Shore width factor	0.3	0.3 (default value from Reg Guide 1.109 for lake shore)	Site-specific value from ER - appropriate for use
Dilution factors for aquatic food & boating, shoreline & swimming, and drinking water	10 (from Table 5.4-1 of ER)	10	(Per response to RAI E5.4.2-2 (7/12/04 follow-up response) the liquid effluent release rate is 100 gpm with a dilution flow of 10,000 gpm. This yields a dilution factor of 100. Be conservative, the Applicant used a factor 10. This value is conservative and appropriate for use.)
Transit time (h)	0	0	Site specific value - conservative value (appropriate for use)
Consumption and usage factors for adult, teen, children, and infant	Table 5.4-2 of ER	Table 5.4-2 of ER	Appropriate for use - either default values from Reg Guide 1.109 or site specific values that were higher.
Population supplied by drinking water (population)	22,100	22,100	Value provided by Applicant in response to RAI E5.4.2-2 (7/12/04). Site-specific value assumed to be appropriate.
Dilution factor for water intake locations, shoreline exposure location, swimming usage location, and boating usage location (population)	10	10	(Per response to RAI E5.4.2-2 (7/12/04 follow-up response) the liquid effluent release rate is 100 gpm with a dilution flow of 10,000 gpm. This yields a dilution factor of 100. Be conservative, the Applicant used a factor 10. This value is conservative and appropriate for use.)
Total shoreline usage time (person-hours/year) (population)	1.31×10^6	1.31×10^6	Value provided by Applicant in response to RAI E5.4.2-2 (7/12/04). Site-specific value assumed to be appropriate.
Total exposure time for swimming usage location (person-hours/year) (population)	8.76×10^5	8.76×10^5	Value provided by Applicant in response to RAI E5.4.2-2 (7/12/04). Site-specific value assumed to be appropriate.
Total exposure time for boating activities (person-hours/year) (population)	2.19×10^6	2.19×10^6	Value provided by Applicant in response to RAI E5.4.2-2 (7/12/04). Site-specific value assumed to be appropriate.

Comparison of Results

Type of Dose	Applicant's ER (Dominion 2003)	Staff's Calculation	Percent Difference	Regulatory Limits	File name
Total Body (mrem/y)	1.3 (adult)	1.29[a] (adult)	-0.8%	3	*North anna_popul.lnp and North anna_popul_other.lnp*
Organ Dose (mrem/y)	1.7 (child liver)	1.68[b] (child liver)	-1.2%	10	*North anna_popul.lnp* and *North anna_popul_other.lnp*
Thyroid (mrem/y)	1.3 (infant)	1.30(infant)	0%	75	*North anna_popul.lnp*
Other organ - bone (mrem/y)	1.15[c]	1.165[d]	1.7%	25	*North anna_popul.lnp* and *North anna_popul_other.lnp*
Population dose from liquid pathway (person-rem)	14	8.2 (assumes 24-h transit time recalculate using 0 h)	-41%	n/a	*North anna_popul.lnp*

a - This is the combined dose to adult total body for both *north anna_popul.lnp* and *north anna_popul_other.lnp* calculations (1.27 mrem + 0.0163 mrem = 1.29 mrem)
b - This is the combined dose to child liver for both *north anna_popul.lnp* and *north anna_popul_other.lnp* calculations (1.65 mrem + 0.0276 mrem = 1.68 mrem)
c - Value from Table 5.4-11 of Dominion (2003) for Liquid (other organ -bone). This value in the table is for two units (2.3 mrem).
d - This is the combined dose to child bone from both *North anna_mei.lnp* and *North anna_mei_other.lnp* calculations (i.e., 0.583 mrem + 0.582 mrem = 1.165 mrem).

Impact of Other Radionuclides

The LADTAP code will only accept 34 radionuclides. Another computer run was made with the omitted radionuclides (see *north anna_popul_other.lnp* for a listing of these radionuclides). The results are shown in the table below and only contribute significantly to the bone dose.

Type of Dose	Other Radionuclides	Main Radionuclide Calculation	% of Total Dose	Regulatory Limits
Total Body (mrem/y)	0.0163 (adult)	1.27 (adult)	1.27	3
Organ Dose (mrem/y)	0.0276 (child liver)	1.65 (child liver)	1.6	10
Thyroid (mrem/y)	5.94×10^{-5} (infant)	1.30 (infant)	0	75
Bone -child (mrem/y)	0.582 (child)	0.583 (child)	50	25
Population dose (person-rem)	8.2	10^{-4}	0	n/a

The following radionuclides in Table 5.4-6 of Dominion (2003) were not in the LADTAP radionuclide library – Co-56, Sr-91, Y-93, Rh-103m, Rh-106, Ag-110, and Ba-137m.

References

Strenge et al. 1986. *LADTAP II - Technical Reference and User Guide*. NUREG/CR-4013, April 1986, Pacific Northwest Laboratory, Richland, WA.

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities", Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as is Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents.

40 CFR 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation."

U. S. Nuclear Regulatory Commission (NRC). 1977. *Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I.* Regulatory Guide 1.109, Rev.1, April 1977, Washington, DC.

Dominion. 2003. *North Anna Early Site Permit Application - Part 3 - Environmental Report.* Revision 1, October 2003.

Table 5.4-6 Release of Activities in Liquid Effluent

Isotope	Release (Ci/yr)	Isotope	Release (Ci/yr)	Isotope	Release (Ci/yr)	Isotope	Release (Ci/yr)
C-14	4.4E-04	Rb-88	2.7E-04	Ru-106	7.4E-02	Cs-134	9.9E-03
Na-24	3.1E-03	Rb-89	4.8E-05	Rh-103m	4.9E-03	Cs-136	6.3E-04
P-32	2.0E-04	Sr-89	1.2E-04	Rh-106	7.4E-02	Cs-137	1.3E-02
Cr-51	8.4E-03	Sr-90	3.8E-05	Ag-110m	1.1E-03	Cs-138	2.1E-04
Mn-54	2.8E-03	Sr-91	9.8E-04	Ag-110	1.4E-04	Ba-137m	1.2E-02
Mn-56	4.2E-03	Sr-92	8.8E-04	Sb-124	6.8E-04	Ba-140	5.5E-03
Fe-55	6.4E-03	Y-90	3.4E-06	Te-129m	1.2E-04	La-140	7.4E-03
Fe-59	2.0E-04	Y-91M	1.0E-05	Te-129	1.5E-04	Ce-141	1.3E-04
Co-56	5.7E-03	Y-91	1.2E-04	Te-131m	9.0E-05	Ce-143	1.9E-04
Co-57	7.9E-05	Y-92	6.6E-04	Te-131	3.0E-05	Ce-144	3.2E-03
Co-58	3.4E-03	Y-93	9.8E-04	Te-132	2.4E-04	Pr-143	1.3E-04
Co-60	1.0E-02	Zr-95	1.0E-03	I-131	1.4E-02	Pr-144	3.2E-03
Ni-63	1.5E-04	Nb-95	1.9E-03	I-132	2.8E-03	W-187	1.3E-04
Cu-64	8.2E-03	Mo-99	9.1E-04	I-133	1.1E-02	Np-239	3.4E-03
Zn-65	4.1E-04	Tc-99M	8.8E-04	I-134	1.9E-03	Total w/o H-3	3.2E-01
Br-84	2.0E-05	Ru-103	4.9E-03	I-135	8.2E-03	H-3	3.1E+03

Note: These composite values are somewhat different than those in Table 3.1-7 because these reflect ABWR releases at an uprated power level of 4300 MWth.

Primary calculation

Secondary RN calculation

No in Code history

1
1

File "northanna - popel - log"

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*                                                                           *
*          L      AAA   DDDD   TTTTT   AAA   PPPP     IIIII IIIII           *
*          L     A   A  D   D    T    A   A  P   P      I     I             *
*          L     A   A  D   D    T    A   A  P   P      I     I             *
*          L     AAAAA  D   D    T    AAAAA  PPPP       I     I             *
*          L     A   A  D   D    T    A   A  P          I     I             *
*          LLLLL A   A  DDDD     T    A   A  P        IIIII IIIII           *
*                                                                           *
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*        EVALUATION OF RADIATION DOSES FROM RELEASES OF RADIACTIVITY        *
*                                                                           *
*                  IN NUCLEAR POWER PLANTS LIQUID EFFLUENTS                 *
*                                                                           *
*                   REVISION DATE:  JSB PC - February 1996                  *
*                                                                           *
*                                                                           *
*     North Anna - Liquid Effluent - MEI                                    *
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*                                                                           *
*                       RADIOLOGICAL ASSESSMENT BRANCH                      *
*                                                                           *
*                       DIVISION OF SYSTEMS INTEGRATION                     *
*                                                                           *
*                       U. S. NUCLEAR REGULATORY COMMISSION                 *
*                                                                           *
*                       WASHINGTON, D. C.                                   *
*                                                                           *
*                       DATE OF RUN:    23-Jul-2004                         *
*                                                                           *
*****************************************************************************
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1
North Anna - Liquid Effluent - MEI
0 DISCHARGE=2.20E+01 CFS SOURCE TERM MULTIPLIER=1.00E+00
0. 50-MILE POPULATION=2.78E+06 FRACTION --- ADULT= .71
                                  TEENAGER= .11
                                  CHILD= .18

0 FRESHWATER SITE
1
Table 5.4-6 of ER
NO INTERNAL RECONCENTRATION MODEL EMPLOYED
0

0

NUCLIDE		CURIE/YEAR	INGESTION DOSE FACTORS (MREM/PCI INTAKE) BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SHORELINE (MREM/HR)/(PCI/M**2) SKIN	TOTAL BODY	RECON
1H	3	3.10E+03	0.00E+00	5.99E-08	5.99E-08	5.99E-08	5.99E-08	5.99E-08	5.99E-08	0.00E+00	0.00E+00	1.00E+00
11NA	24	3.10E-03	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	2.90E-08	2.50E-08	1.00E+00
24CR	51	8.40E-03	0.00E+00	0.00E+00	2.66E-09	1.59E-09	5.86E-10	3.53E-09	6.69E-07	2.60E-10	2.20E-10	1.00E+00
25MN	54	2.80E-03	0.00E+00	4.57E-06	8.72E-07	0.00E+00	1.36E-06	0.00E+00	1.40E-05	6.80E-09	5.80E-09	1.00E+00
25MN	56	4.20E-03	0.00E+00	1.15E-07	2.04E-08	0.00E+00	1.46E-07	0.00E+00	3.67E-06	1.30E-08	1.10E-08	1.00E+00
26FE	55	6.40E-03	2.75E-06	1.90E-06	4.43E-07	0.00E+00	0.00E+00	1.06E-06	1.09E-06	0.00E+00	0.00E+00	1.00E+00
26FE	59	2.00E-04	4.34E-06	1.02E-05	3.91E-06	0.00E+00	0.00E+00	2.85E-06	3.40E-05	9.40E-09	8.00E-09	1.00E+00
27CO	57	7.90E-05	0.00E+00	1.75E-07	2.91E-07	0.00E+00	0.00E+00	0.00E+00	4.44E-06	1.00E-09	9.10E-10	1.00E+00
27CO	58	3.40E-03	0.00E+00	7.45E-07	1.67E-06	0.00E+00	0.00E+00	0.00E+00	1.51E-05	8.20E-09	7.00E-09	1.00E+00
27CO	60	1.00E-02	0.00E+00	2.14E-06	4.72E-06	0.00E+00	0.00E+00	0.00E+00	4.02E-05	2.00E-08	1.70E-08	1.00E+00
30ZN	65	4.10E-04	4.84E-06	1.54E-05	6.96E-06	0.00E+00	1.03E-05	0.00E+00	9.70E-06	4.60E-09	4.00E-09	1.00E+00
37RB	88	2.70E-04	0.00E+00	6.05E-08	3.21E-08	0.00E+00	0.00E+00	0.00E+00	8.36E-19	4.00E-09	3.50E-09	1.00E+00
38SR	89	1.20E-04	3.08E-04	0.00E+00	8.84E-06	0.00E+00	0.00E+00	0.00E+00	4.94E-05	6.50E-13	5.60E-13	1.00E+00
38SR	90	3.80E-05	8.71E-03	0.00E+00	1.75E-04	0.00E+00	0.00E+00	0.00E+00	2.19E-04	0.00E+00	0.00E+00	1.00E+00
41NB	95	1.90E-03	6.22E-09	3.46E-09	1.86E-09	0.00E+00	3.42E-09	0.00E+00	2.10E-05	6.00E-09	5.10E-09	1.00E+00
42MO	99	9.10E-04	0.00E+00	4.31E-06	8.20E-07	0.00E+00	9.76E-06	0.00E+00	9.99E-06	2.20E-09	1.90E-09	1.00E+00
43TC	99M	8.80E-04	2.47E-10	6.98E-10	8.89E-09	0.00E+00	1.06E-08	3.42E-10	4.13E-07	1.10E-09	9.60E-10	1.00E+00
44RU	103	4.90E-03	1.85E-07	0.00E+00	7.97E-08	0.00E+00	7.06E-07	0.00E+00	2.16E-05	4.20E-09	3.60E-09	1.00E+00
44RU	106	7.40E-02	2.75E-06	0.00E+00	3.48E-07	0.00E+00	5.31E-06	0.00E+00	1.78E-04	1.80E-09	1.50E-09	1.00E+00
47AG	110M	1.10E-03	1.60E-07	1.48E-07	8.79E-08	0.00E+00	2.91E-07	0.00E+00	6.04E-05	2.10E-08	1.80E-08	1.00E+00
51SB	124	6.80E-04	2.80E-06	5.29E-08	1.11E-06	6.79E-09	0.00E+00	2.18E-06	7.95E-05	1.50E-08	1.30E-08	1.00E+00
53I	131	1.40E-02	4.16E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	0.00E+00	1.57E-06	3.40E-09	2.80E-09	1.00E+00
53I	132	2.80E-03	2.03E-07	5.43E-07	1.90E-07	1.90E-05	8.65E-07	0.00E+00	1.02E-07	2.00E-08	1.70E-08	1.00E+00
53I	133	1.10E-02	1.42E-06	2.47E-06	7.53E-07	3.63E-04	4.31E-06	0.00E+00	2.22E-06	4.50E-09	3.70E-09	1.00E+00
53I	134	1.90E-03	1.06E-07	2.88E-07	1.03E-07	4.99E-06	4.58E-07	0.00E+00	2.51E-10	1.90E-08	1.60E-08	1.00E+00
53I	135	8.20E-03	4.43E-07	1.16E-06	4.28E-07	7.65E-05	1.86E-06	0.00E+00	1.31E-06	1.40E-08	1.20E-08	1.00E+00
55CS	134	9.90E-03	6.22E-05	1.48E-04	1.21E-04	0.00E+00	4.79E-05	1.59E-05	2.59E-06	1.40E-08	1.20E-08	1.00E+00
55CS	136	6.30E-04	6.51E-06	2.57E-05	1.85E-05	0.00E+00	1.43E-05	1.96E-06	2.92E-06	1.70E-08	1.50E-08	1.00E+00
55CS	137	1.30E-02	7.97E-05	1.09E-04	7.14E-05	0.00E+00	3.70E-05	1.23E-05	2.11E-06	4.90E-09	4.20E-09	1.00E+00
55CS	138	2.10E-04	5.52E-08	1.09E-07	5.40E-08	0.00E+00	8.01E-08	7.91E-09	4.65E-13	2.40E-08	2.10E-08	1.00E+00
56BA	140	5.50E-03	2.03E-05	2.55E-08	1.33E-06	0.00E+00	8.67E-09	1.46E-08	4.18E-05	2.40E-09	2.10E-09	1.00E+00
57LA	140	7.40E-03	2.50E-09	1.26E-09	3.33E-10	0.00E+00	0.00E+00	0.00E+00	9.25E-05	1.70E-08	1.50E-08	1.00E+00
58CE	141	1.30E-04	9.36E-09	6.33E-09	7.18E-10	0.00E+00	2.94E-09	0.00E+00	2.42E-05	6.20E-10	5.50E-10	1.00E+00
58CE	144	3.20E-03	4.88E-07	2.04E-07	2.62E-08	0.00E+00	1.21E-07	0.00E+00	1.65E-04	3.70E-10	3.20E-10	1.00E+00

0 * * * TEENAGER DOSE FACTORS * * *

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NUCLIDE		CURIE/YEAR	INGESTION DOSE FACTORS (MREM/PCI INTAKE) BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SHORELINE (MREM/HR)/(PCI/M**2) SKIN	TOTAL BODY	RECON
1H	3	3.10E+03	0.00E+00	6.04E-08	6.04E-08	6.04E-08	6.04E-08	6.04E-08	6.04E-08			
11NA	24	3.10E-03	2.30E-06	2.30E-06	2.30E-06	2.30E-06	2.30E-06	2.30E-06	2.30E-06			
24CR	51	8.40E-03	0.00E+00	0.00E+00	3.60E-09	2.00E-09	7.89E-10	5.14E-09	6.05E-07			
25MN	54	2.80E-03	0.00E+00	5.90E-06	1.17E-06	0.00E+00	1.76E-06	0.00E+00	1.21E-05			
25MN	56	4.20E-03	0.00E+00	1.58E-07	2.81E-08	0.00E+00	2.00E-07	0.00E+00	1.04E-05			
26FE	55	6.40E-03	3.78E-06	2.68E-06	6.25E-07	0.00E+00	0.00E+00	1.70E-06	1.16E-06			
26FE	59	2.00E-04	5.87E-06	1.37E-05	5.29E-06	0.00E+00	0.00E+00	4.32E-06	3.24E-05			
27CO	57	7.90E-05	0.00E+00	2.38E-07	3.99E-07	0.00E+00	0.00E+00	0.00E+00	4.44E-06			
27CO	58	3.40E-03	0.00E+00	9.72E-07	2.24E-06	0.00E+00	0.00E+00	0.00E+00	1.34E-05			
27CO	60	1.00E-02	0.00E+00	2.81E-06	6.33E-06	0.00E+00	0.00E+00	0.00E+00	3.66E-05			
30ZN	65	4.10E-04	5.76E-06	2.00E-05	9.33E-06	0.00E+00	1.28E-05	0.00E+00	8.47E-06			
37RB	88	2.70E-04	0.00E+00	8.52E-08	4.54E-08	0.00E+00	0.00E+00	0.00E+00	7.30E-15			
38SR	89	1.20E-04	4.40E-04	0.00E+00	1.26E-05	0.00E+00	0.00E+00	0.00E+00	5.24E-05			
38SR	90	3.80E-05	1.02E-02	0.00E+00	2.04E-04	0.00E+00	0.00E+00	0.00E+00	2.33E-04			
41NB	95	1.90E-03	8.22E-09	4.56E-09	2.51E-09	0.00E+00	4.42E-09	0.00E+00	1.95E-05			
42MO	99	9.10E-04	0.00E+00	6.03E-06	1.15E-06	0.00E+00	1.38E-05	0.00E+00	1.08E-05			
43TC	99M	8.80E-04	3.32E-10	9.26E-10	1.20E-08	0.00E+00	1.38E-08	5.14E-10	6.08E-07			
44RU	103	4.90E-03	2.55E-07	0.00E+00	1.09E-07	0.00E+00	8.99E-07	0.00E+00	2.13E-05			
44RU	106	7.40E-02	3.92E-06	0.00E+00	4.94E-07	0.00E+00	7.56E-06	0.00E+00	1.88E-04			
47AG	110M	1.10E-03	2.05E-07	1.94E-07	1.18E-07	0.00E+00	3.70E-07	0.00E+00	5.45E-05			
51SB	124	6.80E-04	3.87E-06	7.13E-08	1.51E-06	8.78E-09	0.00E+00	3.38E-06	7.80E-05			

53I	132	2.80E-03	2.79E-07	7.30E-07	2.62E-07	2.46E-05	1.15E-06	0.00E+00	3.18E-07
53I	133	1.10E-02	2.01E-06	3.41E-06	1.04E-06	4.76E-04	5.98E-06	0.00E+00	2.58E-06
53I	134	1.90E-03	1.46E-07	3.87E-07	1.39E-07	6.45E-06	6.10E-07	0.00E+00	5.10E-09
53I	135	8.20E-03	6.10E-07	1.57E-06	5.82E-07	1.01E-04	2.48E-06	0.00E+00	1.74E-06
55CS	134	9.90E-03	8.37E-05	1.97E-04	9.14E-05	0.00E+00	6.26E-05	2.39E-05	2.45E-06
55CS	136	6.30E-04	8.59E-06	3.38E-05	2.27E-05	0.00E+00	1.84E-05	2.90E-06	2.72E-06
55CS	137	1.30E-02	1.12E-04	1.49E-04	5.19E-05	0.00E+00	5.07E-05	1.97E-05	2.12E-06
55CS	138	2.10E-04	7.76E-08	1.49E-07	7.45E-08	0.00E+00	1.10E-07	1.28E-08	6.76E-11
56BA	140	5.50E-03	2.84E-05	3.48E-08	1.83E-06	0.00E+00	1.18E-08	2.34E-08	4.38E-05
57LA	140	7.40E-03	3.48E-09	1.71E-09	4.55E-10	0.00E+00	0.00E+00	0.00E+00	9.82E-05
58CE	141	1.30E-04	1.33E-08	8.88E-09	1.02E-09	0.00E+00	4.18E-09	0.00E+00	2.54E-05
58CE	144	3.20E-03	6.96E-07	2.88E-07	3.74E-08	0.00E+00	1.72E-07	0.00E+00	1.75E-04

0 * * * CHILD DOSE FACTORS * * *

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			INGESTION DOSE FACTORS (MREM/PCI INTAKE)							SHORELINE (MREM/HR)/(PCI/M**2)		
NUCLIDE		CURIE/YEAR	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY	RECON
1H	3	3.10E+03	0.00E+00	1.16E-07	1.16E-07	1.16E-07	1.16E-07	1.16E-07	1.16E-07			
11NA	24	3.10E-03	5.80E-06	5.80E-06	5.80E-06	5.80E-06	5.80E-06	5.80E-06	5.80E-06			
24CR	51	8.40E-03	0.00E+00	0.00E+00	8.90E-09	4.94E-09	1.35E-09	9.02E-09	4.72E-07			
25MN	54	2.80E-03	0.00E+00	1.07E-05	2.85E-06	0.00E+00	3.00E-06	0.00E+00	8.98E-06			
25MN	56	4.20E-03	0.00E+00	3.34E-07	7.54E-08	0.00E+00	4.04E-07	0.00E+00	4.84E-05			
26FE	55	6.40E-03	1.15E-05	6.10E-06	1.89E-06	0.00E+00	0.00E+00	3.45E-06	1.13E-06			
26FE	59	2.00E-04	1.65E-05	2.67E-05	1.33E-05	0.00E+00	0.00E+00	7.74E-06	2.78E-05			
27CO	57	7.90E-05	0.00E+00	4.93E-07	9.98E-07	0.00E+00	0.00E+00	0.00E+00	4.04E-06			
27CO	58	3.40E-03	0.00E+00	1.80E-06	5.51E-06	0.00E+00	0.00E+00	0.00E+00	1.05E-05			
27CO	60	1.00E-02	0.00E+00	5.29E-06	1.56E-05	0.00E+00	0.00E+00	0.00E+00	2.93E-05			
30ZN	65	4.10E-04	1.37E-05	3.65E-05	2.27E-05	0.00E+00	2.30E-05	0.00E+00	6.41E-06			
37RB	88	2.70E-04	0.00E+00	1.90E-07	1.32E-07	0.00E+00	0.00E+00	0.00E+00	9.32E-09			
38SR	89	1.20E-04	1.32E-03	0.00E+00	3.77E-05	0.00E+00	0.00E+00	0.00E+00	5.11E-05			
38SR	90	3.80E-05	2.56E-02	0.00E+00	5.15E-04	0.00E+00	0.00E+00	0.00E+00	2.29E-04			
41NB	95	1.90E-03	2.25E-08	8.76E-09	6.26E-09	0.00E+00	8.23E-09	0.00E+00	1.62E-05			
42MO	99	9.10E-04	0.00E+00	1.33E-05	3.29E-06	0.00E+00	2.84E-05	0.00E+00	1.10E-05			
43TC	99M	8.80E-04	9.23E-10	1.81E-09	3.00E-08	0.00E+00	2.63E-08	9.19E-10	1.03E-06			
44RU	103	4.90E-03	7.31E-07	0.00E+00	2.81E-07	0.00E+00	1.84E-06	0.00E+00	1.89E-05			
44RU	106	7.40E-02	1.17E-05	0.00E+00	1.46E-06	0.00E+00	1.58E-05	0.00E+00	1.82E-04			
47AG	110M	1.10E-03	5.39E-07	3.64E-07	2.91E-07	0.00E+00	6.78E-07	0.00E+00	4.33E-05			
51SB	124	6.80E-04	1.11E-05	1.44E-07	3.89E-06	2.45E-08	0.00E+00	6.16E-06	6.94E-05			
53I	131	1.40E-02	1.72E-05	1.73E-05	9.83E-06	5.72E-03	2.84E-05	0.00E+00	1.54E-06			
53I	132	2.80E-03	8.00E-07	1.47E-06	6.76E-07	6.82E-05	2.25E-06	0.00E+00	1.73E-06			
53I	133	1.10E-02	5.92E-06	7.32E-06	2.77E-06	1.36E-03	1.22E-05	0.00E+00	2.95E-06			
53I	134	1.90E-03	4.19E-07	7.78E-07	3.58E-07	1.79E-05	1.19E-06	0.00E+00	5.16E-07			
53I	135	8.20E-03	1.75E-06	3.15E-06	1.49E-06	2.79E-04	4.83E-06	0.00E+00	2.40E-06			
55CS	134	9.90E-03	2.34E-04	3.84E-04	8.10E-05	0.00E+00	1.19E-04	4.27E-05	2.07E-06			
55CS	136	6.30E-04	2.35E-05	6.46E-05	4.18E-05	0.00E+00	3.44E-05	5.13E-06	2.27E-06			
55CS	137	1.30E-02	3.27E-04	3.13E-04	4.62E-05	0.00E+00	1.02E-04	3.67E-05	1.96E-06			
55CS	138	2.10E-04	2.28E-07	3.17E-07	2.01E-07	0.00E+00	2.23E-07	2.40E-08	1.46E-07			
56BA	140	5.50E-03	8.31E-05	7.28E-08	4.85E-06	0.00E+00	2.37E-08	4.34E-08	4.21E-05			
57LA	140	7.40E-03	1.01E-08	3.53E-09	1.19E-09	0.00E+00	0.00E+00	0.00E+00	9.84E-05			
58CE	141	1.30E-04	3.97E-08	1.98E-08	2.94E-09	0.00E+00	8.68E-09	0.00E+00	2.47E-05			
58CE	144	3.20E-03	2.08E-06	6.52E-07	1.11E-07	0.00E+00	3.61E-07	0.00E+00	1.70E-04			

0 * * * INFANT DOSE FACTORS * * *

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			INGESTION DOSE FACTORS (MREM/PCI INTAKE)							SHORELINE (MREM/HR)/(PCI/M**2)		
NUCLIDE		CURIE/YEAR	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY	RECON
1H	3	3.10E+03	0.00E+00	1.76E-07	1.76E-07	1.76E-07	1.76E-07	1.76E-07	1.76E-07			
11NA	24	3.10E-03	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05			
24CR	51	8.40E-03	0.00E+00	0.00E+00	1.41E-08	9.20E-09	2.01E-09	1.79E-08	4.11E-07			
25MN	54	2.80E-03	0.00E+00	1.99E-05	4.51E-06	0.00E+00	4.41E-06	0.00E+00	7.31E-06			
25MN	56	4.20E-03	0.00E+00	8.18E-07	1.41E-07	0.00E+00	7.03E-07	0.00E+00	7.43E-05			
26FE	55	6.40E-03	1.39E-05	8.98E-06	2.40E-06	0.00E+00	0.00E+00	4.39E-06	1.14E-06			
26FE	59	2.00E-04	3.08E-05	5.38E-05	2.12E-05	0.00E+00	0.00E+00	1.59E-05	2.57E-05			
27CO	57	7.90E-05	0.00E+00	1.15E-06	1.87E-06	0.00E+00	0.00E+00	0.00E+00	3.92E-06			
27CO	58	3.40E-03	0.00E+00	3.60E-06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

27CO	60	1.00E-02	0.00E+00	1.08E-05	2.55E-05	0.00E+00	0.00E+00	0.00E+00	2.57E-05
30ZN	65	4.10E-04	1.84E-05	6.31E-05	2.91E-05	0.00E+00	3.06E-05	0.00E+00	5.33E-05
37RB	88	2.70E-04	0.00E+00	4.98E-07	2.73E-07	0.00E+00	0.00E+00	0.00E+00	4.85E-07
38SR	89	1.20E-04	2.51E-03	0.00E+00	7.20E-05	0.00E+00	0.00E+00	0.00E+00	5.16E-05
38SR	90	3.80E-05	2.83E-02	0.00E+00	5.74E-04	0.00E+00	0.00E+00	0.00E+00	2.31E-04
41NB	95	1.90E-03	4.20E-08	1.73E-08	1.00E-08	0.00E+00	1.24E-08	0.00E+00	1.46E-05
42MO	99	9.10E-04	0.00E+00	3.40E-05	6.63E-06	0.00E+00	5.08E-05	0.00E+00	1.12E-05
43TC	99M	8.80E-04	1.92E-09	3.96E-09	5.10E-08	0.00E+00	4.26E-08	2.07E-09	1.15E-06
44RU	103	4.90E-03	1.48E-06	0.00E+00	4.95E-07	0.00E+00	3.08E-06	0.00E+00	1.80E-05
44RU	106	7.40E-02	2.41E-05	0.00E+00	3.01E-06	0.00E+00	2.85E-05	0.00E+00	1.83E-04
47AG	110M	1.10E-03	9.96E-07	7.27E-07	4.81E-07	0.00E+00	1.04E-06	0.00E+00	3.77E-05
51SB	124	6.80E-04	2.14E-05	3.15E-07	6.63E-06	5.68E-08	0.00E+00	1.34E-05	6.60E-05
53I	131	1.40E-02	3.59E-05	4.23E-05	1.86E-05	1.39E-02	4.94E-05	0.00E+00	1.51E-06
53I	132	2.80E-03	1.66E-06	3.37E-06	1.20E-06	1.58E-04	3.76E-06	0.00E+00	2.73E-06
53I	133	1.10E-02	1.25E-05	1.82E-05	5.33E-06	3.31E-03	2.14E-05	0.00E+00	3.08E-06
53I	134	1.90E-03	8.69E-07	1.78E-06	6.33E-07	4.15E-05	1.99E-06	0.00E+00	1.84E-06
53I	135	8.20E-03	3.64E-06	7.24E-06	2.64E-06	6.49E-04	8.07E-06	0.00E+00	2.62E-06
55CS	134	9.90E-03	3.77E-04	7.03E-04	7.10E-05	0.00E+00	1.81E-04	7.42E-05	1.91E-06
55CS	136	6.30E-04	4.59E-05	1.35E-04	5.04E-05	0.00E+00	5.38E-05	1.10E-05	2.05E-06
55CS	137	1.30E-02	5.22E-04	6.11E-04	4.33E-05	0.00E+00	1.64E-04	6.64E-05	1.91E-06
55CS	138	2.10E-04	4.81E-07	7.82E-07	3.79E-07	0.00E+00	3.90E-07	6.09E-08	1.25E-06
56BA	140	5.50E-03	1.71E-04	1.71E-07	8.81E-06	0.00E+00	4.06E-08	1.05E-07	4.20E-05
57LA	140	7.40E-03	2.11E-08	8.32E-09	2.14E-09	0.00E+00	0.00E+00	0.00E+00	9.77E-05
58CE	141	1.30E-04	7.87E-08	4.80E-08	5.65E-09	0.00E+00	1.48E-08	0.00E+00	2.48E-05
58CE	144	3.20E-03	2.98E-06	1.22E-06	1.67E-07	0.00E+00	4.93E-07	0.00E+00	1.71E-04

0TOTAL NUMBER IN SOURCE TERM IS 34 TOTAL RELEASE IS 3.1002E+03

1 * * * AS LOW AS REASONABLY ACHIEVABLE * * *

0 A D U L T D O S E S

0 DOSE__(MREM PER YEAR INTAKE)

0PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		3.56E-01	6.39E-01	4.75E-01	6.10E-02	2.25E-01	8.59E-02	1.76E-01
INVERTEBRATE		4.72E-02	1.10E-01	6.57E-02	7.68E-03	4.16E-02	1.30E-02	2.29E-01
DRINKING		9.02E-03	7.01E-01	6.98E-01	7.97E-01	6.95E-01	6.91E-01	7.47E-01
SHORELINE	3.59E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02
SWIMMING		2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04
BOATING		3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04
TOTAL	3.59E-02	4.43E-01	1.48E+00	1.27E+00	8.97E-01	9.93E-01	8.21E-01	1.18E+00

0	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR= .3
FISH	21.0	10.0	24.00	
INVERTEBRATE	5.0	10.0	24.00	
DRINKING	730.0	10.0	12.00	
SHORELINE	300.0	10.0	.00	
SWIMMING	200.0	10.0	.00	
BOATING	500.0	10.0	.00	

0 T E E N A G E R D O S E S

0 DOSE__(MREM PER YEAR INTAKE)

0PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		3.75E-01	6.52E-01	2.74E-01	5.42E-02	2.25E-01	9.43E-02	1.27E-01
INVERTEBRATE		4.94E-02	1.10E-01	4.13E-02	6.47E-03	4.11E-02	1.35E-02	1.70E-01
DRINKING		8.57E-03	4.96E-01	4.90E-01	5.79E-01	4.91E-01	4.87E-01	5.28E-01
SHORELINE	3.59E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02
SWIMMING		2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04
BOATING		3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04
TOTAL	3.59E-02	4.64E-01	1.29E+00	8.37E-01	6.70E-01	7.89E-01	6.26E-01	8.56E-01

0	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR= .3
FISH	16.0	10.0	24.00	
INVERTEBRATE	3.8	10.0	24.00	
DRINKING	510.0	10.0	12.00	
SHORELINE	300.0	10.0	.00	
SWIMMING	200.0	10.0	.00	
BOATING	500.0	10.0	.00	

0 C H I L D D O S E S

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0PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		4.64E-01	5.68E-01	1.13E-01	5.37E-02	1.90E-01	7.48E-02	5.29E-02
INVERTEBRATE		6.36E-02	9.71E-02	2.32E-02	6.28E-03	3.51E-02	1.13E-02	6.89E-02
DRINKING		2.44E-02	9.54E-01	9.38E-01	1.16E+00	9.44E-01	9.35E-01	9.73E-01
SHORELINE	3.59E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02
SWIMMING		2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04
BOATING		3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04
TOTAL	3.59E-02	5.83E-01	1.65E+00	1.11E+00	1.25E+00	1.20E+00	1.05E+00	1.13E+00

0 USAGE (KG/YR,HR/YR) DILUTION TIME(HR) SHOREWIDTH FACTOR= .3

FISH	6.9	10.0	24.00
INVERTEBRATE	1.7	10.0	24.00
DRINKING	510.0	10.0	12.00
SHORELINE	300.0	10.0	.00
SWIMMING	200.0	10.0	.00
BOATING	500.0	10.0	.00

0 I N F A N T D O S E S

0 DOSE__(MREM PER YEAR INTAKE)

0PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
DRINKING		2.58E-02	9.43E-01	9.20E-01	1.27E+00	9.27E-01	9.19E-01	9.42E-01
SHORELINE	3.59E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02	3.06E-02
SWIMMING		2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04	2.91E-04
BOATING		3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04
TOTAL	3.59E-02	5.71E-02	9.74E-01	9.51E-01	1.30E+00	9.59E-01	9.50E-01	9.73E-01

0 USAGE (KG/YR,HR/YR) DILUTION TIME(HR) SHOREWIDTH FACTOR= .3

FISH	.0	10.0	24.00
DRINKING	330.0	10.0	12.00
SHORELINE	300.0	10.0	.00
SWIMMING	200.0	10.0	.00
BOATING	500.0	10.0	.00

1 * * * POPULATION WATER CONSUMPTION DOSES * * *

0

0SUPPLIER-Lake Anna

0 DOSE (PERSON-REM)

0PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
DRINKING	ADULT	5.81E+06	7.14E-02	5.57E+00	5.55E+00	6.28E+00	5.53E+00	5.49E+00	5.93E+00
DRINKING	TEENAGER	6.32E+05	1.06E-02	6.15E-01	6.08E-01	7.08E-01	6.09E-01	6.04E-01	6.53E-01
DRINKING	CHILD	1.03E+06	4.93E-02	1.94E+00	1.90E+00	2.31E+00	1.91E+00	1.90E+00	1.97E+00
DRINKING	TOTAL	7.47E+06	1.31E-01	8.12E+00	8.06E+00	9.30E+00	8.05E+00	7.99E+00	8.56E+00

0POPULATION=2.21E+04 DILUTION=1.00E+01 TRANSIT TIME=2.40E+01 HR (INCLUDING 24 HR FOR TREATMENT FACILITY)

0AVERAGE INDIVIDUAL CONSUMPTION (L/YR) ADULT=3.70E+02 TEEN=2.60E+02 CHILD=2.60E+02

0-----CUMULATIVE TOTAL-----

0PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
DRINKING	CUMUL TOTAL	7.47E+06	1.31E-01	8.12E+00	8.06E+00	9.30E+00	8.05E+00	7.99E+00	8.56E+00

0

0_____HYDROSPHERE TRITIUM DOSE_____

0AVERAGE INDIVIDUAL WATER CONSUMPTION = 3.0 L/DAY

0PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
WATER	TOTAL	2.86E+11	0.00E+00	2.36E-02	2.36E-02	2.36E-02	2.36E-02	2.36E-02	2.36E-02

1 * * * RECREATION POPULATION DOSES * * *

0

0LOCATION- Lake Anna

0DILUTION= 1.00E+01 TRANSIT TIME= 0.00E+00 HR SWF= .3

0 DOSE (PERSON-REM)

0PATHWAY	AGE GROUP	USAGE	SKIN	TOTAL BODY	THYROID
SHORELINE	TOTAL POPUL	1.31E+06	1.57E-01	1.34E-01	1.34E-01

0

0LOCATION- Lake Anna

0DILUTION= 1.00E+01 TRANSIT TIME= 0.00E+00 HR

0 DOSE (PERSON-REM)

0PATHWAY	AGE GROUP	USAGE	SKIN	TOTAL BODY	THYROID
SWIMMING	TOTAL POPUL	8.76E+05		1.28E-03	1.28E-03

0

0LOCATION- Lake Anna
0DILUTION= 1.00E+01 TRANSIT TIME= 0.00E+00 HR
0

0PATHWAY	AGE GROUP	USAGE	DOSE (PERSON-REM) SKIN	TOTAL BODY	THYROID
BOATING	TOTAL POPUL	2.19E+06		1.60E-03	1.60E-03

1 * * * COST-BENEFIT ANALYSIS * * *

0 NUCLIDE	RELEASE CI/YR	PERSON-REM DOSE TOTAL BODY	PERSON-REM DOSE THYROID	PERSON-REM PER CURIE TOTAL BODY	PERSON-REM PER CURIE THYROID
1H 3	3.10E+03	7.98E+00	7.98E+00	2.57E-03	2.57E-03
11NA 24	3.10E-03	3.42E-04	3.42E-04	1.10E-01	1.10E-01
24CR 51	8.40E-03	1.57E-05	1.52E-05	1.87E-03	1.82E-03
25MN 54	2.80E-03	1.18E-03	1.06E-03	4.21E-01	3.77E-01
25MN 56	4.20E-03	1.36E-04	1.36E-04	3.23E-02	3.23E-02
26FE 55	6.40E-03	1.60E-04	4.11E-09	2.50E-02	6.42E-07
26FE 59	2.00E-04	5.85E-05	1.87E-05	2.93E-01	9.33E-02
27CO 57	7.90E-05	5.26E-06	4.07E-06	6.66E-02	5.15E-02
27CO 58	3.40E-03	6.87E-04	3.99E-04	2.02E-01	1.17E-01
27CO 60	1.00E-02	6.34E-02	6.10E-02	6.34E+00	6.10E+00
30ZN 65	4.10E-04	2.30E-04	8.44E-05	5.60E-01	2.06E-01
37RB 88	2.70E-04	3.25E-06	3.25E-06	1.20E-02	1.20E-02
38SR 89	1.20E-04	5.92E-05	6.21E-09	4.93E-01	5.18E-05
38SR 90	3.80E-05	3.24E-04	2.06E-10	8.53E+00	5.41E-06
41NB 95	1.90E-03	9.50E-05	9.48E-05	5.00E-02	4.99E-02
42MO 99	9.10E-04	3.72E-05	5.24E-06	4.09E-02	5.76E-03
43TC 99M	8.80E-04	2.19E-06	2.16E-06	2.48E-03	2.45E-03
44RU 103	4.90E-03	2.02E-04	1.82E-04	4.13E-02	3.72E-02
44RU 106	7.40E-02	9.89E-03	8.45E-03	1.34E-01	1.14E-01
47AG 110M	1.10E-03	1.05E-03	1.05E-03	9.55E-01	9.51E-01
51SB 124	6.80E-04	1.70E-04	1.31E-04	2.50E-01	1.93E-01
53I 131	1.40E-02	2.31E-03	1.22E+00	1.65E-01	8.75E+01
53I 132	2.80E-03	1.24E-04	1.26E-04	4.44E-02	4.52E-02
53I 133	1.10E-02	3.12E-04	9.61E-02	2.83E-02	8.74E+00
53I 134	1.90E-03	8.02E-05	8.02E-05	4.22E-02	4.22E-02
53I 135	8.20E-03	2.91E-04	2.94E-03	3.55E-02	3.59E-01
55CS 134	9.90E-03	6.05E-02	1.81E-02	6.11E+00	1.83E+00
55CS 136	6.30E-04	5.52E-04	5.07E-05	8.76E-01	8.04E-02
55CS 137	1.30E-02	7.71E-02	4.44E-02	5.93E+00	3.41E+00
55CS 138	2.10E-04	8.44E-06	8.44E-06	4.02E-02	4.02E-02
56BA 140	5.50E-03	4.25E-04	5.66E-05	7.72E-02	1.03E-02
57LA 140	7.40E-03	3.41E-04	3.41E-04	4.61E-02	4.61E-02
58CE 141	1.30E-04	6.39E-07	6.34E-07	4.91E-03	4.87E-03
58CE 144	3.20E-03	6.57E-05	6.10E-05	2.05E-02	1.91E-02
0 TOTAL		8.20E+00	9.44E+00		

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1

File "northanna-population.lup"

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*                                                                           *
*                                                                           *
*            L      AAA   DDDD   TTTTT   AAA   PPPP     IIIII IIIII         *
*            L     A   A  D   D    T    A   A  P   P      I     I           *
*            L     A   A  D   D    T    A   A  P   P      I     I           *
*            L     AAAAA  D   D    T    AAAAA  PPPP       I     I           *
*            L     A   A  D   D    T    A   A  P          I     I           *
*            LLLLL A   A  DDDD     T    A   A  P        IIIII IIIII         *
*                                                                           *
*                                                                           *
*                                                                           *
*                                                                           *
*                                                                           *
*          EVALUATION OF RADIATION DOSES FROM RELEASES OF RADIACTIVITY      *
*                                                                           *
*                    IN NUCLEAR POWER PLANTS LIQUID EFFLUENTS               *
*                                                                           *
*                     REVISION DATE:  JSB PC - February 1996                *
*                                                                           *
*                                                                           *
*      North Anna - Liquid Effluent - MEI (other radionuclides)             *
*                                                                           *
*                                                                           *
*                                                                           *
*                                                                           *
*                         RADIOLOGICAL ASSESSMENT BRANCH                    *
*                                                                           *
*                         DIVISION OF SYSTEMS INTEGRATION                   *
*                                                                           *
*                         U. S. NUCLEAR REGULATORY COMMISSION               *
*                                                                           *
*                         WASHINGTON, D. C.                                 *
*                                                                           *
*                         DATE OF RUN:    23-Jul-2004                       *
*                                                                           *
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1
 North Anna - Liquid Effluent - MEI (other radionuclides)
0  DISCHARGE=2.20E+01 CFS          SOURCE TERM MULTIPLIER=1.00E+00
0  50-MILE POPULATION=2.78E+06     FRACTION ---  ADULT= .71
                                                 TEENAGER= .11
                                                 CHILD= .18
0  FRESHWATER SITE
1
 Table 5.4-6 of ER
 NO INTERNAL RECONCENTRATION MODEL EMPLOYED
0
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NUCLIDE	CURIE/YEAR	INGESTION DOSE FACTORS (MREM/PCI INTAKE) BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SHORELINE (MREM/HR)/(PCI/M**2) SKIN	TOTAL BODY	RECON
6C 14	4.40E-04	2.84E-06	5.68E-07	5.68E-07	5.68E-07	5.68E-07	5.68E-07	5.68E-07	0.00E+00	0.00E+00	1.00E+00
15P 32	2.00E-04	1.93E-04	1.20E-05	7.46E-06	0.00E+00	0.00E+00	0.00E+00	2.17E-05	0.00E+00	0.00E+00	1.00E+00
28NI 63	1.50E-04	1.30E-04	9.01E-06	4.36E-06	0.00E+00	0.00E+00	0.00E+00	1.88E-06	0.00E+00	0.00E+00	1.00E+00
29CU 64	8.20E-03	0.00E+00	8.33E-08	3.91E-08	0.00E+00	2.10E-07	0.00E+00	7.10E-06	1.70E-09	1.50E-09	1.00E+00
35BR 84	2.00E-05	0.00E+00	0.00E+00	5.21E-08	0.00E+00	0.00E+00	0.00E+00	4.09E-13	1.40E-08	1.20E-08	1.00E+00
37RB 89	4.80E-05	0.00E+00	4.01E-08	2.82E-08	0.00E+00	0.00E+00	0.00E+00	2.33E-21	1.80E-08	1.50E-08	1.00E+00
38SR 91	9.80E-04	5.67E-06	0.00E+00	2.29E-07	0.00E+00	0.00E+00	0.00E+00	2.70E-05	8.30E-09	7.10E-09	1.00E+00
38SR 92	8.80E-04	2.15E-06	0.00E+00	9.30E-08	0.00E+00	0.00E+00	0.00E+00	4.26E-05	1.00E-08	9.00E-09	1.00E+00
39Y 90	3.40E-06	9.62E-09	0.00E+00	2.58E-10	0.00E+00	0.00E+00	0.00E+00	1.02E-04	2.60E-12	2.20E-12	1.00E+00
39Y 91M	1.00E-05	9.09E-11	0.00E+00	3.52E-12	0.00E+00	0.00E+00	0.00E+00	2.67E-10	4.40E-09	3.80E-09	1.00E+00
39Y 91	1.20E-04	1.41E-07	0.00E+00	3.77E-09	0.00E+00	0.00E+00	0.00E+00	7.76E-05	2.70E-11	2.40E-11	1.00E+00
39Y 92	6.60E-04	8.45E-10	0.00E+00	2.47E-11	0.00E+00	0.00E+00	0.00E+00	1.48E-05	1.90E-09	1.60E-09	1.00E+00
39Y 93	9.80E-04	2.68E-09	0.00E+00	7.40E-11	0.00E+00	0.00E+00	0.00E+00	8.50E-05	7.80E-10	5.70E-10	1.00E+00
40ZR 95	1.00E-03	3.04E-08	9.75E-09	6.60E-09	0.00E+00	1.53E-08	0.00E+00	3.09E-05	5.80E-09	5.00E-09	1.00E+00
52TE 129M	1.20E-04	1.15E-05	4.29E-06	1.82E-06	3.95E-06	4.80E-05	0.00E+00	5.79E-05	9.00E-10	7.70E-10	1.00E+00
52TE 129	1.50E-04	3.14E-08	1.18E-08	7.65E-09	2.41E-08	1.32E-07	0.00E+00	2.37E-08	8.40E-10	7.10E-10	1.00E+00
52TE 131M	9.00E-05	1.73E-06	8.46E-07	7.05E-07	1.34E-06	8.57E-06	0.00E+00	8.40E-05	9.90E-09	8.40E-09	1.00E+00
52TE 131	3.00E-05	1.97E-08	8.23E-09	6.22E-09	1.62E-08	8.63E-08	0.00E+00	2.79E-09	2.60E-06	2.20E-09	1.00E+00
52TE 132	2.40E-04	2.52E-06	1.63E-06	1.53E-06	1.80E-06	1.57E-05	0.00E+00	7.71E-05	2.00E-09	1.70E-09	1.00E+00
58CE 143	1.90E-04	1.65E-09	1.22E-06	1.35E-10	0.00E+00	5.37E-10	0.00E+00	4.56E-05	2.50E-09	2.20E-09	1.00E+00
59PR 143	1.30E-04	9.20E-09	3.69E-09	4.56E-10	0.00E+00	2.13E-09	0.00E+00	4.03E-05	0.00E+00	0.00E+00	1.00E+00
59PR 144	3.20E-03	3.01E-11	1.25E-11	1.53E-12	0.00E+00	7.05E-12	0.00E+00	4.33E-18	2.30E-10	2.00E-10	1.00E+00
74W 187	1.30E-04	1.03E-07	8.61E-08	3.01E-08	0.00E+00	0.00E+00	0.00E+00	2.82E-05	3.60E-09	3.10E-09	1.00E+00
93NP 239	3.40E-03	1.19E-09	1.17E-10	6.45E-11	0.00E+00	3.65E-10	0.00E+00	2.40E-05	1.10E-09	9.50E-10	1.00E+00

0 * * * TEENAGER DOSE FACTORS * * *

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NUCLIDE	CURIE/YEAR	INGESTION DOSE FACTORS (MREM/PCI INTAKE) BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SHORELINE (MREM/HR)/(PCI/M**2) SKIN	TOTAL BODY	RECON
6C 14	4.40E-04	4.06E-06	8.12E-07	8.12E-07	8.12E-07	8.12E-07	8.12E-07	8.12E-07			
15P 32	2.00E-04	2.76E-04	1.71E-05	1.07E-05	0.00E+00	0.00E+00	0.00E+00	2.32E-05			
28NI 63	1.50E-04	1.77E-04	1.25E-05	6.00E-06	0.00E+00	0.00E+00	0.00E+00	1.99E-06			
29CU 64	8.20E-03	0.00E+00	1.15E-07	5.41E-08	0.00E+00	2.91E-07	0.00E+00	8.92E-06			
35BR 84	2.00E-05	0.00E+00	0.00E+00	7.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
37RB 89	4.80E-05	0.00E+00	5.50E-08	3.89E-08	0.00E+00	0.00E+00	0.00E+00	8.43E-17			
38SR 91	9.80E-04	8.07E-06	0.00E+00	3.21E-07	0.00E+00	0.00E+00	0.00E+00	3.66E-05			
38SR 92	8.80E-04	3.05E-06	0.00E+00	1.30E-07	0.00E+00	0.00E+00	0.00E+00	7.77E-05			
39Y 90	3.40E-06	1.37E-08	0.00E+00	3.69E-10	0.00E+00	0.00E+00	0.00E+00	1.13E-04			
39Y 91M	1.00E-05	1.29E-10	0.00E+00	4.93E-12	0.00E+00	0.00E+00	0.00E+00	6.09E-09			
39Y 91	1.20E-04	2.01E-07	0.00E+00	5.39E-09	0.00E+00	0.00E+00	0.00E+00	8.24E-05			
39Y 92	6.60E-04	1.21E-09	0.00E+00	3.50E-11	0.00E+00	0.00E+00	0.00E+00	3.32E-05			
39Y 93	9.80E-04	3.83E-09	0.00E+00	1.05E-10	0.00E+00	0.00E+00	0.00E+00	1.17E-04			
40ZR 95	1.00E-03	4.12E-08	1.30E-08	8.94E-09	0.00E+00	1.91E-08	0.00E+00	3.00E-05			
52TE 129M	1.20E-04	1.63E-05	6.05E-06	2.58E-06	5.26E-06	6.82E-05	0.00E+00	6.12E-05			
52TE 129	1.50E-04	4.48E-08	1.67E-08	1.09E-08	3.20E-08	1.88E-07	0.00E+00	2.45E-07			
52TE 131M	9.00E-05	2.44E-06	1.17E-06	9.76E-07	1.76E-06	1.22E-05	0.00E+00	9.39E-05			
52TE 131	3.00E-05	2.79E-08	1.15E-08	8.72E-09	2.15E-08	1.22E-07	0.00E+00	2.29E-09			
52TE 132	2.40E-04	3.49E-06	2.21E-06	2.08E-06	2.33E-06	2.12E-05	0.00E+00	7.00E-05			
58CE 143	1.90E-04	2.35E-09	1.71E-06	1.91E-10	0.00E+00	7.67E-10	0.00E+00	5.14E-05			
59PR 143	1.30E-04	1.31E-08	5.23E-09	6.52E-10	0.00E+00	3.04E-09	0.00E+00	4.31E-05			
59PR 144	3.20E-03	4.30E-11	1.76E-11	2.18E-12	0.00E+00	1.01E-11	0.00E+00	4.74E-14			
74W 187	1.30E-04	1.46E-07	1.19E-07	4.17E-08	0.00E+00	0.00E+00	0.00E+00	3.22E-05			
93NP 239	3.40E-03	1.76E-09	1.66E-10	9.22E-11	0.00E+00	5.21E-10	0.00E+00	2.67E-05			

0 * * * CHILD DOSE FACTORS * * *

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NUCLIDE	CURIE/YEAR	INGESTION DOSE FACTORS (MREM/PCI INTAKE) BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SHORELINE (MREM/HR)/(PCI/M**2) SKIN	TOTAL BODY	RECON
6C 14	4.40E-04	1.21E-05	2.42E-06	2.42E-06	2.42E-06	2.42E-06	2.42E-06	2.42E-06			
15P 32	2.00E-04	8.25E-04	3.86E-05	3.18E-05	0.00E+00	0.00E+00	0.00E+00	2.28E-05			
28NI 63	1.50E-04	5.38E-04	2.88E-05	1.83E-05	0.00E+00	0.00E+00	0.00E+00	1.94E-06			
29CU 64	8.20E-03	0.00E+00	2.45E-07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

35BR	84	2.00E-05	0.00E+00	0.00E+00	1.98E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
37RB	89	4.80E-05	0.00E+00	1.17E-07	1.04E-07	0.00E+00	0.00E+00	0.00E+00	1.02E-09
38SR	91	9.80E-04	2.40E-05	0.00E+00	9.06E-07	0.00E+00	0.00E+00	0.00E+00	5.30E-05
38SR	92	8.80E-04	9.03E-06	0.00E+00	3.62E-07	0.00E+00	0.00E+00	0.00E+00	1.71E-04
39Y	90	3.40E-06	4.11E-08	0.00E+00	1.10E-09	0.00E+00	0.00E+00	0.00E+00	1.17E-04
39Y	91M	1.00E-05	3.82E-10	0.00E+00	1.39E-11	0.00E+00	0.00E+00	0.00E+00	7.48E-07
39Y	91	1.20E-04	6.02E-07	0.00E+00	1.61E-08	0.00E+00	0.00E+00	0.00E+00	8.02E-05
39Y	92	6.60E-04	3.60E-09	0.00E+00	1.03E-10	0.00E+00	0.00E+00	0.00E+00	1.04E-04
39Y	93	9.80E-04	1.14E-08	0.00E+00	3.13E-10	0.00E+00	0.00E+00	0.00E+00	1.70E-04
40ZR	95	1.00E-03	1.16E-07	2.55E-08	2.27E-08	0.00E+00	3.65E-08	0.00E+00	2.66E-05
52TE	129M	1.20E-04	4.87E-05	1.36E-05	7.56E-06	1.57E-05	1.43E-04	0.00E+00	5.94E-05
52TE	129	1.50E-04	1.34E-07	3.74E-08	3.18E-08	9.56E-08	3.92E-07	0.00E+00	8.34E-06
52TE	131M	9.00E-05	7.20E-06	2.49E-06	2.65E-06	5.12E-06	2.41E-05	0.00E+00	1.01E-04
52TE	131	3.00E-05	8.30E-08	2.53E-08	2.47E-08	6.35E-08	2.51E-07	0.00E+00	4.36E-07
52TE	132	2.40E-04	1.01E-05	4.47E-06	5.40E-06	6.51E-06	4.15E-05	0.00E+00	4.50E-05
58CE	143	1.90E-04	6.99E-09	3.79E-06	5.49E-10	0.00E+00	1.59E-09	0.00E+00	5.55E-05
59PR	143	1.30E-04	3.93E-08	1.18E-08	1.95E-09	0.00E+00	6.39E-09	0.00E+00	4.24E-05
59PR	144	3.20E-03	1.29E-10	3.99E-11	6.49E-12	0.00E+00	2.11E-11	0.00E+00	8.59E-08
74W	187	1.30E-04	4.29E-07	2.54E-07	1.14E-07	0.00E+00	0.00E+00	0.00E+00	3.57E-05
93NP	239	3.40E-03	5.25E-09	3.77E-10	2.65E-10	0.00E+00	1.09E-09	0.00E+00	2.79E-05

0 * * * INFANT DOSE FACTORS * * *

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		INGESTION DOSE FACTORS (MREM/PCI INTAKE)							SHORELINE (MREM/HR)/(PCI/M**2)		
NUCLIDE	CURIE/YEAR	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY	RECON
6C	14	4.40E-04	2.37E-05	5.06E-06	5.06E-06	5.06E-06	5.06E-06	5.06E-06			
15P	32	2.00E-04	1.70E-03	1.00E-04	6.59E-05	0.00E+00	0.00E+00	2.30E-05			
28NI	63	1.50E-04	6.34E-04	3.92E-05	2.20E-05	0.00E+00	0.00E+00	1.95E-06			
29CU	64	8.20E-03	0.00E+00	6.09E-07	2.82E-07	0.00E+00	1.03E-06	1.25E-05			
35BR	84	2.00E-05	0.00E+00	0.00E+00	3.82E-07	0.00E+00	0.00E+00	0.00E+00			
37RB	89	4.80E-05	0.00E+00	2.86E-07	1.97E-07	0.00E+00	0.00E+00	9.74E-08			
38SR	91	9.80E-04	5.00E-05	0.00E+00	1.81E-06	0.00E+00	0.00E+00	5.92E-05			
38SR	92	8.80E-04	1.92E-05	0.00E+00	7.13E-07	0.00E+00	0.00E+00	2.07E-04			
39Y	90	3.40E-06	8.69E-08	0.00E+00	2.33E-09	0.00E+00	0.00E+00	1.20E-04			
39Y	91M	1.00E-05	8.10E-10	0.00E+00	2.76E-11	0.00E+00	0.00E+00	2.70E-06			
39Y	91	1.20E-04	1.13E-06	0.00E+00	3.01E-08	0.00E+00	0.00E+00	8.10E-05			
39Y	92	6.60E-04	7.65E-09	0.00E+00	2.15E-10	0.00E+00	0.00E+00	1.46E-04			
39Y	93	9.80E-04	2.43E-08	0.00E+00	6.62E-10	0.00E+00	0.00E+00	1.92E-04			
40ZR	95	1.00E-03	2.06E-07	5.02E-08	3.56E-08	0.00E+00	5.41E-08	0.00E+00	2.50E-05		
52TE	129M	1.20E-04	1.00E-04	3.43E-05	1.54E-05	3.84E-05	2.50E-04	0.00E+00	5.97E-05		
52TE	129	1.50E-04	2.84E-07	9.79E-08	6.63E-08	2.38E-07	7.07E-07	0.00E+00	2.27E-05		
52TE	131M	9.00E-05	1.52E-05	6.12E-06	5.05E-06	1.24E-05	4.21E-05	0.00E+00	1.03E-04		
52TE	131	3.00E-05	1.76E-07	6.50E-08	4.94E-08	1.57E-07	4.50E-07	0.00E+00	7.11E-06		
52TE	132	2.40E-04	2.08E-05	1.03E-05	9.61E-06	1.52E-05	6.44E-05	0.00E+00	3.81E-05		
58CE	143	1.90E-04	1.48E-08	9.82E-06	1.12E-09	0.00E+00	2.86E-09	0.00E+00	5.73E-05		
59PR	143	1.30E-04	8.13E-08	3.04E-08	4.03E-09	0.00E+00	1.13E-08	0.00E+00	4.29E-05		
59PR	144	3.20E-03	2.74E-10	1.06E-10	1.38E-11	0.00E+00	3.84E-11	0.00E+00	4.93E-06		
74W	187	1.30E-04	9.03E-07	6.28E-07	2.17E-07	0.00E+00	0.00E+00	0.00E+00	3.69E-05		
93NP	239	3.40E-03	1.11E-08	9.93E-10	5.61E-10	0.00E+00	1.98E-09	0.00E+00	2.87E-05		

0TOTAL NUMBER IN SOURCE TERM IS 24 TOTAL RELEASE IS 2.1371E-02

1 * * * AS LOW AS REASONABLY ACHIEVABLE * * *

0 A D U L T D O S E S

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0PATHWAY	SKIN	BONE	LIVER	DOSE (MREM PER YEAR INTAKE) TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		3.94E-01	2.46E-02	1.53E-02	1.61E-04	5.15E-04	1.23E-04	4.59E-02
INVERTEBRATE		1.93E-02	1.36E-03	8.68E-04	1.95E-04	1.48E-03	5.78E-05	7.92E-03
DRINKING		2.34E-04	2.01E-05	1.20E-05	4.45E-06	4.02E-05	9.28E-07	8.90E-04
SHORELINE	1.84E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05
SWIMMING		1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05
BOATING		1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05
TOTAL	1.84E-05	4.13E-01	2.60E-02	1.63E-02	4.01E-04	2.08E-03	2.23E-04	5.47E-02

0	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR= .3
FISH	21.0	10.0	24.00	
INVERTEBRATE	[illegible]	[illegible]	[illegible]	

DRINKING	730.0	10.0	12.00
SHORELINE	300.0	10.0	.00
SWIMMING	200.0	10.0	.00
BOATING	500.0	10.0	.00

0 T E E N A G E R D O S E S

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0PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
				DOSE__(MREM PER YEAR INTAKE)				
FISH		4.29E-01	2.67E-02	1.68E-02	1.72E-04	5.52E-04	1.34E-04	3.74E-02
INVERTEBRATE		2.10E-02	1.47E-03	9.43E-04	2.00E-04	1.57E-03	6.28E-05	6.33E-03
DRINKING		2.30E-04	1.97E-05	1.18E-05	4.16E-06	3.92E-05	9.27E-07	7.18E-04
SHORELINE	1.84E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05
SWIMMING		1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05
BOATING		1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05
TOTAL	1.84E-05	4.50E-01	2.82E-02	1.78E-02	4.17E-04	2.20E-03	2.39E-04	4.45E-02

0	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR= .3
FISH	16.0	10.0	24.00	
INVERTEBRATE	3.8	10.0	24.00	
DRINKING	510.0	10.0	12.00	
SHORELINE	300.0	10.0	.00	
SWIMMING	200.0	10.0	.00	
BOATING	500.0	10.0	.00	

0 C H I L D D O S E S

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0PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
				DOSE__(MREM PER YEAR INTAKE)				
FISH		5.53E-01	2.60E-02	2.15E-02	2.19E-04	5.41E-04	1.72E-04	1.59E-02
INVERTEBRATE		2.81E-02	1.50E-03	1.24E-03	2.62E-04	1.47E-03	8.38E-05	2.75E-03
DRINKING		6.90E-04	4.49E-05	3.45E-05	1.21E-05	8.09E-05	2.76E-06	8.35E-04
SHORELINE	1.84E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05
SWIMMING		1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05
BOATING		1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05
TOTAL	1.84E-05	5.82E-01	2.76E-02	2.28E-02	5.34E-04	2.13E-03	3.00E-04	1.96E-02

0	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR= .3
FISH	6.9	10.0	24.00	
INVERTEBRATE	1.7	10.0	24.00	
DRINKING	510.0	10.0	12.00	
SHORELINE	300.0	10.0	.00	
SWIMMING	200.0	10.0	.00	
BOATING	500.0	10.0	.00	

0 I N F A N T D O S E S

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0PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
				DOSE__(MREM PER YEAR INTAKE)				
FISH		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
DRINKING		8.00E-04	6.46E-05	4.14E-05	1.83E-05	8.92E-05	3.74E-06	5.76E-04
SHORELINE	1.84E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05	1.58E-05
SWIMMING		1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05	1.12E-05
BOATING		1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05	1.41E-05
TOTAL	1.84E-05	8.41E-04	1.06E-04	8.25E-05	5.94E-05	1.30E-04	4.49E-05	6.17E-04

0	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR= .3
FISH	.0	10.0	24.00	
DRINKING	330.0	10.0	12.00	
SHORELINE	300.0	10.0	.00	
SWIMMING	200.0	10.0	.00	
BOATING	500.0	10.0	.00	

1 * * * POPULATION WATER CONSUMPTION DOSES * * *

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0SUPPLIER-Lake Anna

0

0PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
					DOSE (PERSON-REM)				
DRINKING	ADULT	5.81E+06	1.79E-03	1.50E-04	8.88E-05	3.35E-05	2.91E-04	7.38E-06	5.32E-03
DRINKING	TEENAGER	6.32E+05	2.74E-04	2.30E-05	1.36E-05	4.88E-06	4.43E-05	1.15E-06	6.42E-04
DRINKING	CHILD	1.03E+06	1.34E-03	8.60E-05	6.55E-05	2.33E-05	1.50E-04	5.60E-06	1.13E-03
DRINKING	TOTAL	7.47E+06	3.40E-03	2.59E-04	1.68E-04	6.17E-05	4.86E-04	1.41E-05	7.09E-03

0POPULATION=2.21E+04 DILUTION=1.00E+01 TRANSIT TIME=[illegible]

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0AVERAGE INDIVIDUAL CONSUMPTION (L/YR)     ADULT=3.70E+02     TEEN=2.60E+02     CHILD=2.60E+02
0-----CUMULATIVE TOTAL-----
0PATHWAY      AGE GROUP        USAGE      BONE      LIVER   TOTAL BODY  THYROID   KIDNEY      LUNG      GI-LLI
 DRINKING     CUMUL TOTAL   7.47E+06  3.40E-03  2.59E-04  1.68E-04  6.17E-05  4.86E-04  1.41E-05  7.09E-03
1                                   *   *   *   RECREATION POPULATION DOSES   *   *   *
0_____________________________________________________________________________________________________
0LOCATION- Lake Anna
0DILUTION= 1.00E+01          TRANSIT TIME= 0.00E+00 HR          SWF=  .3
0                                                   _____________DOSE (PERSON-REM)_____________
0PATHWAY       AGE GROUP          USAGE            SKIN        TOTAL BODY       THYROID
 SHORELINE    TOTAL POPUL        1.31E+06        8.04E-05       6.91E-05        6.91E-05
0_____________________________________________________________________________________________________
0LOCATION- Lake Anna
0DILUTION= 1.00E+01          TRANSIT TIME= 0.00E+00 HR
0                                                   _____________DOSE (PERSON-REM)_____________
0PATHWAY       AGE GROUP          USAGE            SKIN        TOTAL BODY       THYROID
 SWIMMING     TOTAL POPUL        8.76E+05                        4.93E-05        4.93E-05
0_____________________________________________________________________________________________________
0LOCATION- Lake Anna
0DILUTION= 1.00E+01          TRANSIT TIME= 0.00E+00 HR
0                                                   _____________DOSE (PERSON-REM)_____________
0PATHWAY       AGE GROUP          USAGE            SKIN        TOTAL BODY       THYROID
 BOATING      TOTAL POPUL        2.19E+06                        6.16E-05        6.16E-05
1                    *  *  *  COST-BENEFIT ANALYSIS  *  *  *
0  NUCLIDE        RELEASE      _____PERSON-REM DOSE_________PERSON-REM PER CURIE____
                !  CI/YR    ! TOTAL BODY !   THYROID  ! TOTAL BODY !   THYROID  !
    6C    14    !  4.40E-04  !  1.41E-05  !  1.41E-05  !  3.21E-02  !  3.21E-02  !
   15P    32    !  2.00E-04  !  8.04E-05  !  1.28E-08  !  4.02E-01  !  6.42E-05  !
   28NI   63    !  1.50E-04  !  3.66E-05  !  0.00E+00  !  2.44E-01  !  0.00E+00  !
   29CU   64    !  8.20E-03  !  3.64E-05  !  3.17E-05  !  4.43E-03  !  3.87E-03  !
   35BR   84    !  2.00E-05  !  7.03E-07  !  7.03E-07  !  3.51E-02  !  3.51E-02  !
   37RB   89    !  4.80E-05  !  2.17E-06  !  2.17E-06  !  4.51E-02  !  4.51E-02  !
   38SR   91    !  9.80E-04  !  2.13E-05  !  1.92E-05  !  2.18E-02  !  1.96E-02  !
   38SR   92    !  8.80E-04  !  2.31E-05  !  2.31E-05  !  2.63E-02  !  2.63E-02  !
   39Y    90    !  3.40E-06  !  4.85E-10  !  4.47E-10  !  1.43E-04  !  1.32E-04  !
   39Y    91M   !  1.00E-05  !  1.01E-07  !  1.01E-07  !  1.01E-02  !  1.01E-02  !
   39Y    91    !  1.20E-04  !  6.71E-08  !  4.18E-08  !  5.59E-04  !  3.48E-04  !
   39Y    92    !  6.60E-04  !  3.07E-06  !  3.07E-06  !  4.66E-03  !  4.66E-03  !
   39Y    93    !  9.80E-04  !  1.91E-06  !  1.91E-06  !  1.95E-03  !  1.95E-03  !
   40ZR   95    !  1.00E-03  !  7.95E-05  !  7.92E-05  !  7.95E-02  !  7.92E-02  !
   52TE   129M  !  1.20E-04  !  1.28E-05  !  2.63E-05  !  1.07E-01  !  2.19E-01  !
   52TE   129   !  1.50E-04  !  2.87E-07  !  2.87E-07  !  1.91E-03  !  1.91E-03  !
   52TE   131M  !  9.00E-05  !  4.13E-06  !  5.90E-06  !  4.59E-02  !  6.56E-02  !
   52TE   131   !  3.00E-05  !  2.23E-07  !  2.23E-07  !  7.43E-03  !  7.43E-03  !
   52TE   132   !  2.40E-04  !  1.68E-05  !  1.96E-05  !  7.00E-02  !  8.18E-02  !
   58CE   143   !  1.90E-04  !  1.20E-06  !  1.20E-06  !  6.33E-03  !  6.32E-03  !
   59PR   143   !  1.30E-04  !  5.28E-09  !  2.09E-09  !  4.06E-05  !  1.60E-05  !
   59PR   144   !  3.20E-03  !  1.80E-06  !  1.80E-06  !  5.62E-04  !  5.62E-04  !
   74W    187   !  1.30E-04  !  1.27E-06  !  1.16E-06  !  9.75E-03  !  8.94E-03  !
   93NP   239   !  3.40E-03  !  9.71E-06  !  9.70E-06  !  2.86E-03  !  2.85E-03  !
0  TOTAL                        3.48E-04     2.42E-04
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