UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 29, 2000

MEMORANDUM TO: Richard J. Barrett, Chief
Probabilistic Safety Assessment Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

John N. Hannon, Chief
Plant Systems Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

FROM: Farouk Eltawila, Chief
Safety Margins and Systems Analysis Branch
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

SUBJECT: EFFECT OF FISSION PRODUCT INVENTORY AND AIR INGRESSION ON SPENT FUEL POOL ACCIDENT CONSEQUENCES

As part of its generic study, undertaken to develop generic, risk-informed requirements for plants that are being decommissioned, the Office of Nuclear Reactor Regulation (NRR) requested the Office of Nuclear Regulatory Research (RES) to perform an evaluation of the offsite radiological consequences of spent fuel pool accidents involving sustained loss of cooling. The results of our evaluation are documented in *Assessment of Offsite Consequences for a Severe Spent Fuel Pool Accident*, SMSAB-99-02, November 1999. Our evaluation was based on a complete release of volatile isotopes (i.e., cesium and any remaining noble gases and iodine) from the number of fuel assemblies equivalent to 3.5 cores. As a follow up to this evaluation, we identified further opportunities to reduce uncertainty and potentially unnecessary conservatism (*Opportunities to Reduce Uncertainty in Consequence Assessment for Spent Fuel Pool Accidents*, memorandum from F. Eltawila to J. Hannon, December 10, 1999). In this memorandum, we stated that basing the consequence assessment on a release of the fission product inventory from 3.5 cores of fuel assemblies may be overly conservative, because, as a result of a year of radioactive decay, assemblies other than the final core may not reach temperatures high enough to release fission products.

We subsequently addressed ACRS issues on spent fuel accident analysis (*Issues Related to Spent Fuel Pool Accident Analysis*, memorandum from F. Eltawila to J. Hannon, January 19, 2000). In this memorandum, we concluded that significant air ingression, influencing fission product release, will occur in spent fuel pool accidents involving quick drain-down, and the consequence assessment we performed should accommodate any reasonable uncertainty in the progression of the accident with the possible exception of an increase in the ruthenium release. Small-scale Canadian experiments show that, in an air environment, significant ruthenium releases begin after the oxidation of 75% to 100% of the cladding.

To assess the effect of fission product inventory and ruthenium releases on spent fuel pool accident consequences, we performed supplemental sensitivity studies on spent fuel pool

accident consequences using the MACCS code (MELCOR Accident Consequence Code System). Our assessment, which is attached, showed that for cases with early evacuation the overall effect of ruthenium releases on prompt fatalities is insignificant, because the number of prompt fatalities predicted remains less than 1. Early evacuation is modeled as beginning three hours before the fission product release. For cases with late evacuation (beginning after the fission product release), the effect on prompt fatalities is an increase of one to two orders of magnitude as a result of ruthenium's high radiological dose per curie inhaled relative to that of cesium which was previously the dominant fission product released. Specifically, the prompt fatalities increased from 9 to 134 and from 1 to 95 for a uniform population density and for the Surry population density, respectively. However, *Draft Final Technical Study on Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants*, February 2000, states that, after a year of decay, it will take at least 10 hours for the fuel with the highest decay power density to heat up to the point of releasing fission products in the fastest progressing accident scenarios. Therefore, an early evacuation is more likely, and an increase in the ruthenium release will not alter short term consequences.

We also assessed the effect of ruthenium releases on long-term consequences by calculating societal dose and cancer fatalities within 100 miles and within 500 miles. The effect of ruthenium releases on societal dose ranged from no increase to a factor-of-two increase. The effect on cancer fatalities ranged from no increase to a factor-of-four increase. Overall, the effect on long-term consequences is a modest increase.

With respect to limiting the fission product inventory available for release to that in the final reactor core (1 core versus 3.5 cores), we assessed offsite consequences for cases with late evacuation. Our assessment showed that for sequences involving boil-off or slow drain-down (i.e., no ruthenium release) prompt fatalities would be eliminated. Our assessment showed that for sequences involving rapid drain-down and air ingression (i.e., significant ruthenium release) prompt fatalities would only be reduced by up to 50%, because most of the inventory of the dominant fission product, ruthenium, is in the final core offload due to its 1 year half-life. Finally, regardless of whether a significant ruthenium release occurs, limiting the fission product inventory released to that in the final core offload reduced the long-term consequences by only a modest amount (20 to 40%).

Attachment: As stated

cc: G. Holahan

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United States
Nuclear Regulatory Commission

Effect of Fission Product Inventory and Air Ingression on Spent Fuel Pool Accident Consequences

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Office of Nuclear Regulatory Research

March 2000

Effect of Fission Product Inventory and Air Ingression
on Spent Fuel Pool Accident Consequences

Introduction

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We subsequently addressed ACRS issues on spent fuel accident analysis (*Issues Related to Spent Fuel Pool Accident Analysis*, memorandum from F. Eltawila to J. Hannon, January 19, 2000). In this memorandum, we concluded that significant air ingression, influencing fission product release, will occur in spent fuel pool accidents involving quick drain-down, and the consequence assessment we performed should accommodate any reasonable uncertainty in the progression of the accident with the possible exception of an increase in the ruthenium release. Small-scale Canadian experiments show that, in an air environment, significant ruthenium releases begin after the oxidation of 75% to 100% of the cladding.

To assess the effect of fission product inventory and ruthenium releases on spent fuel pool accident consequences, we performed supplemental sensitivity studies on spent fuel pool accident consequences using the MACCS code (MELCOR Accident Consequence Code System).[1] The results of our assessment are given below.

Effect of Air Ingression

To assess the sensitivity of the consequences to air ingression, we performed consequence calculations with and without significant ruthenium releases. The starting point for this assessment was the Base Case calculation from *Assessment of Offsite Consequences for a Severe Spent Fuel Pool Accident*, November 1999. The Base Case calculation assumed that evacuation begins 1.4 hours after the fission product release begins. However, *Draft Final Technical Study on Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants*, February 2000, states that, after a year of decay, it will take at least 10 hours for the fuel with the highest decay power density to heat up to the point of releasing fission products in the fastest progressing accident scenarios. Therefore, it is more likely to have evacuation before the release begins. As a result of these considerations, the Base Case calculation then was

modified to begin the evacuation 3 hours before the fission product release begins. This modified Base Case is called Case 13. The MACCS input decks for Case 13 are given in Appendix A. A total of eight cases were run varying the evacuation start time and the population density. The results for these eight cases are given in Table 1.

Table 1 Cases varying the evacuation start time and the population distribution

Case	Evacuation	Population Density*	Ruthenium release fraction	Distance	Prompt Fatalities	Societal Dose (Sv)	Cancer Fatalities
13	early	Surry	$2x10^{-5}$	0-100	.0048	41,800	1,990
				0-500	.0048	591,000	26,500
14	early	Surry	1	0-100	.132	67,500	6,300
				0-500	.132	597,000	31,000
15	early	uniform	$2x10^{-5}$	0-100	.045	46,500	2,170
				0-500	.045	473,000	21,300
16	early	uniform	1	0-100	.277	63,800	4,940
				0-500	.277	470,000	24,200
Base Case	late	Surry	$2x10^{-5}$	0-100	1.01	45,400	2,320
				0-500	1.01	595,000	26,800
11	late	Surry	1	0-100	95.3	95,300	9,150
				0-500	95.3	624,000	33,900
21	late	uniform	$2x10^{-5}$	0-100	9.33	50,500	2,490
				0-500	9.33	477,000	21,600
22	late	uniform	1	0-100	134	94,600	6,490
				0-500	134	501,000	25,700

*The uniform population density site has a population density of 100 people/mi^2 with an Exclusion Area Boundary of .75 miles.

For the cases with early evacuation (Cases 13-16), the effect of ruthenium on prompt fatalities is insignificant, because the number of prompt fatalities predicted remains less than 1. Also, the effect on societal dose and cancer fatalities is a modest increase, with the largest effect being a factor-of-three increase in cancer fatalities within 100 miles.

For the cases with late evacuation (Base Case, Cases 11, 21, 22), the effect of ruthenium is to increase the number of prompt fatalities by one to two orders of magnitude. However, as discussed above, late evacuation is less likely than early evacuation. Also, for the cases with late evacuation, the effect of ruthenium on societal dose and cancer fatalities is about the same as for the cases with early evacuation.

The total number of prompt fatalities is calculated in MACCS by multiplying, in each sector, the individual risk of a prompt fatality by the total number of people in that sector. For the cases with late evacuation, Table 2 gives the MACCS results for the individual risk of a prompt fatality in each radial ring which is composed of 16 sectors. The individual risk of a prompt fatality is a function of the dose to an individual and is independent of the population density. For the cases with late evacuation in Table 1, the total number of prompt fatalities increases by a larger factor for Surry than for the uniform population density when a significant ruthenium release is included. This is caused by Surry's non-uniform population density which also is shown in Table 2. Table 3, which is the result of multiplying the individual risk of a prompt fatality in each ring by the population in each ring, demonstrates that Surry's higher increase in prompt fatalities is caused by the jump in the Surry population density at 8.1 km.

Table 2 Individual Risk of a Prompt Fatality for Cases with Late Evacuation

Distance (km)	Individual risk of a prompt fatality		Ratio	Surry population density* (persons/ km^2)
	Base Case and Case 21, Ru release fraction of $2x10^{-5}$	Cases 11 and 22, Ru release fraction of 1		
0 - .2	.146	.169	1.16	0
.2 - .5	.0302	.0657	2.18	0
.5 - 1.2	.0138	.0374	2.71	1.33
1.2 - 1.6	.00828	.0301	3.64	1.13
1.6 - 2.1	.00575	.0266	4.63	1.80
2.1 - 3.2	.00326	.0216	6.63	1.58
3.2 - 4.0	.00151	.0146	9.67	7.15
4.0 - 4.8	.00167	.0132	7.90	7.77
4.8 - 5.6	.00171	.0110	6.43	7.84
5.6 - 8.1	.0000672	.0131	194.94	8.07
8.1 - 11.3	.000000254	.00301	11850.39	117.80
11.3 - 16.1	0	.0000225	NA	118.36
16.1 - 20.9	0	0	NA	83.75

*This data is from the MACCS input file SURSIT.INP.

Table 3 Number of Prompt Fatalities in Each Radial Ring for Cases with Late Evacuation

Distance (km)	Number of early fatalities with Surry population density		Number of early fatalities with uniform population density	
	Base Case, Ru release fraction of $2x10^{-5}$	Case 11, Ru release fraction of 1	Case 21, Ru release fraction of $2x10^{-5}$	Case 22, Ru release fraction of 1
0 - .2	0	0	0	0
.2 - .5	0	0	0	0
.5 - 1.2	.0690	.1870	0	0
1.2 - 1.6	.0331	.1204	1.1329	4.1184
1.6 - 2.1	.0633	.2926	1.3564	6.2750
2.1 - 3.2	.0945	.6264	2.3060	15.2788
3.2 - 4.0	.1963	1.8980	1.0609	10.2574
4.0 - 4.8	.2923	2.3100	1.4521	11.4777
4.8 - 5.6	.3523	2.2660	1.7357	11.1653
5.6 - 8.1	.0564	10.9909	.2699	52.6050
8.1 - 11.3	.0058	69.2661	.0019	22.7135
11.3 - 16.1	0	1.1027	0	.3599
16.1 - 20.9	0	0	0	0
Total	1.16	89.06	9.32	134.25

To determine the isotope responsible for the increase in prompt fatalities when a significant ruthenium release is included in the consequence calculations, sensitivity cases were run varying the amount of each isotope in the ruthenium group. The isotopes in the ruthenium group remaining after a year of radioactive decay are Co-58, Co-60, Ru-103, and Ru-106. These cases were run starting with a case for which a significant number of early fatalities was predicted (Base Case). The results of these calculations are shown in Table 4. These results indicate that the isotope responsible for the increase in prompt fatalities is Ru-106.

Table 4 Cases varying the inventories of the isotopes in the ruthenium group

Case	Description of Case	Distance	Prompt Fatalities	Societal Dose (Sv)	Cancer Fatalities
Base Case	Ru release fraction of $2x10^{-5}$	0-100	1.01	45,400	2,320
		0-500	1.01	595,000	26,800
11	Ru release fraction of 1	0-100	95.3	95,300	9,150
		0-500	95.3	624,000	33,900
11a	Ru release fraction of 1 No Co isotopes	0-100	94.4	95,100	9,120
		0-500	94.4	627,000	34,000
11b	Ru release fraction of 1 No Co isotopes Only Ru-106	0-100	94.3	95,100	9,120
		0-500	94.3	627,000	34,000
11c	Ru release fraction of 1 No Co isotopes Only Ru-103	0-100	1.02	45,400	2,320
		0-500	1.02	595,000	26,800

Table 2 shows that the individual risk of a prompt fatality generally increases by more than a factor of 2 when ruthenium is included in the consequence calculation. However, the amounts (Bq) of the dominant cesium isotope (Cs-137) and the dominant ruthenium isotope (Ru-106) are about the same in a spent fuel pool at one year after final shutdown. A comparison of the dose conversion factors for Cs-137 and Ru-106 is given in Table 5. These dose conversion factors were taken from the MACCS input file DOSDATA.INP. An examination of these dose conversion factors indicates that the large Ru-106 inhalation dose conversion factor in MACCS used to calculate acute doses is partly responsible for the increase in individual risk of a prompt fatality beyond what would be expected as a result of the additional amount of Ru-106.

Table 5 Dose conversion factors for Ru-106 and Cs-137

	organ	cloud-shine (Sv sec/ Bq m^3)	ground-shine (Sv sec/ Bq m^2)	inhalation/ acute (Sv/Bq)	inhalation/ chronic (Sv/Bq)	ingestion (Sv/Bq)
Ru-106	lungs	7.99E-15	1.58E-16	2.09E-08	1.04E-06	1.48E-09
	red marrow	8.05E-15	1.61E-16	8.74E-11	1.77E-09	1.48E-09
Cs-137	lungs	2.88E-14	4.35E-16	8.29E-10	8.80E-09	1.27E-08
	red marrow	2.22E-14	4.41E-16	5.63E-10	8.30E-09	1.32E-08
Ratio of Ru-106 to Cs-137	lungs	.4	.4	25	118	.1
	red marrow	.4	.4	.2	.2	.1

Effect of Fission Product Inventory

To assess the sensitivity of the consequences to the fission product inventory released, we performed consequence calculations with 3.5 cores releasing fission products and 1 core releasing fission products. These calculations were run starting with cases for which a significant number of early fatalities was predicted (Base Case, Case 21). The inventories for the cases with 1 core releasing fission products were based on Table A.5 of NUREG/CR-4982. Table A.5 gives inventories in the reactor core at the beginning of refueling outage 11. The inventories used in the MACCS calculations for 1 core are the Table A.5 inventories reduced by one year of radioactive decay. The results of the MACCS calculations are given in Table 6. The inventories used in these calculations are shown in Appendix B.

Table 6 Cases varying the amount of fuel assemblies releasing fission products

Case	Evacuation	Population Density	Ruthenium Release Fraction	# of cores	Distance	Prompt Fatalities	Societal Dose (Sv)	Cancer Fatalities
Base Case	late	Surry	$2x10^{-5}$	3.5	0-100	1.01	45,400	2,320
					0-500	1.01	595,000	26,800
31	late	Surry	$2x10^{-5}$	1	0-100	.014	32,300	1,530
					0-500	.014	354,000	15,900
11	late	Surry	1	3.5	0-100	95.3	95,300	9,150
					0-500	95.3	624,000	33,900
32	late	Surry	1	1	0-100	50.5	72,500	7,360
					0-500	50.5	376,000	21,900
21	late	uniform	$2x10^{-5}$	3.5	0-100	9.33	50,500	2,490
					0-500	9.33	477,000	21,600
33	late	uniform	$2x10^{-5}$	1	0-100	.177	31,000	1,480
					0-500	.177	276,000	12,500
22	late	uniform	1	3.5	0-100	134	94,600	6,490
					0-500	134	501,000	25,700
34	late	uniform	1	1	0-100	103	65,900	4,960
					0-500	103	303,000	16,500

For the cases without a significant ruthenium release, the reduction in prompt fatalities is caused by the reduction in the Cs-137 inventory which decreases from 8.38E17 Bq to 2.11E17 Bq in going from 3.5 cores to 1 core. This was confirmed by repeating Case 33 with a Cs-137 inventory of 8.38E17 Bq. The reductions in prompt fatalities for uniform and Surry population densities are factors of 52 and 72, respectively. These reductions are more than proportional to

the factor of 4 reduction in Cs-137 inventory, because of the combined effects of individual risk of early fatality and non-uniform population density as discussed in the above analysis of the effect of air ingression on offsite consequences.

For the cases with a significant ruthenium release, the reduction in prompt fatalities is caused by the reduction in the Ru-106 inventory which decreases from 5.77E17 Bq to 4.59E17 Bq in going from 3.5 cores to 1 core. This was confirmed by repeating Case 34 with a Ru-106 inventory of 5.77E17 Bq. The reductions in prompt fatalities for uniform and Surry population densities are factors of 1.30 and 1.89, respectively. These reductions are nearly proportional to the factor of 1.26 reduction in the Ru-106 inventory. Again, deviations from being proportional are due to the combined effects of individual risk of early fatality and non-uniform population density. Overall, the effect of reducing the number of assemblies on prompt fatalities is less pronounced for the cases with a significant ruthenium release, in part, because the additional 2.5 cores has a small amount of Ru-106 (1 year half-life) in comparison with Cs-137 (30 year half-life). Finally, in all of the cases, the effect of reducing the amount of fuel releasing fission products from 3.5 cores to 1 core is a modest decrease (20 to 40%) in societal dose and latent cancer fatalities.

Conclusion

The objective of this assessment was to determine the effect of fission product inventory and ruthenium release on spent fuel pool accident consequences at a decommissioned reactor. This assessment was performed in support of the NRC's generic evaluation of spent fuel pool risk that is being performed to support related risk-informed requirements for decommissioned reactors. This assessment supplements the earlier assessement of consequences in *Assessment of Offsite Consequences for a Severe Spent Fuel Pool Accident*, SMSAB-99-02, November 1999.

To assess the effect of fission product inventory and ruthenium releases on spent fuel pool accident consequences, we performed supplemental sensitivity studies on spent fuel pool accident consequences using the MACCS code. Our assessment showed that for cases with early evacuation the overall effect of ruthenium releases on prompt fatalities is insignificant, because the number of prompt fatalities predicted remains less than 1. Early evacuation is modeled as beginning three hours before the fission product release. For cases with late evacuation (beginning after the fission product release), the effect on prompt fatalities is an increase of one to two orders of magnitude as a result of ruthenium's high radiological dose per curie inhaled relative to that of cesium which was previously the dominant fission product released. Specifically, the prompt fatalities increased from 9 to 134 and from 1 to 95 for a uniform population density and for the Surry population density, respectively. However, *Draft Final Technical Study on Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants*, February 2000, states that, after a year of decay, it will take at least 10 hours for the fuel with the highest decay power density to heat up to the point of releasing fission products in the fastest progressing accident scenarios. Therefore, an early evacuation is more likely, and an increase in the ruthenium release will not alter short term consequences.

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With respect to limiting the fission product inventory available for release to that in the final reactor core (1 core versus 3.5 cores), we assessed offsite consequences for cases with late

evacuation. Our assessment showed that for sequences involving boil-off or slow drain-down (i.e., no ruthenium release) prompt fatalities would be eliminated. Our assessment showed that for sequences involving rapid drain-down and air ingression (i.e., significant ruthenium release) prompt fatalities would only be reduced by up to 50%, because most of the inventory of the dominant fission product, ruthenium, is in the final core offload due to its 1 year half-life. Finally, regardless of whether a significant ruthenium release occurs, limiting the fission product inventory released to that in the final core offload reduced the long-term consequences by only a modest amount (20 to 40%).

Reference

1. *Code Manual for MACCS2*, NUREG/CR-6613, May 1998

Appendix A

MACCS Input Files

This appendix contains the MACCS2 input files for Case 13. MACCS2 uses a total of five input files for each run. The first file (ATMOS.INP) contains the source term and atmospheric dispersion input. The second file (EARLY.INP) contains the input for emergency response and variables that are affected during the first week of the accident. The third file (CHRONC.INP) contains the input for variables that are affected after the first week of the accident. The fourth file (METSUR.INP) gives the meteorological data. For brevity, only the beginning and end of the METSUR.INP file are shown in this appendix. Finally, the fifth file (SURSIT.INP) gives the siting information, such as offsite population in each sector. (Note: SURSIT.INP is not used for Case 13.)

MACCS Input File

ATMOS.INP

```
* GENERAL DESCRIPTIVE TITLE DESCRIBING THIS "ATMOS" INPUT
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RIATNAM1001 'IN1A.INP, Sample Problem A--Using Table-Lookup Sigmas, ATMOS input'
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* GEOMETRY DATA BLOCK, LOADED BY INPGEO, STORED IN /GEOM/
*
* NUMBER OF RADIAL SPATIAL ELEMENTS
*
GENUMRAD001  26
*
*  SURRY
*
GESPAEND001      .16       .52      1.21      1.61      2.13
GESPAEND002     3.22      4.02      4.83      5.63      8.05
GESPAEND003    11.27     16.09     20.92     25.75     32.19
GESPAEND004    40.23     48.28     64.37     80.47    112.65
GESPAEND005   160.93    241.14    321.87    563.27    804.67
GESPAEND006  1609.34
*******************************************************************************
* NUCLIDE DATA BLOCK, LOADED BY INPISO, STORED IN /ISOGRP/, /ISONAM/
*
* Number of pseudo-stable nuclides (used to truncate the decay chains)
*
ISNUMSTB001      27
*
* List of pseudo-stable nuclides
*
ISNAMSTB001     I-129    (daughter of Te-129 and Te-129m)
ISNAMSTB002     Xe-131m  (daughter of I-131)
ISNAMSTB003     Xe-133m  (daughter of I-133)
ISNAMSTB004     Xe-135m  (daughter of I-135)
ISNAMSTB005     Cs-135   (daughter of Xe-135 and Xe-135m)
ISNAMSTB006     Sm-147   (daughter of Pm-147)
ISNAMSTB007     U-234    (daughter of Pu-238)
ISNAMSTB008     U-235    (daughter of Pu-239)
ISNAMSTB009     U-236    (daughter of Pu-240)
ISNAMSTB010     U-237    (daughter of Pu-241)
ISNAMSTB011     Np-237   (daughter of Am-241)
ISNAMSTB012     Rb-87    (daughter of Kr-87)
ISNAMSTB013     Ba-137m  (daughter of Cs-137)
ISNAMSTB014     Rb-88    (daughter of Kr-88)
ISNAMSTB015     Y-91m    (daughter of Sr-91)
ISNAMSTB016     Zr-93    (daughter of Y-93)
ISNAMSTB017     Nb-93m   (daughter of Zr-93)
ISNAMSTB018     Nb-95m   (daughter of Zr-95)
ISNAMSTB019     Nb-97    (daughter of Zr-97 and Nb-97m)
ISNAMSTB020     Nb-97m   (daughter of Zr-97)
ISNAMSTB021     Tc-99    (daughter of Mo-99)
ISNAMSTB022     Rh-103m  (daughter of Ru-103)
ISNAMSTB023     Rh-106   (daughter of Ru-106)
ISNAMSTB024    Te-131    (daughter of Te-131m)
ISNAMSTB025     Pr-144   (daughter of Ce-144 and Pr-144m)
ISNAMSTB026     Pr-144m  (daughter of Ce-144)
ISNAMSTB027     Pm-147   (daughter of Nd-147)
*
* Number of radioactive nuclides to be considered
*
ISNUMISO001 60
*
* NUMBER OF NUCLIDE GROUPS
*
ISMAXGRP001  9
*
* WET AND DRY DEPOSITION FLAGS FOR EACH NUCLIDE GROUP
```

```
*
*                WETDEP      DRYDEP
*
ISDEPFLA001     .FALSE.     .FALSE.
ISDEPFLA002     .TRUE.      .TRUE.
ISDEPFLA003     .TRUE.      .TRUE.
ISDEPFLA004     .TRUE.      .TRUE.
ISDEPFLA005     .TRUE.      .TRUE.
ISDEPFLA006     .TRUE.      .TRUE.
ISDEPFLA007     .TRUE.      .TRUE.
ISDEPFLA008     .TRUE.      .TRUE.
ISDEPFLA009     .TRUE.      .TRUE.
*
* NUCLIDE GROUP DATA FOR 9 NUCLIDE GROUPS
*
*                NUCNAM     IGROUP
*
ISOTPGRP001      Co-58         6
ISOTPGRP002      Co-60         6
ISOTPGRP003      Kr-85         1
ISOTPGRP004      Kr-85m        1
ISOTPGRP005      Kr-87         1
ISOTPGRP006      Kr-88         1
ISOTPGRP007      Rb-86         3
ISOTPGRP008      Sr-89         5
ISOTPGRP009      Sr-90         5
ISOTPGRP010      Sr-91         5
ISOTPGRP011      Sr-92         5
ISOTPGRP012      Y-90          7
ISOTPGRP013      Y-91          7
ISOTPGRP014      Y-92          7
ISOTPGRP015      Y-93          7
ISOTPGRP016      Zr-95         7
ISOTPGRP017      Zr-97         7
ISOTPGRP018      Nb-95         7
ISOTPGRP019      Mo-99         6
ISOTPGRP020      Tc-99m        6
ISOTPGRP021      Ru-103        6
ISOTPGRP022      Ru-105        6
ISOTPGRP023      Ru-106        6
ISOTPGRP024      Rh-105        6
ISOTPGRP025      Sb-127        4
ISOTPGRP026      Sb-129        4
ISOTPGRP027      Te-127        4
ISOTPGRP028      Te-127m       4
ISOTPGRP029      Te-129        4
ISOTPGRP030      Te-129m       4
ISOTPGRP031      Te-131m       4
ISOTPGRP032      Te-132        4
ISOTPGRP033      I-131         2
ISOTPGRP034      I-132         2
ISOTPGRP035      I-133         2
ISOTPGRP036      I-134         2
ISOTPGRP037      I-135         2
ISOTPGRP038      Xe-133        1
ISOTPGRP039      Xe-135        1
ISOTPGRP040      Cs-134        3
ISOTPGRP041      Cs-136        3
ISOTPGRP042      Cs-137        3
ISOTPGRP043      Ba-139        9
ISOTPGRP044      Ba-140        9
ISOTPGRP045      La-140        7
ISOTPGRP046      La-141        7
ISOTPGRP047      La-142        7
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ISOTPGRP048     Ce-141      8
ISOTPGRP049     Ce-143      8
ISOTPGRP050     Ce-144      8
ISOTPGRP051     Pr-143      7
ISOTPGRP052     Nd-147      7
ISOTPGRP053     Np-239      8
ISOTPGRP054     Pu-238      8
ISOTPGRP055     Pu-239      8
ISOTPGRP056     Pu-240      8
ISOTPGRP057     Pu-241      8
ISOTPGRP058     Am-241      7
ISOTPGRP059     Cm-242      7
ISOTPGRP060     Cm-244      7
*****************************************************************************
* WET DEPOSITION DATA BLOCK, LOADED BY INPWET, STORED IN /WETCON/
*
* WASHOUT COEFFICIENT NUMBER ONE, LINEAR FACTOR
*
WDCWASH1001  9.5E-5   (JON HELTON AFTER JONES, 1986)
*
* WASHOUT COEFFICIENT NUMBER TWO, EXPONENTIAL FACTOR
*
WDCWASH2001  0.8      (JON HELTON AFTER JONES, 1986)
*****************************************************************************
* DRY DEPOSITION DATA BLOCK, LOADED BY INPDRY, STORED IN /DRYCON/
*
* NUMBER OF PARTICLE SIZE GROUPS
*
DDNPSGRP001   1
*
* DEPOSITION VELOCITY OF EACH PARTICLE SIZE GROUP (M/S)
*
DDVDEPOS001   0.01   (VALUE SELECTED BY S. ACHARYA, NRC)
*****************************************************************************
* DISPERSION PARAMETER DATA BLOCK, LOADED BY INPDIS, STORED IN /DISPY/, /DISPZ/
*
* # of distances in plume-size tables--which can be used as an alternative to the
power-law model:
* (to utilize the power-law model, set NUM_DIST to zero or delete the following data
card)
*
NUM_DIST001   50
*
* A-stability      Distance (m)  Sigma-y (m)    Sigma-z (m)
A-STB/DIS01        1.000E+00     3.6580E-01     2.5000E-04  Tadmor/Gur (0.5-5 km)
A-STB/DIS02        1.400E+00     4.9569E-01     5.1105E-04  Tadmor/Gur (0.5-5 km)
A-STB/DIS03        2.000E+00     6.8408E-01     1.0905E-03  Tadmor/Gur (0.5-5 km)
A-STB/DIS04        3.000E+00     9.8658E-01     2.5812E-03  Tadmor/Gur (0.5-5 km)
A-STB/DIS05        4.000E+00     1.2793E+00     4.7568E-03  Tadmor/Gur (0.5-5 km)
A-STB/DIS06        5.000E+00     1.5649E+00     7.6428E-03  Tadmor/Gur (0.5-5 km)
A-STB/DIS07        6.000E+00     1.8450E+00     1.1259E-02  Tadmor/Gur (0.5-5 km)
A-STB/DIS08        8.000E+00     2.3923E+00     2.0749E-02  Tadmor/Gur (0.5-5 km)
A-STB/DIS09        1.000E+01     2.9265E+00     3.3338E-02  Tadmor/Gur (0.5-5 km)
A-STB/DIS10        1.000E+02     2.3412E+01     4.4457E+00  Tadmor/Gur (0.5-5 km)
A-STB/DIS11        1.400E+02     3.1726E+01     9.0879E+00  Tadmor/Gur (0.5-5 km)
A-STB/DIS12        2.000E+02     4.3783E+01     1.9392E+01  Tadmor/Gur (0.5-5 km)
A-STB/DIS13        3.000E+02     6.3144E+01     4.5901E+01  Tadmor/Gur (0.5-5 km)
A-STB/DIS14        4.000E+02     8.1877E+01     8.4590E+01  Tadmor/Gur (0.5-5 km)
A-STB/DIS15        5.000E+02     1.0016E+02     1.3591E+02  Tadmor/Gur (0.5-5 km)
A-STB/DIS16        6.000E+02     1.1808E+02     2.0022E+02  Tadmor/Gur (0.5-5 km)
A-STB/DIS17        8.000E+02     1.5312E+02     3.6898E+02  Tadmor/Gur (0.5-5 km)
A-STB/DIS18        1.000E+03     1.8730E+02     5.9284E+02  Tadmor/Gur (0.5-5 km)
A-STB/DIS19        1.400E+03     2.5381E+02     1.2119E+03  Tadmor/Gur (0.5-5 km)
A-STB/DIS20        2.000E+03     3.5027E+02     2.5860E+03  Tadmor/Gur (0.5-5 km)
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A-STB/DIS21	3.000E+03	5.0516E+02	6.1210E+03	Tadmor/Gur (0.5-5 km)
A-STB/DIS22	4.000E+03	6.5503E+02	1.1280E+04	Tadmor/Gur (0.5-5 km)
A-STB/DIS23	5.000E+03	8.0128E+02	1.8124E+04	Tadmor/Gur (0.5-5 km)
A-STB/DIS24	6.000E+03	9.4470E+02	2.6700E+04	Tadmor/Gur (0.5-5 km)
A-STB/DIS25	8.000E+03	1.2250E+03	4.9205E+04	Tadmor/Gur (0.5-5 km)
A-STB/DIS26	1.000E+04	1.4985E+03	7.9057E+04	Tadmor/Gur (0.5-5 km)
A-STB/DIS27	1.400E+04	2.0305E+03	1.6161E+05	Tadmor/Gur (0.5-5 km)
A-STB/DIS28	2.000E+04	2.8022E+03	3.4485E+05	Tadmor/Gur (0.5-5 km)
A-STB/DIS29	3.000E+04	4.0414E+03	8.1625E+05	Tadmor/Gur (0.5-5 km)
A-STB/DIS30	4.000E+04	5.2404E+03	1.5042E+06	Tadmor/Gur (0.5-5 km)
A-STB/DIS31	5.000E+04	6.4104E+03	2.4169E+06	Tadmor/Gur (0.5-5 km)
A-STB/DIS32	6.000E+04	7.5577E+03	3.5605E+06	Tadmor/Gur (0.5-5 km)
A-STB/DIS33	8.000E+04	9.8000E+03	6.5615E+06	Tadmor/Gur (0.5-5 km)
A-STB/DIS34	1.000E+05	1.1988E+04	1.0542E+07	Tadmor/Gur (0.5-5 km)
A-STB/DIS35	1.400E+05	1.6245E+04	2.1551E+07	Tadmor/Gur (0.5-5 km)
A-STB/DIS36	2.000E+05	2.2418E+04	4.5986E+07	Tadmor/Gur (0.5-5 km)
A-STB/DIS37	3.000E+05	3.2332E+04	1.0885E+08	Tadmor/Gur (0.5-5 km)
A-STB/DIS38	4.000E+05	4.1924E+04	2.0059E+08	Tadmor/Gur (0.5-5 km)
A-STB/DIS39	5.000E+05	5.1284E+04	3.2229E+08	Tadmor/Gur (0.5-5 km)
A-STB/DIS40	6.000E+05	6.0463E+04	4.7480E+08	Tadmor/Gur (0.5-5 km)
A-STB/DIS41	8.000E+05	7.8401E+04	8.7500E+08	Tadmor/Gur (0.5-5 km)
A-STB/DIS42	1.000E+06	9.5906E+04	1.4059E+09	Tadmor/Gur (0.5-5 km)
A-STB/DIS43	1.400E+06	1.2996E+05	2.8738E+09	Tadmor/Gur (0.5-5 km)
A-STB/DIS44	2.000E+06	1.7935E+05	6.1324E+09	Tadmor/Gur (0.5-5 km)
A-STB/DIS45	3.000E+06	2.5866E+05	1.4515E+10	Tadmor/Gur (0.5-5 km)
A-STB/DIS46	4.000E+06	3.3540E+05	2.6750E+10	Tadmor/Gur (0.5-5 km)
A-STB/DIS47	5.000E+06	4.1028E+05	4.2979E+10	Tadmor/Gur (0.5-5 km)
A-STB/DIS48	6.000E+06	4.8372E+05	6.3316E+10	Tadmor/Gur (0.5-5 km)
A-STB/DIS49	8.000E+06	6.2723E+05	1.1668E+11	Tadmor/Gur (0.5-5 km)
A-STB/DIS50	1.000E+07	7.6726E+05	1.8747E+11	Tadmor/Gur (0.5-5 km)
*				
* B-stability	Distance (m)	Sigma-y (m)	Sigma-z (m)	
B-STB/DIS01	1.000E+00	2.7510E-01	1.9000E-03	Tadmor/Gur (0.5-5 km)
B-STB/DIS02	1.400E+00	3.7279E-01	3.2574E-03	Tadmor/Gur (0.5-5 km)
B-STB/DIS03	2.000E+00	5.1446E-01	5.7681E-03	Tadmor/Gur (0.5-5 km)
B-STB/DIS04	3.000E+00	7.4196E-01	1.1045E-02	Tadmor/Gur (0.5-5 km)
B-STB/DIS05	4.000E+00	9.6208E-01	1.7511E-02	Tadmor/Gur (0.5-5 km)
B-STB/DIS06	5.000E+00	1.1769E+00	2.5036E-02	Tadmor/Gur (0.5-5 km)
B-STB/DIS07	6.000E+00	1.3875E+00	3.3530E-02	Tadmor/Gur (0.5-5 km)
B-STB/DIS08	8.000E+00	1.7992E+00	5.3161E-02	Tadmor/Gur (0.5-5 km)
B-STB/DIS09	1.000E+01	2.2009E+00	7.6007E-02	Tadmor/Gur (0.5-5 km)
B-STB/DIS10	1.000E+02	1.7607E+01	3.0406E+00	Tadmor/Gur (0.5-5 km)
B-STB/DIS11	1.400E+02	2.3859E+01	5.2127E+00	Tadmor/Gur (0.5-5 km)
B-STB/DIS12	2.000E+02	3.2927E+01	9.2307E+00	Tadmor/Gur (0.5-5 km)
B-STB/DIS13	3.000E+02	4.7487E+01	1.7675E+01	Tadmor/Gur (0.5-5 km)
B-STB/DIS14	4.000E+02	6.1576E+01	2.8023E+01	Tadmor/Gur (0.5-5 km)
B-STB/DIS15	5.000E+02	7.5323E+01	4.0066E+01	Tadmor/Gur (0.5-5 km)
B-STB/DIS16	6.000E+02	8.8805E+01	5.3657E+01	Tadmor/Gur (0.5-5 km)
B-STB/DIS17	8.000E+02	1.1515E+02	8.5073E+01	Tadmor/Gur (0.5-5 km)
B-STB/DIS18	1.000E+03	1.4086E+02	1.2163E+02	Tadmor/Gur (0.5-5 km)
B-STB/DIS19	1.400E+03	1.9088E+02	2.0853E+02	Tadmor/Gur (0.5-5 km)
B-STB/DIS20	2.000E+03	2.6342E+02	3.6926E+02	Tadmor/Gur (0.5-5 km)
B-STB/DIS21	3.000E+03	3.7991E+02	7.0705E+02	Tadmor/Gur (0.5-5 km)
B-STB/DIS22	4.000E+03	4.9262E+02	1.1210E+03	Tadmor/Gur (0.5-5 km)
B-STB/DIS23	5.000E+03	6.0260E+02	1.6028E+03	Tadmor/Gur (0.5-5 km)
B-STB/DIS24	6.000E+03	7.1046E+02	2.1465E+03	Tadmor/Gur (0.5-5 km)
B-STB/DIS25	8.000E+03	9.2124E+02	3.4033E+03	Tadmor/Gur (0.5-5 km)
B-STB/DIS26	1.000E+04	1.1269E+03	4.8658E+03	Tadmor/Gur (0.5-5 km)
B-STB/DIS27	1.400E+04	1.5271E+03	8.3419E+03	Tadmor/Gur (0.5-5 km)
B-STB/DIS28	2.000E+04	2.1074E+03	1.4772E+04	Tadmor/Gur (0.5-5 km)
B-STB/DIS29	3.000E+04	3.0393E+03	2.8285E+04	Tadmor/Gur (0.5-5 km)
B-STB/DIS30	4.000E+04	3.9410E+03	4.4845E+04	Tadmor/Gur (0.5-5 km)
B-STB/DIS31	5.000E+04	4.8209E+03	6.4117E+04	Tadmor/Gur (0.5-5 km)
B-STB/DIS32	6.000E+04	5.6838E+03	8.5868E+04	Tadmor/Gur (0.5-5 km)

B-STB/DIS33	8.000E+04	7.3701E+03	1.3614E+05	Tadmor/Gur (0.5-5 km)
B-STB/DIS34	1.000E+05	9.0155E+03	1.9465E+05	Tadmor/Gur (0.5-5 km)
B-STB/DIS35	1.400E+05	1.2217E+04	3.3371E+05	Tadmor/Gur (0.5-5 km)
B-STB/DIS36	2.000E+05	1.6860E+04	5.9093E+05	Tadmor/Gur (0.5-5 km)
B-STB/DIS37	3.000E+05	2.4315E+04	1.1315E+06	Tadmor/Gur (0.5-5 km)
B-STB/DIS38	4.000E+05	3.1529E+04	1.7940E+06	Tadmor/Gur (0.5-5 km)
B-STB/DIS39	5.000E+05	3.8568E+04	2.5649E+06	Tadmor/Gur (0.5-5 km)
B-STB/DIS40	6.000E+05	4.5471E+04	3.4350E+06	Tadmor/Gur (0.5-5 km)
B-STB/DIS41	8.000E+05	5.8962E+04	5.4462E+06	Tadmor/Gur (0.5-5 km)
B-STB/DIS42	1.000E+06	7.2126E+04	7.7867E+06	Tadmor/Gur (0.5-5 km)
B-STB/DIS43	1.400E+06	9.7737E+04	1.3350E+07	Tadmor/Gur (0.5-5 km)
B-STB/DIS44	2.000E+06	1.3488E+05	2.3639E+07	Tadmor/Gur (0.5-5 km)
B-STB/DIS45	3.000E+06	1.9453E+05	4.5264E+07	Tadmor/Gur (0.5-5 km)
B-STB/DIS46	4.000E+06	2.5224E+05	7.1765E+07	Tadmor/Gur (0.5-5 km)
B-STB/DIS47	5.000E+06	3.0855E+05	1.0261E+08	Tadmor/Gur (0.5-5 km)
B-STB/DIS48	6.000E+06	3.6378E+05	1.3741E+08	Tadmor/Gur (0.5-5 km)
B-STB/DIS49	8.000E+06	4.7171E+05	2.1787E+08	Tadmor/Gur (0.5-5 km)
B-STB/DIS50	1.000E+07	5.7702E+05	3.1150E+08	Tadmor/Gur (0.5-5 km)
*				
* C-stability	Distance (m)	Sigma-y (m)	Sigma-z (m)	
C-STB/DIS01	1.000E+00	2.0890E-01	2.0000E-01	Tadmor/Gur (0.5-5 km)
C-STB/DIS02	1.400E+00	2.8308E-01	2.6660E-01	Tadmor/Gur (0.5-5 km)
C-STB/DIS03	2.000E+00	3.9066E-01	3.6158E-01	Tadmor/Gur (0.5-5 km)
C-STB/DIS04	3.000E+00	5.6341E-01	5.1125E-01	Tadmor/Gur (0.5-5 km)
C-STB/DIS05	4.000E+00	7.3056E-01	6.5369E-01	Tadmor/Gur (0.5-5 km)
C-STB/DIS06	5.000E+00	8.9367E-01	7.9097E-01	Tadmor/Gur (0.5-5 km)
C-STB/DIS07	6.000E+00	1.0536E+00	9.2428E-01	Tadmor/Gur (0.5-5 km)
C-STB/DIS08	8.000E+00	1.3662E+00	1.1818E+00	Tadmor/Gur (0.5-5 km)
C-STB/DIS09	1.000E+01	1.6712E+00	1.4300E+00	Tadmor/Gur (0.5-5 km)
C-STB/DIS10	1.000E+02	1.3370E+01	1.0224E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS11	1.400E+02	1.8118E+01	1.3629E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS12	2.000E+02	2.5003E+01	1.8484E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS13	3.000E+02	3.6060E+01	2.6136E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS14	4.000E+02	4.6758E+01	3.3417E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS15	5.000E+02	5.7198E+01	4.0435E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS16	6.000E+02	6.7435E+01	4.7250E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS17	8.000E+02	8.7442E+01	6.0414E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS18	1.000E+03	1.0696E+02	7.3102E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS19	1.400E+03	1.4495E+02	9.7447E+01	Tadmor/Gur (0.5-5 km)
C-STB/DIS20	2.000E+03	2.0003E+02	1.3216E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS21	3.000E+03	2.8849E+02	1.8687E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS22	4.000E+03	3.7408E+02	2.3893E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS23	5.000E+03	4.5759E+02	2.8911E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS24	6.000E+03	5.3949E+02	3.3784E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS25	8.000E+03	6.9955E+02	4.3196E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS26	1.000E+04	8.5573E+02	5.2267E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS27	1.400E+04	1.1596E+03	6.9673E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS28	2.000E+04	1.6003E+03	9.4493E+02	Tadmor/Gur (0.5-5 km)
C-STB/DIS29	3.000E+04	2.3080E+03	1.3361E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS30	4.000E+04	2.9927E+03	1.7083E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS31	5.000E+04	3.6608E+03	2.0671E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS32	6.000E+04	4.3161E+03	2.4155E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS33	8.000E+04	5.5965E+03	3.0884E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS34	1.000E+05	6.8460E+03	3.7371E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS35	1.400E+05	9.2770E+03	4.9816E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS36	2.000E+05	1.2803E+04	6.7562E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS37	3.000E+05	1.8464E+04	9.5529E+03	Tadmor/Gur (0.5-5 km)
C-STB/DIS38	4.000E+05	2.3942E+04	1.2214E+04	Tadmor/Gur (0.5-5 km)
C-STB/DIS39	5.000E+05	2.9287E+04	1.4780E+04	Tadmor/Gur (0.5-5 km)
C-STB/DIS40	6.000E+05	3.4529E+04	1.7270E+04	Tadmor/Gur (0.5-5 km)
C-STB/DIS41	8.000E+05	4.4773E+04	2.2082E+04	Tadmor/Gur (0.5-5 km)
C-STB/DIS42	1.000E+06	5.4769E+04	2.6720E+04	Tadmor/Gur (0.5-5 km)
C-STB/DIS43	1.400E+06	7.4218E+04	3.5618E+04	Tadmor/Gur (0.5-5 km)
C-STB/DIS44	2.000E+06	1.0242E+05	4.8306E+04	Tadmor/Gur (0.5-5 km)

C-STB/DIS45	3.000E+06	1.4772E+05	6.8302E+04	Tadmor/Gur (0.5-5 km)
C-STB/DIS46	4.000E+06	1.9154E+05	8.7331E+04	Tadmor/Gur (0.5-5 km)
C-STB/DIS47	5.000E+06	2.3430E+05	1.0567E+05	Tadmor/Gur (0.5-5 km)
C-STB/DIS48	6.000E+06	2.7624E+05	1.2348E+05	Tadmor/Gur (0.5-5 km)
C-STB/DIS49	8.000E+06	3.5819E+05	1.5788E+05	Tadmor/Gur (0.5-5 km)
C-STB/DIS50	1.000E+07	4.3817E+05	1.9104E+05	Tadmor/Gur (0.5-5 km)
*				
* D-stability	Distance (m)	Sigma-y (m)	Sigma-z (m)	
D-STB/DIS01	1.000E+00	1.4740E-01	3.0000E-01	Tadmor/Gur (0.5-5 km)
D-STB/DIS02	1.400E+00	1.9974E-01	3.7374E-01	Tadmor/Gur (0.5-5 km)
D-STB/DIS03	2.000E+00	2.7565E-01	4.7180E-01	Tadmor/Gur (0.5-5 km)
D-STB/DIS04	3.000E+00	3.9754E-01	6.1486E-01	Tadmor/Gur (0.5-5 km)
D-STB/DIS05	4.000E+00	5.1549E-01	7.4197E-01	Tadmor/Gur (0.5-5 km)
D-STB/DIS06	5.000E+00	6.3058E-01	8.5840E-01	Tadmor/Gur (0.5-5 km)
D-STB/DIS07	6.000E+00	7.4344E-01	9.6696E-01	Tadmor/Gur (0.5-5 km)
D-STB/DIS08	8.000E+00	9.6400E-01	1.1669E+00	Tadmor/Gur (0.5-5 km)
D-STB/DIS09	1.000E+01	1.1792E+00	1.3500E+00	Tadmor/Gur (0.5-5 km)
D-STB/DIS10	1.000E+02	9.4340E+00	6.0746E+00	Tadmor/Gur (0.5-5 km)
D-STB/DIS11	1.400E+02	1.2784E+01	7.5678E+00	Tadmor/Gur (0.5-5 km)
D-STB/DIS12	2.000E+02	1.7642E+01	9.5533E+00	Tadmor/Gur (0.5-5 km)
D-STB/DIS13	3.000E+02	2.5444E+01	1.2450E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS14	4.000E+02	3.2993E+01	1.5024E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS15	5.000E+02	4.0359E+01	1.7382E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS16	6.000E+02	4.7582E+01	1.9580E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS17	8.000E+02	6.1699E+01	2.3628E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS18	1.000E+03	7.5474E+01	2.7335E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS19	1.400E+03	1.0227E+02	3.4054E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS20	2.000E+03	1.4114E+02	4.2989E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS21	3.000E+03	2.0356E+02	5.6024E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS22	4.000E+03	2.6395E+02	6.7606E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS23	5.000E+03	3.2288E+02	7.8215E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS24	6.000E+03	3.8067E+02	8.8107E+01	Tadmor/Gur (0.5-5 km)
D-STB/DIS25	8.000E+03	4.9360E+02	1.0632E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS26	1.000E+04	6.0381E+02	1.2300E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS27	1.400E+04	8.1821E+02	1.5324E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS28	2.000E+04	1.1292E+03	1.9344E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS29	3.000E+04	1.6285E+03	2.5210E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS30	4.000E+04	2.1116E+03	3.0422E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS31	5.000E+04	2.5831E+03	3.5196E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS32	6.000E+04	3.0454E+03	3.9647E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS33	8.000E+04	3.9489E+03	4.7843E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS34	1.000E+05	4.8306E+03	5.5350E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS35	1.400E+05	6.5458E+03	6.8956E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS36	2.000E+05	9.0335E+03	8.7047E+02	Tadmor/Gur (0.5-5 km)
D-STB/DIS37	3.000E+05	1.3028E+04	1.1344E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS38	4.000E+05	1.6893E+04	1.3689E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS39	5.000E+05	2.0665E+04	1.5838E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS40	6.000E+05	2.4364E+04	1.7841E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS41	8.000E+05	3.1592E+04	2.1529E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS42	1.000E+06	3.8645E+04	2.4907E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS43	1.400E+06	5.2368E+04	3.1029E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS44	2.000E+06	7.2270E+04	3.9170E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS45	3.000E+06	1.0423E+05	5.1048E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS46	4.000E+06	1.3515E+05	6.1601E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS47	5.000E+06	1.6532E+05	7.1267E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS48	6.000E+06	1.9492E+05	8.0280E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS49	8.000E+06	2.5274E+05	9.6877E+03	Tadmor/Gur (0.5-5 km)
D-STB/DIS50	1.000E+07	3.0917E+05	1.1208E+04	Tadmor/Gur (0.5-5 km)
*				
* E-stability	Distance (m)	Sigma-y (m)	Sigma-z (m)	
E-STB/DIS01	1.000E+00	1.0460E-01	4.0000E-01	Tadmor/Gur (0.5-5 km)
E-STB/DIS02	1.400E+00	1.4174E-01	4.8983E-01	Tadmor/Gur (0.5-5 km)
E-STB/DIS03	2.000E+00	1.9561E-01	6.0717E-01	Tadmor/Gur (0.5-5 km)
E-STB/DIS04	3.000E+00	2.8211E-01	7.7506E-01	Tadmor/Gur (0.5-5 km)

E-STB/DIS05	4.000E+00	3.6581E-01	9.2164E-01	Tadmor/Gur (0.5-5 km)
E-STB/DIS06	5.000E+00	4.4748E-01	1.0542E+00	Tadmor/Gur (0.5-5 km)
E-STB/DIS07	6.000E+00	5.2757E-01	1.1765E+00	Tadmor/Gur (0.5-5 km)
E-STB/DIS08	8.000E+00	6.8409E-01	1.3990E+00	Tadmor/Gur (0.5-5 km)
E-STB/DIS09	1.000E+01	8.3682E-01	1.6001E+00	Tadmor/Gur (0.5-5 km)
E-STB/DIS10	1.000E+02	6.6947E+00	6.4012E+00	Tadmor/Gur (0.5-5 km)
E-STB/DIS11	1.400E+02	9.0719E+00	7.8387E+00	Tadmor/Gur (0.5-5 km)
E-STB/DIS12	2.000E+02	1.2520E+01	9.7165E+00	Tadmor/Gur (0.5-5 km)
E-STB/DIS13	3.000E+02	1.8056E+01	1.2403E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS14	4.000E+02	2.3413E+01	1.4749E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS15	5.000E+02	2.8640E+01	1.6870E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS16	6.000E+02	3.3766E+01	1.8827E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS17	8.000E+02	4.3784E+01	2.2388E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS18	1.000E+03	5.3559E+01	2.5607E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS19	1.400E+03	7.2577E+01	3.1358E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS20	2.000E+03	1.0016E+02	3.8870E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS21	3.000E+03	1.4445E+02	4.9617E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS22	4.000E+03	1.8731E+02	5.9001E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS23	5.000E+03	2.2912E+02	6.7485E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS24	6.000E+03	2.7013E+02	7.5316E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS25	8.000E+03	3.5028E+02	8.9559E+01	Tadmor/Gur (0.5-5 km)
E-STB/DIS26	1.000E+04	4.2848E+02	1.0244E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS27	1.400E+04	5.8063E+02	1.2544E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS28	2.000E+04	8.0129E+02	1.5549E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS29	3.000E+04	1.1556E+03	1.9849E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS30	4.000E+04	1.4985E+03	2.3603E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS31	5.000E+04	1.8330E+03	2.6997E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS32	6.000E+04	2.1611E+03	3.0129E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS33	8.000E+04	2.8023E+03	3.5827E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS34	1.000E+05	3.4279E+03	4.0979E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS35	1.400E+05	4.6452E+03	5.0182E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS36	2.000E+05	6.4105E+03	6.2203E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS37	3.000E+05	9.2453E+03	7.9403E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS38	4.000E+05	1.1988E+04	9.4419E+02	Tadmor/Gur (0.5-5 km)
E-STB/DIS39	5.000E+05	1.4665E+04	1.0800E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS40	6.000E+05	1.7289E+04	1.2053E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS41	8.000E+05	2.2419E+04	1.4332E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS42	1.000E+06	2.7424E+04	1.6393E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS43	1.400E+06	3.7162E+04	2.0074E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS44	2.000E+06	5.1285E+04	2.4883E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS45	3.000E+06	7.3964E+04	3.1764E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS46	4.000E+06	9.5907E+04	3.7771E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS47	5.000E+06	1.1732E+05	4.3203E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS48	6.000E+06	1.3832E+05	4.8215E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS49	8.000E+06	1.7935E+05	5.7334E+03	Tadmor/Gur (0.5-5 km)
E-STB/DIS50	1.000E+07	2.1940E+05	6.5578E+03	Tadmor/Gur (0.5-5 km)
*				
* F-stability	Distance (m)	Sigma-y (m)	Sigma-z (m)	
F-STB/DIS01	1.000E+00	7.2200E-02	2.0000E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS02	1.400E+00	9.7838E-02	2.4491E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS03	2.000E+00	1.3502E-01	3.0356E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS04	3.000E+00	1.9473E-01	3.8749E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS05	4.000E+00	2.5250E-01	4.6076E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS06	5.000E+00	3.0887E-01	5.2700E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS07	6.000E+00	3.6415E-01	5.8814E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS08	8.000E+00	4.7219E-01	6.9934E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS09	1.000E+01	5.7761E-01	7.9989E-01	Tadmor/Gur (0.5-5 km)
F-STB/DIS10	1.000E+02	4.6210E+00	3.1991E+00	Tadmor/Gur (0.5-5 km)
F-STB/DIS11	1.400E+02	6.2619E+00	3.9174E+00	Tadmor/Gur (0.5-5 km)
F-STB/DIS12	2.000E+02	8.6417E+00	4.8557E+00	Tadmor/Gur (0.5-5 km)
F-STB/DIS13	3.000E+02	1.2463E+01	6.1981E+00	Tadmor/Gur (0.5-5 km)
F-STB/DIS14	4.000E+02	1.6161E+01	7.3700E+00	Tadmor/Gur (0.5-5 km)
F-STB/DIS15	5.000E+02	1.9769E+01	8.4297E+00	Tadmor/Gur (0.5-5 km)
F-STB/DIS16	6.000E+02	2.3307E+01	9.4076E+00	Tadmor/Gur (0.5-5 km)

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F-STB/DIS17        8.000E+02     3.0222E+01     1.1186E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS18        1.000E+03     3.6969E+01     1.2795E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS19        1.400E+03     5.0096E+01     1.5667E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS20        2.000E+03     6.9135E+01     1.9420E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS21        3.000E+03     9.9707E+01     2.4789E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS22        4.000E+03     1.2929E+02     2.9476E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS23        5.000E+03     1.5815E+02     3.3714E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS24        6.000E+03     1.8646E+02     3.7625E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS25        8.000E+03     2.4178E+02     4.4739E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS26        1.000E+04     2.9576E+02     5.1172E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS27        1.400E+04     4.0078E+02     6.2661E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS28        2.000E+04     5.5309E+02     7.7669E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS29        3.000E+04     7.9767E+02     9.9142E+01  Tadmor/Gur (0.5-5 km)
F-STB/DIS30        4.000E+04     1.0343E+03     1.1789E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS31        5.000E+04     1.2653E+03     1.3484E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS32        6.000E+04     1.4917E+03     1.5048E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS33        8.000E+04     1.9343E+03     1.7893E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS34        1.000E+05     2.3661E+03     2.0466E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS35        1.400E+05     3.2063E+03     2.5061E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS36        2.000E+05     4.4248E+03     3.1063E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS37        3.000E+05     6.3815E+03     3.9651E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS38        4.000E+05     8.2748E+03     4.7149E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS39        5.000E+05     1.0122E+04     5.3927E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS40        6.000E+05     1.1934E+04     6.0183E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS41        8.000E+05     1.5475E+04     7.1563E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS42        1.000E+06     1.8929E+04     8.1852E+02  Tadmor/Gur (0.5-5 km)
F-STB/DIS43        1.400E+06     2.5651E+04     1.0023E+03  Tadmor/Gur (0.5-5 km)
F-STB/DIS44        2.000E+06     3.5400E+04     1.2424E+03  Tadmor/Gur (0.5-5 km)
F-STB/DIS45        3.000E+06     5.1053E+04     1.5858E+03  Tadmor/Gur (0.5-5 km)
F-STB/DIS46        4.000E+06     6.6200E+04     1.8857E+03  Tadmor/Gur (0.5-5 km)
F-STB/DIS47        5.000E+06     8.0980E+04     2.1568E+03  Tadmor/Gur (0.5-5 km)
F-STB/DIS48        6.000E+06     9.5474E+04     2.4070E+03  Tadmor/Gur (0.5-5 km)
F-STB/DIS49        8.000E+06     1.2380E+05     2.8621E+03  Tadmor/Gur (0.5-5 km)
F-STB/DIS50        1.000E+07     1.5144E+05     3.2736E+03  Tadmor/Gur (0.5-5 km)
*
*  LINEAR SCALING FACTOR FOR SIGMA-Y FUNCTION, NORMALLY 1
*
DPYSCALE001    1.
*
*  LINEAR SCALING FACTOR FOR SIGMA-Z FUNCTION,
*  NORMALLY USED FOR SURFACE ROUGHNESS LENGTH CORRECTION.
*  (Z1 / Z0) ** 0.2,   FROM CRAC2 WE HAVE  (10 CM / 3 CM) ** 0.2 = 1.27
*
DPZSCALE001    1.27
*************************************************************************** *
* EXPANSION FACTOR DATA BLOCK, LOADED BY INPEXP, STORED IN /EXPAND/
*
* TIME BASE FOR EXPANSION FACTOR (SECONDS)
*
PMTIMBAS001    600.   (10 MINUTES)
*
* BREAK POINT FOR FORMULA CHANGE (SECONDS)
*
PMBRKPNT001   3600.   (1 HOUR)
*
* EXPONENTIAL EXPANSION FACTOR NUMBER 1
*
PMXPFAC1001      0.2
*
* EXPONENTIAL EXPANSION FACTOR NUMBER 2
*
PMXPFAC2001      0.25
*************************************************************************
* PLUME RISE DATA BLOCK, LOADED BY INPLRS, STORED IN /PLUMRS/
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*
* SCALING FACTOR FOR THE CRITICAL WIND SPEED FOR ENTRAINMENT OF A BOUYANT PLUME
* (USED BY FUNCTION CAUGHT)
*
PRSCLCRW001   1.
*
* SCALING FACTOR FOR THE A-D STABILITY PLUME RISE FORMULA
* (USED BY FUNCTION PLMRIS)
*
PRSCLADP001   1.
*
* SCALING FACTOR FOR THE E-F STABILITY PLUME RISE FORMULA
* (USED BY FUNCTION PLMRIS)
*
PRSCLEFP001   1.
*******************************************************************************
* RELEASE DATA BLOCK, LOADED BY INPREL, STORED IN /ATNAM2/, /MULREL/
*
RDATNAM2001 'SECOND DRAFT 1150, WORST CASE SOURCE TERM FOR EARLY FATALITIES'
*
* TIME AFTER ACCIDENT INITIATION WHEN THE ACCIDENT REACHES GENERAL EMERGENCY
* CONDITIONS (AS DEFINED IN NUREG-0654), OR WHEN PLANT PERSONNEL CAN RELIABLY
* PREDICT THAT GENERAL EMERGENCY CONDITIONS WILL BE ATTAINED
*
RDOALARM001      1300.
*
* NUMBER OF PLUME SEGMENTS THAT ARE RELEASED
*
RDNUMREL001          1
*
* SELECTION OF RISK DOMINANT PLUME
*
RDMAXRIS001          1
*
* REFERENCE TIME FOR DISPERSION AND RADIOACTIVE DECAY
*
RDREFTIM001       0.00
*
* HEAT CONTENT OF THE RELEASE SEGMENTS (W)
* A VALUE SPECIFIED FOR EACH OF THE RELEASE SEGMENTS
*
RDPLHEAT001     3.7E+6
*
* HEIGHT OF THE PLUME SEGMENTS AT RELEASE (M)
* A VALUE SPECIFIED FOR EACH OF THE RELEASE SEGMENTS
*
RDPLHITE001         0.
*
* DURATION OF THE PLUME SEGMENTS (S)
* A VALUE SPECIFIED FOR EACH OF THE RELEASE SEGMENTS
*
RDPLUDUR001      1800.
*
* TIME OF RELEASE FOR EACH PLUME (S AFTER SCRAM)
* A VALUE SPECIFIED FOR EACH OF THE RELEASE SEGMENTS
*
RDPDELAY001     19300.
*
* Initial value of sigma-y for each plume--Note: values required for each plume
*
SIGYINIT001  9.302  (initial sigma-y, calculated for 40 meter wide bldg.)
*
* Initial value of sigma-z for each plume--Note: values required for each plume
*
```

```
SIGZINIT001  23.26  (initial sigma-z, calculated for 50 meter high bldg.)
*
* Building height (meters)--Note: values required for each plume
*
WEBUILDH001   50.0  (Surry)
*
* PARTICLE SIZE DISTRIBUTION OF EACH NUCLIDE GROUP
* YOU MUST SPECIFY A COLUMN OF DATA FOR EACH OF THE PARTICLE SIZE GROUPS
*
RDPSDIST001      1.
RDPSDIST002      1.
RDPSDIST003      1.
RDPSDIST004      1.
RDPSDIST005      1.
RDPSDIST006      1.
RDPSDIST007      1.
RDPSDIST008      1.
RDPSDIST009      1.
*
* Millstone 1 spent fuel pool inventory
* - spent fuel pool contains 11 batches of spent fuel plus rest of last core
* - inventory reflects 1 year of radioactive decay since last batch
*   was put in pool
* - inventory is based on inventories in NUREG/CR-4982, July 1987
* - Millstone 1 has a power of 2011 MWt
*
*               NUCNAM        CORINV (Bq)
*
RDCORINV001     Co-58         9.170E+13
RDCORINV002     Co-60         1.340E+16
RDCORINV003     Kr-85         5.940E+16
RDCORINV004     Kr-85m        0.000E+00
RDCORINV005     Kr-87         0.000E+00
RDCORINV006     Kr-88         0.000E+00
RDCORINV007     Rb-86         2.980E+09
RDCORINV008     Sr-89         1.160E+16
RDCORINV009     Sr-90         5.980E+17
RDCORINV010     Sr-91         0.000E+00
RDCORINV011     Sr-92         0.000E+00
RDCORINV012     Y-90          6.020E+17
RDCORINV013     Y-91          2.960E+16
RDCORINV014     Y-92          0.000E+00
RDCORINV015     Y-93          0.000E+00
RDCORINV016     Zr-95         6.160E+16
RDCORINV017     Zr-97         0.000E+00
RDCORINV018     Nb-95         7.950E+16
RDCORINV019     Mo-99         0.000E+00
RDCORINV020     Tc-99m        0.000E+00
RDCORINV021     Ru-103        3.420E+15
RDCORINV022     Ru-105        0.000E+00
RDCORINV023     Ru-106        5.770E+17
RDCORINV024     Rh-105        0.000E+00
RDCORINV025     Sb-127        0.000E+00
RDCORINV026     Sb-129        0.000E+00
RDCORINV027     Te-127        2.390E+15
RDCORINV028     Te-127m       2.430E+15
RDCORINV029     Te-129        4.450E+13
RDCORINV030     Te-129m       4.430E+13
RDCORINV031     Te-131m       0.000E+00
RDCORINV032     Te-132        0.000E+00
RDCORINV033     I-131         2.130E+04
RDCORINV034     I-132         0.000E+00
RDCORINV035     I-133         0.000E+00
RDCORINV036     I-134         0.000E+00
```

```
RDCORINV037     I-135          0.000E+00
RDCORINV038     Xe-133         0.000E+00
RDCORINV039     Xe-135         0.000E+00
RDCORINV040     Cs-134         2.800E+17
RDCORINV041     Cs-136         3.400E+08
RDCORINV042     Cs-137         8.380E+17
RDCORINV043     Ba-139         0.000E+00
RDCORINV044     Ba-140         7.920E+09
RDCORINV045     La-140         8.060E+09
RDCORINV046     La-141         0.000E+00
RDCORINV047     La-142         0.000E+00
RDCORINV048     Ce-141         1.220E+15
RDCORINV049     Ce-143         0.000E+00
RDCORINV050     Ce-144         1.040E+18
RDCORINV051     Pr-143         2.210E+10
RDCORINV052     Nd-147         1.220E+08
RDCORINV053     Np-239         1.070E+14
RDCORINV054     Pu-238         1.780E+16
RDCORINV055     Pu-239         3.870E+15
RDCORINV056     Pu-240         5.400E+15
RDCORINV057     Pu-241         9.320E+17
RDCORINV058     Am-241         1.200E+16
RDCORINV059     Cm-242         1.770E+16
RDCORINV060     Cm-244         8.400E+15
*
*  SCALING FACTOR TO ADJUST THE CORE INVENTORY FOR POWER LEVEL
*
RDCORSCA001   1.711  *  convert from Millstone to Susquehanna
*                       by multiplying by ratio of powers
*                       (3441MWt/2011MWt)
*
*
RDAPLFRC001   PARENT       (apply rel fracs the same as prior versions)
*
* RELEASE FRACTIONS FOR ISOTOPE GROUPS IN RELEASE
*
*  ISOTOPE GROUPS:
*
*            XE/KR    I     CS     TE     SR     RU     LA     CE     BA
*
RDRELFRC001 1.0E+0 1.0E+0 1.0E+0 2.0E-2 2.0E-3 2.0E-5 1.0E-6 1.0E-6 2.0E-3
*******************************************************************************
* OUTPUT CONTROL DATA BLOCK, LOADED BY INPOPT, STORED IN /STOPME/, /ATMOPT/
*
* FLAG TO INDICATE THAT THIS IS THE LAST PROGRAM IN THE SERIES TO BE RUN
*
OCENDAT1001  .FALSE. (SET THIS VALUE TO .TRUE. TO SKIP EARLY AND CHRONC)
*
OCIDEBUG001  0
*
* NAME OF THE NUCLIDE TO BE LISTED ON THE DISPERSION LISTINGS
*
OCNUCOUT001  Cs-137
*
*              NUM0
TYPE0NUMBER      2
*
*             INDREL   INDRAD
TYPE0OUT001       1        9
TYPE0OUT002       1       10          XCCDF
*******************************************************************************
* METEOROLOGICAL SAMPLING DATA BLOCK
*
* METEOROLOGICAL SAMPLING OPTION CODE:
```

```
*
* METCOD = 1, USER SPECIFIED DAY AND HOUR IN THE YEAR (FROM MET FILE),
*          2, WEATHER CATEGORY BIN SAMPLING,
*          3, 120 HOURS OF WEATHER SPECIFIED ON THE ATMOS USER INPUT FILE,
*          4, CONSTANT MET (BOUNDARY WEATHER USED FROM THE START),
*          5, STRATIFIED RANDOM SAMPLES FOR EACH DAY OF THE YEAR.
*
M1METCOD001  2
*
* LAST SPATIAL INTERVAL FOR MEASURED WEATHER
*
M2LIMSPA001  25
*
* BOUNDARY WEATHER MIXING LAYER HEIGHT
*
M2BNDMXH001  1000.  (METERS)
*
* BOUNDARY WEATHER STABILITY CLASS INDEX
*
M2IBDSTB001  4      (D-STABILITY)
*
* BOUNDARY WEATHER RAIN RATE
*
M2BNDRAN001  5.     (MM/HR)
*
* BOUNDARY WEATHER WIND SPEED
*
M2BNDWND001  5.     (M/S)
*
* NUMBER OF RAIN DISTANCE INTERVALS FOR BINNING
*
M4NRNINT001  5
*
* ENDPOINTS OF THE RAIN DISTANCE INTERVALS (KILOMETERS)
*
* NOTE: THESE MUST BE CHOSEN TO MATCH THE SPATIAL ENDPOINT DISTANCES
*       SPECIFIED FOR THE ARRAY SPAEND (10 % ERROR IS ALLOWED).
*
M4RNDSTS001  3.22  5.63  11.27  20.92  32.19
*
* NUMBER OF RAIN INTENSITIY BREAKPOINTS
*
M4NRINTN001   3
*
* RAIN INTENSITY BREAKPOINTS FOR WEATHER BINNING (MILLIMETERS PER HOUR)
*
M4RNRATE001   2.  4.  6.
*
* NUMBER OF SAMPLES PER BIN
*
M4NSMPLS001  4  (THIS NUMBER SHOULD BE SET TO 4 FOR RISK ASSESSMENT)
*
* INITIAL SEED FOR RANDOM NUMBER GENERATOR
*
M4IRSEED001   79
.
*
*
**********************************************************************
* 4/14/99: J. Schaperow commented out source term number 2 of 2.*
**********************************************************************
*
*
********** RELEASE DATA BLOCK **************
```

```
* SOURCE TERM NUMBER 2 OF 2
*
*RDATNAM2001 'RELEASE FRACTIONS OF SOURCE TERM 1 REDUCED BY A FACTOR OF TEN'
*
*            XE/KR     I      CS      TE      SR      RU      LA      CE      BA
*
*RDRELFRC001 1.0E-1 6.8E-2 6.4E-2 1.7E-2 4.2E-4 2.3E-4 1.6E-5 4.0E-5 6.3E-4
*RDRELFRC002 4.3E-4 9.5E-4 2.4E-4 1.4E-2 6.8E-3 4.7E-5 6.8E-4 7.1E-4 5.4E-3
*.
```

MACCS Input File

EARLY.INP

```
* GENERAL DESCRIPTIVE TITLE DESCRIBING THIS "EARLY" INPUT FILE
*
MIEANAM1001 'IN2A.INP, Sample Problem A of NUREG/CR-4691, Vol. 1, EARLY input'
DCF_FILE001 'DOSDATA.INP'  (DCF file of MACCS 1.5.11.1)
*
*             ORGNAM          ORGFLG
*
MIORGDEF001  'A-SKIN'         .TRUE.
MIORGDEF002  'A-RED MARR'     .TRUE.
MIORGDEF003  'A-LUNGS'        .TRUE.
MIORGDEF004  'A-THYROIDH'     .TRUE.
MIORGDEF005  'A-STOMACH'      .TRUE.
MIORGDEF006  'A-LOWER LI'     .FALSE.  (does not contribute to early fatalities)
MIORGDEF007  'L-EDEWBODY'     .TRUE.
MIORGDEF008  'L-RED MARR'     .TRUE.
MIORGDEF009  'L-BONE SUR'     .TRUE.
MIORGDEF010  'L-BREAST'       .TRUE.
MIORGDEF011  'L-LUNGS'        .TRUE.
MIORGDEF012  'L-THYROID'      .TRUE.
MIORGDEF013  'L-LOWER LI'     .TRUE.
MIORGDEF014  'L-BLAD WAL'     .TRUE.
MIORGDEF015  'L-LIVER'        .FALSE.
MIORGDEF016  'L-THYROIDH'     .TRUE.
*
* FLAG TO INDICATE THAT THIS IS THE LAST PROGRAM IN THE SERIES TO BE RUN
*
MIENDAT2001  .FALSE.    (SET THIS VALUE TO .TRUE. TO SKIP CHRONC)
*
* DISPERSION MODEL OPTION CODE:  1  *  STRAIGHT LINE
*                                2  *  WIND-SHIFT WITH ROTATION
*                                3  *  WIND-SHIFT WITHOUT ROTATION
*
MIIPLUME001  2
*
* NUMBER OF FINE GRID SUBDIVISIONS USED BY THE MODEL
*
MINUMFIN001  7    (3, 5 OR 7 ALLOWED)
*
* LEVEL OF DEBUG OUTPUT REQUIRED, NORMAL RUNS SHOULD SPECIFY ZERO
*
MIIPRINT001  0
*
* LOGICAL FLAG SIGNIFYING THAT THE BREAKDOWN OF RISK BY WEATHER CATEGORY
* BIN ARE TO BE PRESENTED TO SHOW THEIR RELATIVE CONTRIBUTION TO THE MEAN
*
*             RISBIN
*
MIRISCAT001   .FALSE.
*
* FLAG INDICATING IF WIND-ROSES FROM ATMOS ARE TO BE OVERRIDDEN
*
MIOVRRID001  .FALSE.  (USE THE WIND ROSE CALCULATED FOR EACH WEATHER BIN)
*******************************************************************************
* POPULATION DISTRIBUTION DATA BLOCK, LOADED BY INPOPU, STORED IN /POPDAT/
*
PDPOPFLG001  FILE
*
*PDPOPFLG001  UNIFORM
*PDIBEGIN001  1     (SPATIAL INTERVAL AT WHICH POPULATION BEGINS)
*PDPOPDEN001  38.61 (100 PEOPLE PER SQUARE MILE)
*******************************************************************************
* SHIELDING AND EXPOSURE FACTORS, LOADED BY INDFAC, STORED IN /EADFAC/
*
* THREE VALUES OF EACH PROTECTION FACTOR ARE SUPPLIED,
```

```
* ONE FOR EACH TYPE OF ACTIVTY:
*
* ACTIVITY TYPE:
*      1 - EVACUEES WHILE MOVING
*      2 - NORMAL ACTIVITY IN SHELTERING AND EVACUATION ZONE
*      3 - SHELTERED ACTIVITY
*
* CLOUD SHIELDING FACTOR
*
*     SITE         GG   PB   SEQ  SUR  ZION
*     SHELTERING   0.7  0.5  0.65 0.6  0.5
*
*             EVACUEES  NORMAL   SHELTER
*
SECSFACT001       1.      0.75      0.6    *  SURRY SHELTERING VALUE
*
* PROTECTION FACTOR FOR INHALATION
*
SEPROTIN001       1.      0.41       0.33  * VALUES FOR NORMAL ACTIVITY AND
*                                            SHELTERING SELECTED BY NRC STAFF
*
* BREATHING RATE (CUBIC METERS PER SECOND)
*
SEBRRATE001  2.66E-4  2.66E-4  2.66E-4
*
* SKIN PROTECTION FACTOR
*
SESKPFAC001  1.0       0.41      0.33     * VALUES FOR NORMAL ACTIVITY AND
*                                            SHELTERING SELECTED BY NRC STAFF
*
* GROUND SHIELDING FACTOR
*
*     SITE         GG   PB   SEQ  SUR  ZION
*     SHELTERING   0.25 0.1  0.2  0.2  0.1
*
SEGSHFAC001       0.5     0.33     0.2    * VALUE FOR NORMAL ACTIVITY SELECTED BY
*                                            NRC STAFF
*
* RESUSPENSION INHALATION MODEL CONCENTRATION COEFFICIENT (/METER)
*
*    RESCON = 1.E-4 IS APPROPRIATE FOR MECHANICAL RESUSPENSION BY VEHICLES.
*    RESHAF = 2.11 DAYS CAUSES 1.E-4 TO DECAY IN ONE WEEK TO 1.E-5, THE VALUE
*    OF RESCON USED IN THE FIRST TERM OF THE LONG-TERM RESUSPENSION EQUATION
*    USED IN CHRONC.
*
SERESCON001    1.E-4      (RESUSPENSION IS TURNED ON)
*
* RESUSPENSION CONCENTRATION COEFFICIENT HALF-LIFE (SEC)
*
SERESHAF001    1.82E5     (2.11 DAYS)
*******************************************************************************
* EVACUATION ZONE DATA BLOCK, LOADED BY EVNETW, STORED IN /NETWOR/, /EOPTIO/
*
* SPECIFIC DESCRIPTION OF THE EMERGENCY RESPONSE SCENARIO BEING USED
*
EZEANAM2001  'EVACUATION WITHIN 10 MILES, RELOCATION MODELS APPLY ELSEWHERE'
*
* THE TYPE OF WEIGHTING TO BE APPLIED TO THE EMERGENCY RESPONSE SCENARIOS
* YOU MUST SUPPLY A VALUE OF 'TIME' OR 'PEOPLE'
*
EZWTNAME001  'PEOPLE'
*
* WEIGHTING FRACTION APPLICABLE TO THIS SCENARIO
*
```

```
EZWTFRAC001  0.995
*
* LAST RING IN THE MOVEMENT ZONE
*
EZLASMOV001     15    (EVACUEES DISAPPEAR AFTER TRAVELING TO 20 MILES)
*
*  Flag defining the time at which evacuees "enter" the destination element
*
*TRAVELPOINT   'CENTERPOINT' (new option implemented at MACCS2 v. 1.11f)
TRAVELPOINT   'BOUNDARY'    (functionality derived from MACCS circa 1984)
*
* RADIAL EVACUATION SPEED (M/S)
*
EZESPEED001    1.8   1.8    1.8          (SURRY)
EZEVATYP001     'RADIAL'
EZDURBEG001    86400.0
EZDURMID001    0.0
EZREFPNT001     'ALARM'
EZNUMEVA001      12
EZDLTSHL001   7200.  7200.  7200.  7200.  7200.  7200.
EZDLTSHL002   7200.  7200.  7200.  7200.  7200.  7200.
EZDLTEVA001     0.     0.     0.     0.     0.     0.
EZDLTEVA002     0.     0.     0.     0.     0.     0.
*************************************************************************
* SHELTER AND RELOCATION ZONE DATA BLOCK, LOADED BY INPEMR,
*                                        STORED IN /INPSRZ/, /RELOCA/
*
* DURATION OF THE EMERGENCY PHASE (SECONDS FROM PLUME ARRIVAL)
*
SRENDEMP001  604800.   (ONE WEEK)
*
* CRITICAL ORGAN FOR RELOCATION DECISIONS
*
SRCRIORG001 'L-EDEWBODY'
*
* HOT SPOT RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
*
SRTIMHOT001  43200.    (ONE-HALF DAY)
*
* NORMAL RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
*
SRTIMNRM001  86400.    (ONE DAY)
*
* HOT SPOT RELOCATION DOSE CRITERION THRESHOLD (SIEVERTS)
*
SRDOSHOT001  0.5    (50 REM DOSE TO WHOLE BODY IN 1 WEEK TRIGGERS RELOCATION)
*
* NORMAL RELOCATION DOSE CRITERION THRESHOLD (SIEVERTS)
*
SRDOSNRM001  0.25   (25 REM DOSE TO WHOLE BODY IN 1 WEEK TRIGGERS RELOCATION)
*************************************************************************
* EARLY FATALITY MODEL PARAMETERS, LOADED BY INEFAT, STORED IN /EFATAL/
*
* NUMBER OF EARLY FATALITY EFFECTS
*
EFNUMEFA001   2
*
*            ORGNAM        EFFACA    EFFACB    EFFTHR
*
EFATAGRP001 'A-RED MARR'      3.8       5.0     1.5
EFATAGRP002 'A-LUNGS'        10.0       7.0     5.0
*************************************************************************
* EARLY INJURY MODEL PARAMETERS, LOADED BY INEINJ, STORED IN /EINJUR/
*
```

```
* NUMBER OF EARLY INJURY EFFECTS
*
EINUMEIN001  7
*
*            EINAME            ORGNAM    EISUSC EITHRE EIFACA EIFACB
*
EINJUGRP001 'PRODROMAL VOMIT' 'A-STOMACH'  1.      .5     2.     3.
EINJUGRP002 'DIARRHEA'        'A-STOMACH'  1.      1.     3.     2.5
EINJUGRP003 'PNEUMONITIS'     'A-LUNGS'    1.      5.    10.     7.
EINJUGRP004 'SKIN ERYTHEMA'   'A-SKIN'     1.      3.     6.     5.
EINJUGRP005 'TRANSEPIDERMAL'  'A-SKIN'     1.     10.    20.     5.
EINJUGRP006 'THYROIDITIS'     'A-THYROIDH' 1.     40.   240.     2.
EINJUGRP007 'HYPOTHYROIDISM'  'A-THYROIDH' 1.      2.    60.     1.3
*******************************************************************************
* ACUTE EXPOSURE CANCER PARAMETERS, LOADED BY INACAN STORED IN /ACANCR/.
*
* NUMBER OF ACUTE EXPOSURE CANCER EFFECTS
*
LCNUMACA001   7
*
* THRESHOLD DOSE FOR APPLYING THE DOSE DEPENDENT REDUCTION FACTOR
*
LCDDTHRE001   0.2  (LOWEST DOSE FOR WHICH DDREFA WILL BE APPLIED)
*
* DOSE THRESHOLD FOR LINEAR DOSE RESPONSE (Sv)
*
LCACTHRE001   0.0  (LINEAR-QUADRATIC MODEL IS NOT BEING USED)
*
*            ACNAME      ORGNAM   ACSUSC DOSEFA DOSEFB CFRISK    CIRISK  DDREFA
*
LCANCERS001 'LEUKEMIA' 'L-RED MARR'  1.0   1.0   0.0   9.70E-3   0.0     2.0
LCANCERS002 'BONE'     'L-BONE SUR'  1.0   1.0   0.0   9.00E-4   0.0     2.0
LCANCERS003 'BREAST'   'L-BREAST'    1.0   1.0   0.0   5.40E-3   1.7E-2  1.0
LCANCERS004 'LUNG'     'L-LUNGS'     1.0   1.0   0.0   1.55E-2   0.0     2.0
LCANCERS005 'THYROID'  'L-THYROIDH'  1.0   1.0   0.0   7.20E-4   7.2E-3  1.0
LCANCERS006 'GI'       'L-LOWER LI'  1.0   1.0   0.0   3.36E-2   0.0     2.0
LCANCERS007 'OTHER'    'L-EDEWBODY'  1.0   1.0   0.0   2.76E-2   0.0     2.0
*******************************************************************************
* RESULT 1 OPTIONS BLOCK, LOADED BY INOUT1, STORED IN /INOUT1/
* TOTAL NUMBER OF A GIVEN EFFECT (LATENT CANCER, EARLY DEATH, EARLY INJURY)
*
* NUMBER OF DESIRED RESULTS OF THIS TYPE
*
TYPE1NUMBER    32
*
TYPE1OUT001    'ERL FAT/TOTAL'                1  26  NOCCDF (0 TO 1000 MILES)
TYPE1OUT002    'ERL INJ/PRODROMAL VOMIT'      1  26  NOCCDF
TYPE1OUT003    'ERL INJ/DIARRHEA'             1  26
TYPE1OUT004    'ERL INJ/PNEUMONITIS'          1  26
TYPE1OUT005    'ERL INJ/THYROIDITIS'          1  26
TYPE1OUT006    'ERL INJ/HYPOTHYROIDISM'       1  26
TYPE1OUT007    'ERL INJ/SKIN ERYTHEMA'        1  26
TYPE1OUT008    'ERL INJ/TRANSEPIDERMAL'       1  26
TYPE1OUT009    'CAN FAT/TOTAL'                1  26  NOCCDF
TYPE1OUT010    'CAN FAT/LUNG'                 1  26
TYPE1OUT011    'CAN FAT/THYROID'              1  26
TYPE1OUT012    'CAN FAT/BREAST'               1  26
TYPE1OUT013    'CAN FAT/GI'                   1  26
TYPE1OUT014    'CAN FAT/LEUKEMIA'             1  26
TYPE1OUT015    'CAN FAT/BONE'                 1  26
TYPE1OUT016    'CAN FAT/OTHER'                1  26
TYPE1OUT017    'CAN INJ/THYROID'              1  26
TYPE1OUT018    'CAN INJ/BREAST'               1  26
TYPE1OUT019    'CAN FAT/TOTAL'                1  19  CCDF  (0 TO 50 MILES)
```

```
TYPE1OUT020    'ERL FAT/TOTAL'                1  12        (0 TO 10 MILES)
TYPE1OUT021    'ERL INJ/PRODROMAL VOMIT'      1  12
TYPE1OUT022    'ERL INJ/DIARRHEA'             1  12
TYPE1OUT023    'ERL INJ/PNEUMONITIS'          1  12
TYPE1OUT024    'ERL INJ/THYROIDITIS'          1  12
TYPE1OUT025    'ERL INJ/HYPOTHYROIDISM'       1  12
TYPE1OUT026    'ERL INJ/SKIN ERYTHEMA'        1  12
TYPE1OUT027    'ERL INJ/TRANSEPIDERMAL'       1  12
TYPE1OUT028    'CAN FAT/TOTAL'                1  12
TYPE1OUT029    'ERL FAT/TOTAL'                1  21        (0 TO 100 MILES)
TYPE1OUT030    'ERL FAT/TOTAL'                1  25        (0 TO 500 MILES)
TYPE1OUT031    'CAN FAT/TOTAL'                1  21        (0 TO 100 MILES)
TYPE1OUT032    'CAN FAT/TOTAL'                1  25        (0 TO 500 MILES)
*******************************************************************************
* RESULT 2 OPTIONS BLOCK, LOADED BY INOUT2, STORED IN /INOUT2/
* FURTHEST DISTANCE AT WHICH A GIVEN RISK OF EARLY DEATH IS EXCEEDED.
*
* NUMBER OF DESIRED RESULTS OF THIS TYPE
*
TYPE2NUMBER  1
*
*            FATALITY RISK THRESHOLD
*
TYPE2OUT001  0.
*******************************************************************************
* RESULT 3 OPTIONS BLOCK, LOADED BY INOUT3, STORED IN /INOUT3/
* NUMBER OF PEOPLE WHOSE DOSE TO A GIVEN ORGAN EXCEEDS A GIVEN THRESHOLD.
*
* NUMBER OF DESIRED RESULTS OF THIS TYPE
*
TYPE3NUMBER  3
*
*               ORGAN NAME   DOSE THRESHOLD (Sv)
*
TYPE3OUT001    'A-RED MARR'        1.5
TYPE3OUT002    'A-LUNGS'           5.0
TYPE3OUT003    'L-EDEWBODY'        0.05
*******************************************************************************
* RESULT 4 OPTIONS BLOCK, LOADED BY INOUT4, STORED IN /INOUT4/
* 360 DEGREE AVERAGE RISK OF A GIVEN EFFECT AT A GIVEN DISTANCE.
*
* POSSIBLE TYPES OF EFFECTS ARE:
*
*   'ERL FAT/TOTAL'
*   'ERL INJ/INJURY NAME'
*   'CAN FAT/CANCER NAME'
*   'CAN FAT/TOTAL'
*
* NUMBER OF DESIRED RESULTS OF THIS TYPE
*
TYPE4NUMBER  5
*
*            RADIAL INDEX   TYPE OF EFFECT
*
TYPE4OUT001       1         'ERL FAT/TOTAL'
TYPE4OUT002       2         'ERL FAT/TOTAL'
TYPE4OUT003       3         'ERL FAT/TOTAL'
TYPE4OUT004       4         'ERL FAT/TOTAL'
TYPE4OUT005       5         'ERL FAT/TOTAL'
*******************************************************************************
* RESULT 5 OPTIONS BLOCK, LOADED BY INOUT5, STORED IN /INOUT5/
*
* TOTAL POPULATION DOSE TO A GIVEN ORGAN BETWEEN TWO DISTANCES.
*
```

```
* NUMBER OF DESIRED RESULTS OF THIS TYPE
*
TYPE5NUMBER     5
*
*             ORGAN       I1DIS5      I2DIS5
*
TYPE5OUT001 'L-EDEWBODY'       1          12          (0-10 MILES)
TYPE5OUT002 'L-EDEWBODY'       1          19     NOCCDF  (0-50 MILES)
TYPE5OUT003 'L-EDEWBODY'       1          26     NOCCDF  (0-1000 MILES)
TYPE5OUT004 'L-EDEWBODY'       1          21          (0-100 MILES)
TYPE5OUT005 'L-EDEWBODY'       1          25          (0-500 MILES)
*******************************************************************************
* RESULT 6 OPTIONS BLOCK, LOADED BY INOUT6, STORED IN /INOUT6/
*
* CENTERLINE DOSE TO AN ORGAN VS DIST BY PATHWAY, PATHWAY NAMES ARE AS FOLLOWS:
*
*  PATHWAY NAME:
*    'CLD'      - CLOUDSHINE
*    'GRD'      - GROUNDSHINE
*    'INH ACU'  - "ACUTE DOSE EQUIVALENT" FROM DIRECT INHALATION OF THE CLOUD
*    'INH LIF'  - "LIFETIME DOSE COMMITMENT" FROM DIRECT INHALATION OF THE CLOUD
*    'RES ACU'  - "ACUTE DOSE EQUIVALENT" FROM RESUSPENSION INHALATION
*    'RES LIF'  - "LIFETIME DOSE COMMITMENT" FROM RESUSPENSION INHALATION
*    'TOT ACU'  - "ACUTE DOSE EQUIVALENT" FROM ALL PATHWAYS
*    'TOT LIF'  - "LIFETIME DOSE COMMITMENT" FROM ALL PATHWAYS
*
* NUMBER OF DESIRED RESULTS OF THIS TYPE
*
TYPE6NUMBER     0
*
*             ORGNAM         PATHNM      I1DIS6   I2DIS6
*
*TYPE6OUT001  'A-RED MARR'    'TOT ACU'      1       19      (0-50 MILES)
*TYPE6OUT002  'A-LUNGS'       'TOT ACU'      1       19      (0-50 MILES)
*TYPE6OUT003  'L-EDEWBODY'    'TOT LIF'      1       26      (0-1000 MILES)
*******************************************************************************
* RESULT 7 OPTIONS BLOCK, LOADED BY INOUT7, STORED IN /INOUT7/
*
* CENTERLINE RISK OF A GIVEN EFFECT VS DISTANCE
*
* NUMBER OF DESIRED RESULTS OF THIS TYPE
*
TYPE7NUMBER   0
*
*                    NAME           I1DIS7       I2DIS7
*
*TYPE7OUT001      'ERL FAT/TOTAL'       1           19       (0-50 MILES)
*TYPE7OUT002      'CAN FAT/TOTAL'       1           26       (0-1000 MILES)
*******************************************************************************
* RESULT 8 OPTIONS BLOCK, LOADED BY INOUT8, STORED IN /INOUT8/
*
* POPULATION WEIGHTED FATALITY RISK BETWEEN 2 DISTANCES
*
* NUMBER OF DESIRED RESULTS OF THIS TYPE
*
TYPE8NUMBER   2
*
*                NAME        I1DIS8  I2DIS8
*
TYPE8OUT001 'ERL FAT/TOTAL'   1        5     NOCCDF  (0-EXCL ZONE + 1 MI)
TYPE8OUT002 'CAN FAT/TOTAL'   1       12     NOCCDF  (0-10 MILES)
*******************************************************************************
* RESULT A OPTIONS BLOCK, LOADED BY INOUTA, STORED IN /INOUTA/
*
```

```
* peak dose to a given organ
*
*            NUMA
TYPEANUMBER   1
*
*              ORGNAM     I1DISA  I2DISA
TYPEAOUT001 'L-EDEWBODY'  1       26
.
*******************************************************************************
* EMERGENCY RESPONSE SCENARIO NUMBER 2
*******************************************************************************
* EVACUATION ZONE DATA BLOCK, LOADED BY EVNETW, STORED IN /NETWOR/, /EOPTIO/
*
* SPECIFIC DESCRIPTION OF THE EMERGENCY RESPONSE SCENARIO BEING USED
*
EZEANAM2001  'NO EVACUATION, RELOCATION MODELS APPLY EVERYWHERE'
*
* WEIGHTING FRACTION APPLICABLE TO THIS SCENARIO
*
EZWTFRAC001  0.005
*
* LAST RING IN THE MOVEMENT ZONE
*
EZLASMOV001     0    (A ZERO TURNS OFF THE EVACUATION MODEL)
.
```

MACCS Input File

CHRONC.INP

```
* GENERAL DESCRIPTIVE TITLE DESCRIBING THIS "CHRONC" INPUT FILE
*
CHCHNAME001 'IN3A_N.INP, Sample Problem A, "New" COMIDA2-Based Food Model'
*******************************************************************************
* EMERGENCY RESPONSE COST DATA BLOCK
*
* DAILY COST FOR A PERSON WHO IS EVACUATED (DOLLARS/PERSON-DAY)
*
CHEVACST001  27.00   (INCLUDES FOOD AND HOUSING COSTS BUT NOT LOST INCOME)
*
* DAILY COST FOR A PERSON WHO IS RELOCATED (DOLLARS/PERSON-DAY)
*
CHRELCST001  27.00   (INCLUDES FOOD AND HOUSING COSTS BUT NOT LOST INCOME)
*******************************************************************************
* LONG TERM PROTECTIVE ACTION DATA BLOCK
*
* Duration of the intermediate phase period--at version 1.11c TMIPND is no
* longer processed.  The new input variable DUR_INTPHAS is the period's
* duration, not the time after plume arrival at which the period ends.
*
DUR_INTPHAS   0.0    (in seconds)   (no intermediate phase)
*
* LONG-TERM PHASE DOSE PROJECTION PERIOD, THE DURATION OF THE EXPOSURE
* PERIOD OVER WHICH THE LONG-TERM DOSE CRITERION IS EVALUATED (SECONDS)
*
CHTMPACT001   1.58E8              (5 YEARS)
*
* DOSE CRITERION FOR INTERMEDIATE PHASE RELOCATION (Sv)
*
CHDSCRTI001   1.0E5               (NO INTERMEDIATE PHASE RELOCATION)
*
* DOSE CRITERION FOR LONG-TERM PHASE RELOCATION (Sv)
*
CHDSCRLT001    0.04
*
* CRITICAL ORGAN NAME FOR LONG-TERM ACTIONS
*
CHCRTOCR001 'L-EDEWBODY'
*
* Long Term Exposure Period    Previously permanently set to:
*    one million years = 3.15 E13 seconds
*    MACCS2 allowable range is 3.15E7 to 1.E10
*
CHEXPTIM001    1.E10
*******************************************************************************
* DECONTAMINATION PLAN DATA BLOCK
*
* NUMBER OF LEVELS OF DECONTAMINATION
*
CHLVLDEC001  2
*
* DECONTAMINATION TIMES CORRESPONDING TO THE LVLDEC LEVELS OF DECONTAMINATION
*  (SECONDS)
*
CHTIMDEC001   5.184E6  1.0368E7    (60, 120 DAYS)
*
* DOSE REDUCTION FACTORS CORRESPONDING TO THE LVLDEC LEVELS OF DECONTAMINATION
*
CHDSRFCT001   3.      15.
*
* COST OF FARM DECONTAMINATION PER FARMLAND UNIT AREA (DOLLARS/HECTARE)
*  FOR THE VARIOUS LEVELS OF DECONTAMINATION
*
CHCDFRM0001   562.5   1250.
```

```
*
* COST OF NONFARM DECONTAMINATION PER RESIDENT PERSON (DOLLARS/PERSON)
*  FOR THE VARIOUS LEVELS OF DECONTAMINATION
*
CHCDNFRM001   3000.   8000.
*
* FRACTION OF FARMLAND DECONTAMINATION COST DUE TO LABOR
*  FOR THE VARIOUS DECONTAMINATION LEVELS
*
CHFRFDL0001  .3       .35
*
* FRACTION OF NON-FARM DECONTAMINATION COST DUE TO LABOR
*  FOR THE VARIOUS DECONTAMINATION LEVELS
*
CHFRNFDL001  .7       .5
*
* FRACTION OF TIME WORKERS IN FARM AREAS SPEND IN CONTAMINATED AREAS
*  FOR THE VARIOUS DECONTAMINATION LEVELS
*
CHTFWKF0001  .10      .33
*
* FRACTION OF TIME WORKERS IN NON-FARM AREAS SPEND IN CONTAMINATED AREAS
*  FOR THE VARIOUS DECONTAMINATION LEVELS
*
CHTFWKNF001  .33      .33
*
* AVERAGE COST OF DECONTAMINATION LABOR (DOLLARS/MAN-YEAR)
*
CHDLBCST001   35000.
*******************************************************************************
* INTERDICTION COST DATA BLOCK
*
* DEPRECIATION (DETERIORATION) RATE DURING INTERDICTION PERIOD (PER YEAR)
*
CHDPRATE001     .20    (VALUE OBTAINED FROM WASH-1400, APPENDIX 6)
*
* INVESTMENT INCOME RETURN (DISCOUNT RATE) DURING INTERDICTION PERIOD (PER YEAR)
* THIS VALUE SHOULD BE DERIVED AS A REAL RETURN RATE ADJUSTED FOR INFLATION
*
CHDSRATE001     .12    (VALUE OBTAINED FROM WASH-1400, APPENDIX 6)
*
* POPULATION RELOCATION COST (DOLLARS/PERSON):
*  ALTERNATIVE HOUSING, MOVING COSTS, AND LOST INCOME FOR PEOPLE IN
*  AREAS WHICH REQUIRE DECONTAMINATION, INTERDICTION, OR CONDEMNATION
*
CHPOPCST001    5000.
*******************************************************************************
* GROUNDSHINE WEATHERING DEFINITION DATA BLOCK
*
* NUMBER OF TERMS IN THE GROUNDSHINE WEATHERING RELATIONSHIP (EITHER 1 OR 2)
*
CHNGWTRM001    2
*
* GROUNDSHINE WEATHERING COEFFICIENTS
*
CHGWCOEF001    0.5     0.5             (JON HELTON)
*
* HALF LIVES CORRESPONDING TO THE GROUNDSHINE WEATHERING COEFFICIENTS (S)
*
CHTGWHLF001    1.6E7   2.8E9           (JON HELTON)
*******************************************************************************
* RESUSPENSION WEATHERING DEFINITION DATA BLOCK
*
* NUMBER OF TERMS IN THE RESUSPENSION WEATHERING RELATIONSHIP
```

```
*
CHNRWTRM001    3
*
* RESUSPENSION CONCENTRATION COEFFICIENTS    (/ METER)
*  RELATIONSHIP BETWEEN GROUND CONCENTRATION AND INSTANTANEOUS AIR CONC.
*
CHRWCOEF001  1.0E-5    1.0E-7    1.0E-9   (VALUES HERE SELECTED BY JON HELTON)
*
* HALF-LIVES CORRESPONDING TO THE RESUSPENSION CONCENTRATION COEFFICIENTS (S)
*
CHTRWHLF001  1.6E7     1.6E8     1.6E9    (6 MONTHS, 5 YEARS, 50 YEARS)
*******************************************************************************
* SITE REGION DESCRIPTION DATA BLOCK
*
* FRACTION OF AREA THAT IS LAND IN THE REGION
*
CHFRACLD001    0.95    (ROUGH GUESS VALUE, SITE FILE OVERRIDES THIS VALUE)
*
* FRACTION OF LAND DEVOTED TO FARMING IN THE REGION
*
CHFRCFRM001    0.382   (VIRGINIA STATE VALUE, SITE FILE OVERRIDES THIS VALUE)
*
* AVERAGE VALUE OF ANNUAL FARM PRODUCTION IN THE REGION (DOLLARS/HECTARE)
*  (CASH RECEIPTS FROM FARMING PLUS VALUE OF HOME CONSUMPTION)/(LAND IN FARMS)
*
CHFRMPRD001    371.0   (VIRGINIA STATE VALUE, SITE FILE OVERRIDES THIS VALUE)
*
* FRACTION OF FARM PRODUCTION RESULTING FROM DAIRY PRODUCTION IN THE REGION
*  (VALUE OF MILK PRODUCED)/(CASH RECEIPTS FROM FARMING PLUS HOME CONSUMPTION)
*
CHDPFRCT001    0.198   (VIRGINIA STATE VALUE, SITE FILE OVERRIDES THIS VALUE)
*
* VALUE OF FARM WEALTH (DOLLARS/HECTARE)
*  (AVERAGE VALUE PER HECTARE OF FARM LAND AND BUILDINGS TO 100 MILES)
*
CHVALWF0001    2613.  *  SURRY
*
* FRACTION OF FARM WEALTH IN IMPROVEMENTS FOR THE REGION
*
CHFRFIM0001    0.25   *  SURRY
*
* NON-FARM WEALTH, PROPERTY AND IMPROVEMENTS FOR THE REGION (DOLLARS/PERSON)
*  THE VALUE OF ALL RESIDENTIAL, BUSINESS, AND PUBLIC ASSETS WHICH WOULD BE
*  LOST IN THE EVENT OF PERMANENT INTERDICTION (CONDEMNATION) OF THE AREA
*
CHVALWNF001    84000.  *  SURRY
*
* FRACTION OF NON-FARM WEALTH IN IMPROVEMENTS FOR THE REGION
*
CHFRNFIM001    0.8
*******************************************************************************
CHFDPATH001 'NEW'
*
* name of the COMIDA2 binary output file
*
BIN_FILE001 'SAMP_A.BIN'    (revised data file of 8/12/95)
*
* Dose limits triggering first year crop disposal of the separate
* milk and non-milk components of the diet, corresponding in purpose,
* more or less, to the MACCS 1.5 input variables PSCMLK and PSCOTH
*
* For NUREG-1150 calculations, the maximum allowable ground concentrations for
* production of milk and non-milk crops contaminated by an accident occurring
* in the growing season were derived based on an assumed maximum allowable
```

```
* dose of 5 rem effective or 15 rem thyroid, per the 1982 FDA guidance that's
* reprinted in the 1992 EPA PAG Manual.  For purposes of comparison against
* the prior results, it is being assumed, for simplicity, that milk and
* non-milk crops contribute equally to the first year dose.  Thus, the 5 rem
* effective dose limit used in NUREG-1150 is equally split between milk and
* non-milk crops, with 2.5 rem allowed for each.  Similarly, the 15 rem
* thyroid limit is split into 7.5 and 7.5 rem for the milk and non-milk
* portions of the diet.
*
*             effective     thyroid  (doses in sieverts)
DOSEMILK001    0.025          0.075
DOSEOTHR001    0.025          0.075
*
* Annual dose limits for the subsequent year's (i.e., after the first year)
* interdiction of BOTH the milk and non-milk (combined) components of the diet
*
* Note: the long-term food critera, GCMAXR, used for NUREG-1150 wre based on
* an ingestion dose integrated from zero to infinity.  It is not possible to
* translate those parameter values into corresponding annual dose limits, as is
* required by the COMIDA2-based food model.  The "total" dose limits used in
* NUREG-1150 for "root uptake", 0.5 rem effective and 1.5 rem thyroid, are used
* here as annual dose limits for interdiction of food production in years the
* years subsequent to the accident.
*
*             effective     thyroid  (doses in sieverts)
DOSELONG001    0.005          0.015
*
* NUMBER OF NUCLIDES IN THE WATER INGESTION PATHWAY MODEL
*
CHNUMWPI001    4
*
* TABLE OF NUCLIDE DEFINITIONS IN THE WATER INGESTION PATHWAY MODEL
*
* IF A SITE DATA FILE IS DEFINED, THE DATA DEFINING THE WATERSHED INGESTION
*  FACTOR IS SUPERSEDED BY THE CORRESPONDING DATA IN THE SITE DATA FILE
*
*                          INITIAL      ANNUAL     INGESTION FACTOR
*             WATER        WASHOFF      WASHOFF     ((Bq INGESTED)/
*            NUCLIDE      FRACTION      RATE         (Bq IN WATER))
*
*             NAMWPI       WSHFRI       WSHRTA          WINGF
CHWTRISO001   Sr-89          0.01        0.004          5.0E-6
CHWTRISO002   Sr-90          0.01        0.004          5.0E-6
CHWTRISO003   Cs-134         0.005       0.001          5.0E-6
CHWTRISO004   Cs-137         0.005       0.001          5.0E-6
*******************************************************************************
* SPECIAL OPTIONS DATA BLOCK
*
* DETAILED PRINT OPTION CONTROL SWITCHES, LOOK AT THE CODE BEFORE TURNING ON!!
*          KSWDSC
*
CHKSWTCH001    0
*******************************************************************************
* DEFINE THE TYPE 9 RESULTS
*
* LONG-TERM POPULATION DOSE IN A GIVEN REGION BROKEN DOWN BY THE 12 PATHWAYS
*
* NUMBER OF RESULTS OF THIS TYPE THAT ARE BEING REQUESTED
* FOR EACH RESULT YOU REQUEST, THE CODE WILL PRODUCE A SET OF 12
*
TYPE9NUMBER    2       (UP TO 10 ALLOWED)
*
*              ORGNAM         INNER       OUTER
*
```

```
TYPE9OUT001   'L-EDEWBODY'       1          26    (0-1000 MILES)
TYPE9OUT002   'L-EDEWBODY'       1          19    (0-50 MILES)
*******************************************************************************
* ECONOMIC COST RESULTS IN A REGION BROKEN DOWN BY 12 TYPES OF COSTS
*
* NUMBER OF RESULTS OF THIS TYPE THAT ARE BEING REQUESTED
* FOR EACH RESULT YOU REQUEST, THE CODE WILL PRODUCE A SET OF 12
*
TYP10NUMBER   2      (UP TO 10 ALLOWED)
*
*              INNER     OUTER
*
TYP10OUT001      1          26    (0-1000 MILES)
TYP10OUT002      1          19    (0-50 MILES)
*******************************************************************************
* DEFINE A FLAG THAT CONTROLS THE PRODUCTION OF THE ACTION DISTANCE RESULTS
*
* SPECIFYING A VALUE OF .TRUE. TURNS ON ALL 8 OF THE ACTION DISTANCE RESULTS,
* A VALUE OF .FALSE. WILL ELIMINATE THE ACTION DISTANCE RESULTS FROM THE OUTPUT.
*
TYP11FLAG11  .TRUE.
*******************************************************************************
* IMPACTED AREA/POPULATION RESULTS IN A REGION BROKEN DOWN BY 6 TYPES OF IMPACTS
*
* NUMBER OF RESULTS OF THIS TYPE THAT ARE BEING REQUESTED
* FOR EACH RESULT YOU REQUEST, THE CODE WILL PRODUCE A SET OF 8
*
TYP12NUMBER   2      (UP TO 10 ALLOWED)
*
*              INNER      OUTER
*
TYP12OUT001      1          26    (0-1000 MILES)
TYP12OUT002      1          19    (0-50 MILES)
*******************************************************************************
* Maximal annual food ingestion dose to an individual, requested by IXOT13
*
* This result is calculated after accounting for temporary or
* permanent interdiction.  It is only available for the "new" food model.
*
* NUMBER OF RESULTS OF THIS TYPE THAT ARE BEING REQUESTED
*
TYP13NUMBER   20   (UP TO 10 ALLOWED)
*
* IRAD13 is the radial spatial interval at which results are requested
*
* ORGN13 is the name of the organ for which results are requested
*  (allowable values for ORGN13 are 'EFFECTIVE' or 'THYROID')
*
*          IRAD13   ORGN13
*
TYP13OUT001   2    EFFECTIVE
TYP13OUT002   4    EFFECTIVE
TYP13OUT003   6    EFFECTIVE
TYP13OUT004   8    EFFECTIVE
TYP13OUT005  10    EFFECTIVE
TYP13OUT006  12    EFFECTIVE
TYP13OUT007  14    EFFECTIVE
TYP13OUT008  16    EFFECTIVE
TYP13OUT009  18    EFFECTIVE
TYP13OUT010  20    EFFECTIVE
TYP13OUT011   2    THYROID
TYP13OUT012   4    THYROID
TYP13OUT013   6    THYROID
TYP13OUT014   8    THYROID
```

```
TYP13OUT015  10    THYROID
TYP13OUT016  12    THYROID
TYP13OUT017  14    THYROID
TYP13OUT018  16    THYROID
TYP13OUT019  18    THYROID
TYP13OUT020  20    THYROID
```

MACCS Input File

METSUR.INP

```
SURRY MET, NRC-12/12/88, CREATED 12/22/88
 MACCS FORMAT--NUREG-1150
   1  1 16 146  0
   1  2  1 146  0
   1  3 16 126  0
   1  4  1  96  0
   1  5  4 146  0
   1  6  4 126  0
   1  7 16  86  0
   1  8  1 126  0
   1  9  2 126  0
   1 10  4 154  0
   1 11  1 194  0
   1 12 13 245  0
   1 13 13 254  0
   1 14 15 251  0
   1 15 15 241  0
   1 16 15 173  0
   1 17 15 135  0
   1 18 15  96  0
   1 19 14 146  0
   1 20 15 156  0
   1 21 16 136  0
   1 22 16 146  0
   1 23 16 156  0
   1 24  1 146  0
   2  1 16 146  0
   2  2  1 146  0
   2  3 16 126  0
   2  4  1  96  0
   2  5  4 146  0
   2  6  4 126  0
   2  7 16  86  0
   2  8  1 126  0
   2  9  2 126  0
   2 10  4 154  0
   2 11  1 194  0
   2 12 13 245  0
   2 13 13 254  0
   2 14 15 251  0
   2 15 15 241  0
   2 16 15 173  0
   2 17 15 135  0
   2 18 15  96  0
   2 19 14 146  0
   2 20 15 156  0
   2 21 16 136  0
   2 22 16 146  0
   2 23 16 156  0
   2 24  1 146  0
   3  1 16 176  0
   3  2 16 146  0
.
.
.
 362  2 10 265  0
 362  3 10 265  0
 362  4  9 235  0
 362  5  8 245  0
 362  6  9 255  0
 362  7  8 245  0
 362  8  8 265  0
 362  9  8 304  0
 362 10  9 342  0
```

362	11	9	451	0
362	12	9	421	0
362	13	9	381	0
362	14	9	351	0
362	15	8	301	0
362	16	9	283	0
362	17	9	225	0
362	18	9	255	0
362	19	9	265	0
362	20	9	215	0
362	21	9	155	0
362	22	9	145	0
362	23	9	146	0
362	24	9	146	0
363	1	9	136	0
363	2	9	146	0
363	3	9	136	0
363	4	8	116	0
363	5	7	126	0
363	6	9	86	0
363	7	9	86	0
363	8	9	136	0
363	9	9	95	0
363	10	9	114	0
363	11	10	173	0
363	12	13	162	0
363	13	10	153	0
363	14	13	114	0
363	15	11	124	0
363	16	13	84	0
363	17	14	55	0
363	18	14	76	0
363	19	14	86	0
363	20	14	66	0
363	21	14	76	0
363	22	14	56	0
363	23	13	56	0
363	24	12	56	0
364	1	12	56	0
364	2	11	56	0
364	3	6	96	0
364	4	7	96	0
364	5	8	96	0
364	6	5	116	0
364	7	7	195	0
364	8	6	195	0
364	9	8	184	0
364	10	7	222	0
364	11	6	271	0
364	12	6	291	0
364	13	6	331	0
364	14	6	321	0
364	15	6	381	0
364	16	7	384	0
364	17	6	404	0
364	18	7	414	0
364	19	7	324	0
364	20	7	235	0
364	21	6	165	0
364	22	7	195	0
364	23	7	265	0
364	24	8	385	0
365	1	8	385	0
365	2	8	325	0

365	3	7	185	0
365	4	7	195	0
365	5	6	185	0
365	6	4	156	0
365	7	5	126	0
365	8	5	156	0
365	9	5	175	0
365	10	7	302	0
365	11	8	321	0
365	12	9	461	0
365	13	9	361	0
365	14	9	331	0
365	15	7	164	0
365	16	4	94	0
365	17	8	55	0
365	18	13	165	0
365	19	13	155	0
365	20	14	86	0
365	21	14	56	0
365	22	12	96	0
365	23	13	96	0
365	24	13	96	0

10.54	18.90	19.24	14.12

MACCS Input File

SURSIT.INP

```
MACCS SITE DATA FILE FOR SURRY (JLS, 11/10/88)
SECPOP POP DISTRIBUTION FROM 1980 CENSUS DATA ALTERED USING 0-10 MI NRC DATA
 26 SPATIAL INTERVALS
 16 WIND DIRECTIONS
  7 CROP CATEGORIES
  4 WATER PATHWAY ISOTOPES
  2 WATERSHEDS
 59 ECONOMIC REGIONS
SPATIAL DISTANCES
     0.16      0.52      1.21      1.61      2.13      3.22      4.02      4.83
     5.63      8.05     11.27     16.09     20.92     25.75     32.19     40.23
    48.28     64.37     80.47    112.65    160.93    241.14    321.87    563.27
   804.67   1609.34
POPULATION
       0.        0.        0.        0.        0.        0.        4.        5.
       6.       25.     3341.     7107.     2173.        0.     1305.      474.
    2252.     2945.     5403.    20169.   112004.  3431358.  1355700.  2742710.
 2487346.   104331.
       0.        0.        0.        1.        2.        9.       13.
      15.       63.     1667.     3550.     1330.     1072.     3198.     2425.
     515.     9469.     5317.     7120.    13586.   198785.  1058744. 20508438.
 3290082.   830354.
       0.        0.        0.        0.        0.        0.        5.        6.
       8.       31.      822.     1752.     4543.     1713.     1597.     2296.
    6535.     1775.        0.     8555.    48596.   119411.   233382.  3003954.
 7620063.  1169436.
       0.        0.        0.        0.        0.        0.        1.        1.
       2.       11.      543.     1157.     3820.     1621.     3364.        0.
       0.      129.     6679.    11858.        0.        0.        0.        0.
       0.        0.
       0.        0.        0.        0.        0.        0.        0.        0.
       0.        0.     4798.    10202.    10348.    10480.     9570.        0.
       0.     2317.     1756.        0.        0.        0.        0.        0.
       0.        0.
       0.        0.        0.        0.        0.        0.        1.        1.
       1.        7.     8316.    17684.    16340.    30419.    39474.    74998.
   24195.    80412.    57477.        0.        0.        0.        0.        0.
       0.        0.
       0.        0.        0.        0.        0.        0.        0.        0.
       0.        0.        0.        0.     1722.     6433.    36763.    20632.
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       0.        0.        0.        0.        0.        0.        2.        2.
       3.       13.      127.      273.     1649.     4571.     3441.     7838.
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       0.        0.
       0.        0.        5.        4.        8.       23.       14.       20.
      23.       93.      301.      650.        0.        0.     1264.     4065.
    1106.    14665.     4071.    18006.    37417.    89072.    81626.        0.
       0.        0.
       0.        0.        0.        0.        0.        0.       19.       25.
      29.      117.       45.      105.        0.      510.      951.     1521.
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 1526840.  3099458.
       0.        0.        0.        0.        1.        2.       14.       20.
      23.       93.      110.      240.     1056.        0.       50.     1396.
     915.     3153.     4132.    16295.    35596.   239712.   709522.  2845970.
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      38.      154.       30.       70.      450.        0.      980.      517.
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      0.         0.       223.       477.         0.      1026.       609.      2575.
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7535605.  9667977.
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   3965.      2084.      6270.     10765.    103787.    970659.    472558.   1396088.
1969210.    73968.
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0.90 0.45 0.60 0.20 0.50 0.50 0.30 0.25 0.50 0.60
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0.15 0.00 0.45 0.30 0.00 0.00 0.00 0.00 0.00 0.00
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CROP SEASON AND SHARE
  1 PASTURE                 90. 270.   0.41
  2 STORED FORAGE          150. 240.   0.13
  3 GRAINS                 150. 240.   0.21
  4 GRN LEAFY VEGETABLES   150. 240.   0.002
  5 OTHER FOOD CROPS       150. 240.   0.004
  6 LEGUMES AND SEEDS      150. 240.   0.15
  7 ROOTS AND TUBERS       150. 240.   0.003
WATERSHED DEFINITION              111111111122222222223333333334444444444
  1 Sr-89                            5.0E-6    0.0
  2 Sr-90                            5.0E-6    0.0
  3 Cs-134                           5.0E-6    0.0
  4 Cs-137                           5.0E-6    0.0
REGIONAL ECONOMIC DATA
  1 ALA              .354 .040      459.     1824.    62000.
  2 ARIZ             .516 .104      110.      682.    74000.
  3 ARK              .483 .041      466.     2049.    61000.
  4 CALIF            .330 .144     1022.     4394.    93000.
  5 COLO             .522 .048      211.      971.    83000.
  6 CONN             .160 .294     1605.     4980.   107000.
  7 DEL              .534 .042     1723.     3428.    82000.
  8 FLA              .375 .080      832.     3341.    80000.
  9 GA               .363 .060      613.     1885.    73000.
 10 IDAHO            .279 .144      343.     1562.    61000.
 11 ILL              .806 .044      709.     3900.    86000.
 12 IND              .713 .079      611.     3283.    72000.
 13 IOWA             .938 .060      695.     3133.    73000.
 14 KANS             .917 .035      281.     1204.    81000.
 15 KY               .571 .112      482.     1838.    61000.
 16 LA               .354 .074      459.     3284.    61000.
 17 MAINE            .079 .260      662.     1133.    70000.
 18 MD               .429 .216      956.     4489.    93000.
 19 MASS             .136 .249     1349.     2563.    97000.
 20 MICH             .313 .247      658.     2187.    81000.
 21 MINN             .597 .223      516.     2111.    82000.
 22 MISS             .470 .054      403.     2084.    53000.
 23 MO               .703 .102      322.     1647.    76000.
 24 MONT             .657 .030       61.      563.    65000.
 25 NEBR             .962 .031      318.     1148.    75000.
 26 NEV              .127 .139       63.      601.    84000.
 27 N.H.             .096 .482      518.     2018.    87000.
 28 N.J.             .203 .129     1399.     6477.   102000.
 29 N.MEX            .590 .144       53.      473.    63000.
 30 N.Y.             .310 .589      711.     1378.    94000.
 31 N.C.             .352 .065      860.     2658.    68000.
 32 N.DAK            .924 .048      164.      948.    69000.
 33 OHIO             .602 .175      581.     2686.    76000.
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 34 OKLA          .751 .060     204.     1508.    67000.
 35 OREG          .292 .111     236.     1203.    73000.
 36 PA            .303 .447     855.     2534.    78000.
 37 R.I.          .108 .213    1062.     6438.    80000.
 38 S.C.          .290 .084     472.     1843.    62000.
 39 S.DAK         .915 .091     145.      587.    65000.
 40 TENN          .509 .153     360.     1850.    66000.
 41 TEX           .816 .064     164.     1492.    74000.
 42 UTAH          .225 .259     123.     1286.    60000.
 43 VT            .286 .789     628.     1472.    73000.
 44 VA            .382 .198     371.     2075.    84000.
 45 WASH          .377 .154     476.     1948.    82000.
 46 W.VA          .246 .224     150.     1728.    58000.
 47 WIS           .517 .591     723.     1751.    76000.
 48 WYO           .561 .028      43.      380.    70000.
 49 BRIT COL      .377 .154     476.     1948.    60000.
 50 OCEAN         .000 .000       0.        0.        0.
 51 SASKAT        .657 .030      61.      563.    60000.
 52 MANITOBA      .924 .048     164.      948.    60000.
 53 ONTARIO       .597 .223     516.     2111.    60000.
 54 QUEBEC        .310 .589     711.     1378.    60000.
 55 NOVA SCOT     .079 .260     662.     1133.    60000.
 56 BAJA CAL      .330 .144    1022.     4394.    10000.
 57 SONORA        .516 .104     110.      682.    10000.
 58 CHIHUAHUA     .590 .144      53.      473.    10000.
 59 COAHUILA      .816 .064     164.     1492.    10000.
END
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Appendix B

Radionuclide Inventories in 3.5 Cores and 1 Core (Final Reactor Core)

Radionuclide	Half-Life	Inventory at 1 Year after Final Shutdown(Bq)	
		3.5 cores	1 core
Co-58	70.9d	9.17E13	9.20E13
Co-60	5.3y	1.34E16	5.32E15
Kr-85	10.8y	5.94E16	1.86E16
Rb-86	18.7d	2.98E09	3.07E09
Sr-89	50.5d	1.16E16	1.16E16
Sr-90	28.8y	5.98E17	1.54E17
Y-90	28.8y	6.02E17	1.58E17
Y-91	58.5d	2.96E16	2.97E16
Zr-95	64.0d	6.16E16	6.18E16
Nb-95	64.0d	7.95E16	6.33E16
Ru-103	37.3d	3.42E15	3.04E15
Ru-106	1.0y	5.77E17	4.59E17
Te-127	109d	2.39E15	2.40E15
Te-127m	109d	2.43E15	2.40E15
Te-129	33.6d	4.45E13	4.40E13
Te-129m	33.6d	4.43E13	4.40E13
I-131	8.0d	2.13E04	3.25E04
Cs-134	2.1y	2.80E17	1.02E17
Cs-136	13.2d	3.40E08	3.70E08
Cs-137	30.0y	8.38E17	2.11E17
Ba-140	12.8d	7.92E09	8.09E09
La-140	12.8d	8.06E09	8.27E09
Ce-141	32.5d	1.22E15	1.22E15

Radionuclide	Half-Life	Inventory at 1 Year after Final Shutdown(Ci)	
		3.5 cores	1 core
Ce-144	284.6d	1.04E18	9.20E17
Pr-143	13.6d	2.21E10	2.28E10
Nd-147	11.0d	1.22E08	1.21E08
Np-239	2.4d	1.07E14	0.00E00
Pu-238	87.7y	1.78E16	3.42E15
Pu-239	24100y	3.87E15	9.21E14
Pu-240	6560y	5.40E15	1.16E15
Pu-241	14.4y	9.32E17	2.54E17
Am-241	432.7y	1.20E16	3.27E14
Cm-242	162.8d	1.77E16	1.64E16
Cm-244	18.1y	8.40E15	2.39E15