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Selection of Dominant Radionuclides for Phase I of the Hanford Environmental Dose Reconstruction Project

B. A. Napier

July 1991

Prepared for the Technical Steering Panel

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SELECTION OF DOMINANT RADIONUCLIDES
FOR PHASE I OF THE HANFORD ENVIRONMENTAL
DOSE RECONSTRUCTION PROJECT

HANFORD ENVIRONMENTAL DOSE
RECONSTRUCTION PROJECT

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Pacific Northwest Laboratory
Richland, Washington 99352

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July 1991

**This document has been reviewed
and approved by the Technical Steering Panel.**

**John A. Till, Chairman
Technical Steering Panel
Hanford Environmental
Dose Reconstruction Project**

June 24, 1991
Date

PREFACE

a In recent years, concern has been mounting about possible health effects to the public from over 40 years of operations at the Hanford Site. This concern prompted the Washington State Nuclear Waste Board and the Indian Health Service to request the Centers for Disease Control to convene a Hanford Health Effects Review Panel to review and evaluate epidemiological and environmental data relevant to Hanford operations. In 1986, based on this review, the Panel recommended ***that two studies be initiated: one*** to reconstruct radiation doses potentially received by the public residing in the vicinity of Hanford and a separate study of thyroid morbidity in the same population. The Hanford Environmental Dose Reconstruction (HEDR) Project is the outgrowth of that recommendation. ***The project is directed by an independent panel of scientists and experts called the Technical Steering Panel (TSP). Scientists at the Pacific Northwest Laboratory conduct the work.***

The HEDR Project is divided into the following technical tasks. These tasks address each of the primary steps in the path from radioactive releases to dose estimates:

Source Terms

- Environmental Transport

Environmental Monitoring Data

- ***Demography, Food Consumption and Agriculture***
- Environmental Pathways and Dose Estimates.

The Source Terms Task will develop estimates of radioactive emissions from Hanford facilities since 1944. These estimates will be based on historical measurements and production information.

The Environmental Transport Task will reconstruct the probable movement of radioactive materials from the areas of release to populations. Movement via the atmosphere, surface water (Columbia River), and groundwater will be studied.

The Environmental Monitoring Data task will assemble, evaluate, and report historical monitoring data.

The Demography, **Food Consumption and** Agriculture Task will develop the data needed to determine which population groups could have been affected by the releases. Population and demographic information will be developed for the general population within the study area. This information will also be developed for several special population groups including the Native American tribes in the study area, military personnel stationed at Hanford, Hanford construction workers, and migrant farm workers. The food and water consumption patterns and practices and sources of food and water must also be estimated.

Historical dairy farming practices and milk distribution systems will be studied because milk is a significant pathway for iodine-131 to enter the human body. Cows could have eaten vegetation contaminated with this radionuclide.

The Environmental Pathways and Dose Estimates Task will use the information produced by the other tasks to estimate the radiation doses people could have received from Hanford **operations**.

This report is the result of a collaboration of the Source Terms and Environmental Pathways and Dose Estimates Tasks. Additional information was provided by the Demography, **Food Consumption and** Agriculture Task. Selection of dominant radionuclides cannot be made without consideration of the resulting doses, and these in turn are functions of the types of human exposures assumed. As more detailed information becomes available, the estimates of **relative** importance of these radionuclides will be reviewed.

FOREWORD

Appendix F is a record of TSP comments and **Battelle's** responses; the TSP has reviewed and approved these responses to their comments. Comment numbers appear in this report in the left margin next to the paragraph in which the corresponding comment was addressed. Changed text is shown in *italics*. In addition to changes to address TSP comments, source text has been changed to correct errors and for further *clarification*.

SUMMARY

22. 23 The objective of the Hanford Environmental Dose Reconstruction (HEDR)
24, 25 Project is to estimate the radiation dose that individuals could have received as a result of emissions from nuclear operations at Hanford since their inception in 1944. The purpose of this report is to identify the most important radionuclides released to the environment *from* Hanford in terms of contribution to potential off-site radiation dose. This information will be used to determine which radionuclides should be included in subsequent studies to determine doses from air and surface water that were received by the population around Hanford. For the time periods of 1944-1947 for atmospheric releases and 1964-1966 for releases *to* surface water (termed HEDR's Phase I time periods), certain radionuclides tend to dominate the dose estimates. Dose calculations were made with preliminary information for the Phase I time periods, permitting **rankings** of radionuclides. *The measure of dose used for rankings is effective dose equivalent, a measure that incorporates doses to various organs in the body into a single unit.*

It was found that for the air releases, ^{131}I accounted for more than 90% of all doses received via **all** pathways of exposure. Addition of the longer-lived radioisotopes of ruthenium (^{106}Ru and ^{103}Ru) accounted for approximately 99% of the dose. For releases to surface water, the results are less definitive, but inclusion of only 5 to 10 radionuclides accounted for the great majority of the dose to the more highly exposed individuals. It was determined that for Phase I, inclusion of at least ^{32}P , ^{239}Np , ^{65}Zn , ^{76}As , and ^{64}Cu is essential, with the inclusion of ^{56}Mn , ^{24}Na , ^{46}Sc , and ^{51}Cr highly desirable.

ACKNOWLEDGMENTS

The author would like to acknowledge the efforts of C. M. Heeb for providing the series of **ORIGEN2** (Croff 1980a) source runs, L. G. Morgan for estimates of release fractions for various radionuclides in the early years, J. E. Till for suggesting the use of the National Council on Radiation Protection (NCRP) screening factors as a second approach, and K. Rhoads for implementing the spreadsheet application of the **ORIGEN2** results with the NCRP screening factors.

ABBREVIATIONS

Ac	actinium	Ge	germanium	Pr	praseodymium
Ag	silver	H	hydrogen	Pt	platinum
Al	aluminum	He	helium	Pu	plutonium
Am	americium	Hf	hafnium	Ra	radium
Ar	argon	Hg	mercury	Rb	rubidium
As	arsenic	Ho	holmium	Re	rhenium
At	astatine	I	iodine	Rh	rhodium
Au	gold	In	indium	Rn	radon
B	boron	Ir	iridium	Ru	ruthenium
Ba	barium	K	potassium	S	sulfur
Be	beryllium	Kr	krypton	Sb	antimony
Bi	bismuth	La	lanthanum	Sc	scandium
Bk	berkelium	Li	lithium	Se	selenium
Br	bromine	Lr	lawrencium	SF	spontaneous fission
C	carbon	Lu	lutetium	Si	silicon
Ca	calcium	Md	mendelevium	Sm	samarium
Cd	cadmium	Mg	magnesium	Sn	tin
Ce	cerium	Mn	manganese	Sr	strontium
Cf	californium	Mo	molybdenum	Ta	tantalum
Cl	chlorine	N	nitrogen	Tb	terbium
Cm	curium	Na	sodium	Tc	technetium
Co	cobalt	Nb	niobium	Te	tellurium
Cr	chromium	Nd	neodymium	Th	thorium
Cs	cesium	Ne	neon	Ti	titanium
Cu	copper	Ni	nickel	Tl	thallium
Dy	dysprosium	No	nobelium	Tm	thulium
Er	erbium	Np	neptunium	U	uranium
Es	einsteinium	O	oxygen	V	vanadium
Eu	europium	Os	osmium	W	tungsten
F	fluorine	P	phosphorus	Xe	xenon
Fe	iron	Pa	protactinium	Y	yttrium
Fm	ferrmium	Pb	lead	Yb	ytterbium
Fr	francium	Pd	palladium	Zn	zinc
Ga	gallium	Pm	promethium	Zr	zirconium
Gd	gadolinium	Po	polonium		

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1.0 INTRODUCTION

1.9

The objective of the Hanford Environmental Dose Reconstruction (HEDR) Project is to estimate the radiation dose that individuals could have received as a result of emissions from nuclear operations at Hanford since their inception in 1944.^(a) A vital step in the estimation of radiation doses is the determination of the "source term," that is, the quantities of radionuclides that were released to the environment from the various Hanford operations. Hanford operations have at various times involved hundreds of different radionuclides, some in relatively large quantities. Those radionuclides present in the largest quantities, although significant from an operational handling point of view, may not necessarily have been those of greatest concern for offsite radiation dose. This report documents the selection of the dominant radionuclides (those that may have resulted in the largest portion of the received doses) in the source term for Phase I of the HEDR Project, that is, for atmospheric releases from 1944 through 1947 and for surface water releases from 1964 through 1966.

In response to a directive from HEDR's TSP, the reconstruction of doses to offsite populations began with an initial "development and testing" phase. The objective of Phase I is to demonstrate through calculation that adequate models and support data exist or can be developed to allow estimation of realistic doses to individuals from releases of radionuclides to the environment that occurred as long as 45 years ago. Much of the data being used in Phase I is preliminary or approximate, and therefore the doses calculated must also be considered to be preliminary approximations. Within the constraints of Phase I, the number of radionuclides investigated in detail is small. As more information is developed, more radionuclides will be addressed and the dose estimates will become more reliable. In addition, as the project addresses times later than the 1944-47 period for atmospheric releases, when effluent control technologies were improved, the release fractions for the various species will change. This difference will result in large changes in the relative significance of the various radionuclides. Additional time periods

(a) The project is being managed and conducted by Pacific Northwest Laboratory (PNL) under the direction of an independent Technical Steering Panel (TSP) .

will also be addressed for the surface water pathways, which may result in the need to revise the selection of radionuclides of interest for that pathway. Therefore, studies such as this will need to be performed throughout the HEDR Project to address changing information requirements.

1.1 NEED FOR RADIONUCLIDE SELECTION

Nuclear processes at Hanford have resulted in the production of hundreds of different radionuclides. Most of these radionuclides have had no significant impact on individuals because the **released** quantities have been small., the radiological half-lives have been short, or the human exposure to them has been minimal. However, it is important to determine which radionuclides have had the potential to result in radiation doses to **offsite** human populations.

Because of the large number of facilities and processes that have been used at Hanford over the past 45 years, it is difficult to adequately **simu-**late the **releases** of **all** radionuclides. Historical environmental monitoring has investigated either gross radioactivity or prominent tracer isotopes. It was not possible to measure many of the nuclides at the concentrations present in the effluent or the environment. Therefore, in order to productively limit the amount of data to be reconstructed, it is beneficial to focus on the radionuclides of most importance in the dose calculations.(a)

The dominant radionuclide selection process could eventually encompass the dominant radionuclides from each Hanford Site operating area and from the specific facilities located in each area. The dominant radionuclides will differ for emissions to the air, surface water, and groundwater. For Phase I, attention has been focused on the facilities where the major releases occurred: for the atmospheric releases, on the nuclear fuel chemical separation facilities; and for the surface water releases, on the production reactors. By using monitoring data on Columbia River concentrations downstream of the Hanford Site, any potential groundwater releases that might have reached

(a) This limitation applies not only to the results of the source term task of the HEDR project, but also to the data investigated in detail by the monitoring task, the modeling of transport of minor constituents by the environmental transport task, and the data and data-handling requirements of the Environmental Pathways and Dose Estimates Task.

the river are automatically included. Thus, groundwater pathways have not been addressed explicitly, but are included in surface water calculations.

1.2 MODELS USED FOR CALCULATIONS

The work described in this report was conducted in accordance with the requirements of **ANSI/ASME NQA-1 1986 Edition (ASME 1986)**, Quality Assurance Program Requirements for Nuclear Facilities, as interpreted by the PNL Quality Assurance (QA) program.

All procedures used to support this report were written and controlled in accordance with PNL QA program requirements. Records that support the data in this report were created and stored in accordance with applicable HEDR Project record control requirements. These included requirements on the generation of computer output, verification of computer codes, and review of all intermediate output. The **ORIGEN2** code (Croff 1980a, 1980b), a generally accepted reactor fuel simulation model, was verified before use. The **GENII** code (Napier *et al.* 1988) was developed at PNL, also under the procedures of **ASME/ANSI NQA-1**. It is maintained by the Hanford Dose Overview Program, and only authorized versions are distributed for use.

For the convenience of those who may wish to perform additional analyses of the basic data used to draw the conclusions presented in this report, all intermediate calculations are presented in the appendices to this document.

Drafts of this document underwent internal independent technical review. Review comments were satisfactorily resolved, and there were no controversial resolutions to the comments.

2.0 PRELIMINARY SOURCE TERM NORMALIZATION

Although estimation of the total source term has not yet been completed, it is possible to estimate dominant radionuclides. The early releases from the Hanford operations were largely continuous with each radionuclide retaining about the same relative fractional contribution to the total released activity. That is, the relative contribution of each radionuclide to the total dose was nearly constant. Therefore, it is not necessary to know the total quantity released in order to rank the radionuclides by importance. A unit source term can be assumed to be released and the radiation doses calculated from that source term can be ranked to determine the overall importance of each radionuclide. This method of normalizing source term contributions from radionuclides is used in the following sections for atmospheric and surface water releases.

2.1 ATMOSPHERIC RELEASES

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The results of the study to date indicate the largest releases of radionuclides to the atmosphere during the Phase I study period occurred during the chemical separation of irradiated fuel in the T-Plant and B-Plant facilities (Ballinger and Hall 1991). The quantities of each radionuclide available for release at any time are functions of the amount of irradiated fuel being dissolved, the irradiation history of the fuel, and the time elapsed since the fuel was removed from the reactor. The amount actually released further depends on the separation process used and on the efficiency of the facility effluent controls.

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The Hanford production reactors were originally designed to operate at a power level of about 275 MW and they rapidly reached and maintained that level during the Phase I period (Hanthorn 1957). The reactor power level prior to fuel discharge determines the levels of short-lived *radionuclides* in the fuel. The total fuel irradiation (fuel power level x time) determines the quantities of long-lived radionuclides produced. The period of time following discharge from the reactor provides the opportunity for the shorter-lived radionuclides to decay to lower concentrations in the fuel. Optimal production of plutonium product (high in the desired ^{239}Pu but low in contaminant

^{240}Pu) is obtained at a fuel irradiation level ("burnup") of between 300 and 500 megawatt-days per ton (Mwd/t), although much of the fuel in the first several years was irradiated to somewhat lower levels than this (DeNea1 1965). As illustrated in Table 2.1, the time elapsed between fuel removal from the reactor and start of dissolution (cooling times) for the Phase I time frame ranged from about 30 to about 90 days, with the potential for a few batches at shorter or longer times. The potential for variations in the fuel composition at dissolution was investigated through a series of burnup calculations using the ORIGEN2 computer code (Croff 1980a, 1980b).

TABLE 2.1. Average Monthly Cooling Time (Days)
for Fuel Before Dissolution

<u>Month</u>	<u>1944</u>	<u>1945</u>	<u>1946</u>	<u>1947</u>
January	-- (a)	39	62	62
February	--	53	67	69
March	--	52	70	69
April	--	42	62	68
May	--	36	62	68
June	--	35	73	77
July	--	40	68	78
August	--	39	63	82
September	--	38	59	84
October	--	44	65	90
November	--	52	65	95
December	49	47	62	95

(a) Dashes (--) indicate that no fuel was dissolved in that month.

The **ORIGEN2** code was run with Hanford reactor parameters for a single ton of fuel for **burnups** ranging from 100 to **1000 MWd/T**, and with cooling times ranging from 10 to 90 days. A sample portion of the resulting output is displayed in Appendix A. These calculated inventories per ton were used in the atmospheric **release** calculations described in Section 4.0.

The effluent monitoring technology in existence in the mid-1940s was not capable of differentiating various radionuclides. Only estimates can be made of the fractions of the various chemicals available in the dissolving fuel mixture that escaped from the facilities. These are approximately 100% for nonreactive noble gases, 50% to 85% for isotopes of iodine, about 1% for isotopes of ruthenium, and about 0.001% for all other nonvolatile species. A representative value of 70% was used in the following calculations for iodine in this report.

2.2 SURFACE WATER AND GROUNDWATER RELEASES

For Phase I calculations, surface water (Columbia River) concentrations *were* evaluated, based on measured values. Contributions from groundwater migration to the river are implicit in these measured values for surface water. Therefore, no additional calculations were performed for groundwater **releases**.

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The original eight plutonium production reactors were cooled with water from the Columbia River. The water was withdrawn from the river, *treated to remove dirt and to provide optimal water chemistry for reactor operations*, passed through the reactors *to cool the fuel*, and returned to the river following holdup *in basins or tanks for a period of up to a few hours*. Various compounds in the river water, including naturally occurring dissolved uranium, passed through the reactors, absorbed neutrons, and became radioactive. Other materials formed very thin films on the inner walls of the cooling tubes or outer walls of the reactor fuel elements, and remained in the reactor long enough to also become radioactive. The discharge of water and dislodged films resulted in release of up to several thousand curies of short-lived materials per day. The radioactive constituents were functions of the treatment given the entering water, the flow rate, reactor construction materials, and operating parameters. Thus, calculation of the actual mix of discharged

radionuclides is very difficult. However, a comprehensive effluent monitoring system developed over time, and during the later years of reactor operation, detailed records of measurements were maintained of the effluent water and of water downstream in the river. For this report, actual measurements of river concentrations are used for determining dominant radionuclides.

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Routine river water monitoring in the mid-1960s addressed about 10 radionuclides in regular detail (AEC **1965b**). Numerous special studies of water flow rates, dilution, sediment transport, etc. (AEC **1965a**) usually used 5 to 10 easily measured radionuclides. Concentrations of about 70 **additional** radionuclides were measured occasionally. Three detailed radiochemical analyses of reactor effluent water and Columbia River water were performed in 1958, 1964, and 1968. Records of these analyses were furnished in a private communication from J. P. Corley to J. K. **Soldat** on March 20, 1969, for use in a draft report on river-water concentrations that was never published. The original copy of that report was recovered from J. K. **Soldat's** files and used for this study. The concentrations derived from the **Soldat** draft are given in Appendix E.

Operations with eight production reactors can be considered a nearly continuous process that results in a relatively constant rate of radionuclide input to the Columbia River. One or more reactors could be off-line at any one time for maintenance or refueling, but this would result in changes in river concentrations of only a few tens of percent. Only for one period during a labor strike, in mid-1966, were all reactors off-line at one time. Occasional events, such as reactor purges or fuel element failures, would add incremental increases of some radionuclides (Koop 1956; Jerman **et al.** 1965). These increases were monitored through the river continuous monitoring systems, and these radionuclides are included in the source terms used in the calculations in Appendix B. A calculation based on an acute release of 1 lb. of uranium and its associated fission products, as predicted using the ORIGEN2 code, is also provided for perspective.

3.0 ENVIRONMENTAL EXPOSURE PATHWAYS

Potential routes through which people may be exposed to radionuclides or radiation are called exposure pathways. Examples of general pathways are external exposure, inhalation, and ingestion. The pathways are the ways people could be exposed in a given circumstance. Thus, an appropriate collection of exposure pathways can be considered to be the definition of an exposure scenario. Because a conceptualization of the types of exposure must be made before the pathways can be fully defined, scenarios are usually defined before the parameters are selected for the pathways.

Various generic exposure pathways are illustrated in Figure 3.1. This figure illustrates how known or assumed values may be propagated through defined steps to estimate radiation doses. In most calculations, the known quantity is generally the release amount, called source terms in Figure 3.1. These terms may take the form of units of activity per unit of time for radioactivity released to the air, surface water, or groundwater. For each pathway, the source terms are converted via appropriate models to concentrations in air or water. Finally, human exposure parameters are factored in, and the dose is estimated.

- 3 *The intent of this document is to indicate the radionuclides important to dose across a range of conditions. For the air pathway, this report investigates a range of potential fuel burnups, a range of potential fuel cooling times, and a range of potential exposure pathway conditions and individual exposures. This information is supplemented with independent estimates of the radionuclide impact embodied in the National Council on Radiation Protection (NCRP) screening factors. For the river pathway, it investigates a range of potential exposure pathway conditions and individual exposure mechanisms, and considers potential variability in the source term by applying monitoring data for a number of years (thus implicitly covering a range of reactor power levels and fuel conditions). The results can be thought of as a matrix of possible answers. The selection of dominant radionuclides is made based on those that frequently occur in the resulting lists.*

FIGURE 3.1. Various Generic Exposure Pathways

3.1 ATMOSPHERIC RELEASE SIMULATIONS

For releases to the atmosphere, the pathways considered in this report are submersion in contaminated air, inhalation, exposure to radionuclides deposited on the ground, ingestion of contaminated food crops, and consumption

of contaminated animal products, such as milk and eggs. Only doses to individuals were calculated; the standard Hanford parameters for a "maximally exposed individual" were used. This set of parameters is based on the assumption that the individual maintains a constant residence at a single location; grows a large fraction of his or her personal food consumption of vegetables, fruits, and grains; and raises dairy and beef cattle and poultry at that location. The dietary and exposure parameters, which are taken from McCormack et al. (1984), are listed in Table 3.1.

The parameters for the maximally exposed individual do not describe a reasonable lifestyle for many people who may not produce their own food products. Therefore, a number of additional variations of the pathways were also investigated. The first was to eliminate milk from the diet, to simulate the

TABLE 3.1. Dietary and Exposure Parameters for the Hanford Maximally Exposed Individual (adapted from McCormack et al. 1984)

<u>Consumption Rates, kg/yr</u>	
Leafy vegetables	30
Other vegetables	220
Fruits	330
Cereal grains	80
Meat	80
Poultry	18
Cow milk	270
Eggs	30
Fish	40
Drinking water	730
<u>Residency Parameter, h/yr</u>	
Inhalation exposure	8760
Air submersion	8760
Exposure to ground	4380
<u>Recreational Parameters, h/yr</u>	
Swimming	100
Boating	100
Shoreline activities	500

possibility that some people either did not drink fresh milk or obtained it from locations distant from Hanford. The second variation was to eliminate all local foods, leaving only submersion, inhalation, and ground exposure to simulate the possibility of someone consuming a completely imported diet. Results from these simulations are provided in Section 4.0.

3.2 SURFACE WATER RELEASE SIMULATIONS

For releases to surface water, many of the same pathways as used for atmospheric releases are considered and others are added. The pathways of drinking contaminated water, recreation in or near contaminated water (swimming, boating, or shoreline activities), and consumption of fish are included, as well as pathways from irrigation with contaminated river water. Irrigation-related pathways include consumption of contaminated produce and animal products (contaminated both by drinking the water and eating contaminated fodder), exposure to soils contaminated by the water, and inhalation of resuspended dusts from such soils.

For surface water release, as for the atmospheric releases, basic parameters for exposure were taken from McCormack *et al.* (1984) for the Hanford maximally exposed individual. Additional calculations to identify radionuclides important for lesser-exposed types of people were also made. The first variation involved consideration of drinking water only; the second involved only external exposures from shoreline and river recreational activities (although the swimming portion included ingestion of a small amount of contaminated water while swimming). The third variation was to change the ingestion parameters to represent more closely the consumption patterns of someone using Columbia River fish as a mainstay of their diet. The consumption rates for this scenario were taken from Hunn and Bruneau (1989).

3.3 EXPOSURE PATHWAY MODELS

Because the planned stochastic simulation model for the HEDR Project is still under development, the majority of the calculations were performed using the GENII computer software system (Napier *et al.* 1988). The GENII system is composed of seven linked computer programs and their associated data libraries. The computer codes are of three types: user interfaces (i.e.,

interactive, menu-driven programs to assist the user with scenario generation and data input), internal and external dose factor generators, and the environmental dosimetry programs. All steps of the code development have been documented and tested.

3.4 NCRP SCREENING FACTORS

A check of the GENII results for atmospheric releases was performed using radiation dose screening factors developed by the NCRP. The U.S. Environmental Protection Agency (EPA) requested that the NCRP help develop a simple system for small users of radionuclides to show compliance with EPA and U.S. Nuclear Regulatory Commission (NRC) requirements. The NCRP provided a system of factors which may be used to conservatively estimate potential doses to individuals as a result of atmospheric releases (NCRP 1989). These factors are based on a scenario of exposure similar to the one described above for the Hanford maximally exposed individual. In their simplest form, they directly relate releases to doses, incorporating many assumptions about atmospheric transport, consumption rates, and other exposure parameters. They provide a simple tool for performing the ranking of the radionuclides identified in Section 2.1. The product of the quantity released and the NCRP screening factor gives a quantity that may be used directly for ranking.

Although three levels of screening are presented in the NCRP system, that used in this report is the simplest, Level I, which is highly conservative (that is, the screening overestimates the potential radiation doses). The estimate of effective dose equivalent (EDE) for Level I screening assumes an atmospheric concentration based upon the radionuclide concentration at the point of emission. Exposure from all pathways is expressed by a single parameter, the Level I screening factor. The radionuclide concentration is multiplied by this factor to obtain an EDE.

Two approaches were taken to using the NCRP screening factors. The simplest was to multiply the NCRP factors by the radionuclide inventory, which was calculated using ORIGEN2. A second approach was to calculate the product of the ORIGEN2 inventory estimate, the release fraction for that radionuclide, and the NCRP factor. The first technique can highlight any radionuclides that might be omitted if the release fractions are incorrect, and the second

technique relates directly to the GENII results. It should be emphasized that the calculation performed for this ranking involves only the inventory, and the Level I screening factor: no additional terms to account for environmental concentration or dilution were used. Thus, the resulting values are not strictly doses, but are indicators of what the rank of the doses would be if dispersion and deposition were included.

4.0 RADIONUCLIDE RANKINGS

This section provides comparisons of the relative **rankings** of **radionuclide** importance calculated in various ways. In each case, the **rankings** are based on the EDE, a concept which uses risk-based weighting factors applied to the doses calculated for each organ to provide a "weighted" whole-body equivalent. For the atmospheric releases, the thyroid is the critical organ in all tables provided; for surface water releases the gastrointestinal tract is usually the critical organ. **If rankings** had been made on the basis of organ doses, they would be slightly different, but the most important radionuclides would be the same. The relative importance of various radionuclides ranked on organ doses would be actually more pronounced than that calculated with the EDE.

4.1 ATMOSPHERIC RELEASES

Rankings of radionuclides found to be dominant in atmospheric releases are shown in Tables 4.1 through 4.5. These tables list the radionuclides that resulted in the largest portion of the EDE received for each of the listed scenarios. These **rankings** were derived from the calculations with the GENII codes provided in Appendix B.

Table 4.1 shows relative rankings by order of importance for the radionuclides found in atmospheric releases in the mid-1940s, assuming the standard scenario for the maximally exposed individual, the **ORIGEN2** inventory, and the release fractions described in Section 3.1. Table 4.1 orders the radionuclides for three fuel burnups (100, 500, and 1000 MWd/t) at an average cooling time of 30 days. This ranking is derived from the doses calculated with the GENII code. **It** is noteworthy that the top five radionuclides are the same in each case: ^{131}I , ^{132}I , ^{106}Ru , ^{103}Ru , and ^{60}Co . In each case, also, the fifth-ranked radionuclide provides less than 1/100,000 times the dose of the first-ranked radionuclide.

The same information is graphically shown in Figure 4.1. This figure illustrates the stabilization of short-lived ^{131}I content in the fuel at

TABLE 4.1. Dominant Radionuclides in Atmospheric Releases as a Function of Fuel **Burnup** (30-Day Cooled Fuel), Ranked by Percent of Contribution to Effective Dose Equivalent

<u>100 MWd/t, % EDE</u>		<u>500 MWd/t, % EDE</u>		<u>1000 MWd/t, % EDE</u>	
^{131}I	99	^{131}I	98	^{131}I	96
^{106}Ru	<1	^{106}Ru	1	^{106}Ru	3
^{103}Ru	<1	^{103}Ru	<1	^{103}Ru	1
^{132}I	<1	^{60}Co	<1	^{60}Co	<1
^{60}Co	<1	^{132}I	<1	^{132}I	<1
^{133}Xe	<1	^{133}Xe	<1	^{144}Ce	<1
^{144}Ce	<1	^{144}Ce	<1	^{239}Pu	<1
^{239}Pu	<1	^{239}Pu	<1	^{133}Xe	<1
$^{129\text{m}}\text{Te}$	<1	^{91}Y	<1	$^{129\text{m}}\text{Te}$	<1
^{91}Y	<1	$^{129\text{m}}\text{Te}$	<1	^{91}Y	<1

TABLE 4.2. Dominant Radionuclides in Atmospheric Releases as a Function of Fuel Cooling Time (500-MWd/t Fuel), Ranked by Percent of Contribution to Effective Dose Equivalent

<u>10 Days, % EDE</u>		<u>30 Days, % EDE</u>		<u>90 Days, % EDE</u>	
^{131}I	99	^{131}I	98	^{106}Ru	57
^{106}Ru	<1	^{106}Ru	1	^{131}I	28
^{103}Ru	<1	^{103}Ru	<1	^{103}Ru	13
^{132}I	<1	^{60}Co	<1	^{60}Co	2
^{133}Xe	<1	^{132}I	<1	^{144}Ce	<1
^{60}Co	<1	^{133}Xe	<1	^{239}Pu	<1
$^{129\text{m}}\text{Te}$	<1	^{144}Ce	<1	^{95}Zr	<1
^{144}Ce	<1	^{239}Pu	<1	^{91}Y	<1
^{239}Pu	<1	^{91}Y	<1	$^{129\text{m}}\text{Te}$	<1
^{91}Y	<1	$^{129\text{m}}\text{Te}$	<1	^{89}Sr	<1

21 TABLE 4.3. Dominant Radionuclides in Atmospheric Releases Calculated by Three Different Techniques for 500-MWd/t Fuel Cooled 30 Days, Ranked by Percent of Contribution to Effective Dose Equivalent

<u>Environmental</u> <u>Calculation, % EDE</u>		<u>NCRP Screening,</u> <u>Release Fractions, % EDE</u>		<u>NCRP Screening</u> <u>No Release Fractions, % EDE</u>	
^{131}I	98	^{131}I	89	^{60}Co	99
^{106}Ru	1	^{103}Ru	6	^{95}Zr	1
^{103}Ru	<1	^{106}Ru	4	^{131}I	<1
^{60}Co	<1	^{60}Co	<1	^{144}Ce	<1
^{132}I	<1	^{95}Zr	<1	^{137}Cs	<1
^{133}Xe	<1	^{132}I	<1	^{90}Sr	<1
^{144}Ce	<1	^{144}Ce	<1	^{91}Y	<1
^{239}Pu	<1	^{137}Cs	t l	^{89}Sr	<1
^{91}Y	<1	^{90}Sr	<1	^{140}Ba	t l
$^{129\text{m}}\text{Te}$	<1	^{91}Y	<1	^{106}Ru	<1

21 TABLE 4.4. Dominant Radionuclides in Atmospheric Releases for Three Exposure Scenarios for 500-MWd/t Fuel Cooled 30 Days, Ranked by Percent of Contribution to Effective Dose Equivalent

<u>Standard Scenario,</u> <u>% EDE</u>		<u>Standard Without</u> <u>Milk Consumption</u> <u>Pathway, % EDE</u>		<u>Minimal Exposure,</u> <u>% EDE</u>	
^{131}I	98	^{131}I	92	^{131}I	47
^{106}Ru	1	^{106}Ru	3	^{106}Ru	38
^{103}Ru	<1	^{103}Ru	2	^{103}Ru	14
^{60}Co	<1	^{132}I	<1	^{60}Co	<1
^{132}I	<1	^{60}Co	<1	^{132}I	<1
^{133}Xe	<1	^{133}Xe	<1	^{133}Xe	<1
^{144}Ce	<1	^{144}Ce	<1	^{239}Pu	<1
^{239}Pu	t l	^{239}Pu	<1	^{144}Ce	<1
^{91}Y	<1	$^{129\text{m}}\text{Te}$	<1	^{91}Y	<1
$^{129\text{m}}\text{Te}$	<1	^{91}Y	<1	^{95}Zr	<1

21 TABLE 4.5. Dominant Radionuclides from Atmospheric Releases for Two Dose Integration Techniques for 500-MWd/t Fuel Cooled 30 Days, Ranked by Percent of Contribution to Effective Dose Equivalent

1-Yr Exposure Lifetime Integration, % EDE		Lifetime Exposure Lifetime Integration, % EDE	
^{131}I	98	^{131}I	97
^{106}Ru	1	^{106}Ru	1
^{103}Ru	<1	^{103}Ru	1
^{60}Co	<1	^{60}Co	<1
^{132}I	<1	^{132}I	<1
^{133}Xe	<1	^{133}Xe	<1
^{144}Ce	<1	^{144}Ce	<1
^{239}Pu	<1		<1
^{91}Y	<1	^{239}Pu	<1
$^{129\text{m}}\text{Te}$	<1	$^{129\text{m}}\text{Te}$	<1

higher *burnups* for a constant power level, while the longer-lived ruthenium isotopes (^{103}Ru and ^{106}Ru) are shown still exponentially *reaching equilibrium* between production and decay.

Table 4.2 contains relative rankings of the order of importance of the radionuclides, assuming the same exposure scenario and a constant fuel burnup, but varying the fuel cooling times. Based on GENII results, the rankings show some change when longer cooling times are reached, but 8 of the top 10 radionuclides at only 10 days cooling are the same as at 3 months cooling, and the top four radionuclides, which are the same in each case, always provide more than 99.9% of the total dose.

This information is graphically shown in Figure 4.2. This figure illustrates the reduction in dose as a result of the exponential decay of each radionuclide with its own half-life. The shorter-lived ^{131}I decreases in the fuel at a faster rate than the longer-lived ruthenium isotopes, with the result being a change in relative importance of the releases after a long cooling time.

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FIGURE 4.1. Dose as a Function of Level Burnup

FIGURE 4.2. Dose as a Function of Cooling Time

In Table 4.3, **rankings** calculated with GENII are compared to those calculated with the NCRP screening factors. When the release fractions are included in the NCRP calculation, 7 of the top 10 radionuclides are the same. Not shown in Table 4.3 (but evident in the complete results in Appendix B) is that the NCRP results for all of the other radionuclides in the GENII-derived list are within the next six calculated in the NCRP scheme. The absolute magnitude varies only over a factor of three from the lowest percent contribution listed in Table 4.3, while the range of those shown in Table 4.3 is over five orders of magnitude. More than 99.9% of the dose is accounted for with only the top four radionuclides in these lists. The column of NCRP results calculated without release fractions shows only radionuclides that were also identified in the other columns, indicating that even gross errors in the estimation of the release fractions would have no impact on selection of the top few radionuclides for investigation.

The robustness of the above results is illustrated by Table 4.4, which shows the impacts of changing the assumptions of the exposure scenario. Ranking in this table are derived from GENII calculations for fuel irradiated to 500 MWd/t and cooled 30 days, with the release fractions described in Section 3.1. Dropping the dominant milk-consumption pathway from the scenario, the **rankings** are essentially unchanged from the basic scenario, which includes a milk-consumption pathway. Finally, considering only the essentially unavoidable exposures of submersion, inhalation, and groundshine, 9 of the 10 original radionuclides are the same. These radionuclides account for a range of four orders of magnitude in relative importance (i.e., the top nine radionuclides account for 99.99% of the dose).

A final check on the results is a comparison of a simple committed EDE (1 year of exposure and 50 years of dose integration) with a cumulative "environmental dose commitment" (1 year of release, an additional 49 years of exposure to environmental residuals, and 50 years of dose integration). This result, presented in Table 4.5, shows that ^{90}Sr , considered to be long-lived in the environment, appears on the list but only at a level five orders of magnitude lower than the controlling nuclide, ^{131}I .

4.2 SURFACE WATER RELEASES

Table 4.6 ranks radionuclides in order of importance for surface water releases in the 1960s, assuming the standard Hanford scenario for the maximally exposed individual. The table contains results for three measurement periods: 1956, 1964, and 1968. These rankings are based on doses calculated with the GENII code, using the monitoring data described in Section 3.2. There is somewhat more variability in the radionuclide rankings from year to year than for the atmospheric release rankings, but the same five or six radionuclides occur repeatedly, always making up greater than 95% of the total dose. Although not shown in Tables 4.6 through 4.8, the fish consumption pathway provides about 85% of the dose to the dominant organ (the lower large intestine) and more than half of the dose to all organs. The contribution of fish consumption to total dose is evident in the data in the appendixes of this report.

The surface water exposure scenario yielded the rankings of radionuclides shown in Table 4.7, which is divided into scenarios of external exposure, untreated drinking water, and an enhanced diet of fish. For consistency, these scenarios are based on the 1968 water measurements. Although there is some variability in the radionuclide listings, the top six, which contribute over 90% of the doses, are the same radionuclides shown in the more restrictive scenarios involving fish.

Finally, Table 4.8 provides radionuclide rankings for the all-pathway and drinking-only exposures for an acute release to the river of 1 lb. of uranium, irradiated to 500 MWd/t with minimal holdup time. One pound of uranium is roughly the amount released in the largest fuel failures (Hall 1963).^(a) Although the radionuclides indicated in Table 4.8 are significantly different than those in the other surface water tables, the absolute magnitude of the dose is much lower than the results from the chronic releases. The radionuclides listed in Table 4.8 were also included in the chronic release source terms used for the calculations leading to the lists of

(a) The average loss for each of the 97 reported fuel failures in 1964 was 25 grams, or about one ounce (Jerman et al. 1965).

TABLE 4.6. Dominant Radionuclides for Surface Water Releases for a Maximally Exposed Individual, Calculated from Concentrations Measured in 1956, 1964, and 1968 and Ranked by Percent of Contribution to Effective Dose Equivalent

<u>1956, % EDE</u>		<u>1964, % EDE</u>		<u>1968, % EDE</u>	
⁶⁵ Zn	34	³² P	37	³² P	53
³² P	19	⁶⁵ Zn	22	⁶⁵ Zn	18
⁷⁶ As	16	⁶⁴ Cu	12	⁴⁶ Sc	5
⁶⁴ Cu	15	²³⁹ Np	8	⁷⁶ As	4
²³⁹ Np	13	⁷⁶ As	6	²³⁹ Np	3
⁷² Ga	3	²⁴ Na	3	⁵⁹ Fe	3
²⁴ Na	2	⁷² Ga	2	¹⁴⁴ Ce	2
^{69m} Zn	1	¹⁵³ Sm	1	²⁴ Na	2
¹³⁶ Cs	<1	⁵⁶ Mn	<1	¹³¹ I	1
²³² Th	<1	²³² Th	<1	⁷² Ga	1

TABLE 4.7. Dominant Radionuclides for Surface Water Releases for Three Scenarios of Exposure, Calculated from Concentrations Measured in 1968 and Ranked by Percent of Contribution to Effective Dose Equivalent

<u>External Exposure Only, % EDE</u>		<u>Untreated Drinking Water Only, % EDE</u>		<u>Enhanced Fish Consumption, % EDE</u>	
²⁴ Na	53	⁴⁶ Sc	19	³² P	72
⁴⁶ Sc	28	³² P	14	²³⁹ Np	9
⁵⁶ Mn	5	²³⁹ Np	12	⁶⁵ Zn	8
⁶⁵ Zn	3	⁷⁶ As	11	⁷⁶ As	5
⁵¹ Cr	1	²⁴ Na	9	⁶⁴ Cu	5
⁶⁴ Cu	1	⁶⁵ Zn	6	²⁴ Na	1
⁹⁵ Zr	1	¹⁴⁴ Ce	4	⁵⁶ Mn	<1

21 TABLE 4.8. Dominant Radionuclides Associated with a Hypothetical Release of 1 lb. of 500-MWd/t Fuel to Surface Water Calculated for Drinking and All-Pathways Scenarios and Ranked by Percent of Contribution to Effective Dose Equivalent

Drinking Water Scenario, % EDE		All-Pathways Scenario, % EDE	
^{129m}Te	50	^{129m}Te	59
^{131}I	15	^{132}Te	7
^{132}Te	6	^{137}Cs	4
^{140}Ba	5	^{140}La	4
^{140}La	5	^{131}I	3
^{133}I	3	^{140}Ba	3
^{91}Y	2	^{239}Np	3
^{97}Zr	2	^{132}I	2
^{143}Ce	2	^{143}Ce	2
^{99}Mo	2	^{144}Ce	2

Tables 4.6 and 4.7. The dominant radionuclides from the acute releases were largely isotopes of iodine and their short-lived precursors, which also appear (relatively far down) in the routine monitoring numbers. The radionuclide producing the highest individual organ dose was ^{131}I . For this reason, concern by individuals responsible for overseeing reactor operations in the 1950s and 1960s focused on iodine during fuel element failure episodes (Hall 1963). Because the radioiodines and their precursors dominate the acute release doses and the overall magnitude of the acute dose is relatively low, it is apparent that over the long term, the routine releases control the total dose.

Thus, we may infer that radionuclides released during purging of the reactors do not significantly alter the dominant radionuclide distributions. The total dose is controlled by the routine releases, the constituents of which are analyzed in Tables 4.6 and 4.7. The same general activation products observed during routine releases are only enhanced during the purges (Koop 1956). The overall public doses were estimated in 1956 to be increased by less than 5% as a result of purges (Koop 1956).

Dominant radionuclides for the surface water are selected for final recommendation based on both the frequency in which they appear in Tables 4.6 and 4.7 and the relative magnitude of the doses presented in the appendixes. For this reason, the top five radionuclides are fairly obvious, and the second group represents a judgment selection of those that must be addressed at some point in the dose reconstruction but that generally should each contribute only a few percent to the total dose to most individuals.

5.0 CONCLUSIONS

For the Phase I time periods of 1944-1947 for atmospheric releases and of 1964-1966 for surface water releases, a small group of radionuclides dominate the dose estimates. For the air releases, ^{131}I by itself generally accounts for much more than 90% of all dose received via all pathways of exposure. Addition of the longer-lived radioisotopes of ruthenium (^{106}Ru and ^{103}Ru) accounts for 99% of the dose. For the surface water releases, the results are less definitive, but inclusion of only 5 to 10 radionuclides accounts for the great majority of the dose to the most highly exposed individuals. For Phase I, inclusion of at least ^{32}P , ^{239}Np , ^{65}Zn , ^{76}As , and ^{64}Cu in the dose calculations is essential, with ^{56}Mn , ^{24}Na , ^{46}Sc , and ^{51}Cr highly desirable additions.

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APPENDIX A

ORIGEN2 OUTPUT FOR 500 MWd/t FUEL

NUCLIDE	INFEASIBLE	10.0D	30.0D	50.0D	70.0D	90.0D	110.0D	130.0D	150.0D	170.0D	190.0D
Activation Products:											
H 1	0.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H 2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H 3	2.773E-08	2.768E-08	2.766E-08	2.751E-08	2.743E-08	2.734E-08	2.726E-08	2.718E-08	2.709E-08	2.701E-08	2.693E-08
H 4	2.565E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
HE 3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
HE 4	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
HE 6	1.393E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI 6	8.000E+00	0.000E+00	8.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E+00	8.000E+00	8.000E+00	0.000E+00
LI 7	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI 8	1.035E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE 8	1.059E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE 9	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE 11	4.938E-09	4.938E-09	4.938E-09	4.938E-09	4.938E-09	4.938E-09	4.938E-09	4.938E-09	4.938E-09	4.938E-09	4.938E-09
BE 11	9.543E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
B 10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
B 11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
B 12	1.706E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C 12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C 13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C 14	3.714E-02	3.714E-02	3.714E-02	3.714E-02	3.714E-02	3.714E-02	3.714E-02	3.714E-02	3.714E-02	3.714E-02	3.714E-02
C 16	2.030E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
N 13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
N 14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
N 15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.00						

NA 23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NA 24	2.779E-01	4.240E-06	9.873E-16	2.299E-25	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NA 24M	4.512E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NA 25	5.362E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MG 24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MQ 25	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MQ 26	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MQ 27	3.677E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MQ 28	3.111E-10	1.091E-13	1.343E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
AL 27	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
AL 28	1.086E-05	1.093E-13	1.345E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
AL 29	4.174E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
AL 30	5.233E-25	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SI 28	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SI 29	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SI 30	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SI 31	4.866E-21	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CA 47	1.037E-16	2.101E-17	2.015E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CA 48	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CA 49	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SC 45	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SC 46	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SC 46M	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SC 47	8.886E-17	4.638E-17	4.645E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SC 48	3.898E-10	0.740E-12	4.395E-15	2.210E-18	1.111E-21	5					

[illegible]

IN115	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
IN116	4.094E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
IN116M	3.228E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Actinides + Daughters:													
HE 4	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TL206	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TL207	1.434E-11	2.619E-11	6.493E-11	1.269E-10	2.144E-10	3.287E-10	4.702E-10	6.393E-10	8.361E-10	1.061E-09	1.313E-09		
TL208	3.243E-09	6.168E-09	1.420E-08	2.437E-08	3.656E-08	5.070E-08	6.674E-08	8.460E-08	1.042E-07	1.255E-07	1.465E-07		
TL209	7.366E-15	1.164E-14	1.694E-14	2.349E-14	3.176E-14	4.166E-14	5.091E-14	6.106E-14	7.141E-14	8.191E-14	9.255E-14		
PB206	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PB207	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PB208	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PB209	3.383E-13	5.387E-13	7.842E-13	1.088E-12	1.470E-12	1.901E-12	2.357E-12	2.827E-12	3.306E-12	3.792E-12	4.285E-12		
PB210	2.662E-15	4.833E-15	7.255E-15	8.561E-15	9.149E-15	9.497E-15	9.699E-15	9.838E-15	9.954E-15	1.007E-14	1.021E-14		
PB211	1.438E-11	2.626E-11	6.511E-11	1.273E-10	2.150E-10	3.296E-10	4.715E-10	6.411E-10	8.384E-10	1.064E-09	1.316E-09		
PB212	9.027E-09	1.722E-08	3.953E-08	6.781E-08	1.017E-07	1.411E-07	1.858E-07	2.355E-07	2.900E-07	3.493E-07	4.132E-07		
PB214	1.262E-15	2.276E-15	5.498E-15	1.033E-14	1.678E-14	2.484E-14	3.454E-14	4.586E-14	5.881E-14	7.340E-14	8.982E-14		
BI208	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BI209	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BI210M	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BI210	1.736E-15	3.526E-15	6.461E-15	8.884E-15	8.932E-15	9.378E-15	9.628E-15	9.790E-15	9.912E-15	1.003E-14	1.016E-14		
BI211	1.438E-11	2.626E-11	6.511E-11	1.273E-10	2.150E-10	3.296E-10	4.715E-10	6.411E-10	8.384E-10	1.064E-09	1.316E-09		
BI212	9.027E-09	1.722E-08	3.953E-08	6.781E-08	1.017E-07	1.411E-07	1.858E-07	2.355E-07	2.900E-07	3.493E-07	4.132E-07		
BI213	3.382E-13	5.387E-13	7.842E-13	1.088E-12	1.470E-12	1.901E-12	2.357E-12	2.827E-12	3.306E-12	3.792E-12	4.285E-12		
BI214	1.262E-15	2.276E-15	5.498E-15	1.033E-14	1.678E-14	2.484E-14	3.454E-14	4.586E-14	5.881E-14	7.340E-14	8.982E-14		
P0210	7.353E-17	1.978E-16	6.692E-16	1.308E-15	1.999E-15	2.684E-15	3.335E-15	3.943E-15	4.506E-15	5.027E-15	5.510E-15		
P0211M	1.684E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
P0211	4.025E-14	7.353E-14	1.023E-13	3.563E-13	6.020E-13	9.228E-13	1.320E-12	1.795E-12	2.348E-12	2.978E-12	3.686E-12		
P0212	5.783E-09	1.103E-08	2.532E-08	4.345E-08	6.519E-08	9.042E-08	1.190E-07	1.509E-07	1.858E-07	2.238E-07	2.647E-07		
P0213	3.309E-13	5.271E-13	7.672E-13	1.064E-12	1.439E-12	1.860E-12	2.306E-12	2.768E-12	3.234E-12	3.710E-12	4.192E-12		
P0214	2.725E-12	1.955E-12	1.008E-12	5.253E-13	2.612E-13	1.006E-13	1.043E-13	8.166E-14	7.719E-14	8.282E-14	9.445E-14		
P0215	1.438E-11	2.626E-11	6.511E-11	1.273E-10	2.150E-10	3.296E-10	4.715E-10	6.411E-10	8.384E-10	1.064E-09	1.316E-09		
P0216	9.027E-09	1.722E-08	3.953E-08	6.781E-08	1.017E-07	1.411E-07	1.858E-07	2.355E-07	2.900E-07	3.493E-07	4.132E-07		
P0218	1.262E-15	2.276E-15	5.498E-15	1.033E-14	1.678E-14	2.484E-14	3.454E-14	4.586E-14	5.881E-14	7.341E-14	8.984E-14		
AT217	3.382E-13	5.387E-13	7.842E-13	1.088E-12	1.470E-12	1.901E-12	2.357E-12	2.827E-12	3.306E-12	3.792E-12	4.285E-12		
RN218	2.724E-12	1.953E-12	1.003E-12	5.150E-13	2.645E-13	1.358E-13	6.974E-14	3.581E-14	1.839E-14	9.443E-15	4.849E-15		
RN219	1.438E-11	2.626E-11	6.511E-11	1.273E-10	2.150E-10	3.296E-10	4.715E-10	6.411E-10	8.384E-10	1.064E-09	1.316E-09		
RN220	9.027E-09	1.722E-08	3.953E-08	6.781E-08	1.017E-07	1.411E-07	1.858E-07	2.355E-07	2.900E-07	3.493E-07	4.132E-07		
RN222	1.262E-15	2.276E-15	5.498E-15	1.033E-14	1.678E-14	2.484E-14	3.454E-14	4.586E-14	5.881E-14	7.341E-14	8.984E-14		
FR221	3.382E-13	5.387E-13	7.842E-13	1.088E-12	1.470E-12	1.901E-12	2.357E-12	2.827E-12	3.306E-12	3.792E-12	4.285E-12		
FR223	1.019E-12	1.490E-12	2.730E-12	4.356E-12	6.369E-12	8.766E-12	1.155E-11	1.471E-11	1.826E-11	2.220E-11	2.651E-11		
RA222	2.724E-12	1.953E-12	1.003E-12	5.150E-13	2.645E-13	1.358E-13	6.974E-14	3.581E-14	1.839E-14	9.443E-15	4.849E-15		
RA223	1.438E-11	2.626E-11	6.511E-11	1.273E-10	2.150E-10	3.296E-10	4.715E-10	6.411E-10	8.384E-10	1.064E-09	1.316E-09		
RA224	9.027E-09	1.722E-08	3.953E-08	6.781E-08	1.017E-07	1.411E-07	1.858E-07	2.355E-07	2.900E-07	3.493E-07	4.132E-07		
RA225	7.495E-13	7.468E-13	9.698E-13	1.339E-12	1.767E-12	2.223E-12	2.691E-12	3.169E-12	3.654E-12	4.145E-12	4.642E-12		
RA226	1.716E-15	2.945E-15	6.608E-15	1.189E-14	1.878E-14	2.730E-14	3.744E-14	4.922E-14	6.262E-14	7.766E-14	9.434E-14		
RA225	7.495E-13	7.468E-13	9.698E-13	1.339E-12	1.767E-12	2.223E-12	2.691E-12	3.169E-12	3.654E-12	4.145E-12	4.642E-12		
RA226	1.716E-15	2.945E-15	6.608E-15	1.189E-14	1.878E-14	2.730E-14	3.744E-14	4.922E-14	6.262E-14	7.766E-14	9.434E-14		
RA226	9.022E-17	1.546E-16	3.459E-16	6.203E-16	9.773E-16	1.418E-15	1.937E-15	2.539E-15	3.222E-15	3.965E-15	4.828E-15		
AC225	3.382E-13	5.387E-13	7.841E-13	1.087E-12	1.470E-12	1.901E-12	2.357E-12	2.827E-12	3.306E-12	3.792E-12	4.284E-12		
AC227	7.366E-11	1.080E-10	1.978E-10	3.157E-10	4.615E-10	6.352E-10	8.366E-10	1.066E-09	1.323E-09	1.608E-09	1.921E-09		
AC228	1.001E-09	1.546E-10	3.459E-10	6.203E-10	9.774E-10	1.417E-09	1.937E-09	2.540E-09	3.222E-09	3.966E-09	4.829E-09		
TH226	2.724E-12	1.953E-12	1.003E-12	5.150E-13	2.645E-13	1.358E-13	6.974E-14	3.581E-14	1.839E-14	9.443E-15	4.849E-15		

TH227	2.933E-11	4.818E-11	1.036E-10	1.845E-10	2.920E-10	4.265E-10	5.884E-10	7.777E-10	9.944E-10	1.238E-09	1.510E-09
TH228	1.253E-08	2.221E-08	4.823E-08	7.803E-08	1.114E-07	1.522E-07	1.982E-07	2.492E-07	3.051E-07	3.656E-07	4.388E-07
TH229	6.189E-13	8.481E-13	1.309E-12	1.773E-12	2.243E-12	2.717E-12	3.197E-12	3.683E-12	4.175E-12	4.672E-12	5.176E-12
TH230	8.647E-11	1.204E-10	1.884E-10	2.586E-10	3.249E-10	3.933E-10	4.619E-10	5.307E-10	5.998E-10	6.687E-10	7.379E-10
TH231	1.300E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02
TH232	1.912E-14	2.657E-14	4.147E-14	5.636E-14	7.126E-14	8.616E-14	1.011E-13	1.160E-13	1.309E-13	1.458E-13	1.607E-13
TH233	1.076E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TH234	2.293E-01	2.477E-01	2.720E-01	2.856E-01	2.933E-01	2.976E-01	3.001E-01	3.014E-01	3.022E-01	3.026E-01	3.029E-01
PA231	3.550E-08	4.381E-08	5.919E-08	7.537E-08	9.155E-08	1.077E-07	1.239E-07	1.401E-07	1.563E-07	1.724E-07	1.886E-07
PA232	9.851E-04	4.988E-06	1.261E-10	3.203E-15	8.134E-20	2.066E-24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PA233	1.514E-03	2.140E-03	3.179E-03	3.847E-03	4.253E-03	4.498E-03	4.642E-03	4.738E-03	4.782E-03	4.813E-03	4.832E-03
PA234M	2.293E-01	2.477E-01	2.720E-01	2.856E-01	2.933E-01	2.976E-01	3.001E-01	3.014E-01	3.022E-01	3.026E-01	3.029E-01
PA234	3.149E-04	3.221E-04	3.536E-04	3.713E-04	3.813E-04	3.869E-04	3.901E-04	3.919E-04	3.929E-04	3.934E-04	3.938E-04
PA235	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U230	2.723E-12	1.951E-12	1.002E-12	5.145E-13	2.642E-13	1.357E-13	6.966E-14	3.577E-14	1.837E-14	9.433E-15	4.844E-15
U231	1.611E-09	3.094E-10	1.140E-11	4.204E-13	1.550E-14	5.719E-16	1.950E-17	2.585E-18	1.820E-18	0.000E+00	0.000E+00
U232	8.721E-07	1.083E-06	1.404E-06	1.721E-06	2.033E-06	2.341E-06	2.644E-06	2.944E-06	3.239E-06	3.530E-06	3.818E-06
U233	8.858E-08	0.878E-08	8.942E-08	9.027E-08	9.124E-08	9.229E-08	9.339E-08	9.451E-08	9.565E-08	9.680E-08	9.795E-08
U234	1.377E-04	1.378E-04	1.381E-04	1.384E-04	1.387E-04	1.390E-04	1.393E-04	1.397E-04	1.400E-04	1.403E-04	1.406E-04
U235	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02
U236	5.515E-03	5.515E-03	5.515E-03	5.515E-03	5.515E-03	5.515E-03	5.515E-03	5.515E-03	5.515E-03	5.515E-03	5.515E-03
U237	1.098E-05	3.920E-04	5.038E-03	6.456E-02	8.283E-01	1.063E+00	1.369E+00	1.817E+01	2.937E+02	9.819E+03	7.295E+03
U238	3.032E-01	3.032E-01	3.032E-01	3.032E-01	3.032E-01	3.032E-01	3.032E-01	3.032E-01	3.032E-01	3.032E-01	3.032E-01
U239	1.580E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U240	3.456E-01	2.598E-04	5.965E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13
U241	3.977E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NP235	1.136E-05	1.116E-05	1.078E-05	1.041E-05	1.005E-05	9.705E-06	9.371E-06	9.049E-06	8.738E-06	8.437E-06	8.147E-06
NP236M	8.677E-02	5.338E-05	2.020E-11	7.646E-16	2.894E-24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NP236	1.011E-08	1.011E-08	1.011E-08	1.011E-08	1.011E-08	1.011E-08	1.011E-08	1.011E-08	1.011E-08	1.011E-08	1.011E-08
NP237	3.913E-03	4.521E-03	4.816E-03	4.854E-03	4.859E-03	4.860E-03	4.860E-03	4.860E-03	4.860E-03	4.860E-03	4.860E-03
NP238	3.305E-03	1.251E-02	1.800E-01	2.579E-04	1.102E-06	7.360E-07	7.352E-07	7.351E-07	7.349E-07	7.347E-07	7.345E-07
NP239	1.578E-07	0.378E-05	2.327E-03	6.485E-08	1.804E-02	1.121E-04	6.223E-05	6.209E-05	6.209E-05	6.209E-05	6.209E-05
NP240M	3.846E-03	2.821E-04	5.988E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13	5.818E-13
NP240	1.518E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NP241	3.977E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PU236	5.887E-04	8.141E-04	8.068E-04	5.980E-04	5.901E-04	5.823E-04	5.748E-04	5.670E-04	5.595E-04	5.521E-04	5.448E-04
PU237	4.123E-03	3.542E-03	2.813E-03	1.928E-03	1.423E-03	1.050E-03	7.748E-04	5.715E-04	4.217E-04	3.111E-04	2.298E-04
PU238	1.477E-08	1.887E-08	1.695E-08	1.694E-08	1.693E-08	1.693E-08	1.692E-08	1.692E-08	1.691E-08	1.690E-08	1.690E-08
PU239	5.581E-01	5.985E-01	6.007E-01	6.007E-01	6.007E-01	6.007E-01	6.007E-01	6.007E-01	6.007E-01	6.007E-01	6.007E-01
PU240	8.293E-08	8.293E-08	8.293E-08	8.293E-08	8.293E-08	8.293E-08	8.293E-08	8.293E-08	8.293E-08	8.293E-08	8.293E-08
PU241	2.895E-02	2.891E-02	2.884E-02	2.876E-02	2.869E-02	2.861E-02	2.853E-02	2.848E-02	2.838E-02	2.831E-02	2.824E-02
PU242	1.415E-04	1.415E-04	1.415E-04	1.415E-04	1.415E-04	1.415E-04	1.415E-04	1.415E-04	1.415E-04	1.415E-04	1.415E-04
PU243	2.285E-01	6.023E-14	1.542E-18	1.542E-18	1.542E-18	1.542E-18	1.542E-18	1.542E-18	1.542E-18	1.542E-18	1.542E-18
PU244	5.825E-13	5.826E-13	5.826E-13	5.826E-13	5.826E-13	5.826E-13	5.826E-13	5.826E-13	5.826E-13	5.826E-13	5.826E-13
PU245	7.550E-07	1.154E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PU246	7.731E-11	4.081E-11	1.137E-11	3.170E-12	8.833E-13	2.462E-13	8.860E-14	1.912E-14	5.328E-15	1.484E-15	4.133E-16
AM239	1.378E-07	1.189E-13	8.425E-28	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
AM240	2.381E-05	8.934E-07	1.278E-09	1.826E-12	2.611E-15	2.103E-18	1.987E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00
AM241	1.583E-02	2.853E-02	5.388E-02	7.910E-02	1.044E-01	1.295E-01	1.548E-01	1.798E-01	2.045E-01	2.294E-01	2.542E-01
AM242M	1.472E-04	1.472E-04	1.472E-04	1.472E-04	1.471E-04	1.471E-04	1.470E-04	1.470E-04	1.470E-04	1.469E-04	1.469E-04
AM242	1.018E-01	4.612E-04	1.465E-04	1.464E-04	1.464E-04	1.463E-04	1.463E-04	1.463E-04	1.462E-04	1.462E-04	1.462E-04

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RB 90	3.209E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
RB 90M	0.986E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SR 90	1.325E+03	1.324E+03	1.322E+03	1.321E+03	1.319E+03	1.317E+03	1.315E+03	1.314E+03	1.312E+03	1.310E+03	1.309E+03
Y 90	1.258E+03	1.319E+03	1.323E+03	1.321E+03	1.319E+03	1.317E+03	1.316E+03	1.314E+03	1.312E+03	1.311E+03	1.309E+03
Y 90M	2.814E+00	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ZR 90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ZR 90M	7.942E-04	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SE 91	3.903E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BR 91	2.875E+04	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
KR 91	2.344E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
RB 91	3.912E+05	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SR 91	4.118E+05	1.024E+02	0.317E+18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Y 91	1.879E+05	1.698E+05	1.338E+05	1.056E+05	0.330E+04	0.573E+04	5.186E+04	4.692E+04	3.229E+04	2.548E+04	2.610E+04
Y 91M	2.389E+05	0.509E+03	4.014E+18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ZR 91	0.000E+00	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NB 91	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SE 92	1.999E+01	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BR 92	2.039E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
KR 92	1.132E+05	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
RB 92	3.367E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SR 92	4.340E+05	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Y 92	4.853E+05	7.130E+15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ZR 92	0.000E+00	0.000E+00	0.009E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NB 92	1.380E+09	7.016E+10	1.793E+10	4.581E+11	1.170E+11	2.991E+12	7.842E+13	1.953E+13	4.989E+14	1.275E+14	3.250E+15
SE 93	0.000E+00	0.000E+00	0.009E+00	0.000E+00	0.000E+00						

CS132	2.812E+00	9.841E-01	1.133E-01	1.331E-02	1.565E-03	1.839E-04	2.161E-05	2.540E-06	2.985E-07	3.508E-08	4.122E-09
BA132	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
IN133	1.174E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SN133	1.835E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SB133	1.846E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE133	3.423E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE133M	2.224E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I133	5.786E+05	1.993E+02	2.252E-05	2.545E-12	2.877E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I133M	1.461E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE133	5.396E+05	1.786E+05	1.277E+04	9.066E+02	6.465E+01	4.600E+00	3.273E-01	2.329E-02	1.657E-03	1.179E-04	8.391E-06
XE133M	1.560E+04	1.135E+03	2.023E+00	3.592E-03	6.393E-06	1.140E-08	2.033E-11	3.633E-14	6.779E-17	0.000E+00	0.000E+00
CS133	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA133	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
IN134	6.675E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SN134	2.628E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SB134	2.970E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SB134M	2.707E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE134	5.169E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I134	6.384E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I134M	5.065E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE134	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE134M	3.281E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS134	1.746E+02	1.731E+02	1.699E+02	1.658E+02	1.638E+02	1.606E+02	1.579E+02	1.550E+02	1.522E+02	1.494E+02	1.467E+02
CS134M	6.136E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA134	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SN135	3.217E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SB135	1.926E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE135	2.678E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I135	5.367E+05	6.335E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE135	9.699E+04	1.729E-02	2.190E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE135M	1.064E+05	1.015E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS135	3.514E-03	3.736E-03	3.736E-03	3.736E-03	3.736E-03	3.736E-03	3.736E-03	3.736E-03	3.736E-03	3.736E-03	3.736E-03
CS135M	1.395E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA135	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA135M	6.436E+02	2.563E-04	2.361E-09	2.175E-14	2.004E-19	1.846E-24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SN136	2.913E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SB136	3.957E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE136	1.511E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I136	2.625E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I136M	1.536E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE136	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS136	2.260E+03	1.331E+03	4.622E+02	1.604E+02	5.569E+01	1.933E+01	6.710E+00	2.329E+00	6.085E-01	2.806E-01	9.741E-02
BA136	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA136M	3.724E+02	2.194E+02	7.616E+01	2.644E+01	9.177E+00	3.166E+00	1.106E+00	3.838E-01	1.332E-01	4.625E-02	1.605E-02
SB137	6.252E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE137	4.382E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I137	2.681E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE137	5.035E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS137	1.592E+03	1.591E+03	1.589E+03	1.587E+03	1.585E+03	1.583E+03	1.581E+03	1.579E+03	1.577E+03	1.575E+03	1.573E+03
BA137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA137M	1.550E+03	1.505E+03	1.503E+03	1.501E+03	1.499E+03	1.497E+03	1.496E+03	1.494E+03	1.492E+03	1.490E+03	1.488E+03

SB138	8.168E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE138	1.203E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I138	1.409E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE138	4.968E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS138	5.448E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS138M	2.256E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA138	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LA138	2.568E-12	2.568E-12	2.568E-12	2.568E-12	2.568E-12	2.568E-12	2.568E-12	2.568E-12	2.568E-12	2.568E-12	2.568E-12	2.568E-12
SB139	8.114E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE139	2.457E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I139	8.625E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE139	3.969E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS139	5.168E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA139	5.290E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LA139	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CE139	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PR139	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE140	3.167E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I140	2.034E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE140	2.722E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS140	4.684E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA140	4.674E-05	2.719E-05	9.198E-04	3.111E-04	1.052E-04	3.559E-03	1.204E-03	4.072E-02	1.378E-02	4.688E-01	1.576E-01	
LA140	4.634E-05	3.117E-05	1.059E-05	3.583E-04	1.212E-04	4.099E-03	1.387E-03	4.690E-02	1.588E-02	5.368E-01	1.815E-01	
CE140	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PR140	1.289E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE141	1.461E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I141	3.535E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE141	9.729E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS141	3.581E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA141	4.828E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LA141	4.848E-05	2.187E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CE141	3.891E-05	2.519E-05	1.645E-05	1.074E-05	7.010E-04	4.576E-04	2.988E-04	1.950E-04	1.273E-04	0.313E-03	5.427E-03	
PR141	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ND141	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TE142	1.588E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I142	5.277E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE142	3.885E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS142	2.258E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA142	4.650E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LA142	4.745E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CE142	4.196E-07	4.205E-07	4.205E-07	4.205E-07	4.205E-07	4.205E-07	4.205E-07	4.205E-07	4.205E-07	4.205E-07	4.205E-07	4.205E-07
PR142	4.238E-02	7.109E-02	1.990E-09	5.588E-17	1.558E-24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PR142M	9.848E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ND142	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I143	3.453E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
XE143	8.861E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CS143	1.189E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BA143	4.151E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LA143	4.613E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CE143	4.802E-05	2.997E-03	1.253E-01	5.242E-06	2.192E-10	9.168E-15	3.834E-19	1.603E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PR143	4.190E-05	2.824E-05	1.017E-05	3.682E-04	1.318E-04	4.742E-03	1.707E-03	8.142E-02	2.210E-02	7.955E-01	2.863E-01	

A.23

APPENDIX B

GENII RESULTS FOR ATMOSPHERIC RELEASES

APPENDIX B

GENII RESULTS FOR ATMOSPHERIC RELEASES

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                        GENII Dose Calculation Program
                        (Version 1.361 30-Aug-88)

Case title:   Top One hundred or so Nuclides, 500MWd, 10 DAY COOLED

Executed on:  09/19/88 at 22:01:11                               Page A.  1
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This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Finite plume, external
 Ground, external
 Inhalation uptake
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

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                                \GENII\BANDIR\overfill.in      9-19-88
GENII Default Parameter Values (3-Aug-88 RAP)                8-12-88
RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)         8-29-88
Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA 8-29-88
External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88 8-29-88
Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP       8-29-88
288 Area Population (Sommer, Rau, and Robinson, PNL-4010)
2100 AREA - 10 M - Pasquill A - F (1987)

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-----Release Terms-----			
Release	Surface		Buried
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3

H 3	8.5E+00	0.0E+00	0.0E+00
C 14	3.7E+02	0.0E+00	0.0E+00
SE79	0.0E+00	0.0E+00	0.0E+00
KR86	1.7E+02	0.0E+00	0.0E+00
RB86	1.0E+04	0.0E+00	0.0E+00
SR89	1.5E+00	0.0E+00	0.0E+00
SR90	1.3E+02	0.0E+00	0.0E+00
Y 90	1.3E+02	0.0E+00	0.0E+00
Y 91	1.7E+00	0.0E+00	0.0E+00
ZR93	3.0E+07	0.0E+00	0.0E+00
NB93M	1.0E+18	0.0E+00	0.0E+00
ZR95	1.9E+00	0.0E+00	0.0E+00
NB95M	1.3E+02	0.0E+00	0.0E+00
NB95	1.0E+00	0.0E+00	0.0E+00

MO99	4.1E-01	0.0E+00	0.0E+00
TC99M	3.9E-01	0.0E+00	0.0E+00
TC99	2.2E-06	0.0E+00	0.0E+00
RU103	1.6E+04	0.0E+00	0.0E+00
RU106	8.9E+02	0.0E+00	0.0E+00
RH103M	1.6E+00	0.0E+00	0.0E+00
AQ110M	4.3E-05	0.0E+00	0.0E+00
AQ111	4.9E-02	0.0E+00	0.0E+00
CD113M	8.3E-06	0.0E+00	0.0E+00
CD115M	2.8E-03	0.0E+00	0.0E+00
CD116	2.8E-03	0.0E+00	0.0E+00
IN115M	3.0E-03	0.0E+00	0.0E+00
SN119M	1.0E-04	0.0E+00	0.0E+00
SN123	2.8E-03	0.0E+00	0.0E+00
SN126	1.9E-02	0.0E+00	0.0E+00
SN128	1.3E-07	0.0E+00	0.0E+00
SB126	3.3E-03	0.0E+00	0.0E+00
SB126M	1.3E-07	0.0E+00	0.0E+00
SB128	9.6E-04	0.0E+00	0.0E+00
SB124	6.9E-06	0.0E+00	0.0E+00
SB127	4.6E-02	0.0E+00	0.0E+00
TE126M	2.3E-04	0.0E+00	0.0E+00
TE127M	9.1E-03	0.0E+00	0.0E+00
TE127	6.3E-02	0.0E+00	0.0E+00
TE129M	6.9E-02	0.0E+00	0.0E+00
TE129	3.8E-02	0.0E+00	0.0E+00
TE131M	1.6E-03	0.0E+00	0.0E+00
TE131	3.3E-04	0.0E+00	0.0E+00
TE132	4.6E-01	0.0E+00	0.0E+00
I 129	3.8E-04	0.0E+00	0.0E+00
I 131	7.7E+04	0.0E+00	0.0E+00
I 132	3.2E+04	0.0E+00	0.0E+00
XE131M	2.2E+03	0.0E+00	0.0E+00
XE133M	1.1E+03	0.0E+00	0.0E+00
XE133	1.8E+06	0.0E+00	0.0E+00
CS134	1.7E-03	0.0E+00	0.0E+00
CS136	1.3E-02	0.0E+00	0.0E+00
CS137	1.6E-02	0.0E+00	0.0E+00
BA140	2.7E+00	0.0E+00	0.0E+00
LA140	3.1E+00	0.0E+00	0.0E+00
CE141	2.6E+00	0.0E+00	0.0E+00
CE143	3.0E-02	0.0E+00	0.0E+00
CE144	4.7E-01	0.0E+00	0.0E+00
PR143	2.8E+00	0.0E+00	0.0E+00
PR144M	6.6E-03	0.0E+00	0.0E+00
PR144	4.7E-01	0.0E+00	0.0E+00
ND147	9.7E-01	0.0E+00	0.0E+00
PM147	6.2E-02	0.0E+00	0.0E+00
PM148M	7.2E-03	0.0E+00	0.0E+00
PM148	2.7E-03	0.0E+00	0.0E+00
PM149	4.6E-02	0.0E+00	0.0E+00
SM151	3.1E-04	0.0E+00	0.0E+00
SM153	7.2E-03	0.0E+00	0.0E+00
EU152	2.9E-07	0.0E+00	0.0E+00
EU154	1.0E-04	0.0E+00	0.0E+00
EU156	4.6E-04	0.0E+00	0.0E+00
EU156	4.4E-02	0.0E+00	0.0E+00
TB160	1.6E-06	0.0E+00	0.0E+00
TH231	1.3E-07	0.0E+00	0.0E+00
PA231	4.3E-13	0.0E+00	0.0E+00
AC227	1.0E-16	0.0E+00	0.0E+00
TH227	1.0E-16	0.0E+00	0.0E+00
FR223	1.0E-16	0.0E+00	0.0E+00
RA223	1.0E-16	0.0E+00	0.0E+00
TH234	2.6E-06	0.0E+00	0.0E+00
PA234	3.2E-09	0.0E+00	0.0E+00
U 236	1.3E-07	0.0E+00	0.0E+00
U 236	6.6E-08	0.0E+00	0.0E+00
U 237	3.9E-01	0.0E+00	0.0E+00
U 238	3.0E-06	0.0E+00	0.0E+00

NP237	4.5E-08	0.0E+00	0.0E+00
PA233	2.1E-08	0.0E+00	0.0E+00
U 233	0.9E-13	0.0E+00	0.0E+00
TH229	1.0E-15	0.0E+00	0.0E+00
RA225	1.0E-15	0.0E+00	0.0E+00
AC225	1.0E-15	0.0E+00	0.0E+00
NP238	1.2E-03	0.0E+00	0.0E+00
NP239	0.4E+00	0.0E+00	0.0E+00
PU238	1.7E-05	0.0E+00	0.0E+00
PU239	0.0E-04	0.0E+00	0.0E+00
PU240	0.2E-05	0.0E+00	0.0E+00
PU241	2.9E-03	0.0E+00	0.0E+00
AM241	2.9E-07	0.0E+00	0.0E+00

===== AIR TRANSPORT =====

Joint frequency data input.

MI distance, direction, and chi/Q rill be selected by the program.

Ground level release.

===== EXTERNAL EXPOSURE =====

8.8E+03 Hours of exposure to plume

4.4E+03 Hours of exposure to ground contamination

===== INHALATION =====

8.8E+03 Hours of exposure to contamination per year

1 Resuspension model: 1-Mass Loading, 2-Anspaugh

1.0E-04 Mass loading factor (g/m3)

===== INGESTION POPULATION =====

1 Atmospheric production definition: 1 - Use population-weighted chi/Q

===== TERRESTRIAL FOOD INGESTION =====

FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TINE no/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	91.1	0	1.1	1.1	1.6	1.0	3.0E+01
Oth. Veg	91.1	0	1.1	1.1	4.1	5.0	2.2E+02
Fruit	91.1	0	1.1	1.1	2.1	5.8	3.3E+02
Cereals	91.1	0	1.1	1.1	1.8	188.8	0.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRAC.	DIET FRAC- TION	GROW TIME d	---STORED FEED---		STOR- AGE d		
	CONSUMPTION RATE kg/yr	HOLDUP d					IRRIGATION-- S RATE * in/yr	TINE no/yr			
Neat	0.0E+01	16.1		1.11	0.3	98.80	0	1.0	8.8	8.88	188.8
Poultry	1.8E+01	1.1		1.11	1.1	91.11	1	1.1	1.8	1.88	188.8
Cow Milk	2.7E+02	1.1		1.11	1.3	46.11	1	1.0	8.8	2.88	188.8
Eggs	3.0E+01	1.1		1.11	1.1	90.00	0	1.1	8.8	8.88	188.8

-----FRESH FORAGE-----										
Neat	0.75	45.0	0	0.0	0.0	2.00	100.0			
Cow Milk	0.75	30.0	0	0.0	0.0	1.50	0.0			

 GENII Dose Calculation Program
 (Version 1.361 30-Aug-88)

Case title: Top One hundred or so Nuclides, 500MWD, 10 DAY COOLED

Executed on: 19/19/88 at 22:16:17

Page C. 9

Release period: 1.1
 Uptake/exposure period: 1.1
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.1E-08	9.5E-08	1.0E-08	1.1E-07	1.1E-17
C 14	1.1E-09	1.7E-07	1.0E-08	1.7E-07	1.7E-07
SE 79	9.0E-15	3.1E-12	7.5E-20	3.1E-12	3.1E-12
KR 85	1.0E-08	1.0E-08	2.1E-09	1.0E-08	2.1E-09
SR 89	1.3E-07	1.2E-06	4.3E-10	1.3E-06	1.3E-06
RB 88	1.6E-11	1.9E-10	9.3E-13	2.1E-10	2.1E-10
SR 90	4.1E-08	2.6E-07	9.4E-13	3.1E-17	3.0E-07
Y 90	1.7E-09	1.4E-08	5.3E-11	1.5E-08	1.5E-08
Y 91	1.3E-06	1.2E-06	1.6E-09	2.4E-06	2.4E-06
ZR 93	3.7E-13	4.4E-14	8.2E-21	4.1E-13	4.1E-13
NB 93Y	7.2E-15	7.5E-16	4.6E-19	7.9E-15	7.9E-15
ZR 96	4.4E-07	5.2E-07	2.4E-07	9.5E-07	1.2E-06
NB 95M	4.9E-10	2.1E-19	1.4E-10	3.1E-09	3.2E-09
NB 95	8.5E-08	2.6E-07	3.3E-07	3.5E-07	6.8E-07
YO 99	1.2E-08	2.2E-08	7.6E-10	3.4E-08	3.4E-08
TC 99M	1.8E-10	1.1E-19	5.4E-10	1.2E-09	1.7E-09
TC 99	3.0E-13	7.2E-12	1.6E-17	7.5E-12	7.5E-12
RU 103	2.1E-03	3.2E-03	9.1E-04	5.3E-03	6.2E-03
PD 103	8.0E-08	1.0E-08	1.0E-08	1.0E-08	1.0E-08
RH 103M	9.8E-07	5.7E-05	3.3E-07	5.8E-05	5.9E-05
RU 106	6.1E-03	2.3E-03	1.0E-04	8.4E-03	8.5E-03
AG 110M	5.5E-11	5.1E-10	4.6E-11	5.6E-10	6.1E-10
AC 111	2.5E-09	3.4E-08	3.5E-11	3.1E-08	3.6E-08
OD 113M	1.9E-10	2.0E-10	7.3E-16	3.9E-10	3.9E-10
OD 115M	3.0E-09	3.6E-09	8.9E-12	6.6E-09	6.6E-09
OD 115	1.1E-18	2.0E-10	6.5E-12	3.6E-10	3.6E-10
IN 115M	5.3E-12	1.3E-11	6.1E-12	1.8E-11	2.4E-11
SN 119M	9.1E-12	1.8E-11	3.3E-14	2.7E-11	2.7E-11
SN 123	1.4E-09	2.7E-09	6.8E-12	4.1E-09	4.1E-09
SN 126	4.4E-09	9.5E-09	1.8E-10	1.4E-08	1.4E-08
SB 126	6.1E-10	9.6E-10	9.6E-10	1.6E-09	2.5E-09
TE 126Y	2.5E-11	4.9E-10	1.0E-12	5.2E-10	5.2E-10
SN 126	1.9E-13	3.8E-13	1.4E-15	5.7E-13	5.8E-13
SB 128M	5.9E-17	1.8E-15	1.5E-13	1.9E-15	1.5E-13
SB 126	1.6E-10	4.5E-10	1.0E-10	6.2E-10	7.2E-10
SB 124	2.2E-11	4.7E-11	1.9E-11	7.0E-11	8.8E-11
SB 127	4.1E-09	6.9E-09	4.9E-10	1.1E-08	1.1E-08

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 GENII Dose Calculation Program
 (Version 1.361 31-Aug-88)

Case title: Top One hundred or so Nuclides, **500MWD, 10 DAY COOLED**

Executed on: 19/19/88 at **22:16:17**

Page C. **10**

.....
 Release period: 1.1
 Uptake/exposure period: 1.1
 Dose commitment period: 61.1
 Dose units: **Rem**

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 127Y	3.0E-09	1.1E-08	2.4E-12	1.4E-08	1.4E-08
TE 127	2.6E-10	1.6E-09	1.6E-11	1.9E-09	1.9E-09
TE 129Y	4.4E-07	2.7E-06	1.7E-10	3.2E-06	3.2E-06
TE 129	8.6E-11	8.2E-10	1.9E-10	9.0E-10	1.1E-09
■ 129	8.6E-10	2.3E-07	3.0E-12	2.3E-07	2.3E-07
TE 131Y	2.6E-10	2.6E-10	1.9E-11	4.6E-10	4.7E-10
TE 131	6.6E-13	6.7E-13	1.3E-12	1.2E-12	2.4E-12
1 131	3.7E-02	3.2E+00	6.1E-03	3.3E+00	3.3E+00
XE 131Y	0.0E+00	0.0E+00	7.4E-07	0.0E+00	7.4E-07
TE 132	8.6E-08	1.3E-07	1.4E-09	2.2E-07	2.2E-07
■ 132	9.4E-05	6.7E-05	3.1E-04	1.6E-04	4.7E-04
XE 133M	0.0E+00	0.0E+00	3.1E-07	0.0E+00	3.1E-07
XE 133	0.0E+00	0.0E+00	5.7E-05	0.0E+00	5.7E-05
CS 134	1.1E-09	3.4E-08	1.6E-09	3.6E-08	3.7E-08
CS 137	6.6E-09	2.4E-07	6.2E-09	2.4E-07	2.5E-07
BA 141	1.2E-07	1.1E-06	2.0E-08	1.2E-06	1.3E-06
LA 141	1.7E-07	1.1E-06	2.8E-07	1.3E-06	1.5E-06
CS 136	1.3E-09	1.1E-08	1.1E-19	1.3E-08	1.4E-08
CE 141	3.3E-07	4.6E-07	9.7E-09	7.9E-07	8.0E-07
CE 143	1.5E-09	1.1E-09	7.3E-11	2.6E-09	2.6E-09
FR 143	3.4E-07	5.0E-07	5.2E-11	9.2E-07	9.2E-07
CE 144	2.6E-06	9.2E-07	2.0E-09	3.6E-06	3.6E-06
FR 144Y	1.9E-12	3.0E-11	5.3E-12	3.2E-11	3.7E-11
FR 144	3.2E-10	5.2E-09	9.0E-09	5.5E-09	1.6E-08
ND 147	1.0E-07	1.6E-07	4.1E-09	2.6E-07	2.6E-07
PY 147	3.1E-08	6.0E-09	3.0E-13	3.8E-08	3.8E-08
SM 147	1.1E-19	1.0E-18	0.0E+00	1.1E-18	1.1E-18
RM 148Y	2.4E-09	3.8E-09	1.8E-09	6.2E-09	8.1E-09
PY 148	4.6E-10	8.9E-10	5.3E-11	1.3E-09	1.4E-09
PY 149	2.0E-09	2.2E-09	6.1E-12	4.2E-09	4.2E-09
SY 161	1.4E-10	1.3E-11	1.4E-10	1.5E-10	1.5E-10
SY 163	2.2E-10	2.2E-10	4.1E-12	4.4E-10	4.5E-10
EU 162	9.2E-13	2.2E-13	2.2E-13	1.1E-12	1.3E-12
EU 164	4.1E-10	1.1E-10	7.8E-11	5.2E-10	5.9E-10
EU 166	2.8E-10	8.0E-11	8.1E-12	3.6E-10	3.7E-10
EU 168	9.6E-09	1.8E-08	2.8E-09	2.8E-08	3.1E-08
TB 168	5.9E-12	8.5E-12	3.1E-12	1.4E-11	1.8E-11

 GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides, 500MWd, 10 DAY COOLED

Executed on: 09/19/88 at 22:16:17

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Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
U 236	1.0E-10	1.3E-13	1.0E-10	1.0E-10	1.0E-10
U 236	2.5E-10	3.3E-13	0.5E-10	2.5E-10	2.5E-10
TH 231	1.7E-15	1.0E-14	4.1E-10	1.0E-14	1.0E-14
PA 231	5.0E-15	8.0E-10	3.2E-20	0.5E-15	0.5E-15
AC 227	1.9E-17	3.3E-18	1.1E-24	2.3E-17	2.3E-17
TH 227	2.4E-19	9.2E-21	9.5E-22	2.5E-19	2.5E-19
FR 223	1.0E-24	2.2E-23	5.7E-24	2.4E-23	2.9E-23
RA 223	1.2E-19	0.0E-20	2.0E-21	1.0E-19	1.0E-19
U 237	2.1E-08	3.0E-08	1.0E-09	0.0E-08	0.1E-08
NP 237	4.3E-10	3.1E-11	2.9E-10	4.0E-10	4.0E-10
PA 233	3.0E-15	1.3E-14	0.0E-15	1.0E-14	2.3E-14
U 233	1.0E-15	2.3E-18	1.0E-22	1.0E-15	1.0E-15
TH 229	2.0E-17	4.0E-19	3.0E-23	2.0E-17	2.0E-17
RA 225	1.1E-19	2.4E-20	1.7E-24	1.3E-19	1.3E-19
AC 225	1.2E-19	1.1E-20	1.7E-22	1.3E-19	1.3E-19
U 238	5.3E-09	0.0E-12	7.9E-17	5.3E-09	5.3E-09
TH 234	1.3E-12	3.9E-12	4.0E-14	5.2E-12	5.2E-12
PA 234	4.3E-17	1.0E-15	0.1E-15	1.1E-15	7.2E-15
NP 238	7.4E-10	5.5E-11	7.3E-12	7.9E-10	8.0E-10
PU 238	7.4E-08	5.0E-10	4.1E-10	7.5E-08	7.5E-08
PU 240	3.0E-07	2.7E-09	1.9E-15	3.7E-07	3.7E-07
PU 241	2.2E-07	1.7E-09	0.7E-20	2.2E-07	2.2E-07
AM 241	1.9E-09	1.7E-10	7.0E-15	2.1E-09	2.1E-09
NP 239	2.9E-07	3.0E-07	1.0E-08	0.5E-07	0.0E-07
PU 239	2.0E-06	1.9E-08	2.0E-14	2.0E-06	2.0E-06

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945

Executed on: 89/23/89 at 17:25:34

Page A. 1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Infinite plume, external
 Ground, external
 Inhalation uptake
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

Input file name: \GENII\BANDIR\NOMILK.in 9-23-89
 METABOLIC PARAMETERS----- 8-12-88
 RMDLIB - Radionuclide Master Library (29-Aug-88 RAP) 8-29-88
 Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA 8-29-88
 External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88 8-29-88
 Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP 8-29-88

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-----Release Terms-----			
Release	Surface Buried		
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3

H 3	8.5E+00	0.0E+00	0.0E+00
CD80	3.2E+00	0.0E+00	0.0E+00
SE79	0.8E+00	0.0E+00	0.0E+00
KR85	1.7E+02	0.0E+00	0.0E+00
RB86	8.4E+05	0.0E+00	0.0E+00
SR89	1.1E+00	0.0E+00	0.0E+00
SR90	1.3E+02	0.0E+00	0.0E+00
Y 90	1.3E+02	0.0E+00	0.0E+00
Y 91	1.3E+00	0.0E+00	0.0E+00
ZR93	3.0E+07	0.0E+00	0.0E+00
NB93M	2.4E+08	0.0E+00	0.0E+00
ZR95	1.5E+00	0.0E+00	0.0E+00
NB95M	1.1E+02	0.0E+00	0.0E+00
NB95	1.2E+00	0.0E+00	0.0E+00
MD99	2.0E+03	0.0E+00	0.0E+00
TC99M	2.5E+03	0.0E+00	0.0E+00
TC99	2.2E+06	0.0E+00	0.0E+00
RU103	1.2E+04	0.0E+00	0.0E+00
RU106	8.0E+02	0.0E+00	0.0E+00
RH103M	1.0E+00	0.0E+00	0.0E+00
AG110M	4.0E+05	0.0E+00	0.0E+00
AG111	7.0E+03	0.0E+00	0.0E+00
CD113M	8.3E+06	0.0E+00	0.0E+00
CD115M	2.1E+03	0.0E+00	0.0E+00
CD115	5.5E+06	0.0E+00	0.0E+00

IN116M	6.1E-06	0.0E+00	0.0E+00
SN119M	9.7E-06	0.0E+00	0.0E+00
SN123	2.6E-03	0.0E+00	0.0E+00
SN126	4.6E-03	0.0E+00	0.0E+00
SN126	1.3E-07	0.0E+00	0.0E+00
SB126	3.3E-03	0.0E+00	0.0E+00
SB126M	1.3E-07	0.0E+00	0.0E+00
SB126	3.1E-04	0.0E+00	0.0E+00
SB124	4.7E-06	0.0E+00	0.0E+00
SB127	1.3E-03	0.0E+00	0.0E+00
TE126M	3.4E-04	0.0E+00	0.0E+00
TE127M	8.2E-03	0.0E+00	0.0E+00
TE127	9.3E-03	0.0E+00	0.0E+00
TE129M	3.9E-02	0.0E+00	0.0E+00
TE129	2.6E-02	0.0E+00	0.0E+00
TE131M	2.2E-08	0.0E+00	0.0E+00
TE131	6.0E-09	0.0E+00	0.0E+00
TE132	6.6E-03	0.0E+00	0.0E+00
I 129	3.8E-04	0.0E+00	0.0E+00
I 131	1.4E-04	0.0E+00	0.0E+00
I 132	4.7E-02	0.0E+00	0.0E+00
XE131M	1.1E-03	0.0E+00	0.0E+00
XE133M	2.0E+00	0.0E+00	0.0E+00
XE133	1.3E-04	0.0E+00	0.0E+00
CS134	1.7E-03	0.0E+00	0.0E+00
CS136	4.6E-03	0.0E+00	0.0E+00
CS137	1.6E-02	0.0E+00	0.0E+00
BA140	9.2E-01	0.0E+00	0.0E+00
LA140	1.1E+00	0.0E+00	0.0E+00
CE141	1.6E+00	0.0E+00	0.0E+00
CE143	1.2E-06	0.0E+00	0.0E+00
CE144	4.4E-01	0.0E+00	0.0E+00
PR143	1.0E+00	0.0E+00	0.0E+00
PR144M	6.3E-03	0.0E+00	0.0E+00
PR144	4.4E-04	0.0E+00	0.0E+00
ND147	2.8E-01	0.0E+00	0.0E+00
PM147	6.9E-02	0.0E+00	0.0E+00
PM148M	6.1E-03	0.0E+00	0.0E+00
PM148	2.3E-03	0.0E+00	0.0E+00
PM149	8.8E-06	0.0E+00	0.0E+00
SM151	3.1E-04	0.0E+00	0.0E+00
SM153	6.8E-06	0.0E+00	0.0E+00
EU152	2.9E-07	0.0E+00	0.0E+00
EU154	1.0E-04	0.0E+00	0.0E+00
EU156	4.6E-04	0.0E+00	0.0E+00
EU156	1.8E-02	0.0E+00	0.0E+00
TB160	1.3E-06	0.0E+00	0.0E+00
TH231	1.3E-07	0.0E+00	0.0E+00
PA231	6.9E-13	0.0E+00	0.0E+00
AC227	1.0E-16	0.0E+00	0.0E+00
TH227	1.0E-16	0.0E+00	0.0E+00
FR223	1.0E-16	0.0E+00	0.0E+00
RA223	1.0E-16	0.0E+00	0.0E+00
TH234	2.7E-06	0.0E+00	0.0E+00
PA234	3.6E-09	0.0E+00	0.0E+00
U 236	1.3E-07	0.0E+00	0.0E+00
U 236	6.6E-08	0.0E+00	0.0E+00
U 237	6.0E-02	0.0E+00	0.0E+00
U 238	3.0E-06	0.0E+00	0.0E+00
NP237	4.8E-08	0.0E+00	0.0E+00
PA233	3.2E-08	0.0E+00	0.0E+00
U 233	8.9E-13	0.0E+00	0.0E+00
TH229	1.0E-16	0.0E+00	0.0E+00
RA226	1.0E-16	0.0E+00	0.0E+00
AC226	1.0E-16	0.0E+00	0.0E+00
NP238	1.8E-06	0.0E+00	0.0E+00
NP239	2.3E-02	0.0E+00	0.0E+00
PU238	1.7E-06	0.0E+00	0.0E+00
PU239	6.0E-04	0.0E+00	0.0E+00
PU240	8.2E-06	0.0E+00	0.0E+00

PU241 2.9E-03 0.0E+00 0.0E+00
 AM241 5.4E-07 0.0E+00 0.0E+00

===== AIR TRANSPORT =====
 5.6E-08 Input chi/Q value (s/m3)

===== EXTERNAL EXPOSURE =====
 8.8E+03 Hours of exposure to plume
 4.4E+03 Hours of exposure to ground contamination

===== INHALATION =====
 8.8E+03 Hours of inhalation exposure per year
 1 Resuspension model: 1-Mass Loading, 2-Anspaugh
 1.0E-04 Mass loading factor (g/m3)

===== INGESTION POPULATION =====
 1 Atmospheric production definition: 1 - Use population-weighted chi/Q

===== TERRESTRIAL FOOD INGESTION =====

FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5	1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0	5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0	5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8	180.0	8.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC- TION	GROW TIME d	---STORED FEED---		STOR- AGE d		
	CONSUMPTION RATE kg/yr	HOLDUP d					--IRRIGATION-- S RATE * in/yr	TIME mo/yr			
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.0	0.80	180.0
Poultry	1.8E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
Cow Milk	2.7E+02	1.0		0.00	0.3	45.00	0	0.0	0.0	2.00	100.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0

-----FRESH FORAGE-----											
Meat					0.75	45.0	0	0.0	0.0	2.00	100.0
Cow Milk					0.75	30.0	0	0.0	0.0	1.50	0.0

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945

Executed on: 09/23/89 at 17:40:19

Page C. 9

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.1E-08	9.5E-08	1.1E-17	1.1E-07	1.1E-07
CO 60	9.0E-06	8.0E-06	4.9E-06	1.0E-05	2.0E-05
SE 79	9.0E-15	3.1E-12	7.9E-20	3.1E-12	3.1E-12
KR 85	0.0E+00	0.0E+00	5.4E-09	0.0E+00	5.4E-09
SR 89	9.2E-08	9.0E-07	3.5E-10	9.9E-07	9.9E-07
RB 88	7.7E-12	9.1E-11	4.7E-13	9.9E-11	9.9E-11
SR 90	4.1E-08	2.0E-07	9.7E-13	3.0E-07	3.0E-07
Y 90	1.7E-09	1.4E-08	5.4E-11	1.5E-08	1.5E-08
Y 91	9.7E-07	8.9E-07	1.3E-09	1.9E-06	1.9E-06
ZR 93	3.7E-13	4.4E-14	9.2E-21	4.1E-13	4.1E-13
NB 93M	1.1E-14	1.1E-15	3.7E-19	1.2E-14	1.2E-14
ZR 95	3.5E-07	4.1E-07	1.9E-07	7.0E-07	9.5E-07
NB 95M	4.2E-10	2.1E-09	1.1E-10	2.5E-09	2.7E-09
NB 95	1.0E-07	2.7E-07	3.0E-07	3.7E-07	6.7E-07
MO 99	7.8E-11	1.4E-10	6.8E-12	2.2E-10	2.3E-10
TC 99M	1.2E-12	6.6E-12	3.9E-12	7.8E-12	1.2E-11
TC 99	3.0E-13	7.1E-12	1.6E-17	7.4E-12	7.4E-12
RU 103	1.0E-03	2.4E-03	7.2E-04	4.0E-03	4.7E-03
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	7.4E-11	4.2E-05	1.3E-07	4.2E-05	4.2E-05
RU 106	6.1E-03	2.2E-03	9.7E-05	8.3E-03	8.4E-03
AG 110M	5.0E-11	4.7E-10	4.3E-11	5.2E-10	5.6E-10
AG 111	3.7E-10	5.3E-09	6.6E-12	5.7E-09	5.7E-09
CD 113M	1.9E-10	2.0E-10	7.5E-10	3.9E-10	3.9E-10
CD 115M	2.3E-09	2.7E-09	6.7E-12	5.0E-09	5.0E-09
CD 115	3.2E-13	4.1E-13	2.1E-14	7.3E-13	7.5E-13
IN 115M	1.1E-14	2.0E-14	1.9E-14	3.7E-14	5.6E-14
SN 119M	9.0E-12	1.8E-11	2.8E-14	2.7E-11	2.7E-11
SN 123	1.3E-09	2.0E-09	6.6E-12	3.0E-09	3.0E-09
SN 125	1.1E-09	2.2E-09	5.2E-11	3.3E-09	3.4E-09
SB 125	6.1E-10	9.3E-10	9.4E-10	1.5E-09	2.5E-09
TE 125M	3.7E-11	5.2E-10	1.0E-12	5.6E-10	5.6E-10
SN 126	1.9E-13	3.8E-13	1.4E-15	5.7E-13	5.6E-13
SB 126M	5.9E-17	1.8E-15	1.5E-13	1.9E-15	1.5E-13
SB 126	5.5E-11	1.5E-10	3.8E-11	2.0E-10	2.4E-10
SB 124	1.0E-11	3.7E-11	1.6E-11	5.5E-11	7.1E-11
SB 127	1.2E-10	2.0E-10	1.9E-11	3.2E-10	3.4E-10

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945

Executed on: 89/23/89 at 17:48:19

Page C. 18

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 127M	2.6E-09	9.9E-09	1.9E-12	1.2E-08	1.2E-08
TE 127	4.6E-11	8.5E-10	1.1E-11	9.0E-10	9.1E-10
TE 129M	2.9E-07	1.8E-06	1.1E-10	2.1E-06	2.1E-06
TE 129	5.9E-11	5.5E-10	1.4E-10	6.1E-10	7.5E-10
I 129	8.6E-10	2.3E-07	3.0E-12	2.3E-07	2.3E-07
TE 131M	4.0E-15	3.1E-15	4.8E-16	7.1E-15	7.6E-15
TE 131	9.4E-18	8.8E-18	3.1E-17	1.8E-17	4.9E-17
I 131	6.5E-03	6.0E-01	1.1E-03	6.0E-01	6.0E-01
XE 131M	0.0E+00	0.0E+00	1.8E-07	0.0E+00	1.8E-07
TE 132	1.2E-09	1.9E-09	2.7E-11	3.1E-09	3.1E-09
I 132	2.8E-06	2.0E-06	1.6E-05	4.7E-06	2.0E-05
XE 133M	0.0E+00	0.0E+00	6.7E-10	0.0E+00	6.7E-10
XE 133	0.0E+00	0.0E+00	3.6E-06	0.0E+00	3.6E-06
CS 134	1.1E-09	3.4E-08	1.6E-09	3.5E-08	3.7E-08
CS 137	6.6E-09	2.4E-07	6.2E-09	2.4E-07	2.5E-07
BA 140	4.3E-08	3.8E-07	7.9E-09	4.3E-07	4.3E-07
LA 140	6.0E-08	3.8E-07	1.1E-07	4.4E-07	5.5E-07
CS 136	4.5E-10	4.1E-09	4.5E-10	4.5E-09	5.0E-09
CE 141	2.1E-07	3.0E-07	6.3E-09	5.0E-07	5.1E-07
CE 143	6.3E-14	4.4E-14	4.1E-15	1.1E-13	1.1E-13
PR 143	1.2E-07	2.1E-07	2.7E-11	3.3E-07	3.3E-07
CE 144	2.4E-06	8.5E-07	1.9E-09	3.3E-06	3.3E-06
PR 144M	1.5E-12	2.8E-11	5.1E-12	2.9E-11	3.4E-11
PR 144	3.0E-13	4.8E-09	8.3E-09	4.8E-09	1.3E-08
ND 147	2.8E-08	4.6E-08	1.3E-09	7.4E-08	7.5E-08
PM 147	3.5E-08	7.0E-09	3.2E-13	4.2E-08	4.2E-08
SM 147	3.0E-21	1.0E-18	0.0E+00	1.0E-18	1.0E-18
PM 148M	1.7E-09	2.7E-09	1.3E-09	4.4E-09	5.7E-09
PM 148	3.9E-10	7.4E-10	5.1E-11	1.1E-09	1.2E-09
PM 149	4.0E-12	4.4E-12	1.7E-14	8.3E-12	8.4E-12
SM 151	1.4E-10	1.3E-11	1.4E-10	1.5E-10	1.5E-10
SM 153	1.7E-13	1.9E-13	4.0E-15	3.6E-13	3.6E-13
EU 152	9.2E-13	2.2E-13	2.2E-13	1.1E-12	1.4E-12
EU 154	4.1E-10	1.1E-10	7.9E-11	5.2E-10	5.9E-10
EU 155	2.7E-10	8.0E-11	8.1E-12	3.5E-10	3.6E-10
EU 156	3.9E-09	7.5E-09	1.3E-09	1.1E-08	1.3E-08
TB 160	5.0E-12	6.9E-12	2.6E-12	1.2E-11	1.4E-11

GENII Dose Calculation Program
(Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945

Executed on: 89/23/89 at 17:48:19

Page C. 11

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
U 238	1.0E-10	1.3E-13	1.2E-10	1.0E-10	1.0E-10
U 235	2.5E-10	3.3E-13	6.5E-15	2.5E-10	2.5E-10
TH 231	1.7E-15	1.6E-14	4.0E-16	1.0E-14	1.0E-14
PA 231	7.7E-15	1.1E-15	3.4E-20	8.8E-15	8.8E-15
AC 227	1.9E-17	3.7E-18	1.2E-24	2.3E-17	2.3E-17
TH 227	2.4E-19	1.0E-20	1.1E-21	2.5E-19	2.6E-19
FR 223	7.0E-23	2.5E-23	6.9E-24	9.4E-23	1.0E-22
RA 223	1.2E-19	7.3E-20	2.9E-21	1.9E-19	1.9E-19
U 237	2.7E-09	5.0E-09	1.5E-10	7.7E-09	7.8E-09
NP 237	4.6E-10	3.1E-11	3.1E-16	4.9E-10	4.9E-10
PA 233	4.6E-15	1.5E-14	6.8E-15	2.0E-14	2.7E-14
U 233	1.0E-15	2.3E-18	1.0E-22	1.8E-15	1.8E-15
TH 229	2.6E-17	4.0E-19	3.0E-23	2.6E-17	2.6E-17
RA 225	1.1E-19	2.4E-20	1.7E-24	1.3E-19	1.3E-19
AC 225	1.2E-19	1.1E-20	1.7E-22	1.3E-19	1.3E-19
U 230	5.3E-09	6.8E-12	5.8E-17	5.3E-09	5.3E-09
TH 234	1.4E-12	4.0E-12	4.0E-14	5.4E-12	5.5E-12
PA 234	4.5E-17	1.1E-15	6.1E-15	1.1E-15	7.2E-15
NP 238	1.1E-12	8.6E-14	1.7E-14	1.2E-12	1.2E-12
PU 238	7.4E-08	5.0E-10	2.5E-16	7.5E-08	7.5E-08
PU 240	3.6E-07	2.7E-09	1.2E-15	3.7E-07	3.7E-07
PU 241	2.2E-07	1.7E-09	8.0E-20	2.2E-07	2.2E-07
AM 241	3.6E-09	2.5E-10	8.3E-15	3.9E-09	3.9E-09
NP 239	8.5E-10	9.9E-10	5.8E-11	1.8E-09	1.9E-09
PU 239	2.0E-06	1.9E-08	1.8E-14	2.8E-06	2.8E-06

 GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides, 500MWd, 90 DAY COOLED

Executed on: 09/19/88 at 22:16:36

Page A. 1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Finite plume, external
 Ground, external
 Inhalation uptake
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

	\\GENII\\BANDIR\\overfill.in	9-19-88
GENII Default Parameter Values (3-Aug-88 RAP)		8-12-88
RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)		8-29-88
Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA		8-29-88
External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88		8-29-88
Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP		8-29-88
200 Area Population (Sommer, Rau, and Robinson, PNL-4010)		
2100 AREA - 10 M - Pasquill A - F (1987)		

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-----Release Terms-----			
Release	Surface Buried		
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3

H 3	0.4E+00	0.0E+00	0.0E+00
C 14	3.7E-02	0.0E+00	0.0E+00
SE79	0.0E+00	0.0E+00	0.0E+00
KR85	1.7E+02	0.0E+00	0.0E+00
RB86	9.0E-06	0.0E+00	0.0E+00
SR89	4.9E-01	0.0E+00	0.0E+00
SR90	1.3E-02	0.0E+00	0.0E+00
Y 90	1.3E-02	0.0E+00	0.0E+00
Y 91	0.6E-01	0.0E+00	0.0E+00
ZR93	3.0E-07	0.0E+00	0.0E+00
NB93M	4.8E-09	0.0E+00	0.0E+00
ZR95	7.9E-01	0.0E+00	0.0E+00
NB95M	5.9E-03	0.0E+00	0.0E+00
NB95	1.1E+00	0.0E+00	0.0E+00
MO99	7.2E-10	0.0E+00	0.0E+00
TC99M	0.9E-10	0.0E+00	0.0E+00
TC99	2.2E-06	0.0E+00	0.0E+00
RU103	4.0E+03	0.0E+00	0.0E+00
RU106	7.6E+02	0.0E+00	0.0E+00
RH103M	3.6E-01	0.0E+00	0.0E+00
AG110M	3.4E-05	0.0E+00	0.0E+00
AG111	2.8E-02	0.0E+00	0.0E+00
CD113M	0.2E-06	0.0E+00	0.0E+00

CD115M	8.1E-04	0.0E+00	0.0E+00
CD115	4.3E-14	0.0E+00	0.0E+00
IN115M	5.7E-08	0.0E+00	0.0E+00
SN119M	8.2E-05	0.0E+00	0.0E+00
SN123	1.0E-03	0.0E+00	0.0E+00
SN125	6.0E-05	0.0E+00	0.0E+00
SN126	1.3E-07	0.0E+00	0.0E+00
SB125	3.3E-03	0.0E+00	0.0E+00
SB126M	1.3E-07	0.0E+00	0.0E+00
SB126	1.1E-05	0.0E+00	0.0E+00
SB124	2.3E-05	0.0E+00	0.0E+00
SB127	2.6E-08	0.0E+00	0.0E+00
TE125M	5.5E-04	0.0E+00	0.0E+00
TE127M	5.6E-03	0.0E+00	0.0E+00
TE127	5.5E-03	0.0E+00	0.0E+00
TE129M	1.1E-02	0.0E+00	0.0E+00
TE129	7.3E-03	0.0E+00	0.0E+00
TE131M	7.9E-23	0.0E+00	0.0E+00
TE131	1.7E-23	0.0E+00	0.0E+00
TE132	1.9E-08	0.0E+00	0.0E+00
I 129	3.8E-04	0.0E+00	0.0E+00
I 131	7.7E-01	0.0E+00	0.0E+00
I 132	1.3E-08	0.0E+00	0.0E+00
XE131M	4.3E-01	0.0E+00	0.0E+00
XE133M	1.1E-08	0.0E+00	0.0E+00
XE133	4.6E-00	0.0E+00	0.0E+00
CS134	1.0E-03	0.0E+00	0.0E+00
CS136	1.9E-04	0.0E+00	0.0E+00
CS137	1.0E-02	0.0E+00	0.0E+00
BA140	3.6E-02	0.0E+00	0.0E+00
LA140	4.1E-02	0.0E+00	0.0E+00
CE141	4.6E-01	0.0E+00	0.0E+00
CE143	9.2E-20	0.0E+00	0.0E+00
CE144	3.8E-01	0.0E+00	0.0E+00
PR143	4.7E-02	0.0E+00	0.0E+00
PR144M	4.6E-03	0.0E+00	0.0E+00
PR144	3.8E-01	0.0E+00	0.0E+00
ND147	6.4E-03	0.0E+00	0.0E+00
PW147	6.0E-02	0.0E+00	0.0E+00
PW148M	1.9E-03	0.0E+00	0.0E+00
PW148	1.1E-04	0.0E+00	0.0E+00
PW149	6.0E-13	0.0E+00	0.0E+00
SM151	3.1E-04	0.0E+00	0.0E+00
SM153	3.0E-15	0.0E+00	0.0E+00
EU152	2.9E-07	0.0E+00	0.0E+00
EU154	1.0E-04	0.0E+00	0.0E+00
EU155	4.4E-04	0.0E+00	0.0E+00
EU156	1.2E-03	0.0E+00	0.0E+00
TB160	7.5E-06	0.0E+00	0.0E+00
TH231	1.3E-07	0.0E+00	0.0E+00
PA231	1.1E-12	0.0E+00	0.0E+00
AC227	1.0E-15	0.0E+00	0.0E+00
TH227	1.0E-15	0.0E+00	0.0E+00
FR223	1.0E-15	0.0E+00	0.0E+00
RA223	1.0E-15	0.0E+00	0.0E+00
TH234	3.0E-08	0.0E+00	0.0E+00
PA234	3.9E-09	0.0E+00	0.0E+00
U 235	1.3E-07	0.0E+00	0.0E+00
U 236	5.5E-08	0.0E+00	0.0E+00
U 237	1.1E-04	0.0E+00	0.0E+00
U 238	3.0E-06	0.0E+00	0.0E+00
NP237	4.5E-08	0.0E+00	0.0E+00
PA233	4.5E-08	0.0E+00	0.0E+00
U 233	9.2E-13	0.0E+00	0.0E+00
TH229	1.0E-15	0.0E+00	0.0E+00
RA225	1.0E-15	0.0E+00	0.0E+00
AC225	1.0E-15	0.0E+00	0.0E+00
NP236	7.4E-12	0.0E+00	0.0E+00
NP239	1.1E-09	0.0E+00	0.0E+00
PU238	1.7E-05	0.0E+00	0.0E+00

PU239 0.0E+00 0.0E+00 0.0E+00
 PU240 0.2E+05 0.0E+00 0.0E+00
 PU241 2.9E+03 0.0E+00 0.0E+00
 AM241 1.2E+06 0.0E+00 0.0E+00

===== AIR TRANSPORT =====
 Joint frequency data input.
 MI distance, direction, and chi/Q will be selected by the program.
 Ground level release.

===== EXTERNAL EXPOSURE =====
 8.8E+03 Hours of exposure to plume
 4.4E+03 Hours of exposure to ground contamination

===== INHALATION =====
 8.8E+03 Hours of exposure to contamination per year
 1 Resuspension model: 1-Mass Loading, 2-Anspaugh
 1.0E+04 Mass loading factor (g/m3)

===== INGESTION POPULATION =====
 1 Atmospheric production definition: 1 - Use population-weighted chi/Q

===== TERRESTRIAL FOOD INGESTION =====

FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5	1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0	5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0	5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8	180.0	8.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD TYPE	---HUMAN---		TOTAL PRODUCTION kg/yr	DRINK WATER CONTAM FRACT.	---STORED FEED---						
	CONSUMPTION RATE kg/yr	HOLDUP d			DIET FRAC- TION	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	STOR- YIELD AGE kg/m3 d		
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.0	0.80	180.0
Poultry	1.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
Cow Milk	2.7E+02	1.0		0.00	0.3	45.00	0	0.0	0.0	2.00	100.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0

-----FRESH FORAGE-----							
Meat	0.75	45.0	0	0.0	0.0	2.00	100.0
Cow Milk	0.75	30.0	0	0.0	0.0	1.50	0.0

Input prepared by: _____ Date: _____
 Input checked by: _____ Date: _____

=====

GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides, 500MWd, 90 DAY COOLED

Executed on: 09/19/88 at 22:31:42

Page C. 9

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.1E-08	9.4E-08	0.0E+00	1.1E-07	1.1E-07
C 14	1.1E-09	1.7E-07	0.0E+00	1.7E-07	1.7E-07
SE 79	9.0E-16	3.1E-12	7.5E-20	3.1E-12	3.1E-12
KR 85	0.0E+00	0.0E+00	2.1E-09	0.0E+00	2.1E-09
SR 89	4.0E-08	4.0E-07	1.4E-10	4.4E-07	4.4E-07
RB 86	8.3E-13	9.8E-12	4.6E-14	1.1E-11	1.1E-11
SR 90	4.1E-08	2.0E-07	9.4E-13	3.0E-07	3.0E-07
Y 90	1.7E-09	1.4E-08	5.3E-11	1.5E-08	1.5E-08
Y 91	4.9E-07	4.0E-07	0.0E-10	9.4E-07	9.4E-07
ZR 93	3.7E-13	4.4E-14	0.2E-21	4.1E-13	4.1E-13
NB 93M	2.2E-16	2.5E-16	1.9E-19	2.4E-16	2.4E-16
ZR 95	1.8E-07	2.1E-07	1.0E-07	3.9E-07	5.0E-07
NB 95M	2.2E-10	1.1E-09	5.9E-11	1.3E-09	1.4E-09
NB 95	9.7E-08	2.2E-07	1.9E-07	3.1E-07	5.0E-07
MO 99	2.2E-17	3.8E-17	1.3E-18	0.0E-17	6.2E-17
TC 99M	3.1E-19	1.0E-18	9.5E-19	2.1E-18	3.1E-18
TC 99	3.0E-13	7.1E-12	1.0E-17	7.4E-12	7.4E-12
RU 103	5.4E-04	7.9E-04	2.2E-04	1.3E-03	1.6E-03
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	2.4E-07	1.4E-06	0.1E-08	1.5E-06	1.5E-06
RU 106	5.1E-03	2.0E-03	0.5E-05	7.1E-03	7.2E-03
AQ 110M	4.3E-11	4.1E-10	3.7E-11	4.5E-10	4.9E-10
AG 111	1.4E-09	1.9E-08	2.0E-11	2.1E-08	2.1E-08
CD 113M	1.8E-10	1.9E-10	0.9E-10	3.7E-10	3.7E-10
CD 115M	0.0E-10	1.0E-09	2.5E-12	1.9E-09	1.9E-09
CD 116	2.4E-21	3.1E-21	1.0E-22	5.5E-21	5.6E-21
IN 116M	7.2E-17	1.5E-17	4.5E-17	0.8E-17	1.3E-16
SN 119M	7.2E-12	1.5E-11	2.0E-14	2.2E-11	2.2E-11
SN 123	0.7E-10	1.0E-09	4.4E-12	2.0E-09	2.0E-09
SN 125	1.4E-11	3.0E-11	5.8E-13	4.4E-11	4.4E-11
SB 125	0.1E-10	9.3E-10	9.2E-10	1.5E-09	2.5E-09
TE 125M	0.0E-11	0.1E-10	1.2E-12	0.7E-10	0.7E-10
SN 126	1.9E-13	3.0E-13	1.4E-15	5.7E-13	5.8E-13
SB 126M	5.9E-17	1.0E-16	1.5E-13	1.9E-16	1.5E-13
SB 126	2.0E-12	5.3E-12	1.2E-12	7.3E-12	0.5E-12
SB 124	0.0E-12	1.0E-11	7.3E-12	2.7E-11	3.5E-11
SB 127	2.3E-16	3.9E-16	2.0E-16	0.2E-16	0.5E-16

GENII Dose Calculation Program
(Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides, 500MWd, 90 DAY COOLED

Executed on: 09/19/88 at 22:31:42

Page C. 10

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 127M	1.8E-09	6.7E-09	1.4E-12	8.5E-09	8.5E-09
TE 127	2.7E-11	5.7E-10	7.0E-12	6.0E-10	6.1E-10
TE 129M	8.4E-08	5.1E-07	3.1E-11	5.9E-07	5.9E-07
TE 129	1.7E-11	1.5E-10	3.6E-11	1.7E-10	2.1E-10
I 129	8.6E-10	2.3E-07	3.0E-12	2.3E-07	2.3E-07
TE 131M	1.3E-29	1.1E-29	9.6E-31	2.4E-29	2.5E-29
TE 131	3.1E-32	3.0E-32	6.6E-32	6.1E-32	1.3E-31
I 131	3.7E-05	3.2E-03	6.1E-08	3.3E-03	3.3E-03
XE 131M	0.0E+00	0.0E+00	6.4E-09	0.0E+00	6.4E-09
TE 132	3.5E-15	5.4E-15	5.9E-17	9.0E-15	9.0E-15
I 132	9.4E-17	3.0E-16	6.7E-16	3.9E-16	1.1E-15
XE 133M	0.0E+00	0.0E+00	3.1E-18	0.0E+00	3.1E-18
XE 133	0.0E+00	0.0E+00	1.4E-09	0.0E+00	1.4E-09
CS 134	1.0E-09	3.2E-08	1.5E-09	3.3E-08	3.5E-08
CS 137	6.6E-09	2.4E-07	6.2E-09	2.4E-07	2.5E-07
BA 140	1.6E-09	1.5E-08	2.7E-10	1.6E-08	1.7E-08
LA 140	2.2E-09	1.5E-08	3.6E-09	1.7E-08	2.1E-08
CS 136	1.9E-11	1.7E-10	1.7E-11	1.9E-10	2.0E-10
CE 141	6.0E-08	8.4E-08	1.7E-09	1.4E-07	1.5E-07
CE 143	4.6E-27	3.2E-27	2.3E-28	7.8E-27	8.0E-27
PR 143	5.7E-09	9.7E-09	8.7E-13	1.5E-08	1.5E-08
CE 144	2.1E-06	7.4E-07	1.6E-09	2.8E-06	2.8E-06
PR 144M	1.5E-12	2.4E-11	4.4E-12	2.6E-11	3.0E-11
PR 144	2.6E-10	4.2E-09	7.2E-09	4.5E-09	1.2E-08
ND 147	6.5E-10	1.0E-09	2.6E-11	1.7E-09	1.7E-09
PM 147	3.6E-08	6.8E-09	3.0E-13	4.2E-08	4.2E-08
SM 147	1.2E-19	1.0E-18	0.0E+00	1.1E-18	1.1E-18
PM 148M	6.4E-10	9.9E-10	4.8E-10	1.6E-09	2.1E-09
PM 148	1.9E-11	7.5E-11	6.8E-12	9.4E-11	1.0E-10
PM 149	2.7E-20	2.9E-20	7.8E-23	5.6E-20	5.8E-20
SM 151	1.4E-10	1.3E-11	1.4E-10	1.5E-10	1.5E-10
SM 153	8.7E-23	9.2E-23	1.7E-24	1.8E-22	1.8E-22
EU 152	9.2E-13	2.2E-13	2.2E-13	1.1E-12	1.3E-12
EU 154	4.1E-10	1.1E-10	7.8E-11	5.2E-10	5.9E-10
EU 155	2.7E-10	7.8E-11	7.5E-12	3.4E-10	3.5E-10
EU 156	2.6E-10	5.1E-10	7.5E-11	7.6E-10	8.4E-10
TB 160	2.7E-12	4.0E-12	1.5E-12	6.7E-12	8.2E-12

 GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides, 500MWd, 90 DAY COOLED

Executed on: 09/19/88 at 22:31:42

Page C. 11

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
U 236	1.0E-10	1.3E-13	1.0E-10	1.0E-10	1.0E-10
U 236	2.5E-10	3.3E-13	0.5E-10	2.5E-10	2.5E-10
TH 231	1.7E-15	1.0E-14	4.1E-10	1.0E-14	1.0E-14
PA 231	1.5E-14	1.7E-15	4.5E-20	1.0E-14	1.0E-14
AC 227	1.9E-17	5.2E-10	1.0E-24	2.5E-17	2.5E-17
TH 227	2.4E-19	1.4E-20	1.5E-21	2.0E-19	2.0E-19
FR 223	1.0E-24	3.5E-23	0.0E-24	3.0E-23	4.5E-23
RA 223	1.2E-19	9.9E-20	4.0E-21	2.1E-19	2.2E-19
U 237	5.0E-12	1.1E-11	2.9E-13	1.0E-11	1.7E-11
NP 237	4.3E-10	2.9E-11	2.9E-10	4.0E-10	4.0E-10
PA 233	0.4E-15	1.7E-14	0.0E-15	2.4E-14	3.1E-14
U 233	1.9E-15	2.4E-10	1.1E-22	1.9E-15	1.9E-15
TH 229	2.0E-17	4.0E-19	3.0E-23	2.0E-17	2.0E-17
RA 225	1.1E-19	2.4E-20	1.7E-24	1.3E-19	1.3E-19
AC 225	1.2E-19	1.1E-20	1.7E-22	1.3E-19	1.3E-19
U 238	5.3E-09	0.0E-12	7.9E-17	5.3E-09	5.3E-09
TH 234	1.0E-12	4.3E-12	4.1E-14	5.0E-12	5.9E-12
PA 234	5.2E-17	1.1E-15	0.1E-15	1.2E-15	7.3E-15
NP 230	4.5E-10	3.4E-19	4.5E-20	4.0E-10	4.9E-10
PU 230	7.4E-00	5.0E-10	4.1E-10	7.5E-00	7.5E-00
PU 240	3.0E-07	2.7E-09	1.9E-15	3.7E-07	3.7E-07
PU 241	2.2E-07	1.7E-09	0.7E-20	2.2E-07	2.2E-07
AM 241	7.9E-09	4.0E-10	1.0E-14	0.4E-09	0.4E-09
NP 239	3.9E-17	4.0E-17	2.1E-10	0.5E-17	0.7E-17
PU 239	2.0E-06	1.9E-00	2.0E-14	2.0E-06	2.0E-06

 GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides @ 100 MWd, 30 DAYS COOLING -
 Air 1945

Executed on: 09/20/88 at 16:11:45

Page A. 1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Finite plume, external
 Ground, external
 Inhalation uptake
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

	\GENII\BANDIR\overfill.in	9-20-88
GENII Default Parameter Values (3-Aug-88 RAP)		8-12-88
RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)		8-29-88
Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA		8-29-88
External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88		8-29-88
Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP		8-29-88
200 Area Population (Sommer, Rau, and Robinson, PNL-4010)		
2100 AREA - 10 M - Pasquill A - F (1987)		

=====

-----Release Terms-----			
Release	Surface Buried		
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3

H 3	1.0E+00	0.0E+00	0.0E+00
C 14	0.0E+03	0.0E+00	0.0E+00
SE79	1.3E+08	0.0E+00	0.0E+00
KR85	3.7E+01	0.0E+00	0.0E+00
RB86	9.9E+06	0.0E+00	0.0E+00
SR89	3.1E+01	0.0E+00	0.0E+00
SR90	2.8E+03	0.0E+00	0.0E+00
Y 90	2.8E+03	0.0E+00	0.0E+00
Y 91	3.5E+01	0.0E+00	0.0E+00
ZR93	6.3E+08	0.0E+00	0.0E+00
NB93M	3.0E+10	0.0E+00	0.0E+00
ZR95	3.8E+01	0.0E+00	0.0E+00
NB95M	2.8E+03	0.0E+00	0.0E+00
NB95	2.2E+01	0.0E+00	0.0E+00
MO99	2.4E+03	0.0E+00	0.0E+00
TC99M	2.3E+03	0.0E+00	0.0E+00
TC99	4.5E+07	0.0E+00	0.0E+00
RU103	2.8E+03	0.0E+00	0.0E+00
RU106	1.2E+02	0.0E+00	0.0E+00
RH103M	2.5E+01	0.0E+00	0.0E+00
AG110M	1.1E+06	0.0E+00	0.0E+00
AG111	3.5E+03	0.0E+00	0.0E+00
CD113M	1.6E+06	0.0E+00	0.0E+00

CD115M	5.6E-04	0.0E+00	0.0E+00
CD115	5.6E-06	0.0E+00	0.0E+00
IN115M	6.1E-06	0.0E+00	0.0E+00
SN119M	2.2E-05	0.0E+00	0.0E+00
SN123	5.7E-04	0.0E+00	0.0E+00
SN125	2.2E-03	0.0E+00	0.0E+00
SN126	2.4E-06	0.0E+00	0.0E+00
SB125	6.4E-04	0.0E+00	0.0E+00
SB126M	2.4E-08	0.0E+00	0.0E+00
SB126	1.1E-04	0.0E+00	0.0E+00
SB124	3.0E-06	0.0E+00	0.0E+00
SB127	6.6E-04	0.0E+00	0.0E+00
TE125M	4.6E-05	0.0E+00	0.0E+00
TE127M	1.7E-03	0.0E+00	0.0E+00
TE127	2.5E-03	0.0E+00	0.0E+00
TE129M	1.0E-02	0.0E+00	0.0E+00
TE129	6.6E-03	0.0E+00	0.0E+00
TE131M	1.9E-08	0.0E+00	0.0E+00
TE131	4.3E-09	0.0E+00	0.0E+00
TE132	5.5E-03	0.0E+00	0.0E+00
I 129	5.6E-05	0.0E+00	0.0E+00
I 131	7.8E-03	0.0E+00	0.0E+00
I 132	4.0E+02	0.0E+00	0.0E+00
XE131M	4.1E+02	0.0E+00	0.0E+00
XE133M	1.9E+00	0.0E+00	0.0E+00
XE133	9.1E+03	0.0E+00	0.0E+00
CS134	2.9E-05	0.0E+00	0.0E+00
CS136	7.5E-04	0.0E+00	0.0E+00
CS137	3.1E-03	0.0E+00	0.0E+00
BA140	4.1E-01	0.0E+00	0.0E+00
LA140	4.7E-01	0.0E+00	0.0E+00
CE141	4.6E-01	0.0E+00	0.0E+00
CE143	1.3E-06	0.0E+00	0.0E+00
CE144	9.5E-02	0.0E+00	0.0E+00
PR143	4.5E-01	0.0E+00	0.0E+00
PR144M	1.1E-03	0.0E+00	0.0E+00
PR144	9.5E-02	0.0E+00	0.0E+00
ND147	1.3E-01	0.0E+00	0.0E+00
PM147	1.2E-02	0.0E+00	0.0E+00
PM148M	1.8E-04	0.0E+00	0.0E+00
PM148	9.8E-05	0.0E+00	0.0E+00
PM149	7.9E-05	0.0E+00	0.0E+00
SM151	7.8E-05	0.0E+00	0.0E+00
SM153	4.0E-06	0.0E+00	0.0E+00
EU152	6.8E-09	0.0E+00	0.0E+00
EU154	3.0E-06	0.0E+00	0.0E+00
EU155	1.3E-04	0.0E+00	0.0E+00
EU156	3.2E-03	0.0E+00	0.0E+00
TB160	5.2E-07	0.0E+00	0.0E+00
TH231	1.4E-07	0.0E+00	0.0E+00
PA231	3.2E-13	0.0E+00	0.0E+00
AC227	1.0E-15	0.0E+00	0.0E+00
TH227	1.0E-15	0.0E+00	0.0E+00
FR223	1.0E-15	0.0E+00	0.0E+00
RA223	1.0E-15	0.0E+00	0.0E+00
TH234	2.1E-06	0.0E+00	0.0E+00
PA234	2.7E-09	0.0E+00	0.0E+00
U 235	1.4E-07	0.0E+00	0.0E+00
U 236	1.2E-08	0.0E+00	0.0E+00
U 237	3.4E-02	0.0E+00	0.0E+00
U 238	3.0E-06	0.0E+00	0.0E+00
NP237	9.9E-09	0.0E+00	0.0E+00
PA233	4.7E-09	0.0E+00	0.0E+00
U 233	2.0E-13	0.0E+00	0.0E+00
TH229	1.0E-15	0.0E+00	0.0E+00
RA225	1.0E-15	0.0E+00	0.0E+00
AC225	1.0E-15	0.0E+00	0.0E+00
NP238	1.3E-07	0.0E+00	0.0E+00
NP239	2.6E-02	0.0E+00	0.0E+00
PU238	3.1E-07	0.0E+00	0.0E+00

PU239 1.4E-04 0.0E+00 0.0E+00
 PU240 3.1E-06 0.0E+00 0.0E+00
 PU241 2.2E-05 0.0E+00 0.0E+00
 AM241 3.1E-09 0.0E+00 0.0E+00

===== AIR TRANSPORT =====
 Joint frequency data input.
 MI distance, direction, and chi/Q will be selected by the program.
 Ground level release.

===== EXTERNAL EXPOSURE =====
 8.8E+03 Hours of exposure to plume
 4.4E+03 Hours of exposure to ground contamination

===== INHALATION =====
 8.8E+03 Hours of exposure to contamination per year
 1 Resuspension model: 1-Mass Loading, 2-Anspaugh
 1.0E-04 Mass loading factor (g/m3)

===== INGESTION POPULATION =====
 1 Atmospheric production definition: 1 - Use population-weighted chi/Q

===== TERRESTRIAL FOOD INGESTION =====

FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	1.5		1.0	3.0E+01
Oth. Veg	90.0	0	0.0	4.0		5.0	2.2E+02
Fruit	90.0	0	0.0	2.0		5.0	3.3E+02
Cereals	90.0	0	0.0	0.8		180.0	8.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRAC- TION	DIET FRAC- TION	GROW TIME d	---STORED FEED---		STOR- YIELD AGE kg/m3 d	
	CONSUMPTION RATE kg/yr	HOLDUP d					--IRRIGATION-- S RATE * in/yr	TIME mo/yr		
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.00	180.0
Poultry	1.8E+01	1.0		0.00	1.0	90.00	0	0.0	0.00	180.0
Cow Milk	2.7E+02	1.0		0.00	0.3	45.00	0	0.0	2.00	100.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.00	180.0

-----FRESH FORAGE-----										
Meat					0.75	45.0	0	0.0	2.00	100.0
Cow Milk					0.75	30.0	0	0.0	1.50	0.0

Input prepared by: _____ Date: _____
 Input checked by: _____ Date: _____

=====

 GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides @ 100 MWd, 30 DAYS COOLING -
 Air 1945

Executed on: 09/20/88 at 16:26:52

Page C. 9

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	2.0E-09	1.8E-08	0.0E+00	2.0E-08	2.0E-08
C 14	2.4E-10	3.6E-08	0.0E+00	3.7E-08	3.7E-08
SE 79	1.0E-15	5.8E-13	1.4E-20	5.8E-13	5.8E-13
KR 85	0.0E+00	0.0E+00	4.6E-10	0.0E+00	4.6E-10
SR 89	2.0E-08	2.5E-07	8.8E-11	2.0E-07	2.8E-07
RB 88	8.9E-13	1.1E-11	5.0E-14	1.2E-11	1.2E-11
SR 90	8.5E-09	5.5E-08	2.0E-13	8.4E-08	8.4E-08
Y 90	3.7E-10	2.9E-09	1.1E-11	3.3E-09	3.3E-09
Y 91	2.0E-07	2.4E-07	3.1E-10	5.0E-07	5.0E-07
ZR 93	7.7E-14	9.3E-15	1.8E-21	8.7E-14	8.7E-14
NB 93M	1.3E-16	2.1E-17	2.3E-20	1.0E-16	1.0E-16
ZR 95	8.0E-08	1.0E-07	4.8E-08	1.9E-07	2.4E-07
NB 95M	1.0E-10	5.3E-10	2.8E-11	6.3E-10	6.6E-10
NB 95	1.9E-08	5.5E-08	6.7E-08	7.4E-08	1.4E-07
MO 99	7.0E-11	1.3E-10	4.5E-12	2.0E-10	2.0E-10
TC 99M	1.1E-12	6.0E-12	3.2E-12	7.0E-12	1.0E-11
TC 99	6.2E-14	1.5E-12	3.2E-10	1.5E-12	1.5E-12
RU 103	3.0E-04	5.5E-04	1.0E-04	9.3E-04	1.1E-03
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	1.7E-07	1.0E-05	5.7E-08	1.0E-05	1.0E-05
RU 106	8.4E-04	3.1E-04	1.4E-05	1.2E-03	1.2E-03
AG 110M	1.4E-12	1.3E-11	1.2E-12	1.5E-11	1.6E-11
AG 111	1.0E-10	2.4E-09	2.5E-12	2.0E-09	2.6E-09
CD 113M	3.0E-11	3.8E-11	1.4E-10	7.4E-11	7.4E-11
CD 115M	6.0E-10	7.1E-10	1.7E-12	1.3E-09	1.3E-09
CD 115	3.2E-13	4.0E-13	1.3E-14	7.1E-13	7.3E-13
IN 115M	1.1E-14	2.6E-14	1.2E-14	3.6E-14	4.9E-14
SN 119M	2.0E-12	4.1E-12	7.2E-15	6.0E-12	6.0E-12
SN 123	2.0E-10	5.5E-10	1.4E-12	8.3E-10	8.3E-10
SN 125	5.2E-10	1.1E-09	2.1E-11	1.0E-09	1.0E-09
SB 125	1.2E-10	1.0E-10	1.8E-10	3.0E-10	4.9E-10
TE 125M	5.0E-12	9.4E-11	1.9E-13	9.9E-11	9.9E-11
SN 126	3.5E-14	7.0E-14	2.7E-16	1.0E-13	1.1E-13
SB 126M	1.1E-17	3.3E-16	2.7E-14	3.4E-16	2.7E-14
SB 126	2.0E-11	5.3E-11	1.2E-11	7.3E-11	8.5E-11
SB 124	1.1E-12	2.4E-12	9.3E-13	3.5E-12	4.5E-12
SB 127	7.8E-11	1.3E-10	9.3E-12	2.1E-10	2.2E-10

GENII Dose Calculation Program
(Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides @ 100 MWd, 30 DAYS COOLING -
Air 1945

Executed on: 09/20/88 at 16:28:52

Page C. 10

Release period: 1.0
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 127M	5.5E-10	2.1E-09	4.4E-13	2.6E-09	2.6E-09
TE 127	1.2E-11	1.9E-10	2.3E-12	2.0E-10	2.0E-10
TE 129M	7.4E-08	4.0E-07	2.0E-11	5.4E-07	5.4E-07
TE 129	1.5E-11	1.4E-10	3.2E-11	1.0E-10	1.9E-10
I 129	1.3E-10	3.4E-08	4.0E-13	3.4E-08	3.4E-08
TE 131M	3.2E-15	2.0E-15	2.4E-16	5.0E-15	6.0E-15
TE 131	7.0E-10	7.2E-10	1.0E-17	1.5E-17	3.1E-17
I 131	3.7E-03	3.3E-01	6.2E-04	3.4E-01	3.4E-01
XE 131M	0.0E+00	0.0E+00	1.0E-07	0.0E+00	1.0E-07
TE 132	1.0E-09	1.0E-09	1.7E-11	2.0E-09	2.0E-09
I 132	1.2E-06	0.4E-07	3.0E-06	2.0E-06	5.0E-06
XE 133M	0.0E+00	0.0E+00	5.4E-10	0.0E+00	5.4E-10
XE 133	0.0E+00	0.0E+00	2.9E-06	0.0E+00	2.9E-06
CS 134	1.0E-11	5.9E-10	2.0E-11	6.1E-10	6.4E-10
CS 137	1.3E-09	4.5E-08	1.2E-09	4.0E-08	4.7E-08
BA 140	1.9E-08	1.7E-07	3.1E-09	1.9E-07	1.9E-07
LA 140	2.5E-08	1.7E-07	4.2E-08	1.9E-07	2.3E-07
CS 136	7.2E-11	0.0E-10	0.5E-11	7.3E-10	0.0E-10
CE 141	0.2E-08	0.7E-08	1.9E-09	1.5E-07	1.5E-07
CE 143	0.7E-14	4.0E-14	3.2E-15	1.1E-13	1.2E-13
PR 143	5.5E-08	9.3E-08	0.3E-12	1.5E-07	1.5E-07
CE 144	5.2E-07	1.9E-07	4.2E-10	7.0E-07	7.0E-07
PR 144M	3.9E-13	0.1E-12	1.1E-12	0.5E-12	7.0E-12
PR 144	0.3E-11	1.0E-09	1.9E-09	1.1E-09	3.0E-09
ND 147	1.3E-08	2.1E-08	5.4E-10	3.5E-08	3.5E-08
PM 147	7.0E-09	1.5E-09	0.0E-14	0.5E-09	0.5E-09
SM 147	2.4E-20	2.2E-19	0.0E+00	2.4E-19	2.4E-19
PM 148M	0.0E-11	9.4E-11	4.5E-11	1.5E-10	2.0E-10
PM 148	1.7E-11	3.1E-11	1.7E-12	4.7E-11	4.9E-11
PM 149	3.0E-12	3.0E-12	1.0E-14	7.5E-12	7.5E-12
SM 151	3.0E-11	3.4E-12	3.7E-17	3.9E-11	3.9E-11
SM 153	1.1E-13	1.2E-13	2.3E-15	2.4E-13	2.4E-13
EU 152	2.1E-14	5.1E-15	5.3E-15	2.0E-14	3.1E-14
EU 154	1.2E-11	3.2E-12	2.3E-12	1.5E-11	1.0E-11
EU 155	0.1E-11	2.3E-11	2.3E-12	1.0E-10	1.1E-10
EU 156	7.0E-10	1.3E-09	2.0E-10	2.0E-09	2.2E-09
TB 160	1.9E-13	2.0E-13	1.0E-13	4.7E-13	5.7E-13

GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides @ 100 MWd, 30 DAYS COOLING -
 Air 1945

Executed on: 09/20/88 at 16:26:52

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Release period: 1.0
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
U 236	2.3E-11	2.8E-14	3.6E-19	2.3E-11	2.3E-11
U 236	2.6E-10	3.5E-13	7.6E-15	2.6E-10	2.6E-10
TH 231	1.7E-15	1.7E-14	4.4E-16	1.9E-14	2.0E-14
PA 231	4.1E-15	7.7E-16	3.1E-20	4.9E-15	4.9E-15
AC 227	1.9E-17	3.0E-18	1.0E-24	2.2E-17	2.2E-17
TH 227	2.4E-19	8.6E-21	9.1E-22	2.5E-19	2.5E-19
FR 223	1.8E-24	2.0E-23	5.5E-24	2.2E-23	2.7E-23
RA 223	1.2E-19	6.3E-20	2.5E-21	1.8E-19	1.8E-19
U 237	1.9E-09	3.3E-09	9.0E-11	5.2E-09	5.3E-09
NP 237	9.5E-11	6.5E-12	6.3E-17	1.0E-10	1.0E-10
PA 233	6.7E-16	2.8E-15	1.4E-15	3.5E-15	4.9E-15
U 233	4.0E-16	5.1E-19	2.3E-23	4.1E-16	4.1E-16
TH 229	2.6E-17	4.0E-19	2.9E-23	2.6E-17	2.6E-17
RA 225	1.1E-19	2.4E-20	1.6E-24	1.3E-19	1.3E-19
AC 225	1.2E-19	1.1E-20	1.6E-22	1.3E-19	1.3E-19
U 238	5.3E-09	6.8E-12	7.9E-17	5.3E-09	5.3E-09
TH 234	1.1E-12	3.6E-12	3.9E-14	4.7E-12	4.7E-12
PA 234	3.6E-17	9.3E-16	6.1E-15	9.7E-16	7.1E-15
NP 238	7.8E-14	6.0E-15	8.0E-16	8.4E-14	8.5E-14
PU 238	1.3E-09	9.1E-12	7.5E-18	1.4E-09	1.4E-09
PU 240	1.4E-08	1.0E-10	7.3E-17	1.4E-08	1.4E-08
PU 241	1.6E-09	1.3E-11	5.1E-22	1.6E-09	1.6E-09
AM 241	2.1E-11	1.6E-12	6.0E-17	2.2E-11	2.2E-11
NP 239	9.2E-10	1.1E-09	5.0E-11	2.0E-09	2.1E-09
PU 239	6.4E-07	4.5E-09	4.6E-15	6.4E-07	6.4E-07

 GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides @ 1000 MWd, 30 DAYS COOLING -
 Air 1945

Executed on: 09/20/88 at 16:27:11

Page A. 1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Finite plume, external
 Ground, external
 Inhalation uptake
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

	\\GENII\\BANDIR\\overfill.in	9-20-88
GENII Default Parameter Values (3-Aug-88 RAP)		8-12-88
RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)		8-29-88
Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA		8-29-88
External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88		8-29-88
Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP		8-29-88
200 Area Population (Sommer, Rau, and Robinson, PNL-4010)		
2100 AREA - 10 M - Pasquill A - F (1987)		

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-----Release Terms-----

Release Radio- nuclide	Air Ci/yr	Surface Water Ci/yr	Buried Source Ci/m3
H 3	1.7E+01	0.0E+00	0.0E+00
C 14	6.0E-02	0.0E+00	0.0E+00
SE79	1.3E-07	0.0E+00	0.0E+00
KR85	3.3E+02	0.0E+00	0.0E+00
RB86	1.7E-05	0.0E+00	0.0E+00
SR89	1.6E+00	0.0E+00	0.0E+00
SR90	2.5E-02	0.0E+00	0.0E+00
Y 90	2.5E-02	0.0E+00	0.0E+00
Y 91	1.9E+00	0.0E+00	0.0E+00
ZR93	5.0E-07	0.0E+00	0.0E+00
NB93M	6.0E-09	0.0E+00	0.0E+00
ZR95	2.3E+00	0.0E+00	0.0E+00
NB95M	1.7E-02	0.0E+00	0.0E+00
NB95	2.3E+00	0.0E+00	0.0E+00
MO99	2.0E-03	0.0E+00	0.0E+00
TC99M	2.5E-03	0.0E+00	0.0E+00
TC99	4.5E-06	0.0E+00	0.0E+00
RU103	1.0E+04	0.0E+00	0.0E+00
RU106	2.1E+03	0.0E+00	0.0E+00
RH103M	1.0E+00	0.0E+00	0.0E+00
AQ110M	1.9E-04	0.0E+00	0.0E+00
AQ111	9.1E-03	0.0E+00	0.0E+00
CD113M	1.7E-05	0.0E+00	0.0E+00

CD115M	2.9E-03	0.0E+00	0.0E+00
CD115	5.2E-06	0.0E+00	0.0E+00
IN115M	5.8E-06	0.0E+00	0.0E+00
SN119M	1.8E-04	0.0E+00	0.0E+00
SN123	4.4E-03	0.0E+00	0.0E+00
SN125	4.8E-03	0.0E+00	0.0E+00
SN126	2.7E-07	0.0E+00	0.0E+00
SB125	6.7E-03	0.0E+00	0.0E+00
SB126M	2.7E-07	0.0E+00	0.0E+00
SB126	3.9E-04	0.0E+00	0.0E+00
SB124	1.3E-04	0.0E+00	0.0E+00
SB127	1.4E-03	0.0E+00	0.0E+00
TE125M	8.8E-04	0.0E+00	0.0E+00
TE127M	1.5E-02	0.0E+00	0.0E+00
TE127	1.6E-02	0.0E+00	0.0E+00
TE129M	5.8E-02	0.0E+00	0.0E+00
TE129	3.8E-02	0.0E+00	0.0E+00
TE131M	2.4E-08	0.0E+00	0.0E+00
TE131	5.8E-09	0.0E+00	0.0E+00
TE132	6.6E-03	0.0E+00	0.0E+00
I 129	6.7E-04	0.0E+00	0.0E+00
I 131	1.5E-04	0.0E+00	0.0E+00
I 132	4.8E-02	0.0E+00	0.0E+00
XE131M	1.2E-03	0.0E+00	0.0E+00
XE133M	2.0E+00	0.0E+00	0.0E+00
XE133	1.3E-04	0.0E+00	0.0E+00
CS134	7.0E-03	0.0E+00	0.0E+00
CS136	8.0E-03	0.0E+00	0.0E+00
CS137	3.2E-02	0.0E+00	0.0E+00
BA140	9.6E-01	0.0E+00	0.0E+00
LA140	1.1E+00	0.0E+00	0.0E+00
CE141	2.2E+00	0.0E+00	0.0E+00
CE143	1.2E-06	0.0E+00	0.0E+00
CE144	8.1E-01	0.0E+00	0.0E+00
PR143	1.1E+00	0.0E+00	0.0E+00
PR144M	9.8E-03	0.0E+00	0.0E+00
PR144	8.1E-01	0.0E+00	0.0E+00
ND147	2.8E-01	0.0E+00	0.0E+00
PM147	1.1E-01	0.0E+00	0.0E+00
PM148M	1.3E-02	0.0E+00	0.0E+00
PM148	5.1E-03	0.0E+00	0.0E+00
PM149	9.0E-05	0.0E+00	0.0E+00
SM151	4.9E-04	0.0E+00	0.0E+00
SM153	7.5E-06	0.0E+00	0.0E+00
EU152	1.3E-06	0.0E+00	0.0E+00
EU154	4.1E-04	0.0E+00	0.0E+00
EU155	7.3E-04	0.0E+00	0.0E+00
EU156	2.9E-02	0.0E+00	0.0E+00
TB160	5.1E-05	0.0E+00	0.0E+00
TH231	1.2E-02	0.0E+00	0.0E+00
PA231	9.0E-13	0.0E+00	0.0E+00
AC227	1.0E-15	0.0E+00	0.0E+00
TH227	1.0E-15	0.0E+00	0.0E+00
FR223	1.0E-15	0.0E+00	0.0E+00
RA223	1.0E-15	0.0E+00	0.0E+00
TH234	3.0E-04	0.0E+00	0.0E+00
PA234	3.8E-09	0.0E+00	0.0E+00
U 236	1.2E-07	0.0E+00	0.0E+00
U 236	9.8E-08	0.0E+00	0.0E+00
U 237	4.7E-02	0.0E+00	0.0E+00
U 238	3.0E-06	0.0E+00	0.0E+00
NP237	9.2E-08	0.0E+00	0.0E+00
PA233	7.2E-08	0.0E+00	0.0E+00
U 233	1.0E-15	0.0E+00	0.0E+00
TH229	1.0E-15	0.0E+00	0.0E+00
RA225	1.0E-15	0.0E+00	0.0E+00
AC225	1.0E-15	0.0E+00	0.0E+00
NP238	3.4E-06	0.0E+00	0.0E+00
NP239	2.0E-02	0.0E+00	0.0E+00
PU238	7.0E-05	0.0E+00	0.0E+00

PU239 1.0E-03 0.0E+00 0.0E+00
 PU240 2.0E-04 0.0E+00 0.0E+00
 PU241 1.7E-02 0.0E+00 0.0E+00
 AM241 4.1E-06 0.0E+00 0.0E+00

===== AIR TRANSPORT =====
 Joint frequency data input.
 MI distance, direction, and chi/Q will be selected by the program.
 Ground level release.

===== EXTERNAL EXPOSURE =====
 0.0E+03 Hours of exposure to plume
 4.4E+03 Hours of exposure to ground contamination

===== INHALATION =====
 0.0E+03 Hours of exposure to contamination per year
 1 Resuspension model: 1-Mass Loading, 2-Anspaugh
 1.0E-04 Mass loading factor (g/m3)

===== INGESTION POPULATION =====
 1 Atmospheric production definition: 1 - Use population-weighted chi/Q

===== TERRESTRIAL FOOD INGESTION =====

FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5	1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0	5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0	5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8	180.0	8.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTA M FRACT.	DIET FRAC- TION	GROW TIME d	---STORED FEED---		STOR- YIELD AGE kg/m3 d	
	CONSUMPTION RATE kg/yr	HOLDUP d					--IRRIGATION-- S RATE * in/yr	TIME mo/yr		
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.00	180.0
Poultry	1.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.00	180.0
Cow Milk	2.7E+02	1.0		0.00	0.3	45.00	0	0.0	2.00	100.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.00	180.0

-----FRESH FORAGE-----									
Meat	0.75	45.0	0	0.0	0.0	2.00	100.0		
Cow Milk	0.75	30.0	0	0.0	0.0	1.50	0.0		

=====

 GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides @ 1000 MWd, 30 DAYS COOLING -
 Air 1945

Executed on: 09/20/88 at 16:42:17

Page C. 9

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	2.2E-08	1.9E-07	0.0E+00	2.1E-07	2.1E-07
C 14	2.0E-09	3.0E-07	0.0E+00	3.1E-07	3.1E-07
SE 79	1.0E-14	5.8E-12	1.4E-19	5.8E-12	5.8E-12
KR 85	0.0E+00	0.0E+00	4.1E-09	0.0E+00	4.1E-09
SR 89	1.3E-07	1.3E-08	4.6E-10	1.4E-08	1.4E-08
RB 88	1.5E-12	1.9E-11	0.0E-14	2.0E-11	2.1E-11
SR 90	7.7E-08	5.1E-07	1.8E-12	5.9E-07	5.9E-07
Y 90	3.3E-09	2.0E-08	1.0E-10	2.9E-08	2.9E-08
Y 91	1.4E-08	1.3E-08	1.7E-09	2.7E-08	2.7E-08
ZR 93	7.2E-13	8.5E-14	1.0E-20	0.0E-13	8.0E-13
NB 93M	3.0E-15	3.7E-16	3.1E-19	3.4E-15	3.4E-15
ZR 95	5.3E-07	0.2E-07	2.9E-07	1.2E-06	1.4E-06
NB 95M	6.4E-10	3.2E-09	1.7E-10	3.0E-09	4.0E-09
NB 95	2.0E-07	4.9E-07	4.7E-07	6.9E-07	1.2E-06
MO 99	7.6E-11	1.4E-10	4.8E-12	2.1E-10	2.2E-10
TC 99M	1.2E-12	0.4E-12	3.4E-12	7.0E-12	1.1E-11
TC 99	0.2E-13	1.5E-11	3.2E-17	1.5E-11	1.5E-11
RU 103	2.4E-03	3.5E-03	1.0E-03	0.0E-03	7.0E-03
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	1.1E-06	0.5E-05	3.7E-07	0.0E-05	0.7E-05
RU 106	1.5E-02	5.4E-03	2.4E-04	2.0E-02	2.1E-02
AG 110M	2.4E-10	2.3E-09	2.0E-10	2.5E-09	2.7E-09
AG 111	4.7E-10	0.2E-09	0.4E-12	0.7E-09	0.7E-09
CD 113M	3.9E-10	4.0E-10	1.5E-15	7.9E-10	7.9E-10
CD 115M	3.1E-09	3.7E-09	0.9E-12	0.0E-09	0.0E-09
CD 116	2.9E-13	3.7E-13	1.2E-14	0.0E-13	0.0E-13
IN 115M	1.0E-14	2.4E-14	1.2E-14	3.4E-14	4.6E-14
SN 119M	1.0E-11	3.3E-11	5.9E-14	4.9E-11	4.9E-11
SN 123	2.1E-09	4.3E-09	1.1E-11	0.4E-09	0.4E-09
SN 125	1.1E-09	2.4E-09	4.0E-11	3.5E-09	3.0E-09
SB 125	1.2E-09	1.9E-09	1.0E-09	3.1E-09	4.9E-09
TE 125M	9.3E-11	1.1E-09	2.2E-12	1.2E-09	1.2E-09
SN 126	4.0E-13	0.0E-13	3.0E-15	1.2E-12	1.2E-12
SB 126M	1.2E-16	3.7E-15	3.0E-13	3.9E-15	3.1E-13
SB 126	0.9E-11	1.0E-10	4.2E-11	2.5E-10	3.0E-10
SB 124	5.1E-11	1.0E-10	4.1E-11	1.5E-10	1.9E-10
SB 127	1.3E-10	2.1E-10	1.5E-11	3.4E-10	3.5E-10

 GENII Dose Calculation Program
 (Version 1.351 30-Aug-88)

Case title: Top One hundred or so Nuclides @ 1000 MWd, 30 DAYS COOLING -
 Air 1945

Executed on: 09/20/88 at 16:42:17

Page C. 10

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 127M	4.9E-09	1.0E-08	3.9E-12	2.3E-08	2.3E-08
TE 127	7.8E-11	1.0E-09	1.9E-11	1.0E-09	1.7E-09
TE 129M	4.3E-07	2.7E-06	1.0E-10	3.1E-06	3.1E-06
TE 129	0.0E-11	0.1E-10	1.9E-10	9.0E-10	1.1E-09
I 129	1.5E-09	4.0E-07	5.4E-12	4.0E-07	4.0E-07
TE 131M	4.1E-15	3.2E-15	3.0E-16	7.3E-15	7.6E-15
TE 131	9.7E-18	9.2E-18	2.0E-17	1.9E-17	3.9E-17
I 131	0.0E-03	0.4E-01	1.2E-03	0.4E-01	0.5E-01
XE 131M	0.0E+00	0.0E+00	2.0E-07	0.0E+00	2.0E-07
TE 132	1.2E-09	1.9E-09	2.1E-11	3.1E-09	3.1E-09
I 132	1.4E-06	1.0E-06	4.5E-06	2.4E-06	0.9E-06
XE 133M	0.0E+00	0.0E+00	5.7E-10	0.0E+00	5.7E-10
XE 133	0.0E+00	0.0E+00	4.1E-06	0.0E+00	4.1E-06
CS 134	4.0E-09	1.4E-07	0.9E-09	1.5E-07	1.5E-07
CS 137	1.3E-08	4.7E-07	1.2E-08	4.0E-07	4.9E-07
BA 140	4.3E-08	3.9E-07	0.9E-09	4.3E-07	4.4E-07
LA 140	0.0E-08	3.9E-07	1.0E-07	4.5E-07	5.5E-07
CS 136	7.9E-10	7.0E-09	7.1E-10	7.0E-09	0.5E-09
CE 141	2.9E-07	4.0E-07	0.0E-09	0.9E-07	0.9E-07
CE 143	0.0E-14	4.2E-14	2.9E-15	1.0E-13	1.0E-13
PR 143	1.4E-07	2.3E-07	2.0E-11	3.0E-07	3.0E-07
CE 144	4.5E-06	1.0E-06	3.5E-09	0.0E-06	0.0E-06
PR 144M	3.2E-12	5.1E-11	9.2E-12	5.5E-11	0.4E-11
PR 144	5.4E-10	0.9E-09	1.0E-08	9.5E-09	2.5E-08
ND 147	2.0E-08	4.0E-08	1.2E-09	7.4E-08	7.5E-08
PM 147	0.0E-08	1.3E-08	5.0E-13	7.9E-08	7.9E-08
SM 147	2.2E-19	1.9E-18	0.0E+00	2.1E-18	2.1E-18
PM 148M	4.4E-09	0.0E-09	3.3E-09	1.1E-08	1.5E-08
PM 148	0.5E-10	1.7E-09	9.0E-11	2.5E-09	2.0E-09
PM 149	4.0E-12	4.3E-12	1.2E-14	0.3E-12	0.3E-12
SM 151	2.2E-10	2.1E-11	2.3E-10	2.4E-10	2.4E-10
SM 153	2.2E-13	2.3E-13	4.2E-15	4.5E-13	4.0E-13
EU 152	4.2E-12	9.7E-13	9.0E-13	5.1E-12	0.1E-12
EU 154	1.7E-09	4.5E-10	3.2E-10	2.1E-09	2.5E-09
EU 155	4.4E-10	1.3E-10	1.3E-11	5.7E-10	5.0E-10
EU 156	0.4E-09	1.2E-08	1.0E-09	1.9E-08	2.0E-08
TB 180	1.9E-11	2.7E-11	1.0E-11	4.0E-11	5.0E-11

GENII Dose Calculation Program
(Version 1.951 30-Aug-88)

**Case title: Top One hundred or so Nuclides @ 1000 MWd, 30 DAYS COOLING -
 Air 1945**

Executed on: 09/20/88 at 16:42:17

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Release period: 1.0
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
U 236	1.9E-10	2.3E-13	2.9E-10	1.9E-10	1.9E-10
U 235	2.2E-10	3.1E-13	6.1E-15	2.2E-10	2.2E-10
TH 231	1.4E-10	9.5E-11	2.0E-12	2.4E-10	2.4E-10
PA 231	7.5E-13	1.1E-12	1.0E-17	1.0E-12	1.0E-12
AC 227	2.0E-17	2.5E-15	7.7E-22	2.0E-15	2.0E-15
TH 227	2.9E-19	6.0E-16	7.1E-19	6.9E-18	7.0E-18
FR 223	2.2E-24	1.7E-20	4.0E-21	1.7E-20	2.1E-20
RA 223	1.4E-19	4.3E-17	2.0E-16	4.3E-17	4.5E-17
U 237	2.5E-09	4.0E-09	1.3E-10	7.2E-09	7.3E-09
NP 237	6.9E-10	5.9E-11	5.0E-16	9.5E-10	9.5E-10
PA 233	1.0E-14	3.1E-14	1.3E-14	4.2E-14	5.5E-14
U 233	2.2E-16	6.0E-20	2.0E-23	2.2E-16	2.2E-16
TH 229	2.0E-17	4.0E-19	2.9E-23	2.0E-17	2.0E-17
RA 225	1.1E-19	2.4E-20	1.0E-24	1.3E-19	1.3E-19
AC 225	1.2E-19	1.1E-20	1.0E-22	1.3E-19	1.3E-19
U 230	5.3E-09	6.0E-12	7.9E-17	5.3E-09	5.3E-09
TH 234	1.0E-10	2.3E-10	4.0E-13	3.9E-10	3.9E-10
PA 234	1.4E-15	6.0E-14	6.0E-14	6.1E-14	1.3E-13
NP 230	2.1E-12	1.0E-13	2.0E-14	2.2E-12	2.2E-12
PU 238	3.1E-07	2.1E-09	1.7E-15	3.2E-07	3.2E-07
PU 240	1.2E-06	8.4E-09	6.1E-15	1.2E-06	1.2E-06
PU 241	1.3E-06	1.0E-08	3.9E-19	1.3E-06	1.3E-06
AM 241	2.7E-08	1.0E-09	5.2E-14	2.9E-08	2.9E-08
NP 239	7.1E-10	8.4E-10	3.0E-11	1.5E-09	1.0E-09
PU 239	4.5E-06	3.2E-08	3.3E-14	4.6E-06	4.6E-06

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 No Milk

Executed on: 09/18/89 at 21:51:35

Page A. 1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Infinite plume, external
 Ground, external
 Inhalation uptake
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

Input file name: \GENII\BANDIR\NOMILK.in

METABOLIC PARAMETERS-----

RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)

Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA

External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88

Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP

=====

-----Release Terms-----			
Release	Surface Buried		
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3
H 3	8.5E+00	0.0E+00	0.0E+00
C060	3.2E+00	0.0E+00	0.0E+00
SE79	6.8E+00	0.0E+00	0.0E+00
KR86	1.7E+02	0.0E+00	0.0E+00
RB86	8.4E+05	0.0E+00	0.0E+00
SR89	1.1E+00	0.0E+00	0.0E+00
SR90	1.3E+02	0.0E+00	0.0E+00
Y 90	1.3E+02	0.0E+00	0.0E+00
Y 91	1.3E+00	0.0E+00	0.0E+00
ZR93	3.0E+07	0.0E+00	0.0E+00
NB93M	2.4E+08	0.0E+00	0.0E+00
ZR95	1.5E+00	0.0E+00	0.0E+00
NB95M	1.1E+02	0.0E+00	0.0E+00
NB95	1.2E+00	0.0E+00	0.0E+00
MO99	2.6E+03	0.0E+00	0.0E+00
TC99M	2.5E+03	0.0E+00	0.0E+00
TC99	2.2E+06	0.0E+00	0.0E+00
RU103	1.2E+04	0.0E+00	0.0E+00
RU106	8.6E+02	0.0E+00	0.0E+00
RH103M	1.0E+00	0.0E+00	0.0E+00
AG110M	4.0E+05	0.0E+00	0.0E+00
AG111	7.6E+03	0.0E+00	0.0E+00
CD113M	8.3E+06	0.0E+00	0.0E+00
CD115M	2.1E+03	0.0E+00	0.0E+00
CD115	5.5E+06	0.0E+00	0.0E+00

IN116M	6.1E-06	0.0E+00	0.0E+00
SN119M	9.7E-05	0.0E+00	0.0E+00
SN123	2.6E-03	0.0E+00	0.0E+00
SN125	4.5E-03	0.0E+00	0.0E+00
SN126	1.3E-07	0.0E+00	0.0E+00
SB125	3.3E-03	0.0E+00	0.0E+00
SB126M	1.3E-07	0.0E+00	0.0E+00
SB126	3.1E-04	0.0E+00	0.0E+00
SB124	4.7E-05	0.0E+00	0.0E+00
SB127	1.3E-03	0.0E+00	0.0E+00
TE126M	3.4E-04	0.0E+00	0.0E+00
TE127M	8.2E-03	0.0E+00	0.0E+00
TE127	9.3E-03	0.0E+00	0.0E+00
TE129M	3.9E-02	0.0E+00	0.0E+00
TE129	2.5E-02	0.0E+00	0.0E+00
TE131M	2.2E-08	0.0E+00	0.0E+00
TE131	5.0E-09	0.0E+00	0.0E+00
TE132	6.5E-03	0.0E+00	0.0E+00
I 129	3.8E-04	0.0E+00	0.0E+00
I 131	1.4E-04	0.0E+00	0.0E+00
I 132	4.7E-02	0.0E+00	0.0E+00
XE131M	1.1E-03	0.0E+00	0.0E+00
XE133M	2.0E-00	0.0E+00	0.0E+00
XE133	1.3E-04	0.0E+00	0.0E+00
CS134	1.7E-03	0.0E+00	0.0E+00
CS136	4.6E-03	0.0E+00	0.0E+00
CS137	1.6E-02	0.0E+00	0.0E+00
BA140	9.2E-01	0.0E+00	0.0E+00
LA140	1.1E-00	0.0E+00	0.0E+00
CE141	1.6E+00	0.0E+00	0.0E+00
CE143	1.2E-06	0.0E+00	0.0E+00
CE144	4.4E-01	0.0E+00	0.0E+00
PR143	1.0E+00	0.0E+00	0.0E+00
PR144M	5.3E-03	0.0E+00	0.0E+00
PR144	4.4E-04	0.0E+00	0.0E+00
ND147	2.8E-01	0.0E+00	0.0E+00
PM147	5.9E-02	0.0E+00	0.0E+00
PM148M	5.1E-03	0.0E+00	0.0E+00
PM148	2.3E-03	0.0E+00	0.0E+00
PM149	8.8E-05	0.0E+00	0.0E+00
SM151	3.1E-04	0.0E+00	0.0E+00
SM153	5.8E-06	0.0E+00	0.0E+00
EU152	2.9E-07	0.0E+00	0.0E+00
EU154	1.0E-04	0.0E+00	0.0E+00
EU155	4.5E-04	0.0E+00	0.0E+00
EU156	1.8E-02	0.0E+00	0.0E+00
TB160	1.3E-05	0.0E+00	0.0E+00
TH231	1.3E-07	0.0E+00	0.0E+00
PA231	5.9E-13	0.0E+00	0.0E+00
AC227	1.0E-15	0.0E+00	0.0E+00
TH227	1.0E-15	0.0E+00	0.0E+00
FR223	1.0E-15	0.0E+00	0.0E+00
RA223	1.0E-15	0.0E+00	0.0E+00
TH234	2.7E-06	0.0E+00	0.0E+00
PA234	3.5E-09	0.0E+00	0.0E+00
U 235	1.3E-07	0.0E+00	0.0E+00
U 236	5.5E-08	0.0E+00	0.0E+00
U 237	5.0E-02	0.0E+00	0.0E+00
U 238	3.0E-06	0.0E+00	0.0E+00
NP237	4.8E-08	0.0E+00	0.0E+00
PA233	3.2E-08	0.0E+00	0.0E+00
U 233	8.9E-13	0.0E+00	0.0E+00
TH229	1.0E-15	0.0E+00	0.0E+00
RA225	1.0E-15	0.0E+00	0.0E+00
AC225	1.0E-15	0.0E+00	0.0E+00
NP238	1.8E-06	0.0E+00	0.0E+00
NP239	2.3E-02	0.0E+00	0.0E+00
PU238	1.7E-05	0.0E+00	0.0E+00
PU239	6.0E-04	0.0E+00	0.0E+00
PU240	8.2E-05	0.0E+00	0.0E+00

PU241 2.9E-03 0.0E+00 0.0E+00
 AM241 5.4E-07 0.0E+00 0.0E+00

===== AIR TRANSPORT =====
 5.6E-06 Input chi/Q value (a/m3)

===== EXTERNAL EXPOSURE =====
 8.8E+03 Hours of exposure to plume
 4.4E+03 Hours of exposure to ground contamination

===== INHALATION =====
 8.8E+03 Hours of inhalation exposure per year
 1 Resuspension model: 1-Mass Loading, 2-Anspaugh
 1.8E-04 Mass loading factor (g/m3)

===== INGESTION POPULATION =====
 1 Atmospheric production definition: 1 - Use population-weighted chi/Q

===== TERRESTRIAL FOOD INGESTION =====

FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5	1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0	5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0	5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8	180.0	8.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC- TION	GROW TIME d	---STORED FEED---		STOR- AGE d		
	CONSUMPTION RATE kg/yr	HOLDUP d					--IRRIGATION-- S RATE * in/yr	TIME mo/yr			
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.0	0.80	180.0
Poultry	1.8E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0

-----FRESH FORAGE-----												
Meat						0.75	45.0	0	0.0	0.0	2.00	100.0

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 No Milk

Executed on: 09/18/89 at 21:55:09

Page C. 9

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.1E-08	6.7E-08	1.1E-17	7.8E-08	7.8E-08
CO 60	9.6E-06	6.0E-06	4.9E-06	1.6E-05	2.0E-05
SE 79	9.0E-15	2.9E-12	7.9E-20	2.9E-12	2.9E-12
KR 85	6.0E+00	6.0E+00	5.4E-09	6.0E+00	5.4E-09
SR 89	9.2E-08	7.8E-07	3.5E-10	8.8E-07	8.8E-07
RB 86	7.7E-12	3.9E-11	4.7E-13	4.7E-11	4.8E-11
SR 90	4.1E-08	2.4E-07	9.7E-13	2.8E-07	2.8E-07
Y 90	1.7E-09	1.3E-08	5.4E-11	1.5E-08	1.5E-08
Y 91	9.7E-07	8.9E-07	1.3E-09	1.9E-06	1.9E-06
ZR 93	3.7E-13	4.4E-14	9.2E-21	4.1E-13	4.1E-13
NB 93M	1.1E-14	1.1E-15	3.7E-19	1.2E-14	1.2E-14
ZR 95	3.5E-07	4.1E-07	1.9E-07	7.6E-07	9.5E-07
NB 95M	4.2E-10	2.1E-09	1.1E-10	2.5E-09	2.7E-09
NB 95	1.0E-07	2.7E-07	3.0E-07	3.7E-07	6.7E-07
MO 99	7.8E-11	1.2E-10	6.8E-12	2.0E-10	2.1E-10
TC 99M	1.2E-12	6.0E-12	3.9E-12	7.2E-12	1.1E-11
TC 99	3.0E-13	7.0E-12	1.6E-17	7.3E-12	7.3E-12
RU 103	1.6E-03	2.4E-03	7.2E-04	4.0E-03	4.7E-03
PD 103	6.0E+00	6.0E+00	6.0E+00	6.0E+00	6.0E+00
RH 103M	7.4E-11	4.2E-05	1.3E-07	4.2E-05	4.2E-05
RU 106	6.1E-03	2.2E-03	9.7E-05	8.3E-03	8.4E-03
AG 110M	5.0E-11	1.4E-10	4.3E-11	1.9E-10	2.3E-10
AG 111	3.7E-10	1.2E-09	6.6E-12	1.6E-09	1.6E-09
CD 113M	1.9E-10	2.0E-10	7.5E-16	3.9E-10	3.9E-10
CD 115M	2.3E-09	2.7E-09	6.7E-12	4.9E-09	5.0E-09
CD 115	3.2E-13	4.1E-13	2.1E-14	7.2E-13	7.4E-13
IN 115M	1.1E-14	2.0E-14	1.9E-14	3.7E-14	5.5E-14
SN 119M	9.0E-12	1.7E-11	2.8E-14	2.6E-11	2.6E-11
SN 123	1.3E-09	2.3E-09	6.6E-12	3.6E-09	3.6E-09
SN 125	1.1E-09	2.0E-09	5.2E-11	3.0E-09	3.1E-09
SB 125	6.1E-10	8.0E-10	9.4E-10	1.5E-09	2.4E-09
TE 125M	3.7E-11	5.1E-10	1.0E-12	5.5E-10	5.5E-10
SN 126	1.9E-13	3.5E-13	1.4E-15	5.5E-13	5.5E-13
SB 126M	5.9E-17	1.7E-15	1.5E-13	1.7E-15	1.5E-13
SB 126	5.5E-11	1.3E-10	3.8E-11	1.9E-10	2.3E-10
SB 124	1.8E-11	3.4E-11	1.6E-11	5.2E-11	6.8E-11
SB 127	1.2E-10	1.8E-10	1.9E-11	3.0E-10	3.2E-10

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 No Milk

Executed on: 89/18/89 at 21:55:59

Page C. 10

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 127M	2.6E-09	9.6E-09	1.9E-12	1.2E-08	1.2E-08
TE 127	4.6E-11	8.2E-10	1.1E-11	8.7E-10	8.8E-10
TE 129M	2.9E-07	1.8E-06	1.1E-10	2.1E-06	2.1E-06
TE 129	5.9E-11	5.3E-10	1.4E-10	5.9E-10	7.2E-10
I 129	8.6E-10	1.0E-07	3.0E-12	1.1E-07	1.1E-07
TE 131M	4.0E-15	3.0E-15	4.8E-16	7.0E-15	7.5E-15
TE 131	9.4E-18	8.5E-18	3.1E-17	1.8E-17	4.9E-17
I 131	6.5E-03	2.3E-01	1.1E-03	2.3E-01	2.3E-01
XE 131M	0.0E+00	0.0E+00	1.8E-07	0.0E+00	1.8E-07
TE 132	1.2E-09	1.8E-09	2.7E-11	3.6E-09	3.1E-09
I 132	2.8E-06	2.0E-06	1.6E-05	4.7E-06	2.0E-06
XE 133M	0.0E+00	0.0E+00	6.7E-10	0.0E+00	6.7E-10
XE 133	0.0E+00	0.0E+00	3.6E-06	0.0E+00	3.6E-06
CS 134	1.1E-09	2.6E-08	1.6E-09	2.7E-08	2.8E-08
CS 137	6.6E-09	1.8E-07	6.2E-09	1.9E-07	1.9E-07
BA 140	4.3E-08	3.6E-07	7.9E-09	4.6E-07	4.1E-07
LA 140	6.0E-08	3.8E-07	1.1E-07	4.4E-07	5.5E-07
CS 136	4.5E-10	2.1E-09	4.5E-10	2.5E-09	3.0E-09
CE 141	2.1E-07	2.9E-07	6.3E-09	5.0E-07	5.1E-07
CE 143	6.3E-14	4.4E-14	4.1E-15	1.1E-13	1.1E-13
PR 143	1.2E-07	2.1E-07	2.7E-11	3.3E-07	3.3E-07
CE 144	2.4E-06	8.5E-07	1.9E-09	3.3E-06	3.3E-06
PR 144M	1.5E-12	2.8E-11	5.1E-12	2.9E-11	3.4E-11
PR 144	3.0E-13	4.8E-09	8.3E-09	4.8E-09	1.3E-08
ND 147	2.8E-08	4.6E-08	1.3E-09	7.4E-08	7.5E-08
PM 147	3.5E-08	7.0E-09	3.2E-13	4.2E-08	4.2E-08
SM 147	3.0E-21	1.0E-18	0.0E+00	1.0E-18	1.0E-18
PM 148M	1.7E-09	2.7E-09	1.3E-09	4.4E-09	5.7E-09
PM 148	3.9E-10	7.4E-10	5.1E-11	1.1E-09	1.2E-09
PM 149	4.0E-12	4.4E-12	1.7E-14	8.3E-12	8.4E-12
SM 151	1.4E-10	1.3E-11	1.4E-16	1.5E-10	1.5E-10
SM 153	1.7E-13	1.9E-13	4.0E-15	3.6E-13	3.6E-13
EU 152	9.2E-13	2.2E-13	2.2E-13	1.1E-12	1.3E-12
EU 154	4.1E-10	1.1E-10	7.9E-11	5.2E-10	5.9E-10
EU 155	2.7E-10	8.0E-11	8.1E-12	3.5E-10	3.6E-10
EU 156	3.9E-09	7.5E-09	1.3E-09	1.1E-08	1.3E-08
TB 160	5.0E-12	6.9E-12	2.6E-12	1.2E-11	1.4E-11

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 No Milk

Executed on: 09/10/89 at 21:55:09

Page C. 11

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
U 238	1.0E-10	1.2E-13	1.2E-10	1.0E-10	1.0E-10
U 235	2.5E-10	3.1E-13	8.5E-10	2.5E-10	2.5E-10
TH 231	1.7E-15	1.8E-14	4.0E-10	1.7E-14	1.8E-14
PA 231	7.7E-15	1.1E-15	3.4E-20	8.8E-15	8.8E-15
AC 227	1.9E-17	3.7E-18	1.2E-24	2.3E-17	2.3E-17
TH 227	2.4E-19	1.0E-20	1.1E-21	2.5E-19	2.5E-19
FR 223	7.0E-23	2.5E-23	8.9E-24	9.4E-23	1.0E-22
RA 223	1.2E-19	7.3E-20	2.9E-21	1.9E-19	1.9E-19
U 237	2.7E-09	4.8E-09	1.5E-10	7.3E-09	7.5E-09
NP 237	4.8E-10	3.1E-11	3.1E-10	4.9E-10	4.9E-10
PA 233	4.8E-15	1.5E-14	8.8E-15	2.0E-14	2.7E-14
U 233	1.8E-15	2.1E-18	1.0E-22	1.8E-15	1.8E-15
TH 229	2.8E-17	4.0E-19	3.0E-23	2.8E-17	2.8E-17
RA 225	1.1E-19	2.4E-20	1.7E-24	1.3E-19	1.3E-19
AC 225	1.2E-19	1.1E-20	1.7E-22	1.3E-19	1.3E-19
U 230	5.3E-09	8.4E-12	5.8E-17	5.3E-09	5.3E-09
TH 234	1.4E-12	4.0E-12	4.0E-14	5.4E-12	5.5E-12
PA 234	4.5E-17	1.1E-15	8.1E-15	1.1E-15	7.2E-15
NP 230	1.1E-12	8.8E-14	1.7E-14	1.2E-12	1.2E-12
PU 230	7.4E-08	5.0E-10	2.5E-10	7.5E-08	7.5E-08
PU 240	3.8E-07	2.7E-09	1.2E-15	3.7E-07	3.7E-07
PU 241	2.2E-07	1.7E-09	8.0E-20	2.2E-07	2.2E-07
AM 241	3.8E-09	2.5E-10	8.3E-15	3.9E-09	3.9E-09
NP 239	8.5E-10	9.9E-10	5.8E-11	1.8E-09	1.9E-09
PU 239	2.8E-06	1.9E-08	1.8E-14	2.8E-06	2.8E-06

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 Minimal

Executed on: 89/18/89 at 21:48:42

Page A. 1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Infinite plume, external
 Ground, external
 Inhalation uptake

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

49 years of air deposition prior to the intake period

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

Input file name: \GENII\BANDIR\minimal.in

METABOLIC PARAMETERS-----

RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)

External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88

Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP

=====

Release Radio- nuclide	-----Release Terms-----		
	Air	Surface	Buried
	Ci/yr	Water	Source
		Ci/yr	Ci/m3
H 3	8.5E+00	0.0E+00	0.0E+00
C060	3.2E+00	0.0E+00	0.0E+00
SE79	6.0E+00	0.0E+00	0.0E+00
KR86	1.7E+02	0.0E+00	0.0E+00
RB86	8.4E+05	0.0E+00	0.0E+00
SR89	1.1E+00	0.0E+00	0.0E+00
SR90	1.3E+02	0.0E+00	0.0E+00
Y 90	1.3E+02	0.0E+00	0.0E+00
Y 91	1.3E+00	0.0E+00	0.0E+00
ZR93	3.0E+07	0.0E+00	0.0E+00
NB93M	2.4E+00	0.0E+00	0.0E+00
ZR95	1.5E+00	0.0E+00	0.0E+00
NB95M	1.1E+02	0.0E+00	0.0E+00
NB95	1.2E+00	0.0E+00	0.0E+00
MO99	2.0E+03	0.0E+00	0.0E+00
TC99M	2.5E+03	0.0E+00	0.0E+00
TC99	2.2E+06	0.0E+00	0.0E+00
RU103	1.2E+04	0.0E+00	0.0E+00
RU106	8.0E+02	0.0E+00	0.0E+00
RH103M	1.0E+00	0.0E+00	0.0E+00
AG110M	4.0E+05	0.0E+00	0.0E+00
AG111	7.0E+03	0.0E+00	0.0E+00
CD113M	8.3E+06	0.0E+00	0.0E+00
CD115M	2.1E+03	0.0E+00	0.0E+00
CD115	5.5E+06	0.0E+00	0.0E+00
IN115M	6.1E+06	0.0E+00	0.0E+00
SN119M	9.7E+05	0.0E+00	0.0E+00

SN123	2.6E-03	0.0E+00	0.0E+00
SN125	4.5E-03	0.0E+00	0.0E+00
SN126	1.3E-07	0.0E+00	0.0E+00
SB125	3.3E-03	0.0E+00	0.0E+00
SB126M	1.3E-07	0.0E+00	0.0E+00
SB126	3.1E-04	0.0E+00	0.0E+00
SB124	4.7E-05	0.0E+00	0.0E+00
SB127	1.3E-03	0.0E+00	0.0E+00
TE126M	3.4E-04	0.0E+00	0.0E+00
TE127M	8.2E-03	0.0E+00	0.0E+00
TE127	9.3E-03	0.0E+00	0.0E+00
TE129M	3.9E-02	0.0E+00	0.0E+00
TE129	2.5E-02	0.0E+00	0.0E+00
TE131M	2.2E-08	0.0E+00	0.0E+00
TE131	5.0E-09	0.0E+00	0.0E+00
TE132	6.5E-03	0.0E+00	0.0E+00
I 129	3.8E-04	0.0E+00	0.0E+00
I 131	1.4E+04	0.0E+00	0.0E+00
I 132	4.7E-02	0.0E+00	0.0E+00
XE131M	1.1E+03	0.0E+00	0.0E+00
XE133M	2.0E+00	0.0E+00	0.0E+00
XE133	1.3E+04	0.0E+00	0.0E+00
CS134	1.7E-03	0.0E+00	0.0E+00
CS136	4.6E-03	0.0E+00	0.0E+00
CS137	1.6E-02	0.0E+00	0.0E+00
BA140	9.2E-01	0.0E+00	0.0E+00
LA140	1.1E+00	0.0E+00	0.0E+00
CE141	1.6E+00	0.0E+00	0.0E+00
CE143	1.2E-06	0.0E+00	0.0E+00
CE144	4.4E-01	0.0E+00	0.0E+00
PR143	1.0E+00	0.0E+00	0.0E+00
PR144M	5.3E-03	0.0E+00	0.0E+00
PR144	4.4E-04	0.0E+00	0.0E+00
ND147	2.8E-01	0.0E+00	0.0E+00
PM147	5.9E-02	0.0E+00	0.0E+00
PM148M	5.1E-03	0.0E+00	0.0E+00
PM148	2.3E-03	0.0E+00	0.0E+00
PM149	8.8E-05	0.0E+00	0.0E+00
SM151	3.1E-04	0.0E+00	0.0E+00
SM153	5.8E-06	0.0E+00	0.0E+00
EU152	2.9E-07	0.0E+00	0.0E+00
EU154	1.0E-04	0.0E+00	0.0E+00
EU155	4.5E-04	0.0E+00	0.0E+00
EU156	1.8E-02	0.0E+00	0.0E+00
TB160	1.3E-05	0.0E+00	0.0E+00
TH231	1.3E-07	0.0E+00	0.0E+00
PA231	5.9E-13	0.0E+00	0.0E+00
AC227	1.0E-15	0.0E+00	0.0E+00
TH227	1.0E-15	0.0E+00	0.0E+00
FR223	1.0E-15	0.0E+00	0.0E+00
RA223	1.0E-15	0.0E+00	0.0E+00
TH234	2.7E-06	0.0E+00	0.0E+00
PA234	3.5E-09	0.0E+00	0.0E+00
U 235	1.3E-07	0.0E+00	0.0E+00
U 236	5.5E-08	0.0E+00	0.0E+00
U 237	5.0E-02	0.0E+00	0.0E+00
U 238	3.0E-06	0.0E+00	0.0E+00
NP237	4.8E-08	0.0E+00	0.0E+00
PA233	3.2E-08	0.0E+00	0.0E+00
U 233	8.9E-13	0.0E+00	0.0E+00
TH229	1.0E-15	0.0E+00	0.0E+00
RA225	1.0E-15	0.0E+00	0.0E+00
AC225	1.0E-15	0.0E+00	0.0E+00
NP238	1.8E-06	0.0E+00	0.0E+00
NP239	2.3E-02	0.0E+00	0.0E+00
PU238	1.7E-05	0.0E+00	0.0E+00
PU239	6.0E-04	0.0E+00	0.0E+00
PU240	8.2E-05	0.0E+00	0.0E+00
PU241	2.9E-03	0.0E+00	0.0E+00
AM241	5.4E-07	0.0E+00	0.0E+00

===== AIR TRANSPORT =====
5.8E-08 Input chi/Q value (s/m3)

===== EXTERNAL EXPOSURE =====
8.8E+03 Hours of exposure to plume
4.4E+03 Hours of exposure to ground contamination

===== INHALATION =====
8.8E+03 Hours of inhalation exposure per year
1 Resuspension model: 1-Mass Loading, 2-Anspaugh
1.8E-04 Mass loading factor (g/m3)

=====

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 Minimal

Executed on: 89/18/89 at 21:51:25

Page C. 9

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.1E-08	0.0E+00	1.1E-17	1.1E-08	1.1E-08
CO 60	9.6E-06	0.0E+00	3.2E-05	9.6E-06	4.2E-05
SE 79	9.0E-16	0.0E+00	2.5E-18	9.0E-16	9.0E-16
KR 85	0.0E+00	0.0E+00	5.4E-09	0.0E+00	5.4E-09
SR 89	9.2E-08	0.0E+00	3.5E-10	9.2E-08	9.3E-08
RB 86	7.7E-12	0.0E+00	4.7E-13	7.7E-12	8.2E-12
SR 90	4.1E-08	0.0E+00	2.6E-11	4.1E-08	4.1E-08
Y 90	1.7E-09	0.0E+00	1.5E-09	1.7E-09	3.2E-09
Y 91	9.7E-07	0.0E+00	1.3E-09	9.7E-07	9.7E-07
ZR 93	3.7E-13	0.0E+00	4.0E-19	3.7E-13	3.7E-13
NB 93M	1.1E-14	0.0E+00	1.0E-16	1.1E-14	1.1E-14
ZR 95	3.5E-07	0.0E+00	2.1E-07	3.5E-07	5.6E-07
NB 95M	4.2E-10	0.0E+00	1.2E-10	4.2E-10	5.3E-10
NB 95	1.0E-07	0.0E+00	3.0E-07	1.0E-07	4.0E-07
MO 99	7.8E-11	0.0E+00	6.8E-12	7.8E-11	8.4E-11
TC 99M	1.2E-12	0.0E+00	3.9E-12	1.2E-12	5.1E-12
TC 99	3.0E-13	0.0E+00	2.9E-17	3.0E-13	3.0E-13
RU 103	1.6E-03	0.0E+00	7.2E-04	1.6E-03	2.3E-03
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	7.4E-11	0.0E+00	1.3E-07	7.4E-11	1.3E-07
RU 106	8.1E-03	0.0E+00	2.0E-04	8.1E-03	6.3E-03
AG 110M	5.0E-11	0.0E+00	5.9E-11	5.0E-11	1.1E-10
AG 111	3.7E-10	0.0E+00	6.6E-12	3.7E-10	3.8E-10
CD 113M	1.9E-10	0.0E+00	1.3E-14	1.9E-10	1.9E-10
CD 115M	2.3E-09	0.0E+00	8.7E-12	2.3E-09	2.3E-09
CD 116	3.2E-13	0.0E+00	2.1E-14	3.2E-13	3.4E-13
IN 115M	1.1E-14	0.0E+00	1.9E-14	1.1E-14	3.0E-14
SN 119M	9.0E-12	0.0E+00	4.5E-14	9.0E-12	9.0E-12
SN 123	1.3E-09	0.0E+00	7.5E-12	1.3E-09	1.3E-09
SN 125	1.1E-09	0.0E+00	5.2E-11	1.1E-09	1.1E-09
SB 125	6.1E-10	0.0E+00	3.6E-09	6.1E-10	4.3E-09
TE 125M	3.7E-11	0.0E+00	4.2E-12	3.7E-11	4.1E-11
SN 126	1.9E-13	0.0E+00	6.5E-14	1.9E-13	2.6E-13
SB 126M	5.9E-17	0.0E+00	6.8E-12	5.9E-17	6.8E-12
SB 126	5.5E-11	0.0E+00	4.0E-11	5.5E-11	9.6E-11
SB 124	1.8E-11	0.0E+00	1.6E-11	1.8E-11	3.4E-11
SB 127	1.2E-10	0.0E+00	1.9E-11	1.2E-10	1.4E-10

GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 Minimal

Executed on: 09/10/89 at 21:51:25

Page C. 10

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 127M	2.6E-09	0.0E+00	2.0E-12	2.6E-09	2.6E-09
TE 127	4.0E-11	0.0E+00	1.1E-11	4.0E-11	5.7E-11
TE 129M	2.9E-07	0.0E+00	1.1E-10	2.9E-07	2.9E-07
TE 129	5.9E-11	0.0E+00	1.4E-10	5.9E-11	1.9E-10
I 129	8.6E-10	0.0E+00	5.3E-12	8.6E-10	8.7E-10
TE 131M	4.0E-15	0.0E+00	4.0E-16	4.0E-15	4.4E-15
TE 131	9.4E-18	0.0E+00	3.1E-17	9.4E-18	4.0E-17
I 131	6.5E-03	0.0E+00	1.1E-03	6.5E-03	7.6E-03
XE 131M	0.0E+00	0.0E+00	1.8E-07	0.0E+00	1.8E-07
TE 132	1.2E-09	0.0E+00	2.7E-11	1.2E-09	1.3E-09
I 132	2.8E-06	0.0E+00	1.6E-06	2.8E-06	1.8E-06
XE 133M	0.0E+00	0.0E+00	6.7E-10	0.0E+00	6.7E-10
XE 133	0.0E+00	0.0E+00	3.6E-06	0.0E+00	3.6E-06
CS 134	1.1E-09	0.0E+00	5.6E-09	1.1E-09	6.7E-09
CS 137	6.6E-09	0.0E+00	1.8E-07	6.6E-09	1.9E-07
BA 140	4.3E-08	0.0E+00	7.9E-09	4.3E-08	5.0E-08
LA 140	6.0E-08	0.0E+00	1.1E-07	6.0E-08	1.7E-07
CS 136	4.5E-10	0.0E+00	4.5E-10	4.5E-10	9.1E-10
CE 141	2.1E-07	0.0E+00	6.4E-09	2.1E-07	2.1E-07
CE 143	6.3E-14	0.0E+00	4.1E-15	6.3E-14	6.7E-14
PR 143	1.2E-07	0.0E+00	2.7E-11	1.2E-07	1.2E-07
CE 144	2.4E-06	0.0E+00	3.3E-09	2.4E-06	2.5E-06
PR 144M	1.5E-12	0.0E+00	8.2E-12	1.5E-12	9.7E-12
PR 144	3.0E-13	0.0E+00	1.4E-08	3.0E-13	1.4E-08
ND 147	2.8E-08	0.0E+00	1.3E-09	2.8E-08	3.0E-08
PM 147	3.5E-08	0.0E+00	1.3E-12	3.5E-08	3.5E-08
SM 147	1.1E-18	0.0E+00	0.0E+00	1.1E-18	1.1E-18
PM 148M	1.7E-09	0.0E+00	1.3E-09	1.7E-09	3.1E-09
PM 148	3.9E-10	0.0E+00	5.1E-11	3.9E-10	4.4E-10
PM 149	4.0E-12	0.0E+00	1.7E-14	4.0E-12	4.0E-12
SM 151	1.4E-10	0.0E+00	5.1E-15	1.4E-10	1.4E-10
SM 153	1.7E-13	0.0E+00	4.0E-15	1.7E-13	1.8E-13
EU 152	9.2E-13	0.0E+00	4.1E-12	9.2E-13	5.1E-12
EU 154	4.1E-10	0.0E+00	1.0E-09	4.1E-10	1.4E-09
EU 156	2.7E-10	0.0E+00	5.9E-11	2.7E-10	3.3E-10
EU 158	3.9E-09	0.0E+00	1.3E-09	3.9E-09	5.2E-09
TB 160	5.0E-12	0.0E+00	2.6E-12	5.0E-12	7.6E-12

GENII Dose Calculation Program
(Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 Minimal

Executed on: 09/10/89 at 21:51:25

Page C. 11

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
U 238	1.0E-10	0.0E+00	5.3E-17	1.0E-10	1.0E-10
U 235	2.5E-10	0.0E+00	3.2E-13	2.5E-10	2.5E-10
TH 231	1.7E-15	0.0E+00	1.9E-14	1.7E-15	2.1E-14
PA 231	8.2E-15	0.0E+00	5.0E-17	8.2E-15	8.2E-15
AC 227	3.2E-10	0.0E+00	5.7E-20	3.2E-10	3.2E-10
TH 227	3.9E-10	0.0E+00	0.1E-17	3.9E-10	6.4E-17
FR 223	8.4E-23	0.0E+00	3.0E-19	8.4E-23	3.0E-19
RA 223	1.9E-10	0.0E+00	1.0E-10	1.9E-10	1.9E-10
U 237	2.7E-09	0.0E+00	1.5E-10	2.7E-09	2.9E-09
NP 237	4.6E-10	0.0E+00	1.3E-14	4.6E-10	4.6E-10
PA 233	4.6E-15	0.0E+00	3.2E-13	4.6E-15	3.3E-13
U 233	1.0E-15	0.0E+00	2.9E-20	1.0E-15	1.0E-15
TH 229	2.6E-17	0.0E+00	1.0E-20	2.6E-17	2.6E-17
RA 225	1.1E-19	0.0E+00	0.1E-22	1.1E-19	1.1E-19
AC 225	1.2E-19	0.0E+00	0.7E-20	1.2E-19	2.1E-19
U 230	5.3E-09	0.0E+00	2.0E-15	5.3E-09	5.3E-09
TH 234	1.4E-12	0.0E+00	2.0E-12	1.4E-12	3.4E-12
PA 234	4.5E-17	0.0E+00	3.0E-13	4.5E-17	3.0E-13
NP 230	1.1E-12	0.0E+00	1.7E-14	1.1E-12	1.1E-12
PU 230	7.4E-08	0.0E+00	0.0E-15	7.4E-08	7.4E-08
PU 240	3.6E-07	0.0E+00	5.1E-14	3.6E-07	3.6E-07
PU 241	2.2E-07	0.0E+00	1.3E-10	2.2E-07	2.2E-07
AM 241	3.9E-09	0.0E+00	0.3E-12	3.9E-09	3.9E-09
NP 239	0.5E-10	0.0E+00	5.0E-11	0.5E-10	9.1E-10
PU 239	2.0E-06	0.0E+00	0.3E-13	2.0E-06	2.0E-06

 GENII Dose Calculation Program
 (Version 1.895 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 FINAL!!

Executed on: 09/18/89 at 21:25:23

Page A. 1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Infinite plume, external
 Ground, external
 Inhalation uptake
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

49 years of air deposition prior to the intake period

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

Input file name: \GENII\BANDIR\last.in
 METABOLIC PARAMETERS-----
 RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)
 Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88
 Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP
 =====

-----Release Terms-----

Release	Surface Buried		
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3
H 3	8.6E+00	0.0E+00	0.0E+00
C060	3.2E+00	0.0E+00	0.0E+00
SE79	0.8E+00	0.0E+00	0.0E+00
KR86	1.7E+02	0.0E+00	0.0E+00
RB86	8.4E+05	0.0E+00	0.0E+00
SR89	1.1E+00	0.0E+00	0.0E+00
SR90	1.3E+02	0.0E+00	0.0E+00
Y 90	1.3E+02	0.0E+00	0.0E+00
Y 91	1.3E+00	0.0E+00	0.0E+00
ZR93	3.0E+07	0.0E+00	0.0E+00
NB93M	2.4E+08	0.0E+00	0.0E+00
ZR95	1.5E+00	0.0E+00	0.0E+00
NB95M	1.1E+02	0.0E+00	0.0E+00
NB95	1.2E+00	0.0E+00	0.0E+00
M099	2.6E+03	0.0E+00	0.0E+00
TC99M	2.5E+03	0.0E+00	0.0E+00
TC99	2.2E+06	0.0E+00	0.0E+00
RU103	1.2E+04	0.0E+00	0.0E+00
RU106	8.6E+02	0.0E+00	0.0E+00
RH103M	1.0E+00	0.0E+00	0.0E+00
AG110M	4.0E+05	0.0E+00	0.0E+00
AG111	7.6E+03	0.0E+00	0.0E+00
CD113M	8.3E+06	0.0E+00	0.0E+00
CD115M	2.1E+03	0.0E+00	0.0E+00

CD116	5.5E-06	0.0E+00	0.0E+00
IN116M	6.1E-06	0.0E+00	0.0E+00
SN119M	9.7E-05	0.0E+00	0.0E+00
SN123	2.6E-03	0.0E+00	0.0E+00
SN125	4.5E-03	0.0E+00	0.0E+00
SN126	1.3E-07	0.0E+00	0.0E+00
SB125	3.3E-03	0.0E+00	0.0E+00
SB126M	1.3E-07	0.0E+00	0.0E+00
SB126	3.1E-04	0.0E+00	0.0E+00
SB124	4.7E-05	0.0E+00	0.0E+00
SB127	1.3E-03	0.0E+00	0.0E+00
TE125M	3.4E-04	0.0E+00	0.0E+00
TE127M	8.2E-03	0.0E+00	0.0E+00
TE127	9.3E-03	0.0E+00	0.0E+00
TE129M	3.9E-02	0.0E+00	0.0E+00
TE129	2.5E-02	0.0E+00	0.0E+00
TE131M	2.2E-08	0.0E+00	0.0E+00
TE131	5.0E-09	0.0E+00	0.0E+00
TE132	6.5E-03	0.0E+00	0.0E+00
I 129	3.6E-04	0.0E+00	0.0E+00
I 131	1.4E-04	0.0E+00	0.0E+00
I 132	4.7E-02	0.0E+00	0.0E+00
XE131M	1.1E+03	0.0E+00	0.0E+00
XE133M	2.0E+00	0.0E+00	0.0E+00
XE133	1.3E+04	0.0E+00	0.0E+00
CS134	1.7E-03	0.0E+00	0.0E+00
CS136	4.6E-03	0.0E+00	0.0E+00
CS137	1.6E-02	0.0E+00	0.0E+00
BA140	9.2E-01	0.0E+00	0.0E+00
LA140	1.1E+00	0.0E+00	0.0E+00
CE141	1.6E+00	0.0E+00	0.0E+00
CE143	1.2E-06	0.0E+00	0.0E+00
CE144	4.4E-01	0.0E+00	0.0E+00
PR143	1.6E+00	0.0E+00	0.0E+00
PR144M	5.3E-03	0.0E+00	0.0E+00
PR144	4.4E-04	0.0E+00	0.0E+00
ND147	2.8E-01	0.0E+00	0.0E+00
PM147	5.9E-02	0.0E+00	0.0E+00
PM148M	5.1E-03	0.0E+00	0.0E+00
PM148	2.3E-03	0.0E+00	0.0E+00
PM149	8.8E-05	0.0E+00	0.0E+00
SM151	3.1E-04	0.0E+00	0.0E+00
SM153	5.8E-06	0.0E+00	0.0E+00
EU152	2.9E-07	0.0E+00	0.0E+00
EU154	1.6E-04	0.0E+00	0.0E+00
EU155	4.5E-04	0.0E+00	0.0E+00
EU156	1.8E-02	0.0E+00	0.0E+00
TB160	1.3E-05	0.0E+00	0.0E+00
TH231	1.3E-07	0.0E+00	0.0E+00
PA231	5.9E-13	0.0E+00	0.0E+00
AC227	1.0E-16	0.0E+00	0.0E+00
TH227	1.0E-16	0.0E+00	0.0E+00
FR223	1.0E-16	0.0E+00	0.0E+00
RA223	1.0E-16	0.0E+00	0.0E+00
TH234	2.7E-06	0.0E+00	0.0E+00
PA234	3.5E-09	0.0E+00	0.0E+00
U 236	1.3E-07	0.0E+00	0.0E+00
U 236	5.5E-08	0.0E+00	0.0E+00
U 237	5.6E-02	0.0E+00	0.0E+00
U 238	3.6E-06	0.0E+00	0.0E+00
NP237	4.8E-08	0.0E+00	0.0E+00
PA233	3.2E-08	0.0E+00	0.0E+00
U 233	8.9E-13	0.0E+00	0.0E+00
TH229	1.0E-16	0.0E+00	0.0E+00
RA225	1.0E-16	0.0E+00	0.0E+00
AC225	1.0E-16	0.0E+00	0.0E+00
NP238	1.8E-06	0.0E+00	0.0E+00
NP239	2.3E-02	0.0E+00	0.0E+00
PU238	1.7E-05	0.0E+00	0.0E+00
PU239	6.0E-04	0.0E+00	0.0E+00

PU240 0.2E-05 0.0E+00 0.0E+00
 PU241 2.9E-03 0.0E+00 0.0E+00
 AM241 5.4E-07 0.0E+00 0.0E+00

===== AIR TRANSPORT =====
 5.6E-08 Input chi/Q value (s/m3)

===== EXTERNAL EXPOSURE =====
 8.8E+03 Hours of exposure to plume
 4.4E+03 Hours of exposure to ground contamination

===== INHALATION =====
 8.8E+03 Hours of inhalation exposure per year
 1 Resuspension model: 1-Mass Loading, 2-Anspaugh
 1.0E-04 Mass loading factor (g/m3)

===== INGESTION POPULATION =====
 1 Atmospheric production definition: 1 - Use population-weighted chi/Q

===== TERRESTRIAL FOOD INGESTION =====

FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE + in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5	1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0	5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0	5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8	180.0	8.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	---STORED FEED---						
	CONSUMPTION kg/yr	HOLDUP d			DIET FRAC- TION	GROW TIME d	--IRRIGATION-- S RATE + in/yr	TIME mo/yr	YIELD kg/m3	STOR- AGE d	
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.0	0.00	180.0
Poultry	1.8E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.00	180.0
Cow Milk	2.7E+02	1.0		0.00	0.3	45.00	0	0.0	0.0	2.00	100.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.00	180.0
----- FRESH FORAGE -----											
Meat					0.75	45.0	0	0.0	0.0	2.00	100.0
Cow Milk					0.75	30.0	0	0.0	0.0	1.50	0.0

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 FINAL!!

Executed on: 09/10/89 at 21:30:14

Page C. 9

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.1E-08	9.5E-08	1.1E-17	1.1E-07	1.1E-07
CO 60	9.6E-06	6.7E-06	3.2E-06	1.6E-05	4.8E-05
SE 79	9.0E-16	5.3E-12	2.5E-18	5.3E-12	5.3E-12
KR 85	0.0E+00	0.0E+00	5.4E-09	0.0E+00	5.4E-09
SR 89	9.2E-08	9.0E-07	3.5E-10	9.9E-07	9.9E-07
RB 86	7.7E-12	9.1E-11	4.7E-13	9.9E-11	9.9E-11
SR 90	4.1E-08	2.8E-06	2.6E-11	2.8E-06	2.8E-06
Y 90	1.7E-09	1.7E-08	1.5E-09	1.9E-08	2.0E-08
Y 91	9.7E-07	8.9E-07	1.3E-09	1.9E-06	1.9E-06
ZR 93	3.7E-13	7.5E-14	4.0E-19	4.4E-13	4.4E-13
NB 93M	1.1E-14	6.7E-15	1.0E-16	1.7E-14	1.8E-14
ZR 95	3.5E-07	4.1E-07	2.1E-07	7.6E-07	9.0E-07
NB 95M	4.2E-10	2.1E-09	1.2E-10	2.5E-09	2.7E-09
NB 95	1.0E-07	2.7E-07	3.0E-07	3.7E-07	6.7E-07
MO 99	7.8E-11	1.4E-10	6.8E-12	2.2E-10	2.3E-10
TC 99M	1.2E-12	6.8E-12	3.9E-12	7.8E-12	1.2E-11
TC 99	3.0E-13	1.2E-11	2.9E-17	1.3E-11	1.3E-11
RU 103	1.6E-03	2.4E-03	7.2E-04	4.0E-03	4.7E-03
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	7.4E-11	4.2E-05	1.3E-07	4.2E-05	4.2E-05
RU 106	6.1E-03	2.3E-03	2.0E-04	8.4E-03	8.6E-03
AG 110M	5.0E-11	5.0E-10	5.9E-11	5.5E-10	6.1E-10
AG 111	3.7E-10	5.3E-09	6.8E-12	5.7E-09	5.7E-09
CD 113M	1.9E-10	1.6E-09	1.3E-14	1.8E-09	1.8E-09
CD 115M	2.3E-09	2.7E-09	6.7E-12	5.0E-09	5.0E-09
CD 115	3.2E-13	4.1E-13	2.1E-14	7.3E-13	7.5E-13
IN 115M	1.1E-14	2.6E-14	1.9E-14	3.7E-14	5.6E-14
SN 119M	9.0E-12	1.8E-11	4.5E-14	2.7E-11	2.7E-11
SN 123	1.3E-09	2.6E-09	7.5E-12	3.8E-09	3.8E-09
SN 125	1.1E-09	2.2E-09	5.2E-11	3.3E-09	3.4E-09
SB 125	6.1E-10	9.7E-10	3.6E-09	1.8E-09	5.2E-09
TE 125M	3.7E-11	1.5E-09	4.2E-12	1.5E-09	1.5E-09
SN 126	1.9E-13	7.6E-13	6.5E-14	9.5E-13	1.0E-12
SB 126M	5.9E-17	2.8E-15	6.8E-12	2.9E-15	6.8E-12
SB 126	5.5E-11	1.5E-10	4.0E-11	2.0E-10	2.4E-10
SB 124	1.8E-11	3.7E-11	1.0E-11	5.5E-11	7.1E-11
SB 127	1.2E-10	2.0E-10	1.9E-11	3.2E-10	3.4E-10

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
 FINAL!!

Executed on: 09/18/89 at 21:30:14

Page C. 10

Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 127M	2.6E-09	1.0E-08	2.0E-12	1.3E-08	1.3E-08
TE 127	4.6E-11	6.7E-10	1.1E-11	9.2E-10	9.3E-10
TE 129M	2.9E-07	1.0E-06	1.1E-10	2.1E-06	2.1E-06
TE 129	5.9E-11	5.5E-10	1.4E-10	6.1E-10	7.5E-10
I 129	8.6E-10	2.4E-07	5.3E-12	2.4E-07	2.4E-07
TE 131M	4.0E-15	3.1E-15	4.8E-16	7.1E-15	7.0E-15
TE 131	9.4E-18	8.8E-18	3.1E-17	1.8E-17	4.9E-17
I 131	6.5E-03	6.0E-01	1.1E-03	6.0E-01	6.0E-01
XE 131M	0.0E+00	0.0E+00	1.0E-07	0.0E+00	1.0E-07
TE 132	1.2E-09	1.9E-09	2.7E-11	3.1E-09	3.1E-09
I 132	2.8E-06	2.0E-06	1.6E-05	4.7E-06	2.0E-05
XE 133M	0.0E+00	0.0E+00	6.7E-10	0.0E+00	6.7E-10
XE 133	0.0E+00	0.0E+00	3.6E-06	0.0E+00	3.6E-06
CS 134	1.1E-09	3.4E-08	5.6E-09	3.6E-08	4.1E-08
CS 137	6.6E-09	2.5E-07	1.8E-07	2.5E-07	4.4E-07
BA 140	4.3E-08	3.8E-07	7.9E-09	4.3E-07	4.3E-07
LA 140	6.0E-08	3.8E-07	1.1E-07	4.4E-07	5.5E-07
CS 136	4.5E-10	4.1E-09	4.5E-10	4.5E-09	5.0E-09
CE 141	2.1E-07	3.0E-07	6.4E-09	5.0E-07	5.1E-07
CE 143	6.3E-14	4.4E-14	4.1E-15	1.1E-13	1.1E-13
PR 143	1.2E-07	2.1E-07	2.7E-11	3.3E-07	3.3E-07
CE 144	2.4E-06	8.5E-07	3.3E-09	3.3E-06	3.3E-06
PR 144M	1.5E-12	2.0E-11	8.2E-12	2.9E-11	3.7E-11
PR 144	3.0E-13	4.8E-09	1.4E-08	4.8E-09	1.9E-08
ND 147	2.8E-08	4.6E-08	1.3E-09	7.4E-08	7.5E-08
PM 147	3.5E-08	7.1E-09	1.3E-12	4.2E-08	4.2E-08
SM 147	1.1E-10	5.1E-10	0.0E+00	6.2E-10	6.2E-10
PM 148M	1.7E-09	2.7E-09	1.3E-09	4.4E-09	5.7E-09
PM 148	3.9E-10	7.4E-10	5.1E-11	1.1E-09	1.2E-09
PM 149	4.0E-12	4.4E-12	1.7E-14	8.3E-12	8.4E-12
SM 151	1.4E-10	1.5E-11	5.1E-15	1.6E-10	1.6E-10
SM 153	1.7E-13	1.9E-13	4.0E-15	3.6E-13	3.6E-13
EU 152	9.2E-13	2.3E-13	4.1E-12	1.1E-12	5.3E-12
EU 154	4.1E-10	1.1E-10	1.0E-09	5.2E-10	1.5E-09
EU 155	2.7E-10	8.0E-11	5.9E-11	3.5E-10	4.1E-10
EU 156	3.9E-09	7.5E-09	1.3E-09	1.1E-08	1.3E-08
TB 160	5.0E-12	6.9E-12	2.6E-12	1.2E-11	1.4E-11

GENII Dose Calculation Program
(Version 1.395 23-Jan-89)

Case title: Top One hundred or so Nuclides to HEDR Selection - Air 1945
FINAL!!

Executed on: 09/10/89 at 21:30:14

Page C. 11

Release period: 1.0
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
U 236	1.0E-10	1.3E-13	5.3E-17	1.0E-10	1.0E-10
U 236	2.5E-10	3.5E-13	3.2E-13	2.5E-10	2.5E-10
TH 231	1.7E-15	1.7E-14	1.9E-14	1.9E-14	3.0E-14
PA 231	0.2E-15	5.1E-14	5.6E-17	5.9E-14	5.9E-14
AC 227	3.2E-10	3.0E-15	5.7E-20	3.3E-15	3.3E-15
TH 227	3.9E-10	5.3E-10	0.1E-17	9.2E-10	7.0E-17
FR 223	0.4E-23	4.5E-22	3.0E-19	5.3E-22	3.0E-19
RA 223	1.9E-10	0.0E-10	1.0E-10	0.7E-10	1.0E-15
U 237	2.7E-09	5.0E-09	1.5E-10	7.7E-09	7.0E-09
NP 237	4.0E-10	3.7E-10	1.3E-14	0.4E-10	0.4E-10
PA 233	4.0E-15	3.3E-14	3.2E-13	3.7E-14	3.0E-13
U 233	1.0E-15	3.2E-10	2.9E-20	1.0E-15	1.0E-15
TH 229	2.0E-17	0.4E-19	1.0E-20	2.0E-17	2.0E-17
RA 225	1.1E-19	3.9E-19	0.1E-22	5.0E-19	5.0E-19
AC 225	1.2E-19	2.2E-20	0.7E-20	1.4E-19	2.3E-19
U 230	5.3E-09	7.2E-12	2.0E-15	5.3E-09	5.3E-09
TH 234	1.4E-12	4.3E-12	2.0E-12	5.7E-12	7.0E-12
PA 234	4.5E-17	1.9E-15	3.0E-13	1.9E-15	3.1E-13
NP 230	1.1E-12	0.0E-14	1.7E-14	1.2E-12	1.2E-12
PU 230	7.4E-08	5.0E-10	0.0E-15	7.5E-08	7.5E-08
PU 240	3.0E-07	2.7E-09	5.1E-14	3.7E-07	3.7E-07
PU 241	2.2E-07	1.7E-09	1.3E-10	2.2E-07	2.2E-07
AM 241	3.9E-09	0.0E-10	0.3E-12	4.7E-09	4.0E-09
NP 239	0.5E-10	9.9E-10	5.0E-11	1.0E-09	1.9E-09
PU 239	2.0E-06	2.0E-08	0.3E-13	2.0E-06	2.0E-06

APPENDIX C

GENII RESULTS FOR SURFACE WATER RELEASES

APPENDIX C

GENII RESULTS FOR SURFACE WATER RELEASES

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: MI dose from concentrations measured in effluent in 1958

Executed on: 89/19/89 at 09:58:36

Page A. 1

This is a near field (narrowly-focused, single site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Surface Water

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:

Ground, external
 Recreation, external
 Inhalation uptake
 Drinking water ingestion
 Aquatic foods ingestion
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:

Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

Input file name: \GENII\BANDIR\river84.in	9-18-89
METABOLIC PARAMETERS-----	8-12-88
RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)	8-29-88
Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA	8-29-88
Bioaccumulation Factor Library - (30-Aug-88) RAP (p-32, zn, np modi	9-12-89
External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88	8-29-88
Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP	8-29-88

=====

-----Release Terms-----

Release	Air	Surface	Buried
Radio-	pCi/yr	pCi/yr	Source
nuclide	pCi/yr	pCi/yr	pCi/m3
H 3	0.0E+00	1.0E+01	0.0E+00
NA24	0.0E+00	0.0E+02	0.0E+00
SI31	0.0E+00	0.0E+02	0.0E+00
P 32	0.0E+00	2.0E+01	0.0E+00
CA45	0.0E+00	7.0E-01	0.0E+00
SC46	0.0E+00	1.0E+00	0.0E+00
CR51	0.0E+00	5.0E+02	0.0E+00
MN54	0.0E+00	4.0E-01	0.0E+00
MN56	0.0E+00	7.0E+03	0.0E+00
FE59	0.0E+00	1.0E+00	0.0E+00
CO60	0.0E+00	4.0E-01	0.0E+00
NI65	0.0E+00	2.0E+00	0.0E+00
CU64	0.0E+00	0.0E+02	0.0E+00

ZN65	0.0E+00	1.0E+01	0.0E+00
ZN69M	0.0E+00	4.0E+01	0.0E+00
QA72	0.0E+00	2.0E+01	0.0E+00
AS76	0.0E+00	1.0E+02	0.0E+00
SR87M	0.0E+00	5.0E+00	0.0E+00
SR89	0.0E+00	6.0E-01	0.0E+00
SR90	0.0E+00	1.0E-02	0.0E+00
SR91	0.0E+00	1.0E+01	0.0E+00
SR92	0.0E+00	5.0E+01	0.0E+00
Y 90	0.0E+00	2.0E+00	0.0E+00
Y 91	0.0E+00	3.0E-01	0.0E+00
Y 92	0.0E+00	2.0E+01	0.0E+00
Y 93	0.0E+00	5.0E+00	0.0E+00
ZR95	0.0E+00	1.9E+00	0.0E+00
NB95	0.0E+00	4.0E-01	0.0E+00
M099	0.0E+00	1.0E+00	0.0E+00
TC99	0.0E+00	0.0E+00	0.0E+00
RU103	0.0E+00	4.0E-02	0.0E+00
RU106	0.0E+00	1.0E-02	0.0E+00
SB122	0.0E+00	1.0E+01	0.0E+00
SB124	0.0E+00	3.5E-01	0.0E+00
I 131	0.0E+00	5.0E-01	0.0E+00
I 132	0.0E+00	2.0E+01	0.0E+00
I 133	0.0E+00	7.0E+00	0.0E+00
I 134	0.0E+00	1.0E+02	0.0E+00
I 135	0.0E+00	1.0E+01	0.0E+00
CS136	0.0E+00	6.0E-02	0.0E+00
CS137	0.0E+00	1.0E-02	0.0E+00
CS138	0.0E+00	1.0E+02	0.0E+00
BA139	0.0E+00	1.0E+02	0.0E+00
BA140	0.0E+00	1.0E+00	0.0E+00
LA140	0.0E+00	1.0E+01	0.0E+00
CE141	0.0E+00	5.0E-01	0.0E+00
CE143	0.0E+00	1.5E+00	0.0E+00
CE144	0.0E+00	2.0E-01	0.0E+00
PR142	0.0E+00	5.0E+00	0.0E+00
PR143	0.0E+00	5.0E-01	0.0E+00
ND147	0.0E+00	3.0E-01	0.0E+00
PM147	0.0E+00	1.0E-01	0.0E+00
PM149	0.0E+00	7.0E-01	0.0E+00
PM151	0.0E+00	4.0E-01	0.0E+00
SM153	0.0E+00	2.4E+01	0.0E+00
EU152M	0.0E+00	6.1E+01	0.0E+00
EU152	0.0E+00	2.0E-01	0.0E+00
EU156	0.0E+00	3.0E-01	0.0E+00
QD153	0.0E+00	2.0E-02	0.0E+00
QD159	0.0E+00	1.0E+00	0.0E+00
TB160	0.0E+00	1.0E-01	0.0E+00
TB161	0.0E+00	5.0E-02	0.0E+00
DY165	0.0E+00	4.0E+01	0.0E+00
HO166	0.0E+00	2.0E+00	0.0E+00
ER169	0.0E+00	2.0E-01	0.0E+00
ER171	0.0E+00	1.0E+00	0.0E+00
TH232	0.0E+00	2.0E-02	0.0E+00
U 238	0.0E+00	7.0E-03	0.0E+00
NP239	0.0E+00	2.0E+02	0.0E+00
PU239	0.0E+00	2.0E-02	0.0E+00
PU240	0.0E+00	2.0E-02	0.0E+00

```

===== NEAR-FIELD PARAMETERS =====
0.0      Inventory disposed n years prior to beginning of intake period
0        LOIC occurred n years prior to beginning of intake period
1.0E+00  Fraction of roots in upper soil (top 15 cm)
0.0E+00  Fraction of roots in deep soil
0.0E+00  Manual redistribution: deep soil/surface soil dilution factor
1250.0   Source area for external dose modification factor (m2)

```

```

===== SURFACE WATER TRANSPORT =====
0      Mixing ratio model: 0-use value, 1-river, 2-lake, 3-river flow
8.0E+00 Transit time to irrigation withdrawal location (h)
3.4E+03 Average water flow rate for: MIXFLG=1,2 (m/s), MIXFLG=0,3 (m3/s)
1.0E+15 Mixing ratio, dimensionless

```

```

===== EXTERNAL EXPOSURE =====
4.4E+03 Hours of exposure to ground contamination
2      Residential irrigation source 1-ground water, 2-surface water
4.0E+01 Residential irrigation application rate (in/yr)
6.0E+00 Residential irrigation duration (mo/yr)
1.0E+02 Hours of exposure from swimming
1.0E+02 Hours of exposure from boating
5.0E+02 Hours of exposure from shoreline activities
1      Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin
8.0E+00 Surface water transit time to recreational site (h)

```

```

===== INHALATION =====
4.4E+03 Hours of inhalation exposure per year
1      Resuspension model: 1-Mass Loading, 2-Anapaugh
1.0E-04 Mass loading factor (g/m3)

```

```

===== DRINKING WATER SOURCE/IRRIGATION =====
7.3E+02 Drinking water consumption rate (l/yr)
2      Drinking water source: 1-ground, 2-surface, 3-system
F      Drinking water treatment: T/F
1.0    Drinking water transit/holdup time (d)

```

```

===== AQUATIC FOODS INGESTION =====

```

FOOD TYPE	TRAN- SIT h	PROD- UCTION kg/yr	----CONSUMPTION----
			HOLDUP d RATE kg/yr
Fish	0.00E+00		1.00E+00 4.00E+01

```

===== TERRESTRIAL FOOD INGESTION =====

```

FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP d RATE kg/yr
Leaf Veg	90.0	2	35.0	0.0	1.5	1.0 3.0E+01
Oth. Veg	90.0	2	40.0	0.0	4.0	5.0 2.2E+02
Fruit	90.0	2	35.0	0.0	2.0	5.0 3.3E+02
Cereals	90.0	2	0.0	0.0	0.0	100.0 8.0E+01

```

===== ANIMAL FOOD INGESTION =====

```

FOOD TYPE	---HUMAN--- CONSUMPTION RATE HOLDUP kg/yr d	TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC- TION	GROW TIME d	---STORED FEED--- --IRRIGATION-- S RATE TIME * in/yr mo/yr	STOR- YIELD AGE kg/m3 d
Meat	0.0E+01 15.0		1.00	0.3	90.00	2 35.0 0.0	0.80 100.0
Poultry	1.8E+01 1.0		1.00	1.0	90.00	2 0.0 0.0	0.80 100.0
Cow Milk	2.7E+02 1.0		1.00	0.3	45.00	2 47.0 0.0	2.00 100.0
Eggs	3.0E+01 1.0		1.00	1.0	90.00	2 0.0 0.0	0.80 100.0

	-----FRESH FORAGE-----						
Meat				0.00	45.0	2	47.0 0.0 2.00 100.0
Cow Milk				0.00	30.0	2	47.0 0.0 1.50 0.0

GENII Dose Calculation Program
(Version 1.395 23-Jan-89)

Case title: MI dose from concentrations measured in effluent in 1958

Executed on: 89/19/89 at 10:31:13

Page C. 1

Release period: 1.0
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Organ	Committed Dose Equivalent	Weighting Factors	Weighted Dose Equivalent
-----	-----	-----	-----
Gonads	2.7E-01	2.5E-01	6.8E-02
Breast	2.2E-01	1.5E-01	3.3E-02
R Marrow	1.0E+00	1.2E-01	1.2E-01
Lung	2.1E-01	1.2E-01	2.5E-02
Thyroid	3.3E-01	3.0E-02	1.0E-02
Bone Sur	1.1E+00	3.0E-02	3.4E-02
LL Int.	2.4E+00	6.0E-02	1.5E-01
UL Int.	1.3E+00	6.0E-02	8.0E-02
S Int.	5.1E-01	6.0E-02	3.1E-02
Stomach	4.5E-01	6.0E-02	2.7E-02
Liver	4.5E-02	6.0E-02	2.7E-03
-----	-----	-----	-----
Internal Effective Dose Equivalent			5.8E-01
External Dose			1.2E-02
-----	-----	-----	-----
Annual Effective Dose Equivalent			5.9E-01

-----	-----
Controlling Organ:	LL Int.
Controlling Pathway:	Ing
Controlling Radionuclide:	P 32
-----	-----
Total Inhalation EDE:	6.3E-07
Total Ingestion EDE:	5.8E-01
-----	-----

GENII Dora Calculation Program
 (Version 1.395 23-Jan-89)

Case title: MI dose from concentrations measured in effluent in 1966

Executed on: 19/19/89 at 10:31:13

Page C. 2

Release period: 1.1
Uptake/exposure period: 1.1
Dora commitment period: 61.1
Dora units: Rem

	Dora Commitment Year				
	1	2	3	...	
Internal Intake Year:					
3			0.0E+00	...	
2		0.0E+00	0.0E+00	...	
1	5.5E-01	1.9E-02	3.7E-03	...	
	= 5.8E-01				Internal Effective Dose Eauivalent
Internal Annual Dora	5.5E-01	1.9E-02	3.7E-03	...	
	= 5.8E-01				Cumulative Internal Dose
External Annual Dora	1.2E-02	0.0E+00	0.0E+00	...	
	= 1.2E-02				Cumulative Dose
Annual Dose	5.5E-01	1.9E-02	3.7E-03	...	
	= 5.9E-01				Maximum Annual Dose Occurred In Year 1

.....
GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: MI dose from concentrations **measured** in effluent in 1966

Executed on: 19/19/89 at 10:31:13

Page C. 3

Release period: 1.1
 Uptake/exposure period: 1.1
 Dose commitment period: 61.1
 Dose units: Rem

Committed Dose Equivalent by Exposure Pathway

Pathway	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro	Testes
Inhrle	2.2E-06	2.8E-09	1.8E-09	2.5E-09	3.6E-09	8.8E-06	6.9E-07	2.9E-08
Leaf Veg	5.8E-04	1.3E-03	1.7E-03	4.6E-03	9.3E-03	7.8E-03	2.4E-03	7.0E-04
Oth. Veg	8.5E-04	1.6E-03	1.9E-03	4.4E-03	8.8E-03	7.2E-03	2.9E-03	1.8E-03
Fruit	7.7E-04	1.4E-03	1.7E-03	3.9E-03	7.8E-03	6.4E-03	2.5E-03	9.1E-04
Cereals	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Meat	7.4E-02	7.4E-02	9.4E-02	9.3E-02	1.2E-01	1.7E-01	1.2E-01	8.8E-02
Poultry	3.9E-05	5.4E-05	6.8E-05	1.2E-04	1.8E-04	6.3E-05	6.4E-05	4.7E-05
Cow Milk	2.6E-02	4.0E-02	3.2E-02	5.1E-02	1.0E-01	1.1E-01	1.1E-01	3.0E-02
Eggs	6.8E-05	1.1E-04	8.8E-05	2.2E-04	5.1E-04	5.2E-04	5.4E-04	7.4E-05
Swim Ing	1.3E-05	1.2E-04	1.2E-04	2.6E-04	3.5E-04	6.3E-05	3.4E-05	1.4E-05
Water	2.7E-03	1.3E-02	1.3E-02	4.2E-02	8.1E-02	2.0E-02	9.0E-03	3.1E-03
Fish	1.0E-01	3.2E-01	3.6E-01	1.1E+00	2.1E+00	8.3E-01	7.9E-01	1.1E-01
Total	2.1E-01	4.5E-01	5.1E-01	1.3E+00	2.4E+00	1.1E+00	1.0E+00	2.4E-01

Pathway	Ovaries	Muscle	Thyroid	Bladder	Kidneys	Liver	Pancrea	Spleen
Inhale	1.3E-09	2.2E-09	2.3E-09	1.0E-12	5.3E-10	4.1E-07	2.2E-12	3.4E-10
Leaf Veg	9.9E-04	6.5E-04	1.9E-03	5.6E-06	4.1E-05	2.6E-04	8.0E-06	4.5E-05
Oth. Veg	1.2E-03	9.3E-04	2.0E-03	4.7E-06	3.5E-05	2.2E-04	6.8E-06	3.8E-05
Fruit	1.1E-03	8.4E-04	1.8E-03	4.1E-06	3.1E-05	1.9E-04	6.0E-06	3.3E-05
Cereals	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Meat	8.2E-02	8.0E-02	7.9E-02	2.4E-08	1.8E-05	9.3E-04	5.4E-13	1.9E-04
Poultry	4.6E-05	4.3E-05	4.3E-05	8.6E-09	3.0E-06	3.5E-06	4.4E-07	2.4E-06
Cow Milk	2.9E-02	2.8E-02	9.7E-02	2.0E-04	4.7E-05	9.4E-05	2.8E-05	9.7E-06
Eggs	7.3E-05	7.1E-05	4.1E-04	2.2E-06	4.8E-07	1.9E-06	7.0E-07	7.4E-07
Swim Ing	2.0E-05	1.4E-05	6.2E-05	5.2E-07	2.6E-06	6.5E-06	1.2E-06	1.9E-06
Water	5.3E-03	3.0E-03	1.4E-02	6.5E-05	6.4E-04	1.3E-03	1.8E-04	4.6E-04
Fish	1.5E-01	1.1E-01	1.4E-01	2.4E-04	9.7E-03	4.2E-02	2.4E-02	1.3E-02
Total	2.7E-01	2.2E-01	3.3E-01	5.4E-04	1.1E-02	4.5E-02	2.5E-02	1.3E-02

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 GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: MI dose from **concentrations** measured in effluent in 1966

Executed on: 19/19/89 at 10:31:13

Page C. 4

.....
 Release period: 1.0
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose unite: Rem

External Dose by Exposure Pathway

Pathway	
-----	-----
Sur Soil	1.7E-03
Swim Ext	6.3E-03
Boating	3.2E-03
Shore	9.8E-04
-----	-----
Total	1.2E-02

GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: **MI** dose from **concentrations** measured in effluent in 1966

Executed on: 19/19/89 at **10:31:13**

Page C. 11

Release period: 1.1
 Uptake/exposure period: 1.1
 Dose commitment period: 61.1
 Dose units: **Rem**

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.0E-00	8.5E-06	1.0E-14	8.5E-06	8.5E-06
NA 24	2.0E-11	1.3E-02	5.6E-03	1.3E-02	1.8E-02
SI 31	1.5E-13	3.1E-04	9.4E-07	3.1E-04	3.1E-04
P 32	1.1E-10	2.2E-01	7.7E-07	2.2E-01	2.2E-01
CA 46	4.2E-11	4.7E-04	7.6E-10	4.7E-04	4.7E-04
SC 46	1.6E-10	4.3E-04	1.2E-04	4.3E-04	5.5E-04
CR 61	3.1E-10	1.7E-03	4.0E-04	1.7E-03	2.1E-03
YN 64	3.7E-11	2.3E-04	4.7E-05	2.3E-04	2.8E-04
YN 66	2.1E-12	1.7E-03	3.9E-03	1.7E-03	5.6E-03
FE 69	3.8E-11	6.0E-03	3.7E-05	6.0E-03	5.1E-03
CO 61	1.3E-09	1.3E-03	1.6E-04	1.3E-03	1.4E-03
NI 66	4.0E-10	8.9E-08	3.6E-07	8.9E-08	4.5E-07
CJ 64	3.0E-12	7.3E-02	2.5E-04	7.3E-02	7.3E-02
ZN 66	1.9E-09	1.3E-01	7.1E-04	1.3E-01	1.3E-01
ZN 69M	8.9E-13	3.1E-03	4.5E-05	3.1E-03	3.1E-03
ZN 69	4.8E-14	2.3E-04	6.8E-08	2.3E-04	2.3E-04
GA 72	1.0E-12	1.1E-02	1.1E-14	1.1E-02	1.1E-12
AS 76	2.4E-11	3.4E-02	1.5E-04	3.4E-02	3.4E-02
SR 89	1.1E-11	2.7E-04	5.8E-08	2.7E-04	2.7E-04
SR 87M	2.3E-10	4.9E-08	6.2E-07	4.9E-08	6.7E-07
SR 91	3.6E-11	8.8E-05	2.0E-10	8.8E-05	8.8E-05
Y 90	4.5E-12	3.0E-04	7.0E-08	3.0E-04	3.0E-04
SR 91	1.4E-13	1.1E-04	1.1E-16	1.1E-04	1.2E-04
Y 91M	3.6E-15	1.2E-06	7.3E-06	1.2E-06	8.5E-06
Y 91	7.3E-11	9.0E-05	9.3E-08	9.0E-05	9.0E-05
SR 92	3.2E-14	5.4E-06	2.7E-05	5.4E-06	3.3E-05
Y 92	1.9E-13	6.8E-05	1.4E-05	6.8E-05	8.2E-05
Y 93	2.1E-13	7.8E-05	8.9E-07	7.8E-05	7.9E-05
MO 93	6.0E-00	6.0E-00	6.0E-00	6.0E-00	6.0E-00
ZR 93	6.5E-10	1.4E-13	2.9E-20	1.4E-13	1.4E-13
NB 93Y	4.8E-20	5.1E-17	2.5E-19	5.1E-17	5.1E-17
ZR 96	1.3E-10	6.2E-04	6.6E-05	6.2E-04	6.9E-04
NB 95M	1.7E-13	7.2E-07	3.4E-08	7.2E-07	7.5E-07
NB 96	5.3E-11	6.7E-05	7.4E-05	6.7E-05	1.4E-04
YO 99	3.6E-13	4.1E-05	6.3E-07	4.1E-05	4.2E-05
TC 99M	5.3E-15	1.1E-06	2.5E-07	1.1E-06	1.4E-06
TC 99	3.9E-10	1.8E-11	7.6E-17	1.8E-11	1.8E-11

 OENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: MI dose from **concentrations** measured in effluent in 1966

Executed on: 19/19/89 at **10:31:13**

Page C. 12

Release period: 1.1
 Uptake/exposure period: 1.1
 Dose commitment period: 61.1
 Dose units: **Rem**

Radio- nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
RU 113	9. BE-13	6.2E-06	6.3E-07	6.2E-06	6.9E-06
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	5.4E-16	4.3E-08	2.0E-10	4.3E-08	4.3E-08
RU 106	6.1E-11	1.8E-05	3.0E-07	1. BE-16	1.8E-05
SB 122	9.1E-12	4.9E-03	2.3E-05	4.9E-03	5.0E-03
SB 124	3.8E-11	3.5E-04	3.0E-05	3.5E-04	3.8E-04
I 131	8.3E-12	2.5E-03	1.5E-06	2.5E-03	2.5E-03
XE 131M	0.0E+00	0.0E+00	7.9E-11	0.0E+00	7.9E-11
I 132	4.7E-15	3.6E-07	1.2E-05	3.6E-07	1.2E-05
I 133	1.8E-12	1.2E-03	1.1E-05	1.2E-03	1.2E-03
XE 133M	0.0E+00	0.0E+00	4.1E-09	0.0E+00	4.1E-09
XE 133	0.0E+00	0.0E+00	7.4E-08	0.0E+00	7.4E-08
I 134	6.7E-17	2.0E-09	1.3E-06	2.0E-09	1.3E-06
1 136	9.9E-14	6.0E-05	2.0E-16	6.0E-05	6.9E-05
XE 135M	0.0E+00	0.0E+00	1.0E-06	0.0E+00	1.0E-06
XE 136	0.0E+00	0.0E+00	2.2E-06	0.0E+00	2.2E-06
CS 136	2.2E-19	8.3E-12	2.6E-18	8.3E-12	8.3E-12
CS 137	4.9E-12	2.7E-03	1.0E-06	2.7E-03	2.7E-03
CS 138	5.2E-19	2.0E-11	2.3E-08	2.0E-11	2.3E-08
BA 139	1.3E-15	8.2E-08	1.7E-07	8.2E-08	2.3E-07
BA 141	2.7E-12	7.8E-04	2.1E-06	7.8E-04	7.8E-04
LA 141	6.7E-12	1.2E-03	9.9E-05	1.2E-03	1.3E-03
CS 136	3.8E-13	3.4E-03	1.5E-06	3.4E-03	3.4E-03
CE 141	9.5E-12	2.9E-04	5.2E-07	2.9E-04	2.9E-04
CE 143	4.2E-13	8.1E-04	1.1E-06	8.1E-04	8.2E-04
FR 143	5.0E-12	1.0E-04	4.3E-09	1.0E-04	1.0E-04
CE 144	8.9E-10	9.0E-04	2.3E-07	9.0E-04	9.0E-04
FR 144M	6.4E-16	3.0E-08	6.0E-10	3.0E-08	3.0E-08
FR 144	1.1E-13	5.1E-06	1.0E-06	5.1E-06	6.2E-06
FR 142	6.0E-13	1.9E-04	7.8E-07	1.9E-04	1.9E-04
ND 147	1.5E-12	2.4E-05	3.6E-07	2.4E-05	2.4E-05
FM 147	6.3E-11	1.7E-05	1.4E-10	1.7E-05	1.7E-05
SM 147	4.2E-19	2.0E-15	0.0E+00	2.0E-15	2.0E-15
FM 149	3.0E-13	2.5E-04	2.9E-08	2.5E-04	2.5E-04
FM 151	5.1E-14	8.2E-05	4.0E-07	8.2E-05	8.2E-05
SM 161	7.8E-15	5.8E-10	1.5E-15	5.8E-10	5.8E-10
SM 163	5.7E-12	6.1E-03	3.8E-06	6.1E-03	6.1E-03

GENII Dora Calculation Program
(Version 1.396 23-Jan-89)

Case title: MI dose from concentrations measured in effluent in 1956

Executed on: 19/19/89 at 10:31:13

Page C. 13

Release period: 1.1
 Uptake/exposure period: 1.1
 Dora commitment period: 61.1
 Dora unit: Ram

Radio-nuclide	Inhalation Effective Dora Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dora Equivalent
EU 162M	7.0E-13	2.4E-03	3.0E-05	2.4E-03	2.4E-03
EU 162	7.3E-10	2.3E-04	4.0E-05	2.3E-04	2.7E-04
EU 156	4.0E-12	3.2E-04	5.4E-06	3.2E-04	3.3E-04
OD 153	5.1E-12	6.0E-06	9.1E-06	5.0E-06	5.1E-06
OD 169	2.0E-14	1.0E-04	9.4E-08	1.0E-04	1.0E-04
TB 160	1.2E-11	2.4E-05	5.4E-06	2.4E-05	2.9E-05
TB 161	7.9E-14	2.0E-06	2.7E-09	2.0E-06	2.0E-06
DY 166	3.5E-15	3.1E-07	2.7E-07	3.1E-07	5.7E-07
HO 166	4.1E-13	7.4E-04	1.0E-07	7.4E-04	7.4E-04
ER 169	2.0E-13	5.0E-05	0.8E-11	5.0E-05	5.0E-05
ER 171	0.1E-15	3.0E-05	5.5E-07	3.0E-05	3.1E-05
TH 232	3.9E-07	5.4E-03	2.4E-10	5.4E-03	5.4E-03
RA 228	0.1E-11	1.0E-05	0.9E-10	1.0E-05	1.0E-05
AC 228	2.5E-12	2.5E-08	2.0E-07	2.5E-08	2.3E-07
TH 228	7.4E-10	8.0E-07	2.4E-11	8.0E-07	8.0E-07
RA 224	0.2E-12	2.0E-07	1.9E-10	2.0E-07	2.0E-07
PB 212	3.6E-13	9.2E-08	2.4E-09	9.2E-08	9.5E-08
BI 212	4.1E-14	2.4E-09	3.2E-08	2.4E-09	3.4E-08
U 238	1.5E-08	7.4E-06	3.0E-11	7.5E-06	7.5E-06
TH 234	3.0E-12	3.1E-06	2.2E-08	3.1E-06	3.1E-06
PA 234	1.5E-16	0.3E-10	3.5E-09	0.3E-10	4.3E-09
PU 241	1.1E-07	0.2E-04	7.7E-11	0.2E-04	0.2E-04
NP 239	7.3E-11	6.0E-02	1.1E-04	5.0E-02	6.0E-02
PU 239	1.1E-47	0.2E-04	1.0E-10	0.2E-04	0.2E-04

 GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: MI dose from concentrations measured in effluent in 1964

Executed on: 19/19/89 at 10:45:40

Page A 1

 This is a near field (narrowly-focused, single site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Surface Water

THE FOLLOWING EXPOSURE PATHS, ARE CONSIDERED:
 Ground, external
 Recreation, external
 Inhalation uptake
 Drinking water ingestion
 Aquatic foods ingestion
 Terrestrial foods ingestion
 Animal product ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.1
 Dose calculations ends after (yr): 50.0
 Release ends after (yr): 1.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

Input file name: \GENII\BANDIR\river84.in 9-18-89
 METABOLIC PARAMETERS----- 8-12-88
 RYDLIB - Radionuclide Master Library (29-Aug-88 RAP) 8-29-88
 Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA 8-29-88
 Bioaccumulation Factor Library - (30-Aug-88) RAP (p-32, zn, np modi 9-12-89
 External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88 8-29-88
 Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP 8-29-88

=====

-----Release Terms-----			
Release	Surface Buried		
Radio-	Air	Water	Source
nuclide	pCi/yr	pCi/yr	pCi/m3

H 3	1.0E+00	1.0E+01	1.0E+00
NA24	0.0E+00	0.0E+02	0.0E+00
S131	1.0E+00	8.0E+02	1.0E+00
P 32	0.0E+00	2.0E+01	0.0E+00
CA46	0.0E+00	7.0E-01	0.0E+00
SC46	0.0E+00	1.0E+00	0.0E+00
CR51	1.0E+00	6.0E+02	1.0E+00
YN54	0.0E+00	4.0E-01	0.0E+00
MN56	0.0E+00	7.0E+03	0.0E+00
FE59	0.0E+00	1.0E+00	0.0E+00
CO60	0.0E+00	4.0E-01	0.0E+00
NI65	1.0E+00	2.0E+00	1.0E+00
CU64	0.0E+00	0.0E+02	0.0E+00
ZN65	1.0E+00	1.0E+01	1.0E+00
ZN69M	1.0E+00	4.0E+01	1.0E+00
GA72	1.0E+00	2.0E+01	1.0E+00
AS78	1.0E+00	1.0E+02	1.0E+00
SR87M	1.0E+00	6.0E+00	0.0E+00
SR89	0.0E+00	0.0E-01	0.0E+00
SR90	0.0E+00	1.0E-02	0.0E+00
SR91	1.0E+00	1.0E+01	1.0E+00
SR92	1.0E+00	6.0E+01	1.0E+00

Y 90	0.0E+00	2.0E+00	0.0E+00
Y 91	0.0E+00	3.0E-01	0.0E+00
Y 92	0.0E+00	2.0E+01	0.0E+00
Y 93	0.0E+00	5.0E+00	0.0E+00
ZR95	0.0E+00	1.9E+00	0.0E+00
NB95	0.0E+00	4.0E-01	0.0E+00
MO99	0.0E+00	1.0E+00	0.0E+00
TC99	0.0E+00	0.0E+00	0.0E+00
RU103	0.0E+00	4.0E-02	0.0E+00
RU106	0.0E+00	1.0E-02	0.0E+00
SB122	0.0E+00	1.0E+01	0.0E+00
SB124	0.0E+00	3.5E-01	0.0E+00
I 131	0.0E+00	5.0E-01	0.0E+00
I 132	0.0E+00	2.0E+01	0.0E+00
I 133	0.0E+00	7.0E+00	0.0E+00
I 134	0.0E+00	1.0E+02	0.0E+00
I 135	0.0E+00	1.0E+01	0.0E+00
CS136	0.0E+00	6.0E-02	0.0E+00
CS137	0.0E+00	1.0E-02	0.0E+00
CS138	0.0E+00	1.0E+02	0.0E+00
BA139	0.0E+00	1.0E+02	0.0E+00
BA140	0.0E+00	1.0E+00	0.0E+00
LA140	0.0E+00	1.0E+01	0.0E+00
CE141	0.0E+00	5.0E-01	0.0E+00
CE143	0.0E+00	1.5E+00	0.0E+00
CE144	0.0E+00	2.0E-01	0.0E+00
PR142	0.0E+00	5.0E+00	0.0E+00
PR143	0.0E+00	5.0E-01	0.0E+00
ND147	0.0E+00	3.0E-01	0.0E+00
PM147	0.0E+00	1.0E-01	0.0E+00
PM149	0.0E+00	7.0E-01	0.0E+00
PM151	0.0E+00	4.0E-01	0.0E+00
SM153	0.0E+00	2.4E+01	0.0E+00
EU152M	0.0E+00	6.1E+01	0.0E+00
EU152	0.0E+00	2.0E-01	0.0E+00
EU156	0.0E+00	3.0E-01	0.0E+00
GD153	0.0E+00	2.0E-02	0.0E+00
GD159	0.0E+00	1.0E+00	0.0E+00
TB160	0.0E+00	1.0E-01	0.0E+00
TB161	0.0E+00	5.0E-02	0.0E+00
DY165	0.0E+00	4.0E+01	0.0E+00
H0166	0.0E+00	2.0E+00	0.0E+00
ER169	0.0E+00	2.0E-01	0.0E+00
ER171	0.0E+00	1.0E+00	0.0E+00
TH232	0.0E+00	2.0E-02	0.0E+00
U 238	0.0E+00	7.0E-03	0.0E+00
NP239	0.0E+00	2.0E+02	0.0E+00
PU239	0.0E+00	2.0E-02	0.0E+00
PU240	0.0E+00	2.0E-02	0.0E+00

===== NEAR-FIELD PARAMETERS =====

8.8	Inventory disposed n years prior to beginning of intake period
8	LOIC occurred n years prior to beginning of intake period
1.0E+00	Fraction of roots in upper soil (top 15 cm)
0.0E+00	Fraction of roots in deep soil
0.0E+00	Manual redistribution: deep soil/surface soil dilution factor
1268.8	Source area for external dose modification factor (m2)

===== SURFACE WATER TRANSPORT =====

0	Mixing ratio model: 8-use value, 1-river, 2-lake, 3-river flow
8.0E+00	Transit time to irrigation withdrawl location (h)
3.4E+03	Average water flow rate for: MIXFLG=1,2 (m/s), MIXFLG=0,3 (m3/s)
1.0E+15	Mixing ratio, dimensionless

```

===== EXTERNAL EXPOSURE =====
4.4E+03 Hour of exposure to ground contamination
      2 Residential irrigation source 1-ground water, 2-surface water
4.0E+01 Residential irrigation application rate (in/yr)
6.0E+00 Residential irrigation duration (no/yr)
1.0E+02 Hour of exposure from swimming
1.0E+02 Hour of exposure from boating
6.0E+02 Hour of exposure from shoreline activities
      1 Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin
8.0E+00 Surface water transit time to recreational site (h)

===== INHALATION =====
4.4E+03 Hour of inhalation exposure per year
      1 Resuspension model: 1-Mass Loading, 2-Anspaugh
1.E-4 Mars loading factor (g/m3)

===== DRINKING WATER SOURCE/IRRIGATION =====
7.3E+02 Drinking water consumption rate (l/yr)
      2 Drinking water source: 1-ground, 2-surface, 3-system
      F Drinking water treatment: T/F
      1.1 Drinking water transit/holdup time (d)

===== AQUATIC FOODS INGESTION =====

FOOD      TRAN-    PROD-    ----CONSUMPTION----
TYPE      SIT      UCTION  HOLDUP    RATE
          h      kg/yr   d      kg/yr
-----
Firm      1.00E+00      1.00E+00  4.00E+01

===== TERRESTRIAL FOOD INGESTION =====

FOOD      GROW  --IRRIGATION--  YIELD  PROD-  --CONSUMPTION--
TYPE      TIME  S RATE  TIME  UCTION  HOLDUP    RATE
          d      * in/yr no/yr kg/m2 kg/yr d      kg/yr
-----
Leaf Veg  91.1  2 36.1  6.1  1.6      1.0  3.0E+01
Oth. Veg  91.1  2 41.1  6.1  4.1      6.0  2.2E+02
Fruit     91.1  2 36.1  6.1  2.1      6.8  3.3E+02
Cereals   91.1  2  1.1  1.1  1.8     181.1  8.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD      ---HUMAN---  TOTAL  DRINK  -----STORED FEED-----
TYPE      CONSUMPTION  PROD-  WATER  DIET  GROW  -IRRIGATION-  STOR-
          RATE  UCTION  CONTAM  FRAC-  TIME  S RATE  TIME  YIELD  AGE
          kg/yr d      kg/yr  FRACT. TION  d      * in/yr no/yr kg/m3 d
-----
Meat      8.0E+01  16.1      1.11  1.3 91.11  2 35.1  6.1  1.88 180.8
Poultry   1.8E+01  1.1      1.11  1.1 91.11  2  1.1  0.0  8.88 188.8
Cow Milk  2.7E+02  1.1      1.11  1.3 46.11  2 47.1  8.8  2.08 188.8
Eggs      3.0E+01  1.1      1.11  1.1 90.00  2  1.1  8.8  8.88 188.8

-----FRESH FORAGE-----
Meat      6.11  46.1  2 47.1  0.0  2.88 180.0
Cow Milk  6.11  31.1  2 47.1  0.0  1.50  8.0

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GENII Dose Calculation Program
 (Version **1.395** 23-Jan-89)

Case title: YI dose from **concentrations** measured in effluent in 1964

Executed on: 19/19/89 at **11:07:13**

Page C. 11

Release period: 1.1
Uptake/exposure period: 1.1
 Dose commitment period: 61.1
Dose units: **Rem**

Radio- nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.0E-00	8.5E-06	1.0E-14	8.5E-06	8.5E-06
NA 24	2.0E-11	1.3E-02	6.0E-03	1.3E-02	1.8E-02
SI 31	1.5E-13	3.1E-04	9.4E-07	3.1E-04	3.1E-04
P 32	1.1E-10	2.2E-01	7.7E-07	2.2E-01	2.2E-01
CA 46	4.2E-11	4.7E-04	7.0E-10	4.7E-04	4.7E-04
SC 46	1.0E-10	4.3E-04	1.2E-04	4.3E-04	5.5E-04
CR 61	3.1E-10	1.7E-03	4.0E-04	1.7E-03	2.1E-03
YN 64	3.7E-11	2.3E-04	4.7E-05	2.3E-04	2.8E-04
YN 66	2.1E-12	1.7E-03	3.9E-03	1.7E-03	5.0E-03
FE 69	3.0E-11	6.0E-03	3.7E-05	6.0E-03	5.1E-03
CO 60	1.3E-09	1.3E-03	1.0E-04	1.3E-03	1.4E-03
NI 66	4.0E-10	8.9E-08	3.0E-07	8.9E-08	4.5E-07
CJ 64	3.0E-12	7.3E-02	2.5E-04	7.3E-02	7.3E-02
ZN 66	1.9E-09	1.3E-01	7.1E-04	1.3E-01	1.3E-01
ZN 69M	8.9E-13	3.1E-03	4.5E-05	3.1E-03	3.1E-03
ZN 69	4.0E-14	2.3E-04	6.0E-08	2.3E-04	2.3E-04
GA 72	1.0E-12	1.1E-02	1.1E-14	1.1E-02	1.1E-02
AS 76	2.4E-11	3.4E-02	1.5E-04	3.4E-02	3.4E-02
SR 89	1.1E-11	2.7E-04	6.0E-08	2.7E-04	2.7E-04
SR 87Y	2.3E-10	4.9E-08	6.2E-07	4.9E-08	6.7E-07
SR 90	3.0E-11	8.8E-05	2.0E-10	8.8E-05	8.8E-05
Y 90	4.5E-12	3.0E-04	7.0E-08	3.0E-04	3.0E-04
SR 91	1.4E-13	1.1E-04	1.1E-05	1.1E-04	1.2E-04
Y 91M	3.0E-16	1.2E-06	7.3E-06	1.2E-06	8.5E-06
Y 91	7.3E-11	9.0E-05	9.3E-08	9.0E-05	9.0E-05
SR 92	3.2E-14	5.4E-06	2.7E-05	5.4E-06	3.3E-06
Y 92	1.9E-13	6.0E-05	1.4E-05	6.0E-05	8.2E-05
Y 93	2.0E-13	7.0E-05	8.9E-07	7.0E-05	7.9E-05
YO 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ZR 93	5.5E-10	1.4E-13	2.9E-20	1.4E-13	1.4E-13
NB 93M	4.8E-20	5.1E-17	2.5E-19	5.1E-17	5.1E-17
ZR 96	1.3E-10	6.2E-04	6.0E-05	6.2E-04	6.0E-04
NB 95M	1.7E-13	7.2E-07	3.4E-08	7.2E-07	7.5E-07
NB 96	5.3E-11	6.7E-05	7.4E-05	6.7E-05	1.4E-04
YO 99	3.0E-13	4.1E-05	6.3E-07	4.1E-05	4.2E-05
TC 99M	5.3E-15	1.1E-06	2.5E-07	1.1E-06	1.4E-06
TC 99	3.9E-10	1.0E-11	7.0E-17	1.0E-11	1.0E-11

GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Care title: MI dose from concentrations measured in effluent in 1964

Executed on: 19/19/89 st 11:07:13

Page C. 12

 Release period: 1.1
 Uptake/exposure period: 1.1
 Dose commitment period: 61.1
 Dose units: Rem

Radio- nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
RJ 113	9.8E-13	6.2E-06	6.3E-07	6.2E-06	6.9E-06
PD 113	6.0E-06	6.0E-06	6.0E-06	6.0E-06	6.0E-06
RH 103M	5.4E-16	4.3E-08	2.0E-10	4.3E-08	4.3E-08
RU 106	6.1E-11	1.8E-05	3.0E-07	1.8E-05	1.8E-05
SB 122	9.1E-12	4.9E-03	2.3E-05	4.9E-03	6.0E-03
SB 124	3.8E-11	3.5E-04	3.0E-05	3.5E-04	3.8E-04
I 131	6.3E-12	2.5E-03	1.5E-06	2.5E-03	2.5E-03
XE 131M	6.0E-06	6.0E-06	7.9E-11	6.0E-06	7.9E-11
I 132	4.7E-15	3.6E-07	1.2E-05	3.6E-07	1.2E-05
I 133	1.8E-12	1.2E-03	1.1E-05	1.2E-03	1.2E-03
XE 133M	6.0E-06	1.0E-06	4.1E-09	6.0E-06	4.1E-09
XE 133	6.0E-06	6.0E-06	7.4E-06	6.0E-06	7.4E-06
I 134	6.7E-17	2.0E-09	1.3E-06	2.0E-09	1.3E-06
I 136	9.9E-14	6.0E-05	2.0E-05	6.0E-05	6.9E-05
XE 136M	6.0E-06	6.0E-06	1.0E-06	6.0E-06	1.0E-06
XE 136	6.0E-06	6.0E-06	2.2E-06	6.0E-06	2.2E-06
CS 136	2.2E-19	8.3E-12	2.6E-18	8.3E-12	8.3E-12
CS 137	4.9E-12	2.7E-03	1.0E-06	2.7E-03	2.7E-03
CS 138	5.2E-19	2.0E-11	2.3E-08	2.0E-11	2.3E-08
BA 139	1.3E-15	6.2E-08	1.7E-07	6.2E-08	2.3E-07
BA 141	2.7E-12	7.8E-04	2.1E-06	7.8E-04	7.8E-04
LA 141	6.7E-12	1.2E-03	9.9E-05	1.2E-03	1.3E-03
CS 136	3.6E-13	3.4E-03	1.5E-06	3.4E-03	3.4E-03
CE 141	9.5E-12	2.9E-04	5.2E-07	2.9E-04	2.9E-04
CE 143	4.2E-13	8.1E-04	1.1E-06	8.1E-04	8.2E-04
FR 143	5.0E-12	1.0E-04	4.3E-09	1.0E-04	1.0E-04
CE 144	8.9E-10	9.0E-04	2.3E-07	9.0E-04	9.0E-04
FR 144M	6.4E-16	3.0E-08	6.0E-10	3.0E-08	3.0E-08
FR 144	1.1E-13	5.1E-06	1.0E-06	5.1E-06	6.2E-06
FR 142	6.0E-13	1.9E-04	7.8E-07	1.9E-04	1.9E-04
ND 147	1.5E-12	2.4E-05	3.6E-07	2.4E-05	2.4E-05
RM 147	6.3E-11	1.7E-05	1.4E-10	1.7E-05	1.7E-05
SM 147	4.2E-19	2.0E-15	6.0E-06	2.0E-15	2.0E-15
RM 149	3.0E-13	2.5E-04	2.9E-08	2.5E-04	2.5E-04
RM 161	5.1E-14	8.2E-05	4.0E-07	8.2E-05	8.2E-05
SM 161	7.8E-15	5.8E-10	1.5E-15	5.8E-10	5.8E-10
SM 163	5.7E-12	6.1E-03	3.8E-06	6.1E-03	6.1E-03

 GENII Dora Calculation Program
 (Version 1.396 21-Jan-89)

Case title: MI dose from concentrations measured in effluent in 1964

Executed on: 19/19/89 at 11:07:13

Page C. 13

Release period: 1.1
 Uptake/exposure period: 1.1
 Dora commitment period: 61.1
 Dora units: Ram

Radio-nuclida	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dora	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
EU 152M	7.6E-13	2.4E-03	3.0E-05	2.4E-03	2.4E-03
EU 162	7.3E-10	2.3E-04	4.0E-05	2.3E-04	2.7E-04
EU 166	4.6E-12	3.2E-04	5.4E-06	3.2E-04	3.3E-04
GD 163	5.1E-12	6.0E-06	9.1E-08	6.0E-06	5.1E-06
GD 169	2.8E-14	1.6E-04	9.4E-08	1.6E-04	1.6E-04
TB 160	1.2E-11	2.4E-05	5.4E-06	2.4E-05	2.9E-05
TB 161	7.9E-14	2.6E-06	2.7E-09	2.6E-06	2.6E-06
DY 165	3.5E-15	3.1E-07	2.7E-07	3.1E-07	5.7E-07
HD 166	4.1E-13	7.4E-04	1.6E-07	7.4E-04	7.4E-04
ER 169	2.6E-13	6.6E-05	6.8E-11	6.6E-05	6.6E-05
ER 171	6.1E-15	3.0E-05	5.5E-07	3.0E-05	3.1E-05
TH 232	3.9E-07	5.4E-03	2.4E-10	5.4E-03	5.4E-03
RA 228	8.1E-11	1.0E-05	6.9E-16	1.0E-05	1.0E-05
AC 228	2.5E-12	2.5E-08	2.0E-07	2.5E-08	2.3E-07
TH 228	7.4E-10	8.4E-17	2.4E-11	8.0E-07	8.0E-07
RA 224	6.2E-12	2.6E-07	1.9E-10	2.6E-07	2.6E-07
PB 212	3.6E-13	9.2E-08	2.4E-09	9.2E-08	9.5E-08
BI 212	4.1E-14	2.4E-09	3.2E-08	2.4E-09	3.4E-08
U 238	1.5E-08	7.4E-06	3.6E-11	7.5E-06	7.5E-06
TH 234	3.8E-12	3.1E-06	2.2E-08	3.1E-06	3.1E-06
PA 234	1.5E-16	8.3E-10	3.5E-09	8.3E-10	4.3E-09
PU 241	1.1E-17	8.2E-04	7.7E-11	8.2E-04	8.2E-04
NP 239	7.3E-11	6.0E-02	1.1E-14	6.0E-02	5.8E-02
PU 239	1.1E-07	8.2E-04	1.6E-10	8.2E-04	8.2E-04

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GENII Dora Calculation Program
(Version 1.396 23-Jan-89)

Case title: YI dose from concentrations measured at Richland in 1968

Executed on: 19/19/89 at 09:32:32

Page A. 1

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 This is a near field (narrowly-focused, single site) scenario.
Release is chronic
Individual dose

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:

Ground, **external**
Recreation, external
Inhalation uptake
Drinking water ingestion
Aquatic food ingestion
Terrestrial foods ingestion
Animal product ingestion

THE FOLLOWING TIMES ARE USED:

Intake ends after (yr): 1.1
Dora calculations ends after (yr): 50.0

===== **FILENAMES AND TITLES OF FILES/LIBRARIES USED** =====

Input file name: \GENII\BANDIR\river68.in 9-18-89
METABOLIC PARAMETERS----- 8-12-88
 RYDLIB - Radionuclida Master Library (29-Aug-88 RAP) 8-29-88
 Food Transfer Factor Library - (RAP 29-Aug-88) (UPDATED LEACHING FA 8-29-88
Bioaccumulation Factor Library - (30-Aug-88) RAP (p-32, **zn**, np modi 9-12-89
External Dora Factors for GENII in person Sv/yr par Bq/n (28-Aug-88 8-29-88
Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP 8-29-88

=====

1 **Surface soil input unit: (1-m2, 2-13, 3-kg)**

----- Basic Concentrationr-----					
Release Radio- nuclide	Air pCi/L	Surface Soil pCi/m2	Deep Soil pCi/m3	Ground Water pCi/L	Surface Water pCi/L
H 3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
NA24	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E+03
S131	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
P 32	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+02
CA45	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+00
SC46	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E+02
CR51	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+03
MN54	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.0E+00
MN56	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+02
FE59	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+01
CO60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E+00
NI65	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
CU64	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+02
ZN65	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
ZN69M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+01
GA72	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.0E+01
AS76	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.9E+02
SR87M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
SR89	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
SR90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+02
SR91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+01
SR92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+00
Y 90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+02
Y 91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00
Y 92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.3E+00
Y 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+02

ZR95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+00
NB95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+01
MO99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+01
TC99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RU103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E+00
RU106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
SB122	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+01
SB124	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00
I 131	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.7E+00
I 132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+01
I 133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+01
I 134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+04
I 135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+00
CS136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+01
CS137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+02
CS138	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+07
BA139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+01
BA140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+00
LA140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+01
CE141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.5E+00
CE143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+00
CE144	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+01
PR142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
PR143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E+00
ND147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+00
PM147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
PM149	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E+00
PM151	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+00
SM153	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+01
EU152M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.2E+01
EU152	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
EU156	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00
QD153	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+01
QD159	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
TB160	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
TB161	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E+01
DY165	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+00
HO166	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ER169	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+01
ER171	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+00
TH232	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02
U 238	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+02
NP239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+02
PU239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02
PU240	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02

===== NEAR-FIELD PARAMETERS =====

0.0	Inventory disposed n years prior to beginning of intake period
0	LOIC occurred n years prior to beginning of intake period
1.0E+00	Fraction of roots in upper soil (top 16 cm)
0.0E+00	Fraction of roots in deep soil
0.0E+00	Manual redistribution: deep soil/surface soil dilution factor
1250.0	Source area for external dose modification factor (m2)

===== EXTERNAL EXPOSURE =====

4.4E+03	Hours of exposure to ground contamination
2	Residential irrigation source 1-ground water, 2-surface water
4.0E+01	Residential irrigation application rate (in/yr)
0.0E+00	Residential irrigation duration (mo/yr)
1.0E+02	Hours of exposure from swimming
1.0E+02	Hours of exposure from boating
5.0E+02	Hours of exposure from shoreline activities
1	Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

===== INHALATION =====
4.4E+03 Hours of inhalation exposure per year
 1 **Resuspension** model: 1-Mass Loading, 2-Anopaugh
1.0E-04 Mass loading factor (g/m3)

===== DRINKING WATER SOURCE/IRRIGATION =====
7.3E+02 Drinking water consumption rate (l/yr)
 2 Drinking water source: 1-ground, 2-surface, 8-system
 F Drinking water treatment: T/F
 1.1 Drinking water transit/holdup time (d)

===== AQUATIC FOODS INGESTION =====

FOOD TYPE	TRAM- SIT h	PROD- UCTION kg/yr	----CONSUMPTION---- HOLDUP d	RATE kg/yr
Fish	a.00E+00		1.00E+00	4.00E+01

===== TERRESTRIAL FOOD INGESTION =====

FOOD TYPE	GROW TIME d	S	RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	---CONSUMPTION--- HOLDUP d	RATE kg/yr
Leaf Veg	91.1	2	36.1	6.1	1.6		1.1	3.0E+01
oth. Veg	91.1	2	41.1	6.1	4.1		6.1	2.2E+02
Fruit	91.1	2	36.1	6.1	2.1		6.1	3.3E+02
Cereals	91.1	2	1.1	1.1	1.8		181.1	8.0E+01

===== ANIMAL FOOD INGESTION =====

FOOD TYPE	---HUMAN--- CONSUMPTION RATE kg/yr	HOLDUP d	TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DMT FRAC- TION	GROW TIME d	---STORED FEED--- -IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m3	STOR- AGE d
Meat	8.0E+01	16.1		1.11	1.3	91.11	2	36.1	6.1	1.80
Poultry	1.0E+01	1.1		1.11	1.1	91.11	2	1.1	1.1	1.80
Cow Milk	2.7E+02	1.1		1.11	1.3	46.11	2	47.1	6.1	2.11
Eggs	3.0E+01	1.1		1.11	1.1	91.11	2	1.1	1.1	1.81

	-----FRESH FORAGE-----									
Moat	6.00	45.0	2	47.0	6.0	2.00	100.0			
Cow Milk	6.00	30.0	2	47.0	6.0	1.50	0.0			

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GENII Dose Calculation Program
(Version 1.396 23-Jan-89)

Case title: MI dose from **concentrations** measured at **Richland** in 1968

Executed on: 19/19/89 at **09:49:44**

Page C. 11

Uptake/exposure period: 1.1
Dose commitment period: 61.1
Dose units: **Rem**

Radio- nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose
-----	-----	-----	-----	-----	-----
H 3	2.0E-00	1.3E-00	1.5E-15	1.3E-00	1.3E-00
NA 24	1.1E-11	5.3E-03	3.1E-03	5.3E-03	8.4E-03
SI 31	9.7E-15	2.0E-00	6.2E-08	2.0E-00	2.7E-00
P 32	1.0E-10	2.0E-01	7.2E-07	2.0E-01	2.0E-01
CA 46	2.2E-11	2.0E-04	4.0E-10	2.0E-04	2.0E-04
SC 46	5.4E-09	1.6E-12	4.0E-03	1.5E-02	1.9E-02
OR 61	1.1E-10	5.0E-04	1.4E-04	5.0E-04	7.0E-04
MN 64	4.0E-11	2.5E-04	5.2E-05	2.5E-04	3.0E-04
MN 58	1.4E-13	1.7E-05	2.5E-04	1.7E-05	2.7E-04
FE 69	8.1E-11	1.1E-02	8.1E-05	1.1E-02	1.1E-12
CO 61	8.8E-10	8.4E-04	1.1E-04	8.4E-04	9.5E-04
NI 66	2.0E-17	1.4E-09	2.4E-08	1.4E-09	2.5E-08
CU 64	8.9E-13	1.2E-02	6.1E-05	1.2E-02	1.2E-02
ZN 66	1.1E-89	6.9E-02	3.9E-04	6.9E-02	7.0E-02
ZN 69M	3.2E-13	7.7E-04	1.0E-05	7.7E-04	7.9E-04
ZN 69	1.5E-14	5.0E-05	2.0E-09	5.0E-05	5.0E-05
GA 72	3.8E-13	2.7E-03	4.2E-05	2.7E-03	2.7E-03
AS 76	1.3E-11	1.4E-02	7.5E-05	1.4E-02	1.4E-02
SR 89	3.3E-12	7.8E-05	1.4E-08	7.8E-05	7.8E-16
SR 87M	1.8E-17	1.0E-09	4.8E-08	1.0E-09	4.9E-08
SR 91	2.2E-11	5.7E-05	1.3E-10	5.7E-05	5.7E-05
Y 91	9.6E-13	2.0E-00	7.0E-09	2.0E-00	2.0E-00
SR 91	2.9E-14	1.4E-05	2.4E-08	1.4E-05	1.6E-05
Y 91M	7.0E-10	1.4E-07	1.2E-07	1.4E-07	2.7E-07
Y 91	3.4E-11	4.0E-05	4.2E-08	4.0E-05	4.0E-05
SR 92	2.2E-15	1.1E-17	1.9E-06	1.1E-17	2.0E-06
Y 92	7.0E-15	8.2E-07	3.8E-17	8.2E-07	1.2E-06
Y 93	7.4E-13	1.7E-04	3.2E-06	1.7E-04	1.8E-04
MO 93	8.0E-00	8.0E-00	8.0E-00	8.0E-00	8.0E-00
ZR 93	1.1E-17	2.9E-13	5.9E-20	2.9E-13	2.9E-13
NB 93M	1.0E-19	1.1E-10	5.4E-19	1.1E-10	1.1E-10
ZR 96	6.0E-11	3.3E-04	3.6E-05	3.3E-04	3.7E-04
NB 95M	8.8E-14	3.9E-07	1.8E-18	3.9E-07	4.1E-07
NB 96	6.8E-11	4.2E-04	1.1E-14	4.2E-04	5.2E-04
MO 99	5.4E-13	6.0E-05	9.0E-07	6.0E-05	6.0E-05
TC 99M	7.5E-15	1.6E-00	1.7E-07	1.6E-00	1.8E-00
TC 99	5.5E-18	2.5E-11	1.1E-10	2.5E-11	2.5E-11
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GENII Dora Calculation Program
 (Varion 1.396 23-Jan-89)

Case title: MI dose from concentrations measured at Richland in 1968

Exacutrd on: 19/19/89 at 09:49:44

Page C. 12

Uptake/exposure period: 1.1
 Dora commitment period: 50.0
 Dora unitr: Ram

Radio- nuclida	Inhalation Effective Dora Equivalent	Ingartion Effective Dora Equivalent	External Dora	Intrrnal Effective Dora Equivalent	Annual Effaetiva Dora Equivalent
RU 103	1.2E-11	7.5E-06	7.0E-06	7.5E-06	8.2E-06
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	6.4E-16	5.2E-07	1.3E-09	5.2E-07	5.2E-07
RU 106	6.5E-10	1.9E-04	3.3E-06	1.9E-04	1.9E-04
SB 122	4.4E-12	2.2E-03	1.2E-05	2.2E-03	2.2E-03
SB 124	1.7E-11	1.0E-04	1.4E-05	1.0E-04	1.7E-04
11 131	1.0E-11	3.1E-13	1.9E-06	3.0E-03	3.0E-03
XE 131M	0.0E+00	0.0E+00	9.3E-11	0.0E+00	9.3E-11
11 132	4.3E-17	1.1E-19	1.1E-07	1.1E-09	1.1E-07
11 133	1.0E-12	5.0E-04	0.0E+00	5.0E-04	5.7E-04
XE 133M	0.0E+00	0.0E+00	1.2E-09	0.0E+00	1.2E-09
XE 133	0.0E+00	0.0E+00	2.5E-08	0.0E+00	2.5E-08
11 134	1.7E-20	4.9E-13	3.2E-10	4.9E-13	3.2E-10
11 135	2.4E-14	5.0E-06	4.7E-06	5.0E-06	1.1E-05
XE 135M	0.0E+00	0.0E+00	1.4E-08	0.0E+00	1.4E-08
XE 136	0.0E+00	0.0E+00	4.0E-08	0.0E+00	4.0E-08
CS 135	2.2E-20	8.4E-13	2.7E-19	8.4E-13	8.4E-13
CS 137	2.0E-12	1.5E-03	6.5E-07	1.5E-03	1.5E-03
CS 138	0.4E-24	3.3E-16	3.7E-13	3.3E-16	3.7E-13
BA 139	1.3E-17	4.2E-10	1.0E-09	4.2E-10	2.0E-09
BA 140	1.5E-12	4.2E-04	1.2E-06	4.2E-04	4.2E-04
LA 144	3.9E-12	6.5E-04	5.0E-05	6.5E-04	7.1E-04
CS 136	1.9E-13	1.0E-03	7.0E-07	1.0E-03	1.0E-03
CE 141	1.0E-11	5.3E-04	9.5E-07	5.3E-04	5.3E-04
CE 143	2.1E-13	3.3E-04	5.3E-07	3.3E-04	3.3E-04
FR 143	2.5E-12	4.7E-05	2.1E-09	4.7E-05	4.7E-05
CE 144	8.9E-09	9.3E-03	2.4E-06	9.3E-03	9.3E-03
FR 144M	6.5E-15	3.0E-07	5.0E-09	3.0E-07	3.1E-07
FR 144	1.1E-12	5.3E-05	1.0E-05	5.3E-05	6.3E-05
FR 142	2.4E-13	6.0E-05	3.1E-07	5.0E-05	6.0E-05
ND 147	0.1E-13	1.2E-05	1.9E-07	1.2E-05	1.2E-05
RM 147	3.4E-11	9.5E-06	7.0E-11	9.5E-06	9.5E-06
SM 147	2.3E-19	1.1E-15	0.0E+00	1.1E-15	1.1E-15
RM 149	1.4E-13	1.1E-04	1.4E-08	1.1E-04	1.1E-04
PM 151	2.2E-14	2.0E-05	1.7E-07	2.0E-05	2.9E-05
SM 161	2.7E-16	2.0E-10	5.1E-16	2.0E-10	2.0E-10
SM 163	2.0E-12	2.0E-03	1.0E-06	2.0E-03	2.0E-03

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GENII Dose Calculation Program
 (Version 1.396 28-Jan-89)

Case title: MI dose from **concentrations measured at Richland in 1988**

Executed on: 19/19/09 at **09:49:44**

Page C. 13

.....
 Uptake/exposure period: 1.1
 Dose commitment period: 61.1
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
EU 152M	2.2E-13	4.0E-04	8.5E-06	4.0E-04	4.0E-04
EU 162	4.0E-10	1.2E-04	2.2E-05	1.2E-04	1.4E-04
EU 166	2.5E-12	1.7E-04	2.9E-06	1.7E-04	1.7E-04
GD 153	2.8E-12	2.7E-06	4.8E-08	2.7E-06	2.7E-06
GD 169	1.1E-14	4.6E-05	3.7E-08	4.6E-05	4.6E-05
TB 161	6.7E-12	1.5E-16	2.9E-06	1.3E-05	1.6E-05
TB 161	3.9E-14	1.3E-06	1.4E-09	1.3E-06	1.3E-06
DY 166	1.8E-10	6.3E-09	1.3E-08	6.3E-09	1.9E-08
HO 166	1.8E-13	2.8E-04	7.1E-08	2.8E-04	2.8E-04
ER 169	1.4E-13	2.9E-05	3.5E-11	2.9E-05	2.9E-05
ER 171	1.4E-15	3.7E-06	1.4E-07	3.7E-06	3.8E-06
TH 232	1.9E-07	2.6E-03	1.2E-10	2.6E-03	2.6E-03
RA 228	3.9E-11	5.1E-06	3.3E-10	5.1E-06	5.1E-06
AC 228	1.2E-12	1.2E-08	9.6E-08	1.2E-08	1.1E-07
TH 228	3.8E-10	3.8E-07	1.1E-11	3.8E-07	3.8E-07
RA 224	3.1E-12	1.2E-07	9.1E-11	1.2E-07	1.2E-07
PB 212	1.8E-13	4.5E-08	1.2E-09	4.5E-08	4.6E-08
BI 212	2.1E-14	1.2E-09	1.5E-08	1.2E-09	1.7E-08
U 238	6.8E-09	3.4E-06	1.8E-11	3.4E-06	3.4E-06
TH 234	1.8E-12	1.4E-06	1.0E-08	1.4E-06	1.4E-06
PA 234	7.0E-17	3.8E-10	1.8E-09	3.8E-10	2.0E-09
PU 241	5.1E-08	3.9E-04	3.7E-11	3.9E-04	3.9E-04
NP 239	2.1E-11	1.3E-02	3.3E-05	1.3E-02	1.3E-02
PU 239	5.1E-08	3.9E-04	7.6E-11	3.9E-04	3.9E-04

 QENII Dora Calculation Program
 (Version 1.396 28-Jan-89)

Case title: MI dose from concentrations measured at Richland in 1968 ext
 ernal only

Executad on: 19/19/89 at 11:58:50

Page A. 1

 Thir is a near field (narrowly-focused, single rite) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Recreation, external

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.1
 Dose calculations andr after (yr): 50.0

***** FILENAMES AND TITLES OF FILES/LIBRARIES USED *****

Input file name: \GENII\BANDIR\river88.in 9-19-89
 METABOLIC PARAMETERS----- 8-12-88
 RYDLIB - Radionuclide Master Library (29-Aug-88 RAP) 8-29-88
 External Dora Factors for GENII in parson Sv/yr par Bq/n (28-Aug-88 8-29-88
 Internal Yearly Dora Increments (Sv/Bq) 29-Aug-88 RAP 8-29-88

1 Surface roil input unit: (1-m2, 2-13, 3-kg)

----- Basic Concentrations-----

Release Radio- nuclida	Air pCi/L	Surface Soil pCi/m2	Deep Soil pCi/m3	Ground Water pCi/L	Surface Water pCi/L
H 3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
NA24	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E+03
SI31	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.8E+01
P 32	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+02
CA46	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+00
SC46	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E+02
CR51	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E+03
MN54	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E+00
MN56	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+02
FE59	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+01
CO60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E+00
NI65	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
CU64	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.8E+02
ZN65	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+01
ZN69M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+01
GA72	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.6E+01
AS76	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.9E+02
SR87M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
SR89	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E+00
SR90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.0E+02
SR91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+01
SR92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+00
Y 90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+02
Y 91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00
Y 92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.3E+00
Y 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+02
ZR95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+00
NB95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+01
MO99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+01
TC99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RU103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E+00
RU106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
SB122	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+01
SB124	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00

I 131	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.7E+00
I 132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+01
I 133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E+01
I 134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+04
I 136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+00
CS136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E+01
CS137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+02
CS138	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+07
BA139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+01
BA140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+00
LA140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+01
CE141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.5E+00
CE143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+00
CE144	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+01
PR142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
PR143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E+00
ND147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+00
PM147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
PM149	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E+00
PM151	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+00
SM153	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+01
EU152M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.2E+01
EU152	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
EU156	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00
GD153	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+01
GD159	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
TB160	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
TB161	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E+01
DY165	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+00
HO166	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+00
ER169	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+01
ER171	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+00
TH232	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02
U 238	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+02
NP239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+02
PU239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02
PU240	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02

***** NEAR-FIELD PARAMETERS *****

0.0	Inventory disposed n years prior to beginning of intake period
0	LOIC occurred n years prior to beginning of intake period
1.0E+00	Fraction of roots in upper soil (top 16 cm)
0.0E+00	Fraction of roots in deep soil
0.0E+00	Manual redistribution: deep soil/surface soil dilution factor

***** EXTERNAL EXPOSURE *****

1.0E+02	Hours of exposure from swimming
1.0E+02	Hours of exposure from boating
5.0E+02	Hours of exposure from shoreline activities
1	Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Care title: **MI dose** from concentrations measured at Richland in 1968 ext
 ornal only

Executed on: 89/19/89 at **12:09:34**

Page C. 9

Uptake/exposure period: **1.0**
 Dose commitment period: 61.1
 Dose units: Rem

Radio- nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.0E-00	1.0E-19	1.0E-15	1.0E-09	1.0E-09
NA 24	1.0E-00	5.7E-06	2.0E-03	5.7E-06	2.0E-03
SI 31	1.0E-00	6.0E-08	6.1E-08	6.0E-08	1.3E-07
P 32	1.0E-00	2.9E-06	3.0E-07	2.9E-06	3.3E-06
CA 46	1.0E-00	2.2E-08	1.7E-10	2.2E-08	2.2E-08
SC 46	1.0E-00	3.9E-06	1.0E-03	3.9E-06	1.0E-03
CR 61	1.0E-00	4.0E-07	6.1E-06	4.0E-07	6.2E-06
YN 64	1.0E-00	2.7E-08	2.0E-05	2.7E-08	2.0E-05
YN 66	1.0E-00	9.0E-07	2.5E-04	9.0E-07	2.5E-04
FE 69	1.0E-00	2.0E-07	3.3E-05	2.0E-07	3.3E-05
CO 60	1.0E-00	6.0E-08	4.1E-05	6.0E-08	4.1E-05
NI 66	1.0E-00	1.0E-10	2.4E-08	1.0E-10	2.4E-08
CU 64	1.0E-00	8.0E-07	5.7E-05	8.0E-07	5.0E-05
ZN 66	1.0E-00	1.3E-06	1.4E-04	1.3E-06	1.5E-04
ZN 69M	1.0E-00	2.3E-07	1.5E-05	2.3E-07	1.5E-05
ZN 69	1.0E-00	1.0E-00	7.2E-10	1.0E-00	7.2E-10
GA 72	1.0E-00	4.3E-07	3.0E-05	4.3E-07	3.9E-05
AS 76	1.0E-00	4.1E-06	6.5E-05	4.1E-06	6.9E-05
SR 89	1.0E-00	2.0E-08	6.1E-09	2.0E-08	3.4E-08
SR 87M	1.0E-00	1.2E-10	4.7E-08	1.2E-10	4.7E-08
SR 90	1.0E-00	1.5E-08	4.0E-11	1.5E-08	1.5E-08
Y 90	1.0E-00	1.1E-09	2.0E-09	1.1E-09	3.7E-09
SR 91	1.0E-00	5.4E-08	2.3E-06	5.4E-08	2.3E-06
Y 91M	1.0E-00	1.0E-00	4.3E-08	1.0E-00	4.3E-08
Y 91	1.0E-00	2.0E-08	1.7E-08	2.0E-08	4.5E-08
SR 92	1.0E-00	1.4E-08	1.9E-06	1.4E-08	1.9E-06
Y 92	1.0E-00	1.7E-08	3.0E-07	1.7E-08	3.0E-07
Y 93	1.0E-00	9.0E-07	3.0E-06	9.0E-07	3.9E-06
YO 93	1.0E-00	1.0E-00	1.0E-00	1.0E-00	1.0E-00
ZR 93	1.0E-00	1.0E-00	2.2E-20	1.0E-00	2.2E-20
NB 93Y	1.0E-00	1.0E-00	2.0E-19	1.0E-00	2.0E-19
ZR 96	1.0E-00	7.1E-08	1.4E-05	7.1E-08	1.4E-05
NB 95M	1.0E-00	1.0E-00	6.5E-09	1.0E-00	6.5E-09
NB 96	1.0E-00	1.5E-07	4.4E-05	1.5E-07	4.4E-05
YO 99	1.0E-00	8.0E-08	7.2E-07	8.0E-08	8.1E-07
TC 99M	1.0E-00	2.0E-00	8.0E-08	1.0E-00	6.0E-08
TC 99	1.0E-00	1.0E-00	4.0E-17	1.0E-00	4.0E-17

GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: **MI dose from concentrations measured at Richland in 1968 external only**
 Executed on: 19/19/89 at 12:09:34 Page C. 10

Uptake/exposure period: 1.1
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
RU 103	1.0E+00	2.7E-08	3.2E-06	2.7E-08	3.3E-06
PD 183	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
RH 103M	1.0E+00	1.0E+00	4.9E-10	1.0E+00	4.9E-10
RU 106	1.0E+00	5.3E-08	1.2E-06	5.3E-08	1.3E-06
SB 122	1.0E+00	6.2E-07	8.7E-06	6.2E-07	9.3E-06
SB 124	1.0E+00	3.0E-08	5.6E-06	3.0E-08	5.7E-06
I 131	1.0E+00	5.5E-07	1.1E-06	6.5E-07	1.7E-06
XE 131Y	1.0E+00	1.0E+00	3.5E-11	1.0E+00	3.5E-11
I 132	1.0E+00	2.1E-10	1.1E-17	2.1E-10	1.1E-17
1 133	1.0E+00	5.6E-07	5.8E-06	5.6E-07	6.4E-06
XE 133Y	1.0E+00	1.0E+00	4.3E-10	1.0E+00	4.3E-10
XE 133	1.0E+00	1.0E+00	9.4E-09	1.0E+00	9.4E-09
I 134	1.0E+00	2.2E-13	3.2E-10	2.2E-13	3.2E-10
I 136	1.0E+00	4.0E-08	4.5E-06	4.0E-08	4.5E-06
XE 136Y	1.0E+00	1.0E+00	5.1E-09	1.0E+00	5.1E-09
XE 136	1.0E+00	1.0E+00	1.5E-08	1.0E+00	1.5E-08
CS 136	1.0E+00	1.0E+00	9.5E-20	1.0E+00	9.5E-20
CS 137	1.0E+00	4.6E-09	2.0E-07	4.6E-09	2.1E-07
CS 138	1.0E+00	1.9E-16	3.7E-13	1.9E-16	3.7E-13
BA 139	1.0E+00	1.4E-10	1.6E-09	1.4E-10	1.7E-09
BA 140	1.0E+00	9.1E-08	6.3E-07	9.1E-08	7.2E-07
LA 141	1.0E+00	8.1E-07	4.2E-05	8.1E-07	4.3E-05
CS 136	1.0E+00	6.0E-09	3.9E-07	6.0E-09	4.0E-07
CE 141	1.0E+00	4.9E-08	4.3E-07	4.9E-08	4.8E-07
CE 143	1.0E+00	5.1E-08	4.5E-07	5.1E-08	5.0E-07
FR 143	1.0E+00	2.3E-08	1.1E-09	2.3E-08	2.4E-08
CE 144	1.0E+00	8.0E-07	9.0E-07	8.0E-07	1.7E-06
FR 144Y	1.0E+00	1.0E+00	2.0E-09	1.0E+00	2.0E-09
FR 144	1.0E+00	1.0E+00	3.7E-06	1.0E+00	3.7E-06
FR 142	1.0E+00	1.5E-07	2.8E-07	1.5E-07	4.3E-07
ND 147	1.0E+00	1.2E-08	1.0E-07	1.2E-08	1.1E-17
PY 147	1.0E+00	1.0E-09	2.9E-11	1.0E-09	1.1E-09
SY 147	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
PY 149	1.0E+00	2.3E-08	1.1E-08	2.3E-08	3.4E-08
PY 151	1.0E+00	7.9E-09	1.5E-07	7.9E-09	1.8E-17
SY 161	1.0E+00	1.0E+00	1.9E-16	1.0E+00	1.9E-16
SY 163	1.0E+00	5.7E-07	1.6E-06	5.7E-07	2.1E-06

GENII Dose Calculation Program
(Version 1.396 23-Jan-89)

Care title: **MI dose from concentrations measured at Richland in 1988 external only**

Executed on: 19/19/89 at 12:09:34

Page C. 11

Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
EU 162Y	1.0E+00	3.7E-07	8.0E-08	3.7E-07	8.3E-08
EU 162	1.0E+00	1.3E-08	8.1E-08	1.3E-08	8.1E-08
EU 158	1.0E+00	2.7E-08	1.4E-08	2.7E-08	1.5E-08
GD 163	1.0E+00	2.3E-10	1.9E-08	2.3E-10	1.9E-08
GD 169	1.0E+00	1.1E-18	3.3E-08	1.1E-08	4.4E-08
TB 180	1.0E+00	6.6E-09	1.1E-08	6.6E-09	1.1E-08
TB 161	1.0E+00	1.3E-09	1.0E-09	1.3E-09	2.4E-09
DY 185	1.0E+00	1.3E-09	1.2E-08	1.3E-09	1.4E-08
HO 166	1.0E+00	7.4E-08	6.2E-08	7.4E-08	1.4E-07
ER 169	1.0E+00	2.9E-09	2.4E-11	2.9E-09	2.9E-09
ER 171	1.0E+00	3.2E-09	1.3E-07	3.2E-09	1.4E-07
TH 232	1.0E+00	5.0E-07	4.6E-11	5.0E-07	6.0E-07
RA 228	1.0E+00	1.0E+00	1.2E-16	1.0E+00	1.2E-16
AC 228	1.0E+00	1.0E+00	3.5E-08	1.0E+00	3.5E-08
TH 228	1.0E+00	1.0E+00	4.2E-12	1.0E+00	4.2E-12
RA 224	1.0E+00	1.0E+00	3.3E-11	1.0E+00	3.3E-11
PB 212	1.0E+00	1.0E+00	4.3E-10	1.0E+00	4.3E-10
BI 212	1.0E+00	1.0E+00	5.6E-09	1.0E+00	5.6E-09
U 238	1.0E+00	1.4E-09	6.8E-12	1.4E-09	1.4E-09
TH 234	1.0E+00	1.0E+00	3.7E-09	1.0E+00	3.7E-09
PA 234	1.0E+00	1.0E+00	6.1E-10	1.0E+00	6.1E-10
PU 240	1.0E+00	6.6E-08	1.6E-11	6.6E-08	6.6E-08
NP 239	1.0E+00	3.2E-06	2.6E-06	3.2E-06	2.9E-06
PU 239	1.0E+00	6.6E-08	2.9E-11	6.6E-08	6.6E-08

QENII Dose Calculation Program
(Version 1.396 23-Jan-89)

Case title: YI dose from concentrations measured at Richland in 1968 DRI
 NKINQ ONLY
Exacutad on: 19/19/89 at 12:09:48 Page A. 1

This is a **near** field (narrowly-focusad, **single** site) scenario.
Release is chronic
 Individual **dose**

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Drinking **water** ingestion

THE FOLLOWING TIMES ARE USED:
Intake ends after (yr): 1.0
Dora calculations ends after (yr): 61.1

===== **FILENAMES AND TITLES OF FILES/LIBRARIES USED** =====

Input file name: \GENII\BANDIR\river68.in	9-19-89
METABOLIC PARAMETERS -----	8-12-88
RMDLIB - Radionuclide Master Library (29-Aug-88 RAP)	8-29-88
Bioaccumulation Factor Library - (30-Aug-88) RAP (p-32, zn, np modi	9-12-89
External Dora Factors for GENII in parson Sv/yr par Bq/n (28-Aug-88	8-29-88
Internal Yearly Dora Incramants (Sv/Bq) 29-Aug-88 RAP	8-29-88

=====

1 Surface soil input unit: (1-m2, 2-13, 3-kg)

-----Basic Concntrations-----					
Release Radio- nuclida	Air pCi/L	Surface Soil pCi/m2	Deep Soil pCi/m3	Ground Water pCi/L	Surfaca Water pCi/L
H 3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
NA24	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E+03
SI31	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.8E+01
P 32	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+02
CA46	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+00
SC46	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E+02
CR51	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E+03
YN64	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E+00
MN56	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+02
FE59	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+01
CO60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E+00
NI65	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
CU64	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.8E+02
ZN65	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
ZN69M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+01
GA72	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E+01
AS76	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.9E+02
SR87M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+01
SR89	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E+00
SR90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+02
SR91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+01
SR92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+00
Y 90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+02
Y 91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00
Y 92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.3E+00
Y 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+02
ZR95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+00
NB95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+01
YO99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+01
TC99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RU103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E+00
RU106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
SB122	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+01

SB124	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00
I 131	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.7E+00
I 132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+01
I 133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E+01
I 134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+04
I 135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+00
CS136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E+01
CS137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+02
CS138	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+07
BA139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+01
BA140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+00
LA140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+01
CE141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.5E+00
CE143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+00
CE144	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+01
PR142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+01
PR143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E+00
ND147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+00
PM147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
PM149	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+00
PM151	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+00
SM153	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+01
EU152M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.2E+01
EU152	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
EU156	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+00
GD153	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+01
GD159	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
TB160	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E+01
TB161	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E+01
DY165	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+00
H0166	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E+00
ER169	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+01
ER171	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+00
TH232	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02
U 236	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+02
NP239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E+02
PU239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02
PU240	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E+02

===== NEAR-FIELD PARAMETERS =====

I.# Inventory disposed n years prior to beginning of intake period
0 LOIC occurred n years prior to beginning of intake period
1.0E+00 Fraction of roots in upper soil (top 15 cm)
0.0E+00 Fraction of roots in deep soil
0.0E+00 Manual redistribution: deep soil/surface soil dilution factor

===== DRINKING WATER SOURCE/IRRIGATION =====

7.3E+02 Drinking water consumption rate (l/yr)
2 Drinking water source: 1-ground, 2-surface, 3-system
F Drinking water treatment: T/F
- - Drinking water transit/holdup time (d)

=====

GENII Dose Calculation Program
(Version 1.396 23-Jan-89)

Case title: MI dose from concentrations measured at **Richland** in **1988** DRI
NKING ONLY

Executed on: 89/19/89 at **12:25:28**

Page C. 9

Uptake/exposure period: 1.1
Dose commitment period: 50.0
Dose units: Rem

Radio- nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
H 3	1.0E+00	5.7E-07	1.0E+00	5.7E-07	5.7E-07
NA 24	1.0E+00	6.9E-04	1.0E+00	6.9E-04	6.9E-04
SI 31	6.0E+00	4.2E-08	1.0E+00	4.2E-08	4.2E-08
P 32	1.0E+00	1.0E-03	1.0E+00	1.0E-03	1.0E-03
CA 46	1.0E+00	7.8E-06	1.0E+00	7.8E-06	7.8E-06
SC 46	1.0E+00	1.4E-03	1.0E+00	1.4E-03	1.4E-03
CR 61	6.0E+00	1.8E-04	1.0E+00	1.8E-04	1.8E-04
MN 64	1.0E+00	9.7E-06	1.0E+00	9.7E-06	9.7E-06
MN 66	1.0E+00	6.6E-07	1.0E+00	6.6E-07	6.6E-07
FE 69	1.0E+00	9.2E-05	1.0E+00	9.2E-05	9.2E-05
CO 60	1.0E+00	1.8E-05	1.0E+00	1.8E-05	1.8E-05
NI 66	1.0E+00	9.1E-11	1.0E+00	9.1E-11	9.1E-11
CU 64	1.0E+00	8.1E-05	1.0E+00	8.1E-05	8.1E-05
ZN 66	1.0E+00	4.8E-04	1.0E+00	4.8E-04	4.8E-04
ZN 69M	1.0E+00	2.6E-05	1.0E+00	2.6E-05	2.6E-05
ZN 69	1.0E+00	1.9E-06	6.0E+00	1.9E-06	1.9E-06
GA 72	1.0E+00	4.7E-05	1.0E+00	4.7E-05	4.7E-05
AS 76	1.0E+00	8.0E-04	1.0E+00	8.1E-04	8.0E-04
SR 89	1.0E+00	1.0E-05	1.0E+00	1.0E-05	1.0E-05
SR 87M	1.0E+00	1.2E-10	1.0E+00	1.2E-10	1.2E-10
SR 90	1.0E+00	5.3E-06	6.0E+00	5.3E-06	5.3E-06
Y 90	8.0E+00	4.1E-07	1.0E+00	4.1E-07	4.1E-07
SR 91	1.0E+00	3.4E-06	1.0E+00	3.4E-06	3.4E-06
Y 91M	1.0E+00	3.8E-08	1.0E+00	3.8E-08	3.8E-08
Y 91	1.0E+00	1.0E-05	1.0E+00	1.0E-05	1.0E-05
SR 92	1.0E+00	1.1E-08	1.0E+00	1.1E-08	1.1E-08
Y 92	1.0E+00	2.1E-17	1.0E+00	2.0E-07	2.0E-07
Y 93	1.0E+00	6.7E-05	1.0E+00	6.7E-05	6.7E-05
MO 93	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
ZR 93	1.0E+00	7.2E-14	1.0E+00	7.2E-14	7.2E-14
NB 93M	1.0E+00	1.8E-18	1.0E+00	1.8E-18	1.8E-18
ZR 96	1.0E+00	2.8E-05	1.0E+00	2.8E-05	2.8E-05
NB 96M	1.0E+00	2.2E-08	1.0E+00	2.2E-08	2.2E-08
NB 96	1.0E+00	5.8E-05	1.0E+00	5.8E-05	5.8E-05
MO 99	1.0E+00	2.3E-05	1.0E+00	2.3E-05	2.3E-05
TC 99M	1.0E+00	5.5E-07	1.0E+00	5.5E-07	5.5E-07
TC 99	1.0E+00	1.7E-13	1.0E+00	1.7E-13	1.7E-13

GENII Dose Calculation Program
(Version 1.396 23-Jan-89)

Case title: MI dose from concentrations measured at Richland in 1968 DRI
N KING ONLY

Executed on: 09/19/89 at 12:20:28

Page C. 10

Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio- nuclidr	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
RJ 103	1.0E+00	9.4E-06	1.0E+00	9.4E-06	9.4E-06
PD 103	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
RH 103M	1.0E+00	3.9E-08	1.0E+00	3.9E-08	3.9E-08
RJ 106	1.0E+00	1.9E-05	1.0E+00	1.9E-05	1.9E-05
SB 122	1.0E+00	1.8E-04	1.0E+00	1.8E-04	1.8E-04
SB 124	1.0E+00	1.1E-05	1.0E+00	1.1E-05	1.1E-05
I 131	1.0E+00	1.9E-04	1.0E+00	1.9E-04	1.9E-04
XE 131M	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
I 132	1.0E+00	5.5E-11	1.0E+00	5.5E-11	5.5E-11
I 133	1.0E+00	9.2E-05	1.0E+00	9.2E-05	9.2E-05
XE 133M	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
XE 133	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
I 134	1.0E+00	4.5E-19	1.0E+00	4.5E-19	4.5E-19
1 136	1.0E+00	1.2E-06	1.0E+00	1.2E-06	1.2E-06
XE 136M	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
XE 136	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
CS 136	1.0E+00	9.0E-15	1.0E+00	9.0E-15	9.0E-15
CS 137	1.0E+00	1.6E-06	1.0E+00	1.6E-06	1.6E-06
CS 138	1.0E+00	2.4E-27	1.0E+00	2.4E-27	2.4E-27
BA 139	1.0E+00	3.1E-13	1.0E+00	3.1E-13	3.1E-13
BA 140	1.0E+00	3.2E-05	1.0E+00	3.2E-05	3.2E-05
LA 140	1.0E+00	2.1E-04	1.0E+00	2.1E-04	2.1E-04
CS 138	1.0E+00	2.1E-06	1.0E+00	2.1E-06	2.1E-06
CE 141	1.0E+00	1.8E-05	1.0E+00	1.8E-05	1.8E-05
CE 143	1.0E+00	1.1E-05	1.0E+00	1.1E-05	1.1E-05
FR 143	1.0E+00	8.5E-06	1.0E+00	8.5E-06	8.5E-06
CE 144	1.0E+00	2.9E-04	1.0E+00	2.9E-04	2.9E-04
FR 144M	1.0E+00	9.7E-09	1.0E+00	9.7E-09	9.7E-09
FR 144	1.0E+00	1.7E-06	1.0E+00	1.7E-06	1.7E-06
FR 142	1.0E+00	2.3E-05	1.0E+00	2.3E-05	2.3E-05
ND 147	1.0E+00	4.0E-06	1.0E+00	4.0E-06	4.0E-06
FM 147	1.0E+00	3.8E-07	1.0E+00	3.8E-07	3.8E-07
SM 147	1.0E+00	1.2E-18	1.0E+00	1.2E-18	1.2E-18
PM 149	1.0E+00	6.2E-06	1.0E+00	6.2E-06	6.2E-06
PM 161	1.0E+00	1.6E-06	1.0E+00	1.6E-06	1.6E-06
SM 161	1.0E+00	5.7E-12	1.0E+00	5.7E-12	5.7E-12
SM 153	1.0E+00	1.5E-04	1.0E+00	1.5E-04	1.5E-04

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GENII Dose Calculation Program
 (Version 1.896 28-Jan-89)

Case title: MI dose from concentration measured at Richland in 1968 DRI
 NKINQ ONLY

Executed on: 19/19/89 at 12:20:20

Page C. 11

Uptake/exposure period: 1.1
Dose commitment period: 50.0
Dose units: Rem

Radio- nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
EU 152M	a. 0E+00	2.2E-05	0.0E+00	2.2E-05	2.2E-05
EU 162	a. 0E+00	4.6E-06	0.0E+00	4.6E-06	4.6E-06
EU 166	a. 0E+00	9.1E-06	0.0E+00	9.1E-06	9.1E-06
GD 163	a. 0E+00	8.6E-06	0.0E+00	8.6E-06	8.6E-06
GD 169	a. 0E+00	1.6E-06	0.0E+00	1.6E-06	1.6E-06
TB 160	a. 0E+00	2.4E-06	0.0E+00	2.4E-06	2.4E-06
TB 161	0.0E+00	4.4E-07	0.0E+00	4.4E-07	4.4E-07
DY 166	a. 0E+00	3.8E-10	0.0E+00	3.8E-10	3.8E-10
HO 166	0.0E+00	1.5E-05	0.0E+00	1.5E-05	1.5E-05
ER 169	a. 0E+00	9.7E-07	0.0E+00	9.7E-07	9.7E-07
ER 171	a. 0E+00	1.3E-07	0.0E+00	1.3E-07	1.3E-07
TH 232	a. 0E+00	1.8E-04	0.0E+00	1.8E-04	1.8E-04
RA 228	a. 0E+00	1.8E-08	0.0E+00	1.8E-08	1.8E-08
AC 228	a. 0E+00	3.0E-11	0.0E+00	3.0E-11	3.0E-11
TH 228	a. 0E+00	2.2E-12	0.0E+00	2.2E-12	2.2E-12
RA 224	a. 0E+00	3.6E-14	0.0E+00	3.6E-14	3.6E-14
PB 212	a. 0E+00	3.6E-16	0.0E+00	3.6E-16	3.6E-16
BI 212	a. 0E+00	6.4E-17	0.0E+00	6.4E-17	6.4E-17
U 238	a. 0E+00	5.2E-07	0.0E+00	5.2E-07	5.2E-07
TH 234	a. 0E+00	8.4E-09	0.0E+00	8.4E-09	8.4E-09
PA 234	a. 0E+00	1.4E-12	0.0E+00	1.4E-12	1.4E-12
PU 240	0.0E+00	2.4E-05	0.0E+00	2.4E-05	2.4E-05
NP 239	a. 0E+00	8.9E-04	0.0E+00	8.9E-04	8.9E-04
PU 239	a. 0E+00	2.4E-05	0.0E+00	2.4E-05	2.4E-05

 OENII Dose Calculation Program
 (Version 1.396 28-Jan-89)

Case title: Native American Diet Simulation

Executed on: 09/12/89 at 16:20:22

Page A. 1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is chronic
 Individual dose

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Aquatic foods ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.1
 Dose calculations ends after (yr): 50.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

Input file name: \GENII\RUSS\YNative American Diet Simulation.IN
 9-12-89
 METABOLIC PARAMETERS----- 8-12-88
 RYDLIB - Radionuclide Master Library (29-Aug-88 RAP) 8-29-88
 Bioaccumulation Factor Library - (30-Aug-88) RAP (p-32, zn, np modi 9-12-89
 External Dose Factors for OENII in person Sv/yr per Bq/n (28-Aug-88 8-29-88
 Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP 8-29-88

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1 Surface soil input unit: (1-m2, 2-m3, 3-kg)

----- Basic Concentrations-----					
Release	Air	Surface	Deep	Ground	Surface
Radio-		Soil	Soil	later	later
nuclide	pCi/L	pCi/m2	pCi/m3	pCi/L	pCi/L
NA24	1.0E+00	1.0E+00	1.0E+00	1.0E+00	2.7E+03
P 32	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+02
MN56	0.0E+00	1.0E+00	0.0E+00	1.0E+00	1.4E+02
CU64	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.1E+03
ZN65	0.0E+00	0.0E+00	0.0E+00	1.0E+00	8.7E+01
AS76	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.0E+02
NP239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+03

===== AQUATIC FOODS INGESTION =====

FOOD TYPE	TRAN- SIT	PROD- UCTION	----CONSUMPTION----	
	h	kg/yr	HOLDUP d	RATE kg/yr
Fish	1.0E+00	1.0E+02	1.0E+00	9.5E+01

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GENII Dose Calculation Program
 (Version **1.395** 28-Jan-89)

Care title: Native American diet Simulation

Executed on: **09/12/89** at **16:21:41**

Page C. 5

Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose unit: Rem

Radio- nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
-----	-----	-----	-----	-----	-----
NA 24	a. 0E+00	a. 0E+00	■ #Eel#	8.0E-03	8.0E-03
P 32	a. 0E+00	4.9E-01	a. 0E+00	4.9E-01	4.9E-01
MN 56	a. 0E+00	8.3E-06	a. 0E+00	8.3E-06	8.3E-06
CU 64	a. 0E+00	3.4E-02	a. 0E+00	3.4E-02	3.4E-02
ZN 66	a. 0E+00	5.3E-02	a. 0E+00	5.3E-02	5.3E-02
AS 76	a. 0E+00	3.7E-02	a. 0E+00	3.7E-02	3.7E-02
NP 239	a. 0E+00	5.9E-02	0.0E+00	5.9E-02	5.9E-02
PU 239	a. 0E+00	6.9E-07	a. 0E+00	6.9E-07	6.9E-07
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 GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, all pathway

Executed on: 18/26/89 at 11:42:32

Page A. 1

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 This is a far-field (wide-scale release, multiple site) scenario.
 Release is acute
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Surface Water

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Ground, external
 Recreation, external
 Drinking water ingestion
 Aquatic foods ingestion

THE FOLLOWING TIMES ARE USED:
 Intake ends after (yr): 1.0
 Dose calculations ends after (yr): 50.0

===== FILENAMES AND TITLES OF FILES/LIBRARIES USED =====

Input file name: \GENII\BANDIR\acutew.in 18-26-89
 METABOLIC PARAMETERS----- 8-12-88
 RYDLIB - Radionuclide Master Library (29-Aug-88 RAP) 8-29-88
 Bioaccumulation Factor Library - (38-Aug-88) RAP 8-38-88
 External Dose Factors for GENII in person Sv/yr per Bq/n (28-Aug-88) 8-29-88
 Internal Yearly Dose Increments (Sv/Bq) 29-Aug-88 RAP 8-29-88

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-----Release Terms-----
 Release Radio- Surface Buried
 nuclide Air Water Source
 Ci/yr Ci/yr Ci/n3

CO60	0.0E+00	4.6E+01	0.0E+00
BR82	0.0E+00	1.4E+02	0.0E+00
SR89	0.0E+00	1.7E+05	0.0E+00
SR90	0.0E+00	1.3E+03	0.0E+00
SR91	0.0E+00	4.1E+05	0.0E+00
Y 90	0.0E+00	1.3E+03	0.0E+00
Y 91M	0.0E+00	2.4E+05	0.0E+00
Y 91	0.0E+00	1.0E+05	0.0E+00
Y 92	0.0E+00	0.0E+00	0.0E+00
Y 93	0.0E+00	4.9E+05	0.0E+00
ZR95	0.0E+00	2.1E+05	0.0E+00
ZR97	0.0E+00	4.9E+05	0.0E+00
NB95M	0.0E+00	1.4E+03	0.0E+00
NB95	0.0E+00	8.2E+04	0.0E+00
NB97M	0.0E+00	4.7E+05	0.0E+00
NB97	0.0E+00	4.9E+05	0.0E+00
YO99	0.0E+00	5.1E+05	0.0E+00
TC99M	0.0E+00	4.6E+05	0.0E+00
RU103	0.0E+00	2.0E+05	0.0E+00
RU106	0.0E+00	9.1E+03	0.0E+00
RH103M	0.0E+00	1.8E+05	0.0E+00
PD109	0.0E+00	4.0E+04	0.0E+00
AG111	0.0E+00	1.2E+04	0.0E+00
CD116	0.0E+00	6.2E+03	0.0E+00
IN115M	0.0E+00	6.2E+03	0.0E+00
SN121	0.0E+00	5.8E+03	0.0E+00
SN125	0.0E+00	3.9E+03	0.0E+00
SB127	0.0E+00	2.7E+04	0.0E+00

TE127	0.0E+00	2.5E+04	0.0E+00
TE129M	0.0E+00	7.2E+04	0.0E+00
TE129	0.0E+00	8.0E+04	0.0E+00
TE131M	0.0E+00	3.7E+04	0.0E+00
TE131	0.0E+00	2.4E+05	0.0E+00
TE132	0.0E+00	3.9E+05	0.0E+00
I 131	0.0E+00	2.0E+05	0.0E+00
I 132	0.0E+00	3.9E+05	0.0E+00
I 133	0.0E+00	5.8E+05	0.0E+00
XE131M	0.0E+00	2.5E+03	0.0E+00
XE133M	0.0E+00	1.0E+04	0.0E+00
XE133	0.0E+00	5.4E+05	0.0E+00
XE135	0.0E+00	9.7E+04	0.0E+00
CS137	0.0E+00	1.0E+03	0.0E+00
BA140	0.0E+00	4.7E+05	0.0E+00
LA140	0.0E+00	4.7E+05	0.0E+00
CE141	0.0E+00	3.1E+05	0.0E+00
CE143	0.0E+00	4.0E+05	0.0E+00
CE144	0.0E+00	4.8E+04	0.0E+00
ND147	0.0E+00	1.8E+05	0.0E+00
PM148	0.0E+00	9.0E+03	0.0E+00
PM149	0.0E+00	1.0E+05	0.0E+00
SM151	0.0E+00	2.0E+01	0.0E+00
SM153	0.0E+00	2.0E+04	0.0E+00
EU156	0.0E+00	0.9E+03	0.0E+00
U 237	0.0E+00	1.1E+05	0.0E+00
U 240	0.0E+00	3.5E+01	0.0E+00
NP238	0.0E+00	3.3E+03	0.0E+00
NP239	0.0E+00	1.0E+05	0.0E+00
PU239	0.0E+00	5.0E+01	0.0E+00
PU240	0.0E+00	8.3E+00	0.0E+00
PU241	0.0E+00	2.9E+02	0.0E+00

===== SURFACE WATER TRANSPORT =====

■ Mixing ratio model: 1-use value, 1-river, 2-lake, 3-river flow
 2.4E+01 Transit time to irrigation withdrawal location (h)
 3.0E+03 Average water flow rate for: MIXFLG=1,2 (m/s), MIXFLG=0,3 (m3/s)
 5.0E+04 Mixing ratio, dimensionless

===== EXTERNAL EXPOSURE =====

4.4E+01 Hours of exposure to ground contamination
 2 Residential irrigation source 1-ground water, 2-surface water
 4.5E+01 Residential irrigation application rate (in/yr)
 0.0E+00 Residential irrigation duration (mo/yr)
 1.0E+02 Hours of exposure from swimming
 1.0E+00 Hours of exposure from boating
 5.0E+00 Hours of exposure from shoreline activities
 1 Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin
 2.4E+01 Surface water transit time to recreational site (h)

===== DRINKING WATER SOURCE/IRRIGATION =====

7.3E+02 Drinking water consumption rate (l/yr)
 2 Drinking water source: 1-ground, 2-surface, 3-system
 F Drinking water treatment: T/F
 ■ - ■ Drinking water transit/holdup time (d)

===== AQUATIC FOODS INGESTION =====

FOOD TYPE	TRAN-SIT h	PROD- UCTION kg/yr	----CONSUMPTION----	
			HOLDUP d	RATE kg/yr
Fish	1.20E+01		1.00E+00	4.00E+01

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GENII Dose Calculation Program
 (Version **1.395** 23-Jan-89)

Cass title: acute release of 1 pound of fresh fuel to river, all pathway

Executed on: 11/26/89 at 11:50:55

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Acute release
Uptake/exposure period: 1.1
 Dose commitment period: 61.1
Dose unit: Rem

Organ	Committed Dose Equivalent	Weighting Factors	Weighted Dose Equivalent
Gonads	1.4E-02	2.5E-01	3.6E-03
Breast	2.8E-04	1.5E-01	4.2E-05
R Yarrow	4.5E-04	1.2E-01	5.4E-05
Lung	2.7E-04	1.2E-01	3.3E-05
Thyroid	1.1E-02	3.0E-02	3.3E-04
Bone Sur	6.4E-04	3.0E-02	1.9E-04
LL Int.	1.1E-12	6.0E-02	6.6E-14
UL Int.	4.5E-03	6.0E-02	2.7E-04
S Int.	1.3E-03	6.0E-02	7.8E-05
Stomach	6.8E-04	6.0E-02	4.1E-05
Bladder	3.0E-04	6.0E-02	1.8E-05
Internal Effective Dose Equivalent			5.1E-03
External Dose			4.6E-04
Annual Effective Dose Equivalent			5.6E-03

 Controlling Organ: Testes
 Controlling Pathway: Ing
 Controlling Radionuclide: TE129M

 Total Inhalation EDE: 6.0E-03
 Total Ingestion EDE: 5.1E-03

GENII Dora Calculation Program
 (Version 1.896 28-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, all pathway

Exacuted on: ⁸ 11/26/89 at 11:50:55

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Acute relrare
 Uptake/exposure period:
 Dora commitment period:
 Dora unitr:

1.1
 61.1
 Rem

Comittad Dora Equivalent by Radionuclide

Radionuclide	Lung	Stonach	S Int.	UL Int.	LL Int.	Bone Su	R Marro	Testes
CO 60	1.0E-08	1.8E-08	4.3E-08	6.8E-08	1.4E-07	9.9E-09	1.5E-08	1.4E-08
BR 82	9.8E-09	1.9E-08	1.3E-08	1.2E-08	1.3E-08	3.6E-09	9.1E-09	1.2E-08
SR 89	1.1E-06	6.8E-06	1.1E-05	6.2E-05	1.9E-04	4.4E-05	2.7E-05	1.1E-06
SR 91	1.3E-08	2.3E-08	4.0E-08	2.9E-07	1.3E-06	2.6E-05	1.2E-05	1.3E-08
Y 91	6.4E-13	5.5E-08	1.3E-07	6.4E-07	1.6E-06	2.0E-11	1.9E-11	6.4E-13
SR 91	6.0E-08	1.8E-08	2.8E-06	7.9E-06	8.4E-06	1.6E-07	2.1E-07	7.5E-08
Y 91M	1.8E-09	6.8E-08	4.4E-08	4.4E-08	3.3E-08	1.2E-09	3.2E-09	4.7E-10
Y 91	1.3E-09	4.4E-06	1.1E-05	6.4E-05	1.9E-04	4.0E-08	4.2E-08	2.6E-09
Y 92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 93	1.9E-09	2.8E-06	5.6E-06	1.7E-05	2.0E-05	3.9E-09	1.1E-08	3.9E-09
YO 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ZR 93	1.8E-18	9.0E-18	2.2E-15	1.3E-14	3.9E-14	3.5E-13	2.9E-14	1.8E-18
NB 93Y	1.1E-20	1.9E-19	4.9E-19	2.7E-18	8.3E-18	3.2E-19	1.2E-19	1.8E-28
ZR 95	8.1E-07	1.3E-05	3.9E-05	1.1E-04	2.8E-04	1.7E-05	7.4E-06	2.8E-06
NB 95M	4.4E-10	3.5E-08	8.7E-08	4.1E-07	1.0E-06	6.6E-09	5.2E-09	1.3E-09
NB 96	2.3E-07	2.3E-06	7.6E-06	1.5E-05	3.3E-05	2.5E-06	1.7E-06	6.8E-07
ZR 97	3.6E-07	2.4E-05	6.8E-05	2.4E-04	3.6E-04	9.2E-07	2.6E-06	1.0E-06
NB 97M	1.7E-09	1.4E-07	8.2E-08	6.3E-08	1.4E-08	8.4E-10	1.8E-09	2.9E-10
NB 97	4.3E-08	8.2E-06	6.7E-06	5.2E-06	1.1E-06	3.5E-08	9.5E-08	1.8E-08
YO 99	1.7E-06	5.0E-06	3.2E-06	1.2E-05	2.6E-05	7.7E-06	4.9E-06	1.4E-06
TC 99M	2.8E-08	6.1E-07	1.9E-07	3.2E-07	2.2E-07	2.3E-08	5.3E-08	2.0E-08
TC 99	7.5E-15	4.0E-13	1.1E-14	4.5E-14	1.3E-13	3.7E-15	7.1E-15	7.5E-15
RJ 113	1.3E-06	5.4E-06	1.5E-05	4.5E-05	1.2E-04	1.4E-06	2.9E-06	2.3E-06
FD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.0E+00
RH 103M	9.4E-11	4.7E-07	3.1E-07	1.8E-07	2.9E-08	6.8E-11	2.0E-10	6.3E-11
RJ 106	1.1E-06	2.0E-06	4.1E-06	2.0E-05	5.9E-05	5.3E-07	1.1E-06	1.2E-06
FD 119	9.0E-11	2.3E-07	4.9E-07	1.8E-06	2.3E-06	5.3E-10	1.6E-09	1.5E-10
AG 111	8.9E-09	4.1E-07	9.6E-07	5.2E-06	1.5E-05	7.0E-09	1.5E-08	9.7E-09
OD 116	1.1E-08	3.0E-07	8.6E-07	4.1E-06	9.9E-06	2.0E-08	4.9E-08	2.4E-08
IN 115M	8.1E-10	1.6E-07	2.5E-07	4.7E-07	2.9E-07	1.6E-09	4.6E-09	9.7E-10
SN 121	3.7E-10	2.4E-07	5.2E-07	2.4E-06	4.5E-06	3.7E-09	1.6E-09	3.9E-10
SN 126	4.5E-08	2.8E-06	6.7E-06	3.6E-05	1.0E-04	6.4E-07	5.9E-07	9.8E-08
SB 126	2.8E-11	5.5E-10	1.7E-09	5.2E-09	1.4E-08	2.1E-10	2.6E-10	1.1E-10
TE 125M	1.6E-13	6.1E-13	1.3E-12	6.1E-12	1.7E-11	4.7E-11	4.4E-12	1.4E-13
SB 127	5.7E-08	2.0E-06	5.7E-06	2.6E-05	7.1E-05	1.9E-07	4.6E-07	2.1E-07
TE 127M	8.3E-10	1.4E-09	3.3E-09	2.6E-08	9.4E-08	1.8E-07	4.7E-08	8.1E-10
TE 127	1.2E-08	9.3E-07	1.6E-06	4.7E-06	5.1E-06	3.1E-08	3.6E-08	1.2E-08
TE 129M	3.7E-06	1.3E-05	3.2E-05	1.8E-04	6.5E-04	1.8E-04	8.0E-05	1.3E-02

 OENII Dora Calculation Program
 (Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, all pathway

Exacutad on: 11/26/89 at 11:50:55

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Acuta release

Uptake/exposure period:

1.1

Dora commitment period:

50.0

Dora units:

Ran

Committed Dora Equivalent by Radionuclide

Radionuclide	Ovaries	Muscle	Thyroid	Bladder	Kidneys	Liver	Spleen	S Wall
CO 60	3.7E-08	1.3E-08	9.9E-09	0.0E+00	0.0E+00	2.9E-08	0.0E+00	0.0E+00
BR 82	1.0E-08	9.8E-09	9.8E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SR 89	1.1E-08	1.1E-08	1.1E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SR 90	1.3E-08	1.3E-08	1.3E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 91	7.4E-13	6.4E-13	6.4E-13	0.0E+00	0.0E+00	1.9E-11	0.0E+00	0.0E+00
SR 91	4.5E-07	1.0E-07	4.5E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 91M	1.0E-08	2.6E-09	1.6E-10	0.0E+00	0.0E+00	3.6E-09	0.0E+00	0.0E+00
Y 91	2.2E-08	3.5E-09	8.3E-10	0.0E+00	0.0E+00	3.8E-08	0.0E+00	0.0E+00
Y 92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 93	4.9E-08	6.9E-09	2.8E-10	0.0E+00	0.0E+00	7.7E-09	0.0E+00	0.0E+00
YO 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ZR 93	1.8E-18	1.8E-18	1.8E-18	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NB 93Y	2.9E-20	1.1E-20	1.1E-20	0.0E+00	1.8E-19	0.0E+00	1.8E-19	0.0E+00
ZR 96	2.8E-05	3.9E-06	2.8E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NB 96M	1.5E-08	1.6E-09	2.5E-10	0.0E+00	2.8E-09	0.0E+00	2.4E-09	0.0E+00
NB 96	6.7E-06	9.1E-07	9.9E-08	0.0E+00	1.2E-06	0.0E+00	9.1E-07	0.0E+00
ZR 97	1.2E-05	1.6E-06	5.4E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NB 97Y	4.0E-09	1.8E-09	1.6E-10	0.0E+00	4.0E-09	0.0E+00	8.8E-09	0.0E+00
NB 97	3.3E-07	7.4E-08	4.8E-09	0.0E+00	1.5E-07	0.0E+00	2.2E-07	0.0E+00
YO 99	1.8E-06	1.6E-06	1.4E-06	0.0E+00	2.1E-05	2.2E-05	0.0E+00	0.0E+00
TC 99M	8.3E-08	3.2E-08	7.2E-07	0.0E+00	1.9E-07	0.0E+00	0.0E+00	8.1E-07
TC 99	7.5E-15	7.5E-15	8.7E-13	0.0E+00	1.7E-13	0.0E+00	0.0E+00	4.0E-13
RU 103	1.0E-05	2.2E-06	1.2E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
FD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	7.7E-10	1.6E-10	6.5E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RU 106	1.3E-06	1.2E-06	1.1E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
FD 109	6.6E-09	4.9E-10	4.9E-11	0.0E+00	3.5E-09	2.0E-09	0.0E+00	0.0E+00
AQ 111	3.5E-08	1.1E-08	7.6E-09	0.0E+00	0.0E+00	9.3E-07	0.0E+00	0.0E+00
OD 115	2.1E-07	3.0E-08	6.4E-09	0.0E+00	6.5E-07	1.4E-07	0.0E+00	0.0E+00
IN 115M	1.8E-08	2.6E-09	1.3E-10	0.0E+00	4.9E-09	3.4E-09	4.3E-09	0.0E+00
SN 121	3.7E-10	3.9E-10	3.9E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SN 126	8.1E-07	1.2E-07	2.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SB 125	1.2E-09	1.4E-10	1.2E-11	0.0E+00	0.0E+00	1.4E-10	0.0E+00	0.0E+00
TE 125M	4.7E-13	1.7E-13	1.4E-13	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SB 127	2.2E-06	2.7E-07	1.6E-08	0.0E+00	0.0E+00	2.6E-07	0.0E+00	0.0E+00
TE 127M	1.1E-09	8.4E-10	8.2E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 127	1.6E-08	1.2E-08	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 129M	5.5E-06	4.1E-06	3.7E-07	3.2E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00

GENII Dose Calculation Program
 (Version 1.896 28-Jan-89)

Care title: acute release of 1 pound of fresh fuel to river, all pathway

Executed on: 11/26/69 at 11:50:55

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Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Committed Dose Equivalent by Radionuclide

Radionuclide	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro	Testes
TE 129	7.4E-09	5.7E-08	4.0E-08	2.7E-08	5.7E-07	1.2E-08	1.0E-08	8.4E-07
I 129	4.2E-16	4.8E-16	3.9E-16	3.0E-16	3.9E-16	3.3E-15	1.7E-15	3.3E-16
TE 131M	3.0E-07	3.0E-06	0.8E-06	2.0E-05	4.4E-05	2.0E-06	1.3E-06	5.5E-05
TE 131	0.4E-10	4.0E-07	1.3E-07	4.1E-08	4.7E-09	5.0E-10	1.2E-09	9.0E-09
I 131	1.0E-06	4.1E-06	9.3E-07	8.9E-07	9.9E-07	6.0E-05	5.0E-06	8.0E-07
XE 131M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 132	1.7E-06	1.0E-05	4.2E-05	1.4E-04	3.2E-04	5.5E-05	1.1E-05	8.3E-04
I 132	3.7E-06	6.3E-05	4.4E-06	4.4E-06	4.5E-06	1.5E-05	1.5E-05	3.5E-06
I 133	6.7E-07	5.0E-06	6.9E-07	6.0E-07	7.0E-07	5.5E-06	4.2E-06	6.4E-07
XE 133M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CS 136	5.0E-13	3.7E-13	6.5E-13	6.1E-13	6.5E-13	2.9E-13	5.0E-13	5.0E-13
CS 137	2.5E-04	2.0E-04	2.9E-04	2.9E-04	2.9E-04	1.3E-04	2.1E-04	2.7E-04
BA 140	2.0E-06	3.9E-05	1.2E-04	5.4E-04	1.9E-03	3.9E-05	2.0E-05	8.0E-06
LA 140	1.5E-06	4.0E-05	1.1E-04	3.3E-04	6.2E-04	3.0E-06	1.0E-05	4.7E-06
CE 141	1.7E-07	2.0E-05	7.1E-05	3.7E-04	1.1E-03	2.9E-06	4.2E-06	9.5E-07
CE 143	3.5E-07	5.0E-05	1.2E-04	5.0E-04	1.1E-03	1.5E-06	4.0E-06	1.4E-06
PR 143	3.0E-11	2.1E-06	5.2E-06	3.0E-05	8.7E-05	6.4E-09	5.0E-09	3.0E-11
CE 144	0.0E+00	2.1E-05	7.2E-05	4.3E-04	1.3E-03	1.0E-06	1.2E-06	1.0E-07
PR 144M	5.5E-12	4.1E-08	1.5E-08	3.5E-09	1.9E-10	3.3E-12	6.9E-12	9.4E-13
PR 144	6.3E-10	8.2E-06	2.0E-06	3.7E-07	2.1E-08	3.1E-10	6.0E-10	1.4E-10
ND 147	1.4E-08	2.0E-06	5.3E-06	2.0E-05	6.0E-05	1.1E-07	2.0E-07	7.9E-08
PM 147	2.7E-14	1.3E-09	3.5E-09	1.9E-08	6.1E-08	4.9E-09	2.0E-10	3.5E-14
SM 147	3.7E-25	2.0E-22	4.9E-22	2.0E-21	9.0E-21	3.2E-19	2.0E-20	3.7E-25
PM 148	2.4E-08	1.9E-06	5.0E-06	2.4E-05	6.4E-05	7.0E-08	2.0E-07	8.0E-08
PM 149	2.7E-09	6.7E-06	1.0E-05	7.9E-05	1.9E-04	1.0E-08	3.0E-08	1.2E-08
SM 151	3.5E-15	1.0E-10	4.1E-10	2.4E-09	7.1E-09	2.4E-09	1.1E-10	3.5E-15
SM 153	2.0E-09	1.3E-06	3.1E-06	1.5E-05	3.1E-05	3.3E-08	1.1E-07	1.4E-08
EU 156	5.3E-08	1.3E-06	3.9E-06	1.4E-05	3.7E-05	1.9E-07	4.0E-07	1.9E-07
U 237	1.1E-08	1.4E-06	3.0E-06	1.7E-05	4.5E-05	1.0E-07	3.0E-07	6.1E-08
NP 237	1.2E-15	1.2E-13	3.0E-13	1.7E-12	5.2E-12	3.1E-09	2.5E-10	2.0E-11
PA 233	9.0E-18	7.0E-16	1.9E-16	8.7E-15	2.4E-14	2.3E-16	1.7E-16	5.1E-17
U 233	9.0E-25	1.0E-23	4.2E-23	2.5E-22	7.4E-22	6.0E-22	3.3E-23	9.0E-25
TH 229	3.7E-29	5.0E-29	9.1E-29	3.4E-28	1.0E-27	3.0E-25	3.1E-26	3.7E-29
RA 226	-5.4E-29	-5.7E-29	-6.0E-29	-2.1E-28	-9.3E-28	-4.5E-26	-2.0E-27	-5.4E-29
AC 226	-1.5E-30	-2.5E-28	-6.1E-28	-3.4E-27	-9.5E-27	-3.4E-27	-2.9E-28	-4.1E-29
NP 238	4.1E-08	1.0E-06	4.5E-06	1.7E-05	3.0E-05	8.5E-06	3.4E-07	1.3E-07

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GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, all pathway

Executed on: 10/26/89 at 11:50:55

Page C. 6

Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Radionuclide

Radionuclide	Ovaries	Muscle	Thyroid	Bladder	Kidneys	Liver	Spleen	S. Wall
TE 129	2.4E-08	9.2E-09	4.6E-10	7.9E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 129	3.0E-10	8.3E-10	6.7E-12	1.1E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 131M	4.0E-08	7.1E-07	2.1E-04	1.7E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 131	2.7E-09	9.0E-10	1.1E-08	2.4E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 131	9.1E-07	1.0E-06	5.7E-03	8.5E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 131M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 132	2.1E-05	3.0E-06	3.0E-03	2.0E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1 132	3.0E-06	3.0E-06	2.7E-04	2.1E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1 133	6.0E-07	7.3E-07	8.4E-04	9.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 133M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CS 136	5.0E-13	5.0E-13	5.0E-13	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CS 137	2.5E-04	2.3E-04	2.5E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
BA 140	6.9E-05	9.5E-06	1.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
LA 140	5.1E-05	6.5E-06	2.4E-07	0.0E+00	0.0E+00	6.2E-06	0.0E+00	0.0E+00
CE 141	1.4E-05	1.4E-06	2.2E-08	0.0E+00	0.0E+00	2.3E-06	2.2E-06	0.0E+00
CE 143	2.0E-05	2.1E-06	3.9E-08	0.0E+00	0.0E+00	2.0E-06	2.1E-06	0.0E+00
FR 143	3.0E-11	3.0E-11	3.9E-11	0.0E+00	9.9E-09	4.0E-08	0.0E+00	0.0E+00
CE 144	1.3E-06	2.0E-07	6.4E-08	0.0E+00	0.0E+00	1.2E-05	9.6E-06	0.0E+00
FR 144M	1.4E-11	6.6E-12	4.1E-13	0.0E+00	1.2E-11	7.5E-12	0.0E+00	0.0E+00
FR 144	1.5E-09	7.0E-10	7.4E-11	0.0E+00	1.5E-09	9.6E-10	0.0E+00	0.0E+00
ND 147	1.0E-06	1.1E-07	1.5E-09	0.0E+00	0.0E+00	1.1E-07	0.0E+00	0.0E+00
RM 147	1.0E-13	3.0E-14	2.5E-14	0.0E+00	0.0E+00	1.2E-09	0.0E+00	0.0E+00
SM 147	3.7E-25	3.7E-25	3.7E-25	0.0E+00	0.0E+00	9.0E-20	0.0E+00	0.0E+00
RM 148	9.6E-07	1.2E-07	3.0E-09	0.0E+00	0.0E+00	1.1E-07	0.0E+00	0.0E+00
RM 149	1.5E-07	1.0E-08	4.0E-10	0.0E+00	0.0E+00	3.0E-08	0.0E+00	0.0E+00
SM 161	1.5E-13	7.0E-15	3.0E-15	0.0E+00	0.0E+00	5.7E-10	0.0E+00	0.0E+00
SM 163	2.0E-07	2.7E-08	1.1E-10	0.0E+00	0.0E+00	2.3E-08	0.0E+00	0.0E+00
EU 168	1.9E-06	2.4E-07	8.5E-09	0.0E+00	2.9E-07	2.6E-07	0.0E+00	0.0E+00
U 237	9.7E-07	9.2E-08	1.2E-09	0.0E+00	1.5E-07	0.0E+00	0.0E+00	0.0E+00
NP 237	7.5E-15	1.0E-15	9.4E-16	0.0E+00	0.0E+00	1.4E-10	0.0E+00	0.0E+00
PA 233	6.1E-16	6.5E-17	1.2E-18	0.0E+00	8.2E-17	5.8E-17	0.0E+00	0.0E+00
U 233	1.0E-24	9.0E-25	9.0E-25	0.0E+00	2.8E-22	0.0E+00	0.0E+00	0.0E+00
TH 229	4.0E-29	3.7E-29	3.7E-29	0.0E+00	0.0E+00	6.0E-28	0.0E+00	0.0E+00
RA 226	-5.7E-29	-5.4E-29	-5.4E-29	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AC 226	-9.9E-30	-2.2E-30	-1.3E-30	0.0E+00	0.0E+00	-9.5E-28	0.0E+00	0.0E+00
NP 238	1.6E-06	2.0E-07	6.2E-09	0.0E+00	0.0E+00	1.9E-07	0.0E+00	0.0E+00

GENII Dose Calculation Program
 (Version **1.395** 28-Jan-89)

Case title: **acute release** of **1** pound of **fresh** fuel to river, **all** pathway

Executed on: 11/26/09 at **11:55:55**

Page C. 7

Acute relrare

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by **Radionuclide**

Radionuclide	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro	Tastes
-----	-----	-----	-----	-----	-----	-----	-----	-----
PU 238	8.7E-14	1.4E-10	3.5E-10	2.1E-09	6.2E-09	1.7E-07	1.4E-08	2.2E-09
U 240	1.5E-12	3.7E-10	8.2E-10	2.8E-09	3.9E-09	3.3E-10	1.0E-11	3.8E-12
PU 248	1.3E-12	2.1E-09	5.2E-09	3.0E-08	9.4E-08	3.1E-08	2.4E-07	3.9E-08
PU 241	1.0E-14	3.5E-10	8.9E-10	5.4E-09	1.5E-08	2.1E-08	1.6E-07	2.8E-08
AM 241	3.0E-15	4.1E-13	1.0E-12	6.0E-12	1.0E-11	5.8E-09	4.5E-10	7.3E-11
NP 239	5.0E-07	7.1E-05	1.8E-04	7.9E-04	1.8E-03	5.8E-06	9.5E-06	2.2E-06
PU 239	8.9E-12	1.4E-08	3.6E-08	2.0E-07	6.3E-07	2.2E-05	1.7E-06	2.7E-07
-----	-----	-----	-----	-----	-----	-----	-----	-----
Total	2.7E-04	6.8E-04	1.3E-03	4.5E-03	1.1E-02	6.4E-04	4.5E-04	1.4E-02

GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, all pathway

Executed on: 11/26/89 at 11:50:55 Page C. 8

Acute release
Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Committed Dose Equivalent by Radionuclide

Radionuclide	Ovaries	Muscle	Thyroid	Bladder	Kidneys	Liver	Spleen	S. Wall
RU 238	4.2E-13	9.7E-14	8.7E-14	0.0E+00	0.0E+00	3.2E-08	0.0E+00	0.0E+00
U 241	5.1E-11	0.2E-12	2.3E-13	0.0E+00	1.1E-11	0.0E+00	0.0E+00	0.0E+00
RU 240	0.6E-12	1.6E-12	1.3E-12	0.0E+00	0.0E+00	5.6E-07	0.0E+00	0.0E+00
RU 241	1.7E-13	2.2E-14	4.2E-15	0.0E+00	0.0E+00	3.2E-07	0.0E+00	0.0E+00
AM 241	2.0E-14	4.1E-15	2.0E-15	0.0E+00	0.0E+00	1.0E-09	0.0E+00	0.0E+00
NP 239	3.4E-05	3.4E-06	4.2E-06	0.0E+00	0.0E+00	3.0E-06	0.0E+00	0.0E+00
RU 239	2.4E-11	9.4E-12	8.9E-12	0.0E+00	0.0E+00	3.7E-06	0.0E+00	0.0E+00
Total	5.6E-04	2.8E-04	1.1E-02	3.0E-04	2.3E-05	5.4E-05	1.6E-05	6.1E-07

 OENII Dose Calculation Program
 (Version 1.396 28-Jan-89)

Case title: **acute** release of **1** pound of fresh **fuel** to river, **all** pathway

Executed on: ⁸**10/26/89** at **11:50:55**

Page C. 9

Acute release
 Uptake/exposure period: **1.0**
 Dose commitment period: **50.0**
 Dose units: **Rem**

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
CO 60	1.0E-08	3.5E-18	1.4E-08	3.3E-08	4.7E-08
BR 82	1.0E-08	1.1E-08	3.3E-08	1.1E-08	4.3E-08
SR 89	1.0E-08	2.1E-05	6.5E-08	2.1E-05	2.1E-05
SR 90	1.0E-08	2.3E-06	3.0E-11	2.3E-06	2.3E-06
Y 90	1.0E-08	1.4E-07	1.3E-09	1.4E-07	1.5E-07
SR 91	1.0E-08	1.4E-06	6.5E-06	1.4E-06	7.9E-06
Y 91M	1.0E-08	1.5E-08	4.3E-06	1.5E-08	4.4E-06
Y 91	1.0E-08	1.6E-05	1.6E-07	1.6E-05	1.6E-05
Y 92	1.0E-08	6.6E-06	1.0E-06	1.0E-06	1.0E-06
Y 93	1.0E-08	2.8E-06	1.3E-06	2.8E-06	4.1E-06
YO 93	1.0E-08	1.0E-06	6.6E-06	1.0E-06	1.0E-06
ZR 93	6.6E-06	1.7E-14	1.3E-20	1.7E-14	1.7E-14
NB 93Y	1.0E-08	7.5E-19	6.2E-22	7.5E-19	7.5E-19
ZR 96	1.0E-08	3.5E-05	2.1E-05	3.5E-05	5.7E-05
NB 95M	1.0E-08	9.9E-08	1.2E-08	9.9E-08	1.1E-17
NB 95	1.0E-08	5.6E-06	9.1E-06	5.6E-06	1.5E-05
ZR 97	1.0E-08	4.5E-05	4.8E-06	4.5E-05	6.0E-05
NB 97M	1.0E-08	2.0E-08	1.7E-05	2.0E-08	1.7E-05
NB 97	1.0E-08	1.4E-06	1.9E-05	1.4E-06	2.0E-05
YO 99	1.0E-08	6.9E-06	8.1E-06	6.9E-06	1.5E-05
TC 99M	1.0E-08	1.9E-07	4.9E-06	1.9E-07	5.1E-06
TC 99	1.0E-08	1.0E-13	2.3E-17	1.0E-13	1.0E-13
RJ 103	1.0E-08	1.4E-05	1.4E-05	1.4E-05	2.9E-05
PD 103	1.0E-08	6.6E-06	1.0E-06	6.6E-06	6.6E-06
RH 103M	1.0E-08	5.9E-08	2.1E-08	5.9E-08	8.0E-08
RJ 106	6.6E-06	6.6E-06	3.1E-07	6.6E-06	6.3E-06
PD 109	1.0E-08	2.9E-07	1.1E-08	2.9E-07	3.1E-17
AO 111	1.0E-08	1.3E-06	4.5E-08	1.3E-06	1.4E-06
OD 116	1.0E-08	1.6E-06	1.4E-07	1.6E-06	1.2E-06
IN 116M	1.0E-08	7.6E-08	1.2E-07	7.6E-08	2.0E-07
SN 121	1.0E-08	4.6E-07	1.0E-06	4.6E-07	4.6E-07
SN 126	1.0E-08	9.1E-06	1.4E-07	9.1E-06	9.2E-06
SB 125	1.0E-08	1.6E-09	1.9E-10	1.6E-09	1.8E-09
TE 125M	1.0E-08	3.6E-12	7.3E-15	3.6E-12	3.6E-12
SB 127	1.0E-08	6.9E-06	2.2E-06	6.9E-06	9.2E-06
TE 127M	1.0E-08	1.9E-08	1.7E-11	1.9E-08	1.9E-08
TE 127	1.0E-08	7.4E-07	1.9E-08	7.4E-07	7.6E-07

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GENII Dora Calculation Program
(Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, all pathway

Executed on: 18/26/89 at 11:50:55

Page C. 10

Acute release
 Uptake/exposure period: 1.1
 Dora commitment period: 50.0
 Dora units: Ram

Radio- nuclida	Inhalation Effectiva Dose Equivalent	Ingestion Effectiva Dose Equivalent	External Dose Dora	Internal Effectiva Dose Equivalent	Annual Effective Dose Equivalent
TE 129M	1.0E-08	3.3E-03	3.0E-07	3.3E-03	3.3E-03
TE 129	1.0E-08	1.0E-06	3.9E-07	1.0E-06	1.4E-06
I 129	1.0E-08	2.0E-13	1.2E-17	2.0E-13	2.0E-13
TE 131Y	1.0E-08	2.5E-05	4.0E-06	2.5E-05	2.9E-05
TE 131	1.0E-08	7.0E-08	2.7E-07	7.0E-08	3.4E-07
I 131	1.0E-08	1.0E-04	1.3E-05	1.0E-04	1.9E-04
XE 131Y	1.0E-08	1.0E-08	2.9E-09	1.0E-08	2.9E-09
TE 132	1.0E-08	3.7E-04	9.7E-06	3.7E-04	3.8E-04
I 132	1.0E-08	1.0E-05	1.1E-04	1.0E-05	1.2E-04
I 133	1.0E-08	2.7E-05	2.3E-05	2.7E-05	5.0E-05
XE 133Y	1.0E-08	1.0E-08	6.2E-08	1.0E-08	6.2E-08
XE 133	1.0E-08	1.0E-08	1.9E-06	1.0E-08	1.9E-06
XE 136	1.0E-08	1.0E-08	5.1E-07	1.0E-08	5.1E-07
CS 136	1.0E-08	5.3E-13	7.1E-20	5.3E-13	5.3E-13
CS 137	1.0E-08	2.3E-04	1.4E-07	2.3E-04	2.3E-04
BA 140	1.0E-08	1.0E-04	1.3E-05	1.0E-04	1.9E-04
LA 141	1.0E-08	8.1E-05	1.5E-04	8.1E-05	2.3E-04
CE 141	1.0E-08	9.7E-05	2.3E-06	9.7E-05	9.9E-05
CE 143	1.0E-08	1.1E-04	9.5E-06	1.1E-04	1.2E-04
FR 143	1.0E-08	7.4E-06	2.0E-09	7.4E-06	7.4E-06
CE 144	1.0E-08	1.1E-04	9.2E-08	1.1E-04	1.1E-04
FR 144Y	1.0E-08	3.6E-09	5.0E-10	3.6E-09	4.2E-09
FR 144	1.0E-08	6.3E-07	2.9E-07	6.3E-07	9.3E-07
ND 147	1.0E-08	6.4E-06	3.0E-06	6.4E-06	9.4E-06
PY 147	1.0E-08	5.4E-09	3.9E-13	5.4E-09	5.4E-09
SY 147	1.0E-08	1.9E-20	1.0E-00	1.9E-20	1.9E-20
PY 148	1.0E-08	6.0E-06	7.0E-07	6.0E-06	6.8E-06
PY 149	1.0E-08	1.0E-05	1.1E-07	1.0E-05	1.8E-05
SY 161	1.0E-08	7.2E-10	2.0E-14	7.2E-10	7.2E-10
SY 163	1.0E-08	3.1E-06	1.2E-07	3.1E-06	3.2E-06
EU 158	1.0E-08	3.9E-06	1.2E-06	3.9E-06	5.1E-06
U 237	1.0E-08	4.4E-06	1.6E-06	4.4E-06	6.0E-06
NP 237	1.0E-08	1.4E-10	1.9E-16	1.4E-10	1.4E-10
PA 233	1.0E-08	2.3E-15	3.0E-17	2.3E-15	2.4E-15
U 233	1.0E-08	1.1E-22	1.7E-28	1.1E-22	1.1E-22
TH 229	1.0E-08	1.5E-26	1.7E-30	1.5E-26	1.5E-26
RA 226	1.0E-08	-1.0E-27	-2.1E-31	-1.0E-27	-1.0E-27

GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, all pathway

Executed on: 11/26/89 at 11:50:55

Page C. 11

Acute release
 Uptake/exposure period: 1.1
 Dose commitment period: 61.1
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
AC 226	1.0E+00	-9.7E-28	-7.5E-31	-9.7E-28	-9.7E-28
NP 238	0.0E+00	4.4E-06	1.7E-07	4.4E-06	4.6E-06
PU 238	0.0E+00	9.8E-09	1.4E-15	9.8E-09	9.8E-09
U 241	0.0E+00	5.0E-10	5.8E-10	6.0E-10	1.1E-09
PU 241	0.0E+00	1.7E-07	1.9E-13	1.7E-07	1.7E-07
PU 241	0.0E+00	1.1E-17	1.6E-17	1.1E-17	1.1E-07
AM 241	0.0E+00	3.1E-10	2.0E-15	3.1E-10	3.1E-10
NP 239	0.0E+00	1.8E-04	2.5E-06	1.8E-04	1.8E-04
PU 239	0.0E+00	1.2E-06	8.6E-13	1.2E-06	1.2E-06

QENII Dora Calculation Program
(Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, drinking only

Executed on: 10/26/89 at 10:25:23

Page A. 1

This is a far-field (wide-scale release, multiple rite) scenario.
Release is acute
Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
Surface Water

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
Drinking water ingestion

THE FOLLOWING TIMES ARE USED:
Intake ends after (yr): 1.1
Dora calculations ends after (yr): 61.1

***** FILENAMES AND TITLES OF FILES/LIBRARIES USED *****

Input file name: \GENII\BANDIR\acutew.in 19-26-89
METABOLIC PARAMETERS----- 8-12-88
RMDLIB " Radionuclide Master Library (29-Aug-88 RAP) 8-29-88
Bioaccumulation Factor Library " (30-Aug-88) RAP 8-38-88
External Dora Factors for QENII in person Sv/yr par Bq/n (28-Aug-88 8-29-88
Internal Yearly Dora Increments (Sv/Bq) 29-Aug-88 RAP 8-29-88

-----Release Terms-----			
Release	Surface Buried		
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3
-----	-----	-----	-----
CO60	0.0E+00	4.6E+01	0.0E+00
BR82	0.0E+00	1.4E+02	0.0E+00
SR89	0.0E+00	1.7E+05	0.0E+00
SR90	0.0E+00	1.3E+03	0.0E+00
SR91	0.0E+00	4.1E+05	0.0E+00
Y 90	0.0E+00	1.3E+03	0.0E+00
Y 91M	0.0E+00	2.4E+05	0.0E+00
Y 91	0.0E+00	1.9E+05	0.0E+00
Y 92	0.0E+00	0.0E+00	0.0E+00
Y 93	0.0E+00	4.9E+05	0.0E+00
ZR95	0.0E+00	2.1E+05	0.0E+00
ZR97	0.0E+00	4.9E+05	0.0E+00
NB95M	0.0E+00	1.4E+03	0.0E+00
NB95	0.0E+00	8.2E+04	0.0E+00
NB97M	0.0E+00	4.7E+05	0.0E+00
NB97	0.0E+00	4.9E+05	0.0E+00
MO99	0.0E+00	5.1E+05	0.0E+00
TC99M	0.0E+00	4.6E+05	0.0E+00
RU103	0.0E+00	2.0E+05	0.0E+00
RU106	0.0E+00	9.1E+03	0.0E+00
RH103M	0.0E+00	1.8E+05	0.0E+00
PD109	0.0E+00	4.0E+04	0.0E+00
AQ111	0.0E+00	1.2E+04	0.0E+00
CD115	0.0E+00	6.2E+03	0.0E+00
IN115M	0.0E+00	6.2E+03	0.0E+00
SN121	0.0E+00	5.8E+03	0.0E+00
SN125	0.0E+00	3.9E+03	0.0E+00
SB127	0.0E+00	2.7E+04	0.0E+00
TE127	0.0E+00	2.6E+04	0.0E+00
TE129M	0.0E+00	7.2E+04	0.0E+00
TE129	0.0E+00	8.0E+04	0.0E+00

TE131M	0.0E+00	3.7E+04	0.0E+00
TE131	0.0E+00	2.4E+05	0.0E+00
TE132	0.0E+00	3.9E+05	0.0E+00
I 131	0.0E+00	2.6E+05	0.0E+00
I 132	0.0E+00	3.9E+05	0.0E+00
I 133	0.0E+00	5.8E+05	0.0E+00
XE131M	0.0E+00	2.5E+03	0.0E+00
XE133M	0.0E+00	1.6E+04	0.0E+00
XE133	0.0E+00	5.4E+05	0.0E+00
XE135	0.0E+00	9.7E+04	0.0E+00
CS137	0.0E+00	1.6E+03	0.0E+00
BA140	0.0E+00	4.7E+05	0.0E+00
LA140	0.0E+00	4.7E+05	0.0E+00
CE141	0.0E+00	3.1E+05	0.0E+00
CE143	0.0E+00	4.6E+05	0.0E+00
CE144	0.0E+00	4.8E+04	0.0E+00
ND147	0.0E+00	1.8E+05	0.0E+00
PW148	0.0E+00	9.8E+03	0.0E+00
PW149	0.0E+00	1.0E+05	0.0E+00
SW151	0.0E+00	2.8E+01	0.0E+00
SW153	0.0E+00	2.6E+04	0.0E+00
EU156	0.0E+00	6.9E+03	0.0E+00
U 237	0.0E+00	1.1E+05	0.0E+00
U 240	0.0E+00	3.5E+01	0.0E+00
NP238	0.0E+00	3.3E+03	0.0E+00
NP239	0.0E+00	1.6E+05	0.0E+00
PU239	0.0E+00	5.6E+01	0.0E+00
PU240	0.0E+00	8.3E+00	0.0E+00
PU241	0.0E+00	2.9E+02	0.0E+00

===== SURFACE WATER TRANSPORT =====

■ Mixing ratio model: 1-use value, 1-river, 2-lake, 3-river flow
 2.4E+01 Transit time to irrigation withdrawal location (h)
 3.0E+03 Average water flow rate for: MIXFLG=1,2 (m/s), MIXFLG=0,3 (m3/s)
 5.0E-04 Mixing ratio, dimensionless

=====-===== DRINKING WATER SOURCE/IRRIGATION =====

7.3E+02 Drinking water consumption rate (l/yr)
 2 Drinking water source: 1-ground, 2-surface, 3-system
 F Drinking water treatment: T/F
 1.8 Drinking water transit/holdup time (d)

=====

GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: acute release of .1 pound of fresh fuel to river, drinking only

Executed on: 11/26/89 at 10:46:12

Page C. 1

Acute release
 Uptake/exposure period: 1.1
 Dose commitment period: 61.1
 Dose units: Rem

Organ	Committed Dose Equivalent	Weighting Factor	Weighted Dose Equivalent
Gonads	6.2E-04	2.5E-01	1.5E-04
Breast	6.6E-06	1.5E-01	9.8E-07
R Marrow	2.9E-05	1.2E-01	3.5E-06
Lung	4.8E-06	1.2E-01	4.7E-07
Thyroid	2.8E-03	3.1E-12	6.1E-05
Bone Sur	5.9E-05	3.8E-02	1.8E-06
LL Int.	8.2E-04	6.8E-02	4.9E-05
UL Int.	3.3E-04	6.8E-02	2.8E-05
S Int.	8.6E-05	6.1E-12	5.2E-06
Stomach	4.4E-05	6.8E-02	2.6E-06
Bladder	1.9E-05	6.8E-02	1.2E-06
.....			
Internal Effective Dose Equivalent			3.8E-04
External Dose			9.8E-06
.....			
Annual Effective Dose Equivalent			3.8E-04

.....
 Controlling Organ: Thyroid
 Controlling Pathway: Ing
 Controlling Radionuclide: TE129M

 Total Inhalation EDE: 8.8E-06
 Total Ingestion EDE: 3.8E-04

GENII Dose Calculation Program
(Version 1.396 28-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, drinking only

Executed on: 11/26/89 at 10:46:12

Page C. 3

Acute release

Uptake/exposure period:

1.1

Dose commitment period:

61.1

Dose units:

Ran

Committed Dose Equivalent by Radionuclide

Radionuclide	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro	Tester
CO 61	5.4E-10	9.4E-10	2.2E-09	3.5E-09	7.3E-09	5.1E-10	7.8E-10	7.1E-10
BR 82	5.2E-10	1.0E-09	6.8E-10	6.4E-10	6.7E-10	1.9E-10	4.8E-10	6.3E-10
SR 89	2.9E-07	1.8E-06	2.9E-06	1.8E-06	5.1E-06	1.2E-06	7.2E-06	2.9E-07
SR 91	3.5E-09	5.9E-09	1.1E-08	7.8E-08	3.3E-07	7.0E-08	3.1E-08	3.5E-09
Y 90	2.4E-13	2.0E-08	4.8E-08	2.4E-07	5.9E-07	7.4E-12	7.2E-12	2.4E-13
SR 91	2.8E-08	8.3E-07	1.3E-06	3.7E-06	3.9E-06	7.5E-08	1.0E-07	3.5E-08
Y 91M	8.2E-10	3.1E-08	2.0E-08	2.0E-08	1.5E-08	5.7E-10	1.4E-09	2.1E-10
Y 91	5.4E-10	1.9E-08	4.6E-08	2.7E-08	8.1E-08	1.7E-08	1.8E-08	1.1E-09
Y 92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 93	1.2E-09	1.7E-06	3.5E-06	1.1E-05	1.3E-05	2.4E-09	6.8E-09	2.4E-09
YO 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ZR 93	2.1E-19	1.0E-16	2.4E-16	1.5E-15	4.4E-15	4.0E-14	3.2E-15	2.0E-19
NB 93M	6.6E-22	1.2E-20	3.1E-20	1.7E-19	5.2E-19	2.0E-20	7.4E-21	6.3E-22
ZR 95	6.8E-08	1.1E-06	3.3E-06	9.2E-06	2.3E-05	1.5E-06	6.2E-07	2.4E-07
NB 95M	5.8E-11	4.6E-09	1.1E-08	5.4E-08	1.4E-07	8.7E-10	6.8E-10	1.7E-10
NB 96	3.4E-08	3.4E-07	1.1E-06	2.2E-06	4.9E-06	3.7E-07	2.4E-07	1.8E-07
ZR 97	4.7E-08	3.2E-06	8.9E-06	3.2E-05	4.7E-05	1.2E-07	3.4E-07	1.4E-07
NB 97M	2.2E-10	1.0E-08	1.1E-08	8.2E-09	1.8E-09	1.1E-10	2.4E-10	3.7E-11
NB 97	5.6E-09	1.1E-08	8.7E-07	6.7E-07	1.5E-07	4.5E-09	1.2E-08	2.3E-09
YO 99	1.1E-06	3.3E-06	2.2E-06	7.8E-06	1.7E-05	5.2E-06	3.3E-06	9.4E-07
TC 99M	1.9E-08	4.1E-07	1.3E-07	2.1E-07	1.5E-07	1.0E-08	3.6E-08	1.3E-08
TC 99	3.7E-15	2.0E-13	5.7E-15	2.2E-14	6.5E-14	1.8E-15	3.6E-15	3.7E-15
RJ 103	2.1E-07	8.4E-07	2.3E-06	7.0E-06	1.8E-05	2.2E-07	4.5E-07	3.7E-07
FD 113	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	1.5E-11	7.3E-08	4.8E-08	2.8E-08	4.5E-09	1.1E-11	3.1E-11	9.8E-12
RJ 106	1.8E-07	3.2E-07	6.3E-07	3.1E-06	9.2E-06	6.3E-08	1.8E-07	1.8E-07
FD 119	3.7E-11	9.5E-08	2.0E-07	7.2E-07	9.5E-07	2.2E-10	6.5E-10	6.0E-11
AG 111	1.4E-09	6.5E-08	1.5E-07	8.4E-07	2.3E-06	1.1E-09	2.3E-09	1.8E-09
OD 116	1.1E-09	3.1E-08	8.7E-08	4.2E-07	1.0E-06	2.0E-09	5.0E-09	2.4E-09
IN 115M	7.0E-11	1.4E-08	2.2E-08	4.1E-08	2.5E-08	1.4E-10	4.0E-10	8.4E-11
SN 121	8.9E-12	5.8E-09	1.2E-08	5.8E-08	1.1E-07	8.9E-11	3.8E-11	9.3E-12
SN 126	8.3E-10	5.2E-08	1.2E-07	6.7E-07	1.9E-06	1.2E-08	1.1E-08	1.8E-09
SB 125	4.8E-13	9.2E-12	2.8E-11	8.0E-11	2.3E-10	3.8E-12	4.4E-12	1.9E-12
TE 125M	2.3E-15	8.8E-15	1.9E-14	8.8E-14	2.4E-13	6.8E-13	6.3E-14	2.0E-15
SB 127	5.2E-09	1.8E-07	5.2E-07	2.3E-06	6.4E-06	1.7E-08	4.2E-08	1.9E-08
TE 127M	3.6E-11	6.3E-11	1.4E-10	1.1E-09	4.1E-09	7.8E-09	2.0E-09	3.5E-11
TE 127	8.9E-10	7.1E-08	1.2E-07	3.8E-07	3.8E-07	2.4E-09	2.7E-09	8.9E-10
TE 129M	1.6E-07	5.5E-07	1.4E-06	8.0E-06	2.4E-05	8.1E-06	3.5E-06	5.7E-04

GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, drinking only

Executed on: 10/26/89 at 10:46:12

Page C. 4

Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Radionuclide

Radionuclide	Ovaries	Muscle	Thyroid	Bladder	Kidneys	Liver	Spleen	S Wall
-----	-----	-----	-----	-----	-----	-----	-----	-----
CO 60	1.9E-09	7.6E-10	5.1E-10	0.0E+00	0.0E+00	1.5E-09	0.0E+00	0.0E+00
BR 82	5.4E-10	5.2E-10	5.2E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SR 89	2.9E-07	2.9E-07	2.9E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SR 90	3.5E-09	3.3E-09	3.5E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 90	2.8E-13	2.4E-13	2.4E-13	0.0E+00	0.0E+00	7.0E-12	0.0E+00	0.0E+00
SR 91	2.1E-07	4.7E-08	2.1E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 91M	4.6E-09	1.2E-09	7.5E-11	0.0E+00	0.0E+00	1.6E-09	0.0E+00	0.0E+00
Y 91	9.5E-09	1.5E-09	3.5E-10	0.0E+00	0.0E+00	1.6E-08	0.0E+00	0.0E+00
Y 92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 93	3.1E-08	4.3E-09	1.7E-10	0.0E+00	0.0E+00	4.8E-09	0.0E+00	0.0E+00
MO 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ZR 93	2.1E-19	2.0E-19	2.0E-19	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NB 93M	1.8E-21	7.0E-22	6.6E-22	0.0E+00	1.2E-20	0.0E+00	1.2E-20	0.0E+00
ZR 96	2.4E-06	3.3E-07	2.4E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NB 95M	1.9E-09	2.1E-10	3.3E-11	0.0E+00	3.7E-10	0.0E+00	3.1E-10	0.0E+00
NB 95	9.9E-07	1.3E-07	1.5E-08	0.0E+00	1.7E-07	0.0E+00	1.3E-07	0.0E+00
ZR 97	1.0E-06	2.1E-07	7.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NB 97M	5.9E-10	2.4E-10	2.1E-11	0.0E+00	5.2E-10	0.0E+00	1.1E-09	0.0E+00
NB 97	4.2E-08	9.6E-09	6.2E-10	0.0E+00	2.0E-08	0.0E+00	2.8E-08	0.0E+00
YO 99	1.2E-06	1.1E-06	9.4E-07	0.0E+00	1.4E-06	1.5E-06	0.0E+00	0.0E+00
TC 99M	5.5E-08	2.2E-08	4.8E-07	0.0E+00	1.3E-07	0.0E+00	0.0E+00	4.1E-07
TC 99	3.7E-15	3.7E-15	4.4E-13	0.0E+00	8.3E-14	0.0E+00	0.0E+00	2.0E-13
RU 103	1.0E-06	3.4E-07	1.8E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	1.2E-10	2.6E-11	1.0E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RU 106	2.1E-07	1.8E-07	1.7E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PD 109	2.7E-09	2.0E-10	2.0E-11	0.0E+00	1.4E-09	8.2E-10	0.0E+00	0.0E+00
AG 111	5.6E-09	1.7E-09	1.2E-09	0.0E+00	0.0E+00	1.5E-07	0.0E+00	0.0E+00
CD 115	2.1E-08	3.0E-09	6.5E-10	0.0E+00	6.5E-08	1.4E-08	0.0E+00	0.0E+00
IN 115M	1.5E-09	2.2E-10	1.1E-11	0.0E+00	4.3E-10	3.0E-10	3.7E-10	0.0E+00
SN 121	8.9E-12	9.3E-12	9.3E-12	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SN 126	1.5E-08	2.3E-09	5.1E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SB 126	1.9E-11	2.3E-12	2.0E-13	0.0E+00	0.0E+00	2.3E-12	0.0E+00	0.0E+00
TE 125M	6.7E-15	2.4E-15	2.1E-15	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SB 127	2.0E-07	2.5E-08	1.4E-09	0.0E+00	0.0E+00	2.4E-08	0.0E+00	0.0E+00
TE 127M	4.8E-11	3.7E-11	3.6E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 127	1.2E-09	9.2E-10	8.9E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 129M	2.4E-07	1.8E-07	1.6E-08	1.4E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00
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GENII Door Calculation Program
(Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh furl to river, drinking only

Executed on: 11/26/89 at 10:46:12

Page C. 6

 Acutr release
 Uptake/exposure period: 1.0
 Dose comitaent period: 50.0
 Dose unitr: Rem

Committed Dose Equivalrnt by Radionuclide

Radionuclide	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro	Testes

TE 129	3.3E-10	2.5E-07	1.8E-07	1.2E-07	2.5E-08	5.1E-10	6.9E-10	3.7E-08
I 129	1.8E-17	2.0E-17	1.6E-17	1.5E-17	1.6E-17	1.4E-16	7.2E-17	1.4E-17
TE 131M	1.6E-08	2.0E-07	4.9E-07	1.4E-06	2.5E-06	1.1E-07	7.3E-08	3.0E-06
TE 131	4.6E-11	2.2E-08	7.3E-09	2.3E-09	2.6E-10	3.2E-11	6.7E-11	4.9E-10
I 131	4.1E-07	1.1E-06	2.4E-07	2.3E-07	2.6E-07	1.3E-06	1.5E-06	2.1E-07
XE 131M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 132	8.0E-08	8.4E-07	2.0E-06	6.7E-06	1.5E-05	2.6E-06	5.3E-07	4.0E-05
I 132	1.8E-07	3.1E-06	2.2E-07	2.2E-07	2.2E-07	7.2E-07	7.2E-07	1.7E-07
I 133	2.4E-07	2.1E-06	2.5E-07	2.4E-07	2.7E-07	2.0E-06	1.5E-06	2.3E-07
XE 133M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CS 136	9.8E-16	6.3E-16	1.1E-15	1.0E-15	1.1E-15	4.9E-16	9.8E-16	9.8E-16
CS 137	3.0E-07	2.5E-07	3.6E-07	3.5E-07	3.5E-07	1.6E-07	2.5E-07	3.3E-07
BA 140	2.4E-07	3.4E-06	1.0E-05	4.7E-05	1.6E-04	3.3E-06	2.4E-06	6.9E-07
LA 140	2.7E-07	7.3E-06	2.0E-05	6.1E-05	1.1E-04	6.6E-07	1.9E-06	8.7E-07
CE 141	6.2E-09	1.0E-06	2.6E-06	1.3E-05	3.9E-05	1.1E-07	1.5E-07	4.4E-08
CE 143	1.6E-08	2.3E-06	5.7E-06	2.3E-05	4.9E-05	6.9E-08	2.1E-07	6.5E-08
PR 143	1.7E-12	9.2E-08	2.3E-07	1.3E-06	3.8E-06	2.8E-10	2.6E-10	1.7E-12
CE 144	3.0E-09	7.3E-07	2.5E-06	1.5E-05	4.5E-05	5.5E-08	4.2E-08	5.5E-09
PR 144M	1.9E-13	1.4E-09	5.3E-10	1.2E-10	6.7E-12	1.2E-13	2.4E-13	3.3E-14
PR 144	2.1E-11	2.8E-07	6.7E-08	1.3E-08	7.3E-10	1.1E-11	2.3E-11	4.7E-12
ND 147	5.8E-09	8.7E-07	2.3E-06	1.1E-05	2.9E-05	4.8E-08	1.2E-07	3.4E-08
PM 147	2.5E-15	1.3E-10	3.3E-10	1.8E-09	5.8E-09	4.6E-10	1.9E-11	3.3E-15
SM 147	1.6E-26	8.5E-24	2.1E-23	1.2E-22	3.9E-22	1.4E-26	1.1E-21	1.6E-26
PM 148	1.5E-09	1.2E-07	3.1E-07	1.5E-06	3.9E-06	4.3E-09	1.2E-08	5.3E-09
PM 149	1.8E-10	4.4E-07	1.0E-06	5.2E-06	1.2E-05	1.0E-09	2.4E-09	7.9E-10
SM 151	2.0E-16	9.4E-12	2.4E-11	1.4E-10	4.1E-10	1.4E-10	6.3E-12	2.0E-16
SM 153	1.9E-10	8.5E-08	2.1E-07	9.8E-07	2.1E-06	2.2E-09	7.3E-09	9.6E-10
EU 156	3.1E-09	7.4E-08	2.2E-07	7.8E-07	2.1E-06	1.1E-08	2.3E-08	1.1E-08
U 237	3.1E-09	3.9E-07	1.0E-06	4.8E-06	1.3E-05	4.9E-08	8.2E-08	1.7E-08
NP 237	1.6E-17	1.6E-15	4.1E-15	2.3E-14	7.1E-14	4.3E-11	3.4E-12	2.8E-13
PA 233	6.3E-26	4.9E-18	1.4E-17	6.1E-17	1.7E-16	1.6E-18	1.2E-18	3.8E-19
U 233	4.6E-27	8.4E-26	2.0E-25	1.2E-24	3.5E-24	3.2E-24	1.5E-26	4.6E-27
TH 229	6.6E-30	1.0E-29	1.8E-29	6.0E-29	1.8E-28	6.7E-26	5.4E-27	6.6E-30
RA 226	-5.1E-31	-5.4E-31	-6.3E-31	-2.0E-30	-8.8E-30	-4.3E-28	-2.7E-29	-5.1E-31
AC 226	-1.1E-31	-1.9E-29	-4.7E-29	-2.6E-28	-7.4E-28	-2.6E-28	-2.2E-29	-3.2E-30
NP 238	3.4E-10	1.5E-08	3.7E-08	1.4E-07	3.2E-07	7.1E-08	2.8E-09	1.1E-09

 GENII Dose Calculation Program
 (Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, drinking only

Executed on: 11/26/89 at 10:46:12

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Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rcm

Committed Dose Equivalent by Radionuclide

Radionuclide	Ovaries	Muscle	Thyroid	Bladder	Kidneys	Liver	Spleen	S. Yall
TE 129	1.1E-09	4.0E-10	2.0E-10	3.5E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00
■ 129	1.5E-17	3.5E-17	2.0E-13	4.7E-17	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 131Y	2.2E-07	3.9E-08	1.2E-05	9.4E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 131	1.5E-10	5.3E-11	6.0E-08	1.3E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00
■ 131	2.4E-07	4.8E-07	1.5E-03	2.2E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 131Y	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 132	1.0E-06	1.7E-07	1.0E-04	1.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
■ 132	1.9E-07	1.9E-07	1.3E-05	1.1E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1 133	2.4E-07	2.8E-07	3.0E-04	3.2E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 133Y	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CS 136	9.0E-16	9.0E-16	9.0E-16	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CS 137	3.0E-07	2.8E-07	3.0E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
BA 140	6.9E-06	8.2E-07	1.0E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
LA 140	9.3E-06	1.2E-06	4.3E-08	0.0E+00	0.0E+00	1.1E-06	0.0E+00	0.0E+00
CE 141	4.9E-07	4.9E-08	8.0E-10	0.0E+00	0.0E+00	8.4E-08	8.0E-08	0.0E+00
CE 143	9.0E-07	9.0E-08	1.0E-09	0.0E+00	0.0E+00	9.0E-08	9.4E-08	0.0E+00
FR 143	1.7E-12	1.7E-12	1.7E-12	0.0E+00	4.3E-10	2.1E-09	0.0E+00	0.0E+00
CE 144	4.5E-08	6.7E-09	2.2E-09	0.0E+00	0.0E+00	3.9E-07	3.3E-07	0.0E+00
FR 144Y	5.0E-13	2.3E-13	1.4E-14	0.0E+00	4.2E-13	2.6E-13	0.0E+00	0.0E+00
FR 144	5.2E-11	2.4E-11	2.5E-11	0.0E+00	5.0E-11	3.3E-11	0.0E+00	0.0E+00
ND 147	4.3E-07	4.0E-08	6.5E-10	0.0E+00	0.0E+00	4.0E-08	0.0E+00	0.0E+00
PY 147	1.5E-14	3.0E-15	2.4E-15	0.0E+00	0.0E+00	1.1E-10	0.0E+00	0.0E+00
SY 147	1.0E-26	1.0E-26	1.0E-26	0.0E+00	0.0E+00	3.9E-21	0.0E+00	0.0E+00
PM 148	6.9E-08	7.4E-09	2.3E-10	0.0E+00	0.0E+00	6.8E-09	0.0E+00	0.0E+00
PY 149	9.0E-09	1.0E-09	2.0E-11	0.0E+00	0.0E+00	2.0E-09	0.0E+00	0.0E+00
SY 161	8.5E-15	4.5E-16	1.8E-16	0.0E+00	0.0E+00	3.3E-11	0.0E+00	0.0E+00
SM 163	1.9E-08	1.0E-09	7.5E-11	0.0E+00	0.0E+00	1.5E-09	0.0E+00	0.0E+00
EU 166	1.1E-07	1.4E-08	4.9E-10	0.0E+00	1.7E-08	1.5E-08	0.0E+00	0.0E+00
U 237	2.7E-07	2.5E-08	3.2E-10	0.0E+00	4.2E-08	0.0E+00	0.0E+00	0.0E+00
NP 237	1.0E-16	2.1E-17	1.3E-17	0.0E+00	0.0E+00	1.0E-12	0.0E+00	0.0E+00
PA 233	4.3E-18	4.0E-19	8.5E-21	0.0E+00	5.0E-19	4.1E-19	0.0E+00	0.0E+00
U 233	4.0E-27	4.0E-27	4.0E-27	0.0E+00	1.3E-24	0.0E+00	0.0E+00	0.0E+00
TH 229	7.1E-30	6.0E-30	6.0E-30	0.0E+00	0.0E+00	1.1E-28	0.0E+00	0.0E+00
RA 226	-5.4E-31	-5.1E-31	-5.1E-31	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AC 226	-7.0E-31	-1.7E-31	-1.0E-31	0.0E+00	0.0E+00	-7.4E-29	0.0E+00	0.0E+00
NP 238	1.3E-08	1.0E-09	5.1E-11	0.0E+00	0.0E+00	1.0E-09	0.0E+00	0.0E+00

GENII Dora Calculation Program
 (Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh furl to river, drinking only

Exrcutad on: 10/26/89 at 10:46:12

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Acute release

Uptake/exposure period:

1.1

Dora commitment prriod:

61.1

Dora unitr:

Ran

Committad Dora **Equivalent** by Radionuclide

Radionuclide	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro	Testes
-----	-----	-----	-----	-----	-----	-----	-----	-----
PU 238	7.1E-10	1.2E-12	2.8E-12	1.7E-11	5.1E-11	1.4E-09	1.1E-10	1.8E-11
U 240	6.1E-13	1.5E-10	3.3E-10	1.1E-09	1.6E-09	1.3E-10	4.2E-12	1.5E-12
PU 240	8.9E-14	1.4E-10	3.6E-10	2.8E-09	6.4E-09	2.1E-07	1.6E-08	2.6E-09
PU 241	8.9E-10	2.4E-11	6.1E-11	3.7E-10	1.1E-09	1.4E-07	1.1E-08	1.9E-09
AM 241	1.7E-10	2.4E-14	8.0E-14	3.4E-13	1.1E-12	3.3E-10	2.6E-11	4.2E-12
NP 239	4.3E-09	6.0E-07	1.5E-06	6.6E-06	1.5E-05	4.9E-08	8.0E-08	1.9E-08
PU 239	6.1E-13	9.8E-10	2.4E-09	1.4E-08	4.3E-08	1.5E-06	1.1E-07	1.8E-08
-----	-----	-----	-----	-----	-----	-----	-----	-----
Totl-	4.0E-06	4.4E-05	8.6E-05	3.3E-04	8.2E-04	5.9E-05	2.9E-05	6.2E-04

GENII Dora Calculation Program
(Version 1.396 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, drinking only

Executed on: 10/26/89 at 10:40:12

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Acute release

Uptake/exposure period:

1.8

Dora commitment period:

50.0

Dora units:

Rem

Committed Dora Equivalent by Radionuclida

Radionuclida	Ovaries	Muscle	Thyroid	Bladder	Kidneys	Liver	Spleen	S Wall
-----	-----	-----	-----	-----	-----	-----	-----	-----
PU 238	3.5E-15	0.0E-10	7.1E-10	0.0E+00	0.0E+00	2.6E-10	0.0E+00	0.0E+00
U 240	2.0E-11	2.5E-12	9.2E-14	0.0E+00	4.4E-12	0.0E+00	0.0E+00	0.0E+00
PU 241	4.4E-13	9.9E-14	0.9E-14	0.0E+00	0.0E+00	3.7E-08	0.0E+00	0.0E+00
PU 241	1.1E-14	1.5E-15	2.9E-10	0.0E+00	0.0E+00	2.2E-08	0.0E+00	0.0E+00
AM 241	1.1E-15	2.4E-10	1.5E-10	0.0E+00	0.0E+00	5.9E-11	0.0E+00	0.0E+00
NP 239	2.9E-07	2.9E-08	3.0E-10	0.0E+00	0.0E+00	2.0E-08	0.0E+00	0.0E+00
PU 239	1.0E-12	0.4E-13	0.1E-13	0.0E+00	0.0E+00	2.0E-07	0.0E+00	0.0E+00
-----	-----	-----	-----	-----	-----	-----	-----	-----
Total	2.9E-05	0.0E-06	2.0E-03	1.0E-05	1.4E-05	1.7E-05	0.0E-07	4.1E-07

GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, drinking only

Executed on: 10/26/89 at 10:46:12

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Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
CD 80	0.0E+00	1.7E-09	0.0E+00	1.7E-09	1.7E-09
BR 82	0.0E+00	5.6E-10	0.0E+00	5.6E-10	5.6E-10
SR 89	0.0E+00	5.7E-08	0.0E+00	5.7E-08	5.7E-08
SR 90	0.0E+00	6.1E-07	0.0E+00	6.1E-07	6.1E-07
Y 90	0.0E+00	5.4E-08	0.0E+00	5.4E-08	5.4E-08
SR 91	0.0E+00	6.6E-07	0.0E+00	6.6E-07	6.6E-07
Y 91M	0.0E+00	6.9E-09	0.0E+00	6.9E-09	6.9E-09
Y 91	0.0E+00	6.9E-08	0.0E+00	6.9E-08	6.9E-08
Y 92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y 93	0.0E+00	1.7E-08	0.0E+00	1.7E-08	1.7E-08
MO 93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ZR 93	0.0E+00	2.0E-15	0.0E+00	2.0E-15	2.0E-15
NB 93M	0.0E+00	4.7E-20	0.0E+00	4.7E-20	4.7E-20
ZR 95	0.0E+00	3.0E-08	0.0E+00	3.0E-08	3.0E-08
NB 95M	0.0E+00	1.3E-08	0.0E+00	1.3E-08	1.3E-08
NB 95	0.0E+00	8.4E-07	0.0E+00	8.4E-07	8.4E-07
ZR 97	0.0E+00	5.9E-08	0.0E+00	5.9E-08	5.9E-08
NB 97M	0.0E+00	2.6E-09	0.0E+00	2.6E-09	2.6E-09
NB 97	0.0E+00	1.8E-07	0.0E+00	1.8E-07	1.8E-07
MO 99	0.0E+00	4.6E-08	0.0E+00	4.6E-08	4.6E-08
TC 99M	0.0E+00	1.2E-07	0.0E+00	1.2E-07	1.2E-07
TC 99	0.0E+00	5.0E-14	0.0E+00	5.0E-14	5.0E-14
RU 103	0.0E+00	2.2E-06	0.0E+00	2.2E-06	2.2E-06
PD 103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RH 103M	0.0E+00	9.2E-09	0.0E+00	9.2E-09	9.2E-09
RU 106	0.0E+00	9.3E-07	0.0E+00	9.3E-07	9.3E-07
PD 109	0.0E+00	1.2E-07	0.0E+00	1.2E-07	1.2E-07
AG 111	0.0E+00	2.1E-07	0.0E+00	2.1E-07	2.1E-07
CD 115	0.0E+00	1.0E-07	0.0E+00	1.0E-07	1.0E-07
IN 115M	0.0E+00	6.6E-09	0.0E+00	6.6E-09	6.6E-09
SN 121	0.0E+00	1.1E-08	0.0E+00	1.1E-08	1.1E-08
SN 125	0.0E+00	1.7E-07	0.0E+00	1.7E-07	1.7E-07
SB 125	0.0E+00	2.8E-11	0.0E+00	2.8E-11	2.8E-11
TE 125M	0.0E+00	5.2E-14	0.0E+00	5.2E-14	5.2E-14
SB 127	0.0E+00	6.3E-07	0.0E+00	6.3E-07	6.3E-07
TE 127M	0.0E+00	8.2E-10	0.0E+00	8.2E-10	8.2E-10
TE 127	0.0E+00	5.7E-08	0.0E+00	5.7E-08	5.7E-08

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, drinking only

Executed on: 10/26/89 at 10:46:12

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Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
TE 129M	0.0E+00	1.6E-04	0.0E+00	1.6E-04	1.6E-04
TE 129	0.0E+00	4.4E-08	0.0E+00	4.4E-08	4.4E-08
I 129	0.0E+00	8.6E-15	0.0E+00	8.6E-15	8.6E-15
TE 131M	0.0E+00	1.4E-06	0.0E+00	1.4E-06	1.4E-06
TE 131	0.0E+00	3.9E-09	0.0E+00	3.9E-09	3.9E-09
I 131	0.0E+00	4.8E-05	0.0E+00	4.8E-05	4.8E-05
XE 131M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TE 132	0.0E+00	1.8E-05	0.0E+00	1.8E-05	1.8E-05
I 132	0.0E+00	9.0E-07	0.0E+00	9.0E-07	9.0E-07
I 133	0.0E+00	9.7E-06	0.0E+00	9.7E-06	9.7E-06
XE 133M	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
XE 135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CS 135	0.0E+00	9.0E-16	0.0E+00	9.0E-16	9.0E-16
CS 137	0.0E+00	2.8E-07	0.0E+00	2.8E-07	2.8E-07
BA 140	0.0E+00	1.6E-05	0.0E+00	1.6E-05	1.6E-05
LA 140	0.0E+00	1.6E-05	0.0E+00	1.6E-05	1.6E-05
CE 141	0.0E+00	3.6E-06	0.0E+00	3.6E-06	3.6E-06
CE 143	0.0E+00	5.1E-06	0.0E+00	5.1E-06	5.1E-06
PR 143	0.0E+00	3.3E-07	0.0E+00	3.3E-07	3.3E-07
CE 144	0.0E+00	3.8E-06	0.0E+00	3.8E-06	3.8E-06
PR 144M	0.0E+00	1.3E-10	0.0E+00	1.3E-10	1.3E-10
PR 144	0.0E+00	2.2E-08	0.0E+00	2.2E-08	2.2E-08
ND 147	0.0E+00	2.7E-06	0.0E+00	2.7E-06	2.7E-06
PM 147	0.0E+00	5.1E-10	0.0E+00	5.1E-10	5.1E-10
SM 147	0.0E+00	8.2E-22	0.0E+00	8.2E-22	8.2E-22
PM 148	0.0E+00	3.7E-07	0.0E+00	3.7E-07	3.7E-07
PM 149	0.0E+00	1.1E-06	0.0E+00	1.1E-06	1.1E-06
SM 151	0.0E+00	4.2E-11	0.0E+00	4.2E-11	4.2E-11
SM 153	0.0E+00	2.1E-07	0.0E+00	2.1E-07	2.1E-07
EU 156	0.0E+00	2.3E-07	0.0E+00	2.3E-07	2.3E-07
U 237	0.0E+00	1.2E-06	0.0E+00	1.2E-06	1.2E-06
NP 237	0.0E+00	1.9E-12	0.0E+00	1.9E-12	1.9E-12
PA 233	0.0E+00	1.6E-17	0.0E+00	1.6E-17	1.6E-17
U 233	0.0E+00	5.0E-25	0.0E+00	5.0E-25	5.0E-25
TH 229	0.0E+00	2.7E-27	0.0E+00	2.7E-27	2.7E-27
RA 226	0.0E+00	-1.7E-29	0.0E+00	-1.7E-29	-1.7E-29

 GENII Dose Calculation Program
 (Version 1.395 23-Jan-89)

Case title: acute release of 1 pound of fresh fuel to river, drinking only

Executed on: 10/26/89 at 10:46:12

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Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
AC 225	0.0E+00	-7.4E-29	0.0E+00	-7.4E-29	-7.4E-29
NP 238	0.0E+00	3.7E-08	0.0E+00	3.7E-08	3.7E-08
PU 238	0.0E+00	8.0E-11	0.0E+00	8.0E-11	8.0E-11
U 240	0.0E+00	2.0E-10	0.0E+00	2.0E-10	2.0E-10
PU 240	0.0E+00	1.2E-08	0.0E+00	1.2E-08	1.2E-08
PU 241	0.0E+00	7.5E-09	0.0E+00	7.5E-09	7.5E-09
AM 241	0.0E+00	1.0E-11	0.0E+00	1.0E-11	1.0E-11
NP 239	0.0E+00	1.5E-06	0.0E+00	1.5E-06	1.5E-06
PU 239	0.0E+00	8.1E-08	0.0E+00	8.1E-08	8.1E-08

APPENDIX D

NCRP SCREENING FACTOR RESULTS

Effective Dose Air Screening Factors (mrem per Ci/m3) Buildup time 30 y									ORIGEN (Ci) Inventory FP/AP/Ac+D per MWd/1 yr Buildup	Release Factor	Weighted Relative Dose factor (TDF x INV x RF) mrem-m3	
NUCLIDE	Half-life	INHW	PLUME	GROUND	VEG	MILK	MEAT	TOTAL				
I-131	8.04 d	2.6E+11	1.8E+09	4.4E+11	9.0E+12	3.3E+13	5.3E+12	4.7E+13	2.0E+04	7.0E-01	6.7E+17	I-131
Ru-103	39.28 d	7.2E+10	2.2E+09	2.6E+12	1.1E+12	1.1E+09	1.7E+11	4.0E+12	1.2E+05	1.0E-01	4.6E+16	Ru-103
Ru-106	368.2 d	3.8E+12	0.0E+00	1.8E+13	1.3E+13	1.3E+10	2.1E+12	3.7E+13	8.6E+03	1.0E-01	3.2E+16	Ru-106
Co-60	5.271 y	1.7E+12	1.2E+10	5.3E+14	1.5E+13	9.7E+12	3.6E+13	6.0E+14	3.2E+05	1.0E-05	1.9E+16	Co-60
Zr-95	63.98 d	1.9E+11	3.5E+09	1.3E+13	1.5E+12	1.0E+09	6.1E+08	1.5E+13	1.5E+05	1.0E-05	2.3E+13	Zr-95
I-132	2.38 h	3.0E+09	1.1E+10	3.0E+10	1.7E+06	4.8E+03	2.4E+13	4.4E+10	6.7E+02	7.0E-01	2.1E+13	I-132
Ce-144	284.3 d	3.0E+12	8.6E+07	6.8E+12	9.7E+12	1.9E+11	1.6E+12	2.1E+13	4.4E+04	1.0E-05	9.3E+12	Ce-144
Cs-137	30.0 y	2.6E+11	8.0E+06	3.8E+14	3.4E+13	6.9E+13	6.5E+13	5.5E+14	1.6E+03	1.0E-05	8.7E+12	Cs-137
Sr-90	29.12 y	1.0E+13	1.0E+07	6.7E+13	3.6E+14	1.2E+14	2.9E+13	5.9E+14	1.3E+03	1.0E-05	7.8E+12	Sr-90
Y-91	68.61 d	3.9E+11	5.9E+07	5.0E+11	3.7E+12	7.6E+10	6.0E+11	5.3E+12	1.3E+05	1.0E-05	7.1E+12	Y-91
Sr-89	50.5 d	3.3E+11	4.0E+07	3.9E+11	3.7E+12	1.3E+12	3.0E+11	6.0E+12	1.1E+05	1.0E-05	6.7E+12	Sr-89
Ba-140	12.74 d	3.0E+10	8.9E+08	4.1E+12	2.2E+12	3.1E+11	3.0E+10	6.6E+12	9.2E+04	1.0E-05	6.1E+12	Ba-140
Nb-95	35.15 d	4.6E+10	3.7E+09	3.6E+12	9.0E+11	6.2E+08	7.1E+07	4.6E+12	1.2E+05	1.0E-05	5.7E+12	Nb-95
Te-129m	33.6 d	1.9E+11	1.8E+08	5.7E+11	3.7E+12	6.4E+13	2.9E+12	7.2E+13	3.9E+03	1.0E-05	2.8E+12	Te-129m
Ce-141	32.501 d	7.2E+10	3.7E+08	3.9E+11	9.9E+11	2.1E+10	1.8E+11	1.6E+12	1.6E+05	1.0E-05	2.6E+12	Ce-141
Pu-239	24065 y	4.1E+15	3.9E+05	3.5E+11	2.1E+14	6.9E+09	1.7E+11	4.4E+15	6.0E+01	1.0E-05	2.6E+12	Pu-239
Xe-133	5.245 d	0.0E+00	1.7E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+08	1.3E+04	1.0E+00	2.2E+12	Xe-133
Pr-143	13.56 d	6.5E+10	1.9E+07	4.1E+10	1.1E+12	2.4E+10	1.6E+11	1.4E+12	1.0E+05	1.0E-05	1.4E+12	Pr-143
La-140	40.272 h	3.9E+10	1.1E+10	4.9E+11	3.0E+11	4.8E+09	5.1E+09	8.5E+11	1.1E+05	1.0E-05	9.0E+11	La-140
Cs-134	2.062 y	3.7E+11	7.4E+09	1.5E+14	3.7E+13	9.2E+13	8.8E+13	3.7E+14	1.7E+02	1.0E-05	6.3E+11	Cs-134
Nd-147	10.98 d	5.5E+10	6.3E+08	2.4E+11	9.1E+11	2.0E+10	1.2E+11	1.3E+12	2.6E+04	1.0E-05	3.6E+11	Nd-147
Pu-240	6537 y	4.1E+15	4.2E+05	7.7E+11	2.1E+14	6.9E+09	1.7E+11	4.4E+15	8.3E+00	1.0E-05	3.6E+11	Pu-240
I-129	1.57E7 y	1.4E+12	3.9E+07	2.0E+13	1.8E+14	6.8E+14	1.7E+14	1.1E+15	4.5E+04	7.0E-01	8.4E+11	I-129
Pu-241	14.4 y	8.3E+13	7.6E+03	3.9E+11	4.5E+12	1.5E+08	3.6E+09	8.8E+13	2.9E+02	1.0E-05	2.5E+11	Pu-241
Sb-125	2.77 y	9.8E+10	2.0E+09	5.8E+13	1.5E+12	7.3E+11	1.4E+11	6.1E+13	3.3E+02	1.0E-05	2.0E+11	Sb-125
Te-132	78.2 h	7.5E+10	1.0E+09	1.1E+12	7.3E+11	1.2E+13	2.0E+11	1.4E+13	6.5E+02	1.0E-05	9.2E+10	Te-132
Cs-136	13.1 d	5.9E+10	1.0E+10	3.8E+12	2.6E+12	7.5E+12	5.4E+12	1.9E+13	4.8E+02	1.0E-05	8.8E+10	Cs-136
Pm-148m	41.3 d	1.8E+11	9.4E+09	1.1E+13	2.8E+12	5.8E+10	4.4E+11	1.5E+13	5.1E+02	1.0E-05	7.7E+10	Pm-148m
Pu-238	87.74 y	3.7E+15	4.3E+05	7.2E+11	1.9E+14	6.2E+09	1.5E+11	3.9E+15	1.7E+00	1.0E-05	6.6E+10	Pu-238
Pm-147	2.6234 y	3.1E+11	8.9E+05	5.0E+08	5.0E+11	9.8E+09	8.1E+10	9.0E+11	5.9E+03	1.0E-05	5.3E+10	Pm-147
Eu-154	8.6 y	2.3E+12	6.0E+09	4.3E+14	4.8E+12	9.2E+10	7.6E+11	4.4E+14	1.0E+01	1.0E-05	4.6E+10	Eu-154
Xe-131m	11.9 d	0.0E+00	4.4E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.4E+07	1.1E+03	1.0E+00	4.6E+10	Xe-131m

Effective Dose Air Screening Factors (area per Ci/a3)								ORIGIN (Ci) Inventory FP/AP/Ac+D 500 MWD/T 30d Buildup		Weighted Relative Dose factor (TDF x INV x RF) area-a3		
NUCLIDE	Half-life	INHAL	PLWE	GROUND	VEQ	MILK	MEAT	TOTAL	Release Factor			
Ag-111	7.46 d	4.9E+10	1.4E+08	5.5E+10	8.2E+11	2.9E+12	2.3E+11	4.1E+12	7.6E+02	1.0E-05	3.1E+10	Ag-111
Sn-126	9.64 d	1.2E+11	1.6E+09	1.0E+12	2.4E+12	8.7E+11	1.5E+12	6.9E+12	4.5E+02	1.0E-05	2.7E+10	Sn-126
Cd-115m	44.6 d	5.8E+11	1.5E+08	4.8E+11	6.5E+12	4.2E+12	4.8E+11	1.2E+13	2.1E+02	1.0E-05	2.5E+10	Cd-115m
Fe-59	44.529 d	1.2E+11	5.7E+09	6.5E+12	2.5E+12	2.8E+11	5.9E+12	1.5E+13	8.8E+01	1.0E-05	1.3E+10	Fe-59
Y-90	64.0 h	6.7E+10	6.7E+07	3.5E+10	6.7E+11	1.2E+10	2.8E+10	8.1E+11	1.3E+03	1.0E-05	1.1E+10	Y-90
Te-125m	58 d	5.8E+10	4.6E+07	1.8E+11	1.5E+12	2.5E+13	1.2E+12	2.8E+13	3.4E+01	1.0E-05	9.5E+09	Te-125m
Eu-155	4.96 y	3.3E+11	2.7E+08	1.8E+13	7.3E+11	1.5E+10	1.2E+11	1.7E+13	4.5E+01	1.0E-05	7.7E+09	Eu-155
Nb-95m	86.6 h	1.9E+10	2.9E+08	4.1E+11	2.0E+11	1.3E+08	6.2E+08	6.2E+11	1.1E+03	1.0E-05	7.0E+09	Nb-95m
Np-239	2.355 d	2.0E+10	7.8E+08	6.0E+10	1.8E+11	5.3E+08	3.0E+09	2.6E+11	2.3E+03	1.0E-05	6.1E+09	Np-239
Pm-148	5.37 d	8.7E+10	2.8E+09	4.4E+11	1.3E+12	2.8E+10	1.2E+11	2.8E+12	2.3E+02	1.0E-05	4.7E+09	Pm-148
Ag-110m	249.9 d	6.4E+11	1.3E+10	6.9E+13	5.7E+12	1.7E+13	2.1E+12	1.1E+14	4.1E+00	1.0E-05	4.5E+09	Ag-110m
Kr-85	10.72 y	8.0E+08	2.5E+07	8.0E+08	8.0E+08	8.0E+08	8.0E+08	2.5E+07	1.7E+02	1.0E+00	4.4E+09	Kr-85
U-238	4.468E9 y	9.5E+14	5.0E+05	1.0E+14	1.3E+14	2.4E+13	1.0E+14	1.3E+15	3.0E+01	1.0E-05	3.9E+09	U-238
Am-241	432.2 y	4.2E+15	8.8E+07	2.6E+13	1.1E+15	1.4E+11	1.7E+12	5.3E+15	5.4E+02	1.0E-05	2.9E+09	Am-241
Mo-99	66.0 h	3.2E+10	7.6E+08	1.2E+11	3.3E+11	2.0E+11	7.1E+10	7.5E+11	2.7E+02	1.0E-05	2.0E+09	Mo-99
Np-237	2.14E6 y	4.0E+15	1.1E+08	2.3E+14	3.4E+16	7.1E+13	1.8E+15	4.0E+16	4.8E+03	1.0E-05	1.9E+09	Np-237
Rb-86	18.66 d	5.3E+10	5.0E+08	3.9E+11	2.6E+12	9.4E+12	5.8E+12	1.8E+13	8.4E+00	1.0E-05	1.5E+09	Rb-86
Sb-124	68.28 d	2.0E+11	9.2E+09	1.4E+13	4.0E+12	1.4E+11	3.2E+11	1.9E+13	4.7E+00	1.0E-05	8.9E+08	Sb-124
Co-58	70.80 d	8.7E+10	4.7E+09	9.3E+12	1.5E+12	9.9E+11	3.5E+12	1.5E+13	5.3E+00	1.0E-05	7.9E+08	Co-58
Cm-242	162.8 d	1.4E+14	4.8E+05	2.5E+10	3.1E+13	4.1E+09	5.0E+10	1.7E+14	3.3E+01	1.0E-05	5.8E+08	Cm-242
Mn-54	312.5 d	5.4E+10	4.0E+09	3.5E+13	1.8E+12	1.5E+11	1.3E+11	3.7E+13	1.5E+00	1.0E-05	5.6E+08	Mn-54
Pr-144	17.28 m	3.5E+08	2.5E+08	2.5E+08	4.1E+10	8.0E+08	8.0E+08	8.5E+08	4.4E+04	1.0E-05	3.8E+08	Pr-144
Xe-133m	2.188 d	8.0E+08	1.5E+08	8.0E+08	8.0E+08	8.0E+08	8.0E+08	1.5E+08	2.0E+00	1.0E+00	3.8E+08	Xe-133m
Sn-126	1.0E5 y	8.0E+11	2.3E+08	1.9E+15	6.5E+13	7.5E+12	1.9E+13	2.0E+15	1.3E+02	1.0E-05	2.6E+08	Sn-126
Fe-55	2.7 y	2.1E+10	1.2E+05	3.1E+10	2.9E+11	2.8E+10	7.0E+11	1.1E+12	1.9E+01	1.0E-05	2.1E+08	Fe-55
Sn-119m	293.0 d	5.0E+10	1.0E+07	2.4E+11	8.1E+11	2.2E+11	5.5E+11	1.9E+12	9.7E+00	1.0E-05	1.8E+08	Sn-119m
U-235	703.8E6 y	9.8E+14	7.1E+08	1.7E+14	1.3E+14	2.5E+13	1.1E+14	1.4E+15	1.3E+02	1.0E-05	1.8E+08	U-235
Tc-99	2.13E5 y	6.7E+10	2.0E+08	5.5E+08	7.0E+13	1.4E+12	3.4E+10	7.1E+13	2.3E+01	1.0E-05	1.6E+08	Tc-99
Eu-152	13.33 y	1.8E+12	5.5E+09	5.2E+14	3.2E+12	6.3E+10	5.2E+11	5.2E+14	2.9E+02	1.0E-05	1.5E+08	Eu-152
Sm-151	90 y	2.4E+11	4.4E+03	4.3E+09	1.9E+11	3.9E+09	3.2E+10	4.7E+11	3.1E+01	1.0E-05	1.4E+08	Sm-151
Rh-106	29.9 m	8.0E+08	1.1E+09	1.7E+07	8.0E+08	8.0E+08	8.0E+08	1.1E+09	8.6E+03	1.0E-05	9.4E+07	Rh-106
U-238	2.341E7 y	1.0E+15	5.8E+05	6.9E+11	1.3E+14	2.6E+13	1.1E+14	1.3E+15	5.5E+03	1.0E-05	7.2E+07	U-238
Rh-103m	58.12 m	4.1E+07	9.5E+05	6.2E+08	3.1E+01	1.2E+09	8.0E+08	4.8E+07	1.0E+05	1.0E-05	5.0E+07	Rh-103m

Effective Dose Air Screening Factors (mrem per Ci/m3) Buildup time 30 y									ORIGEN (Ci) Inventory FP/AP/Ac+D 500 MWD/T 30d Buildup	Weighted Relative Dose factor (TDF x INV x RF) mrem-m3		
NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL	30d Buildup	Release Factor		
Ag-108m	127 y	2.3E+12	7.6E+09	1.3E+15	1.7E+13	2.8E+13	3.5E+12	1.4E+15	3.5E+03	1.0E+05	4.8E+07	Ag-108m
Ba-137m	2.552 m	8.0E+00	2.8E+09	1.5E+08	8.0E+00	8.0E+00	8.0E+00	3.0E+09	1.5E+03	1.0E+05	4.5E+07	Ba-137m
To-129	69.6 m	7.2E+08	2.9E+08	6.9E+08	2.1E+02	2.5E+03	8.0E+00	1.7E+09	2.5E+03	1.0E+05	4.3E+07	To-129
Pm-149	53.08 h	2.3E+10	7.7E+07	1.2E+10	2.0E+11	3.5E+09	6.1E+09	2.4E+11	6.8E+00	1.0E+05	2.1E+07	Pm-149
Tc-99m	6.02 h	2.6E+08	6.1E+08	5.8E+09	4.2E+07	9.6E+04	2.4E+03	5.9E+09	2.6E+02	1.0E+05	1.5E+07	Tc-99m
Th-234	24.10 d	2.8E+11	3.6E+07	3.7E+11	4.2E+12	7.4E+09	3.2E+10	4.9E+12	2.7E+01	1.0E+05	1.3E+07	Th-234
Pu-236	2.851 y	1.3E+15	5.8E+05	3.5E+13	7.5E+13	2.4E+11	3.1E+11	1.4E+15	6.1E+04	1.0E+05	8.5E+06	Pu-236
I-133	20.8 h	4.7E+10	2.9E+09	8.1E+10	1.4E+11	2.5E+11	1.1E+09	5.2E+11	2.3E+05	7.0E+01	8.4E+06	I-133
Cm-244	18.11 y	2.3E+15	4.1E+05	4.7E+11	5.8E+14	7.2E+10	9.1E+11	2.8E+15	2.7E+04	1.0E+05	7.6E+06	Cm-244
Pu-242	3.763E5 y	3.9E+15	3.6E+05	6.4E+11	2.8E+14	6.5E+09	1.6E+11	4.1E+15	1.4E+04	1.0E+05	5.8E+06	Pu-242
Cd-116	53.46 h	3.4E+10	9.6E+08	1.2E+11	3.0E+11	1.7E+11	4.5E+09	6.3E+11	5.5E+01	1.0E+05	3.5E+06	Cd-116
Am-243	7380 y	4.2E+15	2.4E+08	2.3E+14	1.1E+16	1.4E+11	1.7E+12	5.5E+15	6.2E+05	1.0E+05	3.4E+06	Am-243
Zn-65	243.9 d	1.6E+11	2.8E+09	1.8E+13	8.8E+12	2.3E+13	5.6E+13	1.1E+14	2.6E+03	1.0E+05	2.9E+06	Zn-65
Cs-132	6.475 d	9.8E+09	3.3E+09	6.3E+11	2.7E+11	7.7E+11	4.2E+11	2.1E+12	1.1E+01	1.0E+05	2.4E+06	Cs-132
U-234	2.445E5 y	1.1E+15	7.3E+05	7.5E+11	1.4E+14	2.7E+13	1.1E+14	1.3E+15	1.4E+04	1.0E+05	1.8E+06	U-234
Zr-93	1.53E8 y	2.8E+12	8.8E+00	4.5E+11	8.3E+11	5.3E+08	3.3E+08	3.8E+12	3.0E+02	1.0E+05	1.2E+06	Zr-93
Sm-153	46.7 h	1.6E+10	2.5E+08	2.1E+10	1.3E+11	2.2E+09	3.0E+09	1.7E+11	5.8E+01	1.0E+05	9.9E+05	Sm-153
Ca-135	2.3E8 y	3.6E+10	6.4E+05	8.8E+00	5.4E+12	1.8E+13	9.5E+12	2.5E+13	3.7E+03	1.0E+05	9.3E+05	Ca-135
Ni-83	96 y	5.8E+10	8.8E+00	8.8E+00	5.2E+11	1.1E+11	5.7E+10	7.4E+11	1.1E+01	1.0E+05	8.3E+05	Ni-83
Cr-61	27.704 d	2.7E+09	1.5E+08	1.3E+11	4.8E+10	3.4E+10	1.1E+11	3.2E+11	2.4E+01	1.0E+05	7.7E+05	Cr-61
Sn-117m	13.61 d	3.5E+10	7.8E+08	3.1E+11	7.1E+11	2.5E+11	4.9E+11	1.8E+12	2.8E+02	1.0E+05	5.8E+05	Sn-117m
Gd-153	242 d	1.9E+11	4.1E+08	4.1E+12	5.3E+11	1.1E+10	8.7E+10	4.9E+12	9.7E+03	1.0E+05	4.8E+05	Gd-153
H-3	12.35 y	5.8E+08	8.8E+00	8.8E+00	1.9E+09	1.8E+09	4.7E+08	4.4E+09	8.5E+00	1.0E+05	3.7E+05	H-3
C-14	5730 y	1.7E+10	2.7E+05	8.8E+00	4.8E+11	2.3E+11	2.7E+11	9.8E+11	3.7E+02	1.0E+05	3.6E+05	C-14
Ce-143	33.0 h	2.7E+10	1.2E+09	6.3E+10	1.2E+11	1.8E+09	1.2E+09	2.2E+11	1.3E+01	1.0E+05	2.8E+05	Ce-143
Cm-243	28.5 y	2.8E+15	5.9E+08	9.2E+13	7.1E+14	9.2E+10	1.1E+12	3.8E+15	6.3E+06	1.0E+05	2.3E+05	Cm-243
Sn-121m	55 y	9.2E+10	5.8E+06	3.3E+12	5.3E+12	5.8E+11	1.3E+12	1.1E+13	2.1E+03	1.0E+05	2.3E+05	Sn-121m
Cd-109	464 d	9.1E+11	1.8E+07	5.9E+11	1.8E+13	4.4E+12	5.5E+11	1.7E+13	7.9E+04	1.0E+05	1.3E+05	Cd-109
Sb-122	2.70 d	4.1E+10	2.1E+09	1.8E+11	4.6E+11	1.4E+10	9.9E+09	7.1E+11	1.6E+02	1.0E+05	1.1E+05	Sb-122
In-116m	4.486 h	1.1E+09	7.5E+08	4.3E+09	5.8E+07	1.1E+05	4.9E+03	6.2E+09	6.1E+01	1.0E+05	3.8E+04	In-116m
Xe-129m	8.0 d	8.8E+00	1.2E+08	8.8E+00	8.8E+00	8.8E+00	8.8E+00	1.2E+08	2.8E+04	1.0E+05	2.4E+04	Xe-129m
Nb-94	2.03E4 y	3.3E+12	7.6E+09	1.4E+15	4.1E+12	2.4E+09	3.8E+08	1.4E+15	1.1E+06	1.0E+05	1.5E+04	Nb-94
Pu-237	46.3 d	1.6E+10	2.2E+08	3.6E+11	1.6E+11	5.6E+08	1.3E+08	5.4E+11	2.6E+03	1.0E+05	1.4E+04	Pu-237

Effective Dose Air Screening Factor.		(area per Ci/m ³)		Buildup time 31 y		ORIGIN (Ci)		Inventory		Weighted Relative Dose factor (TDF x INV x RF)		Release Factor	area-m ³
NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL	FP/AP/Ac+D 500 MWD/T 30d Buildup	FP/AP/Ac+D 500 MWD/T 30d Buildup	FP/AP/Ac+D 500 MWD/T 30d Buildup		
Ho-166m	1.20E3 y	6.2E+12	7.6E+09	1.4E+15	4.0E+12	8.1E+10	6.8E+11	1.4E+15	9.4E+07	1.0E+05	1.3E+04	1.0E+05	Ho-166m
Pm-231	3.270E4 y	1.0E+16	1.4E+08	1.9E+14	6.2E+15	1.4E+13	3.9E+12	1.7E+16	5.9E+08	1.0E+05	1.0E+04	1.0E+05	Pa-231
Mi-69	7.5E4 y	2.2E+10	2.0E+05	4.0E+11	2.0E+11	4.2E+10	2.1E+10	6.9E+11	8.6E+04	1.0E+05	5.9E+03	1.0E+05	Ni-59
Xe-127	36.41 d	0.0E+00	1.2E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+09	4.1E+06	1.0E+00	5.0E+03	1.0E+00	Xe-127
Th-231	26.62 h	7.0E+09	5.6E+07	2.8E+09	2.5E+10	2.6E+07	5.0E+06	3.5E+10	1.3E+02	1.0E+05	4.5E+03	1.0E+05	Th-231
Nb-93m	13.6 y	2.3E+11	6.5E+05	5.0E+11	2.8E+11	1.7E+08	2.1E+07	1.0E+12	2.4E+04	1.0E+05	2.4E+03	1.0E+05	Nb-93m
08-72	14.1 h	1.5E+10	1.4E+10	2.0E+11	2.9E+10	3.6E+07	7.3E+05	2.6E+11	7.5E+04	1.0E+05	2.6E+03	1.0E+05	Ga-72
As-77	38.8 h	0.4E+09	5.3E+07	4.2E+09	4.3E+10	1.1E+09	6.6E+09	6.4E+10	2.7E+03	1.0E+05	1.7E+03	1.0E+05	As-77
Th-228	1.9151 y	2.7E+15	9.2E+06	1.4E+14	2.0E+14	1.0E+12	1.0E+12	3.1E+15	4.6E+08	1.0E+05	1.4E+03	1.0E+05	Th-228
Br-82	36.31 h	1.2E+10	1.3E+10	5.1E+11	5.2E+10	2.6E+11	1.5E+10	8.6E+11	1.0E+04	1.0E+05	8.8E+02	1.0E+05	Br-82
Ag-110	24.6 s	0.0E+00	2.3E+08	6.0E+06	0.0E+00	0.0E+00	0.0E+00	2.4E+08	5.4E+02	1.0E+05	1.3E+02	1.0E+05	Ag-110
Ac-227	21.773 y	5.4E+16	5.8E+05	3.0E+14	7.0E+15	1.1E+13	1.4E+13	6.1E+16	2.0E+10	1.0E+05	1.2E+02	1.0E+05	Ac-227
Cm-246	8611 y	4.4E+15	3.3E+08	7.5E+13	1.1E+15	1.4E+11	1.8E+12	5.6E+15	1.4E+09	1.0E+05	8.0E+01	1.0E+05	Cm-246
Sm-147	1.06E11 y	6.0E+14	0.0E+00	0.0E+00	9.2E+13	1.9E+12	1.6E+13	7.1E+14	4.4E+09	1.0E+05	3.1E+01	1.0E+05	Sm-147
Ra-224	3.66 d	2.5E+13	4.7E+07	7.4E+11	3.2E+13	6.3E+12	1.0E+12	6.5E+13	4.0E+08	1.0E+05	2.6E+01	1.0E+05	Ra-224
Sn-121	27.16 h	4.1E+09	0.0E+00	0.0E+00	1.9E+10	4.0E+09	4.6E+08	2.7E+10	4.7E+05	1.0E+05	1.3E+01	1.0E+05	Sn-121
Tm-170	128.6 d	2.1E+11	4.0E+07	4.9E+11	2.3E+12	4.6E+10	3.7E+11	3.4E+12	2.5E+07	1.0E+05	8.7E+00	1.0E+05	Tm-170
Th-230	7.7E4 y	2.6E+15	1.8E+06	1.0E+13	2.7E+14	7.0E+11	2.3E+12	2.9E+15	1.9E+10	1.0E+05	5.5E+00	1.0E+05	Th-230
Rn-220	66.6 s	0.0E+00	2.4E+06	1.3E+08	8.8E+04	1.2E+03	3.2E+01	1.3E+08	4.0E+08	1.0E+00	5.1E+00	1.0E+00	Rn-220
Be-10	1.6E6 y	2.8E+12	1.0E+07	4.4E+12	2.4E+12	1.5E+09	9.4E+11	1.1E+13	4.4E+08	1.0E+05	4.9E+00	1.0E+05	Be-10
Cm-246	4731 y	4.3E+15	3.4E+05	6.8E+11	1.1E+15	1.4E+11	1.8E+12	5.4E+15	1.2E+11	1.0E+05	6.6E+01	1.0E+05	Cm-246
Pb-212	11.64 h	1.3E+12	6.9E+08	8.9E+10	1.5E+11	3.7E+09	1.0E+06	1.6E+12	4.0E+08	1.0E+05	6.3E+01	1.0E+05	Pb-212
Cm-241	32.6 d	1.3E+12	2.3E+09	2.3E+12	1.4E+12	2.0E+08	2.2E+09	5.0E+12	8.9E+09	1.0E+05	4.4E+01	1.0E+05	Cm-241
Ag-108	2.37 s	0.0E+00	1.2E+08	1.7E+07	0.0E+00	0.0E+00	0.0E+00	1.4E+08	3.1E+04	1.0E+05	4.3E+01	1.0E+05	Ag-108
Th-229	7341 y	1.7E+16	4.0E+08	3.5E+14	1.8E+15	1.2E+13	1.7E+13	1.9E+16	1.3E+12	1.0E+05	2.5E+01	1.0E+05	Th-229
Zr-97	16.91 h	3.5E+10	9.2E+08	1.6E+11	7.6E+10	2.3E+07	1.0E+05	2.7E+11	7.3E+08	1.0E+05	2.0E+01	1.0E+05	Zr-97
Cu-67	61.86 h	9.8E+09	5.5E+08	4.6E+10	7.9E+10	4.8E+10	1.6E+10	2.0E+11	8.9E+08	1.0E+05	1.8E+01	1.0E+05	Cu-67
Kr-81	2.1E5 y	0.0E+00	4.7E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E+07	1.7E+09	1.0E+00	8.1E+02	1.0E+00	Kr-81
Bi-212	61.66 min	1.7E+11	9.2E+08	7.5E+09	1.1E+02	3.1E+06	0.0E+00	1.8E+11	4.0E+08	1.0E+05	7.1E+02	1.0E+05	Bi-212
Ni-66	64.6 h	6.7E+10	0.0E+00	2.4E+10	6.2E+11	1.8E+11	2.0E+10	9.2E+11	1.9E+09	1.0E+05	1.8E+02	1.0E+05	Ni-66
As-76	26.32 h	3.0E+10	2.1E+09	7.9E+10	1.0E+11	2.2E+09	4.6E+09	2.2E+11	3.4E+09	1.0E+05	7.4E+03	1.0E+05	As-76
Nb-97	72.1 s	6.6E+08	3.2E+09	4.8E+09	4.1E+02	3.2E+07	8.0E+00	8.7E+09	7.9E+08	1.0E+05	6.9E+03	1.0E+05	Nb-97
Th-232	1.405E10 y	1.3E+16	8.8E+05	1.4E+15	1.8E+15	3.4E+13	2.3E+13	1.8E+16	4.1E+14	1.0E+05	6.6E+03	1.0E+05	Th-232

NUCLIDE	Half-life	Effective Dose Air Screening Factors (rrer per Ci/m3)							ORIGIN (Ci)		Weighted Relative Dose factor (TDF x INV x RF)		
		INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL	Inventory FP/AP/Ac+D 500 MWD/T 30d Buildup	Release Factor	arean-m3		
Rn-222	3.8236 d	0.0E+00	1.8E+06	8.9E+11	2.3E+09	1.0E+26	0.0E+00	8.9E+11	5.5E-16	1.0E+00	4.9E-03	Rn-222	
Tl-208	3.07 m	0.0E+00	1.8E+10	8.8E+08	8.0E+00	0.0E+00	0.0E+00	1.9E+10	1.4E-08	1.0E-05	2.7E-03	Tl-208	
Nb-97r	61 m	0.0E+00	3.5E+09	1.4E+08	2.3E+03	5.3E-13	0.0E+00	3.6E+09	6.9E-08	1.0E-05	2.5E-03	Nb-97m	
Pr-142	19.13 h	2.3E+10	3.4E+08	1.5E+10	5.0E+10	0.0E+00	0.5E+07	9.9E+10	2.0E-09	1.0E-05	2.0E-03	Pr-142	
Ra-226	14.8 d	0.2E+13	3.4E+07	5.9E+11	9.5E+13	2.1E+13	0.8E+12	1.9E+14	9.7E-13	1.0E-05	1.8E-03	Ra-226	
In-116	5.1E15 y	0.0E+13	6.6E+06	1.5E+12	0.0E+13	5.0E+12	2.5E+13	1.4E+14	1.1E-12	1.0E-05	1.5E-03	In-116	
Ba-135m	28.7 h	0.0E+09	2.4E+08	1.0E+10	3.8E+10	3.4E+09	2.3E+07	5.8E+10	2.4E-09	1.0E-05	1.3E-03	Ba-135m	
Ta-171	1.92 y	7.3E+10	2.5E+06	7.3E+10	2.0E+11	4.0E+09	3.3E+10	3.9E+11	2.3E-10	1.0E-05	9.1E-04	Ta-171	
I-130	12.36 h	2.1E+10	1.0E+10	1.5E+11	2.2E+10	2.3E+10	0.9E+06	2.3E+11	1.6E-16	7.0E-01	2.7E-04	I-130	
Pb-211	22.8 y	1.1E+14	0.2E+06	2.1E+13	2.9E+16	2.7E+14	1.9E+14	3.5E+16	7.3E-16	1.0E-05	2.5E-04	Pb-211	
Ra-226	1600 y	0.9E+13	3.2E+07	1.5E+15	1.3E+15	1.7E+14	7.6E+13	3.2E+16	0.0E-16	1.0E-05	2.1E-04	Ra-226	
Gd-162	1.08E14 y	1.9E+16	0.0E+00	0.0E+00	8.0E+13	1.0E+12	1.3E+13	2.0E+16	1.1E-16	1.0E-05	2.2E-05	Gd-162	
Po-211	138.38 d	7.5E+13	4.1E+04	1.6E+08	8.3E+14	1.1E+14	3.4E+14	1.4E+16	0.7E-16	1.0E-05	9.4E-06	Po-211	
Ra-228	5.76 y	3.8E+13	3.3E+01	6.1E+14	8.7E+14	1.5E+14	6.1E+13	1.7E+16	3.5E-16	1.0E-05	5.9E-06	Ra-228	
Kr-79	35.04 h	0.0E+00	1.2E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+09	4.1E-16	1.0E+00	5.0E-06	Kr-79	
Pd-109	13.427 h	8.8E+09	2.5E+07	2.2E+09	1.2E+10	1.4E+08	1.4E+05	2.3E+10	3.2E-12	1.0E-05	7.4E-07	Pd-109	
U-241	14.1 h	1.0E+10	8.2E+06	3.1E+10	2.8E+10	2.0E+09	2.3E+07	7.9E+10	0.0E-13	1.0E-05	4.7E-07	U-241	
Bi-210	5.012 d	1.6E+12	2.5E+07	2.2E+10	7.6E+11	2.6E+11	0.9E+10	2.7E+12	6.5E-16	1.0E-05	1.7E-07	Bi-211	
Sc-48	43.7 h	3.3E+10	1.0E+10	7.7E+11	2.9E+11	4.7E+09	5.9E+09	1.1E+12	4.4E-16	1.0E-05	4.8E-08	Sc-48	
Cm-248	3.39E5 y	1.6E+16	3.0E+05	5.5E+11	4.0E+16	5.2E+11	6.5E+12	2.0E+16	1.5E-19	1.0E-05	3.1E-08	Cm-248	
Ac-228	0.13 h	2.5E+12	4.5E+09	3.2E+10	1.3E+09	1.4E+04	2.2E+01	2.5E+12	3.5E-16	1.0E-05	8.6E-09	Ac-228	
Bk-249	320 d	1.1E+13	5.4E+04	7.1E+11	2.9E+12	3.7E+08	4.6E+09	1.4E+13	4.0E-17	1.0E-05	5.6E-09	Bk-249	
Na-24	15.00 h	9.7E+09	2.2E+10	3.0E+11	1.0E+10	5.3E+10	1.0E+08	4.0E+11	9.9E-16	1.0E-05	3.9E-09	Na-24	
Pb-214	26.8 m	0.2E+10	1.2E+09	4.3E+09	2.8E+08	2.2E+26	0.0E+00	6.8E+10	5.5E-16	1.0E-05	3.7E-09	Pb-214	
Bi-214	19.9 m	5.3E+10	7.5E+09	2.7E+09	2.3E+14	0.0E+00	0.0E+00	6.3E+10	5.5E-16	1.0E-05	3.5E-09	Bi-214	
Xe-136	9.09 h	0.0E+00	1.2E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+09	2.2E-18	1.0E+00	2.6E-09	Xe-136	
Cu-64	12.701 h	2.2E+09	8.8E+08	1.4E+10	2.3E+09	5.0E+08	9.0E+05	2.0E+10	7.1E-16	1.0E-05	1.4E-09	Cu-64	
Cf-249	350.6 y	4.5E+16	1.5E+09	3.0E+14	1.1E+16	1.5E+11	1.8E+12	5.9E+16	7.7E-21	1.0E-05	4.6E-10	Cf-249	
Ca-47	4.53 d	5.2E+10	5.1E+09	6.8E+11	7.1E+11	2.4E+12	5.6E+10	3.9E+12	2.0E-18	1.0E-05	7.9E-11	Ca-47	
Sr-Q1	9.5 h	1.3E+10	3.4E+09	5.9E+10	7.8E+09	5.2E+08	3.0E+06	8.4E+10	6.3E-18	1.0E-05	5.3E-12	Sr-Q1	
Y-91m	49.71 m	2.9E+08	2.5E+09	2.8E+09	9.3E+05	3.3E+04	2.6E+05	5.8E+09	4.0E-18	1.0E-05	2.2E-13	Y-91m	
Mg-28	20.91 h	3.9E+10	6.5E+09	3.5E+11	1.1E+11	1.6E+11	2.7E+08	6.8E+11	1.3E-20	1.0E-05	8.9E-14	Mg-28	
Al-28	2.240 m	0.0E+00	9.2E+09	3.6E+08	0.0E+00	0.0E+00	0.0E+00	9.8E+09	1.3E-20	1.0E-05	1.3E-15	Al-28	

NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEQ	MILK	MEAT	TOTAL	ORIGIN (Ci) Inventory FP/AP/Ac+D 500 MWD/T 30d Buildup		Weighted Relative Dose factor (TDF x INV x RF) area-m3	
									Release Factor			
Eu-152m	9.32 h	6.6E+09	1.5E+09	1.9E+10	4.0E+09	1.0E+07	2.0E+04	3.2E+10	2.4E-23	1.0E-05	7.7E-10	Eu-152m
Ac-223	2.2 m	0.0E+00	2.1E+07	2.2E+07	0.0E+00	0.0E+00	0.0E+00	4.3E+07	*	1.0E-05	0.0E+00	Ac-223
Ac-224	2.9 h	1.1E+12	9.1E+08	2.0E+10	2.0E+09	1.1E+08	1.0E+07	1.1E+12	*	1.0E-05	0.0E+00	Ac-224
Ag-105	41.0 d	3.7E+10	2.4E+09	3.0E+12	7.7E+11	2.0E+12	3.0E+11	6.7E+12	*	1.0E-05	0.0E+00	Ag-105
Al-26	7.10E5 y	6.4E+11	1.3E+10	2.2E+15	7.5E+12	4.7E+11	2.9E+11	2.2E+15	*	1.0E-05	0.0E+00	Al-26
Ar-41	1.827 h	0.0E+00	6.2E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.2E+09	*	1.0E-05	0.0E+00	Ar-41
As-72	26.0 h	3.3E+10	8.6E+09	2.0E+11	1.2E+11	2.4E+09	5.0E+09	4.4E+11	*	1.0E-05	0.0E+00	As-72
As-73	80.30 d	2.0E+10	2.1E+07	1.1E+11	3.0E+11	9.9E+09	4.7E+11	9.2E+11	*	1.0E-05	0.0E+00	As-73
As-74	17.76 d	6.4E+10	3.6E+09	1.9E+12	1.1E+12	3.0E+10	1.6E+12	4.7E+12	*	1.0E-05	0.0E+00	As-74
At-211	7.214 h	8.2E+11	1.7E+08	2.0E+09	4.2E+10	1.7E+10	4.1E+04	8.0E+11	*	1.0E-05	0.0E+00	At-211
Au-195	103 d	1.0E+11	3.5E+08	2.4E+12	5.0E+11	1.0E+10	2.0E+11	3.2E+12	*	1.0E-05	0.0E+00	Au-195
Au-195m	30.5 s	0.0E+00	9.3E+08	1.0E+07	0.0E+00	0.0E+00	0.0E+00	9.4E+08	*	1.0E-05	0.0E+00	Au-195m
Au-198	2.696 d	2.6E+10	1.9E+09	1.0E+11	2.7E+11	8.2E+08	2.0E+10	4.9E+11	*	1.0E-05	0.0E+00	Au-198
Au-199	3.139 d	1.2E+10	4.2E+08	4.3E+10	1.3E+11	4.2E+08	1.0E+10	2.1E+11	*	1.0E-05	0.0E+00	Au-199
Ba-126	96.5 m	2.9E+09	7.0E+08	1.3E+10	7.0E+04	3.6E+01	1.6E+24	1.7E+10	*	1.0E-05	0.0E+00	Ba-126
Ba-128	2.43 d	2.4E+10	2.9E+08	3.3E+11	5.9E+11	7.1E+10	2.1E+09	1.0E+12	*	1.0E-05	0.0E+00	Ba-128
Ba-131	11.0 d	5.4E+09	2.1E+09	8.1E+11	4.0E+11	5.0E+10	5.5E+09	1.3E+12	*	1.0E-05	0.0E+00	Ba-131
Ba-133	10.74 y	6.2E+10	1.7E+09	1.7E+14	1.0E+12	2.3E+11	2.0E+10	1.7E+14	*	1.0E-05	0.0E+00	Ba-133
Ba-133m	38.9 h	5.0E+09	2.7E+08	1.5E+10	7.2E+10	7.5E+09	1.1E+08	1.0E+11	*	1.0E-05	0.0E+00	Ba-133m
Ba-139	82.7 m	1.4E+09	2.3E+08	1.0E+09	4.7E+03	4.3E+03	5.2E+30	2.0E+09	*	1.0E-05	0.0E+00	Ba-139
Be-7	53.3 d	2.6E+09	2.3E+08	3.7E+11	4.9E+10	3.4E+07	2.0E+10	4.4E+11	*	1.0E-05	0.0E+00	Be-7
Bi-206	6.243 d	5.2E+10	1.0E+10	2.7E+12	1.2E+12	4.2E+11	1.2E+11	4.5E+12	*	1.0E-05	0.0E+00	Bi-206
Bi-207	30 y	1.0E+11	7.4E+09	1.0E+16	6.7E+12	1.3E+12	6.7E+11	1.0E+16	*	1.0E-05	0.0E+00	Bi-207
Br-76	16.2 h	1.3E+10	1.3E+10	2.2E+11	1.1E+10	3.2E+10	1.2E+08	2.9E+11	*	1.0E-05	0.0E+00	Br-76
Br-77	56 h	2.2E+09	1.5E+09	1.0E+11	1.7E+10	9.0E+10	1.4E+10	2.4E+11	*	1.0E-05	0.0E+00	Br-77
Cs-45	103 d	5.3E+10	1.0E+06	5.0E+03	1.0E+12	5.5E+12	2.7E+11	7.0E+12	*	1.0E-05	0.0E+00	Cs-45
Ce-139	137.66 d	7.2E+10	6.9E+08	3.2E+12	5.0E+11	1.0E+10	8.2E+10	3.9E+12	*	1.0E-05	0.0E+00	Ce-139
Cf-252	2.630 y	1.2E+15	3.7E+05	8.3E+10	2.4E+14	3.1E+10	3.9E+11	1.5E+15	*	1.0E-05	0.0E+00	Cf-252
Cl-36	3.01E5 y	1.0E+11	1.4E+07	1.1E+13	5.7E+14	1.4E+15	1.7E+15	3.7E+15	*	1.0E-05	0.0E+00	Cl-36
Cl-38	37.21 m	1.1E+09	8.0E+09	5.1E+09	8.0E+04	1.1E+14	0.0E+00	1.4E+10	*	1.0E-05	0.0E+00	Cl-38
Co-56	78.76 d	3.2E+11	1.0E+10	3.5E+13	5.2E+12	3.5E+12	1.3E+13	5.7E+13	*	1.0E-05	0.0E+00	Co-56
Co-57	270.9 d	7.2E+10	5.9E+08	5.1E+12	5.6E+11	3.7E+11	1.4E+12	7.5E+12	*	1.0E-05	0.0E+00	Co-57
Cs-128	3.9 m	0.0E+00	4.2E+09	3.3E+08	0.0E+00	0.0E+00	0.0E+00	4.5E+09	*	1.0E-05	0.0E+00	Cs-128

RADIONUCLIDE RANKINGS BASED ON ORIGEN INVENTORY, NCRP SCREENING FACTORS, AND RELEASE FACTORS

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Effective Dose Air Screening Factors (mrem per Ci/m3)								Buildup time 30 y	ORIGIN (Ci) Inventory	Weighted Relative Dose factor (TDF x INV x RF)		
NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEG	MILK	WEAT	TOTAL	FP/AP/Ac+D 500 MWD/1 30d Buildup	Release Factor	mrem-m3	
Cs-129	52.08 h	1.3E+09	1.2E+09	5.2E+10	5.7E+09	1.1E+10	7.6E+08	7.2E+10	*	1.0E-05	0.0E+00	Cs-129
Cs-130	29.9 m	2.4E+08	2.4E+09	1.5E+09	1.4E+07	1.4E+21	0.0E+00	4.1E+09	*	1.0E-05	0.0E+00	Cs-130
Cs-131	9.69 d	1.3E+09	3.3E+07	2.6E+10	4.7E+10	1.4E+11	9.0E+10	3.0E+11	*	1.0E-05	0.0E+00	Cs-131
Cs-138	32.2 m	0.1E+08	1.2E+10	0.0E+09	5.4E+06	0.0E+19	0.0E+00	1.9E+10	*	1.0E-05	0.0E+00	Cs-138
Cu-60	23.2 m	5.5E+08	1.9E+10	7.7E+09	2.3E+11	5.2E+30	0.0E+00	2.8E+10	*	1.0E-05	0.0E+00	Cu-60
Cu-61	3.408 h	1.5E+09	3.8E+09	1.7E+10	1.7E+07	1.0E+05	3.2E+06	2.2E+10	*	1.0E-05	0.0E+00	Cu-61
Cu-62	9.74 m	0.0E+00	4.8E+09	1.1E+09	0.0E+00	0.0E+00	0.0E+00	5.8E+09	*	1.0E-05	0.0E+00	Cu-62
C-11	20.38 m	9.7E+07	4.8E+09	2.0E+09	4.1E+15	0.0E+00	0.0E+00	6.9E+09	*	1.0E-05	0.0E+00	C-11
Dy-167	8.1 h	6.4E+08	1.6E+09	1.7E+10	4.3E+08	1.3E+06	3.8E+02	2.0E+10	*	1.0E-05	0.0E+00	Dy-167
Er-171	7.52 h	4.5E+09	1.7E+09	1.0E+10	1.7E+09	4.6E+06	0.0E+02	2.6E+10	*	1.0E-05	0.0E+00	Er-171
Es-253	20.47 d	3.0E+13	1.6E+08	2.0E+09	7.5E+12	1.1E+09	1.1E+10	3.8E+13	*	1.0E-05	0.0E+00	Es-253
Fe-52	8.275 h	1.0E+10	3.4E+09	1.5E+11	9.1E+09	1.5E+08	0.0E+05	1.8E+11	*	1.0E-05	0.0E+00	Fe-52
F-18	109.77 m	0.7E+08	4.6E+09	1.0E+10	3.8E+04	1.2E+01	1.5E+19	1.6E+10	*	1.0E-05	0.0E+00	F-18
Ga-66	9.40 h	1.5E+10	1.3E+10	1.2E+11	1.1E+10	7.7E+08	0.3E+03	1.6E+11	*	1.0E-05	0.0E+00	Ga-66
Ga-67	70.20 h	4.5E+09	6.0E+08	7.1E+10	6.0E+10	2.0E+08	5.1E+08	1.4E+11	*	1.0E-05	0.0E+00	Ga-67
Ga-68	88.0 m	1.1E+09	4.5E+09	6.6E+09	2.4E+02	4.1E+07	0.0E+00	1.2E+10	*	1.0E-05	0.0E+00	Ga-68
Gd-148	96 y	2.6E+15	0.0E+00	0.0E+00	1.1E+14	2.2E+12	1.8E+13	2.8E+15	*	1.0E-05	0.0E+00	Gd-148
Ge-68	1.00E14 y	1.9E+15	0.0E+00	0.0E+00	0.0E+13	1.0E+12	1.3E+13	2.0E+15	*	1.0E-05	0.0E+00	Ge-68
Ge-68	280 d	4.1E+11	4.6E+05	4.0E+13	6.7E+11	2.0E+12	1.0E+13	5.3E+13	*	1.0E-05	0.0E+00	Ge-68
Hf-172	1.07 y	2.5E+12	4.4E+08	1.0E+14	2.1E+12	1.4E+10	0.9E+10	1.8E+14	*	1.0E-05	0.0E+00	Hf-172
Hf-181	42.4 d	1.2E+11	2.5E+09	3.3E+12	1.7E+12	1.2E+10	5.5E+10	5.2E+12	*	1.0E-05	0.0E+00	Hf-181
Hg-197	64.1 h	5.7E+09	2.9E+08	2.9E+10	6.1E+10	9.2E+09	1.3E+10	1.2E+11	*	1.0E-05	0.0E+00	Hg-197
Hg-203	46.60 d	5.9E+10	1.1E+09	1.5E+12	4.5E+12	7.5E+11	3.5E+12	1.0E+13	*	1.0E-05	0.0E+00	Hg-203
Ho-162	15 m	1.9E+07	7.4E+08	2.4E+08	4.0E+23	0.0E+00	0.0E+00	1.0E+09	*	1.0E-05	0.0E+00	Ho-162
In-111	2.83 d	0.7E+09	1.8E+09	1.7E+11	0.8E+10	5.5E+09	0.1E+09	2.8E+11	*	1.0E-05	0.0E+00	In-111
In-113m	1.650 h	3.3E+08	1.2E+09	2.5E+09	1.1E+04	4.0E+02	3.3E+23	4.0E+09	*	1.0E-05	0.0E+00	In-113m
In-116m	54.15 m	0.1E+08	1.2E+10	1.1E+10	2.9E+08	2.3E+09	0.0E+00	2.4E+10	*	1.0E-05	0.0E+00	In-116m
Ir-192	74.02 d	2.3E+11	3.8E+09	0.0E+12	2.4E+12	1.0E+09	3.8E+11	1.2E+13	*	1.0E-05	0.0E+00	Ir-192
Ir-192m	241 y	3.1E+12	7.7E+08	0.0E+14	2.7E+12	1.1E+09	2.7E+11	0.9E+14	*	1.0E-05	0.0E+00	Ir-192m
Ir-194	19.15 h	2.3E+10	4.9E+08	1.9E+10	0.0E+10	2.0E+07	0.0E+07	1.0E+11	*	1.0E-05	0.0E+00	Ir-194
I-123	13.2 h	2.4E+09	7.5E+08	1.4E+10	2.9E+09	3.2E+09	1.5E+08	2.3E+10	*	7.0E-01	0.0E+00	I-123
I-124	4.18 d	1.5E+11	5.1E+09	5.9E+11	3.1E+12	1.1E+13	1.2E+12	1.6E+13	*	7.0E-01	0.0E+00	I-124
I-125	80.14 d	1.9E+11	5.2E+07	2.0E+11	1.5E+13	5.2E+13	1.2E+13	0.0E+13	*	7.0E-01	0.0E+00	I-125

Effective Dose Air Screening Factor8 (rram per Ci/m3) Buildup time 30 y										ORIGEN (Ci) Inventory FP/AP/Ac/D 500 MWD/T 30d Buildup		Weighted Relative Dose factor (TDF x INV x RF) area-m3	
NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL		Release Factor			
I-126	13.12 d	3.5E+11	2.2E+09	8.4E+11	1.6E+13	5.9E+13	1.1E+13	8.8E+13	*	7.0E-01	0.0E+00	I-126	
I-134	62.6 m	1.1E+09	1.3E+10	1.3E+10	1.9E+08	4.3E+08	0.0E+00	2.7E+10	*	7.0E-01	0.0E+00	I-134	
I-135	6.61 h	9.0E+09	7.7E+09	6.0E+10	1.8E+09	5.7E+08	4.9E+02	8.8E+10	*	7.0E-01	0.0E+00	I-135	
Kr-81m	13 s	0.0E+00	6.2E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.2E+08	*	1.0E+00	0.0E+00	Kr-81m	
Kr-83m	1.88 h	0.0E+00	4.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E+05	*	1.0E+00	0.0E+00	Kr-83m	
Kr-85m	4.48 h	0.0E+00	7.7E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E+08	*	1.0E+00	0.0E+00	Kr-85m	
Kr-87	76.8 m	0.0E+00	4.2E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+09	*	1.0E+00	0.0E+00	Kr-87	
Kr-88	2.84 h	0.0E+00	1.0E+10	1.3E+10	2.0E+10	0.0E+00	0.0E+00	2.3E+10	*	1.0E+00	0.0E+00	Kr-88	
K-48	1.28E9 y	9.9E+10	7.0E+08	1.6E+14	8.2E+13	1.1E+14	7.8E+13	4.1E+14	*	1.0E+05	0.0E+00	K-48	
La-141	3.93 h	4.0E+09	2.7E+08	6.0E+09	1.2E+08	8.0E+04	3.5E+05	1.0E+10	*	1.0E+05	0.0E+00	La-141	
Lu-172	6.70 d	4.0E+10	9.1E+09	0.0E+12	8.3E+11	1.8E+10	8.9E+10	2.6E+12	*	1.1E-16	0.0E+00	Lu-172	
Lu-178	1.37 y	1.0E+11	5.2E+08	9.0E+12	5.1E+11	1.0E+10	0.3E+10	1.0E+13	*	1.0E+05	0.0E+00	Lu-178	
Lu-177	6.71 d	2.0E+10	1.7E+08	3.7E+10	3.2E+11	6.8E+09	3.4E+10	4.1E+11	*	1.0E+05	0.0E+00	Lu-177	
Mn-62	6.691 d	4.0E+10	1.7E+10	2.4E+12	9.9E+11	1.0E+11	4.6E+10	3.0E+12	*	1.0E+05	0.0E+00	Mn-62	
Mn-62r	21.1 m	5.4E+08	1.1E+10	4.0E+09	9.9E+05	4.7E+04	2.1E+04	1.7E+10	*	1.1E-16	0.0E+00	Mn-62r	
Mn-66	2.6786 h	3.0E+09	8.7E+09	2.4E+10	6.0E+06	1.1E+03	9.2E+12	3.0E+10	*	1.0E+05	0.0E+00	Mn-66	
Na-22	2.602 y	6.1E+10	1.0E+10	2.6E+14	8.2E+12	7.4E+13	3.7E+13	3.7E+14	*	1.0E+05	0.0E+00	Na-22	
Nd-149	1.78 h	1.0E+09	1.0E+09	4.7E+09	6.8E+05	1.6E+04	2.8E+04	8.3E+09	*	1.1E-16	0.0E+00	Nd-149	
Ni-67	36.08 h	1.5E+10	9.3E+09	3.8E+11	1.2E+11	2.9E+10	1.6E+09	5.6E+11	*	1.0E+05	0.0E+00	Ni-67	
Ni-66	2.621 h	2.8E+09	2.7E+09	7.8E+09	3.2E+06	1.7E+03	4.0E+12	1.3E+10	*	1.0E+05	0.0E+00	Ni-66	
N-13	9.966 m	0.0E+00	4.8E+09	1.0E+09	0.0E+00	0.0E+00	0.0E+00	5.8E+09	*	1.0E+05	0.0E+00	N-13	
O8-191	16.4 d	3.3E+10	3.2E+08	1.7E+11	5.8E+11	2.1E+10	0.4E+10	9.0E+11	*	1.1E-16	0.0E+00	O8-191	
O-16	122.24 s	0.0E+00	4.8E+09	2.1E+08	0.0E+00	0.0E+00	0.0E+00	5.0E+09	*	1.0E+05	0.0E+00	O-16	
Pa-231	17.4 d	1.2E+13	3.1E+09	1.0E+12	1.7E+12	8.0E+09	5.3E+09	1.5E+13	*	1.1E-16	0.0E+00	Pa-231	
Pb-203	62.16 h	4.2E+09	1.4E+09	9.7E+10	5.3E+10	4.6E+09	0.3E+08	1.6E+11	*	1.0E+05	0.0E+00	Pb-203	
Pd-103	16.96 d	1.3E+10	8.5E+06	2.0E+10	2.1E+11	7.5E+09	3.1E+09	2.6E+11	*	1.1E-16	0.0E+00	Pd-103	
Pm-145	17.7 y	2.4E+11	7.8E+07	1.5E+13	2.3E+11	4.6E+09	3.9E+10	1.6E+13	*	1.0E+05	0.0E+00	Pm-145	
Pt-195m	4.12 d	9.7E+09	3.1E+08	4.5E+10	2.4E+11	8.2E+09	1.7E+09	3.1E+11	*	1.1E-16	0.0E+00	Pt-195m	
Pt-197	18.3 h	4.5E+09	1.2E+08	3.5E+09	1.7E+10	2.7E+08	1.4E+06	2.5E+10	*	1.0E+05	0.0E+00	Pt-197	
P-32	14.29 d	1.2E+11	4.8E+07	1.3E+11	2.3E+12	1.6E+13	1.2E+13	3.0E+13	*	1.0E+05	0.0E+00	P-32	
P-33	25.4 d	1.9E+10	1.5E+06	0.0E+00	3.2E+11	2.1E+12	1.8E+12	4.2E+12	*	1.0E+05	0.0E+00	P-33	
Ra-227	42.2 m	2.3E+09	7.2E+08	6.8E+08	1.3E+02	1.6E+13	0.0E+00	3.7E+09	*	1.0E+05	0.0E+00	Ra-227	
Rb-81	4.58 h	1.0E+09	2.8E+09	1.7E+10	2.6E+07	2.8E+06	2.7E+02	2.1E+10	*	1.0E+05	0.0E+00	Rb-81	

NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEQ	MILK	MEAT	TOTAL	ORIGEN (Ci)		Release Factor	Weighted Relative Dose factor (TDF x INV x RF)	
									Inventory	FP/AP/Ac/D		area-m3	area-m3
									500 MWD/T	30d Buildup			
Rb-81m	32 m	1.0E+00	2.1E+07	2.0E+09	2.5E+04	1.0E+03	1.5E+05	2.1E+09	•	1.E - 6	0.0E+00	Rb-81m	
Rb-82	1.3 m	0.0E+00	5.2E+09	1.5E+08	0.0E+00	0.0E+00	0.0E+00	5.4E+09	•	1.0E-05	0.0E+00	Rb-82	
Rb-83	88.2 d	3.9E+10	2.3E+09	6.0E+12	3.4E+12	1.1E+13	8.1E+12	2.9E+13	•	1.0E-05	0.0E+00	Rb-83	
Rb-84	32.77 d	5.2E+10	4.3E+09	4.0E+12	3.5E+12	1.2E+13	8.2E+12	2.8E+13	•	1.0E-05	0.0E+00	Rb-84	
Rb-88	17.8 m	5.7E+00	3.5E+09	1.3E+09	3.5E+17	0.0E+00	0.0E+00	5.5E+09	•	1.0E-05	0.0E+00	Rb-88	
Rb-89	16.2 m	3.4E+00	1.1E+10	2.8E+09	1.1E+21	0.0E+00	0.0E+00	1.4E+10	•	1.0E-05	0.0E+00	Rb-89	
Re-107	5E10 y	4.3E+00	0.0E+00	0.0E+00	2.3E+10	7.3E+09	9.1E+09	3.9E+10	•	1.0E-05	0.0E+00	Re-187	
Re-188	16.90 h	1.0E+10	3.3E+08	1.3E+10	2.8E+10	8.4E+09	7.9E+07	8.7E+10	•	1.0E-05	0.0E+00	Re-188	
Ru-97	2.9 d	0.0E+00	1.1E+09	1.0E+11	4.8E+10	4.5E+07	2.3E+09	1.5E+11	•	1.E - 1	0.0E+00	Ru-97	
Sb-117	2.80 h	2.0E+00	8.1E+08	3.1E+09	8.4E+05	8.9E+01	2.8E+11	4.1E+09	•	1.0E-05	0.0E+00	Sb-117	
Sc-44	8.927 h	3.9E+09	1.0E+10	4.7E+10	1.2E+08	4.2E+04	2.2E+04	5.1E+10	•	1.0E-05	0.0E+00	Sc-44	
Sc-44a	68.8 h	5.1E+10	1.3E+09	7.9E+11	5.8E+11	1.1E+10	2.1E+10	1.5E+12	•	1.0E-05	0.0E+00	Sc-44a	
Sc-46	88.03 d	2.4E+11	9.7E+09	2.2E+13	2.7E+12	5.4E+10	4.3E+11	2.5E+13	•	1.0E-05	0.0E+00	Sc-46	
Sc-49	67.4 m	8.1E+00	6.3E+07	4.6E+08	1.0E+01	8.8E+09	0.0E+00	1.3E+09	•	1.0E-05	0.0E+00	Sc-49	
Se-73	7.16 h	3.7E+09	5.1E+09	4.8E+10	1.7E+09	8.4E+08	8.9E+05	5.9E+10	•	1.0E-05	0.0E+00	Se-73	
Se-76	119.0 d	5.0E+10	1.8E+09	6.9E+12	4.3E+12	1.4E+13	3.4E+13	8.0E+13	•	1.0E-05	0.0E+00	Se-76	
Si-31	167.3 m	1.8E+09	4.4E+07	8.7E+08	3.7E+05	5.2E+01	3.2E+12	2.7E+09	•	1.0E-05	0.0E+00	Si-31	
Si-32	461 y	8.1E+12	8.9E+05	6.0E+13	7.9E+13	1.1E+14	8.3E+13	3.4E+14	•	1.0E-05	0.0E+00	Si-32	
Sn-113	116.1 d	8.5E+10	3.9E+07	4.4E+12	1.5E+12	4.8E+11	1.1E+12	7.8E+12	•	1.0E-05	0.0E+00	Sn-113	
Sn-127	2.10 h	2.8E+09	9.5E+09	3.0E+10	2.8E+07	1.1E+08	5.3E+05	4.2E+10	•	1.0E-05	0.0E+00	Sn-127	
Sr-82	26 d	4.4E+11	1.7E+08	4.3E+12	8.9E+12	2.4E+12	5.3E+11	1.5E+13	•	1.0E-05	0.0E+00	Sr-82	
Sr-86	64.84 d	4.0E+10	2.4E+09	4.8E+12	8.4E+11	2.9E+11	8.8E+10	5.8E+12	•	1.0E-05	0.0E+00	Sr-86	
Sr-86m	69.6 m	8.8E+07	1.0E+09	4.8E+09	3.8E+07	1.1E+07	2.7E+05	5.7E+09	•	1.0E-05	0.0E+00	Sr-86m	
Sr-87m	2.816 h	3.4E+08	1.5E+09	5.4E+09	1.5E+05	1.8E+03	5.2E+11	7.2E+09	•	1.0E-05	0.0E+00	Sr-87m	
Sr-92	2.71 h	5.4E+09	6.4E+09	2.4E+10	1.8E+07	1.5E+04	1.1E+09	3.7E+10	•	1.0E-05	0.0E+00	Sr-92	
S-36	87.44 d	2.0E+10	3.3E+05	0.0E+00	3.6E+11	2.1E+12	5.2E+12	7.7E+12	•	1.0E-05	0.0E+00	S-36	
Ta-180	1.0E13 y	2.0E+12	2.5E+09	5.3E+14	1.8E+12	2.9E+09	7.3E+05	5.4E+14	•	1.0E-05	0.0E+00	Ta-180	
Ta-182	116.1 d	3.0E+11	6.2E+09	1.9E+13	2.8E+12	4.7E+09	1.1E+09	2.2E+13	•	1.0E-05	0.0E+00	Ta-182	
Tb-167	161 y	7.4E+10	1.2E+07	3.9E+12	6.2E+10	1.2E+09	1.0E+10	4.0E+12	•	1.0E-05	0.0E+00	Tb-167	
Tb-168	150 d	2.0E+12	3.8E+09	6.0E+14	2.2E+12	4.4E+10	3.7E+11	5.8E+14	•	1.0E-05	0.0E+00	Tb-168	
Tc-95m	61 d	2.0E+10	3.2E+09	5.9E+12	1.2E+12	3.1E+10	7.4E+08	7.1E+12	•	1.0E-05	0.0E+00	Tc-95m	
Te-121	17 d	1.5E+10	2.8E+09	1.3E+12	4.5E+11	8.0E+12	3.3E+11	1.0E+13	•	1.0E-05	0.0E+00	Te-121	
Te-121m	164 d	1.3E+11	9.8E+08	1.5E+13	3.8E+12	5.8E+13	2.8E+12	8.0E+13	•	1.0E-05	0.0E+00	Te-121m	

NUCLIDE	Half-life	Air Screening Factor	INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL	ORIGEN (Ci) Inventory FP/AP/Ac+D 500 MWD/T 30d Buildup	Release Factor	Weighted Relative Dose factor (TDF x INV x RF) area-m3	
Te-133m	66.4	m	8.5E+09	1.1E+10	1.0E+10	5.2E+06	1.1E+07	5.1E+04	3.0E+10	*	1.1E-15	1.0E+00	Te-133m
Te-134	41.8	s	1.0E+09	4.1E+09	1.4E+10	1.2E+02	4.2E-11	0.0E+00	1.9E+10	*	1.0E-05	1.0E+00	Te-134
Ti-44	47.8	y	0.1E+12	0.2E+08	1.7E+16	1.1E+13	3.0E+13	1.0E+13	1.7616	*	1.0E-05	0.0E+00	Ti-44
Ti-2#1	8.044	d	1.9E+09	4.0E+08	4.4E+10	2.2E+10	2.1E+10	1.1E+10	9.9E+10	*	1.0E-05	0.0E+00	Ti-211
Ti-204	8.779	y	1.9E+10	1.9E+07	3.0E+12	2.9E+12	1.8E+12	3.1E+12	1.1E+13	*	1.0E-05	0.0E+01	Ti-214
Ta-167	9.24	d	2.4E+10	0.1E+08	2.0E+11	4.3E+11	9.4E+09	5.4E+10	7.2E+11	*	1.0E-05	0.0E+00	Ta-167
U-2M	20.0	d	1.0E+14	5.2E+06	1.1E+11	2.0E+14	5.0E+13	2.0E+14	0.7E+14	*	1.0E-05	1.0E+00	U-231
U-232	72	y	5.3E+15	1.3E+06	1.1E+15	7.4E+14	1.3E+14	5.2E+14	7.7E+15	*	1.0E-05	1.0E+00	U-232
U-233	1.505E5	y	1.1E+15	1.1E+06	9.3E+11	1.4E+14	2.7E+13	1.1E+14	1.4E+15	*	1.1E-16	0.0E+00	U-233
V-48	10.230	d	0.2E+10	1.4E+10	0.0E+12	2.2E+12	4.0E+11	1.0E+12	1.0E+13	*	1.0E-05	0.0E+01	V-48
W-181	121.2	d	1.2E+09	1.5E+08	7.5E+11	2.0E+11	1.0E+10	5.3E+11	1.6612	*	1.0E-05	0.0E+00	W-181
W-185	75.1	d	0.0E+09	4.9E+06	3.0E+09	9.0E+11	0.7E+10	2.0E+12	3.9E+12	*	1.1E-16	1.0E+00	W-185
W-187	21.9	h	4.9E+09	2.2E+09	0.0E+10	4.0E+10	2.8E+09	2.9E+09	1.3E+11	*	1.0E-05	0.0E+00	W-187
W-188	69.4	d	3.3E+10	1.1E+07	1.3E+12	4.0E+12	4.1E+11	1.3E+13	1.9E+13	*	1.0E-05	0.0E+00	W-188m
X-1361	16.29	m	0.0E+00	2.0E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+09	*	1.0E+00	1.0E+1	X-1361
Xe-138	14.17	m	0.0E+00	5.0E+09	3.0E+09	2.9E+09	0.3E-23	0.0E+00	0.8E+09	*	1.0E+00	0.0E+00	Xe-138
Yb-169	32.01	d	0.4E+10	1.3E+09	1.5E+12	1.0E+12	2.1E+10	1.0E+11	2.8E+12	*	1.0E-05	0.0E+00	Yb-169
Yb-175	4.10	d	1.3E+10	1.9E+08	2.4E+10	1.7E+11	3.5E+09	1.3E+10	2.3E+11	*	1.0E-05	0.0E+00	Yb-175
Y-86	14.74	h	1.4E+10	1.0E+10	2.0E+11	2.9E+10	2.2E+08	0.0E+00	3.4E+11	*	1.0E-05	0.0E+00	Y-86
Y-87	80.3	h	1.4E+10	2.1E+09	3.7E+11	1.9E+11	3.0E+09	1.1E+10	5.9E+11	*	1.0E-05	0.0E+00	Y-87
Y-88	100.04	d	2.2E+11	1.4E+10	3.5E+13	2.0E+12	5.2E+10	4.2E+11	3.9E+13	*	1.0E-05	0.0E+00	Y-88
Zn-62	9.20	h	1.0E+10	2.1E+09	0.5E+10	0.3E+09	5.4E+09	1.7E+08	1.2E+11	*	1.0E-05	0.0E+00	Zn-62
Zn-63	38.1	m	0.5E+08	5.1E+09	4.0E+09	0.9E+04	1.5E-14	0.0E+00	9.0E+09	*	1.0E-05	0.0E+00	Zn-63
Zn-69	57	m	3.1E+08	1.9E+07	1.2E+06	3.2E+00	1.1E-07	0.0E+00	4.5E+08	*	1.0E-05	0.0E+00	Zn-69
Zn-69m	13.76	h	0.5E+09	1.9E+09	3.5E+10	7.9E+09	9.3E+09	5.5E+07	0.1E+10	*	1.0E-05	0.0E+00	Zn-69m
Zr-88	10.5	h	1.0E+10	1.3E+09	3.5E+11	3.3E+10	9.7E+06	4.0E+04	4.0E+11	*	1.0E-05	0.0E+00	Zr-88

* Indicates isotopes for which ORIGEN inventory is either 0 or missing

RADIONUCLIDE RANKINGS BASED ON ORIGIN INVENTORY AND MCRP SCREENING FACTORS

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Effective Dose Air Screening Factors (area per Ci/m ³) Buildup time 30 y								ORIGEN (Ci) Inventory FP/AP/Ac-D 500 MWD/T 30d Buildup	Weighted Relative Dose factor (TDF x INV x RF) Release Factor area-m ³
NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL	
Co-60	5.271 y	1.7E+12	1.2E+10	5.3E+14	1.5E+13	9.7E+12	3.6E+13	6.0E+14	3.2E+05
Zr-95	63.98 d	1.9E+11	3.5E+09	1.3E+13	1.5E+12	1.0E+09	6.1E+08	1.5E+13	1.5E+05
I-131	8.04 d	2.6E+11	1.8E+09	4.4E+11	9.0E+12	3.3E+13	5.3E+12	4.7E+13	2.0E+04
Ce-144	284.3 d	3.0E+12	8.0E+07	6.8E+12	9.7E+12	1.9E+11	1.6E+12	2.1E+13	4.4E+04
Cs-137	30.0 y	2.6E+11	8.0E+06	3.8E+14	3.4E+13	6.9E+13	6.5E+13	5.5E+14	1.6E+03
Sr-90	29.12 y	1.0E+13	1.0E+07	6.7E+13	3.0E+14	1.2E+14	2.9E+13	5.9E+14	1.3E+03
Y-91	58.51 d	3.9E+11	5.9E+07	5.0E+11	3.7E+12	7.6E+10	6.0E+11	5.3E+12	1.3E+05
Sr-89	50.5 d	3.3E+11	4.0E+07	3.9E+11	3.7E+12	1.3E+12	3.0E+11	6.0E+12	1.1E+05
Ba-140	12.74 d	3.0E+10	8.9E+08	4.1E+12	2.2E+12	3.1E+11	3.0E+10	6.0E+12	9.2E+04
Nb-95	35.15 d	4.6E+10	3.7E+09	3.6E+12	9.0E+11	6.2E+06	7.1E+07	4.6E+12	1.2E+05
Ru-103	39.28 d	7.2E+10	2.2E+09	2.6E+12	1.1E+12	1.1E+09	1.7E+11	4.0E+12	1.2E+05
Ru-106	368.2 d	3.8E+12	8.0E+08	1.8E+13	1.3E+13	1.3E+10	2.1E+12	3.7E+13	8.6E+03
Te-129m	33.6 d	1.9E+11	1.8E+08	5.7E+11	3.7E+12	6.4E+13	2.9E+12	7.2E+13	3.9E+03
Ce-141	32.501 d	7.2E+10	3.7E+08	3.9E+11	9.9E+11	2.1E+10	1.6E+11	1.6E+12	1.6E+05
Pu-239	24065 y	4.1E+15	3.9E+05	3.5E+11	2.1E+14	6.9E+09	1.7E+11	4.4E+15	6.0E+01
Pr-143	13.56 d	6.5E+10	1.9E+07	4.1E+10	1.1E+12	2.4E+10	1.6E+11	1.4E+12	1.0E+05
La-140	40.272 h	3.9E+10	1.1E+10	4.9E+11	3.0E+11	4.8E+09	5.1E+09	8.5E+11	1.1E+05
Ce-134	2.062 y	3.7E+11	7.4E+09	1.5E+14	3.7E+13	9.2E+13	8.6E+13	3.7E+14	1.7E+02
Nd-147	10.98 d	5.5E+10	6.3E+08	2.4E+11	9.1E+11	2.0E+10	1.2E+11	1.3E+12	2.8E+04
Pu-240	6537 y	4.1E+15	4.2E+05	7.7E+11	2.1E+14	6.9E+09	1.7E+11	4.4E+15	8.3E+00
Pu-241	14.4 y	8.3E+13	7.6E+03	3.9E+11	4.5E+12	1.5E+08	3.6E+09	8.8E+13	2.9E+02
Sb-125	2.77 y	9.8E+10	2.0E+09	5.8E+13	1.5E+12	7.3E+11	1.4E+11	6.1E+13	3.3E+02
Te-132	78.2 h	7.5E+10	1.0E+09	1.1E+12	7.3E+11	1.2E+13	2.0E+11	1.4E+13	6.5E+02
Ce-136	13.1 d	5.9E+10	1.0E+10	3.8E+12	2.6E+12	7.5E+12	5.4E+12	1.9E+13	4.6E+02
Pu-148m	41.3 d	1.8E+11	9.4E+09	1.1E+13	2.8E+12	5.8E+10	4.4E+11	1.5E+13	5.1E+02
Pu-238	87.74 y	3.7E+15	4.3E+05	7.2E+11	1.9E+14	6.2E+09	1.5E+11	3.9E+15	1.7E+00
Pu-147	2.6234 y	3.1E+11	8.9E+05	5.0E+08	5.0E+11	9.8E+09	8.1E+10	9.0E+11	5.9E+03
Eu-154	8.8 y	2.3E+12	6.0E+09	4.3E+14	4.6E+12	9.2E+10	7.6E+11	4.4E+14	1.0E+01
Ag-111	7.45 d	4.9E+10	1.4E+08	5.5E+10	8.2E+11	2.9E+12	2.3E+11	4.1E+12	7.6E+02
Sn-125	9.64 d	1.2E+11	1.6E+09	1.0E+12	2.4E+12	8.7E+11	1.5E+12	5.9E+12	4.5E+02
Cd-115m	44.6 d	5.8E+11	1.5E+08	4.8E+12	4.8E+12	4.2E+12	4.8E+11	1.2E+13	2.1E+02
Fe-59	44.529 d	1.2E+11	5.7E+09	8.5E+12	2.5E+12	2.6E+11	5.9E+12	1.5E+13	8.8E+01
Fe-59	44.529 d	1.2E+11	5.7E+09	8.5E+12	2.5E+12	2.6E+11	5.9E+12	1.5E+13	8.8E+01

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RADIOISOTOPE RANKINGS BASED ON ORIGIN INVENTORY AND MCRP SCREENING FACTORS

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Effective Dose Air Screening Factors (aron per Ci/a3) Buildup time 30 y								ORIGIN (Ci) Inventory FP/AP/Ac-D 500 MWD/T 30d Buildup	Relative Dose Factor (Total Dose Factor x Inventory) aron-a3
ISOTOPE	Half-life	INHAL	PLUME	GROUND	VEQ	MILK	MEAT	TOTAL	
Y-90	64.0 h	0.7E+10	0.7E+07	3.5E+10	0.7E+11	1.2E+10	2.0E+10	0.1E+11	1.3E+03
Te-125a	58 d	5.0E+10	4.0E+07	1.0E+11	1.5E+12	2.5E+13	1.2E+12	2.0E+13	3.4E+01
Eu-155	4.90 y	3.3E+11	2.7E+08	1.0E+13	7.3E+11	1.5E+10	1.2E+11	1.7E+13	4.5E+01
Nb-95a	80.0 h	1.0E+10	2.0E+08	4.1E+11	2.0E+11	1.3E+08	0.2E+08	0.2E+11	1.1E+03
Np-239	2.365 d	2.0E+10	7.0E+08	0.0E+10	1.0E+11	5.3E+08	3.0E+09	2.0E+11	2.3E+03
Pu-140	5.37 d	0.7E+10	2.0E+09	4.4E+11	1.3E+12	2.0E+10	1.2E+11	2.0E+12	2.3E+02
Ag-110a	249.0 d	0.4E+11	1.3E+10	0.0E+13	5.7E+12	1.7E+13	2.1E+12	1.1E+14	4.1E+00
U-230	4.480E9 y	0.5E+14	5.0E+05	1.0E+14	1.3E+14	2.4E+13	1.0E+14	1.3E+15	3.0E+01
Am-241	432.2 y	4.2E+16	0.0E+07	2.0E+13	1.1E+15	1.4E+11	1.7E+12	5.3E+15	5.4E+02
Mo-99	66.0 h	3.2E+10	7.0E+08	1.2E+11	3.3E+11	2.0E+11	7.1E+10	7.5E+11	2.7E+02
Np-237	2.14E6 y	4.0E+15	3.1E+08	2.3E+14	3.4E+10	7.1E+13	1.0E+15	4.0E+10	4.0E+03
Rb-86	18.68 d	5.3E+10	5.0E+08	3.0E+11	2.0E+12	0.4E+12	5.0E+12	1.0E+13	0.4E+00
Sb-124	60.20 d	2.0E+11	9.2E+09	1.4E+13	4.0E+12	1.4E+11	3.2E+11	1.0E+13	4.7E+00
Co-58	70.80 d	0.7E+10	4.7E+09	0.3E+12	1.5E+12	0.9E+11	3.5E+12	1.5E+13	5.3E+00
Ca-242	102.0 d	1.4E+14	4.0E+05	2.5E+10	3.1E+13	4.1E+09	5.0E+10	1.7E+14	3.3E+01
Mn-54	312.5 d	5.4E+10	4.0E+09	3.5E+13	1.0E+12	1.5E+11	1.3E+11	3.7E+13	1.5E+00
Pr-144	17.20 m	3.5E+08	2.5E+08	2.5E+08	4.1E+10	0.0E+08	0.0E+08	0.5E+08	4.4E+04
I-132	2.30 h	3.0E+09	1.1E+10	3.0E+10	1.7E+08	4.0E+03	2.4E+13	4.4E+10	0.7E+02
Sn-120	1.0E5 y	0.0E+11	2.3E+08	1.0E+15	0.5E+13	7.5E+12	1.0E+13	2.0E+15	1.3E+02
Fe-55	2.7 y	2.1E+10	1.2E+05	3.1E+10	2.0E+11	2.0E+10	7.0E+11	1.1E+12	1.0E+01
Sn-110a	203.0 d	5.0E+10	1.0E+07	2.4E+11	0.1E+11	2.2E+11	5.5E+11	1.0E+12	0.7E+00
U-235	703.0E6 y	0.0E+14	7.1E+08	1.7E+14	1.3E+14	2.5E+13	1.1E+14	1.4E+15	1.3E+02
Tc-99	2.13E5 y	0.7E+10	2.0E+08	5.5E+08	7.0E+13	1.4E+12	3.4E+10	7.1E+13	2.3E+01
Eu-152	13.33 y	1.0E+12	5.5E+09	5.2E+14	3.2E+12	0.3E+10	5.2E+11	5.2E+14	2.0E+02
Sm-151	90 y	2.4E+11	4.4E+03	4.3E+09	1.0E+11	3.0E+09	3.2E+10	4.7E+11	0.1E+01
Rh-108	20.0 a	0.0E+08	1.1E+09	1.7E+07	0.0E+08	0.0E+08	0.0E+08	1.1E+09	0.0E+03
U-230	2.8416E7 y	1.0E+15	5.0E+05	0.0E+11	1.3E+14	2.0E+13	1.1E+14	1.3E+15	5.5E+03
Rh-103a	50.12 a	4.1E+07	0.5E+05	0.2E+04	3.1E+01	1.2E+00	0.0E+00	4.0E+07	1.0E+05
Ag-108a	127 y	2.3E+12	7.0E+09	1.3E+15	1.7E+13	2.0E+13	3.5E+12	1.4E+15	3.5E+03
Ba-137a	2.552 m	0.0E+08	2.0E+09	1.5E+08	0.0E+08	0.0E+08	0.0E+08	3.0E+09	1.5E+03
Te-129	69.0 m	7.2E+08	2.0E+08	0.0E+08	2.1E+02	2.5E+03	0.0E+08	1.7E+09	2.5E+03
Xe-133	5.245 d	0.0E+08	1.7E+08	0.0E+08	0.0E+08	0.0E+08	0.0E+08	1.7E+08	1.3E+04
Pu-140	53.00 h	2.3E+10	7.7E+07	1.2E+10	2.0E+11	3.5E+09	0.1E+09	2.4E+11	0.0E+00

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RADIONUCLIDE RANKINGS BASED ON ORIGEN INVENTORY AND NCRP SCREENING FACTORS

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Effective Dose Air Screening Factors (rem per Ci/m3) Buildup time 30 y								ORIGEN (Ci) Inventory FP/AP/Ac-D 600 MWd/T 30d Buildup	Relative Dose Factor (Total Dose Factor x Inventory) area-m3
NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL	
Tc-99m	6.02 h	2.0E+00	0.1E+00	5.0E+00	4.2E+07	0.0E+04	2.4E+03	5.0E+00	2.0E+02
Th-234	24.10 d	2.0E+11	3.0E+07	3.7E+11	4.2E+12	7.4E+09	3.2E+10	4.0E+12	2.7E+01
Pu-230	2.651 y	1.3E+16	6.0E+06	3.6E+13	7.6E+13	2.4E+11	3.1E+11	1.4E+16	0.1E+04
Ce-244	10.11 y	2.3E+16	4.1E+06	4.7E+11	6.0E+14	7.2E+10	0.1E+11	2.0E+16	2.7E+04
Pu-242	3.703E5 y	3.9E+16	3.0E+06	0.4E+11	2.0E+14	0.6E+09	1.0E+11	4.1E+16	1.4E+04
I-129	1.57E7 y	1.4E+12	3.9E+07	2.0E+13	1.0E+14	0.0E+14	1.7E+14	1.1E+16	4.6E+04
Cd-116	63.40 h	3.4E+10	0.0E+00	1.2E+11	3.0E+11	1.7E+11	4.6E+09	0.3E+11	6.6E+01
Am-243	7300 y	4.2E+16	2.4E+00	2.3E+14	1.1E+16	1.4E+11	1.7E+12	6.6E+16	0.2E+06
Zn-65	243.0 d	1.0E+11	2.0E+09	1.0E+13	0.0E+12	2.3E+13	6.0E+13	1.1E+14	2.0E+03
Ce-132	0.476 d	0.0E+00	3.3E+09	0.3E+11	2.7E+11	7.7E+11	4.2E+11	2.1E+12	1.1E+01
U-234	2.446E5 y	1.1E+16	7.3E+06	7.6E+11	1.4E+14	2.7E+13	1.1E+14	1.3E+16	1.4E+04
Zr-93	1.63E0 y	2.0E+12	0.0E+00	4.6E+11	0.3E+11	6.3E+00	3.3E+00	3.0E+12	3.0E+02
Sn-153	40.7 h	1.0E+10	2.6E+00	2.1E+10	1.3E+11	2.2E+09	3.0E+00	1.7E+11	6.0E+01
Ce-136	2.3E0 y	3.0E+10	0.4E+06	0.0E+00	6.4E+12	1.0E+13	0.6E+12	2.6E+13	3.7E+03
Ni-63	96 y	6.0E+10	0.0E+00	0.0E+00	6.2E+11	1.1E+11	6.7E+10	7.4E+11	1.1E+01
Cr-61	27.704 d	2.7E+09	1.6E+00	1.3E+11	4.0E+10	3.4E+10	1.1E+11	3.2E+11	2.4E+01
Sn-117m	13.01 d	3.6E+10	7.0E+00	3.1E+11	7.1E+11	2.6E+11	4.0E+11	1.0E+12	2.0E+02
Qd-163	242 d	1.0E+11	4.1E+00	4.1E+12	6.3E+11	1.1E+10	0.7E+10	4.0E+12	0.7E+03
Xe-131m	11.9 d	0.0E+00	4.4E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.4E+07	1.1E+03
H-3	12.35 y	6.0E+00	0.0E+00	0.0E+00	1.0E+09	1.0E+00	4.7E+00	4.4E+09	0.6E+00
C-14	5730 y	1.7E+10	2.7E+06	0.0E+00	4.0E+11	2.3E+11	2.7E+11	0.0E+11	3.7E+02
Ce-143	33.0 h	2.7E+10	1.2E+09	0.3E+10	1.2E+11	1.0E+09	1.2E+09	2.2E+11	1.3E+01
Ce-243	20.5 y	2.0E+16	6.0E+00	0.2E+13	7.1E+14	0.2E+10	1.1E+12	3.0E+16	0.3E+00
Sn-121m	66 y	0.2E+10	6.0E+00	3.3E+12	6.3E+12	6.0E+11	1.3E+12	1.1E+13	2.1E+03
Cd-109	404 d	0.1E+11	1.0E+07	6.0E+11	1.0E+13	4.4E+12	6.6E+11	1.7E+13	7.9E+04
Sb-122	2.70 d	4.1E+10	2.1E+09	1.0E+11	4.0E+11	1.4E+10	0.9E+09	7.1E+11	1.0E+02
Kr-85	10.72 y	0.0E+00	2.6E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E+07	1.7E+02
In-116m	4.400 h	1.1E+09	7.6E+00	4.3E+09	6.0E+07	1.1E+06	4.9E+03	0.2E+09	0.1E+01
Nb-94	2.03E4 y	3.3E+12	7.0E+09	1.4E+16	4.1E+12	2.4E+09	3.0E+00	1.4E+16	1.1E+00
Pu-237	45.3 d	1.0E+10	2.2E+00	3.0E+11	1.0E+11	6.0E+00	1.3E+00	6.4E+11	2.0E+03
No-160m	1.20E3 y	0.2E+12	7.0E+09	1.4E+16	4.0E+12	0.1E+10	0.0E+11	1.4E+16	0.4E+07
Re-37A	2.33E4 y	3.3E+12	7.4E+09	1.9E+16	3.7E+12	2.4E+09	3.0E+00	1.7E+16	1.7E+00
Pu-237	45.3 d	1.0E+10	2.2E+00	3.0E+11	1.0E+11	6.0E+00	1.3E+00	6.4E+11	2.0E+03
No-160m	1.20E3 y	0.2E+12	7.0E+09	1.4E+16	4.0E+12	0.1E+10	0.0E+11	1.4E+16	0.4E+07
Pa-231	3.270E4 y	1.0E+10	1.4E+00	1.9E+14	0.2E+16	1.4E+13	3.9E+12	1.7E+10	6.9E+00
Ni-60	7.6E4 y	2.2E+10	2.0E+06	4.0E+11	2.0E+11	4.2E+10	2.1E+10	0.0E+11	0.0E+00

Effective Dose Air Screening Factors (area per Ci/m3) Buildup time 30 y								ORIGIN (Ci) Inventory FP/AP/Ac+D 500 MWD/T 30d Buildup	Relative Dose Factor (Total Dose Factor x Inventory) area-m3
NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL	
Th-231	25.52 h	7.0E+09	5.0E+07	2.0E+09	2.5E+10	2.0E+07	5.0E+06	3.5E+10	1.3E-02
Xe-133m	2.188 d	0.0E+00	1.5E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+08	2.0E+00
Nb-93m	13.6 y	2.3E+11	0.5E+05	5.0E+11	2.0E+11	1.7E+08	2.1E+07	1.0E+12	2.4E-04
Ga-72	14.1 h	1.5E+10	1.4E+10	2.0E+11	2.9E+10	3.0E+07	7.3E+05	2.0E+11	7.5E-04
As-77	30.0 h	0.4E+09	5.3E+07	4.2E+09	4.3E+10	1.1E+09	0.0E+09	0.4E+10	2.7E-03
Th-228	1.9131 y	2.7E+15	9.2E+06	1.4E+14	2.0E+14	1.0E+12	1.0E+12	3.1E+15	4.0E-08
Br-82	35.30 h	1.2E+10	1.3E+10	5.1E+11	5.2E+10	2.0E+11	1.5E+10	0.0E+11	1.0E-04
Ag-110	24.6 s	0.0E+00	2.3E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E+08	5.4E-02
Ac-227	21.773 y	5.4E+10	5.0E+05	3.0E+14	7.0E+15	1.1E+13	1.4E+13	0.1E+16	2.0E-10
I-133	20.6 h	4.7E+10	2.9E+09	0.1E+10	1.4E+11	2.5E+11	1.1E+09	5.2E+11	2.3E-05
Cm-245	8500 y	4.4E+15	3.3E+08	7.5E+13	1.1E+15	1.4E+11	1.0E+12	5.0E+15	1.4E-09
Sm-147	1.06E11 y	0.0E+14	0.0E+00	0.0E+00	9.2E+13	1.9E+12	1.0E+13	7.1E+14	4.4E-09
Ra-224	3.66 d	2.5E+13	4.7E+07	7.4E+11	3.2E+13	0.3E+12	1.0E+12	0.5E+13	4.0E-08
Sn-121	27.06 h	4.1E+09	0.0E+00	0.0E+00	1.9E+10	4.0E+09	4.0E+08	2.7E+10	4.7E-05
Tm-170	120.6 d	2.1E+11	4.0E+07	4.9E+11	2.3E+12	4.0E+10	3.7E+11	3.4E+12	2.5E-07
Th-230	7.7E4 y	2.0E+15	1.0E+06	1.0E+13	2.7E+14	7.0E+11	2.3E+12	2.9E+15	1.9E-10
Be-10	1.6E6 y	2.0E+12	1.0E+07	4.4E+12	2.4E+12	1.5E+09	9.4E+11	1.1E+13	4.4E-06
Cm-246	4730 y	4.3E+15	3.4E+05	0.0E+11	1.1E+15	1.4E+11	1.0E+12	5.4E+15	1.2E-11
Pb-212	10.64 h	1.3E+12	0.9E+08	0.9E+10	1.5E+11	3.7E+09	1.0E+06	1.0E+12	4.0E-08
Cm-241	32.8 d	1.3E+12	2.3E+09	2.3E+12	1.4E+12	2.0E+08	2.2E+09	5.0E+12	0.9E-09
Ag-108	2.37 m	0.0E+00	1.2E+08	1.7E+07	0.0E+00	0.0E+00	0.0E+00	1.4E+08	3.1E-04
Th-229	7340 y	1.7E+16	4.0E+08	3.5E+14	1.0E+15	1.2E+13	1.7E+13	1.9E+16	1.3E-12
Xe-129m	8.0 d	0.0E+00	1.2E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+08	2.0E-04
Zr-97	10.90 h	3.5E+10	9.2E+08	1.0E+11	7.0E+10	2.3E+07	1.0E+05	2.7E+11	7.3E-08
Cu-67	61.06 h	9.0E+09	5.5E+08	4.0E+10	7.9E+10	4.0E+10	1.0E+10	2.0E+11	0.9E-08
Bi-212	60.55 m	1.7E+11	9.2E+08	7.5E+09	1.1E+02	3.1E+06	0.0E+00	1.0E+11	4.0E-08
Xe-127	36.41 d	0.0E+00	1.2E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+09	4.1E-06
Ni-66	54.6 h	0.7E+10	0.0E+00	2.4E+10	0.2E+11	1.0E+11	2.0E+10	9.2E+11	1.9E-09
As-76	26.32 h	3.0E+10	2.1E+09	7.9E+10	1.0E+11	2.2E+09	4.0E+09	2.2E+11	3.4E-09
Nb-97	72.1 m	0.0E+00	3.2E+09	4.0E+09	4.1E+02	3.2E+07	0.0E+00	0.7E+09	7.9E-08
Th-232	1.405E10y	1.3E+16	0.0E+05	1.4E+15	1.0E+15	3.4E+13	2.3E+13	1.0E+16	4.1E-14
Tl-208	3.07 m	0.0E+00	1.0E+10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+10	1.4E-08
Nb-97m	60 s	0.0E+00	3.5E+09	1.4E+08	2.3E+03	5.3E+13	0.0E+00	3.0E+09	0.9E-08

Effective Dose Air Screening Factors (area per Ci/m3) Buildup time 30 y									ORIGEN (Ci) Inventory FP/AP/Ac+D 500 MWD/T 30d Buildup	Relative Dose Factor (Total Dose Factor x Inventory) area-m3
NUCLIDE	Half-life	INHAL	PLUME	GROUND	VEG	MILK	MEAT	TOTAL		
Pr-142	19.13 h	2.3E+10	3.4E+08	1.5E+10	6.0E+10	6.0E+08	6.5E+07	9.9E+10	2.0E+09	2.0E+02
Ra-226	14.8 d	6.2E+13	3.4E+07	5.9E+11	9.5E+13	2.1E+13	6.0E+12	1.9E+14	9.7E+13	1.8E+02
In-116	5.1E15 y	3.0E+13	6.0E+06	1.5E+12	8.0E+13	5.0E+12	2.5E+13	1.4E+14	1.1E+12	1.5E+02
Ba-135m	28.7 h	4.0E+09	2.4E+08	1.0E+10	3.8E+10	3.4E+09	2.3E+07	5.0E+10	2.4E+09	1.3E+02
Tm-171	1.92 y	7.3E+10	2.5E+06	7.3E+10	2.0E+11	4.0E+09	3.3E+10	3.9E+11	2.3E+10	9.1E+01
Pb-210	22.3 y	1.1E+14	6.2E+06	2.1E+13	2.9E+15	2.7E+14	1.9E+14	3.5E+15	7.3E+15	2.5E+01
Ra-226	1600 y	6.9E+13	3.2E+07	1.5E+15	1.3E+15	1.7E+14	7.6E+13	3.2E+15	6.0E+15	2.1E+01
Rn-220	55.6 s	0.0E+00	2.4E+06	1.3E+08	0.8E+04	1.2E+03	3.2E+01	1.3E+08	4.0E+00	5.1E+00
Gd-152	1.08E14 y	1.9E+15	0.0E+00	0.0E+00	0.0E+13	1.6E+12	1.3E+13	2.0E+15	1.1E+15	2.2E+00
Po-210	130.38 d	7.5E+13	4.1E+04	1.0E+00	0.3E+14	1.1E+14	3.4E+14	1.4E+15	6.7E+10	9.4E+01
Ra-226	5.75 y	3.8E+13	3.3E+01	6.1E+14	0.7E+14	1.5E+14	6.1E+13	1.7E+15	3.5E+10	5.9E+01
Kr-81	2.1E5 y	0.0E+00	4.7E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E+07	1.7E+09	0.1E+02
Pd-109	13.427 h	0.8E+09	2.5E+07	2.2E+09	1.2E+10	1.4E+08	1.4E+05	2.3E+10	3.2E+12	7.4E+02
U-240	14.1 h	1.0E+10	8.2E+06	3.1E+10	2.0E+10	2.0E+09	2.3E+07	7.9E+10	6.0E+13	4.7E+02
Bi-210	5.012 d	1.6E+12	2.5E+07	2.2E+10	2.6E+11	6.9E+10	6.9E+10	2.7E+12	6.5E+15	1.7E+02
Rn-222	3.8235 d	0.0E+00	1.8E+06	8.9E+11	2.3E+09	1.0E+20	0.0E+00	8.9E+11	5.5E+15	4.9E+03
Sc-40	43.7 h	3.3E+10	1.0E+10	7.7E+11	2.9E+11	4.7E+09	5.9E+09	1.1E+12	4.4E+15	4.8E+03
Cm-240	3.39E5 y	1.0E+16	3.0E+05	5.5E+11	4.0E+15	5.2E+11	6.5E+12	2.0E+16	1.5E+19	3.1E+03
Ac-228	6.13 h	2.5E+12	4.5E+09	3.2E+10	1.3E+09	1.4E+04	2.2E+01	2.5E+12	3.5E+10	8.6E+04
Bk-249	320 d	1.1E+13	5.4E+04	7.1E+11	2.9E+12	3.7E+08	4.6E+09	1.4E+13	4.0E+17	5.6E+04
Na-24	15.00 h	9.7E+09	2.2E+10	3.0E+11	1.0E+10	5.3E+10	1.0E+08	4.0E+11	9.9E+10	3.9E+04
I-130	12.36 h	2.1E+10	1.0E+10	1.5E+11	2.2E+10	2.3E+10	6.9E+06	2.3E+11	1.6E+15	3.8E+04
Pb-214	26.8 m	6.2E+10	1.2E+09	4.3E+09	2.8E+08	2.2E+25	0.0E+00	6.8E+10	5.5E+15	3.7E+04
Bi-214	19.9 m	5.3E+10	7.5E+09	2.7E+09	2.3E+14	0.0E+00	0.0E+00	6.3E+10	5.5E+15	3.5E+04
Cu-64	12.701 h	2.2E+09	8.8E+08	1.4E+10	2.3E+09	5.0E+08	9.0E+05	2.0E+10	7.1E+15	1.4E+04
Cf-249	350.6 y	4.5E+15	1.5E+09	3.0E+14	1.1E+15	1.5E+11	1.8E+12	5.9E+15	7.7E+21	4.6E+05
Ca-47	4.53 d	5.2E+10	5.1E+09	6.0E+11	7.1E+11	2.4E+12	5.6E+10	3.9E+12	2.0E+18	7.9E+06
Kr-79	35.04 h	0.0E+00	1.2E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+09	4.1E+15	5.0E+06
Sr-91	9.5 h	1.3E+10	3.4E+09	5.9E+10	7.6E+09	5.2E+08	3.0E+06	8.4E+10	6.3E+10	5.3E+07
Y-91m	49.71 m	2.9E+08	2.5E+09	2.0E+09	9.3E+05	3.3E+04	2.6E+05	5.6E+09	4.0E+10	2.2E+08
Mg-28	20.91 h	3.9E+10	5.5E+09	3.5E+11	1.1E+11	1.6E+11	2.7E+08	6.8E+11	1.3E+20	0.9E+09
Xe-135	9.09 h	0.0E+00	1.2E+09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+09	2.2E+18	2.6E+09
Al-28	2.240 m	0.0E+00	9.2E+09	3.6E+08	0.0E+00	0.0E+00	0.0E+00	9.6E+09	1.3E+20	1.3E+10
Eu-152m	9.32 h	6.5E+09	1.5E+09	1.9E+10	4.6E+09	1.8E+07	2.0E+04	3.2E+10	2.4E+23	7.7E+13
Eu-152m	9.32 h	6.5E+09	1.5E+09	1.9E+10	4.6E+09	1.8E+07	2.0E+04	3.2E+10	2.4E+23	7.7E+13

APPENDIX E

MEASURED CONCENTRATIONS OF RADIONUCLIDES IN THE COLUMBIA RIVER

APPENDIX E

MEASURED CONCENTRATIONS OF RADIONUCLIDES IN THE COLUMBIA RIVER

J. K. Soldat (Draft 1969)

INTRODUCTION

The concentrations of about 70 radionuclides have been measured occasionally in samples of the cooling water leaving the Hanford production reactors and entering the Columbia River. These analyses, together with appropriate factors for dilution and radioactive decay, have been used to estimate the concentrations of the radionuclides in the river at Richland, Washington. This evaluation was done principally to generate an order of magnitude estimate of the concentrations of several radionuclides that might be present in the Columbia River at levels below their detection limit.

RADIOCHEMICAL ANALYSES

The three detailed radiochemical analyses of reactor effluent water available for the present study were performed in 1956, 1964, and February 1968. The results are summarized in Table I.^(a) Not all 70 nuclides were reported in each sample. The 1968 data were used whenever possible. If no analysis was reported in 1968 or if the result was quoted as a less than value, the 1964 data were applied. The 1956 results were not used in the present analysis but were included for comparison with the later data. Note that these older data were reported as concentrations 4 hours after sample time, while the 1964 and 1968 results were corrected for radioactive decay back to time of sampling.

The different nuclides reported in each analysis depend, among other things, on the expertise of the laboratory personnel in interpreting gamma spectrometric analyses of the samples and upon the degree of chemical separation applied prior to this gamma analysis. Certain gamma energies present in

(a) The analytical data was furnished in a private communication from J. P. Corley to J. K. Soldat, March 20, 1969.

trace amounts could easily be interpreted as different nuclides by different laboratories or by the same laboratories at different points in time.

Radiochemical analyses of certain radionuclides are performed routinely on samples of Columbia River water collected at Richland, Washington. During 1968, the long lived nuclides were measured in weekly and monthly cumulative samples, while the shorter-lived nuclides were measured in monthly grab samples. The results of these analyses for the sampling periods closest to the data of the effluent water analysis (2/20/68) are presented in Table II.

DILUTION FACTOR

The apparent dilution of the reactor effluent in the Columbia River was estimated by comparison of the concentrations measured at Richland and the corresponding concentrations measured in the effluent water. For the nuclides with half-lives of 2 weeks or less, account was taken of the amount of radioactive decay which had occurred between the discharge point and the measurement point. The ratio of concentrations in the river (pCi/L) to that in the effluent (pCi/mL) was then calculated. Table III summarizes the results of this comparison.

The apparent dilution ratios in Table III range from 1 to 10. Even though the ratio should depend upon the number of reactors operating, there is no large difference between the range of values for those nuclides for which 1968 data were available and for those for which 1964 data were applied. The average of the ratios listed in Table III is 6. If those which seem to have been significantly reduced by sedimentation and/or biological removal are deleted (e.g., ^{46}Sc , ^{54}Mn , and ^{56}Mn), the average becomes 8. The one nuclide which is least affected by radioactive decay or biological uptake in the river is ^{51}Cr and it has the highest apparent dilution ratio (~10). Three other nuclides have similar ratios. Those with smaller ratios are probably significantly removed from the river water by biological activity and/or sedimentation. The latter is true for ^{46}Sc which is one of the major contributors to river shoreline contamination. It seems appropriate therefore to use a ratio of 10 to calculate the concentrations in the river at the point of discharge. Concentrations further downstream can then be calculated assuming radioactive

decay is the only removal process. This is obviously an over-simplification, which can result in values which are up to an order of magnitude too high, for those radionuclides that are accumulated in biota and/or sediment.

RADIOACTIVE DECAY

By 1968, the majority of the effluent activity was being discharged to the river from the 100-K reactor area. The river flow rate in late February 1968 was 75,000 cfs.⁽¹⁾ The travel time in the river from the 100-K reactor discharge point to the Richland sample point at the stated flow is 16 hours.⁽²⁾ Prior to discharge into the river, the reactor effluent passes through effluent retention basins where a short delay time is experienced. This delay time is small compared to the travel time in the river and is within the range of errors present the travel-time estimate. Therefore, the total decay time between effluent sample analysis and Columbia River at Richland was taken to be 16 hours.

RESULTS

The results of applying the appropriate dilution ratio and decay factors to the effluent concentrations, are shown in Table IV. The concentrations in the river at the point of discharge, assuming no radioactive decay or deposition in the effluent basins are shown in Column 2. Decay during travel through the basin is significant only for ^{134}I and ^{138}Cs . The estimated concentrations in the river at Richland, Washington, are shown in Column 5, and the concentrations actually measured there are shown in Column 6 for comparison. Excluding those nuclides for which fallout of weapon test debris is a significant source (^3H , ^{90}Sr - ^{90}Y , and ^{131}I), there is reasonable agreement (within an order of magnitude) between the predicted and measured values. This is true even for those nuclides where the prediction is based on the 1964 effluent analyses.

The values in Table IV represent only an approximation to the concentrations at Richland at one point in time. The quantities of radionuclides discharged to the river with the reactor effluent water vary with time. The river flow rate also varies widely throughout the year, affecting 1) the

amount of water available for dilution, 2) the travel time from the point of discharge to Richland, and 3) the rate of deposition of certain nuclides to the river bottom and the shoreline mud. Thus, not only do the numerical values of the concentrations change, but also the relative abundance of the radionuclides can change with river flow rate.

REFERENCES

1. Woolridge, C. B., ed. "Environmental Surveillance in the Vicinity of Hanford for February 1968," BNWL-778-2, (Unclassified), April 30, 1968.
2. J. K. Soldat, "Columbia River Flow Time Calculations," HW-58312 Rev., (Unclassified), July 1, 1962.

TABLE I - Concentrations of Several Radionuclides in Reactor Effluent Water, pCi/mL

Nuclide	1968	1964	1968(a) (4 hr Decay)	Nuclide	1968	1964	1968(a) (4 hr Decay)
3H	2.8	10	-	139Ba	-	100	-
24Na	910	800	500	140Ba	-	1	2
31Si	-	800	170	140La	13	10	4
32P	30	20	10	141Ce	1.7	0.5	1
45Ca	-	0.7	0.6	143Ce	-	1.5	1
46Sc	64	1	1.5	144Ce	3.7	0.2	<0.1
51Cr	310	500	300	142Pr	-	5	1
54Mn	0.95	0.4	0.3	143Pr	-	0.5	0.1
56Mn	-	7000	1000	147Nd	-	0.3	0.6
59Fe	4	1	0.3	147Pm	-	0.1	-
60Co	0.5	0.4	0.2	149Pm	-	0.7	0.3
64Cu	420	600	700	151Pm	-	0.4	0.2
65Ni	-	2	<0.07	153Sm	-	24	8
65Zn	-	10	15	152mEu	-	61	8
69mZn	-	40	70	152Eu	-	0.2	-
72Ga	-	20	35	156Eu	-	0.3	0.2
76As	120	100	280	153Gd	-	0.02	-
87mSr	5	5	-	159Gd	-	1	-
89Sr	0.32	0.6	0.3	160Tb	-	0.1	-
90Sr	0.012	0.01	0.02	161Tb	-	0.05	-
90Y	0.012	2	10	165Dy	-	40	-
91Sr	7	10	17	166Ho	-	2	-
91Y	<15	0.3	0.4	169Er	-	0.2	-
92Sr	50	50	30	171Er	-	1	-
92Y	20	-	-	232Th	<0.02	-	-
93Zr	1.9	-	-	238U	<0.007	-	-
93Y	20	5	10	239Pu	<0.02	-	-
95Zr	1.9	-	-	240Pu	<0.02	-	-
95Nb	6	0.4	0.3	239Np	120	200	300
99Mo	3	1	2				
103Ru	0.9	0.04	0.05				
106Ru	-	0.01	-				
122Sb	-	10	-				
124Sb	-	0.3	-				
131I	1.2	0.5	1				
132I	4	20	4				
133I	10	7	25				
134I	30	100	-				
135I	<370	10	10				
136Cs	-	0.06	0.1				
137Cs	-	0.01	0.01				
138Cs	-	100	-				

(a) 1968 data are reported as of 4 hours after sample time. The 1964 and 1968 data were corrected for radioactive decay back to the time of sample collection.

TABLE II. Concentrations of Selected Radionuclides Measured in Columbia River at Richland, Washington (February 1968), pCi/L

Nuclide	Grab Sample 2/13/68	Cumulative Sample 2/19-26/68	Value Chosen for Present Evaluation
^3H	-	<103(a)	~103(b)
^{24}Na	2170	-	2170
^{32}P	192	216	216
^{46}Sc	-	96.7	96.7
^{51}Cr	1500	3270	3270
^{54}Mn	12.7	1.64(a)	1.64
^{56}Mn	136	-	136
^{64}Cu	1090	-	1090
^{65}Zn	74.9	99.1	99.1
^{76}As	461	-	461
^{90}Sr	-	0.60(a)	0.60(b)
^{95}Zr - ^{95}Nb	-	<5.00(a)	~10(c)
^{99}Tc	-	6.36(a)	6.36
^{106}Ru	-	<5.00(a)	<5.00
^{122}Sb	79.2	-	79.2
^{131}I	12.6	18.9	18.9(d)
^{239}Np	1010	-	1010

- (a) Analysis performed on a monthly composite of the weekly cumulative samples.
- (b) The source of ^3H and ^{90}Sr in the Columbia River is fallout of debris from weapons testing. The value for ^3H for January was 1900 and for March was 1300.
- (c) The results for the February monthly composite seem inordinately low. The values for January and March were 7.4 and 12.8, respectively.
- (d) Occasionally increased ^{131}I is also present from fallout.

TABLE III. Estimated "Dilution Factors" for Reactor Effluent Water in the Columbia River

Nuclide	Concentration in River, pCi/L			Concentration in Effluent, pCi/mL	Ratio River, pCi/L Effluent, pCi/mL
	Measured at Richland	Decay(a) Correction	Calculated at Discharge Point		
²⁴ Na	2170	0.477	4550	910	5.0
³² P	216	0.968	223	36	6.2
⁴⁶ Sc	96.7	-	96.7	64	1.5
⁵¹ Cr	3270	-	3270	310	10.5
⁵⁴ Mn	1.64	-	1.64	0.95	1.7
⁵⁶ Mn	136	0.0140	9710	(7000)	(1.4) (b)
⁶⁴ Cu	1090	0.420	2600	420	6.2
⁶⁵ Zn	99.1	-	99.1	(10)	(9.9)
⁷⁶ As	461	0.657	702	120	5.8
¹²² Sb	79.2	0.848	93.4	(10)	(9.3)
²³⁹ Np	1010	0.821	1230	120	10.0

(a) For a travel time of 16 hours.

(b) Numbers () are based on 1964 data

TABLE IV. Comparison of Estimated and Measured Concentrations of Radionuclides in Columbia River Water (pCi/L)

Nuclide	Estimated River Concentration				Measured Concentration
	at Point of Discharge	t1/2 (hr)	$e^{-\lambda t(a)}$	at Richland	
^3H	28	-	-	28(b)	~103(c)
^{24}Na	9100	15	0.477	4300	2700
^{31}Si	(8000) (d)	2.62	0.0145	(116)	-
^{32}P	360	343	0.968	349	220
^{45}Ca	(7)	-	-	(7)	-
^{46}Sc	640	-	-	640	97
^{51}Cr	3100	-	-	3100	3300
^{54}Mn	9.5	-	-	9.5	1.6
^{56}Mn	(70,000)	2.6	0.014	(980)	140
^{59}Fe	40	-	-	40	-
^{60}Co	5	-	-	5	-
^{64}Cu	4200	12.8	0.420	1800	1090
^{65}Ni	20	2.6	0.014	0.28	-
^{65}Zn	(100)	-	-	(100)	99
^{69}mZn	(400)	13.8	0.448	(180)	-
^{72}Ga	(200)	14.1	0.455	(91)	-
^{76}As	1200	26.4	0.657	790	460
^{87}mSr	50	2.83	0.0199	0.99	-
^{89}Sr	3.2	-	-	3.2	-
^{90}Sr	0.12	-	-	0.12	0.60(c)
^{90}Y	0.12	64(c)	0.841	0.10	~0.60(c)
^{91}Sr	70	9.67	0.318	22	-
^{91}Y	3.0	-	-	3.0	-
^{92}Sr	500	2.71	0.0167	8.4	-
^{92}Y	200	3.53	0.0432	8.6	-
^{93}Y	200	10.1	0.334	67	-
^{95}Zr	19	-	-	19	<2.5
^{95}Nb	60	-	-	60	<2.5
^{99}Mo	30	67	0.847	25	-
^{99}Tc	-	-	-	-	6.4
^{103}Ru	9	-	-	9	-
^{106}Ru	(0.1)	-	-	(0.1)	<5.0
^{122}Sb	(100)	64.8	0.843	(84)	79
$^{124}\text{Sb}(c)$	(3.0)	-	-	(3.0)(c)	-
^{131}I	12	193	0.944	11	16
^{132}I	40	2.26	0.00739	0.30	-
^{133}I	100	20.8	0.587	59	-
^{134}I	300	0.877	3.2×10^{-6}	1×10^{-3}	-
^{135}I	(100)	6.61	0.187	(19)	-
^{136}Cs	(0.6)	314	0.965	(0.58)	-
^{137}Cs	(0.1)	-	-	(0.1)	-
^{138}Cs	(1000)	0.537	1.1×10^{-9}	(1×10^{-6})	-
^{139}Ba	(1000)	1.38	0.00032	(0.32)	-

TABLE IV. (contd)

Nuclide	Estimated River Concentration				Measured Concentration
	at Point of Discharge	$t_{1/2}$ (hr)	$e^{-\lambda t(a)}$	at Richland	
¹⁴⁰ Ba	(10)	-	-	(10)	-
¹⁴⁰ La	(30)	40.2	0.759	99	-
¹⁴¹ Ce	17	-	-	1.7	-
¹⁴³ Ce(c)	(15)	33	0.715	(11)	-
¹⁴⁴ Ce(c)	37	-	-	3.7	-
¹⁴² Pr	50	19.2	0.561	(28)	-
¹⁴³ Pr	(5.5)	326	0.967	(4.8)	-
¹⁴⁷ Pr	(3)	266	0.9592	(2.9)	-
¹⁴⁷ Pm	(1)	-	-	(1)	-
¹⁴⁹ Pm	(7)	53.1	0.812	(5.7)	-
¹⁵¹ Pm	(4)	27.8	0.671	(2.7)	-
¹⁵³ Sm	(240)	46.8	0.789	(190)	-
^{152m} Eu	(610)	9.3	0.303	(180)	-
¹⁵² Eu	(2)	-	-	(2)	-
¹⁵⁶ Eu	(3)	365	0.970	(2.9)	-
¹⁵³ Gd	(0.2)	-	-	(0.2)	-
¹⁵⁹ Gd	(10)	18.0	0.540	(5.4)	-
¹⁶⁰ Tb	(1.0)	-	-	(1)	-
¹⁶¹ Tb	(0.5)	166	0.935	(0.47)	-
¹⁶⁵ Dy	(400)	2.33	0.00857	(3.4)	-
¹⁶⁶ Ho(c)	(20)	26.9	0.662	(13)	-
¹⁶⁹ Er	(2)	223	0.951	(1.9)	-
¹⁷¹ Er	(10)	7.52	0.299	(3.0)	-
²³² Th	<0.2	-	-	<0.2	-
²³⁸ U	<0.07	-	-	<0.07	~0.5(e)
²³⁹ Pu	<0.2	-	-	<0.2	-
²⁴⁰ Pu	<0.2	-	-	<0.2	-
²³⁹ Np	1200	56.5	0.822	990	1010

- (a) At a river flow of 75,000 cfs, the travel time is 16 hours.
 (b) The February monthly average at Priest River Dam was 2500 pCi/L; the January and March averages at Richland were 1900 and 1300, respectively.
 (c) Essentially all from fallout.
 (d) Values in () were obtained from 1964 data.
 (e) Naturally occurring at ~1 µg/L.

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APPENDIX F

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7231 HDRDocument Title Selection of Dominant Radionuclides for
Phase I of the HDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
1.	J. Stohr (JS)	Page 1.1, para 1, line 14	Misspelled "Pproject."	Corrected.
2.	JS		For Phase I, inclusion of iodine-131 in the surface water calculations may prove useful. It would point out the associated low-dose and possibly add some credibility to these initial estimates.	NA - Iodine-131 not investigated in river pathway in Phase I - future work.
3.	K.L. Garlid (KLG)		The paper gives me the impression of a kind of scattered, shotgun approach, and I don't think that's the impression you want to give. Careful editing might be worthwhile, because this is an important component of the Phase I work.	The intent of this document is to indicate the radionuclides important to dose across a range of conditions. For the air pathway, it investigates a range of potential fuel burnups, a range of potential fuel cooling times, and a range of potential exposure pathway conditions and individual exposures. This information is supplemented with independent estimates of the radionuclide impact embodied in the NCRP screening factors. For the river pathway, it investigates a range of potential exposure pathway conditions and individual exposure mechanisms, and considers potential variability in the source
NA = No	action.			

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7231 HEDB

Document Title Selection of Dominant Radionuclides for
Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
4.	KLG		The criteria for selecting the isotopes is not clear. In the water pathway isotope tables, some of the percentages add up to more than 100%, and some to only 80% or so.	<p>term by applying monitoring data for a number of years (thus implicitly covering a range of reactor power levels and fuel conditions). A paragraph describing this matrix of investigations has been added to Section 3.</p> <p>Tables 4.1 through 4.8 are prepared from the detailed information in Appendixes B and C. Rounding of the detailed values sometimes yields results that slightly exceed 100%, but for simplicity (and as an implicit acknowledgment of the uncertainty), only 2 significant figures are used in the tables. The radionuclides were selected for final recommendation based on both the frequency in which they appeared in the general tables in Section 4 and the relative magnitude of the doses presented in the appendixes. A paragraph has been added to Section 4.2 to elucidate this concept.</p>
NA = No	action.			

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7231 HEDRDocument Title Selection of Dominant Radionuclides for
Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
5.	KLG		I am not convinced that it is wise to label many of the isotopes "dominant" at this stage. There is no doubt about the iodine-131 being dominant, but for the water-pathway isotopes, the term seems rather arbitrary.	NA - Of the potentially hundreds of radionuclides released to the Columbia River during historical Hanford operations, at most a few dozen contribute essentially all of the dose. Those listed in the tables in Section 4 or the recommendation of Section 5 are generally those that actually do "dominate" the dose to most people, although some may contribute only a few percent to the total for any one individual.
6.	G.S. Roessler (GSR)		Tables in Appendix are hard to read.	Appendix tables are direct computer printouts. The only way to make them clearer would be to retype each page.
7.	GSR		A list of important elements and their abbreviations would be helpful for persons not intimately familiar with all 100+ elements.	A list of abbreviations was added on page xi.
8.	GSR	Page iii, para. 1	Add TSP, Direction, etc. in paragraph.	Added.
9.	GSR	Page 1.1, para. 1, line 14	Project, not Pproject	Corrected.
NA = No action.				

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7231 I&DR

Document Title Selection of Dominant Radionuclides for
Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
10.	B. Shlison (BS)		I am concerned by the lack of emphasis on uncertainty analysis and estimates of accuracy and precision which appear to be associated with the Phase I results.	NA - Future work
11.	BS		The following pathways need attention: Air-Rainout-Runoff-River Water-Irrigation-Backyard Cow-Milk-Humans, and Air-Rainout-Runoff-Ci-terns-Irrigation-Background Cow-Milk-Humans	NA - Future work
12.	BS		If the dose cut-off limit is set low, say 10 mrem whole body and 30 mrem thyroid, would we not have to consider many more radionuclides? When would this consideration occur?	NA - Rationales for scoping decisions will be proposed for future work.
13.	D. Price	Page 33	The diet items are not well defined and many common items are missing.	NA - The dietary information presented in Table 3.1 includes the basic pathways selected for the Phase I HEDR model, as well as representing the general groupings historically used at Hanford. This information is described in more detail in PNL-7274 HEDR, <u>Computational Model Design Specification for Phase I of the Hanford Environmental Dose Reconstruction Project</u> . The category for "other vegetables" includes potatoes, beets, and others. The
NA = No	attention			

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7231 HEDRDocument Title Selection of Dominant Radionuclides for
Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
14.	G.G. Caldwell (GGC)	Page 1.3, lines 2-6; page 2.3, para. 2, lines 2-5	These statements are true only for the transport by ground water to the river. How will well water be handled?	"milk" category includes butter, cheese, and other milk products. The holdup times assigned to each pathway deal with the fractionation between fresh and stored. The diet is derived from Hanford-related dietary surveys performed in the 1950s and 1960s. NA - Future work in FY 1991.
15.	GGC	Page vii, para. 1, lines 14-22	Mention the other biologically important radionuclides, if only to explicitly indicate their small quantity and relative unimportance.	NA - Selection of "biologically important" radionuclides depends on the pathways being considered and the interests of the reader. They are all included in Appendixes B and C. Inclusion here is not feasible without greatly increasing the complexity of the summary.
16.	GGC	Page 3.3, Table 3.1	Does "drinking water" include that from both the river and wells?	NA - In the instance referred to, only river water is included. Groundwater is not explicitly
NA = No action.				

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Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
17.	M.A. Robkin (MAR)	Page 2.1	The statement of how radionuclide quantities are determined is not complete. The quantities of short-lived radionuclides are determined by the fuel power level.	treated in this report, and drinking from riparian wells should be bounded by doses from drinking from the river itself. A sentence has been added to complete the discussion.
18.	MAR	Page 4.2, Table 4.4	The importance of the milk pathway is not clear from the table, which shows its contribution to the dose from iodine-131 to be only about 6%.	NA - The tables show only relative magnitude for each exposure scenario, not absolute magnitude. The percentages can be added downwards only, not across. What is indicated in Table 4.4 is that, even without including milk, iodine dominates the dose through inhalation and crop ingestion. The absolute results presented in Appendix B indicate that the milk pathway for these scenarios could provide over 60% of the dose to an individual.
NA = No action.				

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Comment Number	Comment	Page, Paragraph	Comment Summary	Resolution
19.	M.L. Blazek	Page 3 1	The "highly desirable additions" should be added as well as iodine-131 in Phase I.	NA - The nine river pathway radio-nuclides stated in the text were studied in Phase I. Iodine-131 will be studied for the river pathway in future work.
20.	A. Slicapoo		Is this a final determination?	No; future work will determine contribution of other radio-nuclides to dose.
21.	W.S. Till [WST]		Insert tables and figures in the text after callout, rather than at end of report.	Tables and figures now follow their callouts as closely as possible.
22.	WE I	Page vii, line 5	"to the environment <u>from</u> Hanford..."	Wording was changed.
23.	WET Σ	Page vii, line 10	"1964-1966 for releases to surface water..."	Wording was changed.
24.	WET	Page vii, line 14	Make it clear in the summary that we are referring to effective dose equivalent. This is important to understand for the 1944-47 releases.	A sentence has been added to the Summary in response to this comment.
25.	WST	Page vii	Sixth line from bottom: Again, say "releases to surface water..."	Wording was changed.
26.	WET	Page 2.1, para 2	Begin first sentence with "The results of the study to date indicate the largest releases ..."	Change was made.
NA = No action				

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27.	JET	Page 2.3, para. 3	Second sentence: Define "processed," and specify "brief."	The sentence has been revised to address this comment.
28.	JET	Page 2.4	First sentence: "70 <u>additional</u> radionuclides ..."	Change was made.
29.	JET	Page 3.1, para. 3, line 2	We usually refer to "immersion" in air rather than submersion.	NA - At Hanford, the terminology has historically been "submersion" when describing air, and "immersion" when describing water. This distinction has been retained for continuity with the historical documents.
30.	JET	Page 4.1, para. 4	Figures of the data in Tables 4.1 and 4.2 would be useful.	Figures 4.1 and 4.2 have been added in response to this comment.
31.	JET	Page 4.2, para. 2, line 3	"radionuclides"	Corrected.
32.	JET	Page 4.3, Table 4.3	What is meant by NCRP Screening Fractions?	NA - The headings read "NCRP Screening, Release Fractions" and "NCRP Screening, No Release Fractions", as described in Section 4.1.
33.	JET	Page 4.8, Table 4.8	Did you carry out a similar evaluation for a pulse release to air?	NA - No acute release calculations were performed for the air
NA = No action.				

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

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34.	JET	Page A.1	I assume the 10.D, 30.0D, etc. refer to cooling time. Can these be labeled? It is not necessary if a major change in the code is required.	<p>pathway, because the radionuclide spectrum would be the same as for the routine releases considered. This evaluation was done for the river releases only because the spectrum of radionuclides released was so different from the routine releases.</p> <p>NA - The assumption is correct. Because this appendix is a reproduction of output from a computer code (ORIGEN2) developed outside the HEDR Project, no changes have been made.</p>
NA = No action.				

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