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Volume 2

Users Manual

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PRESTO-EPA-POP: A Low-Level Radioactive Waste Environmental Transport and Risk Assessment Code

Volume 2

USERS MANUAL

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PREFACE

This two-volume PRESTO-EPA-POP model documentation provides the background information on the mathematical modeling used to generate the basic data for the Environmental Impact Statement (EIS) which is used to support EPA's rulemaking for generally applicable environmental standards for the management and disposal of low-level radioactive wastes (LLW). Volume 1 of the PRESTO-EPA-POP documentation presents the theoretical bases of the mathematical model and their implemented computer code for the assessment of the cumulative population health effects (including fatal cancer deaths and serious genetic effects) to the general population residing in the downstream regional basin of a LLW disposal site. The model simulates the leaching of radionuclides from the waste matrix, the hydrological, hydrogeological, and biological transports, the resultant human exposures, and finally the assessment of the probable health effects for the entire regional water basin population. Volume 2 of the PRESTO-EPA-POP documentation provides the information on the structure of the computer code and how it is used in the health effects assessments.

The two volumes present enough model detail so that interested persons may apply the model, using appropriate and applicable input data, for assessing the cumulative population health effects from a LLW disposal site.

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EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) is responsible for developing a generally applicable standard for the land disposal of low-level radioactive waste (LLW). As an aid in developing the standard, a family of computer codes, entitled PRESTO-EPA-POP, PRESTO-EPA-DEEP, PRESTO-EPA-CPG, PRESTO-EPA-BRC and PATHRAE-EPA, has been developed under EPA direction. The PRESTO-EPA-POP code was the first code developed and served as the basis for the other PRESTO-EPA codes in the family. PRESTO-EPA-POP estimates potential health effects to local and regional populations from the shallow land disposal of low-level radioactive waste under a wide variety of hydrologic, geologic, climatic, site engineering, and waste form conditions. The EPA uses the PRESTO-EPA code family to compare the potential health impacts of a broad number of LLW disposal alternatives to evaluate and support its decisions for the LLW standard.

This report documents the PRESTO-EPA-POP computer code and provides information and guidance in the use of the code. The PRESTO-EPA-POP code was implemented by Rogers and Associates Engineering Corporation under EPA direction to estimate cumulative population health effects from low-level radioactive waste buried in shallow trenches. The code can be used for both local health effect assessments and for regional basin health effect assessments for up to 10,000 years following the end of LLW disposal operations at a site.

The user of the PRESTO-EPA-POP code, may simulate a specific waste type, a specific form for the waste and special containers. The user may also simulate particular site engineering and waste emplacement configura-

tions such as sanitary landfill, use of deeper trenches, or installation of trench caps with either natural or special low permeability obtained from use of clays and compaction. The PRESTO-EPA-POP code treats all LLW trenches and their wastes as a single, representative, combined trench and volume of wastes.

Water, principally from precipitation, is the primary agent of release and transport of radioactivity from LLW disposed in shallow trenches. Geology, hydrology, and climate affect the mode and rate of release, the dominant transport pathways, and the rate of transport. The input data base to the PRESTO-EPA-POP code is designed with flexibility to accommodate varying hydrologic and climatic conditions.

The PRESTO-EPA-POP code can simulate typical water-related release and transport phenomena. Precipitation falling on the ground surface above the trench is apportioned between infiltration into the trench through the trench cap, drainage away from the site by surface runoff, and evaporation into the atmosphere. The user can specify the time and percent of trench cap failure, when the trench contents are exposed directly to surface erosion, and the time duration of container integrity. Radionuclides released from the waste by infiltrated water are transported away from a LLW disposal trench primarily by groundwater or surface runoff. The amount of groundcover, length and steepness of the slope, and runoff percent can be specified to simulate erosion of the surface soil and the trench cap. Radioactively contaminated water exfiltrating into the subtrench soil zone may ultimately enter an aquifer. Radionuclides that reach the aquifer will be transported horizontally within the aquifer. These radionuclides are generally transported at a slower rate than the ground water velocity in

the aquifer due to hydrological and geochemical interaction with the solid materials in the aquifer which retards nuclide migration. Some of the radionuclides which enter the aquifer may reach irrigation or water supply wells or surface streams and become available for human uptake. Those not taken up by the local population travel to a regional basin stream as residual radionuclides.

The overflow of contaminated water from the trench onto the surface soil is simulated when conditions are suitable for overflow. With overflow, radionuclides are transported by surface runoff into nearby streams and may become available for human consumption via irrigation or drinking water. Residual radionuclides in the streams which are not consumed during the 1,000 year assessment period are assumed to be released to the regional basin within one year.

The exposure of the local population to radionuclides transported from LLW sites by the atmospheric pathway is also simulated. The atmospheric transport calculations nominally assume that the local population resides within a single 22.5-degree sector. User specified parameters give the fraction of the year that the wind blows in that sector. A simple external model not contained in the PRESTO-EPA codes enables the user to make downwind atmospheric concentration calculations which properly distributes atmospheric contamination to population centers throughout a 360 degree circle around the site, to model more complicated population distributions.

Radionuclides remaining on the soil surface by trench overflow from spillage during disposal operations or erosion of the trench cap may become suspended in the atmosphere and transported downwind. These nuclides may

be inhaled or deposited on vegetation and soil resulting in external exposure to humans and internal exposure from the ingestion of contaminated crops, meat, and milk.

The PRESTO-EPA-POP code considers the routine migration of radionuclides from the trench through the hydrologic and atmospheric environmental pathways to crops and drinking water. Normal scenarios assume that the population resides downstream of the plume of contamination and ingests radionuclides from various hydrologic, atmospheric, and food chain pathways. Processes considered in calculating individual or population exposure include groundwater transport under saturated or partially saturated flow conditions, surface runoff, trench water overflow and seepage, geochemical exchange, trench cap erosion, stream dilution, and resuspension and atmospheric dispersion of contaminated soil.

Average annual concentrations of each radionuclide in water, soil, or the atmosphere are used to calculate radionuclide concentrations in foodstuffs. Information from foodstuffs and human ingestion and breathing rates are utilized to calculate the annual average intake of radionuclides per individual in the population by ingestion and inhalation. These intake data are used by the DARTAB subroutine to estimate dose rates, health effects, and genetic effects.

The PRESTO-EPA-POP code calculates doses, health effects, and genetic effects for individuals and local populations. Each person in the population is assumed to be a member of a large population cohort that is exposed to constant, averaged radionuclide concentration levels. Each member of the population is assumed to ingest similar but appropriate quantities of contaminated food and water.

The PRESTO-EPA-POP code considers special exposure and pathway scenarios for inadvertent intruders residing on or farming the site. The inadvertent resident intruder scenario assumes that an intruder unknowingly excavates a basement in the disposal trench while building a residence. The individual is externally exposed to the buried radionuclides from the walls of the basement of the residence which are assumed to be surrounded by trench material. The time of residency during the assessment period when the residence is first occupied and the composition of the initial trench inventory which contributes to exposure are specified by the user.

Farming on the site after loss of institutional control is also treated as a separate intrusion scenario. The farmer is affected by the transport processes previously described and may also ingest crops whose roots have penetrated into the radioactive waste in the trench. The water used by the farmer for irrigation and drinking normally would contain a much higher concentration of radioactivity than water used by the off-site population because the water is taken from a well, stream, or pond immediately adjacent to the disposal trench. Farming activities may mechanically suspend contaminated soil into the atmosphere. The time when mechanical suspension of the surface soil is initiated by farming is specified by the user. The impact of such mechanical suspension is calculated for both the farmer and the downwind population.

The PRESTO-EPA-POP code can be used to make health effect assessments for up to 10,000 years following the end of the disposal operations for the local population and that of a regional basin. These assessments are made in two stages. The first stage calculates the health effects to the local population for up to 1000 years and the second stage calculates the health

effects to the larger regional basin population (incorporating the local population after 1000 years) over 10,000 years. The local assessment period may be extended for several thousand years or more, but with a significant increase in computer time and costs.

The health effects to the regional basin population are based on the cumulative residual radionuclides leaving the disposal area with the surface water or groundwater. Residual radioactivity is calculated by taking into account the time required for the radionuclides to flow through the aquifer from the local use point to the basin stream. All radionuclides not consumed by the local population are allowed to migrate to the regional basin population. Additional dilution in the regional basin stream occurs by contributions from surface runoff and stream flow.

The end of LLW disposal operations at a site is the starting time for the health effects assessments made by the code. The user specifies the length of time for the local assessment period, usually 1,000 years. The regional basin assessment period is optionally set equal to the local assessment period or the local assessment period plus 9,000 years. For the local assessment, subtotals for the releases to surface water, well, and atmosphere may be calculated and printed at a number of user-specified time intervals within the assessment period. EPA normally reports releases every 100 years for a standard 1,000 year run. Health effects for the local population are averaged over the length of the local assessment period.

The time step for the PRESTO-EPA-POP code is fixed at one year and default parameters in the model give annual averages. The maximum concentration of each radionuclide and the year of the maximum for each

nuclide is printed out for the concentrations in the atmosphere, well, and stream.

The PRESTO-EPA-POP code uses unit response, bookkeeping, and scheduled event types of subroutines. The unit response subroutines calculate the annual response for a process. The INFIL unit response subroutine calculates the annual infiltration through an intact trench cap which is apportioned within each year by the bookkeeping subroutines. Other unit response models calculate the atmospheric radionuclide concentration transported downwind per unit source strength and the annual average erosion of the trench cap.

Bookkeeping subroutines follow the results of unit response subroutines and user-supplied control options. For example, the TRENCH subroutine, which maintains a water balance in the trench, calculates the maximum level of standing water in the trench and the water volume annually leaving via the trench bottom or overflow. Scheduled event subroutines consider the events such as cap failure, basement construction, the failure of container integrity, and initiation of scheduled mechanical suspension of dust. The timing for these events is specified by the user.

The PRESTO-EPA-POP code is written in the FORTRAN IV language to run on an IBM 3081 or comparable digital computer system and requires about 850K bytes of memory. The code is designed to model up to 40 distinct radionuclides for a maximum of 10,000 years. Evaluation of local and regional basin health effects from 31 radionuclides over 10,000 years takes approximately 7 minutes to execute on the IBM 3081. An assessment with ten nuclides takes less than two minutes to execute. The program should be easily transferable to other IBM installations. The program has run

satisfactorily on another non-EPA IBM computer system after installation directly from magnetic tape. Non-IBM users may have to modify the NAMELIST inputs and perhaps some other program segments where character manipulations are used.

The Environmental Protection Agency wishes to warn potential users that, like any complex computer code, the PRESTO-EPA codes can be misused. Misuse could consist of using the code to examine a site where one or more critical modeling assumptions are invalid, or where values for significant input parameters are chosen that do not accurately reflect variables such as radionuclide inventory, site meteorology, surface and subsurface hydrology and geology, and future population demographics. Certain release and transport scenarios, such as major changes in meteorology or mining of the trench contents, are not considered in the PRESTO-EPA-POP model and code. Significant changes to the existing code and the input data would be required to consider such scenarios. The PRESTO-EPA codes were developed to assess and compare alternative methods for managing and disposing of LLW at generic sites for general scenarios. The codes were not developed to analyze specific sites.

1. INTRODUCTION

1.1 PURPOSE OF THE USERS MANUAL

The U.S. Environmental Protection Agency (EPA) is developing a generally applicable standard for the land disposal of low-level radioactive waste (LLW) to support the U.S. Nuclear Regulatory Commission (NRC), the U.S. Department of Energy (DOE) and others in developing a national radioactive waste management system. As an aid in developing the standard, a family of computer codes, entitled PRESTO-EPA-POP, PRESTO-EPA-DEEP, PRESTO-EPA-CPG, PRESTO-EPA-BRC and PATHRAE-EPA, was developed under EPA direction. The EPA uses the PRESTO-EPA code family to estimate and compare the potential health impacts of a broad number of LLW disposal alternatives for evaluation and support of the LLW standard. Table 1-1 provides a brief description of each of the PRESTO-EPA codes. These codes, and how the EPA uses them, have been described in detail (Ga84). Information on obtaining complete documentation and users' manuals for the PRESTO-EPA family of codes (EPA87a through EPA87g, Me81, Me84) is available from the EPA.

The primary purpose of this User's Manual for the PRESTO-EPA-POP computer code is to provide the necessary information for the preparation of the input data and executing this code. A detailed discussion of the assumptions, models, and methodology can be found in the document, PRESTO-EPA-POP: A Low Level Radioactive Waste Environment Transport and Risk Assessment Code, Methodology Manual (EPA87a).

The Environmental Protection Agency wishes to warn potential users that, like any complex computer code, the PRESTO-EPA codes can be misused.

TABLE 1-1

PRESTO-EPA CODE FAMILY

PRESTO-EPA CODE	Purpose
PRESTO-EPA-POP	Estimates cumulative population health effects to local and regional basin populations from land disposal of LLW by shallow methods; long-term analyses are modeled (generally 10,000 years).
PRESTO-EPA-DEEP	Estimates cumulative population health effects to local and regional basin populations from land disposal of LLW by deep methods.
PRESTO-EPA-CPG	Estimates maximum annual whole-body dose to a critical population group from land disposal of LLW by shallow or deep methods; dose in maximum year is determined.
PRESTO-EPA-BRC	Estimates cumulative population health effects to local and regional basin populations from less restrictive disposal of BRC wastes by sanitary landfill and incineration methods.
PATHRAE-EPA	Estimates annual whole-body doses to a critical population group from less restrictive disposal of BRC wastes by sanitary landfill and incineration methods.

Misuse could consist of using the code to examine a site where one or more critical modeling assumptions are invalid, or where values for significant input parameters are chosen that do not accurately reflect variables such as radionuclide inventory, site meteorology, surface and subsurface hydrology and geology, and future population demographics. Certain release and transport scenarios, such as major changes in meteorology or mining of the trench contents, are not considered in the PRESTO-EPA-POP model and code. Significant changes to the existing code and the input data would be required to consider such scenarios. The PRESTO-EPA codes were developed to assess and compare alternative methods for managing and disposing of LLW at generic sites for general scenarios. The codes were not developed to analyze specific sites.

1.2 DESCRIPTION OF THE MODEL

The PRESTO-EPA-POP model has been designed to calculate cumulative health effects to the local population resulting from the disposal of low level radioactive wastes in trenches. The model also calculates the health effects to the population of a regional basin. The local population is analyzed for a time period of up to 1000 years and the regional basin population for the same period of time. The regional basin analysis can be optionally extended for an additional 9000 years.

PRESTO-EPA-POP is a modular computer code and readily permits modification and allows different versions of the submodels and subroutines to be substituted, if desired. PRESTO-EPA-POP first simulates the environmental transport of radionuclides from the low level waste trench to the environment of the local and regional basin population. Then

PRESTO-EPA-POP calculates doses and health effects using the DARTAB model for the local population and a separate health effects accounting model for the regional basin population. Calculations in DARTAB are based on average internal intakes of radioactive materials and average external radiation exposures. Internal intakes arise from ingestion of contaminated foods and water and inhalation of contaminated air. Direct external exposures arise from air and soil contaminated with radioactive material. For a detailed account of the DARTAB methodology see Section 2.3 in the DARTAB documentation report (Be81). The health effects calculations for the regional basin population are based on the total amount of radionuclides released to the regional basin through a basin stream during the assessment period, usually taken to be 10,000 years.

Many of the submodels included in PRESTO-EPA-POP were initially developed for other types of assessments and have been adapted to estimate the environmental transport of radioactive waste and ensuing health effects resulting from LLW disposal.

The code has been developed to handle different hydrogeologic and climatic situations and has been subjected to extensive expert review (EPA87h). PRESTO-EPA-POP can also treat waste leaching and the underground water pathway transport of nuclides under partially saturated as well as saturated hydrogeologic conditions. Other improvements of the code which resulted from expert review include: 1) a feature to account for the delay and reduction of the leaching process resulting from the use of waste containers; 2) a farming scenario to simulate farming of the trench with plant root uptake of radionuclides from the waste; 3) the calculation of radionuclide transit times in the aquifer from the well to the point of

release to the regional basin stream; 4) revised formulas for the radionuclide concentrations in vegetation; 5) an area source term as opposed to a point source term for the air pathway; 6) calculations which reduce the trench radionuclide inventory at the start of simulation due to radioactive decay during the operational period.

Three types of subroutines are used in the code: 1) unit response subroutines, 2) bookkeeping subroutines, and 3) scheduled event subroutines. The unit response subroutines calculate the annual response associated with a given process. For example, INFIL calculates the annual infiltration through an intact trench cap. This annual infiltration is then apportioned among the transport processes by the bookkeeping subroutines. Other unit response subroutines calculate the annual average atmospheric dispersion coefficient and erosion rate from the trench cap.

Bookkeeping subroutines account for the results of unit response subroutines and user supplied control options. For example, one subroutine maintains the water balance in the trench, calculates the level of standing water in the trench and accounts for the volume of water leaving the trench.

Average concentrations of each radionuclide in the environmental media such as well water or the atmosphere over the local assessment period are used to calculate radionuclide concentrations in foodstuffs. Foodstuff information and average human ingestion and breathing rates are utilized to calculate the annual average radionuclide intake per individual in the local population by ingestion and inhalation. These intake data are then used to estimate dose rates and health effects for the local population.

The atmospheric transport calculations performed by the code assume that the total population resides within the same 22.5-degree areal land

sector. User specified parameters give the fraction of the year that the plume blows in that sector. Therefore, each member of the population, breathing at the same rate, will inhale the same quantity of each radionuclide. A user option allows the standard atmospheric dispersion calculation in the code to be replaced by an externally calculated value for X/Q for several population centers. For example the RADE3 code (EPA87h) can perform this external calculation.

Each member of the local population is assumed to eat the same quantities and varieties of food, all grown on the same fields. This assumption simplifies the calculations and is appropriate because of the large uncertainties in predicting individual mobility, population demography, agricultural and dietary practices, and geologic and hydrologic changes that may occur during the local analysis period.

Different scenarios of human exposure to radiation from the buried waste may be considered by changing appropriate input parameters. These include normal disposal site operations, spillage of waste during disposal operations, a resident intruder on the site, farming of the site, and an eroded trench cap with subsequent atmospheric contamination via suspension of mixed waste material and soil. By changing other site description parameters, the user may design other scenarios of interest. To satisfy the potential assessment needs of EPA, it was determined that the code would be able to perform certain calculations for various combinations of exposure pathways. The exposure pathways for each of the scenarios are listed in Table 1-2. Other combinations of pathways may be evaluated by modifying the input parameters.

TABLE 1-2

RADIOLOGICAL EXPOSURE PATHWAYS FOR SELECTED SCENARIOS

Scenario	Local Population
Normal	Ingests off-site water Ingests off-site foods Inhales downwind air
Farming	Ingests on-site foods Ingests off-site water
Eroded Trench	Inhales suspended material at population centroid Direct exposure from plume

Operational spillage is defined as residual radioactivity remaining on the soil surface at the close of burial operations arising from leakage or spillage. Annual average meteorology for the site is part of the required input data. All members of the local population are assumed to use the same sources of drinking and irrigation water contaminated from trench seepage or overflow. The population age distribution and size are held constant over the assessment period. The user can specify the fraction of drinking and irrigation water that is supplied from the contaminated well or stream. Doses and health effects to populations are calculated by characterizing the population centers for each site with a single, effective geographic centroid location and a total population. Individual dose calculations from atmospheric releases under the normal scenario are for a person at the site boundary in the prevailing downwind direction. Individual doses due to waterborne effluents may also be calculated at the site boundary.

For the intrusion scenario, individual calculations assume that the intruder receives an external dose from excavating a basement and residing in the basement on the trench location in addition to the dose from the surrounding contaminated ground. The time of onset and duration of the basement exposure scenario are user specified.

For the farming or reclamation scenario, the on-site farmers grow and eat vegetables, beef, and milk produced on land irrigated by contaminated trench water, but drink off-site water equal in concentration to the normal scenario population intake. The farmer also may inhale suspended, contaminated soil from the residual operational spillage or trench overflow. Population dose and health effects calculations for the farming

scenario may assume that the food products grown on-site are ingested by the general population rather than only the farming population. The eroded trench scenario comes into play when the trench cap has become completely removed or breached by either erosion or mechanical means. Thereafter, the eroded trench scenario may result in the suspension and atmospheric transport of trench contents and inhalation of radioactive materials by an individual or the specified population. An individual may also be directly exposed to trench contents and, thus, receive an external dose. Populations may also receive an external dose from immersion in the suspended plume.

The code is structured to consider only one scenario per computer run. The particular scenario to be simulated may be determined by the user by changing appropriate input values of such parameters as the population size and location, the distance to the well, the cap failure fraction, the resuspension rate, etc.

1.3 OVERVIEW OF THE PRESTO-EPA-POP CODE

Pathways of environmental transport of radionuclides considered by the PRESTO-EPA-POP model are shown in Figures 1-1 and 1-2. Pathways for environmental transport of radionuclides that involve water (Figure 1-1) include both surface water and groundwater. Water may leave the trench through the bottom or by overflow. The user may choose to allow the soil surface to be contaminated initially by operational spillage. Radionuclides in water near the soil surface may be transported to a surface water body or may enter the aquifer by deep seepage. Contaminated water may ultimately reach human receptors by the use of water from either a well or a surface

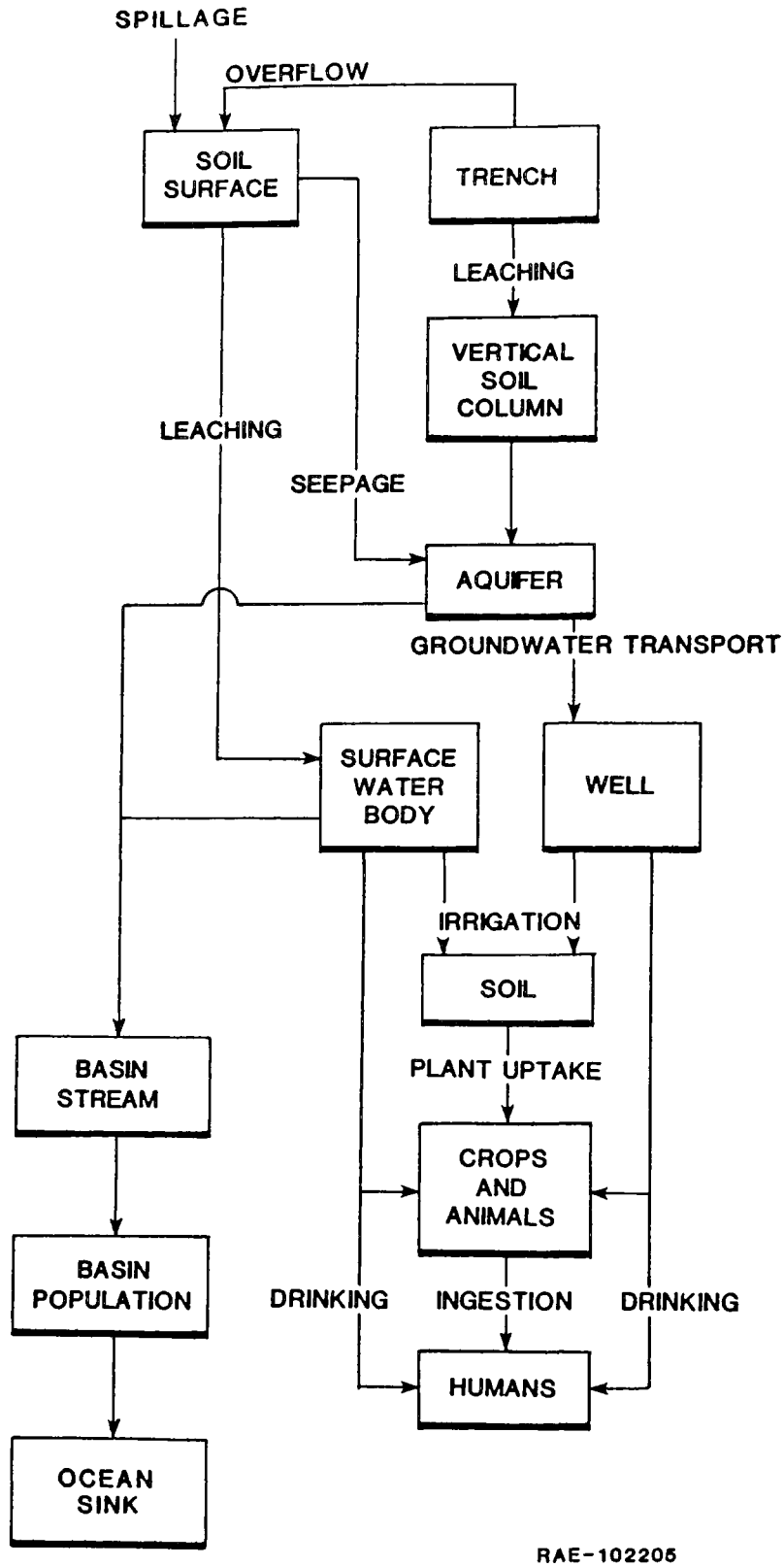

FIGURE 1-1. HYDROLOGIC ENVIRONMENTAL TRANSPORT PATHWAYS.

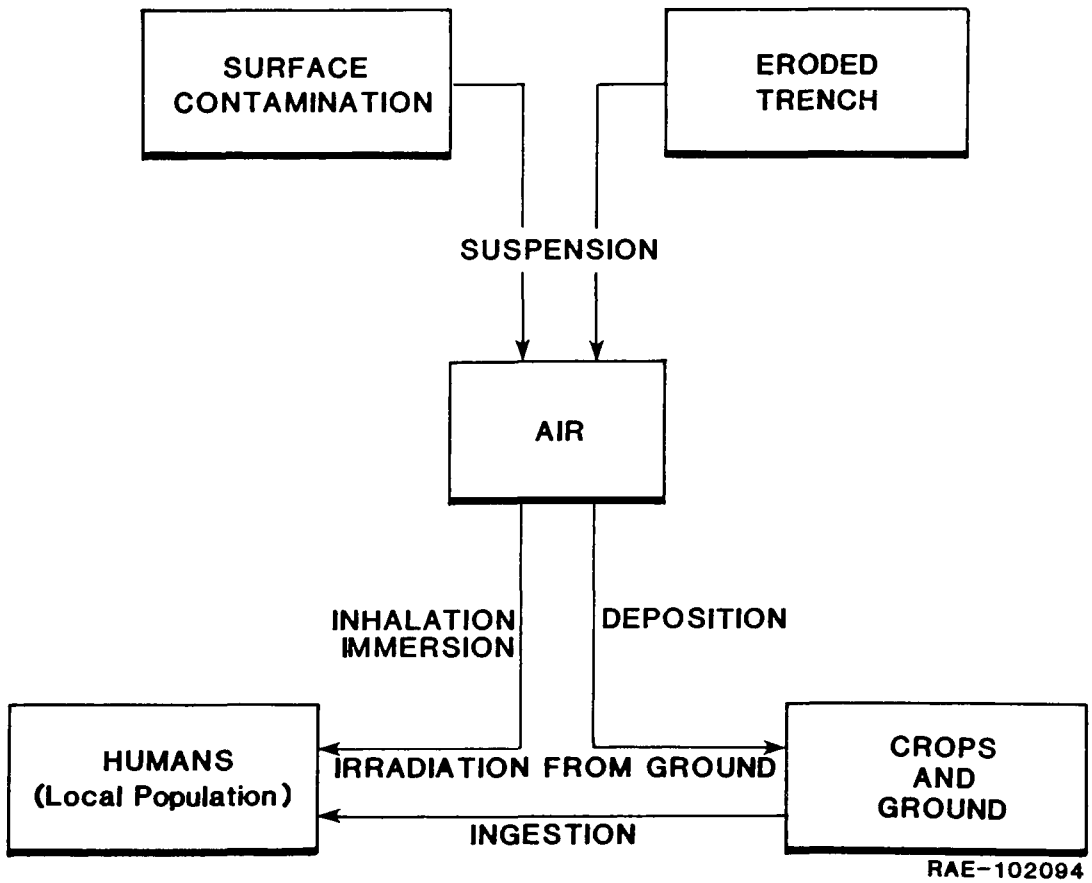

FIGURE 1-2. ATMOSPHERIC ENVIRONMENTAL TRANSPORT PATHWAYS.

water body. Radionuclides not withdrawn with water for the local population consumption will flow to the regional basin. Radionuclides not withdrawn by the regional basin population will flow to the ocean, which acts as a radionuclide sink.

Atmospheric pathways of radionuclide transport are illustrated in Figure 1-2. Radioactive material may reach the atmosphere from the contaminated soil surface via overflow or operational spillage or the denuded trench following an eventual total erosion of the cap after closure of the trench. Humans may ultimately be impacted by inhalation of or immersion in suspended materials downwind, by ingestion of crops contaminated following deposition on soil or crops, or by direct irradiation following deposition on ground surfaces.

Table 1-3 provides a summary of the main steps of the PRESTO-EPA-POP code in the order of execution. Various indentation symbols are used to help explain the structure of the program. A "*" symbol indicates a significant section of the main program; a "-" symbol a significant section of a yearly loop; and a "o" symbol a significant section of a nuclide loop.

1.4 OUTLINE OF USER'S MANUAL

A general description of PRESTO-EPA-POP is given in this Chapter for the user interested in brief development of the model. An overview of the code is also provided for the user interested in the code's algorithms and the implementation of the methodology. Appendix A provides the source listing of the PRESTO-EPA-POP code. In Chapter 2 the input data is described in detail and a sample input data file is presented in Appendix B.

TABLE 1-3

PRESTO-EPA-POP CODE SUMMARY OF MAIN STEPS

Code Summary Statement Steps

* Initialize variables and call subroutine SOURCE for input data.

* Obtain atomic mass data from nuclide names.

* Determine if farming occurs on site.

* If CHIQ is zero then subroutine AIRTRM is called to calculate the normalized atmospheric concentration within the risk area. Otherwise variable EXPOS is set equal to CHIQ (the externally provided atmospheric concentration).

* Subroutine INFIL is called to determine the annual infiltration through the trench cap.

* For each nuclide, the DO loop "1000" calculates:

  - The vertical transit time from the trench to the aquifer.

  - The horizontal transit time in the aquifer from the trench point to the well.

  - The transit time in the aquifer from the well to the basin stream.

  - Hung's correction factor which accounts for combined effects of dispersion and decay.

* Subroutine ERORF is called to determine the annual soil loss due to the erosion of insoluble materials.

* Calculate the available well water volume and the hypothetical amounts of water withdrawn from well and stream.

* For each year of the simulation period, the following operations are performed by the DO loop 1000.

  - Determine if a trench loss occurs and update for the current trench cap thickness.

  - Calculate the fraction of vegetation roots growing into the waste (for on-site farming scenario option).

---

* Section of Main Program.
- Section of Yearly Loop.
- Section of Nuclide Loop.

TABLE 1-3
(Continued)

Code Summary Statement Steps

- Subroutine TRENCH is called to calculate the water balance in the trench.

- The container failure fraction, CFF, is calculated to estimate the delay and containment efficiency of waste container.

- For each nuclide, DO loop "500" performs the following operations to simulate the radionuclide transport from the trench to the well; to the stream waters; and the atmospheric transportation.

• Subroutine LEACH is called to calculate the amount of radionuclide that leaves from bottom of trench to the aquifer and the amount that reaches the surface as a result of water overflowing the trench.

• Subroutine VERHOR is called to determine the arrival at the well of radionuclides leaving the bottom of trench, the current year of simulation and the radionuclides that left the contamintated surface the preceding year. Releases to the basin downstream are recorded for each one of the ten millenia of the simulation period. This recording is governed by the trench-to-well and well-to-basin stream transit times. QDWSB(N) will contain the releases to the basin the first millenium QLB(N,M) contains the releases in the M+1st millenium for M = 1,2,...9. QLB(N,10) considers the radioactivity in transit to the well at year 10,000.

• Calculate the radionuclide concentration at the well site for the current year. Radionuclides arriving at the well before the year 1000 are partially removed from the well with the well water used by the local population. A percentage, PRJ, of the remaining water is transferred to the downstream basin the same year, and the remaining water is assumed to bypass the regional basin stream.

• Update AQAVG to compute the average nuclide concentration of well water.

---

* Section of Main Program.
• Section of Yearly Loop.
\- Section of Nuclide Loop.

TABLE 1-3
(Continued)

Code Summary Statement Steps

- • Check for the year of the maximum nuclide concentration at the well site.
- • Subroutine SURSOL is called to calculate the amount of surface contaminant that enters the stream and the aquifer.
- • Subroutine SUSPND is called to calculate the atmospheric source strength at the spillage area and the average nuclide concentration at the downwind risk area.
- • Determine the radioactive material balance.
- - For each nuclide, DO loop "900" performs the following operations to simulate the radionuclide transport from the well, stream and air to food, water, and air consumed by humans.
- • Subroutine FOODA is called to calculate the radionuclide concentration in vegetables, milk, and meat consumed by man resulting from atmospheric deposition.
- • Subroutine IRRIGA is called to calculate the radionuclide concentration in vegetables, milk, and meat resulting from irrigation water.
- • Subroutine HUMEXA is called to calculate the radionuclide intake by man.
- • Calculate the basement exposure.
- • Determine if the current year has the highest air concentration, surface concentration, ingestion rate per person, or inhalation rate per person.
- - Subroutine OUT is called to output the annual dose summary.

* Subroutine FOOD is called to calculate the average radionuclide concentrations in food due to atmospheric deposition.

* Subroutine IRRIG is called to compute the average radionuclide concentrations in food due to water irrigation.

---

* Section of Main Program.
• Section of Yearly Loop.
\- Section of Nuclide Loop.

TABLE 1-3
(Continued)

Code Summary Statement Steps

* Subroutine HUMEX is called to compute the annual average radionuclide intake by man.

* Calculate variables necessary to pass to DARTAB.

* Subroutine DARTAB is called to create tables of predicted health impacts of radioactive effluents on the local population.

* Yearly loop "1001" will simulate the environmental transport of radionuclides from the trench to the downstream basin, and the releases to the atmosphere, for an additional 9000 years if user options IXTS is left blank in the input data.

  - Subroutine trench calculates the trench water balance.

  - Subroutine LEACH calculates the amounts of radioactivity leaving the trench by overflow or percolation through the bottom of the trench.

  - Additions to the aquifer well and stream are calculated using the results from LEACH and the transit times.

  - Additions to the aquifer and to the stream from the subsurface disposal site are calculated using the subroutine SURSOL.

  - Releases to the atmosphere by wind and mechanical resuspension are calculated using the subroutine SUSPND.

* Health effects on the basin population are calculated.

* Table for the Accounting Model is produced.

---

* Section of Main Program.
• Section of Yearly Loop.
- Section of Nuclide Loop.

In Chapter 3 the output of the model is described. Chapter 4 presents a sample problem and the typical IBM job control language required to execute the code. A sample output is presented in Appendix B. After implementation of the code the user can test the code with the sample input data and compare the results to the sample output.

2. INPUT DATA FOR PRESTO-EPA-POP

There are four sets of input data required by PRESTO-EPA-POP. They are: 1) site specific and radionuclide data used to calculate nuclide concentrations by the environmental transport section of the code, 2) namelist format data used for DARTAB calculations of tabular output, 3) hydrogeologic and meteorologic data for subroutine INFIL, and 4) dosimetric and health effects data used by the DARTAB submodel. Preparation of the first three data sets will be explained in the following sections. The fourth data set is created by executing the RADRISK program (Du80). This reference should be consulted for information concerning the data in this input file.

These four sets of data are organized in three disk files and assigned to different FORTRAN input units as follows:

- Data sets 1 and 2 form one file which is assigned to input unit 5.
- Data set 3 is assigned to unit 4.
- Data set 4 is assigned to unit 25.

Sample input data for 1, 2, and 3 are given in Appendix B.

2.1 SITE SPECIFIC AND RADIONUCLIDE DATA

These data are used in the transport section of the code, they include the physical and hydrogeologic characteristics of the disposal site, data for the biological pathways, and the radionuclide inventory. These data also include control and option parameters to configure different exposure scenarios. Table 2-1 presents a description of the input data variables along with the required input format.

TABLE 2-1

DESCRIPTION OF PRESTO-EPA-POP ENVIRONMENTAL AND NUCLIDES INPUT

Card	Variable (Input Format)	Description
CARD 1	Run Identification (20A4)	
	TITLE	- Identifies the run. Up to 80 characters are allowed.
CARD 2	Location and Site Description (20A4)	
	LOCATE	- Lists the location of the disposal site. Up to 80 characters are allowed.
CARD 3	Time, Nuclides, and Farming Control Parameters (16I5)	
	MAXYR	- The number of years for which the simulation will run.
	NONCLD	- The number of radionuclides which are used in the simulation. Must be 40 or less.
	LEAOPT	- The leaching option. Radionuclides will be removed from trench in different manners depending on the value of LEAOPT. Must be one of the following calculation methods. (Option 1 through 5.)

Option	Leach Calculation Method
1	Total contact, distribution coefficient
2	Immersed fracton, distribution coefficient
3	Total contact, solubility
4	Immersed fraction, solubility
5	Release fraction

NYR1, NYR2	- Beginning and ending years of trench cap failure. Both values must be less than or equal to MAXYR. NYR2 must be greater than or equal to NYR1.
IOPVWV	- Option for direct farming in the waste. < 0 no on-site farming = 0 on-site farming = 1 on-site farming with vegetation decay
IOPSAT	- Not used.

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	IPRT1, IPRT2, IDELT	- Control parameters. An annual summary table will be produced for each year that is a multiple of IDELT and falls between the range of IPRT1 and IPRT2.
	IRRES1, IRRES2	- Beginning and ending year for the mechanical suspension of contaminated soil into atmosphere. Used in the farming scenario.
	LIND	- Option parameter passed to DARTAB to calculate health effects. If LIND = 0 then DARTAB computes concentrations and rates for maximally exposed individuals. If LIND = 1 then general population concentrations are computed.
	IAVG1, IAVG2	- Beginning and ending years for averaging nuclide concentration values.
CARD 4	External Exposures and Time Duration Parameters (16I5)	
	IVAP	- Not used.
	IBSMT	- The beginning year for the basement correction factor for surface gamma exposure calculations made by DARTAB. If IBSMT > 0 correction factor is calculated beginning in that year. If IBSMT = -1 then no correction is calculated.
	IAQSTF	- Not used.
	IXTS	- Control parameter to extend global assessment for an additional 9000 years beyond the local impact analysis period (MAXYR). A blank field defaults to the extended analysis. A nonzero integer stops the global impact simulation at the end of the local assessment period.
	IRST	- Number of years of restricted site use after site closure.
	INTYR(I), I=1,3	- Intermediate years in the local assessment period for which dose and risk output is desired. Up to three times allowed.

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
CARD 5	Water Infiltration and Use (8F10.0)	
	PCT1, PCT2	- The fraction of the waste cap that is assumed to fail between the years NYR1 and NYR2.
	WWATL	- Fraction of irrigation water supplied by contaminated water from well (1.0 if all water comes from well, 0.0 if none).
	WWATA	- Fraction of animal drinking water supplied by contaminated water from well (1.0 if all water comes from well, 0.0 if none).
	WWATH	- Fraction of human drinking water supplied by contaminated water from well (1.0 if all water comes from well, 0.0 if none).
	SWATL	- Fraction of irrigation water supplied by contaminated water from stream (1.0 if all water comes from stream, 0.0 if none).
	SWATA	- Fraction of animal drinking water supplied by contaminated water from stream (1.0 if all water comes from stream, 0.0 if none).
	SWATH	- Fraction of human drinking water supplied by contaminated water from stream (1.0 if all water comes from stream, 0.0 if none).
CARDS 6-12	Comments and References (20A4)	
		- These cards are available for comments and references pertaining to data set. Up to 80 characters allowed in each of six cards.
CARD 13	LLW Site Characteristics (8F10.1)	
	TAREA	- The total combined radioactive waste surface area for the facility being simulated (m^2). Must be nonzero.
	TDEPTH	- Nominal depth (m) of operating trench in the shallow disposal scenario. Includes cover thickness.
	OVER	- Thickness of trench overburden (m). This must be equal to YGMAX of INFIL.

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	PORT	- Porosity of material within trench. Must be nonzero.
	DENCON	- Mean density of the waste materials in the trench (g/cm^3).
	RELFAC	- The annual release fraction of the total trench inventory of each radionuclide if LEAOPT = 5 (see Card 3).
	CPRJ	- Complement to one for the fraction of underground water flowing to the stream (0.0 means 100 percent to the regional basin river).
	SINFL	- Annual infiltration rate for the noncap portions of the site and for local farmland (m/yr).
CARD 14	Groundwater Saturation (2F10.0)	
	SSAT	- Fraction of water saturation in the ground formation beneath the buried waste. If SSAT = 0 or if left blank, the fraction of saturation is calculated internally by the code.
	RESAT	- Fraction of residual saturation.
CARD 15	Site Operations and Waste Containers (6F10.0)	
	PERMT	- Trench permeability (m/yr).
	FACTIM	- Number of years of active operation of the waste site.
	TMN	- Number of years of active maintenance after site closure. No nuclide migration is initiated during the maintenance period, although radioactive decay takes place.
	CFT1	- Number of years before waste containers begin failing.
	DCFT	- Number of years after CFT1 that containers fail completely. At time CFT1+DCFT all containers have failed.

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	FGAM	- Dimensionless factor characterizing the intensity and duration of gamma exposure from the basement scenario.
CARD 16	Transport Parameters (2F5.0, 7F10.0)	
	DTRAQ	- The distance from the bottom of the trench to the nominal depth of the aquifer. DTRAQ + TDEPTH should equal the aquifer depth below the surface (m).
	DWS	- Distance between the well and stream for basin effects calculations (m).
	DWELL	- Distance from the trench to the well used for irrigation and drinking. Must be nonzero (m).
	GWV	- Velocity of the groundwater in the aquifer. Must be nonzero (m/yr).
	AQTHK	- Thickness of the aquifer at the location of the well (m). This is used to calculate the volume of water in which the available radionuclides are diluted. Must be nonzero.
	AQDISP	- Dispersion angle of the pollutant plume in the aquifer (radians). Used with AQTHK to calculate dilution volume. Must be in radians.
	PORA	- Aquifer porosity.
	PORV	- Sub-trench porosity.
	PERMV	- Sub-trench permeability (m/yr).
CARD 17	Atmospheric Parameters (7F10.0)	
	H	- Atmospheric source height of radionuclides (m). One meter is chosen because most re-suspension rate measurements are expressed for that height.
	VG	- Settling velocity of contaminated soil particles due to gravity (m/s).

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	U	- Annual average wind speed (m/s) in the direction of interest. For population calculations this is the wind speed toward the population centroid. Must be nonzero.
	VD	- Deposition velocity (m/s). Nominal generic value is 0.01 m/s.
	XG	- Distance (m) from source (trench) to population or individual of interest. If XG is less than PD, the adjacent farming option will be triggered.
	HLID	- Height of the inversion layer or lid (m).
	ROUGH	- Hosker's roughness parameter (m).
CARD 18	Atmospheric Parameters (7F10.0)	
	FTWIND	- Fraction of the time the wind blows toward the population or individual of interest.
	CHIQ	- User specified atmospheric transport parameter which may be calculated by an external atmospheric dispersion code (s/m^3). A nonzero value will override any calculation of atmospheric dispersion performed within code.
	RE1, RE2, RE3	- Factors (including algebraic signs) used in the resuspension rate equation.
	RR	- During the period between years IRRES1 and IRRES2, the resuspension rate RR (sec^{-1}) will be included as a source term in subroutine AIRTRM. For on-site reclaimer, RR is the dust loading of the inhaled air (gm/m^3).
	FTMECH	- The rate of resuspension, RR, is modified by this fraction, which has a value between zero and unity.
CARD 19	Atmospheric Stability (2I5)	
	IT	- Indicator variable for the type of atmospheric stability class formation. Suggested formation is Pasquill-Gifford, IT = 1.

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	IS	- Stability category indicator. Values of 1 to 6 correspond to stability categories of A-F. A single value represents the most common stability category from nearest meteorology station to site of interest.
CARD 20	Precipitation Parameters (6F10.0)	
	RAINF	- The rainfall factor (R/yr).
	ERODF	- The soil-erodibility factor has units of tons/acre-R, where R = RAINF given above.
	STPLNG	- The slope steepness-length factor.
	COVER	- The crop management factor.
	CONTRL	- The erosion control practices factor.
	SEDELR	- The sediment delivery ratio. This ratio is intended to apply to fouling of waterways from construction activity.
CARD 21	Soil and Surface Water (5F10.0)	
	PORS	- Porosity of the surface soil. Must be nonzero.
	BDENS	- Bulk density of the soil (g/cm^3). Must be nonzero.
	STFLOW	- Annual flow rate of the nearest stream (m^3/yr). Must be nonzero.
	EXTENT	- The cross slope extent of the surface region contaminated by operational spillage (m). Must be nonzero.
	ADEPTH	- The active depth of soil in the surface-contaminated region. Used for the calculation of radionuclide concentration in both surface soil and surface water. Must be nonzero.
CARD 22	Surface Water Runoff (2F10.0)	
	PD	- Distance from the trench to nearest stream (m). Must be nonzero. If PD is greater than XG, the adjacent farming option will be triggered; the farm is then assumed to receive additional radionuclides from initial spillage and trench overflow.

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	RUNOFF	- Fraction of the annual precipitation that runs off.
CARD 23	Agricultural Data (7F10.0)	
	Y1, Y2	- Agricultural productivity for pasture grass and other consumed vegetation respectively (kg/m^2).
	PP	- Surface density of soil (kg/m^2). Assumes a 15 cm plow depth. For farming scenario, this value should be in agreement with the value of BDENS, CARD 20. Must be nonzero.
	XAMBWE	- The weathering removal decay constant for atmospheric deposition onto foodcrops (hr^{-1}).
	TA	- Not used.
	TE1, TE2	- Period of time that pasture grass or crops and leafy vegetables, respectively, are exposed to contaminated air during each growing season (hr).
CARD 24	Agricultural Delay Times and Fractions (8F10.0)	
	TH1 - TH6	- These six variables represent the delay time between harvest and consumption by animal or man of pasture grass, stored feed, leafy vegetables for maximum individual doses, produce for maximum individual doses; and leafy vegetables and produce for general population exposures, respectively (hr).
	FP	- Fraction of each year that animals graze on pasture grass.
	FS	- Fraction of an animal's daily feed that is fresh grass for the period of time animals are in pasture.
CARD 25	Animal Feed Data (7F10.0)	
	QFC	- The amount of feed consumed daily by cattle (kg).

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	QFG	- The amount of feed consumed daily by dairy goats (kg).
	TF1, TF2	- The transport time (hr) from animal feed into milk and into the receptor human for the maximum individual and the general population exposures, respectively.
	TS	- Length of time between slaughter of animals and human consumption of the resultant meat (hr).
	ABSH	- The absolute humidity of the atmosphere (g/m^3). Used for specific activity food-chain calculations for tritium concentrations in foodstuffs. Must be nonzero.
	P14	- The fractional equilibrium ratio for C-14.
CARD 26	Plant Root Parameters (2F10.0)	
	XRTM	- Maximum root depth for on-site farming scenario (m).
	RTGR	- Root growth rate constant (yr^{-1}).
CARD 27	Irrigation Water Data (6F10.0)	
	TW	- Not used.
	FI	- Fraction of the year that crops are irrigated.
	WIRATE	- Irrigation rate (L/m^2-hr). Application time is set equivalent to the number of frost-free days for the area.
	QCW, QGW, QBW	- Values for the amount of water (L/d) consumed by milk cows, milk goats, and beef cattle, respectively.
CARD 28	Human Food Uptake (8F10.0)	
	ULEAFY	- The human uptake of leafy vegetables (kg/yr).
	UPROD	- The human uptake of produce (kg/yr).
	UCMILK	- The human uptake of cow milk (L/yr).

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	UGMILK	- The human uptake of goat milk (L/yr).
	UMEAT	- The human uptake of meat (kg/yr).
	UWAT	- The human uptake of drinking water (L/yr).
	UAIR	- The inhalation rate (m^3/yr).
	POP	- Local Population.
CARD SET 29, 30, 31+	Repeat this set of three cards for each nuclide.	
CARD 29	Nuclide Specific Data (A8, T1, 8A1, 2X, 7F10.0)	
	NUCLID(I)	- The name of the radionuclide used in the code. Must be left justified and with no embedded blanks and with a hyphen separating the alphameric for the element and the numeric for the isotope. The names used must agree with the conventions used in RADRISK and DARTAB.
	NUCL(I,K), K=1,8	- Do not enter data for these variables as the data are read from NUCLID(I) - (see format statement).
	TRAM(I)	- The amount of each radionuclide found in the trench at the beginning of the simulation (Ci).
	SOAM(I)	- The amount of spillage onto the surface that exists at the beginning of the simulation (fraction of initial inventory.)
	STAM(I)	- The amount of radioactivity placed into the stream nearest the site at the beginning of the simulation (Ci).
	ATAM(I)	- The amount of radioactivity of each radionuclide placed into the air directly above the trench at the beginning of the simulation (Ci).
	DECAY(I)	- The radiological decay constant (yr^{-1}). The constant is equal to 0.6931 divided by the radiological half-life in years.

TABLE 2-1
(Continued)

Card	Variable (Input Format)	Description
	SOL(I)	- The solubility of the radionuclide stored in the trench (mg/l). SOL is used only if LEAOPT = 3 or 4.
	CON(I)	- Conversion factor for global health effects (health effects/Ci released).
CARD 30	Nuclide Transport Parameters (A8, 2X, 4F10.0)	
	NU	- Radionuclide name (same as on Card 29).
	XKD(1,I)	- Surface K_d of radionuclide I (ml/g).
	XKD(2,I)	- Waste K_d of radionuclide I (ml/g), used when LEAOPT = 1, 2, 3, or 4.
	XKD(3,I)	- Vertical zone K_d of radionuclide I (ml/g).
	XKD(4,I)	- Aquifer K_d of radionuclide I (ml/g).
CARD 31	Agricultural Data for Nuclides (A8, 2X, 7F10.0)	
	NC	- Radionuclide name (same as Card 29).
	RA(I)	- Radionuclide retention fraction for air.
	RW(I)	- Radionuclide retention fraction for irrigation.
	BV(I)	- Radionuclide soil-to-plant uptake factor for vegetative parts.
	BR(I)	- Radionuclide soil-to-plant uptake factor for grain.
	FMC(I)	- Radionuclide forage-to-milk transfer factor for cows.
	FMG(I)	- Radionuclide forage-to-milk transfer factor for goats.
	FF(I)	- Radionuclide forage-to-beef transfer factor.

2.2 NAMELIST DATA

This DARTAB input provides the user options for processing the exposure data, dosimetric data, and tabulations of output. The first data card is a title card. The remaining data are read using the FORTRAN NAMELIST format. The data must be in special format in order to be read with NAMELIST. The data are grouped in NAMELIST groups. The first character in each data record to be read must be a blank and the first record of each group must have an "&" symbol as its second character followed by the NAMELIST group name. The name cannot contain embedded blanks and must be followed by a comma. The data items then follow, separated by commas.

The order of data items in a NAMELIST group is not important, but arrays that refer to nuclides should have the constants in the same order as the data in Table 2-2. The end of a NAMELIST group is designated by &END. An example of this type of input can be seen in Appendix B. Table 2-2 lists the NAMELIST group names and the variables in each group.

The data described in this section are read from logical unit number 5 and must follow directly after the data described in Table 2-1. Table 2-2 describes the Namelist variables utilized by the subroutine DARTAB.

TABLE 2-2

DESCRIPTION OF NAMELIST INPUT FOR SUBROUTINE DARTAB

Namelist Group	Variable	Description
INPUT	ILOC	Direction index of the exposure array to use for individual tables.
	JLOC	Distance index of the exposure array to use for individual tables. ILOC, JLOC. These are the directions of the exposure array that is used to locate an individual for which a dose or risk table is printed. AIRDOS-EPA, the code for which DARTAB was originally written, supplied a two-dimensional exposure array to DARTAB. PRESTO-EPA-POP, however, supplies only a mean exposure value for each of air concentration, ground surface concentration, collective inhalation rate and collective ingestion rate, for only one location. These values are the first entry of the array; hence, both indices should be specified as 1.
	PLOC	Percent of total risks to use in choosing location for the exposure array for individual tables. This variable is an indirect indicator of the location. Because PRESTO-EPA-POP does not provide a two-dimensional exposure array to DARTAB, PLOC should be set to 100 or omitted.
	AGEX	Average human life expectancy in years (Default value = 70.7565 years).
	ILET	Array dimensioned to 2. ILET = 1 indicates combined high and low LET tables. ILET = 2 indicates separate tables. ILET(1) refers to dose rate tables. ILET(2) refers to health risk tables.

TABLE 2-2
(Continued)

Namelist Group	Variable	Description
		For LLW disposal site simulations with a mixture of nuclides set ILET=1,1 for a combined LET table for both dose and risk tables. For the intrusion scenario, where external exposures are of greater importance the user may wish to set ILET=2,2.
	DTABLE RTABLE	These parameters indicate which tables are to be output for dose rates, health risks, and risk equivalents. Each is dimensioned by 7 corresponding to table type shown below.

Type	Column	Row	Label
1-a	Organs or Cancers	Nuclides	Individual Pathways
2-b	Organs or Cancers	Nuclides	External & Internal
3-c	Organs or Cancers	Nuclides	All Pathways
4-d	Nuclides	Pathways	Organs or Cancers
5-e	Organs or Cancers	Pathways	Nuclides
6-f	Nuclides	Pathways	Summed over Organs or Cancers
7-g	Organs or Cancers	Pathways	Summed over Nuclides

FTABLE — Table output control parameters

0 = no tables of this type
1 = table for selected individual
2 = table for mean individual
3 = table for collective group
4 = all three of the above

TABLE 2-2
(Continued)

Namelist Group	Variable	Description
	OUTPUT	Logical variable which indicates whether dose factors are output. If .TRUE. then one page output of dose factors for each nuclide.
	GSCFAC	Ground surface correction factor. Accounts for roughness.
ORGAN	NORGN	Number of human organs exposed.
	ORGN	Alphanumeric double precision names of organs. There are NORGN entries.
	TIME	Time associated with dose commitment (yr). There are NORGN entries.
QFACTOR	HLET	Relative biological effectiveness factor to use for high-LET dose rates to convert absorbed dose to dose equivalent (rem). There are NORGN entries.
	LLET	Same as HLET but for low-LET dose rates. There are NORGN entries.
CANCER	NCANC	Number of cancers to be considered.
	CANC	Alphanumeric double precision cancer names.
	RELABS	Flag denoting absolute (=1) or relative (=2) risk model used for each cancer.
GENETIC	GENEFF	Logical variable indicates output of genetic effects. If GENEFF = .TRUE. then genetic effects are output. If GENEFF = .FALSE. then genetic effects are not output.
	GEN	Alphanumeric double precision names of the organs to be considered for genetic effects.
	NGEN	Number of human organs exposed.
	GRFAC	Risk conversion factors (genetic effects per rad per million births). GRFAC(1) corresponds to low-LET doses. GRFAC(2) corresponds to high-LET doses. There are NGEN entries.
	REPPER	Replacement rate for the population.

TABLE 2-2
(Continued)

Namelist Group	Variable	Description
	GLLET	Relative biological effectiveness factor used for low-LET genetic doses to convert absorbed dose to dose equivalent (rem). There are NGEN entries.
	GHLET	Same as GLLET but for high-LET. There are NGEN entries.
RNUCLD	NONCLD	Number of radionuclides. This number must be equivalent to the same variable used in transport portion of code, Card 3, but always less than or equal to 40.
	NUCLID	Alphanumeric double precision radionuclide names. Must be written without embedded blanks. Must be listed here in same order as in transport section of input, cards 26+. Each name must be set within apostrophes.
	PSIZE	Activity median aerodynamic diameter associated with each radionuclide (10^{-6} m). There are NONCLD entries.
	RESP	Respiratory clearance class associated with each radionuclide. A respiratory clearance class of either day ('D'), week ('W'), year ('Y'), gas ('*'), or not used (' ') must be entered for each nuclide in the trench. There are NONCLD entries. More extensive lists are given in Sullivan, et al. (Su81), and Eckerman, Ford, and Watson (Ec81).
	GIABS	GI absorption factors. The absorption factor for each of the four segments of the GI tract for each nuclide must be entered. The DARTAB code expects a value for each segment (stomach, small intestine, upper large intestine and lower large intestine). However, most metabolic models assume that materials are absorbed only in the small intestine (Su81, Ec81). Therefore, input zero values for all GI

TABLE 2-2
(Continued)

Namelist Group	Variable	Description
		segments except the small intestine. There are four entries for each nuclide.
LOCTAB	NTLOC	Number of location tables to be output. Since PRESTO-EPA-POP does not provide a location array of environmental concentrations to DARTAB, NTLOC must be set to zero.
	RNLOC	Radionuclide used for table. SUM results in the sum of all nuclides, WORKLEVL results in working level calculations, WLSUM results in total risk for all nuclides.
	OGLOC	Organ or cancer to use for table. SUM results in sum of all cancers.
	PTLOC	Pathway used. This variable specifies the pathway to use in printing the location table. Values of 1 to 7 will result in ingestion, inhalation, air immersion, ground surface exposures, internal exposures (sum of ingestion and inhalation), external exposures (sum of air immersion and ground surface exposures), and total, respectively.
	FALOC	Factor to be printed 0 = both high- and low-LET 1 = only combined LET table 2 = all three tables.
	HLLOC	Factor to be printed = 0 both high- and low-LET = 1 only combined LET table = 2 all three tables.
	LTABLE	Indicates selected individual (LTABLE=1), mean individual (LTABLE=2), or collective group (LTABLE=3).
ORGANF	NORGB	Number of organ dose weights to use to combine dose rates.
	ORGB	The organs to be used.

TABLE 2-2
(Continued)

Namelist Group	Variable	Description
	ORGDAT	Organ dose weighting factors.
	IPATH	Exposure pathway affected (1 = ingestion; 2 = inhalation; 3 = air immersion; 4 = ground surface; 5 = all pathways). The Internation Commission on Radiological Protection has recently suggested the use of a risk equivalent which provides a stochastic weighting of radiosensitivity of various organs in the body for exposure to whole body radiation.

2.3 DATA FOR THE INFILTRATION SUBROUTINE (INFIL)

As indicated by the job control language file shown in Section 4, the input to subroutine INFIL (Hu81) is read from input unit 4. Data for INFIL given in Table 2-3 are of four types: hydrologic and trench cap description characteristics (card 1); maximum day length in hours by month (card 2); daily mean temperatures by month (cards 3-33); and hourly precipitation for nonzero precipitation days (card 34 and subsequent). The last card in the data set must have "99" in the first two columns.

Descriptive parameters include trench cap width (m), and slope (m/m), permeability of the trench cap (m/hr), component of porosities for gravity water and pellicular water (unitless), equivalent upward diffusivity (m^2/hr), hydraulic conductivity (m/hr), and infiltration capacities for the pellicular and gravity water zones (m/hr). Card 2 contains the monthly mean maximum length of day (hr) for the site's latitude. Cards 3 through 33 provide daily mean temperatures (°C) by month on each card. For instance, card 3 consists of daily temperatures for the first day of each month; card 4 has data for January 2, February 2, etc. Cards 34 and subsequent consist of hourly precipitation data for days when precipitation occurs. Data are listed in units of 0.1 mm/hr, one day per card. If no measurable precipitation fell on a given date, it is not included in the data list. The first day of each month is listed whether or not it rained then.

TABLE 2-3

INPUT DATA FOR SUBROUTINE INFIL

Card	Variable (Input Format)	Description
CARD 1	Trench Cap Characteristics (10F7.3)	
	TWT	- The width of the trench cap (m).
	SLOP	- The average slope of trench cover (m/m).
	EPSG	- The component of porosity for gravity water of trench cap (unitless).
	EPSP	- The component of porosity for pellicular water of trench cap (unitless).
	XKI	- The permeability of trench cover (m/hr).
	YGMAX	- The thickness of the trench cap (m). This must be equal to OVER.
	XDE	- The equivalent upward diffusivity (m^2/hr).
	XKE	- The equivalent upward hydraulic conductivity (m/hr).
	YPI	- The initial pellicular water deficit of the trench cap (m).
	YGI	- The initial gravity water deficit of the trench cap (m).
CARD 2	Day Length Data (12F5.1)	
	DTH(IM)	- The maximum day length for month IM (hr). There are 12 values; one for each month from January to December.
CARDS 3-33	Temperature Data (2X, 12F6.2)	
	TMP(IM)	- The mean daily temperatures (°C). Each card has 12 values, one for each month. There are 31 cards of this type, one for each day of the month.
CARD 34+	Precipitation Data (I2, 1X, I2, 1X, 24F3.0)	
	MO	- Month number.
	IDA	- Day number of month MO.

TABLE 2-3
(Continued)

Card	Variable (Input Format)	Description
	P(MO,IDA)	- Amount of precipitation that fell in this hour (0.1 mm/hr). There are 24 values on each card, one for each hour of the day. Include only days with a nonzero amount of precipitation, and the first day of each month.
LAST CARD	End of File (I2)	
	IAMP	Must equal 99, which designates the end of the data set.

2.4 DOSIMETRIC AND HEALTH EFFECTS DATA

This data set is read in an unformatted form from input unit 25 (see job control language, Section 4.3). This data file is on a magnetic tape which contains information for many radionuclides and was created by the program RADRISK (Du80). This data file should be sufficient for most users' needs. For a further description see the DARTAB users' guide (Be81) and other RADRISK documentation.

3. OUTPUT FROM PRESTO-EPA-POP

The output of the PRESTO-EPA-POP code is designed to be self-explanatory, and provide descriptive comments, definitions, and intermediate tabulations. It is assumed that users of the code are unfamiliar with the code structure and that the code may be implemented on a computer other than the IBM 3033 for which it was originally written. For these users the tables and comments will be valuable.

The output will be described in eleven sections, corresponding to the eleven sections in the printout for each run. A source listing for the PRESTO-EPA-POP code can be found in Appendix A.

3.1 REPLICATION OF THE INPUT DATA

The first section of the output of the PRESTO-EPA-POP code prints the input data, with the exception of the input data for the subroutine, INFIL, as it is read in. PRESTO-EPA-POP input data are read in and then written on a temporary storage device and on the output device. Thus, a record of the input data set is printed for a reference identification of the run. Input data are subsequently read from the temporary storage device for use by the code. INFIL input data are treated separately (see Section 3.4). This approach preserves the modularity of the INFIL subroutine.

3.2 DEFINITION, ORGANIZATION, AND PRELIMINARY ANALYSIS OF INPUT DATA

In the second section of the output of the PRESTO-EPA-POP code, the input data are organized and summarized according to data type, transport

sub-system or pathway, and printed out. As a result, the code user should be able to easily review the input data for each run. A detailed description of the input data can be found in Chapter 2.

The first part of this output section consists of the computer run identification and the user-supplied identification from input card 1.

The output labeled "Control Information" identifies the site and interprets the run control data entered by the user. These control data include radionuclide leaching options, trench cap failure data, and water use parameters.

The output labeled "Trench Information" describes the trench area and depth, the porosity of the trench contents and the annual infiltration for the watershed.

The output labeled "Aquifer Information" describes the groundwater velocity, the trench to aquifer distance, the trench to well distance, the aquifer thickness and contamination plume dispersion angle, the porosities of the sub-trench area and the aquifer, and the sub-trench permeability.

The output labeled "Atmospheric Information" describes the effective source height for the wind-blown or mechanically mobilized contamination plume from the site, the gravitational fall velocity of suspended soil particles, the site-to-population distance, the lid height, the Hosker surface roughness factor, the atmospheric stability class and dispersion formulation, the fraction of the time the wind blows toward the population, and the parameters specifying the resuspension factor and resuspension rate.

The output labeled "Surface Information" consists of the universal soil loss equation parameters, the surface soil porosity and bulk density,

the runoff fraction for rainfall, the stream or river flow rate, the cross-slope extent of spillage, the active soil depth, and the average distance from the trench to the stream.

The output labeled "Air-Food-Chain Information" describes productivity data for grass and vegetation, timing data for computation of radioactive decay for the ingestion exposure pathway, and nuclide weathering (from the surface soil) and C-14 equilibrium data.

The output labeled "Water-Food-Chain Information" describes data which characterize water use by milk cattle, goats, and beef cattle and water use for crop irrigation.

The output labeled "Human Ingestion and Inhalation Rate Information" describes the annual ingestion and inhalation parameters and the number of persons at risk.

3.3 RADIONUCLIDE SUMMARY TABLES

A set of three tables under the heading "Nuclide Information" summarize radionuclide data used for the transport calculations. First, an inventory table labeled "Information on Individual Nuclides" specifies the initial inventory in the trench, on the soil surface, in the stream, and in the atmosphere. Also included in this table are the decay constants and the user-supplied solubility constant.

The second radionuclide table labeled "Distribution Coefficients ml/g" summarizes the chemical distribution coefficients for the surface soil, the trench contents, the vertical soil column, and the aquifer.

The third radionuclide table summarizes the seven radionuclide-specific food chain parameters used by the FOOD, IRRIG, HUMEX, CV, and COV subroutines. These parameters are also used by the FOODA, IRRIGA, HUMEXA, CVA, and COVA subroutines.

Also radionuclide atomic mass numbers are extracted from the radionuclide names and used in the calculations. Results from the mass extraction algorithm are printed in a table labeled "Initial Calculations" as a convenience for the user who may be using other alphanumeric string manipulation functions.

3.4 INFIL INPUT/OUTPUT

The fourth section of output of the PRESTO-EPA-POP code consists of the input data and results for the subroutine INFIL. INFIL control is presented first, followed by monthly average values for hours of sunshine, daily average temperature levels, and hourly rainfall amounts.

The trench characteristics printed are the snowmelt coefficient, trench cover thickness, width, slope, permeability, porosity for gravity and pellicular water, equivalent upward diffusivity, and equivalent upward hydraulic conductivity. The INFIL time step (nominally set at 1 hr) is also printed. Results printed are annual precipitation, evaporation (transpiration is not considered), runoff, and cap infiltration.

3.5 UNIT RESPONSE CALCULATIONS

This output section includes results of nuclide-specific annual transport calculations which will be used by the bookkeeping submodels for

each simulation year. Outputs also include soil loss calculation results and the calculated (or input) value for the ratio of atmospheric radionuclide concentration per unit release rate at the radionuclide disposal site.

3.6 ANNUAL SUMMARY TABLES FOR SPECIFIED YEARS

Control variables determine the years for which results will be printed. For these years, a number of hydrologic and transport variables are output. Included are trench cap status, maximum possible water depth in the trench, water loss by overflow and drainage from the trench, the trench inventory. Radionuclide concentration values and flux values are presented for key pathways and regions of interest.

3.7 RADIONUCLIDE CONCENTRATION TABLES

The radionuclide concentration tables present, by nuclide, the average concentration over the entire assessment period, the year of maximum concentration, and the level of the maximum (population mean) concentration for the atmosphere, for the well water, and for the stream water. The level of maximum concentration and the year of occurrence is of interest since it is related to the year at which population exposures are most significant. Human exposures may peak, or even commence, many years after closure of a disposal site.

Separate average radionuclide concentration tables for the user-specified averaging time window which may be a fraction of the total assessment period are included. These tables present the radionuclide concentration in five types of foods due to atmospheric deposition and irrigation.

3.8 RADIONUCLIDE EXPOSURE TABLES

Annual population intakes of radionuclides by ingestion and by inhalation are next printed. The fraction of ingestion dose due to drinking water is given.

Next, the radionuclide exposure tables list, by nuclide, the year of maximum exposure and the corresponding level of the maximum (population mean) exposure for the atmosphere, for the ground surface (including the resident intruder exposure term which also leads to external exposure) for ingestion, and for inhalation. The maximum exposures for the atmosphere and the ground surface are listed in units of Ci/m^3 and Ci/m^2, respectively. The exposures for ingestion and inhalation are presented in units of pCi/yr. Although the exposure terms are dependent on the concentrations summarized in the concentration tables, the times of maximum exposures will in general differ from the times of maximum concentrations. This difference occurs for several reasons, including the dependence of exposure on soil concentration (a function of the values printed in the concentration tables) and the nuclide-specific uptake and concentration mechanism of the food chain which are considered in computing exposures from ingestion.

3.9 DARTAB CONTROL INFORMATION

DARTAB control information includes run identification data, summaries of output table control information, lists of critical organs and cancers to be considered in the run, dose equivalent factors for low and high LET radiation, radionuclide uptake and clearance data, and, if such exist, lists of nuclides and organ dose or cancer risk factors not found in the

RADRISK data sets which were accessed by DARTAB. The location of the population at risk, the lifetime fatal cancer risk at the location, and the organ dose weighting factors are also printed.

3.10 DARTAB DOSE TABLES

DARTAB dose tables produced in the output (see Appendix B) present individual and collective dose summary rates by low and high LET radiation and organ (including weighted sums of organs), by low and high LET radiation and exposure pathway, and by low and high LET radiation and radionuclide. The tables printed depend on the DARTAB control data used.

3.11 DARTAB FATAL CANCER RISK TABLES

DARTAB fatal cancer risk tables produced in the output (see Appendix B) present individual and collective fatal cancer risk, loss of life by premature death, and lifetime fatal cancer risk exposure equivalent. Genetic risks are also summarized. Values presented are summarized by low and high LET radiation and by organ and also by low and high LET radiation and pathway. The tables printed depend on the DARTAB control data used.

3.12 RESIDUAL RADIOACTIVITY RELEASED TO THE BASIN AND HEALTH EFFECTS

This output section shows the amount of radionuclides released to the basin, each millenium, during the 10,000 year simulation. It also shows the aggregated total release of each radionuclide, the health conversion factor and the basin population health effects by radionuclide.

4. SAMPLE PROBLEM

4.1 PROBLEM DEFINITION

For the sample problem the burial of a unit volume (1 m^3) of generated waste is considered. The waste thickness is two meters. A 0.6 meter cover is used and the distance from the bottom of the trench to the aquifer below is 7.3 meters. Trench cover failure begins in year 1 at 20 percent and increases linearly up to a 30 percent maximum and final value at year 200. A 1000 year simulation is performed and annual summaries output every 100 years.

The physical properties of the waste, the subtrench material, and the aquifer are as follows. The porosity and density of the waste are 0.25 and 0.89 g/cc. For the subtrench material these values are 0.35 and 1.6 g/cc. The porosity and density of the aquifer formation are 0.39 and 1.6 g/cc. The subtrench permeability is 2.2 m/yr. The dispersivity in the subtrench soil and in the aquifer is 0.3 meters (the default value). The aquifer velocity is 27.8 meters per year and its thickness is 30.5 meters. An aquifer dispersion angle of 0.3 radian has been assumed.

Half of the livestock water, and all human drinking water are assumed to come entirely from well water. The percentage of aquifer discharge to the surface water is 100 percent. The well is 1610 meters downflow from the facility. The stream has an annual flow of 3.57×10^5 m^3 and is 100 meters downslope from the facility. A cross slope spillage of 1003 meters is assumed. The runoff is 29 percent of the annual precipitation. The watershed infiltration rate is 0.43 m/yr. The surface soil data are summarized in Table 4-1. The atmospheric data used in the sample problem are given in Table 4-2.

TABLE 4-1

SURFACE SOIL DATA

Rainfall Factor	250
Erodability Factor	0.23
Slope Factor	0.27
Cover Factor	0.30
Erosion Control Factor	0.30
Sediment Delivery Factor	1
Cross Slope Extent of Spillage	1003 m
Active Depth For Contamination	0.1 m

TABLE 4-2

ATMOSPHERIC DATA

Source Height	1 m
Gravitational Fall Velocity	0.01 m/sec
Mean Wind Speed	2.01 m/sec
Deposition Velocity	0.10 m/sec
Source to Receptor Distance	1.77×10^{4} m
Atmospheric Lid Height	300 m
Hosker Roughness Factor	0.01 m
Fraction of Time Wind Blows Toward Population	0.484
User Specific X/Q	1.08×10^{-11} s/m^{3}
First Coefficient in Resuspension Equation	1×10^{-6}
Decay Factor in Resuspension Equation	-0.15
Final Coefficient in Resuspension Equation	1×10^{-11}
Fraction of Year Mechanical Disturbance Occurs	0
Stability Class Formulation	1 (Pasquill-Gifford)
Stability Class	4 (neutral)

Foodchain parameters have been summarized in Table 4-3. The human consumption of leafy vegetation is 2 kg/yr; produce is 18 kg/yr; cow milk is 11 L/yr; goat milk is 0 L/yr; and meat is 9 kg/yr. Each person consumes 370 liters of water per year. The inhalation rate is 8000 m^3/yr. The exposed population is 25. Radionuclide specific foodchain data is given in Table 4-4.

The radionuclide inventory for the waste is given in Table 4-5. In addition, a surface spillage fraction of 0.01 is assumed for each radionuclide. Decay constants and sets of K_d's for each radionuclide are given in Table 4-6.

In this sample run the dose data tables in addition to the summary tables are output. Combined low and high LET tables are output. A ground surface correction factor of 0.5 is used. Organs/tissues exposed include the red marrow, endosteum, thyroid, breast, pulmonary, stomach wall, intestinal wall, liver, pancreas, kidneys, and others. Seventy year dose commitments are calculated. The high LET and low LET RBE factors are 20 and 1, respectively. The cancers considered include leukemia, bone, thyroid, breast, lung, stomach, bowel, liver, pancreas, urinary, and other. Absolute risk models are used in each case.

The organs considered for genetic effects are the testes, ovaries, and their average. The high LET and low LET genetic risk conversion factors are 5200 and 260 genetic effects per rad per million births, respectively. The default population replacement rate of 0.014133 yr^{-1} is used. The low LET genetic RBE factors are one and the high genetic RBE factors are 20.

TABLE 4-3

FOODCHAIN PARAMETERS

Grass Production	0.67 kg/m^2yr
Vegetation Production	0.65 kg/m^2yr
Surface Density for Soil	240 kg/m^2
Weathering Decay Constant	0.0021 hr^{-1}
Period Pasture Exposed During Growing Season	720 hr
Period Crops Exposed During Growing Season	1440 hr
Period Between Harvest Pasture and Ingestion by Animal	0.0 hr
Period Between Stored Feed and Ingestion by Animal	2160 hr
Period Between Harvest Leafy Vegetation and Ingestion by Man	24 hr
Period Between Harvest Produce and Ingestion by Man	1440 hr
Period Between Harvest Leafy Vegetables and Ingestion by Man for General Population Exposure	336 hr
Period Between Harvest of Produce and Ingestion by Man for General Population Exposure	336 hr
Fraction of Year Animal Graze on Pasture	1.0
Fraction of Daily Feed that is Fresh Grass While Animals are on Pasture	0.83
Amount of Feed Consumed Daily by Cattle	50 kg
Amount of Feed Consumed Daily by Goats	6 kg
Transport Time Feed-Mill-Receptor for Maximum Individual Exposure	48 hr
Transport Time Feed-Mill-Receptor For General Population Exposure	96 hr
Time From Slaughter of Meat to Consumption	480 hr
Absolute Humidity of the Atmosphere	9.9 g/m^3
Fractional Equilibrium Ratio for Carbon-14	1.0
Fraction of Year Crops are Irrigated	0.40
Irrigation Rate	0.015 L/m^2hr
Amount of Water Consumed by Cows	60 L/d
Amount of Water Consumed by Goats	8 L/d
Amount of Water Consumed by Beef Cattle	50 L/d

TABLE 4-4

RADIONUCLIDE SPECIFIC FOODCHAIN DATA

Nuclide	Retention Fraction For Air	Retention Fraction For Irrigation	Soil-To-Plant Uptake Factor (Vegetables)	Soil-To-Plant Uptake Factor (Grain)	Forage-To-Milk Transfer Factor (Cows)	Forage-To-Milk Transfer Factor (Goats)	Forage-To-Beef Transfer Factor
H-3	0.20	0.25	4.8	4.8	1.0E-2	1.7E-1	1.2E-2
C-14	0.20	0.25	5.5	5.5	1.2E-2	1.0E-1	3.1E-2
Cr-51	0.20	0.25	2.5E-4	5.0E-2	2.2E-3	1.0E-3	2.4E-3
Mn-54	0.20	0.25	2.5E-1	5.0E-2	3.5E-4	2.5E-4	4.0E-4
Fe-55	0.20	0.25	4.0E-3	1.0E-3	2.5E-4	1.3E-4	2.0E-2
Co-58	0.20	0.25	2.0E-2	7.0E-3	2.0E-3	1.0E-3	3.0E-2
Ni-59	0.20	0.25	6.0E-2	6.0E-2	1.0E-3	6.7E-3	6.0E-3
Co-60	0.20	0.25	2.0E-2	7.0E-3	2.0E-3	1.0E-3	2.0E-2
Ni-63	0.20	0.25	6.0E-2	6.0E-2	1.0E-3	6.7E-3	6.0E-3
Sr-90	0.20	0.25	2.5	2.5E-1	2.5E-3	1.4E-2	3.0E-4
Nb-94	0.20	0.25	2.0E-2	5.0E-3	2.0E-2	2.5E-3	2.5E-1
Tc-99	0.20	0.25	9.5	1.5	1.0E-2	2.5E-2	2.5E-3
Ru-106	0.20	0.25	7.5E-2	2.0E-2	6.0E-7	1.3E-4	2.0E-3
Sb-125	0.20	0.25	2.0E-1	3.0E-2	1.0E-4	1.5E-3	1.0E-3
I-129	0.20	0.25	1.0	1.0	1.0E-2	3.0E-1	7.0E-3
Cs-134	0.20	0.25	8.0E-2	3.0E-2	7.0E-3	3.0E-1	2.0E-2
Cs-135	0.20	0.25	8.0E-2	3.0E-2	7.0E-3	3.0E-1	2.0E-2
Cs-137	0.20	0.25	8.0E-2	3.0E-2	7.0E-3	3.0E-1	2.0E-2
Ce-144	0.20	0.25	1.0E-2	4.0E-3	2.0E-5	1.0E-4	7.5E-4
Eu-154	0.20	0.25	2.5E-3	2.5E-3	2.0E-5	2.0E-5	4.8E-3
Ra-226	0.20	0.25	1.5E-4	1.5E-3	4.5E-4	5.0E-6	2.5E-4
U-234	0.20	0.25	8.5E-3	4.0E-3	6.0E-4	5.0E-4	2.0E-4
U-235	0.20	0.25	8.5E-3	4.0E-3	6.0E-4	5.0E-4	2.0E-4
Np-237	0.20	0.25	4.3E-3	4.3E-3	5.0E-6	5.0E-6	5.5E-5
U-238	0.20	0.25	8.5E-3	4.0E-3	6.0E-4	5.0E-4	2.0E-4
Pu-238	0.20	0.25	4.5E-4	4.5E-5	1.0E-7	1.5E-6	5.0E-7
Pu-239	0.20	0.25	4.5E-4	4.5E-5	1.0E-7	1.5E-6	5.0E-7
Pu-241	0.20	0.25	4.5E-4	4.5E-5	1.0E-7	1.5E-6	5.0E-7
Am-241	0.20	0.25	5.5E-3	2.5E-4	4.0E-7	0	3.5E-6
Pu-242	0.20	0.25	4.5E-4	4.5E-5	1.0E-7	1.5E-6	5.0E-7
Am-243	0.20	0.25	5.5E-3	2.5E-4	4.0E-7	0	3.5E-6
Cm-243	0.20	0.25	8.5E-4	1.5E-5	2.0E-5	0	3.5E-6
Cm-244	0.20	0.25	8.5E-4	1.5E-5	2.0E-5	0	3.5E-6

TABLE 4-5

INVENTORY

Nuclide	Inventory (Ci)
H-3	0.99
C-14	0.99
Cr-51	0.99
Mn-54	0.99
Fe-55	0.99
Co-58	0.99
Ni-59	0.99
Co-60	0.99
Ni-63	0.99
Sr-90	0.99
Nb-94	0.99
Tc-99	0.99
Ru-106	0.99
Sb-125	0.99
I-129	0.99
Cs-134	0.99
Cs-135	0.99
Cs-137	0.99
Ce-144	0.99
Eu-154	0.99
U-234	0.99
U-235	0.99
Np-237	0.99
U-238	0.99
Pu-238	0.99
Pu-239	0.99
Pu-240	0.99
Pu-241	0.99
Am-241	0.99
Pu-242	0.99
Am-243	0.99
Cm-243	0.99
Cm-244	0.99

TABLE 4-6

RADIONUCLIDE SPECIFIC DATA

Nuclide	Decay Constant (yr^{-1})	Surface K_d	Trench K_d	Vertical K_d	Aquifer K_d
H-3	5.65E-02	1.00E-02	9.60E-02	1.00E-02	1.00E-02
C-14	1.21E-04	1.00E-02	9.60E-02	1.00E-02	1.00E-02
Cr-51	9.14E+00	2.00E+02	8.90E-04	2.00E+02	2.00E+02
Mn-54	8.09E-01	1.50E+02	8.86E-04	1.50E+02	1.50E+02
Fe-55	2.57E-01	6.00E+03	8.86E-04	6.00E+03	6.00E+03
Co-58	3.55E+00	5.50E+01	8.86E-04	5.50E+01	5.50E+01
Ni-59	8.66E-06	1.50E+02	8.86E-04	1.50E+02	1.50E+02
Co-60	1.32E-01	5.50E+01	8.86E-04	5.50E+01	5.50E+01
Ni-63	7.53E-03	1.50E+02	8.86E-04	1.50E+02	1.50E+02
Sr-90	2.42E-02	1.50E+02	1.47E-03	1.50E+02	2.00E+01
Nb-94	3.47E-05	3.50E+02	6.34E-04	3.50E+02	3.50E+02
Tc-99	3.25E-06	5.00E-01	4.86E-02	5.00E-01	5.00E-01
Ru-106	6.89E-01	2.20E+02	6.34E-04	2.20E+02	2.20E+02
Sb-125	2.50E-01	4.50E+01	8.86E-04	4.50E+01	4.50E+01
I-129	4.08E-08	3.00E+00	1.29E-02	3.00E+00	5.00E-01
Cs-134	3.36E-01	1.00E+03	2.23E-05	1.00E+03	5.00E+02
Cs-135	2.30E-07	1.00E+03	2.23E-05	1.00E+03	5.00E+02
Cs-137	2.31E-02	1.00E+03	2.23E-05	1.00E+03	5.00E+02
Ce-144	8.90E-01	1.10E+03	2.23E-05	1.10E+03	1.10E+03
Eu-154	4.33E-02	4.00E+03	2.23E-05	4.00E+03	4.00E+03
U-234	2.83E-06	7.50E+02	1.49E-05	7.50E+02	7.50E+02
U-235	9.85E-10	7.50E+02	1.49E-05	7.50E+02	7.50E+02
Np-237	3.30E-07	5.00E+00	8.19E-03	5.00E+00	5.00E+00
U-238	1.55E-10	7.50E+02	1.49E-05	7.50E+02	7.50E+02
Pu-238	7.90E-03	3.50E+03	6.38E-05	3.50E+03	3.50E+03
Pu-239	2.87E-05	3.50E+03	6.38E-05	3.50E+03	3.50E+03
Pu-240	1.06E-04	3.50E+03	6.38E-05	3.50E+03	3.50E+03
Pu-241	5.25E-02	3.50E+03	5.55E-04	3.50E+03	3.50E+03
Am-241	1.51E-03	8.00E+04	5.55E-04	8.00E+04	8.00E+04
Pu-242	1.83E-06	3.50E+03	6.38E-05	3.50E+03	3.50E+03
Am-243	9.40E-05	8.00E+04	5.55E-04	8.00E+04	8.00E+04
Cm-243	2.17E-02	3.30E+03	6.38E-05	3.30E+03	3.30E+03
Cm-244	3.94E-02	3.30E+03	6.38E-05	3.30E+03	3.30E+03

The activity median aerodynamic diameter, respiratory clearance class and gastrointestinal absorption factors for each radionuclide are given in Table 4-7. For the latter parameter only the small intestine values are shown. The factors for the other three segments are zero.

The output location table includes the following pathways: ingestion, inhalation, air immersion, ground surface exposures, internal exposures, external exposures and total. Only combined high and low LET tables are output. The organ weighting factors for combined dose rates are given in Table 4-8. The exposures are summed over all pathways. The input data for the INFIL subroutine is listed in Tables 4-9 through 4-12.

The complete output for this problem is given in Appendix B. Each printout includes an exact replica of the corresponding site input data set, and thus the input data set is not reproduced in this section.

4.2 RESULTS

The output for the sample problem described in Section 4.1 is given in Appendix B. Chapter 3 of this Users Manual discusses each section of the PRESTO-EPA-POP output in detail.

A summary of the significant results is given in Table 4-13. From this summary table, the maximum population whole body doses occur mainly from contaminated groundwater and well water via the ingestion pathway. The relatively permeable soils and associated aquifer velocities allow for relatively rapid transport of the more mobile radionuclides to the well. Iodine-129, carbon-14, and technicium-99 dominate the contributions to the total dose commitment.

TABLE 4-7

RADIONUCLIDE SPECIFIC DOSE PARAMETERS

Nuclide	Activity Median Aerodynamic Diameter (10^{-6} m)	Respiratory Clearance Class	Gastrointestinal Absorption Factor (small intestine)
H-3	0.0	* (gas)	0.95
C-14	0.0	* (gas)	0.95
Cr-51	1.0	Week	0.10
Mn-54	1.0	Week	0.10
Fe-55	1.0	Week	0.10
Co-58	1.0	Year	0.05
Ni-59	1.0	Week	0.05
Co-60	1.0	Year	0.05
Ni-63	1.0	Week	0.05
Sr-90	1.0	Day	0.01
Nb-94	1.0	Year	0.01
Tc-99	1.0	Week	0.80
Ru-106	1.0	Year	0.05
Sb-125	1.0	Week	0.20
I-129	1.0	Day	0.95
Cs-134	1.0	Day	0.95
Cs-135	1.0	Day	0.95
Cs-137	1.0	Day	0.0003
Ce-144	1.0	Year	0.0001
Eu-154	1.0	Week	0.20
U-234	1.0	Week	0.002
U-235	1.0	Year	0.002
Np-237	1.0	Year	0.001
U-238	1.0	Week	0.002
Pu-238	1.0	Year	0.001
Pu-239	1.0	Year	0.0001
Pu-240	1.0	Year	0.0001
Pu-241	1.0	Year	0.001
Am-241	1.0	Week	0.001
Pu-242	1.0	Year	0.0001
Am-243	1.0	Week	0.001
Cm-243	1.0	Week	0.001
Cm-244	1.0	Week	0.001

TABLE 4-8

ORGAN WEIGHTING FACTORS

Organ	Factor
Red Marrow	0.1552
Endosteum	0.0035
Thyroid	0.0987
Breast	0.1299
Pulmonary	0.2075
Stomach Wall	0.0840
Intestinal Wall	0.0390
Liver	0.0853
Pancreas	0.0585
Kidneys	0.0248
Other	0.1136

TABLE 4-9

INFIL INPUT DATA FOR THE SAMPLE PROBLEM

Trench cap width	30.5 m
Average slope of trench cover	0.01 m/m
Component of porosity for gravity water of trench cap	0.25
Component of porosity for pellicular water of trench cap	0.24
Permeability of trench cover	0.02 m/hr
Trench cap thickness	1.2 m
Equivalent upward diffusivity	3.5E-4 m^2/hr
Equivalent upward hydraulic conductivity	1.4E-6 m/hr
Initial pellicular water deficit	0.10 m
Initial gravity water deficient	1.2 m
Maximum day lengths	Table 4-10
Daily mean temperatures	Table 4-11
Hourly precipitation	Table 4-12

TABLE 4-10

MAXIMUM DAY LENGTHS FOR SAMPLE PROBLEM

Month	Hours
January	10.8
February	11.2
March	12.0
April	12.8
May	13.4
June	13.7
July	13.6
August	13.0
September	12.3
October	11.6
November	10.9
December	10.6

TABLE 4-11

DAILY TEMPERATURES IN DEGREES CELSIUS

Month Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8.88	10.16	6.00	20.92	17.80	25.34	26.30	24.99	21.89	13.96	19.89	19.77
2	8.48	6.81	8.76	19.34	19.45	26.79	25.79	25.92	22.43	19.38	19.56	19.15
3	7.05	7.79	12.65	20.61	20.04	25.34	27.73	25.28	22.71	20.17	19.56	19.73
4	15.27	13.93	14.35	16.68	20.37	23.45	28.48	26.23	18.00	18.79	19.56	19.23
5	6.13	12.14	17.74	11.78	11.90	25.40	25.39	23.77	16.67	20.95	19.56	20.96
6	8.84	13.12	16.25	12.02	20.78	24.17	22.78	23.78	15.04	22.37	19.56	13.86
7	15.54	6.94	10.90	8.20	20.90	23.86	18.01	25.78	15.87	22.63	19.56	11.56
8	15.54	9.23	4.41	8.60	21.38	26.07	12.58	25.85	16.54	21.47	19.56	11.70
9	15.54	13.06	7.93	12.57	20.27	27.60	21.33	25.12	18.09	22.77	19.56	13.60
10	15.54	8.44	13.33	11.21	20.66	25.60	24.66	25.61	19.68	21.45	19.56	8.13
11	15.54	8.13	17.32	12.79	21.81	24.10	25.09	24.93	21.19	17.03	19.56	9.71
12	15.54	4.59	18.87	15.35	22.07	23.99	25.93	24.71	21.44	19.06	19.56	7.16
13	15.54	7.46	21.13	17.93	15.08	23.10	23.91	24.22	24.27	19.10	19.56	0.08
14	15.54	8.97	19.19	20.56	25.52	23.70	24.89	25.27	24.12	15.71	19.56	4.30
15	15.54	14.71	19.25	20.36	25.06	26.20	24.26	24.69	25.82	12.18	19.56	13.68
16	15.54	19.33	12.33	20.93	24.61	26.46	24.17	25.35	25.74	12.97	19.56	13.17
17	15.54	16.27	17.60	21.36	23.36	21.95	24.74	24.29	25.48	10.93	19.56	4.78
18	8.78	8.03	17.04	16.86	22.95	22.49	25.83	22.87	24.45	12.78	19.56	1.99
19	12.54	10.02	20.02	14.26	21.02	25.70	25.59	24.17	23.35	17.31	19.56	2.85
20	16.73	11.90	23.06	19.05	22.92	26.07	26.55	25.24	21.76	18.55	15.42	6.18
21	15.27	14.61	23.56	20.29	23.55	26.62	27.56	26.62	21.76	18.82	17.86	5.16
22	6.46	8.04	17.91	16.27	24.74	24.69	27.67	25.99	21.76	13.71	16.34	4.64
23	8.41	10.49	15.05	11.65	23.82	24.83	24.88	27.02	21.76	10.64	16.61	8.33
24	5.96	16.75	13.29	13.41	23.58	23.50	25.21	27.62	21.76	8.38	16.83	14.85
25	7.04	12.71	16.55	16.35	24.17	24.63	26.21	25.31	21.76	9.97	9.64	17.31
26	2.14	1.94	13.24	20.59	24.16	24.98	28.02	18.80	21.76	13.11	12.35	15.14
27	-1.54	2.03	6.57	18.13	23.39	24.05	29.36	20.31	21.76	11.43	15.29	16.79
28	5.18	3.65	6.58	17.02	25.76	25.13	27.35	25.31	21.76	12.19	13.85	18.56
29	7.55	0.00	11.19	15.51	27.44	25.97	24.49	20.37	21.76	12.27	19.11	13.72
30	11.00	0.00	16.00	15.75	23.84	27.27	25.53	20.49	20.81	14.62	15.48	7.34
31	16.16	0.00	16.25	0.00	24.13	0.00	24.50	20.24	0.00	17.46	0.00	5.07

TABLE 4-12

HOURLY RAINFALL READ IN AS MONTH, DAY, RAINFALL PER HOUR
AND HOUR AND GIVEN IN 0.1 mm/hr

Month	Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Jan	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jan	3	0.	0.	0.	0.	23.	0.	23.	23.	70.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jan	4	0.	0.	0.	0.	23.	47.	23.	23.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jan	13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.
Jan	14	23.	23.	23.	23.	0.	0.	23.	0.	0.	0.	47.	23.	23.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.
Jan	19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jan	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jan	23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	47.	47.	0.	0.	0.	0.	0.	0.
Jan	31	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	23.	0.	0.	0.	0.
Feb	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Feb	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.
Feb	3	0.	0.	23.	0.	0.	0.	0.	47.	0.	0.	0.	47.	23.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.
Feb	9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.
Feb	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	93.	0.	47.	23.	0.	0.	0.
Feb	16	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	23.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Feb	17	0.	23.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Feb	26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Feb	27	0.	0.	23.	0.	0.	23.	0.	0.	0.	0.	0.	23.	0.	0.	0.	23.	0.	0.	0.	0.	23.	0.	0.	0.
Mar	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Mar	7	23.	0.	0.	0.	0.	0.	0.	0.	47.	0.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Mar	17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	23.	0.	0.	0.	0.	0.	0.
Mar	24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Apr	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Apr	3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Apr	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	70.	23.	0.	0.	0.	0.	0.	0.	0.	0.
Apr	8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	0.	23.	47.	0.	23.	0.	0.	0.	0.	0.
Apr	12	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Apr	17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	0.	0.	140.	0.	0.	0.	23.	0.	0.
Apr	20	0.	0.	0.	0.	0.	0.	23.	93.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Apr	25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	70.	93.	93.	23.	23.	0.	0.	0.	0.
Apr	26	0.	0.	0.	0.	23.	23.	47.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	350.	0.	0.	0.	0.	0.
Apr	27	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
May	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
May	17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	70.	23.	0.	0.	23.	0.	23.	0.
May	19	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
May	24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	117.	23.	0.	0.	0.	0.	0.
May	27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	326.	186.	23.	0.	0.	0.	0.
May	30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TABLE 4-12
(Continued)

Month	Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Jun	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jun	3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	0.	0.	0.	0.	0.
Jun	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	163.	0.	0.	0.	0.
Jun	13	0.	0.	0.	0.	0.	23.	0.	0.	93.	47.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jun	16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	93.	0.	0.	0.
Jun	17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	23.	0.	0.	0.	0.	0.	0.	0.	0.
Jun	22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jun	26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jun	27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	70.	0.	0.	0.	23.	0.	0.	0.
Jun	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	70.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jul	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jul	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jul	5	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jul	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.
Jul	9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	117.	70.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jul	13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	47.	210.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jul	14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	0.	0.	0.	0.	0.
Jul	15	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	0.	0.	0.	0.	0.
Jul	16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	70.	23.	0.	0.	0.	0.	0.	0.	0.
Jul	19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	280.	163.	0.	0.	0.	0.	0.	0.
Jul	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	117.	0.	0.	0.
Jul	23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	210.	23.	23.	0.	0.
Jul	24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.
Jul	27	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Jul	29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Aug	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Aug	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	419.	93.	0.	0.
Aug	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Aug	7	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Aug	8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.
Aug	9	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Aug	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.
Aug	18	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	93.	47.	23.	0.	0.	0.	23.	0.	0.
Sep	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Sep	10	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.
Sep	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	140.	233.	0.	0.	0.
Sep	19	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	0.	0.	0.	0.	0.	0.	0.
Sep	21	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	0.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Sep	26	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TABLE 4-12
(Continued)

Month	Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Oct	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Oct	9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.
Oct	10	23.	0.	0.	23.	23.	0.	23.	0.	0.	0.	0.	0.	23.	23.	23.	23.	23.	0.	0.	0.	0.	0.	0.	0.
Oct	24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	23.	0.	0.	0.
Oct	25	0.	23.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	70.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Oct	26	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Oct	27	0.	0.	0.	0.	47.	0.	0.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Nov	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Nov	16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	47.	0.
Nov	20	0.	0.	0.	0.	0.	0.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Nov	24	0.	0.	0.	0.	0.	23.	0.	0.	23.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.
Nov	30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	0.	23.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.
Dec	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	70.	93.	0.	0.	23.	0.
Dec	2	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Dec	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Dec	14	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	47.	47.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Dec	15	0.	0.	0.	0.	0.	23.	23.	23.	93.	117.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Dec	18	0.	23.	23.	47.	0.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Dec	24	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	23.	0.
Dec	25	0.	0.	0.	23.	47.	23.	23.	23.	0.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Dec	27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Dec	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	163.	0.
Dec	29	0.	23.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Dec	31	0.	0.	0.	47.	23.	23.	47.	70.	47.	70.	47.	47.	70.	47.	47.	23.	0.	0.	0.	0.	0.	0.	0.	0.

NOTE: Unlisted days had zero rainfall.

TABLE 4-13

SUMMARY OF RESULTS FOR SAMPLE CASE

Results	Total	By Pathway			By Nuclide		
		Ingestion	Inhalation	Surface	C-14	Tc-99	I-129
Whole Body Equivalent Dose Rate (person rem/yr)	2.16E-02	2.16E-02	1.84E-11	8.86E-11	8.59E-05	1.02E-04	2.14E-02
Collective Fatal Cancer Risk (deaths/yr)	6.55E-07	6.55E-07	1.45E-15	2.49E-14	2.41E-08	2.87E-08	6.02E-07
Whole Body Equivalent Risk From All Exposures (deaths/yr)	2.34E-03	2.34E-03	5.26E-12	8.86E-11	8.59E-05	1.02E-04	2.15E-03

Finally, it should be noted that the sample problem described in Section 4.1 merely illustrates the application of PRESTO-EPA-POP and is not intended as a basis for arriving at any general conclusions regarding specific disposal alternatives.

4.3 JOB CONTROL LANGUAGE

The IBM job control language (JCL) used to execute the run is shown in Figure 4-1. GMWLLWM.POP is the PRESTO-EPA-POP source code. GMWLLWM.SAMPLE is the site/environmental data file. The infiltration data file is GMWLLWM.BRIT. The file, CBNRACS.RADRISK.V4BD, is the RADRISK data file.

```
1.     //GMW JOB (,),ROGERS,TIME=(7,0)
2.     // EXEC FORTXCLG,GREGION=8000K
3.     //FORT.SYSIN DD DSN=GMWLLWM.POP,DISP=SHB
4.     //GO.FT25F001 DD DSN=CBNRACS.RADRISK.V4BD,DISP=SHR
5.     //GO.FT04F001 DD DSN=GMWLLWM.BRIT,DISP=SHR
6.     //GO.FT26F001 DD UNIT=SYSDA,DSN=&&DATA,DISP=(NEW,DELETE),
7.     //  SPACE=(TRK,(30,10),RLSE),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
8.     //GO/SYSIN    DD DSN=GMWLLWM.SAMPLE,DISP=SHR
```

FIGURE 4-1. PRESTO-EPA-POP JCL.

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APPENDIX A

PRESTO-EPA-POP LISTING

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***
 7571.   ? ***
?
C*****************************************************************************
C*****************************************************************************
C*********************   P R E S T O   P O P   ***********************
C*****************************************************************************
C*****************************************************************************
C***
C***  A CODE FOR PREDICTING THE MIGRATION OF RADIOACTIVE WASTE FROM
C***  SHALLOW LAND BURIAL SITES AND THE HEALTH EFFECTS THAT RESULT
C***  FROM THESE LOW LEVEL RADIOACTIVE WASTES.
C***
C***  MODIFIED OCTOBER 1985 BY ROGERS & ASSOC. ENGR. TO ALLOW DOSE
C***  AND HEALTH EFFECT OUTPUT TO BE PRINTED FOR INTERMEDIATE YEARS
C***  DURING THE SIMULATION PERIOD.
C***
C***  THE MAIN PROGRAM ACTS AS A SUPERVISOR FOR THE REST OF THE
C***  CODE.  MOST OF THE BOOKEEPING, INCLUDING MATERIAL BALANCE,
C***  IS DONE HERE.  THE FOLLOWING SUBROUTINES ARE CALLED:
C***  SOURCE, AIRTRM, ERORF, TRENCH, LEACH, VERHOR, SURSOL,
C***  SUSPND, OUT, FOOD, IRRIG, HUMEX, DARTAB, AND QUANC8.
C***
C***
C***
C***
C***
C***
C
C
C
C
C***   GLOBAL VARIABLES
C
C
C        ADEPTH  = AQUIFER DEPTH                                    M
C        AQDISP  = AQUIFER DISPERSION ANGLE                         RADIANS
C        AQTHK   = AQUIFER THICKNESS                                M
C        AQVOL   = AQUIFER DILUTION FACTOR                          M**3
C        AQAM    = AMOUNT OF NUCLIDE AT WELL SITE                   CI/M**3
C        AQAVG   = AVERAGE NUCLIDE CONCENTRATION AT WELL SITE       CI/M**3
C        AQCON   = NUCLIDE CONCENTRATION AT WELL SITE               CI/M**3
C        ATAVG   = AVERAGE NUCLIDE CONCENTRATION IN ATMOSPHERE      CI/M**3
C        ATCON   = NUCLIDE CONCENTRATION IN ATMOSPHERE DOWNWIND     CI/M**3
C        ATMASS  = NUCLIDE MASS NUMBER
C        ABSERR  = ABSOLUTE ERROR IN DDETA CALCULATION
C        BDENS   = BULK DENSITY OF SOIL                             G/CC
C        CPL1    = NUCLIDE CONCENTRATION IN LEAFY VEGETABLES FOR
C                  M.I.E. BY ATMOSPHERIC DEPOSITION                 PCI/KG
C        CPL2    = NUCLIDE CONCENTRATION IN PRODUCE FOR M.I.E.
C                  BY ATMOSPHERIC DEPOSITION                        PCI/KG
C        CPL3    = NUCLIDE CONCENTRATION IN LEAFY VEGETABLES AND
C                  PRODUCE FOR G.P.E. BY ATMOSPHERIC DEPOSITION     PCI/KG
C        CS      = CONCENTRATION IN SURFACE SOIL                    CI/KG
C        CW      = CONCENTRATION IN SURFACE WATER                   CI/M**3
C        CWAT    = NUCLIDE CONCENTRATION IN WATER
C        CCMI1   = NUCLIDE CONCENTRATION IN COW'S MILK FOR M.I.E.
C                  BY ATMOSPHERIC DEPOSITION                        PCI/L
C        CCMI2   = NUCLIDE CONCENTRATION IN COW'S MILK FOR G.P.E.
C                  BY ATMOSPHERIC DEPOSITION                        PCI/L
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C         CGMI1  = NUCLIDE CONCENTRATION IN GOAT'S MILK FOR
C                  M.I.E. BY ATMOSPHERIC DEPOSITION                PCI/L
C         CGMI2  = NUCLIDE CONCENTRATION IN GOAT'S MILK FOR
C                  G.P.E.BY ATMOSPHERIC DEPOSITION                 PCI/L
C         COPL1  = NUCLIDE CONCENTRATION IN LEAFY VEGETABLES FOR
C                  M.I.E. BY IRRIGATION                            PCI/KG
C         COPL2  = NUCLIDE CONCENTRATION IN PRODUCE FOR M.I.E. BY
C                  IRRIGATION                                      PCI/KG
C         COPL3  = NUCLIDE CONCENTRATION IN LEAFY VEGETABLES AND
C                  PRODUCE FOR G.P.E. BY IRRIGATION                PCI/KG
C         CGMEAT = NUCLIDE CONCENTRATION IN BEEF MEAT BY
C                  ATMOSPHERIC DEPOSITION                          PCI/KG
C         COCMI1 = NUCLIDE CONCENTRATION IN COW'S MILK FOR M.I.E.
C                  BY IRRIGATION                                   PCI/L
C         COCMI2 = NUCLIDE CONCENTRATION IN COW' MILK FOR G.P.E.
C                  BY IRRIGATION                                   PCI/L
C         COGMI1 = NUCLIDE CONCENTRATION IN GOAT'S MILK FOR
C                  M.I.E. BY IRRIGATION                            PCI/L
C         COGMI2 = NUCLIDE CONCENTRATION IN GOAT'S MILK FOR
C                  M.I.E. BY IRRIGATION                            PCI/L
C         COMEAT = NUCLIDE CONC IN BEEF MEAT BY IRRIGATION         PCI/KG
C         DBA    = INTERMEDIATE VARIABLE IN DDETA CALC.
C         DBB    = INTERMEDIATE VARIABLE IN DDETA CALC.
C         DBD    = DISPERSION COEFF. IN DDETA CALC.
C         DBR    = RETARDATION FACTOR IN DDETA CALC.
C         DBAL   = LENGTH OF FLOW IN DDETA CALC.
C         DBAV   = GROUNDWATER VELOCITY IN DDETA CALC.            M
C         DBLA   = RADIOL. DECAY COEFF. IN DDETA CALC.
C         DECN   = DECAY CORRECTION FACTOR
C         DDETA  = DECAY-DISPERSION CORRECTION FACTOR
C         DECAY  = RADIOACTIVE DECAY CONSTANT                     1/Y
C         DOVER  = ANNUAL THICKNESS OF TRENCH OVER BURDEN ERODED  M
C         DTRAQ  = DISTANCE FROM TRENCH TO AQUIFER                M
C         DWELL  = DISTANCE FROM TRENCH TO WELL                   M
C         DDETA1 = DDETA FOR VERTICAL TRANSPORT
C         DDETA2 = DDETA FOR HORIZONTAL TRANSPORT
C         DERATE = ATMOSPHERIC DEPOSITION RATE
C         EXPOS  = NORMALIZED DOWN WIND ATMOSPHERIC EXPOSURE PER
C                  UNIT SOURCE RELEASE
C         EXTENT = CROSS SLOPE EXTENT OF SPILLAGE                 M
C         ERREST =
C         FTWIND = FRACTION OF TIME WIND BLOWS TOWARD POPULATION
C         FI     = FRACTION OF YEAR CROPS ARE IRRIGATED
C         GWV    = GROUND WATER VELOCITY                          M/Y
C         GNDCON = INSOLUBLE SURFACE SPILLAGE GROUND CONCENTRATION
C         HTIME  = HORIZONTAL OR AQUIFER TRANSPORT TIME           Y
C         IDELT  = INCREMENTAL YEAR FOR PRINTING ANNUAL SUMMARIES
C         INTYR  = INTERMEDIATE YEARS DURING THE SIMULATION FOR   Y
C                  WHICH DOSE & HEALTH EFFECT OUTPUT IS DESIRED
C         IPRT1  = INITIAL YEAR FOR PRINTING ANNUAL SUMMARIES
C         IPRT2  = FINAL YEAR FOR PRINTING ANNUAL SUMMARIES
C         ITIME  = TOTAL TRANSPORT TIME FROM TRENCH TO WELL       Y
C         IOPSAT = OPTION INDICATOR FOR CALCULATING LENGTH OF
C                  SATURATED ZONE
C         IOPVWV = OPTION IDICATOR FOR CALCULATING VERTICAL WATER
C                  VELOCITY
C         LU2    = LOGICAL UNIT FOR OUTPUT
C         MAXYR  = NUMBER OF YEARS IN SIMULATION
C         NOFUN  = MAXIMUM NUMBER OF FUNCTION EVALUATIONS TO
C                  BE USED BY QUANC8
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C         NYEAR  = CURRENT YEAR OF SIMULATION
C         NONCLD = NUMBER OF NUCLIDES IN SIMULATION
C         NUCLID = NUCLIDE NAMES
C         OVER   = TRENCH OVER BURDEN THICKNESS                    M
C         PC     = FRACTION OF TRENCH CAP THAT HAS FAILED
C         PCON1  = AIR CONCENTRATION                               CI/M**3
C         PCON2  = GROUND SURFACE CONCENTRATION                    CI/M**2
C         PCON3  = COLLECTIVE INGESTION RATE                       PCI.PER
C         PCON4  = COLLECTIVE INHALATION                           PCI.PER
C         PD     = DOWNSLOPE DISTANCE TO STREAM                    M
C         POLB   = AMOUNT OF NUCLIDE LEAVING BOTTOM OF TRENCH      CI
C         POLO   = AMOUNT OF NUCLIDE OVERFLOWING TRENCH            CI
C         POP    = POPULATION
C         PORS   = POSOSITY OF SOIL
C         PORT   = POROSITY OF TRENCH CONTENTS
C         PERMS  = PERMEABILITY OF SOIL                            M/Y
C         QING    = ANNUAL INTAKE OF RADIONUCLIDE BY INGESTION
C                   OF CONTAMINATED FOOD CONSIDERING ATMOSPHERIC
C                   AND AQUATIC PATHWAYS                           PCI/Y
C         QINH    = ANNUAL INTAKE OF NUCLIDE BY INHALATION         PCI/Y
C         QFRAC   = FRACTION OF INGESTION DUE TO WATER
C         RELERR = RELATIVE ERROR FOR DDETA INTEGRATION
C         RESULT = FINAL FORM OF DDETA CORRECTION FACTOR
C         RESUL1 = FINAL FORM OF VERTICAL DDETA
C         RESUL2 = FINAL FORM OF HORIZONTAL DDETA
C         RETARH = HORIZONTAL RETARDATION FACTOR
C         RETARV = VERTICAL RETARDATION FACTOR
C         SOAM   = AMOUNT OF SURFACE SPILLAGE                      CI
C         SAREA  = AREA OF SPILLAGE                                M**2
C         SDEEP  = AMOUNT OF SOLUBLE SURFACE COMPONENT GOING TO
C                  TRENCH                                          CI
C         STAVG  = AVERAGE NUCLIDE CONCENTRATION IN STREAM         CI/M**3
C         STCON  = NUCLIDE CONCENTRATION IN STREAM                 CI/M**3
C         SOILOS = ANNUAL SOIL LOSS DUE TO EROSION
C         SSTREM = AMOUNT SURFACE COMPONENT GOING TO STREAM        CI
C         STFLOW = STREAM FLOW RATE                                M**3/Y
C         TRAM   = AMOUNT OF NUCLIDE IN TRENCH                     CI
C         VD     = ATMOSPHERIC DEPOSITION VELOCITY                 M/S
C         VOLB   = VOLUME OF WATER LEAVING TRENCH BOTTOM           M**3
C         VOLO   = VOLUME OF WATER OVERFLOWING TRENCH              M**3
C         VOLUSD = HYPOTHETICAL VOLUME OF WATER USED FROM WELL     M**3
C         VTIME  = VERTICAL TRANSPORT TIME                         Y
C         VWV    = VERTICAL WATER VELOCITY (TRENCH TO AQUIFER)     M/Y
C         WIRATE = IRRIGATION RATE                                 L/M**2-
C         XINFL  = ANNUAL INFILTRATION RATE                        M
C         XKD    = CHEMICAL EXCHANGE COEFFICIENT                   ML/G
C         XLSAT  = LENGTH OF SATURATED ZONE                        M
C         YSO    = ATMOSPHERIC SOURCE AMOUNT AT SPILLAGE           CI
C
C
C-----OTHER VARIABLES ARE DEFINED IN SUBROUTINES WHERE THEY
C-----ARE USED MOST FREQUENTLY.
C-----
      DOUBLE PRECISION NUCLID,DBAV,DBAL,DBR,DBA,DBB,DBD,DBLA,
     &                 FCN,RESULT,ABSERR,RELERR,ERREST,FLAG
      DOUBLE PRECISION RESUL1,RESUL2,PNUC
      COMMON/STREAM/DWS                                                 ISINEW
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &       PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &       IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),         RAE1085
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     &        WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
     &        SMASS,WMASS,WDEEP
      COMMON/TRCH/TAREA,TDEPTH,OVER,PORT,RELFAC,DENCON,OLDWAT,FN
      COMMON/WATER/DTRAQ,DWELL,GWV,XLSAT,STFLOW,AQTHK,AQDISP,
     & PORA,PORV,PERMV,IAQSTF,CPRJ
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &        PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &        INSITE
      COMMON/AIR/H,VG,U,IT,IS,VD,XG,HLID,ROUGH,FTWIND,CHIQ,RE1,RE2,RE3
      COMMON/DOUBLE/DBAV,DBAL,DBD,DBR,DBLA
      COMMON/IRRFOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &        ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &        QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &        CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &        CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &        COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &        COMEAT(40),QING(40),QINH(40),POP,
     &        CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &            QCW,QGW,QBW,ABSH,P14
      COMMON/PASS/PNUC(40),PCON1(40),PCON2(40),PCON3(40),
     &       PCON4(40),PPOP,LLIND,LDIST
      COMMON/PCV/SOCON(40)
      COMMON/ACCMOD/FICAN(40),CCNR(40),POPD(40),GNR(40),
     &              TFIC,TCCNR,TPOPD,TGNR
C-----
      EXTERNAL FCN
      DIMENSION ITIME(40),DDETA(40),DECN(40)                            ISIMOD
      DIMENSION DDETA3(40),JTIME(40),DEIWS(40),DEWS(40)                 ISINEWL
      DIMENSION QLB(40,10),TRAP(40),QLBPTH(40),HE(40),QLBTTH(40)
      DIMENSION NUCL(40,8),NUMBER(11),IDIG(3),BSMT(40),SAVE(40,21)      RAE1085
      DIMENSION AQMAX(40),STMAX(40),ATMAX(40),MXAQ(40),MXST(40),MXAT(40)
      DIMENSION PC1(40),PC2(40),PC3(40),PC4(40),NPC1(40),NPC2(40),
     &          NPC3(40),NPC4(40),BSMTA(40),CCNRS(40,4),FICANS(40,4),   RAE1085
     &          GNRS(40,4),HEF(40,4),POPDS(40,4),POSS(40,4),POWS(40,4), RAE1085
     &          QBASIN(40,4),RTAS(40,4),TCCNRS(4),TFICS(4),TGNRS(4),    RAE1085
     &          TPOPDS(4)                                               RAE1085
      DIMENSION QDWSB(40),POW(40),POS(40),PLBT(40),OFT(40),RTA(40)
      DIMENSION CIOT(40),CINEWT(40)
      DATA LU2/6/
      DATA ISW/0/
      DATA MINUS/'-'/
      DATA NUMBER/'1','2','3','4','5','6','7','8','9','0',' '/
      CALL ERRSET (208,256,-1,1)
      IBK=0
      RESAT=0.
      DO 11 K=1,10
      DO 11 I=1,40
   11 QLB(I,K)=0.0
      DO 10 I=1,40
      QDWSB(I)=0.
      QLBPTH(I)=0.0
      QLBTTH(I)=0.0
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```
      POW(I)=0.
      POS(I)=0.
      PLBT(I)=0.
      OFT(I)=0.
      RTA(I)=0.
      AQAVG(I)=0.
      STAVG(I)=0.
      ATAVG(I)=0.
      SOAVG(I)=0.
      BSMT(I)=0.0
      AQMAX(I)=0.0
      STMAX(I)=0.0
      ATMAX(I)=0.0
      MXAQ(I)=0
      MXST(I)=0
      MXAT(I)=0
      PC1(I)=0.
      PC2(I)=0.
      PC3(I)=0.
      PC4(I)=0.
      NPC1(I)=0
      NPC2(I)=0
      NPC3(I)=0
      NPC4(I)=0
      CSP(I)=0.
      CSPT(I)=0.
      CSPO(I)=0.
      CSPOT(I)=0.
      SDEEP(I)=0.
      DO 10 NN=1,1000
      AQAM(I,NN)=0.
   10 CONTINUE
      DO 770 I=1,40
  770 CIOT(I)=0.0
      OLDWAT=0.
      ABSERR=1.0D-5
C       CIOT IS A VARIABLE TO BE USED IN SUB. LEACH
C       INTRODUCED FOR OCT11 VERSION (HUNG)
      RELERR=1.0D-5
C----- INITIALIZE VARIABLES AND INPUT CONTROL PARAMETER.
C----- PRINT OUT INITIAL CONDITIONS.
C-----
      CALL SOURCE(NUCL,CFT1,DCFT,FGAM,IRST,PERMT,RTGR,SSAT,XRTM)
C-----  PRJ=PERCENTAGE OF AQUIFER WATER FLOWING TO STREAM
       PRJ=1.-CPRJ
C----- THE FOLLOWING EXTRACTS THE ATOMIC MASS FROM THE NUCLIDE
C----- NAME. THE NUCLIDE NAME MUST CONSIST OF ONE OR TWO LETTERS,
C----- A MINUS SIGN, AND ONE TO THREE DIGITS.  NO IMBEDDED
C----- BLANKS ARE ALLOWED.  THE NAME MUST BE LEFT JUSTIFIED.
C-----
C
      WRITE(LU2,5000)
      DO 50 I=1,NONCLD
      NDASH=2
      IF(NUCL(I,NDASH) .EQ. MINUS) GO TO 20
      NDASH=3
   20 NNUM=NDASH+1
      DO 30 K=1,3
      ICHAR=NUCL(I,NNUM+K-1)
      DO 25 L=1,11
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```
      IF(ICHAR .EQ. NUMBER(L)) GO TO 27
   25 CONTINUE
   27 IDIG(K)=L
      IF(IDIG(K) .EQ. 10) IDIG(K)=0
   30 CONTINUE
      NDIG=3
      IF(IDIG(3) .EQ. 11) NDIG=2
      IF(IDIG(2) .EQ. 11) NDIG=1
      INUCN=0
      DO 40 L=1,NDIG
      INUCN=INUCN+IDIG(L)*10**(NDIG-L)
   40 CONTINUE
      ATMASS(I)=FLOAT(INUCN)
      WRITE(6,5005)NUCLID(I),ATMASS(I)
   50 CONTINUE
C-----
C----- DETERMINE IF FARMING IS ONSITE
C-----
      INSITE=0
      XIRR=0.0
      IF(XG .GT. PD)GO TO 60
      WRITE(LU2,5006)
      INSITE=1
      XIRR=WIRATE*FI*8760./1.0E3
      FARMGD=EXTENT*PD
      PEOPLE=FARMGD/4492.
      IF(PEOPLE .LT. POP) GO TO 60
      POP=PEOPLE
      WRITE(LU2,5007)POP
   60 CONTINUE
C-----
C----- DETERMINE NORMALIZED ATMOSPHERIC EXPOSURE AND
C----- DEPOSITION.
C-----
      EXPOS=CHIQ
      IF(CHIQ .LE. 0.0)CALL AIRTRM(EXPOS,DEPO)
      PPOP=POP                                                          RAE1085
      LLIND=LIND                                                        RAE1085
      LDIST=XG                                                          RAE1085
      DO 62 I=1,NONCLD                                                  RAE1085
   62 PNUC(I)=NUCLID(I)                                                 RAE1085
C-----
C----- DETERMINE ANNUAL INFILTRATION RATE THROUGH TRENCH CAP
C-----
      CALL INFIL(TXI,TP)
      XINFL=TXI
      PPN=TP
C-----
C----- DETERMINE VERTICAL WATER VELOCITY, RETARDATION FACTOR,
C----- VERTICAL TRANSIT TIME, HORIZONTAL TRANSIT TIME, AND
C----- TOTAL TRANSIT TIME.
C-----
       VWV=PERMV/PORV
      RESAT=RESAT/PORV
      TINFL=(PCT2*(PPN+XIRR)+(2.-PCT2)*XINFL)*0.5
      IF(SSAT .GT. 0.) GO TO 72
      SSAT=RESAT+(1.-RESAT)*(TINFL/PERMV)**0.25
      IF(SSAT .GT. 1.) SSAT=1.
   72 CONTINUE
      WRITE(LU2,1005) SSAT,RESAT
```

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1005 FORMAT(' DEGREE OF SATURATION = ',F6.3,/,
    &       ' RESIDUAL SATURATION  = ',F6.3)
     IF(SSAT .GT. 0.0 .AND. SSAT .LT. 1.) VWV=TINFL/(PORV*SSAT)
      XLSAT=DTRAQ
     WRITE(LU2,6200)
     DO 100 I=1,NONCLD
     RETARV=1.+(BDENS*XKD(3,I))/PORV
     IF(SSAT .GT. 0.0 .AND. SSAT .LT. 1.) RETARV=1.+(RETARV-1.)/SSAT
     VTIME=DTRAQ*RETARV/VWV
     DDETA1=1.0
     IF (VTIME .GT. 1000. .OR. VTIME .GT. 50.*.693/DECAY(I)) GO TO 70
     DBAL=DTRAQ
     DBD=.3D0*VWV
     DBLA=DECAY(I)
     DBAV=VWV
     DBR=RETARV
     DBA=VTIME/10.0D0
     DBB=VTIME
     CALL QUANC8(FCN,DBA,DBB,ABSERR,RELERR,RESUL1,ERREST,NOFUN,FLAG)
     DBA=VTIME
     DBB=VTIME*10.0D0
     CALL QUANC8(FCN,DBA,DBB,ABSERR,RELERR,RESUL2,ERREST,NOFUN,FLAG)
     RESULT=RESUL1+RESUL2
     DDETA1=RESULT*DEXP(DBAL*DBR*DBLA/DBAV)
     IF(DDETA1 .LT. 1.0) DDETA1=1.0
  70 RETARH=1.+(BDENS*XKD(4,I))/PORA
     HTIME=DWELL*RETARH/GWV
     DDETA2=1.0
     IF(HTIME .GT. 1000. .OR. HTIME .GT. 50.*.693/DECAY(I)) GO TO 80
     DBAL=DWELL
     DBD=.3D0*GWV
     DBAV=GWV
     DBR=RETARH
     DBA=HTIME/10.0D0
     DBB=HTIME
     CALL QUANC8(FCN,DBA,DBB,ABSERR,RELERR,RESUL1,ERREST,NOFUN,FLAG)
     DBA=HTIME
     DBB=HTIME*10.0D0
     CALL QUANC8(FCN,DBA,DBB,ABSERR,RELERR,RESUL2,ERREST,NOFUN,FLAG)
     RESULT=RESUL1+RESUL2
     DDETA2=RESULT*DEXP(DBAL*DBR*DBLA/DBAV)
     IF(DDETA2 .LT. 1.0) DDETA2=1.0
  80 DDETA(I)=DDETA1*DDETA2
     TEMP=VTIME+HTIME
     IF(TEMP .GT. FLOAT(MAXYR) .AND. TEMP .LT. 1.1*FLOAT(MAXYR))IBK=1
     IF(TEMP .GT. 10000.) TEMP=10001.
     ITIME(I)=INT(TEMP)
     WRITE(LU2,6210)NUCLID(I),RETARV,VTIME,DDETA1,RETARH,HTIME,
    &               DDETA2,DDETA(I),TEMP
     WSTIME=DWS*RETARH/GWV                                          ISINEW
     DDETA3(I)=1.0                                                  ISINEW
     IF(WSTIME .GT .1000. .OR. WSTIME .GT. 50.*.693/DECAY(I))GO TO 90     ISIN
     DBAL=DWS                                                       ISINEW
     DBD=.3D0*GWV
     DBAV=GWV                                                       ISINEW
     DBR=RETARH                                                     ISINEW
     DBA=WSTIME/10.0D0
     DBB=WSTIME                                                     ISINEW
     CALL QUANC8(FCN,DBA,DBB,ABSERR,RELERR,RESUL1,ERREST,NOFUN,FLAG)  ISINEWL
     DBA=WSTIME                                                     ISINEWL
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```
      DBB=WSTIME*10.0D0
      CALL QUANC8(FCN,DBA,DBB,ABSERR,RELERR,RESUL2,ERREST,NOFUN,FLAG)    ISINEWL
      RESULT=RESUL1+RESUL2                                               ISINEWL
      DDETA3(I)=RESULT*DEXP(DBAL*DBR*DBLA/DBAV)                          ISINEWL
      IF(DDETA3(I).LT.1.0)DDETA3(I)=1.0                                  ISINEWL
   90 IF(WSTIME.GT.10000) WSTIME=10000                                   ISINEWL
      JTIME(I)=INT(WSTIME)                                               ISINEWL
  100 CONTINUE
      IF(IBK .EQ. 1)WRITE(LU2,6220)
C-----
C----- DETERMINE ANNUAL SOIL LOSS DUE TO EROSION OF INSOLUBLE
C----- MATERIALS (UNIVERSAL SOIL LOSS EQUATION).
C-----
      CALL ERORF
      SOILOS=SOILOS*.22412
      DOVER=SOILOS/(1000.*BDENS)
      WRITE(LU2,602)SOILOS,DOVER
      WRITE(LU2,603)XINFL
      WRITE(LU2,604)VWV
      WRITE(LU2,605)EXPOS
  300 CONTINUE
C-----
C----- CALCULATE AQUIFER VOLUME
      AQVOL=GWV*PORA*AQTHK*(SQRT(TAREA)+2.*TAN(AQDISP/2.)*DWELL)
C-----
C----- COMPUTE HYPOTHETICAL RADIONUCLIDE WITHDRAWL FROM WELL PER YEAR.
C-----
      VOLUSW=(WIRATE*4492.*FI*8760.*WWATL +
     &       UWAT*WWATH + 15000.*WWATA)*POP*1.0E-3
      VOLUSS=(WIRATE*4492.*FI*8760.*SWATL +
     &       UWAT*SWATH + 15000.*SWATA)*POP*1.0E-3
C
C
C-----
C----- THE FOLLOWING LOOP WILL BE PROCESSED FOR EACH YEAR IN
C----- THE SIMULATION.
C-----
C      DO LOOP 260 CALCULATES REMAINING RADIOACTIVITY
C      IN TRENCH AFTER 10000 YEARS ASSUMING PERFECT
C       TRENCH ISOLATION
      DO 260 I=1,NONCLD
  260 TRAP(I)=TRAM(I)*EXP(-DECAY(I)*10000.)
      DO 999 I=1,NONCLD
      DECN(I)=EXP(-DECAY(I))
      DETW(I)=EXP(-DECAY(I)*ITIME(I))                                    ISICH
      DETWS(I)=EXP(-DECAY(I)*(ITIME(I)+JTIME(I)))                        ISINEWL
  999 DEWS(I)=EXP(-DECAY(I)*JTIME(I))                                    ISINEWL
C ****  SUBROUTINE XPRESS IS CALLED TO CALCULATE A RESUSPENSION
C****   RATE NEEDED EVERY YEAR FOR EVERY NUCLIDE BUT THAT ONLY
C ****  DEPENDS ON THE CURRENT YEAR. THIS SHOULD CUT COMPUTATION
C ***   COST BY A FACTOR EQUAL THE NUMBER OF NUCLIDES
C ***
      CALL XPRESS(RE1,RE2,RE3,PD,EXTENT)
C
      JYR=1                                                              RAE1085
      DO 1000 N=1,MAXYR
      NYEAR=N
      AUX=FLOAT(N)
      TRLS=0.
      IF(DOVER .GT. OVER)TRLS=DOVER-OVER
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      TDEPTH=TDEPTH-TRLS
      OVER=OVER-DOVER
      IF(OVER .LT. 0.)OVER=0.
      FONSIT=0.
      IF(NYEAR .LT. IRST .OR. INSITE .EQ. 0) GO TO 1068
      RSTR=FLOAT(NYEAR-IRST)
      XRT=XRTM
      IF(RSTR*RTGR .GT. 9.0 .OR. RTGR .LE. 0.001) GO TO 1069
      XRT=XRTM*(1.-EXP(-RTGR*RSTR))
 1069 IF(XRT .LE. OVER) GO TO 1068
      D1R=TDEPTH
      IF(XRT .LE. D1R) FONSIT=1.-OVER/XRT
      IF(XRT .GT. D1R) FONSIT=(TDEPTH-OVER)/XRT
 1068 IF(FONSIT .LE. 0.) FONSIT=0.
C-----
C----- CALCULATE TRENCH WATER BALANCE.
C-----
      CALL TRENCH(NYEAR,VOLB,VOLO,DMAX,PC,TINFL)
      IF(VOLB .LE. .1*AQVOL .OR. ISW .GT. 0)GO TO 450
      ISW=ISW+1
      WRITE(LU2,615)NYEAR
  450 CONTINUE
      CFF=1.
      IF(CFT1 .LT. 0.5 .AND. DCFT .LT. 0.5) GO TO 451
      IF(AUX .LT. CFT1) CFF=0.
      IF(DCFT .LT. 0.5) GO TO 451
      CFT2 = CFT1 + DCFT
      IF(AUX .GE. CFT1 .AND. AUX .LE. CFT2) CFF=(AUX-CFT1)/DCFT
  451 CONTINUE
C-----
C----- THE FOLLOWING LOOP IS EXECUTED FOR EACH NUCLIDE.
C-----
      DO 500 I=1,NONCLD
      II=I
      XDECN=DECN(II)
      TRAM(II)=TRAM(II)*XDECN
      CS(II)=CS(II)*XDECN
      CW(II)=CW(II)*XDECN
C-----
C----- CALCULATE THE AMOUNT OF LEACHING.
C-----
      CALL LEACH(II,NYEAR,VOLB,VOLO,DMAX,CIOT,CFF,XDECN,TINFL,PERMT)
      PLBT(II)=PLBT(II)+POLB(II)
      OFT(II)=OFT(II)+POLO(II)
C-----
C----- CALCULATE ADDITIONS TO AQUIFER.
C-----
      CALL VERHOR(II,NYEAR,ITIME,DDETA)
C     ITMP IS THE YEAR OF ARRIVAL OF POLB AND SDEEP TO A POINT IN        ISINEWL
C     THE AQUIFER EXACTLY BELOW THE WELL                                 ISINEWL
      ITMP=ITIME(II)+NYEAR
      IF(ITMP.LE.1000) GO TO 241
C     IF R-ACTIVITY POLB AND SDEEP GET TO THE WELL POINT AFTER YEAR      ISINEWL
C     1000 NO DECREASE BY WATER COMMUNITY USE IS CONSIDERED IN THE       ISINEWL
C     CALCULATION OF R-ACTIVITY FLOW FROM THE WELL POINT TO THE STREAM   ISINEWL
      JTMP=NYEAR+ITIME(II)+JTIME(II)                                     ISINEWL
      KIN=INT(FLOAT(JTMP-1)/1000.)                                       ISINEWL
      IF(KIN.GT.10) KIN=10                                               ISINEWL
      IF (KIN.EQ.10) GO TO 231                                           ISINEWL
      QLB(II,KIN)=QLB(II,KIN)+DETWS(II)*PRJ*(POLB(II)+                       ISIC
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     &              SDEEP(II))*DDETA(II)*DDETA3(II)                          ISICH
      GO TO 241
  231 AUX=FLOAT(NYEAR)
      QLB(II,10)=QLB(II,10)+EXP(-DECAY(II)*(10000.-AUX))*(POLB(II)+
     &              SDEEP(II))*DDETA(II)*DDETA3(II)                         ISICH
  241 CONTINUE
      AQCON(II)=AQAM(II,NYEAR)/AQVOL
      AMT1=VOLUSW*AQCON(II)
      IF(AMT1 .LE. AQAM(II,NYEAR) .OR. AMT1 .EQ. 0.) GO TO 350
      AQCON(II)=AQAM(II,NYEAR)/(VOLUSW)
  350 IF(N .GE. IAVG1 .AND. N .LE. IAVG2)AQAVG(II)=AQAVG(II)+AQCON(II)
      IF(AQCON(II) .LE. AQMAX(II)) GO TO 360
      AQMAX(II)=AQCON(II)
      MXAQ(II)=N
  360 CONTINUE
C     ACTIVITY PUMPED OUT FROM THE WELL FOR COMMUNITY USE
      AMT1=VOLUSW*AQCON(II)
      POW(II)=POW(II)+AMT1
      IF(VOLUSW.GE.AQVOL) GO TO 351                                        IISINEW
C     IF MORE WATER IS PUMPED OUT FROM THE WELL THAN IS AVAILABLE IN       ISINEW
C     AQUIFER VOLUME NO ACTIVITY WILL FLOW FROM WELL POINT TO STREAM       ISINEW
      JTMP=NYEAR+ITIME(II)+JTIME(II)                                       ISINEW
      KIND=INT(FLOAT(JTMP-1)/1000.)                                        ISINEW
      IF(KIND.EQ.0)QDWSB(II)=QDWSB(II)+DEWS(II)*PRJ*                          ISIN
     &              (AQAM(II,NYEAR)-AMT1)*DDETA3(II)                       ISINEW
      IF(KIND.EQ.0) GO TO 351                                              ISINEW
      IF(KIND.GT.10) KIND=10                                               ISINEW
      IF(KIND.LT.10) GO TO 352                                             ISINEW
      QLB(II,10)=QLB(II,10)+EXP(-DECAY(II)*(10000-FLOAT(NYEAR)))*          ISINEWL
     &            (AQAM(II,NYEAR)-AMT1)*DDETA3(II)                         ISINEW
      GO TO 351                                                            ISINEWL
  352 QLB(II,KIND)=QLB(II,KIND)+DEWS(II)*PRJ*(AQAM(II,NYEAR)-AMT1)*           ISIN
     &              DDETA3(II)
  351 CONTINUE                                                             ISINEWL
C-----
C----- CALCULATE TRANSPORT OF SOLUBLE SURFACE COMPONENT
C-----
      CALL SURSOL(II,NYEAR,VOLO)
      IF(NYEAR .EQ. 1)SSTREM(II)=STAM(II)+SSTREM(II)
       STCON(II)=SSTREM(II)/STFLOW                                         ISIMOD
      AMT=VOLUSS*STCON(II)
      IF(AMT .LE. SSTREM(II) .OR. AMT .EQ. 0.)GO TO 365
      STCON(II)=SSTREM(II)/(VOLUSS)
  365 IF(N .GE. IAVG1 .AND. N .LE. IAVG2)STAVG(II)=STAVG(II)+STCON(II)
      IF(STCON(II) .LE. STMAX(II))GO TO 370
      STMAX(II)=STCON(II)
      MXST(II)=N
  370 CONTINUE
      POS(II)=POS(II)+VOLUSS*STCON(II)
C     RESIDUAL R-ACTIVITY FROM STREAM 'DITCH' AFTER COMMUNITY USE         ISINEWL
C     IS PASSED TO THE BASIN IN THE SAME YEAR.                            ISINEWL
      IF(VOLUSS.LE.STFLOW)QDWSB(II)=(STFLOW-VOLUSS)*STCON(II)+QDWSB(II)
C
C-----
C----- CALCULATE ATMOSPHERIC CONCENTRATION AND AMOUNT
C----- ABOVE SPILLAGE AREA
C-----
C
      GNDCON=CS(II)*BDENS*ADEPTH*1.0E3
      IF(INSITE .EQ. 0 .OR. IRRES1 .GE. NYEAR) GO TO 381
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```
      D1R=TRAM(II)/(TAREA*TDEPTH*DENCON*1000.)
      CALL SUSPND(NYEAR,II,D1R)
      ATCON(II)=YSO(II)
      GO TO 382
  381 CONTINUE
      CALL SUSPND(NYEAR,II,GNDCON)
      RTA(II)=RTA(II)+YSO(II)*3.1536E7
      ATCON(II)=YSO(II)*EXPOS*FTWIND
  382 IF(N .GE. IAVG1 .AND. N .LE. IAVG2)ATAVG(II)=ATAVG(II)+ATCON(II)   ISISEPT
      IF(ATCON(II) .LE. ATMAX(II)) GO TO 380                             ISISEPT
      ATMAX(II)=ATCON(II)
      MXAT(II)=N
  380 CONTINUE
      BSMTA(II)=0.
      IF(IBSMT .GT. 0 .AND. NYEAR .GE. IBSMT)BSMT(II)=BSMT(II)+TRAM(II)
      IF(IBSMT .GT. 0 .AND. NYEAR .GE. IBSMT)BSMTA(II)=+TRAM(II)
      IF(NYEAR .EQ. 1 .AND. IVAP .EQ. 1) BSMTA(II)=TRAM(II)
      IF(NYEAR .EQ. 1 .AND. IVAP .EQ. 1)  BSMT(II)=BSMTA(II)
C
C-----
C----- MATERIAL BALANCE
C-----
C
C----- 3.1536E7 IS THE NUMBER OF SECONDS IN A YEAR
      CS(II)=CS(II)+((TRLS/(TDEPTH+TRLS)*TRAM(II)-YSO(II)*3.1536E7)/
     1  (EXTENT*PD*ADEPTH))*1.0E-3/BDENS
      TRAM(II)=TRAM(II)*(1.0-TRLS/(TDEPTH+TRLS))
      IF(LEAOPT.EQ.5 .AND. DMAX.GT.0.)TRAM(II)=TRAM(II)*(1-RELFAC)      ISIMOD
      IF(LEAOPT.NE.5)TRAM(II)=TRAM(II)-POLB(II)-POLO(II)
      IF(TRAM(II) .LT. 0.)TRAM(II)=0.
      CW(II)=CW(II)+(POLO(II)/
     &    (EXTENT*PD*ADEPTH*PORS))
      IF(CW(II) .LT. 0.) CW(II)=0.
      IF(CS(II) .LT. 0.)CS(II)=0.
C ---
C----- COMPUTE SOIL CONCENTRATION
C-----
      D1R=0.
      SOCON(II)=1.0E12*ADEPTH*(CW(II)*PORS+1000.*CS(II)*BDENS+D1R)
      IF(IOPVWV .LT. 0) GO TO 384
      IF(IRST .LT. N .AND. TDEPTH .GT. 0.) D1R=FONSIT*TRAM(II)/
     & (TAREA*TDEPTH)
      IF(IOPVWV .EQ. 1) D1R=D1R*BV(II)
      SOCON(II)=1.0E12*ADEPTH*D1R
  384 CONTINUE
      IF(N .GE. IAVG1 .AND. N .LE. IAVG2)SOAVG(II)=SOAVG(II)+SOCON(II)
C
  500 CONTINUE
      DO 900 I=1,NONCLD
      II=I
      DERATE(II)=ATCON(II)*VD*3.6E15
      CALL FOODA(II)
      IF(N .GE. IAVG1 .AND. N .LE. IAVG2)CSPT(II)=CSPT(II)+CSP(II)
      CWAT(II)=(WWATL*AQCON(II)+SWATL*STCON(II))*1.0E9
      CALL IRRIGA(II)
      IF(N .GE. IAVG1 .AND. N .LE. IAVG2)CSPOT(II)=CSPOT(II)+CSPO(II)
      CWAT(II)=(WWATH*AQCON(II)+SWATH*STCON(II))*1.0E9
      CALL HUMEXA(II)
      BSMTA(II)=BSMTA(II)*.03333333*FGAM/(TDEPTH*TAREA)
      QSUR=(CSP(II)+CSPO(II))/1.0E12
```

```
      TEMP=ATCON(II)
      IF(PC1(II) .GE. TEMP)GO TO 820
      PC1(II)=TEMP
      NPC1(II)=NYEAR
  820 CONTINUE
      TEMP=QSUR+BSMTA(II)
      IF(PC2(II) .GE. TEMP)GO TO 840
      PC2(II)=TEMP
      NPC2(II)=NYEAR
  840 CONTINUE
      TEMP=QING(II)*POP
      IF(PC3(II) .GE. TEMP)GO TO 860
      PC3(II)=TEMP
      NPC3(II)=NYEAR
  860 CONTINUE
      TEMP=QINH(II)*POP
      IF(PC4(II) .GE. TEMP) GO TO 880
      PC4(II)=TEMP
      NPC4(II)=NYEAR
  880 CONTINUE
  900 CONTINUE
      WD=DMAX
      IF(WD .GT. TDEPTH)WD=TDEPTH
      IF(MOD(NYEAR-IPRT1,IDELT) .EQ. 0 .OR. NYEAR .EQ. 1)
     &   CALL OUT(NYEAR,PC,WD,VOLO,VOLB)
C                                                                       RAE1085
C     CALCULATE AVERAGE NUCLIDE CONCENTRATIONS                          RAE1085
C     AND CALL DARTAB FOR INTERMEDIATE YEARS                            RAE1085
C                                                                       RAE1085
      IF(NYEAR .NE. INTYR(JYR)) GO TO 1000                              RAE1085
C                                                                       RAE1085
C     SAVE VALUES OF PERTINENT VARIABLES                                RAE1085
C                                                                       RAE1085
      ISAV1=IAVG1                                                       RAE1085
      ISAV2=IAVG2                                                       RAE1085
      DO 990 I=1,NONCLD                                                 RAE1085
        SAVE(I,1)=CL1(I)                                                RAE1085
        SAVE(I,2)=CL2(I)                                                RAE1085
        SAVE(I,3)=CP1(I)                                                RAE1085
        SAVE(I,4)=CP2(I)                                                RAE1085
        SAVE(I,5)=CSP(I)                                                RAE1085
        SAVE(I,6)=CWAT(I)                                               RAE1085
        SAVE(I,7)=CMEAT(I)                                              RAE1085
        SAVE(I,8)=CCMI1(I)                                              RAE1085
        SAVE(I,9)=CCMI2(I)                                              RAE1085
        SAVE(I,10)=CGMI1(I)                                             RAE1085
        SAVE(I,11)=CGMI2(I)                                             RAE1085
        SAVE(I,12)=COL1(I)                                              RAE1085
        SAVE(I,13)=COL2(I)                                              RAE1085
        SAVE(I,14)=COP1(I)                                              RAE1085
        SAVE(I,15)=COP2(I)                                              RAE1085
        SAVE(I,16)=COCMI1(I)                                            RAE1085
        SAVE(I,17)=COCMI2(I)                                            RAE1085
        SAVE(I,18)=COGMI1(I)                                            RAE1085
        SAVE(I,19)=COGMI2(I)                                            RAE1085
        SAVE(I,20)=COMEAT(I)                                            RAE1085
        SAVE(I,21)=CSPO(I)                                              RAE1085
        AQAVG(I)=AQAVG(I)/NYEAR                                         RAE1085
        ATAVG(I)=ATAVG(I)/NYEAR                                         RAE1085
        SOAVG(I)=SOAVG(I)/NYEAR                                         RAE1085
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  990   STAVG(I)=STAVG(I)/NYEAR                                          RAE1085
C                                                                        RAE1085
C     PREPARE CONCENTRATION ARRAYS, PCON, FOR DARTAB                     RAE1085
C                                                                        RAE1085
      IAVG1=1                                                            RAE1085
      IAVG2=NYEAR                                                        RAE1085
      DO 992 I=1,NONCLD                                                  RAE1085
        II=I                                                             RAE1085
        DERATE(II)=ATAVG(II)*VD*3.6E15                                   RAE1085
        CALL FOOD(II)                                                    RAE1085
        CWAT(II)=(WWATL*AQAVG(II)+SWATL*STAVG(II))*1.E9                  RAE1085
        CALL IRRIG(II)                                                   RAE1085
        CWAT(II)=(WWATH*AQAVG(II)+SWATH*STAVG(II))*1.E9                  RAE1085
        CALL HUMEX(II)                                                   RAE1085
C     PREPARE ARRAYS TO PASS TO DARTAB                                   RAE1085
        PCON1(II)=ATAVG(II)*POP                                          RAE1085
        PCON2(II)=(CSP(II)+CSPO(II))*POP*1.E-12                          RAE1085
        PCON3(II)=QING(II)*POP                                           RAE1085
        PCON4(II)=QINH(II)*POP                                           RAE1085
  992 CONTINUE                                                           RAE1085
C                                                                        RAE1085
C     RESTORE SAVED VALUES                                               RAE1085
C                                                                        RAE1085
      DO 994 I=1,NONCLD                                                  RAE1085
        CL1(I)=SAVE(I,1)                                                 RAE1085
        CL2(I)=SAVE(I,2)                                                 RAE1085
        CP1(I)=SAVE(I,3)                                                 RAE1085
        CP2(I)=SAVE(I,4)                                                 RAE1085
        CSP(I)=SAVE(I,5)                                                 RAE1085
        CWAT(I)=SAVE(I,6)                                                RAE1085
        CMEAT(I)=SAVE(I,7)                                               RAE1085
        CCMI1(I)=SAVE(I,8)                                               RAE1085
        CCMI2(I)=SAVE(I,9)                                               RAE1085
        CGMI1(I)=SAVE(I,10)                                              RAE1085
        CGMI2(I)=SAVE(I,11)                                              RAE1085
        COL1(I)=SAVE(1,12)                                               RAE1085
        COL2(I)=SAVE(I,13)                                               RAE1085
        COP1(I)=SAVE(I,14)                                               RAE1085
        COP2(I)=SAVE(I,15)                                               RAE1085
        COCMI1(I)=SAVE(I,16)                                             RAE1085
        COCMI2(I)=SAVE(I,17)                                             RAE1085
        COGMI1(I)=SAVE(I,18)                                             RAE1085
        COGMI2(I)=SAVE(I,19)                                             RAE1085
        COMEAT(I)=SAVE(I,20)                                             RAE1085
        CSPO(I)=SAVE(I,21)                                               RAE1085
        AQAVG(I)=AQAVG(I)*NYEAR                                          RAE1085
        ATAVG(I)=ATAVG(I)*NYEAR                                          RAE1085
        SOAVG(I)=SOAVG(I)*NYEAR                                          RAE1085
  994   STAVG(I)=STAVG(I)*NYEAR                                          RAE1085
      IAVG1=ISAV1                                                        RAE1085
      IAVG2=ISAV2                                                        RAE1085
C                                                                        RAE1085
C     CALL DARTAB FOR INTERMEDIATE YEAR OUTPUT                           RAE1085
C                                                                        RAE1085
      IF(JYR .EQ. 1) CALL DARTAB(0)                                      RAE1085
      CALL DARTAB(4)                                                     RAE1085
C                                                                        RAE1085
C     SAVE DATA FOR ACCOUNTING MODEL TABLE                               RAE1085
C                                                                        RAE1085
      DO 996 I=1,NONCLD                                                  RAE1085
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        POSS(I,JYR)=POS(I)                                              RAE1085
        POWS(I,JYR)=POW(I)                                              RAE1085
        RTAS(I,JYR)=RTA(I)                                              RAE1085
        QBASIN(I,JYR)=QDWSB(I)                                          RAE1085
        HEF(I,JYR)=QDWSB(I)*CON(I)                                      RAE1085
        FICANS(I,JYR)=FICAN(I)                                          RAE1085
        POPDS(I,JYR)=POPD(I)                                            RAE1085
        CCNRS(I,JYR)=CCNR(I)                                            RAE1085
        GNRS(I,JYR)=GNR(I)                                              RAE1085
        TFICS(JYR)=TFIC                                                 RAE1085
        TPOPDS(JYR)=TPOPD                                               RAE1085
        TCCNRS(JYR)=TCCNR                                               RAE1085
  996   TGNRS(JYR)=TGNR                                                 RAE1085
      JYR=JYR+1                                                         RAE1085
 1000 CONTINUE
      NEXYR=IAVG2-IAVG1+1
      WRITE(LU2,700)IAVG1,IAVG2
      DO 1100 II=1,NONCLD
      AQAVG(II)=AQAVG(II)/FLOAT(NEXYR)
      STAVG(II)=STAVG(II)/FLOAT(NEXYR)
      ATAVG(II)=ATAVG(II)/FLOAT(NEXYR)
      SOAVG(II)=SOAVG(II)/FLOAT(NEXYR)
      WRITE(LU2,6215)NUCLID(II),ATAVG(II),ATMAX(II),MXAT(II),AQAVG(II),
     &               AQMAX(II),MXAQ(II),STAVG(II),STMAX(II),MXST(II)
 1100 CONTINUE
C
C-----
C----- CALCULATE RADIONUCLIDE CONCENTRATIONS IN FOOD DUE TO
C----- ATMOSPERIC DEPOSITION.
C-----
C
      WRITE(LU2,6000)
      WRITE(LU2,6005)
      DO 1200 I=1,NONCLD
      II=I
      DERATE(II)=ATAVG(II)*VD*3.6E15
      CALL FOOD(II)
      WRITE(LU2,6210)NUCLID(II),CL1(II),CP1(II),CL2(II),CP2(II),
     &               CCMI1(II),CCMI2(II),CGMI1(II),CGMI2(II),CMEAT(II)
 1200 CONTINUE
C
C-----
C----- CALCULATE RADIONUCLIDE CONCENTRATIONS IN FOOD DUE TO
C----- WATER IRRIGATION.  ALSO CALCULATE ANNUAL RADIONUCLIDE
C----- INTAKE BY MAN.
C-----
C
      WRITE(LU2,6010)
      WRITE(LU2,6005)
      DO 1300 I=1,NONCLD
      II=I
      CWAT(II)=(WWATL*AQAVG(II)+SWATL*STAVG(II))*1.0E9
      CALL IRRIG(II)
      WRITE(LU2,6210)NUCLID(II),COL1(II),COP1(II),COL2(II),COP2(II),
     &     COCMI1(II),COCMI2(II),COGMI1(II),COGMI2(II),COMEAT(II)
      CWAT(II)=(WWATH*AQAVG(II)+SWATH*STAVG(II))*1.0E9
      CALL HUMEX(II)
 1300 CONTINUE
      WRITE(LU2,6020)
      IF(LIND .EQ. 0)WRITE(LU2,6024)
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      IF(LIND .NE. 0)WRITE(LU2,6026)
      WRITE(LU2,6030)
      DO 1310 I=1,NONCLD
      WRITE(LU2,6040)NUCLID(I),QING(I),QINH(I)
 1310 CONTINUE
C     TABLE OF CUMULATIVE (AGGREGATED) VALUES OF RADIOACTIVITY
C     PRODUCED HERE
      WRITE(LU2,6041)
 6041 FORMAT('1',10X,'AGGREGATED VALUES OF RADIOACTIVITY:',/,
     &1X,'NUCLIDE',6X,'PUMPED OUT ',5X,'PUMPED OUT ',5X,'LEFT BOTTOM',
     &5X,'OVERFLOWED ',5X,'RELEASED TO',5X,'RELEASED TO'/' ',13X,
     &'  THE WELL ',5X,' THE STREAM',5X,' OF TRENCH ',5X,'   TRENCH  ',
     &3X,'THE ATMOSPHERE',4X,'   BASIN')
      DO 1313 I=1,NONCLD
      WRITE(LU2,6042) NUCLID(I),POW(I),POS(I),PLBT(I),OFT(I),RTA(I),
     &QDWSB(I)
 1313 CONTINUE
 6042 FORMAT(' ',1X,A8,5X,6(1PE11.4,5X))
      WRITE(LU2,6045)
C
C-----
C----- CALCULATE VARIABLES NECESSARY TO PASS TO DARTAB.
C----- DARTAB COMBINES RADIONUCLIDE ENVIRONMENTAL EXPOSURE
C----- DATA WITH DOSIMETRIC AND HEALTH EFFECTS DATA TO GENERATE
C----- TABULATIONS OF PREDICTED IMPACTS.
C-----
C
      DO 1320 I=1,NONCLD
      QSUR=(CSP(I)+CSPO(I))/1.0E12
      QFRAC=0.
      BSMT(I)=BSMT(I)/FLOAT(MAXYR-IBSMT+1)*.03333333/(TDEPTH*TAREA)
      IF(QING(I) .EQ. 0.0) GO TO 1315
      QFRAC=CWAT(I)*UWAT/QING(I)
 1315 WRITE(LU2,6050)NUCLID(I),QFRAC
      PCON1(I)=ATAVG(I)*POP
      PCON2(I)=QSUR*POP
      PCON3(I)=QING(I)*POP
      PCON4(I)=QINH(I)*POP
 1320 CONTINUE
      WRITE(LU2,6300)
      DO 1340 I=1,NONCLD
      WRITE(LU2,6310)NUCLID(I),PC1(I),NPC1(I),PC2(I),NPC2(I),
     &                         PC3(I),NPC3(I),PC4(I),NPC4(I)
 1340 CONTINUE
      IF(JYR .EQ. 1) CALL DARTAB(0)                                    RAE1085
      CALL DARTAB(4)                                                   RAE1085
      IF(IXTS.NE.0) STOP
C                                                                      RAE1085
C     SAVE DATA FOR ACCOUNTING MODEL TABLE                             RAE1085
C                                                                      RAE1085
      DO 1350 I=1,NONCLD                                               RAE1085
        POSS(I,JYR)=POS(I)                                             RAE1085
        POWS(I,JYR)=POW(I)                                             RAE1085
        RTAS(I,JYR)=RTA(I)                                             RAE1085
        QBASIN(I,JYR)=QDWSB(I)                                         RAE1085
        HEF(I,JYR)=QDWSB(I)*CON(I)                                     RAE1085
        FICANS(I,JYR)=FICAN(I)                                         RAE1085
        POPDS(I,JYR)=POPD(I)                                           RAE1085
        CCNRS(I,JYR)=CCNR(I)                                           RAE1085
        GNRS(I,JYR)=GNR(I)                                             RAE1085
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        TFICS(JYR)=TFIC                                                 RAE1085
        TPOPDS(JYR)=TPOPD                                               RAE1085
        TCCNRS(JYR)=TCCNR                                               RAE1085
 1350   TGNRS(JYR)=TGNR                                                 RAE1085
      INTYR(JYR)=MAXYR                                                  RAE1085
C
C     NPTH1 IS THE FIRST YEAR AFTER LOCAL SIMULATION PERIOD
C     NPTH2 IS THE LAST YEAR OF GLOBAL SIMULATION
      NPTH1=MAXYR+1
      NPTH2=MAXYR+9000
      DO 1001 N=NPTH1,NPTH2
      NYEAR=N
      TRLS=0.
      IF(DOVER .GT. OVER)TRLS=DOVER-OVER
      TDEPTH=TDEPTH-TRLS
      OVER=OVER-DOVER
      IF(OVER .LT. 0.)OVER=0.
      FONSIT=0.
      IF(NYEAR .LT. IRST .OR. INSITE .EQ. 0) GO TO 1070
      RSTR=FLOAT(NYEAR-IRST)
      XRT=XRTM
      IF(RSTR*RTGR .GT. 9.0 .OR. RTGR .LE. 0.001) GO TO 1071
      XRT=XRTM*(1.-EXP(-RTGR*RSTR))
 1071 IF(XRT .LE. OVER) GO TO 1070
      D1R=OVER+TDEPTH
      IF(XRT .LE. D1R) FONSIT=1.-OVER/XRT
      IF(XRT .GT. D1R) FONSIT=TDEPTH/XRT
 1070 CONTINUE
C-----
C----- CALCULATE TRENCH WATER BALANCE.
C-----
      CALL TRENCH(NYEAR,VOLB,VOLO,DMAX,PC,TINFL)
      IF(VOLB .LE. .1*AQVOL .OR. ISW .GT. 0)GO TO 455
      ISW=ISW+1
      WRITE(LU2,615)NYEAR
  455 CONTINUE
C-----
C----- THE FOLLOWING LOOP IS EXECUTED FOR EACH NUCLIDE.
C-----
      DO 505 I=1,NONCLD
      II=I
      XDECN=DECN(II)
      TRAM(II)=TRAM(II)*XDECN
      CS(II)=CS(II)*XDECN
      CW(II)=CW(II)*XDECN
C-----
C----- CALCULATE THE AMOUNT OF LEACHING.
C-----
      CALL LEACH(II,NYEAR,VOLB,VOLO,DMAX,CIOT,CFF,XDECN,TINFL,PERMT)
      PLBT(II)=PLBT(II)+POLB(II)
      OFT(II)=OFT(II)+POLO(II)
C-----
C----- CALCULATE ADDITIONS TO AQUIFER.
C-----
      ITMP=ITIME(II)+JTIME(II)+NYEAR                                    ISIMOD
      KIND=INT(FLOAT(ITMP-1)/1000.)
      IF(KIND.GT.10) KIND=10
C     POLB AND SDEEP ARE AMOUNTS OF RADIOACTIVITY
C     RELEASED TO THE BASIN IN MILLENIUM KIND+1
      IF(KIND.EQ.10)GO TO 199
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C     NUCLIDE ARRIVES AT STREAM AFTER YEAR 1000 BUT BEFORE YEAR 10001   ISINEWL
      QLB(II,KIND)=QLB(II,KIND)+DETWS(II)*PRJ*(POLB(II)+                   ISIM
     &              SDEEP(II))*DDETA(II)*DDETA3(II)                       ISIMOD
      GO TO 210
  199 QLB(II,10)=QLB(II,10)+EXP(-DECAY(II)*(10000.-FLOAT(N)))*(POLB(II)+
     & SDEEP(II))*DDETA(II)*DDETA3(II)                                    ISIMOD
  210 CONTINUE
C-----
C----- CALCULATE TRANSPORT OF SOLUBLE SURFACE COMPONENT
C-----
      CALL SURSOL(I1,NYEAR,VOLO)
      KIND=INT(FLOAT(NYEAR-1)/1000.)
      IF(KIND.GT.10) KIND=10
C     SSTREM IS RADIOACTIVITY FROM SURFACE RUN-OFF
C     RELEASED DOWNSTREAM IN MILLENIUM KIND+1
      QLB(II,KIND)=QLB(II,KIND)+SSTREM(II)
C-----
C----- CALCULATE ATMOSPHERIC CONCENTRATION AND AMOUNT
C----- ABOVE SPILLAGE AREA
C-----
C
      GNDCON=CS(II)*BDENS*ADEPTH*1.0E3
      IF(INSITE .EQ. 0 .OR. IRRES1 .GT. NYEAR) GO TO 386
      D1R=TRAM(II)/(TAREA*TDEPTH*DENCON*1000.)
      CALL SUSPND(NYEAR,II,D1R)
      ATCON(II)=YSO(II)
      RTA(II)=RTA(II)+YSO(II)
      GO TO 387
  386 CONTINUE
      CALL SUSPND(NYEAR,I1,GNDCON)
      RTA(II)=RTA(II)+YSO(II)*3.1536E7
  387 CONTINUE
C
C-----
C----- MATERIAL BALANCE
C-----
C
C----- 3.1536E7 IS THE NUMBER OF SECONDS IN A YEAR
      CS(II)=CS(II)+((TRLS/(TDEPTH+TRLS)*TRAM(II)-YSO(II)*3.1536E7)/
     1  (EXTENT*PD*ADEPTH))*1.0E-3/BDENS
      TRAM(II)=TRAM(II)*(1.0-TRLS/(TDEPTH+TRLS))
      IF(LEAOPT.EQ.5 .AND. DMAX.GT.0.)TRAM(II)=TRAM(II)*(1-RELFAC)      ISIMOD
      IF(LEAOPT.NE.5)TRAM(II)=TRAM(II)-POLB(II)-POLO(II)
      IF(TRAM(II) .LT. 0.)TRAM(II)=0.
      CW(II)=CW(II)+(POLO(II)/
     &    (EXTENT*PD*ADEPTH*PORS))
      IF(CW(II) .LT. 0.) CW(II)=0.
      IF(CS(II) .LT. 0.)CS(II)=0.
C-----
C----- COMPUTE SOIL CONCENTRATION
C-----
      D1R=0.
      IF(IOPVWV .LT. 0) GO TO 388
      IF(IRST .LT. N .AND. TDEPTH .GT. 0.) D1R=FONSIT*TRAM(II)/
     & (TAREA*TDEPTH)
      IF(IOPVWV .EQ. 1) D1R=D1R*BV(II)
  388 CONTINUE
      SOCON(II)=1.0E12*ADEPTH*(CW(II)*PORS+1000.*CS(II)*BDENS)
      IF(N .GE. IAVG1 .AND. N .LE. IAVG2)SOAVG(II)=SOAVG(II)+SOCON(II)
C
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```
  505 CONTINUE
      WD=DMAX
      IF(WD .GT. TDEPTH)WD=TDEPTH
C     IF(MOD(NYEAR,1000).EQ.0 .OR. NYEAR.EQ.1001)
C    &   CALL THSUM(
 1001 CONTINUE
C     QLBPTH IS THE AMOUNT OF RADIOACTIVITY LEAVING
C     THE BASIN WITH THE STREAM WATER BETWEEN YEARS
C     1001 AND 10000
      DO 506 II=1,NONCLD
        DO 250 L=1,9
  250   QLBPTH(II)=QLBPTH(II)+QLB(II,L)
C       FIRST MILLENNIUM RELEASE INCLUDED FOR HEALTH EFFECTS CALC.
        QLBTTH(II)=QLBPTH(II)+QDWSB(II)
  506 CONTINUE
C     HE IS THE HEALTH EFFECT CALCULATED USING CONVERSION FACTOR CON
      DO 270 L=1,NONCLD
  270 HE(L)=QLBTTH(L)*CON(L)
C
C     OUTPUT FOR THE EXTENDED SIMULATION PERIOD IS PRODUCED
C     IN DO LOOP 1004. DO LOOPS 1007 AND 1010 REPORT THE HEALTH
C     EFFECTS FROM THE RESIDUAL RELEASE DOWNSTREAM THE BASIN
C
      WRITE(6,1002)
 1002 FORMAT('1',32X,'RESIDUAL RADIOACTIVITY RELEASED ',
     &  'OUTSIDE THE BASIN'/43X,'WITH THE STREAM WATER'//' ',
     &  'NUCLIDE',5X,'FIRST',6X,'SECOND',5X,'THIRD',6X,'FOURTH',5X,
     &  'FIFTH',5X,'SIXTH',6X,'SEVENTH',4X,'EIGHTH',5X,'NINTH',6X,
     &  'TENTH'/' ',10X,10('MILLENNIUM',1X),/)
      DO 1004 I=1,NONCLD
 1004 WRITE(6,1003) NUCLID(I),QDWSB(I),(QLB(I,K),K=1,9)
      WRITE(6,2002)
 2002 FORMAT('1',10X,'RESIDUAL RADIOACTIVITY IN',10X,'REMAINING IN',
     & 11X,'RELEASED TO THE',/,10X,'TRANSIT IN YEAR 10000',
     & 16X,'TRENCH',20X,'ATMOSPHERE',/)
      DO 2004 I=1,NONCLD
 2004 WRITE(6,2003) NUCLID(I),QLB(I,10),TRAM(I),RTA(I)
 2003 FORMAT(' ',A8,6X,PE11.4,20X,PE11.4,16X,PE11.4)
      DO 1420 J=1,JYR                                                   RAE1085
        WRITE(6,1400) INTYR(J)                                          RAE1085
 1400   FORMAT(////,32X,'HEALTH EFFECTS RESULTING FROM RESIDUAL',/,     RAE1085
     &  32X,'RADIOACTIVITY RELEASED IN ',I5,' YEARS',//,30X,            RAE1085
     &  'NUCLIDE',5X,'RESIDUAL',3X,'CONVERSION',3X,'HEALTH',/,42X,      RAE1085
     &  'ACTIVITY',5X,'FACTOR',5X,'EFFECTS',/)                          RAE1085
        DO 1410 I=1,NONCLD                                              RAE1085
 1410   WRITE(6,1008) NUCLID(I),QBASIN(I,J),CON(I),HEF(I,J)             RAE1085
 1420 CONTINUE                                                          RAE1085
      WRITE(6,1006)
 1006 FORMAT(////,32X,'HEALTH EFFECTS RESULTING FROM RESIDUAL',/,
     &  32X,'RADIOACTIVITY RELEASED IN 10000 YEARS',//,30X,
     &  'NUCLIDE',5X,'RESIDUAL',3X,'CONVERSION',3X,'HEALTH',/,42X,
     &  'ACTIVITY',5X,'FACTOR',5X,'EFFECTS',/)
      DO 1007 I=1,NONCLD
 1007 WRITE(6,1008) NUCLID(I),QLBTTH(I),CON(I),HE(I)
 1008 FORMAT(30X,A8,1X,3(2X,1PE10.4))                                   RAE1085
C
C     WRITE ACCOUNTING MODEL TABLE FOR INTERMEDIATE & FINAL YEARS
C
      DO 1020 J=1,JYR                                                   RAE1085
      LASTYR=10000-INTYR(J)                                             RAE1085
```

```
      WRITE(6,1009) (INTYR(J),I=1,5),LASTYR                             RAE1085
 1009 FORMAT('1',///,30X,'TABLE FOR ACCOUNTING MODEL  --  YEAR ',I5,    RAE1085
     &  /,' COLUMN  1: INDIVIDUAL CANCER RISK (UNITLESS)',
     &  /,' COLUMN  2: POPULATION DOSE (PERSON-REM/YEAR)',
     &  /,' COLUMN  3: COLLECTIVE CANCER RISK (DEATHS/YEAR)',
     &  /,' COLUMN  4: GENETIC RISK (EFFECTS/YEAR)',
     &  /,' COLUMN  5: R-ACTIVITY PUMPED OUT THE WELL 1ST ',I5,
     &  ' YEARS (CI)',
     &  /,' COLUMN  6: R-ACTIVITY PUMPED OUT THE STREAM 1ST ',I5,
     &  ' YEARS (CI)',
     &  /,' COLUMN  7: R-ACTIVITY RELEASED TO ATMOSPHERE 1ST ',I5,
     &  ' YEARS (CI)',
     &  /,' COLUMN  8: R-ACTIVITY RELEASED DOWNSTREAM 1ST ',I5,
     &  ' YEARS (CI)',
     &  /,' COLUMN  9: R-ACTIVITY RELEASED DOWNSTREAM LAST ',I5,
     &  ' YEARS (CI)',
     &  /,' COLUMN 10: R-ACTIVITY IN TRENCH AFTER 10000 YEARS ',
     &  'ASSUMING PERFECT CONTAINMENT (CI)',/)
      DO 1010 I=1,NONCLD
      QLAST=QDWSB(I)-QBASIN(I,J)                                        RAE1085
      QLAST=QLAST+QLBPTH(I)                                             RAE1085
      WRITE(6,1011) NUCLID(I),FICANS(I,J),POPDS(I,J),CCNRS(I,J),        RAE1085
     &  GNRS(I,J),POWS(I,J),POSS(I,J),RTAS(I,J),QBASIN(I,J),QLAST,      RAE1085
     &  TRAP(I)                                                         RAE1085
 1010 CONTINUE
      WRITE(6,1012) TFICS(J),TPOPDS(J),TCCNRS(J),TGNRS(J)               RAE1085
 1011 FORMAT(1X,A8,1X,1P10E11.4)                                        RAE1085
 1012 FORMAT(1X,'TOTALS:',2X,1P4E11.4)                                  RAE1085
 1020 CONTINUE                                                          RAE1085
 1003 FORMAT(' ',A8,2X,12(PE10.4,1X))
      STOP
 6200 FORMAT('1',51X,'INITIAL CALCULATIONS',
     &       //' ',2X,'NUCLIDE',4X,'VERTICAL',5X,'VERTICAL',
     &       5X,'VERTICAL',4X,'HORIZONTAL',3X,'HORIZONTAL',
     &       3X,'HORIZONTAL',5X,'DDETA',5X,'BREAK THRU',
     &       /' ',11X,'RETARDATION',5X,'TIME Y',7X,'DDETA',5X,
     &       'RETARDATION',4X,'TIME Y',8X,'DDETA',21X,'TIME Y')
 6210 FORMAT(' ',A8,3X,9(1PE11.4,2X))
 6215 FORMAT(' ',A8,3X,3(2(1PE11.4,2X),0PI4,5X))
 6220 FORMAT(/' ',5X,'RADIONUCLIDE BREAKTHROUGH TIME IS ONLY SLIGHTLY',
     &        ' GREATER THAN SIMULATION TIME AND LEADING EDGE OF PULSE',
     &        ' MAY BE MISSED')
  602 FORMAT(//' ',10X,'ANNUAL SOIL LOSS IS ',1PE11.4,' KILOGRAMS PER',
     &        ' SQUARE METER',/' ',20X,'OR ',E11.4,
     &        ' METERS IS REMOVED FROM THE SURFACE')
  603 FORMAT(' ',10X,'ANNUAL INFILTRATION INTO TRENCH IS ',
     &       F8.4,' METERS')
  604 FORMAT(' ',10X,'VERTICAL WATER VELOCITY IS ',F8.4,' METERS',
     &        ' PER YEAR')
  605 FORMAT(' ',10X,'NORMALIZED DOWN WIND ATMOSPHERIC EXPOSURE',
     &  ' PER UNIT SOURCE RELEASE IS ',E11.4,' CI/M**3 PER CI/SEC')
  615 FORMAT(//' ',5X,'WATER OUTFLOW FROM TRENCH BOTTOM IS APPROACHING',
     & ' DILUTION VOLUME IN AQUIFER FOR YEAR ',I4)
  700 FORMAT('1',35X,'AVERAGE CONCENTRATIONS OVER THE YEARS ',I3,
     &        ' TO ',I4,' OF THE SIMULATION',
     &        /' ',50X,'MAXIMUM ANNUAL CONCENTRATIONS',
     &        ///' ',1X,'NUCLIDE',8X,'ATMOSPHERE DOWNWIND',
     &        24X,'IN WELL',26X,'IN STREAM',
     &        //' ',7X,3(6X,'AVERAGE',6X,'MAXIMUM',4X,'YEAR',1X),
     &        /' ',7X,3(2(6X,'CI/M**3'),9X))
```

```
 5000 FORMAT('1',51X,'INITIAL CALCULATIONS',//' ',50X,'NUCLIDE',
     &   10X,'MASS',//)
 5005 FORMAT(' ',51X,A8,8X,F5.0)
 5006 FORMAT(' ',5X,'THE POPULATION RESIDES ONSITE')
 5007 FORMAT(' ',5X,'POPULATION RESET TO ',F10.0,' FOR ONSITE FARM')
 6000 FORMAT('1',30X,'RADIONUCLIDE CONCENTRATION IN FOODS DUE TO',
     & ' ATMOSPHERIC DEPOSITION',/' ',55X,'PICO CURIES PER KILOGRAM')
 6005 FORMAT(//' ',1X,'NUCLIDE',4X,'LEAFY VEG',6X,'PRODUCE',5X,
     &       'LEAFY VEG',6X,'PRODUCE',4X,'COW''S MILK',3X,'COW''S MILK',
     &       3X,'GOAT''S MILK',2X,'GOAT''S MILK',3X,'BEEF MEAT',
     &       /' ',14X,'M.I.E.',7X,'M.I.E.',7X,2('G.P.E.',7X),'M.I.E.',
     &       7X,'G.P.E.',7X,'M.I.E.',7X,'G.P.E.')
 6010 FORMAT(////' ',35X,'RADIONUCLIDE CONCENTRATION IN FOODS DUE TO',
     &       ' IRRIGATION',/' ',55X,'PICO CURIES PER KILOGRAM')
 6020 FORMAT(///' ',5X,'NOTE: G.P.E. - GENERAL POPULATION',
     & ' EXPOSURE',/' ',11X,'M.I.E. - MAXIMUM INDIVIDUAL',
     & ' EXPOSURE')
 6024 FORMAT('0',11X,'M.I.E. WILL BE USED TO CALCULATE',
     &       ' HEALTH EFFECTS')
 6026 FORMAT('0',11X,'G.P.E. WILL BE USED TO CALCULATE',
     &       ' HEALTH EFFECTS')
 6030 FORMAT('1',1X,'NUCLIDE',10X,'ANNUAL INTAKE',10X,
     & 'ANNUAL INTAKE'/' ',
     & 18X,'BY INGESTION',11X,'BY INHALATION'/' ',20X,
     & 'PCI/Y',18X,'PCI/Y')
 6040 FORMAT(' ',1X,A8,9X,1PE11.4,12X,1PE11.4)
 6050 FORMAT(' ',50X,A8,8X,F8.4)
 6045 FORMAT('1',50X,'FRACTION OF INGESTION DUE TO WATER',
     &  //' ',50X,'NUCLIDE',10X,'FRACTION')
 6300 FORMAT('1',55X,'MAXIMUM ANNUAL EXPOSURE',
     &       ///,2X,'NUCLIDE',12X,'AIR',8X,'YEAR',8X,
     &       'SURFACE',6X,'YEAR',7X,'INGESTION',5X,'YEAR',6X,
     &       'INHALATION',5X,'YEAR',
     &       /' ',15X,2('CONCENTRATION',12X),5X,
     &       2('RATE',19X),
     &       /' ',18X,'CI/M**3',18X,'CI/M**2',
     &       16X,2('PERSON.PCI/Y',12X)/)
 6310 FORMAT(' ',A8,8X,4(1PE11.4,4X,0P14,6X))
      END
      SUBROUTINE XPRESS(RE1,RE2,RE3,PD,EXTENT)
      COMMON/EXP/ ARG,RES(10000)
C******* REPLACES REDUNDANT AND EXPENSIVE CALCULATION *******
C******* OF RESUSPENSION PARAMETER RE                 *******
C
      DO 200 IYR=1,10000
      TX=FLOAT(IYR)*365.
      RES(IYR)=RE1*EXP(RE2*SQRT(TX))+RE3
  200 CONTINUE
C
C*******  ARG IS ALSO CALLED IN SUSPND FOR
C*******    EVERY NUCLIDE AND EVERY YEAR
C
      ARG=SQRT(PD*EXTENT)
      RETURN
      END
C
C
C
        SUBROUTINE AIRTRM(EXPOS,DEPO)
C
```

```
C
C
C
C
C       D.E. FIELDS,  2/81
C       COMPUTES ATMOSPHERIC EXPOSURE VALUES AT POINTS DOWNWIND FROM
C               RELEASE SITE FOR 22.5 DEG. SECTOR
C       RECEPTOR ASSUMED AT GROUND LEVEL
C
C
C
C       DEPO    =DEPOSITION RATE PER UNIT SOURCE STRENGTH
C       EXPN    =NORMALIZED EXPOSURE = EU/Q, S/M**2,
C       EXPOS   =EXPOSURE PER SOURCE STRENGTH NORMALIZED TO
C               WIND VELOCITY
C       H       =SOURCE HGT, M
C       HLID    =LID HEIGHT
C       IPLU    =1 IMPLIES TRANSVERSE PLUME CALCULATION REQUIRED
C       ISEC    =1 IMPLIES SECTOR AVERAGE REQUIRED
C       IS      =STABILITY CLASS
C       IT      =TYPE OF STABILITY FORMULATION,
C                       =1 FOR PG
C                       =2 FOR BRIGGS-SMITH
C       ROUGH   =HOSKER ROUGHNESS PARAMETER, M, ABOUT
C               .01*PHYSICAL ROUGHNESS
C       U       =VELOCITY, WIND, M/S
C       VD      =VELOCITY, DEPOSITION, M/S
C       VG      =VELOCITY, GRAVITATIONAL FALL, M/S
C       XG      =GAUGE DISTANCE FROM SOURCE BASE, M
      COMMON/AIR/H,VG,U,IT,IS,VD,XG,HLID,ROUGH,FTWIND,CHIQ,RE1,RE2,RE3
C
C  TEST FOR INVALID COMBINATIONS OF IS AND IT:
36      IF(IS.LT.1.OR.IS.GT.6)WRITE(6,38)IT,IS
        IF(IT.EQ.5.AND.(IS.EQ.1.OR.IS.EQ.5))WRITE(6,38)IT,IS
        IF(IT.EQ.6.AND.(IS.EQ.1.OR.IS.EQ.6))WRITE(6,38)IT,IS
38      FORMAT(2X,'INVALID COMBINATION OF IT=',I2,'AND IS=',I2)
C       INITIALIZE PARAMETERS
        PI=3.141593
        IF(HLID.EQ.0.)HLID=12000.
        XG = XG + EXTENT/0.3978247
        LID=HLID
        IXG=XG
C       ACCOUNT FOR PLUME TILT
        HH=H-VG*XG/U
        IF(HH.LT.0.)HH=0.0
C       COMPUTE PLUME WIDTH FACTORS AT DISTANCE XG
        CALL SIGMAZ(XG,IT,IS,ROUGH,SIGZ, IKPM,HLID,VG,U,HH)
C       RESTRICT HLID TO TROPOPAUSE IF INPUT SPEC. =0.0
C       COMPUTE CORRECTION FACTOR FOR PLUME DEPLETION
C
        COR=1.
        IF(VG.EQ.0..AND.VD.EQ.0.)GOTO45
        CALL DPLT(PI,HH,VD,U,IT,IS,XG,ROUGH,HLID,COR,VG,H)
C
C     IF(COR.LT..999)WRITE(6,40) COR
40      FORMAT(2X,'DEPLETION CORRECTION FACTOR =',F8.4)
45      EXPO=EXP(-HH*HH/2./SIGZ/SIGZ)
C       COMPUTE SECTOR AVERAGE VALUES
        EXPN=COR*2.032*EXPO/SIGZ/XG
        EXPOS=EXPN/U
```

```
      DEPO=EXPOS*VD
80    CONTINUE
1000  CONTINUE
      RETURN
      END
C
C
      SUBROUTINE DPLT(PI,HH,VD,U,IT,IS,XG,ROUGH,HLID,COR,VG,H)
COMPUTES PLUME DEPLETION CORRECTION
      DIMENSION XX(50),FX(50),AX(50)
     COMMON/C/BY(6),BZ1(6),BZ2(6),BZ3(6),A1(6),A2(6),B1(6),B2(6),
    & B3(6),PY(6,5),PZ(6,5),QY(6,5),QZ(6,5),XM(50)
      IF(IS.GT.6)IS=6
      IKPM=1
      IDUM=1
      CALL SIGMAZ(XG,IT,IS,ROUGH,SIGZ,IKPM,HLID,VG,U,HH)
C     IKPM HAS BEEN RECOMPUTED
      IKP=IKPM+1
      SQRTPI=.79785
      FX(IKP)=EXP(-.5*(HH/SIGZ)**2)/SIGZ
      XX(IKP)=XG
      DO 20 I=1,IKPM
      XX(I)=XM(I)
      CALL SIGMAZ(XX(I),IT,IS,ROUGH,SIGZ,IDUM,HLID,VG,U,HH)
      FX(I)=EXP(-.5*(HH/SIGZ)**2)/SIGZ
20    CONTINUE
      L=1
      CALL SIMPUN(XX,FX,IKP,L,AX)
      COR=EXP(-SQRTPI*VD/U*AX(IKP))
      RETURN
      END
C
C
C
      SUBROUTINE SIGMAZ(XG,IT,IS,ROUGH,SIGZ,IKPM,HLID,VG,U,HH)
COMPUTES VERTICAL DISPERSION COEFFICIENT
C     D.E. FIELDS,  2/81
     COMMON/C/BY(6),BZ1(6),BZ2(6),BZ3(6),A1(6),A2(6),B1(6),B2(6),
    & B3(6),PY(6,5),PZ(6,5),QY(6,5),QZ(6,5),XM(50)
     DIMENSION AONE(6),BONE(6),ATWO(6),BTWO(6),CONE(6),DONE(6),
    &CTWO(6),DTWO(6),RGH(6)
     DATA AONE/0.112,0.130,0.112,0.098,0.0609,0.0638/
     DATA BONE/1.06,0.950,0.920,0.889,0.895,0.783/
     DATA ATWO/5.38E-4,6.52E-4,9.05E-4,1.35E-3,1.96E-3,1.36E-3/
     DATA BTWO/0.815,0.750,0.718,0.688,0.684,0.672/
     DATA CONE/1.56,2.02,2.72,5.16,7.37,11.7/
     DATA DONE/0.0480,0.0269,0.,-0.060,-0.0957,-0.128/
     DATA CTWO/6.25E-4,7.76E-4,0.,186.,4.29E+3,4.59E+4/
     DATA DTWO/0.45,0.37,0.,-0.225,-0.60,-0.78/
     DATA RGH/0.01,0.04,0.10,0.40,1.0,4.0/
     P=0.0
      DO 8 I=1,50
      IKP=I
      IF(XM(I).GE.XG)GOTO9
8     CONTINUE
9     IF(IKP.LT.2)IKP=2
      IKPM=IKP-1
CHOOSE TYPE OF COMPUTATION
      IPOINT=IT
      IF(IT.GT.3)IPOINT=4
```

```
      GOTO(10,20,30,40),IPOINT
C        PASQUILL-GIFFORD DISPERSION VALUES, FROM VOGT
10    ALX=ALOG(XG)
      SIGZ=(EXP(B1(IS)+(B2(IS)+B3(IS)*ALX)*ALX))/2.15
      GOTO99
C        HOSKER'S FORM. OF BRIGGS-SMITH DISPERSION VALUES, FROM ATM
   20 ABS=ROUGH
      C1 =YLAG(ABS,RGH,CONE,0,3,6,0)
      D1 =YLAG(ABS,RGH,DONE,0,2,6,0)
      C2 =YLAG(ABS,RGH,CTWO,0,3,6,0)
      D2 =YLAG(ABS,RGH,DTWO,0,2,6,0)
      G=AONE(IS)*XG**BONE(IS)/(1.0+ATWO(IS)*XG**BTWO(IS))
      F=C1*(XG**D1)
      F=ALOG(F)
      IF(ROUGH.LE.0.10) GO TO 26
      F=F+ALOG(1.+1./(C2*XG**D2))
      GO TO 27
   26 F=F-ALOG(1.+C2*XG**D2)
   27 SIGZ=G*F
       IF(SIGZ.LT.1.0) SIGZ=1.0
      GOTO99
C     BRIGGS DISPERSION VALUES, FROM AIRDOS II
30    SIGZ=BZ1(IS)*XG*(1+BZ2(IS)*XG)**BZ3(IS)
      GOTO99
C     DISPERSION VALUES AFTER KLUG, AND OTHERS
40    J=IT-3
C              =1 FOR KLUG
C              =2 FOR BROOKHAVEN
C              =3 FOR ST. LOUIS
C              =4 FOR JULICH(50M)
C              =5 FOR JULICH(100M)
      SIGZ=PZ(IS,J)*XG**QZ(IS,J)
99    SIGCAL=2.*(HLID-HH*.5)/2.15                                        8/16
     IF(SIGZ.LT.SIGCAL) GO TO 1000
      SIGZ=SIGCAL
1000  RETURN
     END
C
C
C
C
     SUBROUTINE SIMPUN(XX,FX,NX,I,AX)
C  PROGRAM AUTHOR       J. BARISH,
C  COMPUTING TECHNOLOGY CENTER, UNION CARBIDE CORP., NUCLEAR DIV.,
C  OAK RIDGE, TENN.
C
     DIMENSION XX(2),FX(2),AX(2)
     IF (I.LT.0) GO TO 30
     AX(1)=0.0
     DO 10 IX=2,NX,2
        D1=XX(IX)-XX(IX-1)
        AX(IX)=AX(IX-1)+D1/2.0*(FX(IX)+FX(IX-1))
        IF (NX.EQ.IX) GO TO 20
        D2=XX(IX+1)-XX(IX-1)
        D3=D2/D1
        A2=D3/6.0*D2**2/(XX(IX+1)-XX(IX))
        A3=D2/2.0-A2/D3
   10   AX(IX+1)=AX(IX-1)+(D2-A2-A3)*FX(IX-1)+A2*FX(IX)+A3* FX(IX+1)
   20 RETURN
   30 AX(NX)=0.0
```

```
      DO 40 IX=2,NX,2
         IC=NX+1-IX
         D1=XX(IC+1)-XX(IC)
         AX(IC)=AX(IC+1)+D1/2.0*(FX(IC+1)+FX(IC))
         IF (NX.EQ.IX) GO TO 20
         D2=XX(IC+1)-XX(IC-1)
         D3=D2/(XX(IC)-XX(IC-1))
         A2=D3/6.0*D2**2/D1
         A3=D2/2.0-A2/D3
   40    AX(IC-1)=AX(IC+1)+(D2-A2-A3)*FX(IC-1)+A2*FX(IC)+ A3*FX(IC+1)
      RETURN
      END
C
C
       FUNCTION YLAG(XI,X,Y,IND1,N1,IMAX, IEX)
C  PROGRAM AUTHORS  A. A. BROOKS AND E.C. LONG,
C  COMPUTING TECHNOLOGY CENTER, UNION CARBIDE CORP., NUCLEAR DIV.,
C  OAK RIDGE, TENN.
C
C     LAGRANGIAN INTERPOLATION
C     XI IS INTEPOLATED ENTRY INTO X-ARRAY
C     N IS THE ORDER OF LAGRANGRAN INTERPOLATION
C     Y IS ARRAY FROM WHICH YLAG IS OBTAINED BY INTERPOLATION
C     IND IS THE MIN-I FOR X(I).GT.XI
C     IF IND=0,X-ARRAY WILL BE SEARCHED
C     IMAX IS MAX INDEX OF X-AND Y-ARRAYS
C     EXTRAPOLATION CAN OCCUR,IEX=-1 OR +1
C
C
      DIMENSION X(1),Y(1)
      IND=IND1
      N=N1
      IEX=0
      IF (N.LE.IMAX) GO TO 10
      N=IMAX
      IEX=N
   10 IF (IND.GT.0) GO TO 40
      DO 20 J = 1,IMAX
         IF (XI-X(J)) 30,130,20
   20    CONTINUE
      IEX=1
      GO TO 70
   30 IND=J
   40 IF (IND.GT.1) GO TO 50
      IEX=-1

   50 INL=IND-(N+1)/2
      IF (INL.GT.0) GO TO 60
      INL=1
   60 INU=INL+N-1
      IF (INU.LE.IMAX) GO TO 80
   70 INL=IMAX-N+1
      INU=IMAX
   80 S=0.
      P=1.
      DO 110 J=INL,INU
         P=P*(XI-X(J))
         D=1.
         DO 100 I=INL,INU
            IF (I.NE.J) GO TO 90
```

```
            XD=XI
            GO TO 100
   90       XD=X(J)
  100       D=DA(XD-X(I))
  110     S=S+Y(J)/D
      YLAG=S*P
  120 RETURN
  130 YLAG=Y(J)
      GO TO 120
      END
C
C
        BLOCK DATA
C       D.E. FIELDS,  2/81
      COMMON/C/BY(6),BZ1(6),BZ2(6),BZ3(6),A1(6),A2(6),B1(6),B2(6),
     & B3(6),PY(6,5),PZ(6,5),QY(6,5),QZ(6,5),XM(50)
C       FOR BRIGGS
        DATA BY/.22,.16,.11,.08,.06,.04/,
     & BZ1/.2,.12,.08,.06,.03,.016/,
     & BZ2/0.,0.,.0002,.0015,.0003,.0003/,
     & BZ3/1.,1.,-.5,-.5,-1.,-1./
C       FOR PG
        DATA A1/-.0234,-.0147,-.0117,-.0059,-.0059,-.0029/,
     & A2/.35,.248,.175,.108,.088,.054/,
     & B1/.88,-.985,-1.186,-1.35,-2.88,-3.8/,
     & B2/-.152,.82,.85,.793,1.255,1.419/,
     & B3/.1475,.0168,.0045,.0022,-.042,-.055/
C       FOR KLUG, ET. AL. TYPES OF DISPERSION...
        DATA PY/.469,.306,.23,.219,.237,.273,0.,.4,.36,.32,.0,.31,
     & .0,1.7,1.44,.91,1.02,.0,.66,.66,.63,.53,.41,7.56,
     & .34,.37,.40,.43,.46,7.56/
        DATA QY/.903,.885,.855,.764,.691,.594,0.,.91,.86,.78,.0,.71,
     & 0.,.717,.71,.729,.648,.0,.83,.83,.80,.80,.87,.52,
     & 1.00,.94,.88,.82,.76,.52/
        DATA PZ/.017,.072,.076,.14,.217,.262,.0,.411,.326,.223,.0,
     & .062,.0,.079,.131,.91,1.93,.0,.14,.14,.21,.26,.13,.56,
     & .037,.076,.16,.32,.66,1.37/
        DATA QZ/1.38,1.021,.879,.727,.61,.5,.0,.907,.859,.776,.0,.709,
     & .0,1.2,1.046,.702,.465,.0,1.09,1.09,.98,.89,.83,.55,1.28,
     & 1.12,.96,.88,.63,.47/
      DATA XM/
     &  1.000E+00,2.000E+00,3.000E+00,4.000E+00,5.000E+00,
     &  1.000E+01,1.500E+01,2.000E+01,2.500E+01,3.000E+01,
     &  3.500E+01,4.000E+01,4.500E+01,5.000E+01,1.500E+02,
     &  2.000E+02,3.000E+02,4.000E+02,5.000E+02,6.000E+02,
     &  7.000E+02,8.000E+02,9.000E+02,1.000E+03,1.100E+03,
     &  1.200E+03,1.300E+03,1.400E+03,1.600E+03,1.800E+03,
     &  2.000E+03,2.500E+03,3.000E+03,3.500E+03,4.000E+03,
     &  4.500E+03,5.000E+03,6.000E+03,7.000E+03,8.000E+03,
     &  1.000E+04,1.500E+04,2.000E+04,3.000E+04,4.000E+04,
     &  5.000E+04,6.000E+04,7.000E+04,8.000E+04,1.000E+05/
      END
C
C
C
      FUNCTION CAP(NYEAR)
C
C
C***
C***
```

```
C*** THIS FUNCTION CALCULATES AND RETURNS THE FRACTION OF THE TRENCH
C*** CAP THAT HAS FAILED.  FAILURE CAN BE CAUSED BY EROSION AS
C*** DETERMINED FROM THE UNIVERSAL SOIL LOSS EQUATION OR BY USER
C*** INPUTS.  CAP=1 INDICATES TOTAL CAP FAILURE.  THIS FUNCTION
C*** IS CALLED BY TRENCH.
C***
C***
C***
C***
C***
C***
C
C  INPUT VARIABLES
C
C     NYEAR = CURRENT YEAR OF SIMULATION
C     NYR1  = FIRST YEAR OF FAILURE
C     NYR2  = LAST YEAR OF FAILURE
C     PCT1  = PER CENT FAILURE IN NYR1
C     PCT2  = PER CENT FAILURE IN NYR2
C     OVER  = THICKNESS OF TRENCH CAP
C
C  OUTPUT VARIABLE
C
C     CAP   = FRACTION OF CAP THAT HAS FAILED
C
C
      DOUBLE PRECISION NUCLID
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &       PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &       IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),          RAE1085
     &       WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/TRCH/TAREA,TDEPTH,OVER,PORT,RELFAC,DENCON,OLDWAT,FN
      CAP=0.0
      IF(OVER .GT. 1.E-2) GO TO 20
      CAP=1.0
      RETURN
   20 IF(NYEAR .LT. NYR1 .OR. NYR1 .GE. NYR2) RETURN
      CAP=((PCT2-PCT1)/(NYR2-NYR1))*(NYEAR-NYR1)+PCT1
      IF(NYEAR .GT. NYR2) CAP=PCT2
      RETURN
      END
C
C
C
C
C
      SUBROUTINE EROSF
C
C  DETERMINES SEDIMENT LOADING FOR RAIN DRIVEN SURFACE
C  EROSION.  AVERAGE ANNUAL SOIL LOSS IN TONS PER ACRE
C  IS CALCULATED USING THE UNIVERSAL SOIL LOSS EQUATION.
C
C
C
C
C
C
C
C
C*************** VARIABLES FOR UNIVERSAL SOIL LOSS EQUATION ************
```

```
C
C   RAINF=RAINFALL FACTOR
C   ERODF=ERODIBILITY FACTOR
C   STPLNG=SLOPE-STEEPNESS AND SLOPE LENGTH FACTOR
C   COVER=COVER FACTOR
C   CONTRL=EROSION CONTROL PRACTICE FACTOR
C   SEDELR=SEDIMENT DELIVERY RATIO
C
C
C
C
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &        PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &        INSITE
      SOILOS = RAINF * ERODF * STPLNG * COVER * CONTRL * SEDELR
      RETURN
      END
C
C
C
C
      SUBROUTINE FOOD(NN)
C
C
C
C***** CALCULATION OF RADIONUCLIDE CONCENTRATION IN VEGETABLES, MILK AND
C       MEAT CONSUMED BY MAN RESULTING FROM ATMOSPHERIC DEPOSITION
C       CALLED BY MAIN.
C
C
C
C
C
C
C
C     INPUT VARIABLES
C
C       NN     = NUCLIDE NUMBER
C       DECAY  = RADIOACTIVE DECAY CONSTANT                          1/Y
C       XAMBWE = WEATHER DECAY CONSTANTE                             1/H
C                AIRBORNE MATERIAL
C       TA     = PERIOD OF TIME FOR WHICH SOIL IS EXPOSED TO THE
C                CONTAMINATED AIRBORNE MATERIAL                      H
C       PP     = SURFACE DENSITY FOR SOIL                            KG/M**2
C       RA     = RETENTION FRACTION
C       BV     = CONCENTRATION FRACTION FOR UPTAKE OF RADIONUCLIDE
C                FROM SOIL BY VEGETATIVE PARTS OF CROPS
C       BR     - CONCENTRATION FRACTION FOR UPTAKE OF RADIONUCLIDE
C                FROM SOIL BY REPRODUCTIVE PARTS OF CROPS
C       DERATE= RADIONUCLIDE DEPOSITION RATE                         PCI/M**
C       IOPT   = OPTIONS FOR SPECIALS RADIONUCLIDES H-3 AND C-14
C                IOPT = 1 IF H-3 AND C-14 IS NOT INCLUDED IN THIS RUN
C                IOPT = 2 IF ONLY H-3 IS INCLUDED
C                IOPT = 3 IF ONLY C-14 IS INCLUDED
C                IOPT = 4 IF BOTH ARE INCLUDED
C       Y1     = AG PRODUCTIVITY FOR GRASS CONSUMED BY ANIMALS       KG/M**2
C       Y2     = AG PRODUCTIVITY FOR VEGETATION CONSUMED BY MAN      KG/M**2
C       TE1    = TIME PASTURE GRASS EXPOSED DURING GROWING SEASON    H
C       TE2    = TIME CROP/VEG EXPOSED DURING GROWING SEASON         H
C       TH1    = PERIOD DELAY BETWEEN HARVEST OF PASTURE GRASS
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C               AND INGESTION BY ANIMALS                                H
C       TH2   = PERIOD DELAY BETWEEN HARVEST OF STORED FEED AND
C               INGESTION BY ANIMAL                                     H
C       TH3   = PERIOD DELAY BETWEEN HARVEST OF LEAFY VEG AND
C               INGESTION BY MAN FOR MAXIMUM INDIVIDUAL EXPOSURE        H
C       TH4   = PERIOD DELAY BETWEEN HARVEST OF PRODUCE AND
C               INGESTION BY MAN FOR MAXIMUM INDIVIDUAL EXPOSURE        H
C       TH5   = TIME DELAY BETWEEN HARVEST  LEAFY VEG AND
C               INGESTION BY MAN FOR GENERAL POPULATION EXPOSURE        H
C       TH6   = TIME DELAY BETWEEN HARVEST OF PRODUCE AND
C               INGESTION BY MAN FOR GENERAL POPULATION EXPOSURE        H
C       FP    = FRACTION OF YEAR THAT ANIMAL GRAZE ON PASTURE
C       FS    = FRACTION OF DAILY FEED THAT IS FRESH GRASS WHEN
C               ANIMALS GRAZE ON PASTURE
C       FMC   = FRACTION OF THE COW'S DAILY INTAKE OF
C               RADIONUCLIDE WHICH APPEARS IN EACH LITER OF MILK        D/L
C       FMG   = FRACTION OF THE GOAT'S DAILY INTAKE OF
C               RADIONUCLIDE WHICH APPEARS IN EACH LITER OF MILK        D/L
C       QFC   = AMOUNT OF FEED CONSUMED BY CATTLE                       KG/D
C       QFG   = AMOUNT OF FEED CONSUMED BY GOATS                        KG/D
C       TF1   = TRANSPORT TIME OF RADIONUCLIDE FROM
C               FEED-MILK-RECEPTOR FOR M.I.E.                           H
C       TF2   = TRANSPORT TIME OF RADIONUCLIDE FROM
C               FEED-MILK-RECEPTOR FOR G.P.E.                           H
C       FF    = FRACTION OF THE ANIMAL'S DAILY INTAKE OF
C               RADIONUCLIDE WHICH APPEARS IN EACH KG OF FLESH          D/KG
C       TS    = TIME FROM SLAUGHTER OF MEAT TO CONSUMPTION              H
C       ABSH  = ABSOLUTE HUMIDITY OF THE ATMOSPHERE                     G/M**3
C       P14   = FRACTIONAL EQUILIBRIUM RATIO FOR C-14
C       INTERMEDIATE VARIABLES
C       XAMBEF= EFFECTIVE DECAY CONSTANT
C       CPAST = NUCLIDE CONC IN PASTURE GRASS CONSUMED BY ANIMALS
C       CSTO  = NUCLIDE CONC IN STORED FEED CONSUMED BY ANIMALS
C       CFEED = RADIONUCLIDE CONCENTRATION IN ANIMALS'S FEED
C
C
C       OUTPUT VARIABLES
C
C       CL1   = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED BY MAN
C               FOR M.I.E.                                              PCI/KG
C       CL2   = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED BY MAN
C               FOR G.P.E.                                              PCI/KG
C       CP1   = RADIONUCLIDE CONC IN PRODUCE CONSUMED BY MAN
C               FOR M.I.E.                                              PCI/KG
C       CP2   = RADIONUCLIDE CONC IN PRODUCE CONSUMED BY MAN
C               FOR G.P.E.                                              PCI/KG
C       CCMI1 = RADIONUCLIDE CONC IN COW'S MILK FOR M.I.E.             PCI/L
C       CCMI2 = RADIONUCLIDE CONC IN COW'S MILK FOR G.P.E.             PCI/L
C       CGMI1 = RADIONUCLIDE CONC IN GOAT'S MILK FOR M.I.E.            PCI/L
C       CGMI2 = RADIONUCLIDE CONC IN GOAT'S MILK FOR G.P.E.            PCI/L
C       CMEAT = RADIONUCLIDE CONC IN BEEF CATTLE'S MEAT                PCI/KG
C
C
C
      DOUBLE PRECISION NUCLID,H3,C14
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &       AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &       SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &       AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &       ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
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     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/IRRFOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &        ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &        QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &        CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &        CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &        COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &        COMEAT(40),QING(40),QINH(40),POP,
     &        CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &            QCW,QGW,QBW,ABSH,P14
      DATA H3/8HH-3     /,C14/8HC-14    /
      DECA=DECAY(NN)/8760.
      IF(NUCLID(NN) .EQ. H3) GO TO 200
      IF(NUCLID(NN) .EQ. C14) GO TO 300
C      CALCULATION OF CPAST= RADIONUCLIDE CONCENTRATION IN PASTURE GRASS
C                            CONSUMED BY ANIMALS
  100 B=0.243*BV(NN)                                                    RAE0186
      CPAST=CV(NN,Y1,TE1,TH1,B,1.)
C      CALCULATION OF CSTO = RADIONUCLIDE CONCENTRATION IN STORED FEED
C                            CONSUMED BY ANIMALS
      B=0.680*(0.378*BR(NN)+0.622*BV(NN))                               RAE0186
      CSTO=CV(NN,Y1,TE1,TH2,B,0.1)
C     CALCULATION OF CFEED = RADIONUCLIDE CONCENTRATION IN ANIMAL'S FEED
      CFEED=FP*FS*CPAST+(1.0-FP*FS)*CSTO
C
C*** CALCULATION OF CLX = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED
C                         BY MAN
      B=0.066*BV(NN)                                                    RAE0186
C*** 1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      CL1(NN)=CV(NN,Y2,TE2,TH3,B,1.)
C
C*** 2. FOR GENERAL POPULATION
      CL2(NN)=CV(NN,Y2,TE2,TH5,B,1.)
C
C*** CALCULATION OF CPX = RADIONUCLIDE CONC IN PRODUCE
C                         CONSUMED BY MAN
C*** 1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      B=0.187*BR(NN)                                                    RAE0186
      CP1(NN)=CV(NN,Y2,TE2,TH4,B,0.1)
C
C*** 2. FOR GENERAL POPULATION
      CP2(NN)=CV(NN,Y2,TE2,TH6,B,0.1)
C
C***   CALCULATION OF CCMIX = RADIONUCLIDE CONCENTRATION IN COW'S MILK
C***   1 FOR MAXIMUM INDIVIDUAL EXPOSURE
      CCMI1(NN)=FMC(NN)*CFEED*QFC*EXP(-DECA*TF1)
C
C***   2 FOR GENERAL POPULATION
      CCMI2(NN)=FMC(NN)*CFEED*QFC*EXP(-DECA*TF2)
C
C***   CALCULATION OF CGMIX = RADIONUCLIDE CONCENTRATION IN GOAT'S MILK
C      1 FOR MAXIMUM INDIVIDUAL EXPOSURE
      CGMI1(NN)=FMG(NN)*CFEED*QFG*EXP(-DECA*TF1)
C
C***   2 FOR GENERAL POPULATION
      CGMI2(NN)=FMG(NN)*CFEED*QFG*EXP(-DECA*TF2)
C
C***  CALCULATION OF CMEAT = RADIONUCLIDE CONCENTRATION IN BEEF CATTLE
      CMEAT(NN)=FF(NN)*CFEED*QFC*EXP(-DECA*TS)
```

```
      RETURN
C
C***   CALCULATION FOR SPECIAL RADIONUCLIDE: TRITIUM
C
C***   CALCULATION OF CV3 = TRITIUM CONCENTRATION IN ALL VEGETATION
  200 CV3=3.75E14*ATAVG(NN)/ABSH
C***  CALCULATION OF CONCENTRATION OF TRITIUM IN VEGETATION, MILK,
C***  AND MEAT CONSUMED BY MAN
      CL1(NN)=CV3
      CL2(NN)=CV3
      CP1(NN)=CV3
      CP2(NN)=CV3
      CCMI1(NN)=FMC(NN)*CV3*QFC
      CCMI2(NN)=CCMI1(NN)
      CGMI1(NN)=FMG(NN)*CV3*QFG
      CGMI2(NN)=CGMI1(NN)
      CMEAT(NN)=FF(NN)*CV3*QFC
      RETURN
C
C***   CALCULATION FOR SPECIAL RADIONUCLIDE: CARBON-14
C
C***   CALCULATION OF CV14 = C-14 CONCENTRATION IN ALL VEGETATION
  300 CV14=6.875E14*ATAVG(NN)*P14
C***  CALCULATION OF C-14 CONCENTRATION IN VEGETATION, MILK,
C***  AND MEAT CONSUMED BY MAN
      CL1(NN)=CV14
      CL2(NN)=CV14
      CP1(NN)=CV14
      CP2(NN)=CV14
      CCMI1(NN)=FMC(NN)*CV14*QFC
      CCMI2(NN)=CCMI1(NN)
      CGMI1(NN)=FMG(NN)*CV14*QFG
      CGMI2(NN)=CGMI1(NN)
      CMEAT(NN)=FF(NN)*CV14*QFC
      RETURN
      END
C
C
      FUNCTION CV(1,Y,TE,TH,B,TV)
C
C
C***   CALCULATION OF RADIONUCLIDE CONCENTRATION IN FORAGE, PRODUCE AND
C      VEGETABLES  CALLED BY FOOD
C
C
C
C
      DOUBLE PRECISION NUCLID
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &       AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &       SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &       AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &       ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &       FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &       PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &       INSITE
      COMMON/IRRFOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &       ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &       QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
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     &        CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &        CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &        COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &        COMEAT(40),QING(40),QINH(40),POP,
     &        CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &            QCW,QGW,QBW,ABSH,P14
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
     $        SMASS,WMASS,WDEEP
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &        PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &        IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,ETMECH,INTYR(4),          RAE1085
     &        WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      NEXYR=IAVG2-IAVG1+1
      DECA=DECAY(I)/8760.
      XAMBEF=DECA+XAMBWE
      TERM1=DERATE(I)*RA(I)*TV*(1.0-EXP(-XAMBEF*TE))/(Y*XAMBEF)
      CSP(I)=CSPT(I)/FLOAT(NEXYR)
      IF(INSITE .EQ. 1)CSP(I)=SOAVG(I)
      TERM2=CSP(I)*B/PP
      CV=(TERM1+TERM2)*EXP(-DECA*TH)
      RETURN
      END
C
C
C
      SUBROUTINE FOODA(NN)
C
C
C
C***** CALCULATION OF RADIONUCLIDE CONCENTRATION IN VEGETABLES, MILK AND
C       MEAT CONSUMED BY MAN RESULTING FROM ATMOSPHERIC DEPOSITION
C       CALLED BY MAIN.
C
C
C
C
C
C
C     INPUT VARIABLES
C
C       NN     = NUCLIDE NUMBER
C       DECAY  = RADIOACTIVE DECAY CONSTANT                          1/Y
C       XAMBWE = WEATHER DECAY CONSTANTE                             1/H
C                AIRBORNE MATERIAL
C       TA     = PERIOD OF TIME FOR WHICH SOIL IS EXPOSED TO THE
C                CONTAMINATED AIRBORNE MATERIAL                      H
C       PP     = SURFACE DENSITY FOR SOIL                            KG/M**2
C       RA     = RETENTION FRACTION
C       BV     = CONCENTRATION FRACTION FOR UPTAKE OF RADIONUCLIDE
C                FROM SOIL BY VEGETATIVE PARTS OF CROPS
C       BR     = CONCENTRATION FRACTION FOR UPTAKE OF RADIONUCLIDE
C                FROM SOIL BY REPRODUCTIVE PARTS OF CROPS
C       DERATE = RADIONUCLIDE DEPOSITION RATE                        PCI/M**
C       IOPT   = OPTIONS FOR SPECIALS RADIONUCLIDES H-3 AND C-14
C                IOPT = 1 IF H-3 AND C-14 IS NOT INCLUDED IN THIS RUN
C                IOPT = 2 IF ONLY H-3 IS INCLUDED
C                IOPT = 3 IF ONLY C-14 IS INCLUDED
C                IOPT = 4 IF BOTH ARE INCLUDED
```

```
C       Y1     = AG PRODUCTIVITY FOR GRASS CONSUMED BY ANIMALS      KG/M**2
C       Y2     = AG PRODUCTIVITY FOR VEGETATION CONSUMED BY MAN     KG/M**2
C       TE1    = TIME PASTURE GRASS EXPOSED DURING GROWING SEASON   H
C       TE2    = TIME CROP/VEG EXPOSED DURING GROWING SEASON        H
C       TH1    = PERIOD DELAY BETWEEN HARVEST OF PASTURE GRASS
C                AND INGESTION BY ANIMALS                           H
C       TH2    = PERIOD DELAY BETWEEN HARVEST OF STORED FEED AND
C                INGESTION BY ANIMAL                                H
C       TH3    = PERIOD DELAY BETWEEN HARVEST OF LEAFY VEG AND
C                INGESTION BY MAN FOR MAXIMUM INDIVIDUAL EXPOSURE   H
C       TH4    = PERIOD DELAY BETWEEN HARVEST OF PRODUCE AND
C                INGESTION BY MAN FOR MAXIMUM INDIVIDUAL EXPOSURE   H
C       TH5    = TIME DELAY BETWEEN HARVEST  LEAFY VEG AND
C                INGESTION BY MAN FOR GENERAL POPULATION EXPOSURE   H
C       TH6    = TIME DELAY BETWEEN HARVEST OF PRODUCE AND
C                INGESTION BY MAN FOR GENERAL POPULATION EXPOSURE   H
C       FP     = FRACTION OF YEAR THAT ANIMAL GRAZE ON PASTURE
C       FS     = FRACTION OF DAILY FEED THAT IS FRESH GRASS WHEN
C                ANIMALS GRAZE ON PASTURE
C       FMC    = FRACTION OF THE COW'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH LITER OF MILK   D/L
C       FMG    = FRACTION OF THE GOAT'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH LITER OF MILK   D/L
C       QFC    = AMOUNT OF FEED CONSUMED BY CATTLE                  KG/D
C       QFG    = AMOUNT OF FEED CONSUMED BY GOATS                   KG/D
C       TF1    = TRANSPORT TIME OF RADIONUCLIDE FROM
C                FEED-MILK-RECEPTOR FOR M.I.E.                      H
C       TF2    = TRANSPORT TIME OF RADIONUCLIDE FROM
C                FEED-MILK-RECEPTOR FOR G.P.E.                      H
C       FF     = FRACTION OF THE ANIMAL'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH KG OF FLESH     D/KG
C       TS     = TIME FROM SLAUGHTER OF MEAT TO CONSUMPTION         H
C       ABSH   = ABSOLUTE HUMIDITY OF THE ATMOSPHERE                G/M**3
C       P14    = FRACTIONAL EQUILIBRIUM RATIO FOR C-14
C       INTERMEDIATE VARIABLES
C       XAMBEF= EFFECTIVE DECAY CONSTANT
C       CPAST = NUCLIDE CONC IN PASTURE GRASS CONSUMED BY ANIMALS
C       CSTO  = NUCLIDE CONC IN STORED FEED CONSUMED BY ANIMALS
C       CFEED = RADIONUCLIDE CONCENTRATION IN ANIMALS'S FEED
C
C
C       OUTPUT VARIABLES
C
C       CL1    = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED BY MAN
C                FOR M.I.E.                                         PCI/KG
C       CL2    = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED BY MAN
C                FOR G.P.E.                                         PCI/KG
C       CP1    = RADIONUCLIDE CONC IN PRODUCE CONSUMED BY MAN
C                FOR M.I.E.                                         PCI/KG
C       CP2    = RADIONUCLIDE CONC IN PRODUCE CONSUMED BY MAN
C                FOR G.P.E.                                         PCI/KG
C       CCMI1 = RADIONUCLIDE CONC IN COW'S MILK FOR M.I.E.         PCI/L
C       CCMI2 = RADIONUCLIDE CONC IN COW'S MILK FOR G.P.E.         PCI/L
C       CGMI1 = RADIONUCLIDE CONC IN GOAT'S MILK FOR M.I.E.        PCI/L
C       CGMI2 = RADIONUCLIDE CONC IN GOAT'S MILK FOR G.P.E.        PCI/L
C       CMEAT = RADIONUCLIDE CONC IN BEEF CATTLE'S MEAT            PCI/KG
C
C
C
      DOUBLE PRECISION NUCLID,H3,C14
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      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &       AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &       SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &       AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &       ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &       FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/IRREOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &       ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &       QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &       CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &       CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &       COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &       COMEAT(40),QING(40),QINH(40),POP,
     &       CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &       PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &       INSITE
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
     &       SMASS,WMASS,WDEEP
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &             QCW,QGW,QBW,ABSH,P14
      COMMON/PCV/SOCON(40)
      DATA H3,C14/8HH-3     ,8HC-14    /
      IF(NUCLID(NN) .EQ. H3) GO TO 200
      IF(NUCLID(NN) .EQ. C14) GO TO 300
      DECA=DECAY(NN)/8760.
      DECSL=SINFL/(0.15*(1.+BDENS/PORS*XKD(1,NN)))/8760.
      CSP(NN)=(CSP(NN)+DERATE(NN)*8760.)*EXP(-(DECA+DECSL)*8760.)
      IF(INSITE .EQ. 1) CSP(NN)=SOCON(NN)
C      CALCULATION OF CPAST= RADIONUCLIDE CONCENTRATION IN PASTURE GRASS
C                            CONSUMED BY ANIMALS
      B=0.243*BV(NN)                                                    RAE0186
      TERM2=CSP(NN)*B/PP                                                RAE0186
      CPAST=CVA(NN,Y1,TE1,TH1,TERM2,1.)
C      CALCULATION OF CSTO = RADIONUCLIDE CONCENTRATION IN STORED FEED C
C                            BY ANIMALS
      B=0.680*(0.378*BR(NN)+0.622*BV(NN))                               RAE0186
      TERM2=CSP(NN)*B/PP                                                RAE0186
      CSTO=CVA(NN,Y1,TE1,TH2,TERM2,0.1)
C      CALCULATION OF CFEED = RADIONUCLIDE CONCENTRATION IN ANIMAL'S FEE
      CFEED=FP*FS*CPAST+(1.0-FP*FS)*CSTO
C
C*** CALCULATION OF CLX = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED
C                         BY MAN
      B=0.066*BV(NN)                                                    RAE0186
      TERM2=CSPO(NN)*B/PP                                               RAE0186
C*** 1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      CL1(NN)=CVA(NN,Y2,TE2,TH3,TERM2,1.)
C
C*** 2. FOR GENERAL POPULATION
      CL2(NN)=CVA(NN,Y2,TE2,TH5,TERM2,1.)
C
C*** CALCULATION OF CPX = RADIONUCLIDE CONC IN PRODUCE
C                         CONSUMED BY MAN
C*** 1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      B=0.187*BR(NN)                                                    RAE0186
      TERM2=CSP(NN)*B/PP                                                RAE0186
      CP1(NN)=CVA(NN,Y2,TE2,TH4,TERM2,0.1)
C
C*** 2. FOR GENERAL POPULATION
```

```
      CP2(NN)=CVA(NN,Y2,TE2,TH6,TERM2,0.1)
C
C***   CALCULATION OF CCMIX = RADIONUCLIDE CONCENTRATION IN COW'S MILK
C***   1 FOR MAXIMUM INDIVIDUAL EXPOSURE
      CCMI1(NN)=FMC(NN)*CFEED*QFC*EXP(-DECA*TF1)
C
C***   2 FOR GENERAL POPULATION
      CCMI2(NN)=FMC(NN)*CFEED*QFC*EXP(-DECA*TF2)
C
C***   CALCULATION OF CGMIX = RADIONUCLIDE CONCENTRATION IN GOAT'S MILK
C      1 FOR MAXIMUM INDIVIDUAL EXPOSURE
      CGMI1(NN)=FMG(NN)*CFEED*QFG*EXP(-DECA*TF1)
C
C***   2 FOR GENERAL POPULATION
      CGMI2(NN)=FMG(NN)*CFEED*QFG*EXP(-DECA*TF2)
C
C***  CALCULATION OF CMEAT = RADIONUCLIDE CONCENTRATION IN BEEF CATTLE
      CMEAT(NN)=FF(NN)*CFEED*QFC*EXP(-DECA*TS)
      RETURN
C
C***   CALCULATION FOR SPECIAL RADIONUCLIDE: TRITIUM
C
C***   CALCULATION OF CV3 = TRITIUM CONCENTRATION IN ALL VEGETATION
  200 CV3=3.75E14*ATCON(NN)/ABSH
C***  CALCULATION OF CONCENTRATION OF TRITIUM IN VEGETATION, MILK,
C***  AND MEAT CONSUMED BY MAN
      CL1(NN)=CV3
      CL2(NN)=CV3
      CP1(NN)=CV3
      CP2(NN)=CV3
      CCMI1(NN)=FMC(NN)*CV3*QFC
      CCMI2(NN)=CCMI1(NN)
      CGMI1(NN)=FMG(NN)*CV3*QFG
      CGMI2(NN)=CGMI1(NN)
      CMEAT(NN)=FF(NN)*CV3*QFC
      RETURN
C
C***   CALCULATION FOR SPECIAL RADIONUCLIDE: CARBON-14
C
C***  CALCULATION OF CV14 = C-14 CONCENTRATION IN ALL VEGETATION
  300 CV14=6.875E14*ATCON(NN)*P14
C***  CALCULATION OF C-14 CONCENTRATION IN VEGETATION, MILK,
C***  AND MEAT CONSUMED BY MAN
      CL1(NN)=CV14
      CL2(NN)=CV14
      CP1(NN)=CV14
      CP2(NN)=CV14
      CCMI1(NN)=FMC(NN)*CV14*QFC
      CCMI2(NN)=CCMI1(NN)
      CGMI1(NN)=FMG(NN)*CV14*QFG
      CGMI2(NN)=CGMI1(NN)
      CMEAT(NN)=FF(NN)*CV14*QFC
      RETURN
      END
C
C
      FUNCTION CVA(I,Y,TE,TH,TERM2,TV)
C
C
C***   CALCULATION OF RADIONUCLIDE CONCENTRATION IN FORAGE, PRODUCE AND
```

```
C       VEGETABLES  CALLED BY FOODA
C
C
      DOUBLE PRECISION NUCLID
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &            QCW,QGW,QBW,ABSH,P14
      DECA=DECAY(I)/8760.
      XAMBEF=DECA+XAMBWE
      TERM1=DERATE(I)*RA(I)*TV*(1.0-EXP(-XAMBEF*TE))/(Y*XAMBEF)
      CVA=(TERM1+TERM2)*EXP(-DECA*TH)
      RETURN
      END
C
C
C
       SUBROUTINE HUMEX(NN)
C
C
C       CALCULATION OF ANNUAL RADIONUCLIDE INTAKE BY MAN.  CALLED BY MAIN
C
C
C
C
C
C
C       INPUT VARIABLES
C       NN     = RADIONUCLIDE NUMBER
C       ULEAFY = ANNUAL INTAKE OF LEAFY VEGETABLES (KG/Y)
C       UPROD  = ANNUAL INTAKE OF PRODUCE (KG/Y)
C       UCMILK = ANNUAL INTAKE OF COW'S MILK(L/Y)
C       UGMILK = ANNUAL INTAKE OF GOAT'S MILK(L/Y)
C       UMEAT  = ANNUAL INTAKE OF BEEF CATTLE'S MEAT(KG/Y)
C       UWAT   = ANNUAL INTAKE OF DRINKING WATER(L/Y)
C       UAIR   = ANNUAL INHALATION RATE OF AIR(M3/Y)
C
C       OUTPUT VARIABLES
C       QING   = ANNUAL INTAKE OF RADIONUCLIDE BY INGESTION OF CONTAMINED
C                FOOD CONSIDERING ATMOSPHERIC AND AQUATIC PATHWAYS(PCI/Y)
C       QINH   = ANNUAL INTAKE OF RADIONUCLIDE BY INHALATION(PCI/Y)
C
      DOUBLE PRECISION NUCLID,PNUC
      COMMON/IRREOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &        ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &        QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &        CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &        CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &        COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &        COMEAT(40),QING(40),QINH(40),POP,
     &        CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
```

```
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/PASS/PNUC(40),PCON1(40),PCON2(40),PCON3(40),
     &       PCON4(40),PPOP,LLIND,LDIST
C
C**** CALCULATION OF RADIONUCLIDE INTAKE BY CONSUMPTION OF VEGETATION,
C        MILK, MEAT AND DRINKING WATER
C
      IF(LLIND .EQ. 0) GO TO 100
      QVEG=(CL2(NN)+COL2(NN))*ULEAFY+(CP2(NN)+COP2(NN))*UPROD
      QMILK=(CCMI2(NN)+COCMI2(NN))*UCMILK+(CGMI2(NN)+COGMI2(NN))*UGMILK
      GO TO 200
  100 QVEG=(CL1(NN)+COL1(NN))*ULEAFY+(CP1(NN)+COP1(NN))*UPROD
      QMILK=(CCMI1(NN)+COCMI1(NN))*UCMILK+(CGMI1(NN)+COGMI1(NN))*UGMILK
  200 QMEAT=(CMEAT(NN)+COMEAT(NN))*UMEAT
      QWAT=CWAT(NN)*UWAT
      QING(NN)=QVEG+QMILK+QMEAT+QWAT
C
C**** CALCULATION OF RADIONUCLIDE INTAKE BY INHALATION
C
      COAIR=ATAVG(NN)*1.0E12
      QINH(NN)=COAIR*UAIR
      RETURN
      END
C
C
C
        SUBROUTINE HUMEXA(NN)
C
C
C       CALCULATION OF ANNUAL RADIONUCLIDE INTAKE BY MAN.  CALLED BY MAIN
C
C
C
C
C
C
C
C       INPUT VARIABLES
C       NN     = RADIONUCLIDE NUMBER
C       ULEAFY = ANNUAL INTAKE OF LEAFY VEGETABLES (KG/Y)
C       UPROD  = ANNUAL INTAKE OF PRODUCE (KG/Y)
C       UCMILK = ANNUAL INTAKE OF COW'S MILK(L/Y)
C       UGMILK = ANNUAL INTAKE OF GOAT'S MILK(L/Y)
C       UMEAT  = ANNUAL INTAKE OF BEEF CATTLE'S MEAT(KG/Y)
C       UWAT   = ANNUAL INTAKE OF DRINKING WATER(L/Y)
C       UAIR   = ANNUAL INHALATION RATE OF AIR(M3/Y)
C
C       OUTPUT VARIABLES
C       QING   = ANNUAL INTAKE OF RADIONUCLIDE BY INGESTION OF CONTAMINED
C                FOOD CONSIDERING ATMOSPHERIC AND AQUATIC PATHWAYS(PCI/Y)
C       QINH   = ANNUAL INTAKE OF RADIONUCLIDE BY INHALATION(PCI/Y)
C
      DOUBLE PRECISION NUCLID,PNUC
      COMMON/IRRFOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &        ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &        QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &        CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &        CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &        COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
```

```
     &        COMEAT(40),QING(40),QINH(40),POP,
     &        CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/PASS/PNUC(40),PCON1(40),PCON2(40),PCON3(40),
     &       PCON4(40),PPOP,LLIND,LDIST
C
C**** CALCULATION OF RADIONUCLIDE INTAKE BY CONSUMPTION OF VEGETATION,
C        MILK, MEAT AND DRINKING WATER
C
      IF(LLIND .EQ. 0) GO TO 100
      QVEG=(CL2(NN)+COL2(NN))*ULEAFY+(CP2(NN)+COP2(NN))*UPROD
      QMILK=(CCMI2(NN)+COCMI2(NN))*UCMILK+(CGMI2(NN)+COGMI2(NN))*UGMILK
      GO TO 200
  100 QVEG=(CL1(NN)+COL1(NN))*ULEAFY+(CP1(NN)+COP1(NN))*UPROD
      QMILK=(CCMI1(NN)+COCMI1(NN))*UCMILK+(CGMI1(NN)+COGMI1(NN))*UGMILK
  200 QMEAT=(CMEAT(NN)+COMEAT(NN))*UMEAT
      QWAT=CWAT(NN)*UWAT
      QING(NN)=QVEG+QMILK+QMEAT+QWAT
C
C**** CALCULATION OF RADIONUCLIDE INTAKE BY INHALATION
C
      COAIR=ATCON(NN)*1.0E12
      QINH(NN)=COAIR*UAIR
      RETURN
      END
C
C
C
C
      SUBROUTINE INFIL(TXI,TP)
C THIS SUBROUTINE, WITH SUBROUTINES SOIL AND ROUT, CALCULATES
C INFILRATION THROUGH THE TRENCH CAP FOR A SINGLE YEAR AND
C RETURNS THAT VALUE TO THE MAIN PROGRAM.  THE ORIGINAL MODEL AND
C PROGRAM WERE WRITTEN BY C.Y.HUNG, OFFICE OF RADIATION PROGRAMS,
C USEPA, WASHINGTON D.C.
      COMMON /BLOCK1/R(25),EP(25),H(25),QL(25),YP(25),YG(25),ETO(25),
     1 ETS(25),VP(25),VG(25),YTP(25),YTG(25),XI(25),P(12,31,25)
      COMMON /BLOCK2/HT(4),YPT(4),YGT(4)
      COMMON /BLOCK3/RT,EPT,YPTE,XKL,ETOT,QLT,XL,VGT,VPT,DELT,ETST,EPSP,
     1YTGPP,HUPMAX,VPMAX,HUGMAX,VGMAX,YPMAX,XNS,UYMAX,XKI,I,XIT,
     2EPSG,YTGPG,YGMAX,XDE,XKE
      DIMENSION MODAY(12),TMP(12,31),DTH(12)
      DATA IAMP/99/,MODAY/31,28,31,30,31,30,31,31,30,31,30,31/
      WRITE(6,3010)
C READ CONTROL PARAMETERS
      READ(4,1010)TWT,SLOP,XKI,EPSG,EPSP,YGMAX,XDE,XKE,YPI,YGI
      WRITE(6,9010)TWT,SLOP,XKI,EPSG,EPSP,YGMAX,XDE,XKE,YPI,YGI
 9010 FORMAT(//,' INPUT DATA AS READ IN',//,5X,6F7.3,2E10.3,2F7.3)
      YP(1)=YPI
      YG(1)=YGI
      YPMAX=YGMAX
      VPMAX=0.0
      VGMAX=XKI
C  CREATE A 3-DIMENSIONAL ZERO-RATE RAINFALL MATRIX
      DO 100 IM=1,12
```

```
      NODAY=MODAY(IM)
      DO 100 ID=1,NODAY
      DO 100 IH=2,25
      P(IM,ID,IH)=0.
  100 CONTINUE
C READ MONTHLY MAXIMUM DAY LENGTH
      READ(4,1020) (DTH(IM),IM=1,12)
      WRITE (6,3020) (DTH(IM),IM=1,12)
C READ DAILY MEAN TEMPERATURES (DEG C)
      DO 200 ID=1,31
      READ(4,1030) (TMP(IM,ID),IM=1,12)
  200 CONTINUE
      WRITE(6,3030)
      DO 300 ID=1,31
      WRITE(6,3031) ID,(TMP(IM,ID),IM=1,12)
  300 CONTINUE
C  OVERLAY PERTINENT DATA (0.1MM/HR) ONTO PRECIP ARRAY AS READ IN
      WRITE(6,3040)
  400 READ(4,1040) MO,IDA,(P(MO,IDA,IH),IH=2,25)
      IF(IAMP.EQ.MO) GO TO 500
      WRITE(6,3041) MO,IDA,(P(MO,IDA,IH),IH=2,25)
      GO TO 400
C CONVERT RAINFALL TO M/HR
  500 DO 600 MO=1,12
      NODAY=MODAY(MO)
      DO 600 IDA=1,NODAY
      DO 600 IH=2,25
      P(MO,IDA,IH)=P(MO,IDA,IH)*1E-4
  600 CONTINUE
C CALCULATE OR DEFINE CONSTANTS
      DELT=1.0
      TAU=0.66
      XKCMMD=120./39.37
      CEP=.14/(24. * 1000.)
      XL=TWT/2.
      XKL=SQRT(SLOP)*3600./0.05
      H(1)=0.
      XKCM=XKCMMD/(1000.*24)
      TEP=0.
      TP=0.
      TXI=0.
      HSNW=0.
      TRO=0.
      XKI=VGMAX+VPMAX
      WRITE(6,3050)
      WRITE(6,3051) XKCMMD,YGMAX,TWT,SLOP,XKI
      WRITE(6,3052)EPSP,EPSG,XDE,XKE,DELT
C
C     STEADY STATE INFILTRATION LOOP
C
      TXIL=0.0
      DO 80 IY=1,10
      TP=0.0
      TEP=0.0
      TRO=0.0
      TXI=0.0

C
C MONTHLY LOOP**********************
      DO 70 IM=1,12
```

```
      NODAY=MODAY(IM)
      DT=DTH(IM)/12.
C DAILY LOOP*************************
      DO 60 ID=1,NODAY
      TC=TMP(IM,ID)
      IF(TC .LT. -20.8) XT = 0.
      IF(TC .LT. -20.8) GO TO 5
      BB=(TC+20.8)/31.98
      XT=BB**0.861
    5 PT=10.**XT
      EP(1)=CEP*DT*DT*PT
      HR=1.0
C HOURLY LOOP************************
      DO 50 IH=2,25
      I=IH
      EP(I)=EP(1)
C CONVERT BACK TO FAHRENHEIT TEMP (TF)
      TF=(1.8*TC)+32.
      IF(TF.GE.32.) GO TO 10
      HSNW = HSNW + P(IM,ID,I)
      R(I) = 0.
      GO TO 40
   10 SM=XKCM*(TF-24.)
      IF(SM .LT. HSNW) GO TO 30
      SM=HSNW
   30 HSNW=HSNW-SM
      R(I)=SM+P(IM,ID,I)
   40 CONTINUE
      CALL ROUT
      TEP=TEP+(ETS(I)+ETO(I))*DELT
      TP=TP+P(IM,ID,I)*DELT
      TXI=TXI+XI(I)*DELT
      TRO=TRO+QL(I)*DELT
      ETSO=ETS(I)+ETO(I)
      I1=I-1
      HR=HR+1.
C
   50 CONTINUE
      H(1)=H(25)
      YG(1)=YG(25)
      YP(1)=YP(25)
   60 CONTINUE
   70 CONTINUE
      WRITE(6,81) IY
   81 FORMAT(//,10X,'YEAR=',I2)
      WRITE(6,3060) TP,TEP,TRO,TXI
      WRITE(6,3061) YP(25),YG(25),HSNW
 3061 FORMAT(5X,'PELLICULAR',4X,'GRAVITY',5X,'SNOW'/,5X,'DEFICIT',
     C       7X,'DEFICIT'/,5X,50('-')/,4X,3(1PE11.2)/)
      PERTXI=TXI-TXIL
      WRITE(6,82) PERTXI
      PER=0.02*TXIL
      IF(PERTXI.LE.PER.AND.IY.NE.1) RETURN
      TXIL=TXI
   80 CONTINUE
   82 FORMAT(//,' CHANGE OF TOTAL ANNUAL INFILTRATION='
     C        ,1PE11.2,////)
C FORMAT STATEMENTS*************************
 1010 FORMAT(10F7.3)
 1020 FORMAT(12F5.1)
```

```
 1030 FORMAT(2X,12F6.2)
 1040 FORMAT(I2,1X,I2,1X,24(F3.0),2X)
 3010 FORMAT(1X,'OUTPUT FROM SUBROUTINE INFIL'/,28('*'),//)
 3020 FORMAT(1X,'DAILY SUNSHINE BY MONTH (HOURS)'/,3X,12F8.1//)
 3030 FORMAT(1X,'DAILY TEMPERATURES (DEGREES CELSIUS):'//,
     1 2X,'MONTH=   JAN    FEB    MAR    APR    MAY    JUN    JUL    AUG
     2     SEP     OCT     NOV     DEC'/,3X,'DAY'/)
 3031 FORMAT(3X,12,3X,12(F6.2,1X),/)
 3040 FORMAT(//,1X,'MONTH,DAY,& RAINFALL AS READ IN (0.1MM/HR):'/)
 3041 FORMAT(1X,2(I2,1X),24F4.0)
 3050 FORMAT(/,1X,'TRENCH CHARACTERISTICS: '/)
 3051 FORMAT(15X,'SNOWMELT COEFFICIENT =',F10.2,'MM/DEG-DAY'/,
     115X,'THICKNESS OF TRENCH COVER =',F10.2,' M'/,
     215X,'TOTAL WIDTH OF TRENCH COVER =',F10.2,' M'/,
     315X,'AVERAGE SLOPE OF TRENCH COVER =',F10.2,' M/M'/,
     415X,'PERMEABLITY OF TRENCH CAP =',E12.3,'M/HR')
 3052 FORMAT(15X,'POROSITY FOR PELLIC WATER =', F10.2,' (UNITLESS)'/,
     115X,'POROSITY FOR GRAVITY WATER =',F10.2,'(UNITLESS)'/,
     215X,'EQUIVALENT UPWARD DIFFUSIVITY =',E12.2,' M**2/HR',/,
     315X,'EQUIVALENT UPWARD HYDRAULIC CONDUCTIVITY =',E12.2,' M/HR',/
     415X,'TIME STEP FOR MODEL =', F10.2,' HOURS'/)
 3060 FORMAT(///,1X,12('*'),'CUMULATIVE ANNUAL VALUES (M)',12('*')//
     1 8X,'PRECIP',6X,'EVAP',6X,'RUNOFF',6X,'INFIL',/,5X,50('-')/,
     2 4X,4(1PE11.2)/)
      RETURN
      END
C
C
C
C
      SUBROUTINE ROUT
      COMMON /BLOCK1/R(25),EP(25),H(25),QL(25),YP(25),YG(25),ETO(25),
     1 ETS(25),VP(25),VG(25),YTP(25),YTG(25),XI(25),P(12,31,25)
      COMMON /BLOCK2/HT(4),YPT(4),YGT(4)
      COMMON /BLOCK3/RT,EPT,YPTE,XKL,ETOT,QLT,XL,VGT,VPT,DELT,ETST,EPSP,
     1YTGPP,HUPMAX,VPMAX,HUGMAX,VGMAX,YPMAX,XNS,UYMAX,XKI,I,XIT,
     2EPSG,YTGPG,YGMAX,XDE,XKE
      RT=R(I)
      EPT=EP(I)
      CALL SOIL
      IF(ETOT .EQ. 0.0) GO TO 300
      HT(1) = H(I-1)
      DO 200 J=1,4
      QLT=XKL*HT(J)**1.667
      HT(J)=(RT-ETOT-ETST-QLT/XL-VPT-VGT)*DELT + H(I-1)
      IF(HT(J) .LT. 0.0) HT(J)=0.
      IF(J .GE. 3) GO TO 100
      HT(J+1)=(HT(J) + H(I-1))*0.5
      GO TO 200
  100 IF(J .EQ. 3) HT(J+1) = HT(J)
  200 CONTINUE
      H(I)=(HT(1)+2.0*(HT(2)+HT(3)) + HT(4))/6.0
      QL(I)=(R(I)-ETOT-VGT-VPT-(H(I)-H(I-1))/DELT)
      GO TO 400
  300 H(I)=0.
      QL(I)=0.
  400 YP(I)=YP(I-1)+(ETST-VPT)*DELT/EPSP
      YG(I)=YG(I-1)+(XIT-VGT)*DELT/EPSG
      ETO(I) = ETOT
      ETS(I)=ETST
```

```
      XI(I)=XIT
      VP(I)=VPT
      VG(I)=VGT
      RETURN
      END
C
C
C
C
      SUBROUTINE SOIL
      COMMON /BLOCK1/R(25),EP(25),H(25),QL(25),YP(25),YG(25),ETO(25),
     1 ETS(25),VP(25),VG(25),YTP(25),YTG(25),XI(25),P(12,31,25)
      COMMON /BLOCK2/HT(4),YPT(4),YGT(4)
      COMMON /BLOCK3/RT,EPT,YPTE,XKL,ETOT,QLT,XL,VGT,VPT,DELT,ETST,EPSP,
     1YTGPP,HUPMAX,VPMAX,HUGMAX,VGMAX,YPMAX,XNS,UYMAX,XKI,I,XIT,
     2EPSG,YTGPG,YGMAX,XDE,XKE
      TSWE=(RT-EPT)*DELT+H(I-1)
      IF(TSWE .LT. 0.0) GO TO 100
      ETOT=EPT
      ETST=0.0
      VPT=VGMAX
      AUX=TSWE/DELT
      IF(AUX .LT. VGMAX) VPT=TSWE/DELT
   50 YPTT=VPT*DELT/EPSP
      IF(YPTT .GT. YP(I-1)) VPT=YP(I-1)*EPSP/DELT
      IF(YPTT .GE. YP(I-1)) YPTT=VPT*DELT/EPSP
      TGHW=TSWE-VPT*DELT
      IF(TGHW .LT. 0.0) TGHW=0.
      VGT=VGMAX-VPT
      IF(TGHW .LT. VGT) VGT=TGHW/DELT
      YGTT= VGT*DELT/EPSG
      IF(YGTT .GT. YG(I-1)) VGT = YG(I-1)*EPSG/DELT
      IF(YGTT .GT. YG(I-1)) YGTT=VGT*DELT/EPSG
      GO TO 150
  100 ETOT=TSWE/DELT+EPT
      IF(ETOT .LT.0.) ETOT=0.
      EPSPG=EPSP+EPSG
      EPTE=EPT-ETOT
      IF(YP(I-1).EQ.0.) GO TO 110
      ETSTW=(XDE*EPSP/YP(I-1))-XKE
      IF(ETSTW.GT.EPTE) ETSTW=EPTE
      GO TO 120
  110 ETSTW=EPTE
  120 ETSTV=EPTE/(1+(YP(I-1)*0.5/(0.66*EPSPG)))
      IF(ETSTV.GE.ETSTW) ETST=ETSTV
      IF(ETSTW.GE.ETSTV) ETST=ETSTW
      VPT=0.
      VGT=0.
  150 IF(YG(I-1) .LT. YGMAX) GO TO 200
      XIT=0.
      GO TO 250
  200 XIT=XKI
      YGIT=XIT*DELT/EPSG
      XX=YGMAX-YG(I-1)
      IF(YGIT .GT. XX)  XIT=XX*EPSG/DELT
  250 CONTINUE
      RETURN
      END
C
C
```

```
C
      SUBROUTINE IRRIG(NN)
C
C
C
C***** CALCULATION OF RADIONUCLIDE CONCENTRATION IN VEGETABLE, MILK AND
C       CONSUMED BY MAN RESULTING FROM WATER IRRIGATION.  CALLED BY MAIN.
C
C
C
C
C
C     INPUT VARIABLES
C
C       NN     = NUCLIDE NUMBER
C       DECAY  = RADIOACTIVE DECAY CONSTANTE                          1/Y
C       XAMBWE = WEATHER DECAY CONSTANTE                              1/H
C       TW     = PERIOD OF TIME FOR WHICH SOIL IS EXPOSED TO THE
C                CONTAMINATED WATER                                   H
C       PP     = SURFACE DENSITY FOR SOIL                            KG/M**2
C       RW     = RETENTION FRACTION
C       BV     = CONCENTRATION FRACTION FOR UPTAKE OF RADIONUCLIDE
C                FROM SOIL BY VEGETATIVE PARTS OF CROPS
C       BR     = CONCENTRATION FRACTION FOR UPTAKE OF RADIONUCLIDE
C                FROM SOIL BY REPRODUCTIVE PARTS OF CROPS
C       FI     =FRACTION OF THE YEAR CROPS ARE IRRIGATED
C       WIRATE= IRRIGATION RATE                                       L/M**2-
C       CWAT   = RADIONUCLIDE CONCENTRATION IN WATER                  PCI/L
C       IOPT   = OPTIONS FOR SPECIAL RADIONUCLIDE H-3
C                IOPT = 1 IF H-3 IS NOT INCLUDED IN THIS RUN
C                IOPT = 2 IF H-3 IS INCLUDED
C       Y1     = AG PRODUCTIVITY FOR GRASS CONSUMED BY ANIMALS        KG/M**2
C       Y2     = AG PRODUCTIVITY FOR VEGETATION CONSUMED BY MAN       KG/M**2
C       TE1    = TIME PASTURE GRASS EXPOSED DURING GROWING SEASON     H
C       TE2    = TIME CROP/VEG EXPOSED DURING GROWING SEASON          H
C       TH1    = PERIOD DELAY BETWEEN HARVEST OF PASTURE GRASS
C                AND INGESTION BY ANIMALS                             H
C       TH2    = PERIOD DELAY BETWEEN HARVEST OF STORED FEED
C                AND INGESTION BY ANIMAL                              H
C       TH3    = PERIOD DELAY BETWEEN HARVEST OF LEAFY VEGETABLE
C                AND INGESTION BY MAN FOR M.I.E.                      H
C       TH4    = PERIOD DELAY BETWEEN HARVEST OF PRODUCE AND
C                INGESTION BY MAN FOR M.I.E.                          H
C       TH5    = PERIOD DELAY BETWEEN HARVEST OF LEAFY VEG
C                AND INGESTION BY MAN FOR G.P.E.                      H
C       TH6    = PERIOD DELAY BETWEEN HARVEST OF PRODUCE
C       TH5    = PERIOD DELAY BETWEEN HARVEST OF LEAFY VEG
C       FP     = FRACTION OF YEAR THAT ANIMAL GRAZE ON PASTURE
C       FS     = FRACTION OF DAILY FEED THAT IS FRESH GRASS WHEN
C                ANIMALS GRAZE ON PASTURE
C       FMC    = FRACTION OF THE COW'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH L OF MILK         D/L
C       FMG    = FRACTION OF THE GOAT'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH L OF MILK         D/L
C       QFC    = AMOUNT OF FEED CONSUMED BY CATTLE                    KG/D
C       QFG    = AMOUNT OF FEED CONSUMED BY GOATS                     KG/D
C       TF1    = TRANSPORT TIME OF RADIONUCLIDE FROM
C                FEED-MILK-RECEPTOR FOR M.I.E.                        H
C       TF2    = TRANSPORT TIME OF RADIONUCLIDE FROM
C                FEED-MILK-RECEPTOR FOR G.P.E.                        H
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C       FF     = FRACTION OF THE ANIMAL'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH KG OF FLESH     D/KG
C       TS     = TIME FROM SLAUGHTER OF MEAT TO CONSUMPTION         H
C       QCW    = AMOUNT OF WATER CONSUMED BY COW                    L/D
C       QGW    = AMOUNT OF WATER CONSUMED BY GOAT                   L/D
C       QBW    = AMOUNT OF WATER CONSUMED BY BEEF CATTLE            L/D
C
C     INTERMEDIATE VARIABLES
C
C       XAMBEF= EFFECTIVE DECAY CONSTANT
C       COPAST= RADIONUCLIDE CONCENTRATION IN PASTURE GRASS CONSUMED BY A
C       COPAST= RADIONUCLIDE CONCENTRATION IN STORED FEED CONSUMED BY ANI
C       COFEED= RADIONUCLIDE CONCENTRATION IN ANIMALS'S FEED
C
C     OUTPUT VARIABLES
C
C       COL1   = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED BY MAN
C                FOR M.I.E.                                         PCI/KG
C       COL2   = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED BY MAN
C                FOR G.P.E.                                         PCI/KG
C       COP1   = RADIONUCLIDE CONC IN PRODUCE CONSUMED BY MAN
C                FOR M.I.E.                                         PCI/KG
C       COP2   = RADIONUCLIDE CONC IN PRODUCE CONSUMED BY MAN
C                FOR G.P.E.                                         PCI/KG
C       COCMI1= RADIONUCLIDE CONC IN COW'S MILK FOR M.I.E.         PCI/L
C       COCMI2= RADIONUCLIDE CONC IN COW'S MILK FOR G.P.E.         PCI/L
C       COGMI1= RADIONUCLIDE CONC IN GOAT'S MILK FOR M.I.E.        PCI/L
C       COGMI2= RADIONUCLIDE CONC IN GOAT'S MILK FOR G.P.E.        PCI/L
C       COMEAT= RADIONUCLIDE CONC IN BEEF CATTLE'S MEAT            PCI/KG
      DOUBLE PRECISION NUCLID,H3,C14
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &        PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &        IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),        RAE1085
     &        WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/NUC/NUCLID(40),ATMASS(40),IRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/IRRFOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &        ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &        QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &        CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &        CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &        COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &        COMEAT(40),QING(40),QINH(40),POP,
     &        CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &            QCW,QGW,QBW,ABSH,P14
      DATA H3,C14/8HH-3     ,8HC-14    /
      DECA=DECAY(NN)/8760.
C
      IF(NUCLID(NN) .EQ. H3)GO TO 200
      IF(NUCLID(NN) .EQ. C14) GO TO 300
C      CALCULATION OF COPAST=RADIONUCLIDE CONCENTRATION IN PASTURE GRASS
C                              CONSUMED BY ANIMALS
      B=0.243*BV(NN)                                                    RAE0186
      COPAST=COV(NN,Y1,TE1,TH1,B,1.)
C     CALCULATION OF COSTO = RADIONUCLIDE CONCENTRATION IN STORED FEED
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C                                CONSUMED BY ANIMALS
      B=0.680*(0.378*BR(NN)+0.622*BV(NN))                                RAE0186
      COSTO=COV(NN,Y1,TE1,TH2,B,0.1)
C     CALCULATION OF COFEED = RADIONUCLIDE CONCENTRATION IN ANIMAL FEED
      COFEED=FP*FS*COPAST+(1.0-FP*FS)*COSTO
C
C***   CALCULATION OF COPLX = RADIONUCLIDE CONCENTRATION IN LEAFY
C      VEGETABLE CONSUMED BY MAN
       B=0.066*BV(NN)                                                    RAE0186
C***   1. FOR  MAXIMUM INDIVIDUAL EXPOSURE
      COL1(NN)=COV(NN,Y2,TE2,TH3,B,1.)
C
C***   2. FOR GENERAL POPULATION EXPOSURE
      COL2(NN)=COV(NN,Y2,TE2,TH5,B,1.)
C
C*** CALCULATION OF COPX = RADIONUCLIDE CONC IN PRODUCE CONSUMED
C                              BY MAN
C***   1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      B=0.187*BR(NN)                                                    RAE0186
      COP1(NN)=COV(NN,Y2,TE2,TH4,B,0.1)
C
C
C*** 2. FOR GENERAL POPULATION
      COP2(NN)=COV(NN,Y2,TE2,TH6,B,0.1)
C***   CALCULATION OF COCMIX = RADIONUCLIDE CONCENTRATION IN COW'S MILK
      CWAT(NN)= WWATA*AQAVG(NN)+SWATA*STAVG(NN)
C***   1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      COCMI1(NN)=FMC(NN)*(COFEED*QFC+CWAT(NN)*QCW)*EXP(-DECA*TF1)
C
C***   2. FOR GENERAL POPULATION
      COCMI2(NN)=FMC(NN)*(COFEED*QFC+CWAT(NN)*QCW)*EXP(-DECA*TF2)
C
C***   CALCULATION OF COGMIX = RADIONUCLIDE CONCENTRATION IN GOAT'S MILK
C***   1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      COGMI1(NN)=FMG(NN)*(COFEED*QFG+CWAT(NN)*QGW)*EXP(-DECA*TF1)
C
C***   2. FOR GENERAL POPULATION
      COGMI2(NN)=FMG(NN)*(COFEED*QFG+CWAT(NN)*QGW)*EXP(-DECA*TF2)
C
C***   CALCULATION OF COMEAT = RADIONUCLIDE CONCENTRATION IN BEEF CATTLE
      COMEAT(NN)=FF(NN)*(COFEED*QFC+CWAT(NN)*QBW)*EXP(-DECA*TS)
      RETURN
C
C***  CALCULATION FOR SPECIAL RADIONUCLIDE: TRITIUM
C***  TRITIUM CONC. IN VEGETATION = TRITIUM CONC. IN ANIMAL FEED =
C***  TRITIUM CONC. IN WATER = CWAT(1)
C***  CALCULATION OF H-3 CONCENTRATION IN VEGETATION, MILK,
C***  AND MEAT CONSUMED BY MAN
  200 COL1(NN)=CWAT(NN)
      COL2(NN)=CWAT(NN)
      COP1(NN)=CWAT(NN)
      COP2(NN)=CWAT(NN)
      CWAT(NN)= WWATA*AQAVG(NN)+SWATA*STAVG(NN)
      COCMI1(NN)=FMC(NN)*CWAT(NN)*(QFC+QCW)
      COCMI2(NN)=COCMI1(NN)
      COGMI1(NN)=FMG(NN)*CWAT(NN)*(QFG+QGW)
      COGMI2(NN)=COGMI1(NN)
      COMEAT(NN)=FF(NN)*CWAT(NN)*(QFC+QCW)
      RETURN
  300 CO14=0.
```

```
      COL1(NN)=CO14
      COL2(NN)=CO14
      COP1(NN)=CO14
      COP2(NN)=CO14
      CWAT(NN)= WWATA*AQAVG(NN)+SWATA*STAVG(NN)
      COCMI1(NN)=FMC(NN)*CO14*(QFC+QCW)
      COCMI2(NN)=COCMI1(NN)
      COGMI1(NN)=FMG(NN)*CO14*(QFG+QGW)
      COGMI2(NN)=COGMI1(NN)
      COMEAT(NN)=FF(NN)*CO14*(QFC+QCW)
      RETURN
      END
C
C
C
      FUNCTION COV(I,Y,TE,TH,B,TV)
C
C
C***   CALCULATION OF RADIONUCLIDE CONCENTRATION IN FORAGE, PRODUCE AND
C       VEGETABLES.  CALLED BY IRRIG.
C
C
C
C
C
C
      DOUBLE PRECISION NUCLID
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &        PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &        INSITE
      COMMON/IRREQO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &        ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &        QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &        CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &        CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &        COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &        COMEAT(40),QING(40),QINH(40),POP,
     &        CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &             QCW,QGW,QBW,ABSH,P14
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
     $        SMASS,WMASS,WDEEP
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &        PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &        IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),          RAE1085
     &        WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      NEXYR=IAVG2-IAVG1+1
      DECA=DECAY(I)/8760.
      XAMBEF=DECA+XAMBWE
      TERM1=WIRATE*CWAT(I)*TV*RW(I)*(1.0-EXP(-XAMBEF*TE))/(Y*XAMBEF)
      CSPO(I)=CSPOT(I)/FLOAT(NEXYR)
      IF(INSITE .EQ. 1)CSPO(I)=SOAVG(I)
      TERM2=CSPO(I)*B/PP
      COV=(TERM1+TERM2)*EXP(-DECA*TH)
```

```
      RETURN
      END
C
C
C
      SUBROUTINE IRRIGA(NN)
C
C
C
C***** CALCULATION OF RADIONUCLIDE CONCENTRATION IN VEGETABLE, MILK AND
C       CONSUMED BY MAN RESULTING FROM WATER IRRIGATION.  CALLED BY MAIN.
C
C
C
C
C
C     INPUT VARIABLES
C
C       NN     = NUCLIDE NUMBER
C       DECAY  = RADIOACTIVE DECAY CONSTANTE                          1/Y
C       XAMBWE = WEATHER DECAY CONSTANTE                              1/H
C       TW     = PERIOD OF TIME FOR WHICH SOIL IS EXPOSED TO THE
C                CONTAMINATED WATER                                   H
C       PP     = SURFACE DENSITY FOR SOIL                            KG/M**2
C       RW     = RETENTION FRACTION
C       BV     = CONCENTRATION FRACTION FOR UPTAKE OF RADIONUCLIDE
C                FROM SOIL BY VEGETATIVE PARTS OF CROPS
C       BR     = CONCENTRATION FRACTION FOR UPTAKE OF RADIONUCLIDE
C                FROM SOIL BY REPRODUCTIVE PARTS OF CROPS
C       FI     =FRACTION OF THE YEAR CROPS ARE IRRIGATED
C       WIRATE= IRRIGATION RATE                                       L/M**2-
C       CWAT   = RADIONUCLIDE CONCENTRATION IN WATER                  PCI/L
C       IOPT   = OPTIONS FOR SPECIAL RADIONUCLIDE H-3
C                IOPT = 1 IF H-3 IS NOT INCLUDED IN THIS RUN
C                IOPT = 2 IF H-3 IS INCLUDED
C       Y1     = AG PRODUCTIVITY FOR GRASS CONSUMED BY ANIMALS        KG/M**2
C       Y2     = AG PRODUCTIVITY FOR VEGETATION CONSUMED BY MAN       KG/M**2
C       TE1    = TIME PASTURE GRASS EXPOSED DURING GROWING SEASON     H
C       TE2    = TIME CROP/VEG EXPOSED DURING GROWING SEASON          H
C       TH1    = PERIOD DELAY BETWEEN HARVEST OF PASTURE GRASS
C                AND INGESTION BY ANIMALS                             H
C       TH2    = PERIOD DELAY BETWEEN HARVEST OF STORED FEED
C                AND INGESTION BY ANIMAL                              H
C       TH3    = PERIOD DELAY BETWEEN HARVEST OF LEAFY VEGETABLE
C                AND INGESTION BY MAN FOR M.I.E.                      H
C       TH4    = PERIOD DELAY BETWEEN HARVEST OF PRODUCE AND
C                INGESTION BY MAN FOR M.I.E.                          H
C       TH5    = PERIOD DELAY BETWEEN HARVEST OF LEAFY VEG
C                AND INGESTION BY MAN FOR G.P.E.                      H
C       TH6    = PERIOD DELAY BETWEEN HARVEST OF PRODUCE
C       TH5    = PERIOD DELAY BETWEEN HARVEST OF LEAFY VEG
C       FP     = FRACTION OF YEAR THAT ANIMAL GRAZE ON PASTURE
C       FS     = FRACTION OF DAILY FEED THAT IS FRESH GRASS WHEN
C                ANIMALS GRAZE ON PASTURE
C       FMC    = FRACTION OF THE COW'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH L OF MILK         D/L
C       FMG    = FRACTION OF THE GOAT'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH L OF MILK         D/L
C       QFC    = AMOUNT OF FEED CONSUMED BY CATTLE                    KG/D
C       QFG    = AMOUNT OF FEED CONSUMED BY GOATS                     KG/D
```

```
C       TF1    = TRANSPORT TIME OF RADIONUCLIDE FROM
C                FEED-MILK-RECEPTOR FOR M.I.E.                          H
C       TF2    = TRANSPORT TIME OF RADIONUCLIDE FROM
C                FEED-MILK-RECEPTOR FOR G.P.E.                          H
C       FF     = FRACTION OF THE ANIMAL'S DAILY INTAKE OF
C                RADIONUCLIDE WHICH APPEARS IN EACH KG OF FLESH         D/KG
C       TS     = TIME FROM SLAUGHTER OF MEAT TO CONSUMPTION             H
C       QCW    = AMOUNT OF WATER CONSUMED BY COW                        L/D
C       QGW    = AMOUNT OF WATER CONSUMED BY GOAT                       L/D
C       QBW    = AMOUNT OF WATER CONSUMED BY BEEF CATTLE                L/D
C
C     INTERMEDIATE VARIABLES
C
C       XAMBEF= EFFECTIVE DECAY CONSTANT
C       COPAST= RADIONUCLIDE CONCENTRATION IN PASTURE GRASS CONSUMED BY A
C       COPAST= RADIONUCLIDE CONCENTRATION IN STORED FEED CONSUMED BY ANI
C       COFEED= RADIONUCLIDE CONCENTRATION IN ANIMALS'S FEED
C
C     OUTPUT VARIABLES
C
C       COL1   = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED BY MAN
C                FOR M.I.E.                                             PCI/KG
C       COL2   = RADIONUCLIDE CONC IN LEAFY VEG CONSUMED BY MAN
C                FOR G.P.E.                                             PCI/KG
C       COP1   = RADIONUCLIDE CONC IN PROCUCE CONSUMED BY MAN
C                FOR M.I.E.                                             PCI/KG
C       COP2   = RADIONUCLIDE CONC IN PRODUCE CONSUMED BY MAN
C                FOR G.P.E.                                             PCI/KG
C       COCMI1= RADIONUCLIDE CONC IN COW'S MILK FOR M.I.E.             PCI/L
C       COCMI2= RADIONUCLIDE CONC IN COW'S MILK FOR G.P.E.             PCI/L
C       COGMI1= RADIONUCLIDE CONC IN GOAT'S MILK FOR M.I.E.            PCI/L
C       COGMI2= RADIONUCLIDE CONC IN GOAT'S MILK FOR G.P.E.            PCI/L
C       COMEAT= RADIONUCLIDE CONC IN BEEF CATTLE'S MEAT                PCI/KG
      DOUBLE PRECISION NUCLID,H3,C14
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &       PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &       IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),          RAE1085
     &       WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &       AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &       SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &       AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &       ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &       FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/IRRFOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &       ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &       QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &       CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &       CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &       COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &       COMEAT(40),QING(40),QINH(40),POP,
     &       CSP(40),CSPT(40),CSPO(40),CSPOT(40)
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &       PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &       INSITE
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
     &       SMASS,WMASS,WDEEP
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &            QCW,QGW,QBW,ABSH,PI4
      COMMON/PCV/SOCON(40)
```

```
      DATA H3,C14/8HH-3     ,8HC-14    /
C
      IF(NUCLID(NN) .EQ. H3)GO TO 200
      IF(NUCLID(NN) .EQ. C14) GO TO 300
      DECA=DECAY(NN)/8760.
      DECSL=SINEL/(0.15*(1.+BDENS/PORS*XKD(1,NN)))/8760.
      CSPO(NN)=(CSPO(NN)+CWAT(NN)*WIRATE*8760.*FI)*EXP(-(DECA+DECSL)
     &          *8760.)
      IF(INSITE .EQ. 1) CSPO(NN)=SOCON(NN)
      B=0.243*BV(NN)                                                    RAE0186
      TERM2=CSPO(NN)*B/PP                                               RAE0186
C      CALCULATION OF COPAST=RADIONUCLIDE CONCENTRATION IN PASTURE GRASS
C                              CONSUMED BY ANIMALS
      COPAST=COVA(NN,Y1,TE1,TH1,TERM2,1.)
C     CALCULATION OF COSTO = RADIONUCLIDE CONCENTRATION IN STORED FEED
C                              CONSUMED BY ANIMALS
      B=0.680*(0.378*BR(NN)+0.622*BV(NN))                               RAE0186
      TERM2=CSPO(NN)*B/PP                                               RAE0186
      COSTO=COVA(NN,Y1,TE1,TH2,TERM2,0.1)
C     CALCULATION OF COFEED = RADIONUCLIDE CONCENTRATION IN ANIMAL FEED
      COFEED=FP*FS*COPAST+(1.0-FP*FS)*COSTO
C
C***   CALCULATION OF COPLX = RADIONUCLIDE CONCENTRATION IN LEAFY
C      VEGETABLE CONSUMED BY MAN
      B=0.066*BV(NN)                                                    RAE0186
      TERM2=CSPO(NN)*B/PP                                               RAE0186
C***   1. FOR  MAXIMUM INDIVIDUAL EXPOSURE
      COL1(NN)=COVA(NN,Y2,TE2,TH3,TERM2,1.)
C
C***   2. FOR GENERAL POPULATION EXPOSURE
      COL2(NN)=COVA(NN,Y2,TE2,TH5,TERM2,1.)
C
C*** CALCULATION OF COPX = RADIONUCLIDE CONC IN PRODUCE CONSUMED
C                              BY MAN
C***   1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      B=0.187*BR(NN)                                                    RAE0186
      TERM2=CSPO(NN)*B/PP                                               RAE0186
      COP1(NN)=COVA(NN,Y2,TE2,TH4,TERM2,0.1)
C
C
C*** 2. FOR GENERAL POPULATION
      COP2(NN)=COVA(NN,Y2,TE2,TH6,TERM2,0.1)
      CWAT(NN)= WWATA*AQCON(NN)+SWATA*STCON(NN)
C***   CALCULATION OF COCMIX = RADIONUCLIDE CONCENTRATION IN COW'S MILK
C***   1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      COCMI1(NN)=FMC(NN)*(COFEED*QFC+CWAT(NN)*QCW)*EXP(-DECA*TF1)
C
C***   2. FOR GENERAL POPULATION
      COCMI2(NN)=FMC(NN)*(COFEED*QFC+CWAT(NN)*QCW)*EXP(-DECA*TF2)
C
C***   CALCULATION OF COGMIX = RADIONUCLIDE CONCENTRATION IN GOAT'S MILK
C***   1. FOR MAXIMUM INDIVIDUAL EXPOSURE
      COGMI1(NN)=FMG(NN)*(COFEED*QFG+CWAT(NN)*QGW)*EXP(-DECA*TF1)
C
C***   2. FOR GENERAL POPULATION
      COGMI2(NN)=FMG(NN)*(COFEED*QFG+CWAT(NN)*QGW)*EXP(-DECA*TF2)
C
C***   CALCULATION OF COMEAT = RADIONUCLIDE CONCENTRATION IN BEEF CATTLE
      COMEAT(NN)=FF(NN)*(COFEED*QFC+CWAT(NN)*QBW)*EXP(-DECA*TS)
      RETURN
```

```
C
C***  CALCULATION FOR SPECIAL RADIONUCLIDE: TRITIUM
C***  TRITIUM CONC. IN VEGETATION = TRITIUM CONC. IN ANIMAL FEED =
C***  TRITIUM CONC. IN WATER = CWAT(1)
C***  CALCULATION OF H-3 CONCENTRATION IN VEGETATION, MILK,
C***  AND MEAT CONSUMED BY MAN
  200 COL1(NN)=CWAT(NN)
      COL2(NN)=CWAT(NN)
      COP1(NN)=CWAT(NN)
      COP2(NN)=CWAT(NN)
      CWAT(NN)= WWATA*AQCON(NN)+SWATA*STCON(NN)
      COCMI1(NN)=FMC(NN)*CWAT(NN)*(QFC+QCW)
      COCMI2(NN)=COCMI1(NN)
      COGMI1(NN)=FMG(NN)*CWAT(NN)*(QFG+QGW)
      COGMI2(NN)=COGMI1(NN)
      COMEAT(NN)=FF(NN)*CWAT(NN)*(QFC+QCW)
      RETURN
  300 C014=0.
      COL1(NN)=C014
      COL2(NN)=C014
      COP1(NN)=C014
      COP2(NN)=C014
      CWAT(NN)= WWATA*AQCON(NN)+SWATA*STCON(NN)
      COCMI1(NN)=FMC(NN)*C014*(QFC+QCW)
      COCMI2(NN)=COCMI1(NN)
      COGMI1(NN)=FMG(NN)*C014*(QFG+QGW)
      COGMI2(NN)=COGMI1(NN)
      COMEAT(NN)=FF(NN)*C014*(QFC+QCW)
      RETURN
      END
C
C
C
      FUNCTION COVA(I,Y,TE,TH,TERM2,TV)
C
C
C***   CALCULATION OF RADIONUCLIDE CONCENTRATION IN FORAGE, PRODUCE AND
C       VEGETABLES.  CALLED BY IRRIGA.
C
C
      DOUBLE PRECISION NUCLID
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &       AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &       SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &       AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &       ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &       FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &            QCW,QGW,QBW,ABSH,P14
      DECA=DECAY(I)/8760.
      XAMBEF=DECA+XAMBWE
      TERM1=WIRATE*CWAT(I)*TV*RW(I)*(1.0-EXP(-XAMBEF*TE))/(Y*XAMBEF)
      COVA=(TERM1+TERM2)*EXP(-DECA*TH)
      RETURN
      END
C
C
C
      SUBROUTINE LEACH(NN,NYEAR,VOLB,VOLO,DMAX,CIOT,CFF,XDECN,
     & TINFL,PERMT)
```

```
C
C
C***
C***
C***
C***
C***
C*** THIS SUBROUTINE CALCULATES THE AMOUNT OF EACH RADIONUCLIDE
C*** THAT LEAVES FROM THE BOTTOM OF THE TRENCH TO THE AQUIFER
C*** AND THE AMOUNT THAT LEAVES AS A RESULT OF WATER OVERFLOWING THE
C*** TRENCH.  THIS SUBROUTINE IS CALLED BY MAIN.
C***
C*** THERE ARE FIVE METHODS THAT MAY BE USED TO CALCULATE THESE
C*** AMOUNTS.   THEY ARE GIVEN BY THE FOLLOWING VALUES OF
C*** LEAOPT:
C***          1 TOTAL CONTACT,CHEMICAL EXCHANGE
C***          2 IMMERSED FRACTION, CHEMICAL EXCHANGE
C***          3 TOTAL CONTACT, CHEMICAL SOLUBILITY
C***          4 IMMERSED FRACTION, CHEMICAL SOLUBILITY
C***          5 RELEASE FACTOR
C***
C
C   INPUT VARIABLES
C
C      NN      = NUCLIDE NUMBER
C      NYEAR   = CURRENT YEAR OF SIMULATION
C      TAREA   = AREA OF TRENCH
C      TDEPTH  = DEPTH OF TRENCH
C      PORT    = POROSITY OF TRENCH MATERIAL
C      RELFAC  = RELEASE FACTOR
C      LEAOPT  = LEACHING OPTION
C      SOL     = SOLUBILITY OF RADIONUCLIDE IN TRENCH
C      DENCON  = DENSITY OF WASTE
C      VOLO    = VOLUME OF WATER OVERFLOWING TRENCH
C      VOLB    = VOLUME OF WATER LEAVING BOTTOM OF TRENCH
C      NONCLD  = NUMBER OF NUCLIDES
C      TRAM    = AMOUNT OF NUCLIDE IN TRENCH
C      OLDWAT  = AMOUNT OF WATER IN TRENCH
C      DILFAC  = DILUTION FACTOR
C      DMAX    = MAXIMUM WATER DEPTH IN TRENCH
C      XKD     = CHEMICAL EXCHANGE COEFFICIENT
C
C   OUTPUT VARIABLES
C
C      POLB    = AMOUNT OF EACH NUCLIDE LEAVING BOTTOM OF TRENCH
C      POLO    = AMOUNT OF EACH NUCLIDE OVERFLOWING TRENCH
C
C   INTERMEDIATE VARIABLES
C
C      CCWAT   = CONCENTRATION OF NUCLIDE IN WATER
C      FWET    = WETTED OR IMMERSED FRACTION
C      POLOUT  = TOTAL AMOUNT OF NUCLIDE LEAVING TRENCH
C
C
      DOUBLE PRECISION NUCLID
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &       PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &       IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),
     &       WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
```

```
     &        SMASS,WMASS,WDEEP
      COMMON/TRCH/TAREA,TDEPTH,OVER,PORT,RELFAC,DENCON,OLDWAT,EN
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40),
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),RV(40),RR(40),DERATE(40),CWAT(40)
      DIMENSION CIOT(40),CINEWT(40)
      DATA LU6/6/
      IF(DMAX.LE.0.)CCWAT=0.
      IF(DMAX.LE.0.)GOTO 600
C---
C--- FOR OPTIONS 1 AND 3 ASSUME WETTED FRACTION
C--- TO BE TOTAL CONTACT AREA.
C---
      FWET=1.
      TCON=1.
      GO TO (200,100,400,300,500),LEAOPT
      WRITE(LU6,6000)
 6000 FORMAT(' ','*** ERROR *** - INVALID LEACHING PARAMETER')
      RETURN
C----
C---- FOR OPTION 2 USE IMMERSED FRACTION TO COMPUTE WETTED FRACTION.
C----
  100 FWET=DMAX/TDEPTH
      IF(FWET.GT.1.0)FWET=1.0
      TCON=TINFL/PERMT
      IF (TCON.GT.1.0) TCON = 1.0
      IF(FWET.GE.1.0)TCON=1.0
      FWAST=(DMAX-VOLB/(PORT*TAREA))/(TDEPTH-OVER)
      IF(FWAST.GT.1.0)FWAST=1.0
      IF(FWAST.GT.1.0)TCON=TCON*(1.-FWAST)+FWAST
      IF(TCON.GT.1.0)TCON=1.0
C----
C---- FOR OPTIONS 1 AND 2 COMPUTE CONCENTRATIONS USING
C---- CHEMICAL EXCHANGE.
C----
  200 CCWAT=TRAM(NN)*FWET*TCON/(TAREA*(DMAX*PORT+TDEPTH*FWET*
     & XKD(2,NN)*DENCON))
      TEMP=5.163E11*SOL(NN)*DECAY(NN)/ATMASS(NN)
      IF(CCWAT.GT.TEMP.AND.SOL(NN).NE.0.0)CCWAT=TEMP
      CCWAT=CCWAT*CFF
      GO TO 600
C----
C---- FOR OPTION 4 WETTED FRACTION IS THE IMMERSED FRACTION.
C----
  300 FWET=DMAX/TDEPTH
      IF(FWET.GT.1.0)FWET=1.0

C----
C---- FOR OPTIONS 3 AND 4 USE CHEMICAL SOLUBILITY
C----
  400 CCWAT=TRAM(NN)*FWET/(DMAX*TAREA*PORT)
      TEMP=5.163E11*SOL(NN)*DECAY(NN)/ATMASS(NN)
      IF(CCWAT.GT.TEMP)CCWAT=TEMP
      CCWAT=CCWAT*CFF
      GO TO 600
C----
C---- FOR OPTION 5 USE RELEASE FACTOR.
```

```
C----
C 500 POLOUT=RELFAC*TRAM(NN)
C     GO TO 610
  500 IF(DMAX.EQ.0.)GO TO 515
      CINEWT(NN)=CIOT(NN)+TRAM(NN)*RELFAC*CFF
      IF(DMAX.GT.TDEPTH)DMAX=TDEPTH
      CCWAT=CINEWT(NN)/(DMAX*PORT*TAREA+VOLB+VOLO+TAREA*DMAX*
     & XKD(2,NN)*DENCON)
      GO TO 525
  515 CINEWT(NN)=CIOT(NN)
      CCWAT=0.
  525 CIOT(NN)=CCWAT*DMAX*PORT*TAREA*XDECN
  600 POLOUT=(VOLB+VOLO)*CCWAT
C----
C---- DISTRIBUTE RADIONUCLIDE OUTPUT BETWEEN OVERFLOW AND SEEPAGE
C----
  610 VOLS=VOLB+VOLO
      IF(VOLS.NE.0.)GO TO 620
      POLB(NN)=0.0
      POLO(NN)=0.0
      RETURN
  620 POLB(NN)=POLOUT*VOLB/VOLS
      POLO(NN)=POLOUT*VOLO/VOLS
      RETURN
      END
C
      SUBROUTINE OUT(NYEAR,PC,WDEPTH,VOLO,VOLB)
C
C
C
C*** THIS ROUTINE OUTPUTS AN ANNUAL SUMMARY FOR YEARS
C*** REQUESTED BY USER INPUT.  OUT IS CALLED BY MAIN.
C***
C***
C***
C***
C
C
C    INPUT VARIABLES
C
C      NYEAR  = CURRENT YEAR OF SUMULATION
C      PC     = FRACTION OF TRENCH CAP THAT HAS FAILED
C      WDEPTH = MAXIMUM DEPTH OF WATER IN TRENCH
C
      DOUBLE PRECISION NUCLID
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &       PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &       IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),          RAE1085
     &       WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &       AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &       SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &       AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &       ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &       FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      DATA LU6/6/
      WRITE(LU6,6000)NYEAR
      PER=100.*PC
      WRITE(LU6,6005)PER
      WRITE(LU6,6010)WDEPTH
```

```
      WRITE(LU6,6015)VOLB,VOLO
      WRITE(LU6,6020)
      DO 10 I=1,NONCLD
      WRITE(LU6,6025)NUCLID(I),TRAM(I),POLO(I),POLB(I),
     &               AQAM(I,NYEAR)
   10 CONTINUE
      WRITE(LU6,6030)
      DO 20 I=1,NONCLD
      WRITE(LU6,6025)NUCLID(I),CS(I),CW(I),SSTREM(I),
     &               SDEEP(I),YSO(I),ATCON(I),AQCON(I)
   20 CONTINUE
      RETURN
 6000 FORMAT('1',20X,'ANNUAL SUMMARY FOR YEAR ',I5,' OF THE ',
     &       'SIMULATION')
 6005 FORMAT(////' ',10X,'THE TRENCH CAP HAS HAD ',F6.2,
     &       ' PER CENT FAILURE')
 6010 FORMAT(' ',10X,'THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH ',
     &       'DURING THE YEAR IS ',1PE10.2,' METERS')
 6015 FORMAT(' ',10X,1PE11.4,' CUBIC METERS OF WATER LEFT BOTTOM',
     &       ' OF TRENCH',/' ',10X,1PE11.4,' CUBIC METERS OF WATER',
     &       '  OVERFLOWED TRENCH')
 6020 FORMAT(/////' ',51X,'NUCLIDE TRANSPORT INFORMATION',
     &        ///' ',2X,'NUCLIDE',3X,'AMOUNT IN',6X,'TRENCH',
     &        7X,'TRENCH',5X,'AMOUNT AT',/' ',14X,'TRENCH',6X,
     &        'OVERFLOW',4X,' DRAINAGE ',5X,'WELL',
     &        /' ',16X,4('CI',11X))
 6025 FORMAT(' ',A8,3X,9(1PE11.4,2X))
 6030 FORMAT(////' ',2X,'NUCLIDE',5X,'SURFACE',5X,'SURFACE',
     &        4X,'SOLUBLE TO',3X,'SOLUBLE TO',3X,'ATMOSPHERE',
     &        3X,'ATMOSPHERE',3X,'WELL WATER',
     &        /' ',13X,'SOIL CONC',3X,'WATER CONC',4X,'STREAM',4X,
     &        'DEEP LAYERS',2X,'AT SPILLAGE',3X,'DOWN WIND',6X,'CONC',
     &      /' ',15X,'CI/KG',6X,'CI/M**3',9X,'CI',11X,
     &      'CI',3X,3(5X,'CI/M**3'))
      END
C
C
      SUBROUTINE SOURCE(NUCL,CFT1,DCFT,FGAM,IRST,PERMT,RTGR,SSAT,XRTM)
C
C*********************************************************************
C***
C*** THIS SUBROUTINE PERFORMS THE NECESSARY INPUTS TO INITIALIZE
C*** PARAMETERS AND VARIABLES.  SOURCE IS CALLED FROM MAIN.
C***
C***
C***
C***
      DOUBLE PRECISION NUCLID,NU,NC,DATE,DTIME
      COMMON/STREAM/DWS                                                 ISINEW
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &        PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &        IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),        RAE1085
     &        WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
     $        SMASS,WMASS,WDEEP
      COMMON/TRCH/TAREA,TDEPTH,OVER,PORT,RELFAC,DENCON,OLDWAT,FN
      COMMON/WATER/DTRAQ,DWELL,GWV,XLSAT,STFLOW,AQTHK,AQDISP,
     & PORA,PORV,PERMV,IAQSTF,CPRJ
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
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     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &        PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &        INSITE
      COMMON/AIR/H,VG,U,IT,IS,VD,XG,HLID,ROUGH,FTWIND,CHIQ,RE1,RE2,RE3
      COMMON/IRREOO/Y1,Y2,TE1,TE2,TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,
     &        ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,
     &        QFC,QFG,TF1,TF2,TS,CL1(40),CL2(40),CP1(40),CP2(40),
     &        CCMI1(40),CCMI2(40),CGMI1(40),CGMI2(40),
     &        CMEAT(40),COL1(40),COL2(40),COP1(40),COP2(40),
     &        COCMI1(40),COCMI2(40),COGMI1(40),COGMI2(40),
     &        COMEAT(40),QING(40),QINH(40),POP,
     &        CSP(40),CSPI(40),CSPO(40),CSPOT(40)
      COMMON/FUNC/XAMBWE,TA,TW,FI,PP,WIRATE,
     &            QCW,QGW,QBW,ABSH,PI4
      DIMENSION MONTH(12),DAT(20),NUCL(40,8)
      DATA LU5/5/,LU6/6/,LU26/26/
C      DATA MONTH/'JAN','FEB','MAR','APR','MAY','JUN','JUL','AUG',
C     &           'SEP','OCT','NOV','DEC'/
      WRITE(LU6,2010)
    5 READ(LU5,3000,END=7)DAT
      WRITE(LU26,3000)DAT
      WRITE(LU6,2005)DAT
      GO TO 5
    7 REWIND LU26
C-----
C----- CONTROL INFORMATION.
C-----
      READ(LU26,3000)TITLE
      READ(LU26,3000)LOCATE
      READ(LU26,3010)MAXYR,NONCLD,LEAOPT,NYR1,NYR2,IOPVWV,IOPSAT,
     &               IPRT1,IPRT2,IDELT,IRRES1,IRRES2,LIND,IAVG1,IAVG2
      READ(LU26,3010)IVAP,IBSMT,IAQSTF,IXTS,IRST,(INTYR(I),I=1,3)        RAE1085
      READ(LU26,3005)PCT1,PCT2,WWATL,WWATA,WWATH,SWATL,SWATA,SWATH
      IF(IAVG1 .LE. 0)IAVG1=1
      IF(IAVG2 .GT. MAXYR)IAVG2=MAXYR
      IF(IAVG1 .GT. IAVG2)IAVG1=1
      IF(IAVG1 .GT. IAVG2)IAVG2=MAXYR
C
C     SORT INTYR ARRAY IN ASCENDING ORDER
C
      DO 20 I=1,3                                                        RAE1085
      J=INTYR(I)                                                         RAE1085
      IF(J.LE.0 .OR. J.EQ.MAXYR) INTYR(I)=MAXYR+1                        RAE1085
   20 CONTINUE                                                           RAE1085
      DO 30 K=1,2                                                        RAE1085
      J=K                                                                RAE1085
      J1=J+1                                                             RAE1085
        DO 25 I=J1,3                                                     RAE1085
        IF(INTYR(I) .LT. INTYR(J)) J=1                                   RAE1085
   25   CONTINUE                                                         RAE1085
      IF(J .EQ. K) GO TO 30                                              RAE1085
      I=INTYR(K)                                                         RAE1085
      INTYR(K)=INTYR(J)                                                  RAE1085
      INTYR(J)=I                                                         RAE1085
   30 CONTINUE                                                           RAE1085
C-----
```

```
      WRITE(LU6,6000)
C---- ITIME IS PART OF THE SYSTEM LIBRARY.  IT RETURNS THE CURRENT
C---- WALL TIME, ELAPSED TIME, AND DATE.
C----
C     CALL ITIME(ICLOCK,IDIFF,DATE,IDAT)
C     CLOCK=FLOAT(ICLOCK)/360000.
C     WRITE(LU6,6002)CLOCK,DATE
C      CALL CTIME(DATE,DTIME)
C      WRITE(LU6,6002) DTIME,DATE
      WRITE(LU6,6005)TITLE
      WRITE(LU6,6008)
      WRITE(LU6,6010)LOCATE
      IF(NONCLD .GE. 1 .AND. NONCLD .LE. 40) GO TO 10
      WRITE(LU6,6015)
      STOP
   10 CONTINUE
      WRITE(LU6,6020)MAXYR,NONCLD
      WRITE(LU6,6025)LEAOPT
      IF(NYR1 .LT. NYR2)WRITE(LU6,6030)NYR1,PCT1,PCT2,NYR2
      IF(IOPVWV .EQ. 1)WRITE(LU6,6035)
      IF(IOPVWV .EQ. 0)WRITE(LU6,6040)
      IF(IOPSAT .EQ. 1)WRITE(LU6,6045)
      IF(IOPSAT .EQ. 0)WRITE(LU6,6050)
      WRITE(LU6,6060)LIND
      IF(LIND .EQ. 0)WRITE(LU6,6064)
      IF(LIND .NE. 0)WRITE(LU6,6066)
      WRITE(LU6,6072)WWATL,WWATA,WWATH
      WRITE(LU6,6074)SWATL,SWATA,SWATH
      IF(IBSMT .GT. 0)WRITE(LU6,6088)IBSMT
C-----
C----- COMMENTS
C-----
      READ(LU26,3000)
      READ(LU26,3000)
      READ(LU26,3000)
      READ(LU26,3000)
      READ(LU26,3000)
      READ(LU26,3000)
      READ(LU26,3000)
C-----
C-----
C----- TRENCH INFORMATION
C-----
      READ(LU26,3005)TAREA,TDEPTH,OVER,PORT,DENCON,RELFAC,
     & CPRJ,SINFL
      READ(LU26,3005) SSAT,RESAT
      WRITE(LU6,6200)
      WRITE(LU6,6205)TAREA,TDEPTH
      WRITE(LU6,6210)PORT
      WRITE(LU6,6215)SINFL
      READ(LU26,3005) PERMT,FACTIM,TMN,CFT1,DCFT,FGAM
C-----
C----- AQUIFER INFORMATION
C-----
      READ(LU26,3006)DTRAQ,DWS,DWELL,GWV,AQTHK,AQDISP,PORA,PORV,PERMV   ISICHG
      WRITE(LU6,6300)
      WRITE(LU6,6305)GWV
      WRITE(LU6,6310)DTRAQ
      WRITE(LU6,6315)DWELL
      WRITE(LU6,6316) DWS                                               ISINEW
```

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      WRITE(LU6,6320)AQTHK,AQDISP
      WRITE(LU6,6325)PORA,PORV,PERMV
C-----
C----- ATMOSPHERIC INFORMATION
C-----
      READ(LU26,3005)H,VG,U,VD,XG,HLID,ROUGH
      READ(LU26,3005)FTWIND,CHIQ,RE1,RE2,RE3,RR,FTMECH
      READ(LU26,3010)IT,IS
C-----
      WRITE(LU6,6400)
      WRITE(LU6,6405)H
      WRITE(LU6,6410)VG
      WRITE(LU6,6415)U
      WRITE(LU6,6420)VD
      WRITE(LU6,6425)XG
      WRITE(LU6,6435)HLID
      WRITE(LU6,6440)ROUGH
      WRITE(LU6,6445)IT,IS
      WRITE(LU6,6450)FTWIND
      IF(CHIQ .LT. 0.0)WRITE(LU6,6470)
      IF(CHIQ .GE. 1.0E-10)WRITE(LU6,6460)CHIQ
      WRITE(LU6,6480)RE1,RE2,RE3
      WRITE(LU6,6055)IRRES1,IRRES2,RR,FTMECH
C-----
C----- SURFACE INFORMATION
C-----
      READ(LU26,3005)RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR
      READ(LU26,3005)PORS,BDENS,STFLOW,EXTENT,ADEPTH
      READ(LU26,3005)PD,RUNOFF
C-----
      WRITE(LU6,6500)
      WRITE(LU6,6505)RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR
      WRITE(LU6,6510)PORS,BDENS
      WRITE(LU6,6515)RUNOFF
      WRITE(LU6,6520)STFLOW,EXTENT,ADEPTH,PD
C-----
C----- AIR-FOODCHAIN INFORMATION
C-----
      WRITE(LU6,7800)
      READ(LU26,3005)Y1,Y2,PP,XAMBWE,TA,TE1,TE2
      READ(LU26,3005)TH1,TH2,TH3,TH4,TH5,TH6,FP,FS
      READ(LU26,3005)QFC,QFG,TF1,TF2,TS,ABSH,P14
      READ(LU26,3005) XRTM,RTGR
      WRITE(LU6,7805)Y1,Y2,PP,XAMBWE,TE1,TE2
      WRITE(LU6,7815)TH1,TH2,TH3,TH4,TH5,TH6,FP,FS,QFC
      WRITE(LU6,7825)QFG,TF1,TF2,TS,ABSH,P14
C-----
C----- WATER-FOODCHAIN INFORMATION
C-----
      WRITE(LU6,7900)
      READ(LU26,3005)TW,FI,WIRATE,QCW,QGW,QBW
      WRITE(LU6,7905)FI,WIRATE,QCW,QGW,QBW
C-----
C----- HUMAN INGESTION AND INHALATION INFORMATION
C-----
      READ(LU26,3005)ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,POP
      WRITE(LU6,6905)
      WRITE(LU6,6910)ULEAFY,UPROD,UCMILK,UGMILK,UMEAT,UWAT,UAIR,POP
C-----
C----- NUCLIDE INFORMATION
```

```
C-----
      WRITE(LU6,7000)
      SMASS=1000.*BDENS*EXTENT*PD*ADEPTH
      WMASS=1000.*PORS*EXTENT*PD*ADEPTH
      WDEEP=SINFL*EXTENT*PD
      DO 40 I=1,NONCLD
      READ(LU26,3012)NUCLID(I),(NUCL(I,K),K=1,8),TRAM(I),
     &               SOAM(I),STAM(I),ATAM(I),DECAY(I),SOL(I),CON(I)
      READ(LU26,3015)NU,(XKD(K,I),K=1,4)
      READ(LU26,3015)NC,RA(I),RW(I),BV(I),BR(I),FMC(I),FMG(I),FF(I)
      D1R=DECAY(I)
      FNCL=(EXP(D1R)-1.0)/D1R
      IF(FACTIM .GT. 0.) FNCL=FNCL*(1.-EXP(-D1R*FACTIM))/(D1R*FACTIM)
      IF(D1R.LT.0.01) FNCL = 1.0
      TRAM(I)=TRAM(I)*FNCL*EXP(-D1R*TMN)
      SOAM(I)=SOAM(I)*TRAM(I)
      CW(I)=1000.*SOAM(I)/(XKD(1,I)*SMASS+WMASS)
      CS(I)=CW(I)*XKD(1,I)*1.0E-3
      WRITE(LU6,7005)NUCLID(I),TRAM(I),SOAM(I),STAM(I),ATAM(I),
     &               DECAY(I),SOL(I),FNCL
   40 CONTINUE
      WRITE(LU6,7010)
      DO 50 I=1,NONCLD
      WRITE(LU6,7807)NUCLID(I),(XKD(K,I),K=1,4)
   50 CONTINUE
      WRITE(LU6,7806)
      DO 70 I=1,NONCLD
      WRITE(LU6,7807)NUCLID(I),RA(I),RW(I),BV(I),BR(I),FMC(1),
     1               FMG(I),FF(I)
   70 CONTINUE
      RETURN
 2005 FORMAT(' ',20A4)
 2010 FORMAT('1',5X,'** INPUT DATA AS READ IN **',//)
 3000 FORMAT(20A4)
 3005 FORMAT(8F10.0)
 3006 FORMAT(2F5.0,7F10.0)                                              ISINEW
 3010 FORMAT(16I5)
 3012 FORMAT(A8,I1,8A1,2X,7F10.0)
 3015 FORMAT(A8,2X,7F10.0)
 6000 FORMAT('1',30X,'PRESTO - A MODEL FOR PREDICTING THE',
     &       ' MIGRATION OF RADIOACTIVE WASTES',
     &       /' ',40X,'FROM SHALLOW TRENCH BURIAL SITES')
C6002 FORMAT('0',40X,'THIS RUN WAS MADE AT ',F6.3,' ON ',A8)
 6002 FORMAT('0',40X,'THIS RUN WAS MADE AT ',A8,' ON ',A8)
 6005 FORMAT('0',2(/' ',20X,20A4))
 6008 FORMAT(///' ',5X,'***CONTROL INFORMATION ***')
 6010 FORMAT('0',10X,'THE BURIAL SITE IS LOCATED AT ',12A4)
 6015 FORMAT('0','*** ERROR :***  INVALID NUMBER OF NUCLIDES')
 6020 FORMAT(' ',10X,'THE SIMULATION WILL RUN FOR',I5,' YEARS AND',
     &       ' WILL INCLUDE',I3,' NUCLIDES')
 6025 FORMAT(' ',10X,'LEACHING OPTION NUMBER',I2,' WILL BE USED')
 6030 FORMAT(' ',10X,'IN YEAR',I4,' ',F4.2,' OF THE CAP WILL BE',
     &       ' ASSUMED TO FAIL',/' ',15X,'THIS WILL CONTINUE',
     &       ' UNTIL ',F4.2,' HAS FAILED IN YEAR ',I4,
     &       /' ',10X,'CAP MAY ALSO FAIL BY SURFACE EROSION')
 6035 FORMAT(' ',10X,'VERTICAL WATER VELOCITY WILL BE CALCULATED',
     &       ' USING INFILTRATION AND POROSITY')
 6040 FORMAT(' ',10X,'PERMEABILITY WILL BE USED FOR MINIMUM',
     &       ' VERTICAL WATER VELOCITY')
 6045 FORMAT(' ',10X,'LENGTH OF VERTICAL SATURATED ZONE WILL BE',
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    &        ' CALCULATED USING INFILTRATION AND POROSITY')
6050 FORMAT(' ',10X,'LENGTH OF VERTICAL SATURATED ZONE WILL BE',
    &        ' SET TO THE TRENCH TO AQUIFER DISTANCE')
6055 FORMAT(' ',10X,'FROM YEAR ',I4,' TO YEAR ',I4,
    &        ' THE RESUSPENSION RATE DUE TO MECHANICAL DISTURBANCES',
    &        ' WILL BE ',1PE11.4,/' ',15X,'THIS WILL OCCUR DURING ',
    &        F5.2,' OF EACH YEAR')
6060 FORMAT(' ',10X,'POPULATION INDICATOR IS ',I2)
6064 FORMAT(' ',15X,'MAXIMUM INDIVIDUAL EXPOSURE WILL BE USED',
    &        ' TO CALCULATE HEALTH EFFECTS')
6066 FORMAT(' ',15X,'GENERAL POPULATION EXPOSURE WILL BE USED',
    &        ' TO CALCULATE HEALTH EFFECTS')
6070 FORMAT(' ',10X,'THE POPULATION WILL BE EXPOSED TO CONTAMINATED ',
    & 'MATERIALS FROM YEAR ',I3,' TO ',I4)
6072 FORMAT(' ',10X,F6.3,' OF IRRIGATION WATER WILL BE GOTTEN FROM ',
    &                    'WELL',
    &       /' ',10X,F6.3,' OF DRINKING WATER FOR ANIMALS WILL BE',
    &                    ' GOTTEN FROM WELL',
    &       /' ',10X,F6.3,' OF DRINKING WATER FOR HUMANS WILL',
    &        ' BE GOTTEN FROM WELL')
6074 FORMAT(' ',10X,F6.3,' OF IRRIGATION WATER WILL BE GOTTEN FROM ',
    &                    'STREAM',
    &       /' ',10X,F6.3,' OF DRINKING WATER FOR ANIMALS WILL BE ',
    &        'GOTTEN FROM STREAM',
    &       /' ',10X,F6.3,' OF DRINKING WATER FOR HUMANS WILL',
    &        ' BE GOTTEN FROM STREAM')
6088 FORMAT(' ',10X,'BEGINNING IN YEAR ',14,', PEOPLE WILL LIVE ',
    &        'IN THE BASEMENT')
6200 FORMAT('1',5X,'*** TRENCH INFORMATION ***')
6205 FORMAT(//' ',10X,'THE TRENCH HAS AN AREA OF ',
    &        E11.4,' SQUARE METERS AND A DEPTH OF ',
    &        E11.4,' METERS')
6210 FORMAT(' ',10X,'TRENCH POROSITY IS ',F8.2)
6215 FORMAT(' ',10X,'ANNUAL INFILTRATION FOR THE WATERSHED IS',
    &        F7.4,' METERS')
6300 FORMAT(//' ',5X,'*** AQUIFER INFORMATION ***')
6305 FORMAT(//' ',10X,'THE GROUND WATER HAS A VELOCITY OF ',F10.3,
    &                ' METERS PER YEAR')
6310 FORMAT(' ',10X,'TRENCH TO AQUIFER DISTANCE IS ',F6.1,' METERS')
6315 FORMAT(' ',10X,'TRENCH TO WELL DISTANCE IS ',F8.2,' METERS')
6316 FORMAT(' ',10X,'WELL TO STREAM DISTANCE IS',F8.2,'METERS')        ISINEW
6320 FORMAT(' ',10X,'THE AQUIFER THICKNESS IS ',F8.2,' METERS',
    &       /' ',10X,'THE AQUIFER DISPERSION ANGLE IS ',F8.4,' RADIANS')
6325 FORMAT(' ',10X,'POROSITY OF THE AQUIFER REGION IS ',F8.5,
    &       /' ',10X,'POROSITY BENEATH THE TRENCH IS ',F8.5,
    &       /' ',10X,'PERMEABILITY BENEATH THE TRENCH IS ',F8.3,
    &                ' METERS/YEAR')
6400 FORMAT(//'1',5X,'*** ATMOSPHERIC INFORMATION ***')
6405 FORMAT(//' ',10X,'SOURCE HEIGHT IS ',F6.1,' METERS')
6410 FORMAT(' ',10X,'VELOCITY OF GRAVITATION FALL IS ',
    &        F6.2,' METERS/SECOND')
6425 FORMAT(' ',10X,'GAUGE DISTANCE FROM SOURCE IS ',F8.2,' METERS')
6420 FORMAT(' ',10X,'DEPOSITION VELOCITY IS ',F6.2,' METERS/SECOND')
6415 FORMAT(' ',10X,'WIND VELOCITY IS ',F6.2,' METERS/SECOND')
6435 FORMAT(' ',10X,'LID HEIGHT IS ',F8.2,' METERS')
6440 FORMAT(' ',10X,'HOSKER ROUGHNESS FACTOR IS ',F6.2)
6445 FORMAT(' ',10X,'TYPE OF STABILITY FORMULATION IS ',I2,
    &       /' ',10X,'STABILITY CLASS IS ',I2)
6450 FORMAT(' ',10X,'FRACTION OF TIME WIND BLOWS TOWARD POPULATION IS',
    &        F10.6)
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6460 FORMAT(' ',10X,'NORMALIZED DOWN WIND ATMOSPHERIC EXPOSURE PER ',
    & 'UNIT SOURCE AREA IS ',1PE11.4,' CI/M**3 PER CI/SEC')
6470 FORMAT(' ',10X,'NORMALIZED DOWN WIND ATMOSPHERIC EXPOSURE PER  ',
    & 'UNIT SOURCE AREA WILL BE CALCULATED INTERNALLY')
6480 FORMAT(' ',10X,'RESUSPENSION FACTOR PARAMETERS ',3(5X,E11.4))
6500 FORMAT(///' ',5X,'*** SURFACE INFORMATION ***')
6505 FORMAT(///' ',10X,'PARAMETERS FOR UNIVERSAL LOSS EQUATION',
    &       /' ',15X,'RAINFALL        ',F8.2,
    &       /' ',15X,'ERODIBILITY     ',F8.2,
    &       /' ',15X,'STEEPNESS-SLOPE',F8.2,
    &       /' ',15X,'COVER           ',F8.2,
    &       /' ',15X,'EROSION CONTROL',F8.2,
    &       /' ',15X,'DELIVERY RATIO ',F8.2)
6510 FORMAT(' ',10X,'SOIL POROSITY IS ',F8.5,
    &       /' ',10X,'SOIL BULK DENSITY IS ',F8.5,' G/CC')
6515 FORMAT(' ',10X,'RUNOFF FRACTION IS ',F8.5)
6520 FORMAT(/' ',10X,
    &     10X,'STREAM FLOW RATE IS ',1PE11.4,' CUBIC METERS PER YEAR',
    &     /' ',10X,'CROSS SLOPE EXTENT OF SPILLAGE IS ',0PF8.2,' METERS'
    &       /' ',10X,'ACTIVE SOIL DEPTH IS ',F8.2,' METERS',
    &       /' ',10X,'AVERAGE DOWN SLOPE DISTANCE TO STREAM IS ',F8.2,
    &                ' METERS')
7800 FORMAT('1',5X,'*** AIR-FOODCHAIN INFORMATION ***')
7805 FORMAT(/' ',10X,'AGRICULTURAL PRODUCTIVITY FOR GRASS',F10.2,
    & ' KG/M**2',
    &       /' ',10X,'AGRICULTURAL PRODUCTIVITY FOR VEGETATION',
    &                F10.2,' KG/M**2',
    &       /' ',10X,'SURFACE DENSITY FOR SOIL ',F10.2,' KG/M**2',
    &       /' ',10X,'WEATHER DECAY CONSTANT',F10.2,' 1/HOURS',
    &       /' ',10X,'PERIOD PASTURE GRASS EXPOSURE GROWING SEASON',
    &                F10.2,' HOURS',
    &       /' ',10X,'PERIOD CROP/VEGETATION EXPOSURE GROWING SEASON',
    &                F10.2,' HOURS')
7815 FORMAT(' ',10X,'PERIOD BETWEEN HARVEST PASTURE GRASS AND',
    &                ' INGESTION BY ANIMAL',F10.2,' HOURS',
    &       /' ',10X,'PERIOD BETWEEN STORED FEED AND INGESTION',
    &                ' BY ANIMAL',F10.2,' HOURS',
    &       /' ',10X,'PERIOD BETWEEN HARVEST LEAFY VEGETABLES AND',
    &                ' INGESTION BY MAN(M.I.E.)',F10.2,' HOURS',
    &       /' ',10X,'PERIOD BETWEEN HARVEST PRODUCE AND INGESTION BY',
    &                ' MAN(M.I.E.)',F10.2,' HOURS',
    &       /' ',10X,'PERIOD BETWEEN HARVEST LEAFY VEG ',
    &                'AND INGESTION BY MAN(G.P.E.)',F10.2,' HOURS',
    &       /' ',10X,'PERIOD BETWEEN HARVEST PRODUCE',
    &                ' AND INGESTION BY MAN(G.P.E.)',F10.2,' HOURS',
    &       /' ',10X,'FRACTION OF YEAR ANIMALS GRAZE ON PASTURE',F10.2
    &       /' ',10X,'FRACTION OF DAILY FEED THAT IS FRESH GRASS',F10.2,
    &       /' ',10X,'AMOUNT OF FEED CONSUMED BY CATTLE',F10.2,' KG')
7825 FORMAT(' ',10X,'AMOUNT OF FEED CONSUMED BY GOATS',F10.2,' KG',
    &       /' ',10X,'TRANSPORT TIME FEED-MILL-RECEPTOR FOR M.I.E.',
    &                F10.2,' HOURS',
    &       /' ',10X,'TRANSPORT TIME FEED-MILL-RECEPTOR FOR G.P.E.',
    &                F10.2,' HOURS',
    &       /' ',10X,'TIME FROM SLAUGHTER OF MEAT TO CONSUMPTION',F10.2,
    &       ' HOURS',
    &       /' ',10X,'ABSOLUTE HUMIDITY OF THE ATMOSPHERE',F10.2,
    &       ' G/M**3',
    &       /' ',10X,'FRACTIONAL EQUILIBRIUM RATIO FOR C-14',F10.2)
7900 FORMAT('1',5X,'*** WATER-FOODCHAIN INFORMATION ***')
7905 FORMAT(///' ',10X,'FRACTION OF YEAR CROPS ARE IRRIGATED',F10.2,
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     &       /' ',10X,'IRRIGATION RATE ',F10.3,' L/(M**2-H)',
     &       /' ',10X,'AMOUNT OF WATER CONSUMED BY COWS ',F10.2,' L/D',
     &       /' ',10X,'AMOUNT OF WATER CONSUMED BY GOATS ',F10.2,' L/D',
     &       /' ',10X,'AMOUNT OF WATER CONSUMED BY BEEF CATTLE ',F10.2,
     &       ' L/D')
 6905 FORMAT(///' ',5X,'*** HUMAN INGESTION AND INHALATION RATE',
     &       ' INFORMATION ***')
 6910 FORMAT(/' ',10X,'ANNUAL INTAKE OF LEAFY VEG ',F8.2,
     &       ' KILOGRAMS PER YEAR',
     &       /' ',10X,'ANNUAL INTAKE OF PRODUCE ',F8.2,
     &       ' KILOGRAMS PER YEAR',
     &       /' ',10X,'ANNUAL INTAKE OF COW''S MILK ',F8.2,
     &       ' LITERS PER YEAR',
     &       /' ',10X,'ANNUAL INTAKE OF GOAT''S MILK',F8.2,
     &       ' LITERS PER YEAR',
     &       /' ',10X,'ANNUAL INTAKE OF MEAT ',F8.2,' KILOGRAMS PER YEAR'
     &       /' ',10X,'ANNUAL INTAKE OF DRINKING WATER',F8.2,
     &       ' LITERS PER YEAR',
     &       /' ',10X,'ANNUAL INHALATION RATE OF AIR ',F8.2,
     &       ' CUBIC METERS PER YEAR',/' ',10X,'A POPULATION OF ',
     &       F10.0,' WILL BE CONSIDERED')
 7005 FORMAT(' ',A8,3X,9(1PE11.4,2X))
 7000 FORMAT('1',5X,'*** NUCLIDE INFORMATION ***',
     & //' ',50X,'INFORMATION ON INDIVIDUAL NUCLIDES',
     & //' ','NUCLIDE',3X,'AMT IN TRENCH',3X,'SPILLAGE',4X,
     & 'STREAM AMT ',2X,'AIR CONCEN',2X,'DECAY CONST',
     & 2X,'SOLUBILITY CONST',2X,'DECAY CORRECTION FACTOR',
     & /' ',3X,3(12X,'CI'),8X,'CI/M**3',7X,'1/Y',11X,'G/ML')
 7010 FORMAT(////' ',25X,'DISTRIBUTION COEFFICIENTS ML/G',
     & //' ','NUCLIDE',6X,'SURFACE',6X,'TRENCH',6X,'VERTICAL',
     & 5X,'AQUIFER'/)
 7807 FORMAT(' ',A8,1X,9(1PE11.2,2X))
 7806 FORMAT(///' ','NUCLIDE',4X,'RETENTION',4X,'RETENTION',
     &       4X,5('TRANS COEFF',2X),/' ',12X,'IN AIR',6X,'IN WATER',
     &       5X,'SOIL-V CROP',2X,'SOIL-R CROP',2X,'VEG-COW MILK',
     &       2X,'VEG-GOAT MILK',2X,'VEG-MEAT',/' ',40X,2('D/KG',9X),
     &       2('D/L ',9X),'D/KG')
      END
C
C
C
      SUBROUTINE SURSOL(11,NYEAR,VOLO)
C
C
C----- CALCULATES THE AMOUNT OF SOLUBLE SURFACE CONTAMINANT THAT
C----- ENTERS THE STREAM AND TRENCH ANNUALLY.
C----- SURSOL IS CALLED BY MAIN.
C
C
C
C
C
C
C
C   INPUT VARIABLES
C
C      ADEPTH = SOIL DEPTH OF ACTIVE EXCHANGE
C      XINFL  = AVERAGE ANNUAL INFILTRATION
C      RUNOFF = FRACTION OF NET INPUT GOING TO STREAM
C      PD     = DOWNSLOPE DISTANCE TO STREAM
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C       BDENS  = BULK DENSITY OF SOIL
C       EXTENT = CROSS SLOPE EXTENT OF SPILLAGE
C       SOAM   = AMOUNT OF SPILLAGE
C       XKD    = CHEMICAL EXCHANGE COEFFICIENT
C
C
C    INTERMEDIATE VARIABLES
C
C       SMASS  = SOIL MASS
C       WMASS  = WATER MASS
C
C
C    OUTPUT VARIABLES
C
C       SSTREM = AMOUNT OF NUCLIDE GOING TO STREAM
C       SDEEP  = AMOUNT OF NUCLIDE GOING TO TRENCH
C       CW     = NUCLIDE CONCENTRATION IN WATER
C       CS     = NUCLIDE CONCENTRATION IN SURFACE SOIL
C
C
      DOUBLE PRECISION NUCLID
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
     $       SMASS,WMASS,WDEEP
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &       AQAM(40,1000),STAM(40),POLO(40),POLR(40),CS(40),CW(40),
     &       SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &       AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &       ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &       FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &       PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &       INSITE
C
C
      WSTREM=RUNOFF*(PPN*EXTENT*PD+VOLO)
      SOAM=CS(II)*SMASS+CW(II)*WMASS/1.0E3
      WMASS2=1000.*(PORS*EXTENT*PD*ADEPTH+WDEEP+WSTREM)
C-----
C----- COMPUTE NUCLIDE CONCENTRATION PER CUBIC METER OF WATER
C-----
      CW(1I)=1000.*SOAM/(XKD(1,II)*SMASS+WMASS2)
C-----
C----- COMPUTE NUCLIDE CONCENTRATION PER KG OF SOIL
C-----
      CS(1I)=CW(1I)*XKD(1,II)*1.0E-3
      SSTREM(II)=WSTREM*CW(II)
      SDEEP(II)=WDEEP*CW(II)
      RETURN
      END
C
C
C
      SUBROUTINE SUSPND(1YR,II,GNDCON)
C
C
C*** COMPUTES AIR CONCENTRATION AND ATMOSPHERIC SOURCE TERM
C*** AT SPILLAGE AREA.  CALLED ANNUALLY BY MAIN.
C***
C***
C***
```

```
C
C
C
C   INPUT VARIABLES
C
C      IYR    = CURRENT YEAR OF SIMULATION
C      II     = CURRENT NUCLIDE
C      SAREA  = AREA COVERED BY SPILLAGE
C      GNDCON= GROUND CONCENTRATION
C      IRRES1= FIRST YEAR OF RESUSPENSION RATE
C      IRRES2= LAST YEAR OF RESUSPENSION RATE
C      RR     = RESUSPENSION RATE
C      FTMECH=FRACTION OF YEAR FOR MECHANICAL DISTURBANCE
C      U      = WIND VELOCITY
C
C
C
C   INTERMEDIATE VARIABLES
C
C      RE     = RESUSPENSION FACTOR
C      YSO1   = NORMAL CONTRIBUTION TO ATMOSPHERIC SOURCE
C      YSO2   = CONTRIBUTION TO ATMOSPHERIC SOURCE FROM MECHANICAL
C               DISTURBANCE
C
C
C   OUTPUT VARIABLES
C
C      AIRCON= AIR CONCENTRATION AT SPILLAGE AREA
C      YSO    = ATMOSPHERIC SOURCE AMOUNT AT SPILLAGE AREA
C
C
C-----
C----- ASSUME ALL RADIONUCLIDES DEPOSITED ON SOIL SURFACE AT
C----- TIME ZERO.
C-----
C
      DOUBLE PRECISION NUCLID
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &       PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &       IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),          RAE1085
     &       WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &       AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &       SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &       AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &       ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &       FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &       PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &       INSITE
      COMMON/AIR/H,VG,U,IT,IS,VD,XG,HLID,ROUGH,FTWIND,CHIQ,RE1,RE2,RE3
       COMMON/EXP/ ARG,RES(10000)                                         ISIXPR
C      T=FLOAT(IYR)*365.                                                  ISIXPR
C-----
      IF(INSITE .EQ. 1 .AND. IRRES1 .LT. IYR) GO TO 11
C-----
C----- RESUSPENSION FACTOR BY ANSPAUGH ET AL
C-----
C      RE=RE1*EXP(RE2*SQRT(T))+RE3                                        ISIXPR
C      AIRCON(II)=RE*GNDCON                                               ISIXPR
```

```
      AIRCON(II)=RES(IYR)*GNDCON                                        ISIXPR
      IF(IYR .EQ. 1) AIRCON(II)=AIRCON(II)+ATAM(II)
      HD=1.0
C      F=SQRT(PD*EXTENT)*VG/U/HD                                        ISIXPR
      F=ARG*VG/U/HD                                                     ISIXPR
      IF(F .GT. 1.) F=1.0
C      YSO1=AIRCON(II)*HD*U*SQRT(PD*EXTENT)*F                           ISIXPR
      YSO1=AIRCON(II)*HD*U*ARG*F                                        ISIXPR
C-----
C----- THE FOLLOWING IS FOR RESUSPENSION DUE TO MECHANICAL
C----- DISTURBANCES
C-----
      YSO2=0.
      IF((IYR .GE. IRRES1) .AND. (IYR .LE. IRRES2))
     &      YSO2=PD*EXTENT*GNDCON*RR*FTMECH
C-----
      YSO(II)=(YSO1+YSO2)
C     IF(YSO(II) .GT. ONAM(II))YSO(II)=ONAM(II)
      RETURN
   11 YSO(II)=GNDCON*RR*FTMECH*.001
      RETURN
      END
C
C
C
C
      SUBROUTINE TRENCH(NYEAR,VOLB,VOLO,DMAX,PC,TINFL)
C
C
C***
C***
C*** THIS SUBROUTINE MAINTAINS A TRENCH WATER BALANCE.  WATER
C*** ENTERS THE TRENCH IN THE FORM OF PRECIPITATION AND EXITS
C*** FROM THE BOTTOM IF POSSIBLE.  IF MORE WATER ENTERS THE
C*** TRENCH THAN CAN EXIT FROM THE BOTTOM THE TRENCH MAY
C*** OVERFLOW.
C***
C***
C***
C***
C***
C***
C
C    INPUT VARIABLES
C       TDEPTH = TRENCH DEPTH
C       TAREA  = TRENCH AREA
C       PORT   = POROSITY OF TRENCH MATERIAL
C       OLDWAT = VOLUME OF WATER IN TRENCH FROM PREVIOUS YR
C       XLSAT   = LENGTH OF SATURATED ZONE
C       PPN    = ANNUAL PRECIPITATION
C       XINFL  = ANNUAL INFILTRATION
C       NYEAR  = CURRENT YEAR OF SIMULATION
C
C    OUTPUT VARIABLES
C
C       DMAX   = MAXIMUM DEPTH OF WATER IN TRENCH
C       OLDWAT = VOLUME OF WATER IN TRENCH AT END OF YEAR
C       VOLO   = VOLUME OF WATER OVERFLOWING TRENCH
C       VOLB   = VOLUME OF WATER GOING OUT BOTTOM OF TRENCH
C
```

```
C    INTERMEDIATE VARIABLES
C
C       WDEPTH = DEPTH OF WATER IN TRENCH
C       NEWWAT = VOLUME OF WATER ENTERING TRENCH
C       PC     = FRACTION OF TRENCH CAP THAT HAS FAILED
C
C
C
C
      REAL NEWWAT
      COMMON/EVAP/PPN,PHID,P,XIRR,S(12),T(12),TD(12),XINFL,SINFL,
     $       SMASS,WMASS,WDEEP
      COMMON/TRCH/TAREA,TDEPTH,OVER,PORT,RELFAC,DENCON,OLDWAT,EN
      COMMON/WATER/DTRAQ,DWELL,GWV,XLSAT,STFLOW,AQTHK,AQDISP,
     & PORA,PORV,PERMV,IAQSTF,CPRJ
      COMMON/LAND/RAINF,ERODF,STPLNG,COVER,CONTRL,SEDELR,SOILOS,
     &       PORS,BDENS,DWET,EXTENT,ADEPTH,PD,RUNOFF,RESAT,
     &       INSITE
      VOLBT=0.                                                          RAE0286
      VOLOT=0.                                                          RAE0286
      PC=CAP(NYEAR)
      DELT=0.10                                                         RAE0286
      DO 30 I=1,10                                                      RAE0286
      NEWWAT=(TAREA*(PC*(PPN+XIRR)+(1.-PC)*XINFL))*DELT                 RAE0286
      TINFL=NEWWAT/TAREA
      OLDWAT=OLDWAT+NEWWAT
      WDEPTH=OLDWAT/(PORT*TAREA)
      DMAX=WDEPTH                                                       ISICH
      IF(WDEPTH .GT. TDEPTH)WDEPTH=TDEPTH+(WDEPTH-TDEPTH)*PORT
      VOLO=0.
      IF(WDEPTH .GT. TDEPTH) VOLO=(WDEPTH-TDEPTH)*TAREA
      VOLB=0.
      IF(WDEPTH .LT. 1.E-7)GO TO 20
      VOLB=(WDEPTH+XLSAT)*PERMV*TAREA/XLSAT*DELT                        RAE0286
   20 CONTINUE
      IF(VOLB .GT. OLDWAT-VOLO)VOLB=OLDWAT-VOLO
      OLDWAT=OLDWAT-VOLO-VOLB
      IF(OLDWAT .LT. 0.)OLDWAT=0.
      VOLOT=VOLOT+VOLO                                                  RAE0286
      VOLBT=VOLBT+VOLB                                                  RAE0286
   30 CONTINUE                                                          RAE0286
      VOLO=VOLOT                                                        RAE0286
      VOLB=VOLBT                                                        RAE0286
      TINFL=TINFL/DELT
      RETURN
      END
C
C
C
C
      SUBROUTINE VERHOR(II,NYEAR,ITIME,DDETA)
C
C
C
C***
C*** THIS ROUTINE CALCULATES AND DECAYS THE AMOUNT OF RADIO
C*** ACTIVE MATERIAL THAT WILL REACH THE WELL IN A GIVEN YEAR.
C*** THIS SUBROUTINE IS CALLED FROM MAIN.
C***
C***
```

```
C***
C***
C***
C***
C
C
C   INPUT VARIBALES
C
C       II      = NUCLIDE NUMBER
C       NYEAR   = CURRENT YEAR OF SIMULATION
C       ITIME   = TRANSIT TIME FROM TRENCH TO WELL
C       VOLB    = VOLUME OF WATER LEAVING TRENCH
C       POLB    = AMOUNT OF NUCLIDE LEAVING BOTTOM OF TRENCH
C       DECAY   = RADIOACTIVE DECAY CONSTANT
C
C
C
C   OUTPUT VARIABLES
C
C       AQAM    = AMOUNT OF NUCLIDE AT WELL SITE
      DOUBLE PRECISION NUCLID
      COMMON/CNTRL/NONCLD,MAXYR,TITLE(20),LOCATE(12),NYR1,NYR2,
     &        PCT1,PCT2,LEAOPT,IOPVWV,IOPSAT,IPRT1,IPRT2,IDELT,IXTS,
     &        IRRES1,IRRES2,LIND,IAVG1,IAVG2,RR,FTMECH,INTYR(4),          RAE1085
     &        WWATL,WWATA,WWATH,SWATL,SWATA,SWATH,IVAP,IBSMT
      COMMON/NUC/NUCLID(40),ATMASS(40),TRAM(40),SOAM(40),ATAM(40),
     &        AQAM(40,1000),STAM(40),POLO(40),POLB(40),CS(40),CW(40),
     &        SSTREM(40),SDEEP(40),AIRCON(40),YSO(40),SOAVG(40),CON(40),
     &        AQCON(40),STCON(40),ATCON(40),AQAVG(40),STAVG(40),DETW(40), ISINEWL
     &        ATAVG(40),FMC(40),FMG(40),DECAY(40),XKD(4,40),SOL(40),
     &        FF(40),RA(40),RW(40),BV(40),BR(40),DERATE(40),CWAT(40)
      DIMENSION ITIME(40),DDETA(40)
C-----
C----- CALCULATE CORRECT POSITION IN ARRAY AND DECAY THE MATERIAL
C----- FOR THE PERIOD OF TIME MATERIAL IS IN TRANSIT FROM TRENCH
C----- TO WELL.
C-----
      ITMP=ITIME(II)
      IF((NYEAR+ITMP) .GT. (MAXYR) .OR. ITMP .LT. 0) GO TO 10
      AQAM(II,NYEAR+ITIME(II))=DETW(II)*(POLB(II)+                        ISIMOD
     &            SDEEP(II))*DDETA(II)
   10 CONTINUE
      RETURN
      END
      SUBROUTINE QUANC8(FUN,A,B,ABSERR,RELERR,RESULT,ERREST,NOFUN,FLAG)
C
      REAL FUN ,A,B,ABSERR,RELERR,RESULT,ERREST,FLAG
      INTEGER NOFUN
C
C ESTIMATE THE INTEGRAL OF FUN(X) FROM A TO B
C  TO A USER PROVIDED TOLERANCE.
C AN AUTOMATIC  ADAPTIVE ROUTINE BASED ON
C THE 8-PANEL NEWTON-COTES RULE.
C
C INPUT
C
C FUN  THE NAME OF THE INTEGRAND FUNCTION SUBPROGRAM FUN(X)
C      THE LOWER LIMIT OF INTEGRATION
C B    THE UPPER LIMIT OF INTEGRATION(B MAY BE LESS THAN A)
C RELERR  A RELATIVE  ERROR TOLERANCE. (SHOULD BE NON-NEGATIVE)
```

```
C ABSERR  AN ABSOLUTE ERROR TOLERANCE. (SHOULD BE NON-NEGATIVE)
C
C  OUTPUT
C
C RESULT  AN APPROXIMATION TO THE INTEGRAL HOPEFULLY SATISFYING THE
C         LEAST STRINGENT OF THE TWO ERROR TOLERANCES.
C ERREST  AN ESTIMATE OF THE MAGNITUDE OF  THE ACTUAL ERROR.
C  NOFUN  THE NUMBER OF FUNCTION VALUES USED IN CALCULATION OF RESULT.
C  FLAG  A RELIABILITY INDICATTOR   IF FLAG IS ZERO, THEN RESULTPROBABLY
C         SATISFIES THE ERROR TOLERANCE.  IF FLAG IS
C         XXX.YYY, THHEN XXX = THE NUMBER OF INTERVALS WHICH HAVE
C         NOT CONVERGED AND 0.YYY = THE FRACTION OF THE INTERVAL LEFT
C         TO DO WHEN THE LIMIT NOFUN WAS APPROACHED.
C
C
      REAL W0,W1,W2,W3,W4,AREA,X0,F0,STONE,STEP,COR11,TEMP
      REAL QPREV,QNOW,QDIFF,QLEFT,ESTERR,TOLERR
      REAL QRIGHT(31),F(16),X(16),FSAVE(8,30),XSAVE(8,30)
      INTEGER LEVMIN,LEVMAX,LEVOUT,NOMAX,NOFIN,LEV,NIM,I,J
C
C *** STAGE 1 *** GENERAL INITIALIZATION
C       SET CONSTANTS
C
      LEVMIN = 1
      LEVMAX = 30
      LEVOUT = 6
      NOMAX = 5000
      NOFIN = NOMAX - 8*(LEVMAX-LEVOUT+2**(LEVOUT+1))
C
C     TROUBLE WHEN NOFUN EQUALS NOFIN
C
      W0 = 3956.0/14175.0
      W1 = 23552.0/14175.0
      W2 = -3712.0 / 14175.0
      W3 = 41984.0/14175.0
      W4 = -18160.0 / 14175.0
C
C   INITIALIZE RUNNING SUMS TO ZERO
C
      FLAG = 0.0
      RESULT = 0.0
      COR11 = 0.0
      ERREST = 0.0
      AREA = 0.0
      NOFUN = 0
      IF(A .EQ. B ) RETURN
C
C ***** STAGE 2 **** INITIALIZATION FOR FIRST INTERVAL
C
      LEV = 0
      NIM = 1
      X0 = A
      X(16) = B
      QPREV = 0.0
      F0 = FUN(X0)
        STONE = (B-A)/16.0
      X(8) = (X0 + X(16))/ 2.0
      X(4) = (X0 + X(8))/2.0
      X(12) =  (X(8) + X(16))/ 2.0
      X(2) = (X0 + X(4)) / 2.0
```

```
      X(6) = (X(4) + X(8)) / 2.0
      X(10) = (X(8) + X(12)) / 2.0
      X(14) = (X(12) + X(16))/ 2.0
C
      DO 25 J=2,16,2
      F(J) = FUN(X(J))
   25 CONTINUE
C
      NOFUN = 9
C
C    ***** STAGE 3  *** CENTERAL CALCULATION
C   REQUIRES QPREV,X10,X2,X4,....,X16,F0,F4,....F16
C   CALCULATIES X1,X3,X5...X15, F1,F3,...,F15,QLEFT,QRIGHT
C   QNOW,QDIFF,AREA.
C
   30 X(1) = (X0 + X(2)) / 2.0
      F(1) = FUN(X(1))
      DO 35 J = 3, 15, 2
      X(J) = (X(J-1) + X(J+1)) / 2.0
      F(J) = FUN(X(J))
   35 CONTINUE
      NOFUN = NOFUN + 8
      STEP = (X(16) - X0) / 16.0
      QLEFT = (W0*(F0 +F(8)) + W1*(F(1) + F(7))  +  W2*(F(2) + F(6))
     & + W3*(F(3)+F(5)) +  W4*F(4))*STEP
      HOLTM1=ABS(QLEFT)
      IF(HOLTM1 .EQ. 0.0) GO TO 183
      IF(HOLTM1 .GT. 1.0E-65) GO TO 183
      QLEFT=0.0
  183 QRIGHT(LEV+1)=(W0*(F(8)+F(16))+W1*(F(9)+F(15))+W2*(F(10)+F(14))
     &  + W3*(F(11)+F(13)) + W4*F(12))*STEP
      HOLTM2=ABS(QRIGHT(LEV+1))
      IF(HOLTM2 .EQ. 0.0) GO TO 184
      IF(HOLTM2 .GT. 1.0E-65 ) GO TO 184
      QRIGHT(LEV+1)=0.0
  184 QNOW = QLEFT + QRIGHT(LEV+1)
      QDIFF = QNOW - QPREV
  195 AREA = AREA + QDIFF
C
C   **** STAGE 4  *** INTERVAL CONVERGENCE TEST
C
      ESTERR =  ABS(QDIFF) / 1023.0
      TOLERR = AMAX1(ABSERR,RELERR*ABS(AREA)) * (STEP/STONE)
      IF(LEV .LT. LEVMIN) GOTO 50
      IF (LEV .GE. LEVMAX) GO TO 62
      IF(NOFUN .GT. NOFIN) GO TO 60
      IF(ESTERR .LE. TOLERR) GO TO 70
C
C **** STAGE 5 *** NO CONVERGENCE
C
C  LOCATE NEXT INTERVAL
C
   50 NIM = 2*NIM
      LEV = LEV + 1
C
C  STORE RIGHTHAND ELEMENTS FOR FUTURE USE
C
      DO 52 I = 1,8
      FSAVE(I,LEV) = F(I + 8)
      XSAVE(I,LEV) = X(I+8)
```

```
   52 CONTINUE
C
C  ASSEMBLE LEFT HAND ELEMENTS FOR IMMEDIATE USE
C
      QPREV = QLEFT
      DO 55 I = 1,8
      J = -I
      F(2*J+18) = F(J+9)
      X(2*J+18) = X(J+9)
   55 CONTINUE
      GO TO 30
C
C **** STAGE 6 *** TROUBLE SECTION
C
C   NUMBER OF FUNCTION VALUES IS ABOUT TO EXCEED LIMIT
C
   60 NOFIN = 2*NOFIN
      LEVMAX = LEVOUT
C     TEMP1=B-A
      FLAG = FLAG+(B-X0)/(B-A)
      GO TO 70
C
C  CURRENT LEVEL IS LEVMAX.
C
   62 FLAG = FLAG + 1.0
C
C
C ****STAGE 7  *** INTERVAL CONVERGED
C  ADD CONTRIBUTIONS INTO RUNNING SUMS
C
C
   70 RESULT = RESULT + QNOW
      ERREST = ERREST + ESTERR
      COR11 = COR11 + QDIFF / 1023.0
C
C  LOCATE NEXT INTERVAL
C
   72 IF (NIM .EQ. 2*(NIM/2)) GO TO 75
      NIM =  NIM/2
      LEV = LEV-1
      GO TO 72
   75 NIM  = NIM + 1
      IF (LEV .LE. 0 ) GO TO 80
C
C ASSEMBLE ELEMENTS REQUIRED FOR THE NEXT INTERVAL
C
      QPREV = QRIGHT(LEV)
      X0 = X(16)
      F0 = F(16)
      DO 78 I = 1,8
      F(2*I) = FSAVE(I,LEV)
      X(2*I) = XSAVE(I,LEV)
   78 CONTINUE
      GO TO 30
C
C ***  STAGE 8 *** FINALIZE AND RETURN
C
   80 RESULT  = RESULT + COR11
C
C
```

```
C ***  MAKE SURE ERREST NOT LESS THEN ROUNDOFF LEVEL
C
      IF(ERREST .EQ.  0.0) RETURN
   82 TEMP = ABS(RESULT) + ERREST
      IF(TEMP .NE. ABS(RESULT)) RETURN
      ERREST = 2.0*ERREST
      GO TO 82
      END
C
C
C
C
      DOUBLE PRECISION FUNCTION FCN(T)
C
C  FCN DETERMINES FUNCTIONAL EVALUATIONS OF
C  THE INTEGRAND OF THE GROUNDWATER TRANSPORT MODEL.
C  FCN IS CALLED BY QUANC8.
C
      IMPLICIT REAL*8 (A-H,O-Z)
      COMMON/DOUBLE/V,XL,D,R,AL
      DATA PI/3.14159265D0/
      P=V*XL/D
      DN=AL*XL/V
      TH=T*V/XL
      F1=R/TH-1.D0
      F2=0.25D0*P*TH/R
      F3=DN*TH
      F4=(R*P/(PI*TH**3.))**.5
      F3=-F3-F2*F1*F1
      FCN=0.0D0
      IF(F3 .GE. -1.75D2) FCN=.5D0*V*F4*DEXP(F3)/XL
      RETURN
      END
C
C
C
C
      SUBROUTINE DARTAB(IFLAG)
      REAL*8 NUCLID,ORGN,CANC,TOTBOD,RNLOC,OGLOC,GEN,OREP,CREP,RREP,
     A  PO218,PB214,BI214,PO214,PULMO,LUNGS,NDP,TDP,PUL,RREPS
        DATA PO218/8HPO-218  /,PB214/8HPB-214  /,BI214/8HBI-214  /,
     A  PO214/8HPO-214  /,PULMO/8HPULMNARY/,LUNGS/8HLUNGS   /,
     B  NDP/8H*N-P*   /,TDP/8H*T-B*   /,PUL/8H*PUL*   /
        LOGICAL GENEFF,OUTPUT
      REAL LLET
      INTEGER RTABLE,DTABLE,TABLE(7),FTABLE,PTLOC,HLLOC,FALOC
C
      DATA TOTBOD/8HTOT BODY /
      DIMENSION TITLE(20),CONC(4),ILET(2),RREPS(4)
      NAMELIST /INPUT/ILOC,JLOC,PLOC,AGEX,ILET,DTABLE,RTABLE,FTABLE,
     A  OUTPUT,GSCFAC
      NAMELIST /ORGAN/ORGN,NORGN,TIME
      NAMELIST /QFACTR/HLET,LLET
      NAMELIST /CANCER/CANC,NCANC,RELABS
      NAMELIST /RNUCLD/NUCLID,NONCLD,PSIZE,RESP,GIABS
       NAMELIST /LOCTBL/NTLOC,RNLOC,OGLOC,PTLOC,FALOC,HLLOC,LTABLE
        NAMELIST /GENTIC/GENEFF,GEN,NGEN,GREAC,REPPER,GLLET,GHLET
      COMMON/COMEX/EXPP(20,20,40,4),POP(20,20),POPFAC,TOTFAC, NOL,NOU,
     > NRL,NRU,IDIST(20),ILOC,JLOC
      COMMON/COMOR/ORGN(20),NORGN,TIME(20),DOSE(20,40,4,2), DTABLE(7)
```

```
      COMMON/LETFAC/HLET(20),LLET(20)
      COMMON/COMCA/CANC(20),NCANC,RELABS(20),RISK(20,40,4,2), RTABLE(7),
     > AGEX,YRLL(20,40,4,2)
      COMMON/COMRF/REF(20,40,4),FTABLE(7)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
     > INDPOP
        COMMON/COMLOC/RNLOC(10),OGLOC(10),PTLOC(10),FALOC(10),
     >  HLLOC(10),LTABLE(10),NTLOC
        COMMON/COMGEN/GEN(3),NGEN,GDOSE(3,40,4,2),GRISK(3,40,4,2),
     >  GENEFF,GREAC(2),REPPER,GLLET(3),GHLET(3),GREF(3,40,4)
        COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),
     A  RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
        COMMON/COMUS/ARRAY(2200)
C
C       TRANSFER TO 33 IF DOSE CALCULATION; ELSE CONTINUE WITH INPUT
C
        IF (IFLAG.GT.0) GO TO 33
C
C***    SET DEFAULT VALUES.
        OUTPUT=.TRUE.
      ILOC=0
      JLOC=0
      PLOC=100.
      AGEX=70.7565
        REPPER=1.41330E-2
        GSCFAC=.5
      NORGN=0
      NCANC=1
      CANC(1)=TOTBOD
      ILET(1)=0
      ILET(2)=2
      DO 10 J=1,7
      DTABLE(J)=0
      RTABLE(J)=0
      FTABLE(J)=0
   10 CONTINUE
      RTABLE(6)=4
      ILET(1)=1
      ILET(2)=1
      DO 20 J=1,20
      TIME(J)=70.
      HLET(J)=20.
      LLET(J)=1.
      RELABS(J)=1.
   20 CONTINUE
        NGEN=0
        NOREP=4
        NCREP=1
        NRREP=0
        RREPS(1)=PO218
        RREPS(2)=PB214
        RREPS(3)=BI214
        RREPS(4)=PO214
        CREP(1)=PULMO
        OREP(1)=LUNGS
        OREP(2)=NDP
        OREP(3)=TDP
        OREP(4)=PUL
      READ(26,11700) TITLE
      WRITE(6,10000) TITLE
```

```
      READ(26,INPUT)
      IF (PLOC.NE.0) WRITE(6,10100)PLOC
      IF (ILET(1).EQ.0.OR.ILET(1).EQ.2) WRITE(6,10200)
      IF (ILET(1).EQ.1.OR.ILET(1).EQ.2) WRITE(6,10300)
      IF (ILET(2).EQ.0.OR.ILET(2).EQ.2) WRITE(6,10400)
      IF (ILET(2).EQ.1.OR.ILET(2).EQ.2) WRITE(6,10500)
      WRITE(6,10600) DTABLE,RTABLE,FTABLE
        WRITE(6,11900) GSCFAC
C***    READ IN ORGAN PARAMETERS
   40 READ(26,ORGAN)
      WRITE(6,10700) NORGN
      WRITE(6,10800) (ORGN(I),TIME(I),I=1,NORGN)
      IF (ILET(1).GT.0) READ(26,QFACTR)
      IF (ILET(1).GT.0) WRITE(6,10900) (ORGN(I),LLET(I),HLET(I), I=1,
     > NORGN)
C***    READ IN CANCER PARAMETERS
   50 READ(26,CANCER)
      WRITE(6,11000) NCANC
      WRITE(6,11100) (CANC(I),RELABS(I),I=1,NCANC)
C***    READ IN GENETIC PARAMETERS
        READ(26,GENTIC)
        IF(GENEFF) WRITE(6,11800) (GEN(I),I=1,NGEN)
        IF(GENEFF) WRITE(6,11850) GRFAC,REPPER
11800   FORMAT('0GENETIC DOSES ARE PRINTED FOR '
     <  3(1X,A8))
11850   FORMAT(' THE RISK FACTOR (PER RAD/MILLION BIRTHS)',
     <  ' FOR GENETIC DOSE ARE :'/
     <  G15.8  ,' FOR LOW LET, AND'/
     < G15.8,' FOR HIGH LET,'/
     <  ' AND THE REPLACEMENT RATE FOR THE POPULATION IS :'/
     <  1X,G10.5,' YEAR-1')
C***    CONVERT TO /MRAD/BIRTHS
        GRFAC(1)=GRFAC(1)*1.E-9
        GRFAC(2)=GRFAC(2)*1.E-9
C***    READ IN RADIONUCLIDE PARAMETERS
      READ(26,RNUCLD)
      WRITE(6,11200) NONCLD
      WRITE(6,11300)(NUCLID(I),PSIZE(I),RESP(I), (GIABS(J,I),J=1,4),I=1,
     > NONCLD)
        DO 30 I=1,NONCLD
        DO 25 K=1,4
        IF(NUCLID(I).EQ.RREPS(K)) GO TO 27
25      CONTINUE
        GO TO 30
27      NRREP=NRREP+1
        RREP(NRREP)=RREPS(K)
30      CONTINUE
        NTLOC=0
        READ(26,LOCTBL)
        IF(NTLOC.EQ.0) GO TO 55
        WRITE(6,11305) NTLOC
        WRITE(6,11310) (RNLOC(I),OGLOC(I),PTLOC(I),FALOC(I),HLLOC(I),
     >  I=1,NTLOC)
55      CONTINUE
11305   FORMAT('0',I2,' LOCATION TABLES ARE TO BE OUTPUT FOR:'/
     >  ' NUCLIDE   ORGAN   PATHWAY   QUANTITY  LET'/
     >  '                OR CANCER'/)
11310   FORMAT(1X,A8,1X,A8,4X,I2,7X,I2,7X,I2)
C***    READ IN DOSE RATES AND HEALTH RISKS
      CALL RDSTOR(OUTPUT)
```

```
      IF(NORGN.NE.0) CALL RDORGF
C
C      END OF DARTAB INPUT;  RETURN
C
       RETURN
C
C
C      BEGIN DOSE CALCULATIONS
C
C
C***    CHOOSE LOCATION AND FIND EXPOSURES
C
  33  CALL CHLOC(PLOC,CONC,GSCFAC,IFLAG)
        IF ( IFLAG .NE. 1 ) CALL SUMMRY(TITLE,GSCFAC,IFLAG)
C
C      RETURN IF ANNUAL SUMMARY OR MAXIMUM DOSE CALCULATION
C
      IF ( IFLAG .EQ. 2 ) RETURN
      IF ( IFLAG .EQ. 3 ) RETURN
C
      IF (NORGN.LE.0) GO TO 70
C***    DECIDE IF LOW AND HIGH LET ARE TO BE SEPARATE TABLES
C***    AND THEN OUTPUT TABLES
      IDO=0
      DO 60 J=1,7
      IF (DTABLE(J).NE.0) IDO=1
      TABLE(J)=DTABLE(J)
   60 CONTINUE
        IF(NTLOC.EQ.0 .OR. IDO.EQ.1) GO TO 67
        DO 65 J=1,NTLOC
        IF(FALOC(J).EQ.1)IDO=1
65      CONTINUE
67      CONTINUE
C***    ILET = 0 MEANS ONLY TABLES FOR LOW AND HIGH LET SEPARATELY
C***    ILET = 1 MEANS ONLY A TABLE FOR LOW AND HIGH LET COMBINED
C***    ILET = 2 MEANS BOTH SETS OF TABLES
      IF (IDO.EQ.1) CALL PREPDR(TABLE,ILET(1),TITLE,GSCFAC,IFLAG)
C
C      RETURN IF PATHWAY DOSE CONVERSION FACTOR CALCULATION
C
      IF ( IFLAG .EQ. 1 ) RETURN
C
C
   70 IDO=0
      DO 80 J=1,7
      IF (FTABLE(J).NE.0) IDO=1
   80 TABLE(J)=FTABLE(J)
        IF(NTLOC.EQ.0 .OR. IDO.EQ.1) GO TO 87
        DO 85 J=1,NTLOC
        IF(FALOC(J).EQ.3) IDO=1
85      CONTINUE
87      CONTINUE
      IF (IDO.EQ.1) CALL PREPRF(TABLE,TITLE,GSCFAC,IFLAG)
C***    OUTPUT RISK TABLES
      IDO=0
      DO 90 J=1,7
      IF (RTABLE(J).NE.0) IDO=1
   90 TABLE(J)=RTABLE(J)
        IF(NTLOC.EQ.0 .OR. IDO.EQ.1) GO TO 97
        DO 95 J=1,NTLOC
```

```
        IF(FALOC(J).EQ.2)IDO=1
95      CONTINUE
97      CONTINUE
      IF (IDO.EQ.1) CALL PREPHR(TABLE,ILET(2),TITLE,GSCFAC,IFLAG)
      RETURN
10000 FORMAT('1',20A4)
10100 FORMAT(' TABLES FOR THE SELECTED INDIVIDUAL WILL BE DONE FOR',
     >' THE LOCATION HAVING', F8.2,' % OF THE HIGHEST TOTAL RISK.'/)
10200 FORMAT(' DOSE RATE TABLES FOR LOW AND HIGH LET WILL BE ',
     > 'PRINTED SEPARATELY.')
10300 FORMAT(' DOSE RATE TABLES COMBINING LOW AND HIGH LET ',
     > 'WILL BE PRINTED.')
10400 FORMAT(' HEALTH RISK TABLES FOR LOW AND HIGH LET WILL BE ',
     > 'PRINTED SEPARATELY.')
10500 FORMAT(' HEALTH RISK TABLES COMBINING LOW AND HIGH LET ',
     > 'WILL BE PRINTED.')
10600 FORMAT('00 INDICATES THE TABLE WILL NOT BE PRINTED'/
     A' 1 INDICATES INDIVIDUAL VALUES WILL BE PRINTED'/
     B' 2 INDICATES MEAN INDIVIDUAL VALUES WILL BE PRINTED'/
     C' 3 INDICATES COLLECTIVE VALUES WILL BE PRINTED'/
     D' 4 INDICATES ALL OF THE ABOVE WILL BE PRINTED'//
     > '   QUANTITY      TABLE NO.  1  2  3  4  5  6  7'/
     > '+-------------------------------------------------------------'/
     > ' 1.DOSE RATES                ',7(I2,1X)/
     > ' 2.HEALTH RISKS              ',7(I2,1X)/
     > ' 3.RISK EQUIVALENT FACTOR    ',7(I2,1X))
10700 FORMAT('0THERE ARE ',I4,' ORGANS TO BE OUTPUT. THEY ARE:'/)
10800 FORMAT(1X,'ORGAN',4X,'TIME',4X,'ORGAN',4X,'TIME',4X,
     1'ORGAN',4X,'TIME'/
     > (3(1X, A8,2X,F4.0,2X)))
10900 FORMAT('0  ORGAN      DOSE EQUIVALENT FACTORS  '/
     A  '                   LOW LET          HIGH LET'/
     A  (2X,A8,F15.5,1X,F15.4))
11000   FORMAT('0THERE ARE ',I4,' CANCERS TO BE OUTPUT.'/
     > ' A 1 INDICATES ABSOLUTE RISK; A 2 IS RELATIVE RISK.')
11100 FORMAT('   CANCER       CANCER       CANCER       CANCER'/ (1X,4(A8,
     > 1X,F2.0,1X)))
11200 FORMAT('0THERE ARE ',I4,' RADIONUCLIDES TO BE OUTPUT.')
11300 FORMAT('  NUCLIDE  PARTICLE SIZE   CLEARANCE CLASS ',
     > 20X,'G.I. ABSORPTION FRACTION'/49X,'STOMACH',8X,'SI',13X,'ULI',
     >  12X,'LLI'/ (1X,A8,1X,F10.5,6X,10X,A1,4X,4F15.5))
11700 FORMAT(20A4)
11900   FORMAT('0THE GROUND SURFACE CORRECTION FACTOR IS ',F5.2/)
      END
C
C
C
C
      SUBROUTINE RDSTOR(OUTPUT)
C***    THIS SUBROUTINE READS AND STORES DOSE RATES
C***    AND HEALTH RISKS FOR ORGANS AND CANCERS
      REAL*8 NUC,NUCLID,ORGN,CANC,O,C,OG,GEN,OREP,CREP,RREP
        LOGICAL GENEFF,OUTPUT
      COMMON/COMOR/ORGN(20),NORGN,TIME(20),DOSE(20,40,4,2), DTABLE(7)
        COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),
     A  RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
      COMMON/COMCA/CANC(20),NCANC,RELABS(20),RISK(20,40,4,2), RTABLE(7),
     >  AGEX,YRLL(20,40,4,2)
      COMMON/COMRE/REF(20,40,4),ETABLE(7)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
```

```
     > INDPOP
      COMMON/COMUS/C(40),O(40),D(2,40),R(2,40),RE(40),YLL(2,40),
     >  G(2,3),OG(3),DCHK(20,40),RCHK(20,40),GCHK(3,40)
        COMMON/COMGEN/GEN(3),NGEN,GDOSE(3,40,4,2),GRISK(3,40,4,2),
     >  GENEFF,GREAC(2),REPPER,GLLET(3),GHLET(3),GREF(3,40,4)
      DIMENSION GIIN(4)
        LOGICAL*1 FAL,TRU,DCHK,RCHK,GCHK,IW
        DATA TRU/.TRUE./,FAL/.FALSE./
C***    ZERO OUT ALL ARRAYS
        NDO=NORGN+1
        DO 35 N=1,2
      DO 30 J=1,4
      DO 30 K=1,NONCLD
      DO 10 L=1,NDO
      DOSE(L,K,J,N)=0.0
        IF(L.GT.NGEN) GO TO 10
        GDOSE(L,K,J,N)=0.0
   10 CONTINUE
      NDO=NCANC+1
      DO 20 L=1,NDO
      RISK(L,K,J,N)=0.0
        YRLL(L,K,J,N)=0.0
      REF(L,K,J)=0.0
        IF(L.GT.NGEN) GO TO 20
        GRISK(L,K,J,N)=0.0
        GREF(L,K,J)=0.0
   20 CONTINUE
   30 CONTINUE
35      CONTINUE
        DO 38 L=1,40
        DO 37 K=1,20
        DCHK(K,L)=TRU
        RCHK(K,L)=TRU
37      CONTINUE
        DO 39 K=1,3
        GCHK(K,L)=TRU
39      CONTINUE
38      CONTINUE
C***    READ FIRST RECORD
   41 READ(25,END=180) NUC,SIZEIN,RESPIN,GIIN,TIMIN,IND
        IFIND=0
C***    CHECK TO SEE IF THE RADIONUCLIDE IS IN OUTPUT LIST
      DO 50 K=1,NONCLD
      IF (NUC.EQ.NUCLID(K)) GO TO 60
40      CONTINUE
   50 CONTINUE
      IF(IFIND.EQ.0)GO TO 125
        GO TO 41
C***    FIND OUT WHAT TYPE OF RECORD FOLLOWS
   60 IRA=IND/10
        IF(IRA.GT.2) GO TO 401
      ICHOS=IND-IRA*10
      IF (ICHOS.NE.2) GO TO 75
      DO 70 L=1,4
      IF (ABS(GIIN(L)-GIABS(L,K)).GT.1.E-6) GO TO 40
   70 CONTINUE
   75 IF (ICHOS.NE.3) GO TO 80
      IF (ABS(SIZEIN-PSIZE(K)).GT.1.E-6) GO TO 40
      IF (RESPIN.NE.RESP(K)) GO TO 40
   80 IF (IND.LE.5) GO TO 130
```

```
C***     THE NEXT TWO RECORDS CONTAIN CANCERS AND RISKS
         IF(IFIND.NE.0) GO TO 81
       READ(25) NC,ILET,(C(I),I=1,NC)
       READ(25) ((R(L,I),L=1,ILET),I=1,NC)
         READ(25) ((YLL(L,I),L=1,ILET),I=1,NC)
         READ(25)(RF(I),I=1,NC),TRF
81       IFIND=1
         REF(NCANC+1,K,ICHOS-1)=TRF+REF(NCANC+1,K,ICHOS-1)
C***     CHECK TO SEE IF THE CANCER IS IN OUTPUT LIST
       DO 110 I=1,NC
       DO 90 J=1,NCANC
       IF (C(I).EQ.CANC(J)) GO TO 100
   90  CONTINUE
       GO TO 110
C***     THE CANCER NAMES MATCH, NOW DO WE HAVE RELATIVE OR ABS RISK
  100  IF (RELABS(J).NE.IRA) GO TO 110
C***     A MATCH, STORE THE RISK
         RCHK(J,K)=FAL
       RISK(J,K,ICHOS-1,1)=R(1,I)
         YRLL(J,K,ICHOS-1,1)=YLL(1,I)
       IF (ILET.LE.1) GO TO 105
         RISK(J,K,ICHOS-1,2)=R(2,I)
         YRLL(J,K,ICHOS-1,2)=YLL(2,I)
105       REF(J,K,ICHOS-1)=RF(I)
       IF(IND.NE.3)GO TO 110
         DO 106 L=1,NRREP
         IF(NUCLID(K).EQ.RREP(L)) GO TO 107
  106    CONTINUE
         GO TO 110
  107    DO 108 L=1,NCREP
         IF(C(I).EQ.CREP(L)) GO TO 109
  108    CONTINUE
         GO TO 110
  109    RISK(J,K,2,2)=0.0
         YRLL(J,K,2,2)=0.0
  110  CONTINUE
C***     THE RISKS HAVE BEEN STORED OR SKIPPED, GO TO NEXT RECORD
       GO TO 40
C***     SKIP THE RECORDS
  125  READ(25,END=180) DUM
       READ(25,END=180) DUM
         IF(IND.LE.5 .OR. IND.GT.90) GO TO 41
         READ(25,END=180) DUM
         READ(25,END=180) DUM
       GO TO 41
C***     THE NEXT TWO RECORDS CONTAIN ORGANS AND DOSE RATES
  130  IF(IFIND.NE.0) GO TO 131
         READ(25) NO,ILET,(O(I),I=1,NO)
       READ(25) ((D(L,I),L=1,ILET),I=1,NO)
131      IFIND=1
C***     FOR INTERNAL DOSES, ALSO CHECK OTHER NUCLIDE PARAMETERS
C***     CHECK TO SEE IF THE ORGANS ARE ON OUTPUT LIST
  140  DO 170 I=1,NO
       DO 150 J=1,NORGN
       IF (O(I).EQ.ORGN(J)) GO TO 160
  150  CONTINUE
         GO TO 170
C***     A MATCH SO STORE THE DOSE
  160  IF(IND.GT.3) GO TO 159
         IF(ABS(TIMIN-TIME(J)).GT.1.E-6) GO TO 40
```

```
159     DOSE(J,K,IND-1,1)=D(1,I)
      IF (ILET.GT.1) DOSE(J,K,IND-1,2)=D(2,I)
        DCHK(J,K)=FAL
        IF(IND.NE.3) GO TO 170
        DO 162 L=1,NRREP
        IF(NUCLID(K).EQ.RREP(L)) GO TO 163
162     CONTINUE
        GO TO 170
163     DO 165 L=1,NOREP
        IF(ORGN(J).EQ.OREP(L)) GO TO 167
165     CONTINUE
        GO TO 170
167     DOSE(J,K,2,2)=0.0
  170 CONTINUE
        IF(IND.LT.4) GO TO 40
        DO 172 I=1,NO
        DO 152 J=1,NGEN
        IF(O(I).EQ.GEN(J)) GO TO 161
152     CONTINUE
        GO TO 172
161     GDOSE(J,K,IND-1,1)=D(1,I)*30.
        IF(ILET.GT.1)GDOSE(J,K,IND-1,2)=D(2,I)*30.
172     CONTINUE
        GO TO 40
C***    DOSES HAVE BEEN SKIPPED OR STORED, GO TO NEXT RECORD
  180 CONTINUE
        IW=TRU
        DO 200 K=1,NONCLD
        DO 200 J=1,NORGN
        IF(.NOT.DCHK(J,K)) GO TO 200
        IF(IW) WRITE(6,900)
        WRITE(6,901) ORGN(J),NUCLID(K)
        IW=FAL
200     CONTINUE
900     FORMAT('0 THE FOLLOWING NUCLIDES AND ',
     <  'ORGAN DOSE FACTORS WERE NOT FOUND',
     >  ' IN THE INPUT DATA SETS:'/
     >  '   ORGAN  NUCLIDE'/)
901     FORMAT(1X,A8,1X,A8)
        IW=TRU
        DO 300 K=1,NONCLD
        DO 300 J=1,NCANC
        IF(.NOT.RCHK(J,K)) GO TO 300
        IF(IW) WRITE(6,902)
        IW=FAL
902     FORMAT('0THE FOLLOWING NUCLIDES AND ',
     <  'CANCER RISK FACTORS WERE NOT FOUND',
     >  ' IN THE INPUT DATA SETS:'/
     >  '  CANCER  NUCLIDE'/)
        WRITE(6,901) CANC(J),NUCLID(K)
300     CONTINUE
        IF(.NOT.GENEFF) RETURN
       IW=TRU
        DO 400 K=1,NONCLD
        DO 400 J=1,NGEN
        IF(.NOT.GCHK(J,K)) GO TO 400
        IF(IW) WRITE(6,903)
        IW=FAL
903     FORMAT('0THE FOLLOWING NUCLIDES AND ',
     <  'GENETIC DOSE FACTORS WERE NOT',
```

```
     >  ' FOUND IN THE INPUT DATA SETS:'/
     >  ' GEN.DOSE NUCLIDE')
        WRITE(6,901) GEN(J),NUCLID(K)
400     CONTINUE
        DO 625 J=1,NONCLD
        DO 625 K=3,4
        NGN=NGEN-1
        AVG=0.0
        DO 600 I=1,NGN
        AVG=AVG+GDOSE(I,J,K,1)
600     CONTINUE
        GDOSE(NGEN,J,K,1)=AVG/FLOAT(NGN)
625     CONTINUE
        DO 700 L=1,2
        DO 700 I=1,4
        DO 700 K=1,NONCLD
        GRISK(1,K,I,L)=GDOSE(3,K,I,L)*GRFAC(L)
700     CONTINUE
        DO 705 I=1,4
        DO 705 K=1,NONCLD
        GREF(1,K,I)=(GRISK(1,K,1,1)+GRISK(1,K,I,2))/(30.*GRFAC(1))
705     CONTINUE
        IF(OUTPUT) CALL FACOUT
        RETURN
401     IF(IRA.NE.9) GO TO 800
        ICHOS=0
        IF(IND.EQ.98) ICHOS=3
        IF(IND.EQ.99) ICHOS=2
        IF(ICHOS.EQ.0) GO TO 125
        IF(.NOT.GENEFF) GO TO 125
        IF(ICHOS.NE.2)GO TO 507
        DO 505 L=1,4
505      IF (ABS(G1IN(L)-G1ABS(L,K)).GT.1.E-6) GO TO 40
 507    IF(ICHOS.NE.3)GO TO 510
      IF (ABS(SIZEIN-PSIZE(K)).GT.1.E-6) GO TO 40
        IF(RESPIN.NE.RESP(K)) GO TO 40
510     IF(IFIND.NE.0) GO TO 511
        READ(25) NG,LET,(OG(I),I=1,NG)
        READ(25) ((G(L,I),L=1,LET),I=1,NG)
511     IFIND=1
520     DO 530 I=1,NG
        DO 525 J=1,NGEN
        IF(OG(I).EQ.GEN(J)) GO TO 540
525     CONTINUE
        GO TO 530
540     GDOSE(J,K,ICHOS-1,1)=G(1,I)
        IF(LET.GT.1) GDOSE(J,K,ICHOS-1,2)=G(2,I)
        GCHK(J,K)=FAL
530     CONTINUE
        GO TO 40
800     IF(IND.NE.33) GO TO 125
        READ(25) NC,ILET,(C(I),I=1,NC)
        READ(25) ((R(L,I),L=1,ILET),I=1,NC)
        READ(25) ((YLL(L,I),L=1,ILET),I=1,NC)
        READ(25) (RF(I),I=1,NC),TRF
        IFIND=1
        CREP(1)=C(1)
        NCREP=NC
        RRISK=R(1,1)
        RYRLL=YLL(1,1)
```

```
      RREF(1)=RF(1)
      RREF(2)=TRF
      GO TO 40
    END
C
C
C
C
    SUBROUTINE FACOUT
      REAL*8 NUCLID,ORGN,CANC,OG,GEN,OREP,CREP,RREP,RN222,WBODY
      DATA RN222/8HRN-222   /,WBODY/'W BODY  '/
      LOGICAL GENEFF
      COMMON/COMOR/ORGN(20),NORGN,TIME(20),DOSE(20,40,4,2),DTABLE(7)
      COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),
     A RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
      COMMON/COMCA/CANC(20),NCANC,RELABS(20),RISK(20,40,4,2),
     A RTABLE(7),AGEX,YRLL(20,40,4,2)
      COMMON/COMRF/REF(20,40,4),FTABLE(7)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS(4,40),
     A INDPOP
      COMMON/COMGEN/GEN(3),NGEN,GDOSE(3,40,4,2),GRISK(3,40,4,2),
     A GENEFF,GRFAC(2),REPPER,GLLET(3),GHLET(3),GREF(3,40,4)
      DO 1000 K=1,NONCLD
      WRITE(6,10000) NUCLID(K)
      WRITE(6,10100)
10000 FORMAT('1FOR NUCLIDE : ',A8//)
10100 FORMAT(' DOSE RATE CONVERSION FACTORS'/
     A 1X,'ORGAN',11X,'INGESTION',10X,'INHALATION',
     A 9X,'AIR',5X,'GROUND'/
     B 12X,'LOW LET',3X,'HIGH LET',2X,'LOW LET',
     B 3X,'HIGH LET',2X,'IMMERSION',1X,'SURFACE')
      WRITE(6,10200) (ORGN(I),((DOSE(I,K,J,N),N=1,2),J=1,2),
     A (DOSE(I,K,J,1),J=3,4),I=1,NORGN)
10200 FORMAT((1X,A8,1X,6(1PG10.3)))
      IF(.NOT.GENEFF) GO TO 100
      WRITE(6,10300)
      WRITE(6,10200) (GEN(I),((GDOSE(I,K,J,N),N=1,2),J=1,2),
     A (GDOSE(I,K,J,1),J=3,4),I=1,NGEN)
10300 FORMAT(' GENETIC EFFECT DOSE RATE CONVERSION FACTORS')
100   CONTINUE
      WRITE(6,10175)
10175 FORMAT('0',28X,'RISK CONVERSION FACTORS',35X,
     A 'YEARS OF LIFE LOST FACTORS'/
     A 1X,'CANCER',10X,'INGESTION',10X,'INHALATION',
     A 9X,'AIR',5X,'GROUND',9X,'INGESTION',10X,'INHALATION',
     A 7X,'AIR',5X,'GROUND'/
     B 12X,'LOW LET',3X,'HIGH LET',2X,'LOW LET',
     B 3X,'HIGH LET',2X,'IMMERSION',1X,'SURFACE',3X,
     B 'LOW LET',3X,'HIGH LET',2X,'LOW LET',
     B 3X,'HIGH LET',2X,'IMMERSION',1X,'SURFACE')
      WRITE(6,10250) (CANC(I),((RISK(I,K,J,N),N=1,2),J=1,2),
     A (RISK(I,K,J,1),J=3,4),((YRLL(I,K,J,N),N=1,2),J=1,2),
     B (YRLL(I,K,J,1),J=3,4),I=1,NCANC)
10250 FORMAT((1X,A8,1X,12(1PG10.3)))
      IF(.NOT.GENEFF) GO TO 200
      WRITE(6,10400)
10400 FORMAT(' GENETIC EFFECT RISK CONVERSION FACTORS')
      WRITE(6,10200) GEN(3),((GRISK(1,K,J,N),N=1,2),J=1,2),
     A (GRISK(1,K,J,1),J=3,4)
200   CONTINUE
```

```
      WRITE(6,10190)
10190 FORMAT('0RISK EQUIVALENT CONVERSION FACTORS'/
     A 1X,'CANCER',3X,'INGESTION',1X,'INHALATION',
     B 4X,'AIR',4X,'GROUND'/31X,'IMMERSION',2X,'SURFACE')
      NALL=NCANC+1
      CANC(NALL)=WBODY
      WRITE(6,10275) (CANC(I),(REF(I,K,J),J=1,4),I=1,NALL)
10275 FORMAT((1X,A8,1X,4(1PG10.3)))
      IF(.NOT.GENEFF) GO TO 300
      WRITE(6,10600)
10600 FORMAT(' GENETIC EFFECT RISK EQ. CONVERSION FACTOR')
      WRITE(6,10275) GEN(3),(GREF(I,K,I),I=1,4)
300   CONTINUE
1000  CONTINUE
      DO 400 I=1,NONCLD
      IF(NUCLID(I).EQ.RN222) GO TO 450
400   CONTINUE
      RETURN
450   WRITE(6,10700) RRISK,RYRLL,RREF
10700 FORMAT('1FOR RN-222 WORKING LEVEL CALCULATIONS:'/
     A ' RISK CONVERSION FACTOR = ',1PG10.3/
     B ' YEARS OF LIFE LOST FACTOR = ',1PG10.3/
     C ' RISK EQ. CONVERSION FACTOR (PULMNARY) = ',1PG10.3/
     D ' RISK EQ. CONVERSION FACTOR (W BODY  ) = ',1PG10.3)
      RETURN
      END
C
C
C
C
      SUBROUTINE PREPDR(TABLE,ILET,TITLE,GSCFAC,IFLAG)
C***  THIS ROUTINE PREPARES DOSE RATES TO BE OUTPUT.
      REAL*8 ORGN,NUCLID,RNLOC,OGLOC,ORC,ORG,LAST,GEN,OREP,RREP,CREP,
     A GON
      COMMON/HEAD/ORC
      COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),
     A RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
      COMMON/COMWOR/FACO(20,4)
      COMMON/COMGEN/GEN(3),NGEN,GDOSE(3,40,4,2),GRISK(3,40,4,2),
     > GENEFF,GRFAC(2),REPPER,GLLET(3),GHLET(3),GREF(3,40,4)
      DATA ORG/8H ORGAN  /,LAST/8HWT. SUM /,GON/8H GONAD  /
      COMMON/COMLOC/RNLOC(10),OGLOC(10),PTLOC(10),FALOC(10),
     > HLLOC(10),LTABLE(10),NTLOC
      REAL LLET
      INTEGER TABLE,FALOC,HLLOC,PTLOC
      DIMENSION TABLE(1),TITLE(1),TITLA(10,3), FACD(4,3),TLET(2,3),
     > TITL2(2),ITAB(7),TITLB(10,3),TITLGA(10,3),TITLGB(10,3),
     > FACG(4,3),NOTE(20),NOT2(20),OFAC(20,20),NUN(8,3)
      DIMENSION SDOSE(20,40,4,2),SGOSE(3,40,4,2)
      DATA NUN/4H(WOR,4HKING,4H LEV,4HEL) ,4*4H    ,4H(WOR,
     > 4HKING,4H LEV,4HEL) ,4*4H    ,4H(PER,4HSON ,4HWORK,
     > 4HING ,4HLEVE,4HL)  ,2*4H    /
      DATA NOTE/4HRADO,4HN DA,4HUGHT,4HER E,4HXPOS,4HURE:,
     > 14*4H    /,NOT2/20*4H    /
      LOGICAL IDO,GENEFF
      DATA TITLA/4HINDI,4HVIDU,4HAL D,4HOSE ,4HRATE,4H (MR, 4HAD/Y,
     > 4HEAR),4H    ,4H    ,4HMEAN,4H IND,4HIVID,4HUAL , 4HDOSE,4H RAT,
     > 4HE (M,4HRAD/,4HYEAR,4H)   ,4HCOLL,4HECTI, 4HVE D,4HOSE ,4HRATE,
     > 4H (PE,4HRSON,4H RAD,4H /YE,4HAR) /
      DATA TITLB/4HINDI,4HVIDU,4HAL D,4HOSE ,4HEQ. ,4HRATE,4H(MRE,
```

```
     > 4HM/YE,4HAR) ,4H     ,4HMEAN,4H IND,4HIVID,4HUAL , 4HDOSE,4H EQ.,
     > 4H RAT,4HE (M,4HREM/,4HYR) ,4HCOLL,4HECTI, 4HVE D,4HOSE ,4HEQ. ,
     > 4H (PE,4HRSON,4H REM,4H /YE,4HAR) /
       DATA TITLGA/4HINDI,4HVIDU,4HAL G,4HENET,4HIC D,4HOSE ,
     <  4H(MRA,4HD)  ,4H     ,4H
     >  4HMEAN,4H IND,4HIVID,4HUAL ,4HGENE,4HTIC ,4HDOSE,4H (MR,
     >  4HAD) ,4H
     >  4HCOLL,4HECTI,4HVE G,4HENET,4HIC D,4HOSE ,4H( PE,4HRSON,
     >  4H RAD,4H)   /
       DATA TITLGB/4HINDI,4HVIDU,4HAL G,4HENET,4HIC D,4HOSE ,
     >  4HEQ. ,4H(MRE,4HM)  ,4H
     >  4HMEAN,4H IND,4HIVID,4HUAL ,4HGENE,4HTIC ,4HDOSE,4H EQ.,
     >  4H (MR,4HEM)
     >  4HCOLL,4HECTI,4HVE G,4HENET,4HIC D,4HOSE ,4HEQ. ,4H(PER,
     <  4HSON ,4HREM)/
      DATA TLET/4HLOW ,4HLET ,4HHIGH,4H LET,4H     ,4H     /
      COMMON/COMOR/ORGN(20),NORGN,TIME(20),DOSE(20,40,4,2)
      COMMON/LETFAC/HLET(20),LLET(20)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
     > INDPOP
      DATA FACD/1.,1.,1.,100.,1.,1.,1.,100.,.001,.001,.001,.1/
        DATA FACG/1.,1.,1.,100.,1.,1.,1.,100.,.001,.001,.001,.1/
      DATA IKP/0/
C*****??????????
C***    MULTIPLY DOSES BY EXPOSURES
C***    PREPARE TABLE FOR HIGH AND LOW LET SEPARATELY
      IF (IKP.EQ.1) GO TO 6
      IKP = 1
        DO 5 J=1,3
        FACD(4,J)=FACD(4,J)*GSCFAC
        FACG(4,J)=FACG(4,J)*GSCFAC
5       CONTINUE
   6  DO 50 L=1,2
  10  DO 20 K=1,2
  20  TITL2(K)=TLET(K,L)
      DO 40 IT=1,3
        DO 42 J=1,NOREP
        DO 42 K=1,1
        OFAC(J,K)=1.
42      CONTINUE
      IDO=.FALSE.
        IF(ILET.EQ.1) GO TO 35
      DO 30 K=1,7
      ITAB(K)=0
      IF (TABLE(K).NE.IT.AND.TABLE(K).NE.4) GO TO 30
      ITAB(K)=1
      IDO=.TRUE.
  30  CONTINUE
35      CONTINUE
      IF (ITAB(6).NE.0) ITAB(6)=0
        ORC=ORG
      IF (IDO) CALL MULT(IT,FACD(1,IT),DOSE(1,1,1,L),NORGN,ORGN,TITLE,
     > TITLA(1,IT),ITAB,TITL2,NOTE,NUN(1,IT),OFAC,OREP,NOREP,20,IFLAG)
        ORC=GON
        IF(IDO.AND.GENEFF) CALL MULT(IT,FACG(1,IT),GDOSE(1,1,1,L),NGEN,
     >  GEN,TITLE,TITLGA(1,IT),ITAB,TITL2,NOT2,NOT2,0.,0.,0,3,IFLAG)
        IF(IT.EQ.2) GO TO 38
        IF(NTLOC.EQ.0) GO TO 38
        DO 45 LL=1,NTLOC
        IF(FALOC(LL).NE.1) GO TO 45
```

```
        IF(HLLOC(LL).EQ.1) GO TO 45
        IF(LTABLE(LL).NE.IT .AND. LTABLE(LL).NE.4) GO TO 45
        CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),FACD(1,IT),
     A  DOSE(1,1,1,L),TITLE,TITLA(1,IT),TITL2,ORGN,NORGN,20,1)
        IF(GENEFF) CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),
     <  FACG(1,IT),GDOSE(1,1,1,L),TITLE,TITLGA(1,IT),TITL2,GEN,NGEN,
     <  3,1)
45      CONTINUE
38      CONTINUE
      IF (INDPOP.NE.1) GO TO 50
   40 CONTINUE
   50 CONTINUE
C***    COMBINE HIGH AND LOW LET USING INPUT QUALITY FACTORS
      DO 70 K=1,2
      TITL2(K)=ILET(K,3)
   70 CONTINUE
      DO 80 I=1,4
      DO 80 J=1,NONCLD
        DOSE(NORGN+1,J,I,1) = 0.0
      DO 80 K=1,NORGN
        SDOSE(K,J,I,1)  = DOSE(K,J,I,1)
      DOSE(K,J,I,1)=(DOSE(K,J,I,1)*LLET(K)+ DOSE(K,J,I,2)*HLET(K))
        DOSE(NORGN+1,J,I,1)=DOSE(NORGN+1,J,I,1)+DOSE(K,J,I,1)*FACO(K,I)
        IF (K.GT.NGEN) GO TO 80
        SGDOSE(K,J,I,1)  = GDOSE(K,J,I,1)
        GDOSE(K,J,I,1)=(GDOSE(K,J,I,1)*GLLET(K)+GDOSE(K,J,I,2)*GHLET(K))
80      CONTINUE
      DO 100 IT=1,3
      IDO=.FALSE.
        IF(ILET.EQ.0) GO TO 95
      DO 90 K=1,6
      ITAB(K)=0
      IF (TABLE(K).NE.IT.AND.TABLE(K).NE.4) GO TO 90
      ITAB(K)=1
      IDO=.TRUE.
   90 CONTINUE
95      CONTINUE
        ORGN(NORGN+1)=LAST
        ORC=ORG
      IF (IDO) CALL MULT(IT,FACD(1,IT),DOSE,NORGN+1,ORGN,TITLE,
     <  TITLB(1,IT),ITAB,TITL2,NOTE,NUN(1,IT),OFAC,OREP,NOREP,20,IFLAG)
C
C       RETURN IF PATHWAY DOSE CONVERSION FACTOR CALCULATION
C
      IF ( IFLAG .EQ. 1 ) GO TO 105
C
       ORC=GON
        IF(IDO.AND.GENEFF) CALL MULT(IT,FACG(1,IT),GDOSE,NGEN,GEN,
     <  TITLE,TITLGB(1,IT),ITAB,TITL2,NOT2,NOT2,0.,0.,0,3,IFLAG)
        IF(IT.EQ.2) GO TO 138
        IF(NTLOC.EQ.0) GO TO 138
        DO 135 LL=1,NTLOC
        IF(FALOC(LL).NE.1) GO TO 135
        IF(HLLOC(LL).EQ.0) GO TO 135
        IF(LTABLE(LL).NE.IT .AND. LTABLE(LL).NE.4) GO TO 135
        CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),FACD(1,IT),
     >  DOSE,TITLE,TITLB(1,IT),TITL2,ORGN,NORGN,20,1)
        IF(GENEFF) CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),
     >  FACG(1,IT),GDOSE,TITLE,TITLGB(1,IT),TITL2,GEN,NGEN,3,1)
135     CONTINUE
```

```
138     CONTINUE
      IF (INDPOP.NE.1) GO TO 105
  100 CONTINUE
  105   DO 180 I = 1,4
        DO 180 J = 1,NONCLD
        DO 180 K = 1,NORGN
          DOSE(K,J,I,1)  = SDOSE(K,J,I,1)
          IF ( K .GT. NGEN ) GO TO 180
            GDOSE(K,J,I,1) = SGOSE(K,J,I,1)
  180   CONTINUE
      RETURN
      END
C
C
C
C
      SUBROUTINE PREPHR(TABLE,ILET,TITLE,GSCFAC,IFLAG)
C***    PREPARE HEALTH RISKS TO BE OUTPUT
      REAL*8 CANC,NUCLID,RNLOC,OGLOC,ORG,CAN,LAST,GEN,RREP,OREP,CREP,
     A  BL,GON
        COMMON/HEAD/ORG
        COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),
     A  RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
        DATA CAN/8H CANCER /,LAST/8HTOTAL   /,
     A  GON/8H GONAD  /
      INTEGER TABLE,FALOC,HLLOC,PTLOC
      LOGICAL IDO,GENEFF
        COMMON/COMLOC/RNLOC(10),OGLOC(10),PTLOC(10),FALOC(10),
     >  HLLOC(10),LTABLE(10),NTLOC
        COMMON/COMGEN/GEN(3),NGEN,GDOSE(3,40,4,2),GRISK(3,40,4,2),
     >  GENEFF,GREAC(2),REPPER,GLLET(3),GHLET(3),GREF(3,40,4)
      DIMENSION TABLE(1),TITLE(1),TITLA(10,3), TLET(2,3),TITL2(2),
     > FACD(4,3),ITAB(7),TITLG(10,3),FACG(4,3),NOTE(20),NOT2(20)
     > ,NUN(8,3),DRISK(2),SRISK(20,40,4,2),SGISK(3,40,4,2)
        DATA NOTE/4HRADO,4HN DA,4HUGHT,4HER E,4HXPOS,4HURE ,4HRISK,
     >  4H:    ,12*4H    /,NOT2/20*4H    /
        DATA NUN/16*4H    ,4H(DEA,4HTH/Y,4HR)   ,5*4H    /
      DATA TITLA/4HINDI,4HVIDU,4HAL L,4HIFET,4HIME ,4HRISK, 4H (DE,
     > 4HATHS,4H)    ,4H    ,4HMEAN,4H IND,4HIVID,4HUAL , 4HLIFE,4HTIME,
     > 4H RIS,4HK (D,4HEATH,4HS)   ,4HFATA,4HL CA,4HNCER,4H RAT,
     > 4HE (D,4HEATH,4H/YR),3*4H    /
        DATA TITLG/4HINDI,4HVIDU,4HAL G,4HENET,4HIC E,4HFFEC,4HTS P,
     <  4HER B,4HIRTH,4H    ,
     <  4HMEAN,4H IND,4HIVID,4HUAL ,4HGENE,4HTIC ,4HEFFE,4HCTS ,
     <  4H/BIR,4HTH    ,
     <  4HCOLL,4HECTI,4HVE G,4HENET,4HIC E,4HFFEC,4HT(EF,4HFECT,
     <  4HS/YR,4H)   /
      DATA FACD/2*1.E-5,10.,1000.,2*1.E-5,10.,1000.,4*0./
        DATA FACG/1.,1.,1.,100.,1.,1.,1.,100.,.001,.001,.001,.1/
C*****???????
      DATA IKP/0/
      DATA ILET/4HLOW ,4HLET ,4HHIGH,4H LET,4HCOMB,4H.LET/
      COMMON/COMCA/CANC(20),NCANC,RELABS(20),RISK(20,40,4,2),RTABLE(7),
     > AGEX,YRLL(20,40,4,2)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
     > INDPOP
C***    MULTIPLY RISKS BY EXPOSURES
C***    PREPARE HIGH AND LOW LET SEPARATELY
      IF (IKP.EQ.1) GO TO 6
      IKP = 1
```

```
        DO 2 J=1,3
        FACD(4,J)=GSCFAC*FACD(4,J)
        FACG(4,J)=GSCFAC*FACG(4,J)
2       CONTINUE
      DO 5 J=1,4
        FACG(J,3)=FACG(J,2)*REPPER
5     FACD(J,3)=FACD(J,2)/AGEX
   6  DO 50 L=1,2
  10  DO 20 K=1,2
  20  TITL2(K)=ILET(K,L)
        DO 25 I=1,4
        DO 25 J=1,NONCLD
        DO 25 K=1,NCANC
        RISK(NCANC+1,J,I,L)=RISK(K,J,1,L)+RISK(NCANC+1,J,I,L)
25      CONTINUE
      DO 40 IT=1,3
      IDO=.FALSE.
        IF(ILET.EQ.1) GO TO 35
      DO 30 K=1,7
      ITAB(K)=0
      IF (TABLE(K).NE.IT.AND.TABLE(K).NE.4) GO TO 30
      IDO=.TRUE.
      ITAB(K)=1
  30  CONTINUE
35      CONTINUE
        ORG=CAN
        DRISK(1)=RRISK
        IF(IT.EQ.3) DRISK(1)=RRISK/AGEX
        DRISK(2)=DRISK(1)
      IF (IDO) CALL MULT(IT,FACD(1,IT),RISK(1,1,1,L),NCANC+1,CANC,TITLE,
     > TITLA(1,IT),ITAB,TITL2,NOTE,NUN(1,IT),DRISK,CREP,NCREP,20,IFLAG)
        ORG=GON
        IF(IDO.AND. GENEFF) CALL MULT(IT,FACG(1,IT),GRISK(1,1,1,L),
     >  1,GEN(3),TITLE,TITLG(1,IT),ITAB,TITL2,NOT2,NOT2,0.,0.,0,3,IFLAG)
        IF(IT.EQ.2) GO TO 38
        IF(NTLOC.EQ.0) GO TO 38
        DO 45 LL=1,NTLOC
        IF(FALOC(LL).NE.2) GO TO 45
        IF(HLLOC(LL).EQ.1) GO TO 45
        IF(LTABLE(LL).NE.IT .AND. LTABLE(LL).NE.4) GO TO 45
        CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),FACD(1,IT),
     >  RISK(1,1,1,L),TITLE,TITLA(1,IT),TITL2,CANC,NCANC,20,3)
        IF(GENEFF) CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),
     <  FACG(1,IT),GRISK(1,1,1,L),TITLE,TITLG(1,IT),TITL2,
     <  GEN(3),1,3,3)
45      CONTINUE
38      CONTINUE
      IF (INDPOP.NE.1) GO TO 50
  40  CONTINUE
  50  CONTINUE
C***    COMBINE HIGH AND LOW LET USING INPUT QUALITY FACTORS
      DO 70 I=1,4
      DO 70 J=1,NONCLD
        RISK(NCANC+1,J,I,1)=0.0
      DO 70 K=1,NCANC
        SRISK(K,J,I,1) = RISK(K,J,1,1)
      RISK(K,J,I,1)=RISK(K,J,I,1)+RISK(K,J,I,2)
        RISK(NCANC+1,J,I,1)=RISK(NCANC+1,J,I,1)+RISK(K,J,I,1)
        IF(K.GT.1) GO TO 70
        SGISK(K,J,I,1) = GRISK(K,J,I,1)
```

```
        GRISK(K,J,I,1)=GRISK(K,J,I,1)+GRISK(K,J,I,2)
70      CONTINUE
        CANC(NCANC+1)=LAST
      DO 80 K=1,2
      TITL2(K)=ILET(K,3)
   80 CONTINUE
      DO 100 IT=1,3
      IDO=.FALSE.
        IF(ILET.EQ.0) GO TO 95
      DO 90 K=1,6
      ITAB(K)=0
      IF (TABLE(K).NE.IT.AND.TABLE(K).NE.4) GO TO 90
      IDO=.TRUE.
      ITAB(K)=1
   90 CONTINUE
95      CONTINUE
        DRISK(1)=RRISK
        IF(IT.EQ.3) DRISK(1)=RRISK/AGEX
        DRISK(2)=DRISK(1)
        ORG=CAN
      IF (IDO) CALL MULT(IT,FACD(1,IT),RISK,NCANC+1,CANC,TITLE, TITLA(1,
     > IT),ITAB,TITL2,NOTE,NUN(1,IT),DRISK,CREP,NCREP,20,IFLAG)
        ORG=GON
        IF(IDO.AND.GENEFF) CALL MULT(IT,FACG(1,IT),GRISK,1,GEN(3),
     >  TITLE,TITLG(1,IT),ITAB,TITL2,NOT2,NOT2,0.,0.,0,3,IFLAG)
        IF(IT.EQ.2) GO TO 138
        IF(NTLOC.EQ.0) GO TO 138
        DO 135 LL=1,NTLOC
        IF(FALOC(LL).NE.2) GO TO 135
        IF(HLLOC(LL).EQ.0) GO TO 135
        IF(LTABLE(LL).NE.IT .AND. LTABLE(LL).NE.4) GO TO 135
        CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),FACD(1,IT),
     >  RISK,TITLE,TITLA(1,IT),TITL2,CANC,NCANC,20,3)
        IF(GENEFF) CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),
     >  FACG(1,IT),GRISK,TITLE,TITLG(1,IT),TITL2,GEN(3),1,3,3)
135     CONTINUE
138     CONTINUE
      IF (INDPOP.NE.1) GO TO 105
  100 CONTINUE
  105   DO 170 I = 1,4
        DO 170 J = 1,NONCLD
        DO 170 K = 1,NCANC
          RISK(K,J,I,1) = SRISK(K,J,I,1)
          IF ( K .EQ. 1 ) GRISK(K,J,I,1) = SGISK(K,J,1,1)
  170   CONTINUE
      RETURN
      END
C
C
C
C
      SUBROUTINE PREPRF(TABLE,TITLE,GSCFAC,IFLAG)
C***    PREPARE HEALTH EQUIVALENT FACTORS TO BE OUTPUT.
      REAL*8 CANC,NUCLID,TOTAL,RNLOC,OGLOC,ORC,CAN,GEN,OREP,RREP,CREP,
     > GON
        COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),
     A  RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
        LOGICAL GENEFF
        COMMON/HEAD/ORC
        DATA CAN/8H CANCER /,GON/8H GONAD  /
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      DATA TOTAL/8HW. BODY /
      INTEGER TABLE,FALOC,HLLOC,PTLOC
      LOGICAL IDO
        COMMON/COMLOC/RNLOC(10),OGLOC(10),PTLOC(10),FALOC(10),
     >  HLLOC(10),LTABLE(10),NTLOC
        COMMON/COMGEN/GEN(3),NGEN,GDOSE(3,40,4,2),GRISK(3,40,4,2),
     >  GENEFF,GRFAC(2),REPPER,GLLET(3),GHLET(3),GREF(3,40,4)
      DIMENSION TABLE(1),TITLE(1),TITLA(10,3), TITL2(2),FACD(4,3),
     > ITAB(7),NOTE(20),TITLG(10,3),FACG(4,3),NOTA(20),DREF(2),NUN(8,3)
         DATA NUN/4H(MRE,4HM/YR,4H)    ,5*4H     ,4H(MRE,
     >    4HM/YR,4H)    ,5*4H     ,4H(PER,4HSON ,4HREM/,4HYR) ,
     >     4*4H     /
        DATA NOTE/4HRADO,4HN DA,4HUGHT,4HER E, 4HXPOS,4HURE ,
     >  4HRISK,4H EQU,4HIVAL,4HENT:,10*4H     /,NOTA/20*4H     /
        DATA FACD/1.,1.,1.E6,1.E8,1.,1.,1.E6,1.E8,.001,
     A  .001,1.E3,1.E5/
        DATA FACG/1.,1.,1.,100.,1.,1.,1.,100.,.001,.001,.001,.1/
      DATA IKP/0/
      DATA TITLA/4HINDI,4HVIDU,4HAL R,4HISK ,4HEQ. ,4HRATE, 4H (MR,
     > 4HEM/Y,4HEAR),4H     ,4HMEAN,4H IND,4HIVID,4HUAL , 4HRISK,4H EQ.,
     > 4H RAT,4HE(MR,4HEM/Y,4HEAR),4HCOLL,4HECTI, 4HVE R,4HISK ,4HEQ R,
     > 4HATE(,4HPERS,4HON R,4HEM/Y,4HEAR)/
        DATA TITLG/4HINDI,4HVIDU,4HAL G,4HENET,4HIC R,4HISK ,
     A  4HEQ. ,4H(MRE,4HM/YE,4HAR) ,
     A4HMEAN,4H IND,4HIVID,4HUAL ,4HGENE,4HTIC ,4HRISK,
     A4H EQ.,4H(MRE,4HM/Y),
     A4HCOLL,4H. GE,4HNETI,4HC RI,4HSK E,4HQ. (,4HPERS,
     A4HON R,4HEM/Y,4HEAR)/
      DATA TITL2/4H     ,4H     /
      COMMON/COMCA/CANC(20),NCANC,RELABS(20),RISK(20,40,4,2)
      COMMON/COMRE/REF(20,40,4),FTABLE(7)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
     > INDPOP
      NCANR=NCANC+1
      CANC(NCANR)=TOTAL
        CREP(NCREP+1)=TOTAL
      IF (IKP.EQ.1) GO TO 6
      IKP = 1
        DO 5 J=1,3
        FACD(4,J)=FACD(4,J)*GSCFAC
        FACG(4,J)=FACG(4,J)*GSCFAC
5       CONTINUE
    6 DO 20 IT=1,3
      IDO=.FALSE.
      DO 10 K=1,7
      ITAB(K)=0
      IF (TABLE(K).NE.IT.AND.TABLE(K).NE.4) GO TO 10
      ITAB(K)=1
      IDO=.TRUE.
   10 CONTINUE
        NCRR=NCREP+1
        IF(NCREP.EQ.0) NCRR=0
       ORC=CAN
        FAC=1.
        IF(IT.EQ.3)FAC=.001
        DO 12 J=1,NCRR
12       DREF(J)=RREF(J)*FAC
      IF (IDO) CALL MULT(IT,FACD(1,IT),REF,NCANR,CANC,TITLE, TITLA(1,IT)
     > ,ITAB,TITL2,NOTE,NUN(1,IT),DREF,CREP,NCRR,20,IFLAG)
        ORC=GON
```

```
      IF(IDO.AND.GENEFF) CALL MULT(IT,FACG(1,IT),GREF,1,GEN(3),
     > TITLE,TITLG(1,IT),ITAB,TITL2,NOTA,NOTA,0.,0.,0,3,IFLAG)
      IF(IT.EQ.2) GO TO 38
      IF(NTLOC.EQ.0) GO TO 38
      DO 35 LL=1,NTLOC
      IF(FALOC(LL).NE.3) GO TO 35
      IF(LTABLE(LL).NE.IT .AND. LTABLE(LL).NE.4) GO TO 35
      CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),FACD(1,IT),
     A REF,TITLE,TITLA(1,IT),TITL2,CANC,NCANR,20,2)
      IF(GENEFF) CALL LOCTAB(IT,RNLOC(LL),PTLOC(LL),OGLOC(LL),
     A FACG(1,IT),GREF,TITLE,TITLG(1,IT),TITL2,GEN(3),1,3,2)
35    CONTINUE
38    CONTINUE
      IF (INDPOP.NE.1) RETURN
   20 CONTINUE
      RETURN
      END
C
C
C
C
      SUBROUTINE DRTAB(ARRAY,NORGN,ORGN,TITLE,TITL1,DTABLE,TITLA,NOTE,
     A NUN,RFAC,CREP,NCREP,IFLAG)
C***  THIS ROUTINE OUTPUT THE APPROPRIATE TABLES.
      REAL*8 ORGN,NUCLID,ORC,SUM,CREP,OREP,RREP,CFAK,RADON
      DATA RADON/8HRN-222  /
      COMMON/COMRN/OREP(20),RREP(20),CFAK(20),WLRN(20,20),
     A RRISK,RREF(2),RYRLL,NOREP,NRREP,NFREP
      COMMON/HEAD/ORC
      COMMON/PDCF/DCFCTR(4,40)
      INTEGER DTABLE
      DIMENSION ARRAY(20,40,4),ORGN(1),TITLE(20),TITLA(2),PATH(4,7),
     > DTABLE(1),TITL1(10),NOTE(20),CREP(1),WLSUM(4),RFAC(NCREP),NUN(8)
      DATA PATH/4HINGE,4HSTIO,4HN   ,4H    ,4HINHA,4HLATI,4HON  ,
     > 4H    ,4HAIR ,4HIMME,4HRSIO,4HN   ,4HGROU,4HND S, 4HURFA,4HCE  ,
     > 4HINTE,4HRNAL,4H    ,4H    , 4HEXTE,4HRNAL,4H    ,4H    ,
     > 4H    ,4H    ,4H    ,4H    /
      DATA SUM/8HTOTAL  /
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
     > INDPOP
      COMMON/COMUS/SUMX(40,7),SUMY(40,3),PERX(40),PERY(40),TVAL(40),
     > FACD(20,4)
C***    SUM OVER ALL NUCLIDES FOR EACH ORGAN AND PATHWAY
C***    PATHWAY 5 IS INTERNAL, 6 IS EXTERNAL, AND 7 IS ALL PATHWAYS
      DO 10 I=1,7
      DO 10 K=1,NORGN
   10 SUMX(K,I)=0.0
      DO 30 I=1,4
      DO 20 K=1,NORGN
      DO 20 J=1,NONCLD
      SUMX(K,I)=SUMX(K,I)+ARRAY(K,J,I)
      IF (I.LE.2) SUMX(K,5)=SUMX(K,5)+ARRAY(K,J,I)
      IF (I.GE.3) SUMX(K,6)=SUMX(K,6)+ARRAY(K,J,I)
      SUMX(K,7)=SUMX(K,7)+ARRAY(K,J,I)
   20 CONTINUE
   30 CONTINUE
C
C      IF DOSE FACTOR CALCULATION TRANSFER TO STATEMENT 350
C
      IF (IFLAG.EQ.1) GO TO 350
```

```
C
C***    TABLE 1
      IF (DTABLE(1).EQ.0) GO TO 80
      DO 70 I=1,4
      WRITE(6,10000) TITLE,TITL1,TITLA
      WRITE(6,10200) (PATH(N,I),N=1,4)
      WRITE(6,10300) ORC,(ORGN(K),K=1,NORGN)
      WRITE(6,10400)
      DO 60 J=1,NONCLD
      DO 40 K=1,NORGN
      PERX(K)=0.0
   40 IF (SUMX(K,I).NE.0.0) PERX(K)=ARRAY(K,J,I)/SUMX(K,I)*100.
      WRITE(6,10500) NUCLID(J),(ARRAY(K,J,I),K=1,NORGN)
      WRITE(6,10600) (PATH(N,I),N=1,4),(PERX(K),K=1,NORGN)
      DO 50 K=1,NORGN
      II=5
      IF (1.GT.2) II=6
      PERX(K)=0.0
      IF (SUMX(K,II).NE.0.0) PERX(K)=ARRAY(K,J,I)/SUMX(K,II)*100.
      PERY(K)=0.0
   50 IF (SUMX(K,7).NE.0.0) PERY(K)=ARRAY(K,J,I)/SUMX(K,7)*100.
      WRITE(6,10600) (PATH(N,II),N=1,4),(PERX(K),K=1,NORGN)
      WRITE(6,10700) (PERY(K),K=1,NORGN)
      WRITE(6,10100)
   60 CONTINUE
      WRITE(6,11000) (SUMX(K,I),K=1,NORGN)
        IF(I.NE.2) GO TO 70
        DO 75 J=1,NONCLD
        IF(NUCLID(J).NE.RADON) GO TO 75
        WRITE(6,20100) NOTE
        IF(REAC(1).EQ.0.0) GO TO 75
        WRITE(6,10300)ORC, (CREP(JJ),JJ=1,NCREP)
        WRITE(6,20400)NUN,(REAC(JJ),JJ=1,NCREP)
75      CONTINUE
70      CONTINUE
C***    TABLE 2
   80 IF (DTABLE(2).EQ.0) GO TO 120
      DO 110 I=1,2
      WRITE(6,10000) TITLE,TITL1,TITLA
      II=I+4
      WRITE(6,10200) (PATH(N,II),N=1,4)
      WRITE(6,10300) ORC,(ORGN(K),K=1,NORGN)
      WRITE(6,10400)
      DO 100 J=1,NONCLD
      DO 90 K=1,NORGN
      L=1
      IF (1.EQ.2) L=3
      TVAL(K)=ARRAY(K,J,L)+ARRAY(K,J,L+1)
      PERY(K)=0.0
      IF (SUMX(K,II).NE.0.0) PERY(K)=TVAL(K)/SUMX(K,II)*100.
      PERX(K)=0.0
   90 IF (SUMX(K,7).NE.0.0) PERX(K)=TVAL(K)/SUMX(K,7)*100.
      WRITE(6,10500) NUCLID(J),(TVAL(K),K=1,NORGN)
      WRITE(6,10600) (PATH(N,II),N=1,4),(PERY(K),K=1,NORGN)
      WRITE(6,10700) (PERX(K),K=1,NORGN)
  100 CONTINUE
      WRITE(6,11000) (SUMX(K,II),K=1,NORGN)
      WRITE(6,10100)
        IF(I.NE.1) GO TO 110
        DO 115 J=1,NONCLD
```

```
        IF(NUCLID(J).NE.RADON)GO TO 115
         WRITE(6,20100) NOTE
        IF(REAC(1).EQ.0.0) GO TO 115
      WRITE(6,10300)ORC,(CREP(JJ),JJ=1,NCREP)
      WRITE(6,20400)NUN,(REAC(JJ),JJ=1,NCREP)
115     CONTINUE
110     CONTINUE
C***    TABLE 3
  120 IF (DTABLE(3).EQ.0) GO TO 170
      WRITE(6,10000) TITLE,TITL1,TITLA
      WRITE(6,10900)
      WRITE(6,10300) ORC,(ORGN(K),K=1,NORGN)
      WRITE(6,10400)
      DO 160 J=1,NONCLD
      DO 130 K=1,NORGN
  130 TVAL(K)=0.0
      DO 150 K=1,NORGN
      DO 140 I=1,4
      TVAL(K)=ARRAY(K,J,I)+TVAL(K)
  140 CONTINUE
      PERX(K)=0.0
      IF (SUMX(K,7).NE.0.0) PERX(K)=TVAL(K)/SUMX(K,7)*100.
  150 CONTINUE
      WRITE(6,10500) NUCLID(J),(TVAL(K),K=1,NORGN)
      WRITE(6,10700) (PERX(K),K=1,NORGN)
      WRITE(6,10100)
  160 CONTINUE
      WRITE(6,11000) (SUMX(K,7),K=1,NORGN)
        DO 165 J=1,NONCLD
        IF(NUCLID(J).NE.RADON) GO TO 165
        WRITE(6,20100) NOTE
        IF(REAC(1).EQ.0.0) GO TO 165
        WRITE(6,10300)ORC, (CREP(K),K=1,NCREP)
        WRITE(6,20400)NUN, (REAC(JJ),JJ=1,NCREP)
165     CONTINUE
C***    TABLE 4
  170 IF (DTABLE(4).EQ.0) GO TO 260
      DO 250 K=1,NORGN
      WRITE(6,10000) TITLE,TITL1,TITLA
      WRITE(6,11100) ORC,ORGN(K)
      WRITE(6,11200) (NUCLID(J),J=1,NONCLD),SUM
      WRITE(6,11300)
      DO 180 I=1,3
      DO 180 J=1,NONCLD
  180 SUMY(J,1)=0.0
      DO 200 I=1,4
      DO 190 J=1,NONCLD
      IF (I.LE.2) SUMY(J,1)=SUMY(J,1)+ARRAY(K,J,I)
      IF (I.GE.3) SUMY(J,2)=SUMY(J,2)+ARRAY(K,J,I)
      SUMY(J,3)=SUMY(J,3)+ARRAY(K,J,I)
  190 CONTINUE
  200 CONTINUE
      DO 220 I=1,4
      WRITE(6,11400) (PATH(N,I),N=1,4),(ARRAY(K,J,I),J=1,NONCLD),
     > SUMX(K,I)
      DO 210 J=1,NONCLD
      II=1
      IF (I.GT.2) II=2
      PERX(J)=0.0
      IF (SUMY(J,II).NE.0.0) PERX(J)=ARRAY(K,J,I)/SUMY(J,II)*100.
```

```
      PERY(J)=0.0
      IF (SUMY(J,3).NE.0.0) PERY(J)=ARRAY(K,J,I)/SUMY(J,3)*100.
  210 CONTINUE
      WPP=0.0
      IF (SUMX(K,4+II).NE.0.0) WPP=SUMX(K,I)/SUMX(K,4+II)*100.
      WP=0.0
      IF (SUMX(K,7).NE.0.0) WP=SUMX(K,1)/SUMX(K,7)*100.
      WRITE(6,11500) (PATH(N,4+II),N=1,4),(PERX(J),J=1,NONCLD),WPP
      WRITE(6,11600) (PERY(J),J=1,NONCLD),WP
      WRITE(6,10100)
  220 CONTINUE
      DO 240 I=1,2
      WRITE(6,11400) (PATH(N,I+4),N=1,4),(SUMY(J,I),J=1,NONCLD), SUMX(K,
     > 4+I)
      DO 230 J=1,NONCLD
      PERX(J)=0.0
  230 IF (SUMY(J,3).NE.0.0) PERX(J)=SUMY(J,I)/SUMY(J,3)*100.
      WP=0.0
      IF (SUMX(K,7).NE.0.0) WP=SUMX(K,4+I)/SUMX(K,7)*100.
      WRITE(6,11600) (PERX(J),J=1,NONCLD),WP
      WRITE(6,10100)
  240 CONTINUE
      WRITE(6,11700) (SUMY(J,3),J=1,NONCLD),SUMX(K,7)
        DO 245 J=1,NONCLD
        IF(NUCLID(J).NE.RADON) GO TO 245
        JJ=NCREP
        IF(ORGN(K).EQ.SUM) GO TO 256
        DO 255 JJ=1,NCREP
        IF(ORGN(K).NE.CREP(JJ)) GO TO 255
 256    WRITE(6,20100) NOTE
        IF(REAC(1).EQ.0.0) GO TO 250
        WRITE(6,20400)NUN, REAC(JJ)
255     CONTINUE
245     CONTINUE
  250 CONTINUE
C***    TABLE 5
  260 IF (DTABLE(5).EQ.0) GO TO 350
      DO 340 J=1,NONCLD
      WRITE(6,10000) TITLE,TITL1,TITLA
      WRITE(6,11800) NUCLID(J)
      DO 270 I=1,3
      DO 270 K=1,NORGN
  270 SUMY(K,I)=0.0
      DO 280 I=1,4
      DO 280 K=1,NORGN
      IF (I.LE.2) SUMY(K,1)=SUMY(K,1)+ARRAY(K,J,I)
      IF (I.GE.3) SUMY(K,2)=SUMY(K,2)+ARRAY(K,J,I)
      SUMY(K,3)=SUMY(K,3)+ARRAY(K,J,I)
  280 CONTINUE
      WRITE(6,11900) ORC,(ORGN(K),K=1,NORGN)
      WRITE(6,11300)
      DO 300 I=1,4
      WRITE(6,11400) (PATH(N,I),N=1,4),(ARRAY(K,J,I),K=1,NORGN)
      II=1
      IF (I.GE.3) II=2
      DO 290 K=1,NORGN
      PERX(K)=0.0
      IF (SUMY(K,II).NE.0.0) PERX(K)=ARRAY(K,J,I)/SUMY(K,II)*100.
      PERY(K)=0.0
      IF (SUMY(K,3).NE.0.0) PERY(K)=ARRAY(K,J,I)/SUMY(K,3)*100.
```

```
  290 CONTINUE
      WRITE(6,11500) (PATH(N,11+4),N=1,4), (PERX(K),K=1,NORGN)
      WRITE(6,11600) (PERY(K),K=1,NORGN)
      WRITE(6,10100)
  300 CONTINUE
      DO 320 I=1,2
      WRITE(6,11400) (PATH(N,I+4),N=1,4),(SUMY(K,I),K=1,NORGN)
      DO 310 K=1,NORGN
      PERX(K)=0.0
      IF (SUMY(K,3).NE.0.0) PERX(K)=SUMY(K,I)/SUMY(K,3)*100.
  310 CONTINUE
      WRITE(6,11600) (PERX(K),K=1,NORGN)
      WRITE(6,10100)
  320 CONTINUE
      WRITE(6,11700) (SUMY(K,3),K=1,NORGN)
      DO 330 K=1,NORGN
      PERX(K)=0.0
  330 IF (SUMX(K,7).NE.0.0) PERX(K)=SUMY(K,3)/SUMX(K,7)*100.
      WRITE(6,10700) (PERX(K),K=1,NORGN)
        L=1
        WRITE(6,20100) NOTE
        IF(REAC(1).EQ.0.0) GO TO 340
        WRITE(6,10300)ORC, (CREP(K),K=1,NCREP)
        WRITE(6,20400)NUN, (REAC(K),K=1,NCREP)
335     CONTINUE
  340 CONTINUE
C***    TABLE 6
  350 IF (DTABLE(6).EQ.0) GO TO 500
        DO 360 I=1,7
        TVAL(I)=0.0
        DO 360 J=1,NONCLD
        SUMX(J,I)=0.0
360     CONTINUE
  390 DO 400 I=1,4
      DO 400 J=1,NONCLD
      SUMX(J,I)=ARRAY(NORGN,J,I)
        IF(I.GE.3) GO TO 401
      SUMX(J,5)=SUMX(J,5)+ARRAY(NORGN,J,I)
        TVAL(5)=TVAL(5)+ARRAY(NORGN,J,I)
        GO TO 402
401      SUMX(J,6)=SUMX(J,6)+ARRAY(NORGN,J,I)
        TVAL(6)=TVAL(6)+ARRAY(NORGN,J,I)
402      SUMX(J,7)=SUMX(J,7)+ARRAY(NORGN,J,I)
      TVAL(I)=TVAL(I)+ARRAY(NORGN,J,I)
        TVAL(7)=TVAL(7)+ARRAY(NORGN,J,I)
  400 CONTINUE
C
C      SET PATHWAY DOSE CONVERSION FACTORS EQUAL TO SUMX; ELSE GO TO 410
C
      IF ( IFLAG .NE. 1 ) GO TO 410
C
      DO 405 I = 1,4
      DO 405 J = 1,NONCLD
        DCFCTR(1,J) = SUMX(J,I)
  405   CONTINUE
C
C      RETURN IF PATHWAY DOSE CONVERSION FACTOR CALCULATION
C
      RETURN
C
```

```
C
  410 CONTINUE
      WRITE(6,10000) TITLE,TITL1,TITLA
        WRITE(6,12100) ORC
      WRITE(6,11200) (NUCLID(J),J=1,NONCLD),SUM
      DO 430 I=1,4
      WRITE(6,11400) (PATH(N,I),N=1,4),(SUMX(J,I),J=1,NONCLD),TVAL(I)
      II=5
      IF (I.GE.3) II=6
      DO 420 J=1,NONCLD
      PERX(J)=0.0
      IF (SUMX(J,II).NE.0.0) PERX(J)=SUMX(J,I)/SUMX(J,II)*100.
      PERY(J)=0.0
      IF (SUMX(J,7).NE.0.0) PERY(J)=SUMX(J,I)/SUMX(J,7)*100.
  420 CONTINUE
      WP=0.0
      IF (TVAL(II).NE.0.0) WP=TVAL(I)/TVAL(II)*100.
      WPP=0.0
      IF (TVAL(7).NE.0.0) WPP=TVAL(I)/TVAL(7)*100.
      WRITE(6,11500) (PATH(N,II),N=1,4), (PERX(J),J=1,NONCLD),WP
      WRITE(6,11600) (PERY(J),J=1,NONCLD),WPP
      WRITE(6,10100)
  430 CONTINUE
      DO 450 I=5,6
      WRITE(6,11400) (PATH(N,I),N=1,4),(SUMX(J,I),J=1,NONCLD),TVAL(I)
      DO 440 J=1,NONCLD
      PERX(J)=0.0
      IF (SUMX(J,7).NE.0.0) PERX(J)=SUMX(J,1)/SUMX(J,7)*100.
  440 CONTINUE
      WRITE(6,11600) (PERX(J),J=1,NONCLD)
      WRITE(6,10100)
  450 CONTINUE
      WRITE(6,11700) (SUMX(J,7),J=1,NONCLD),TVAL(7)
      DO 460 J=1,NONCLD
      PERX(J)=0.0
      IF (TVAL(7).NE.0.0) PERX(J)=SUMX(J,7)/TVAL(7)*100.
  460 CONTINUE
      WRITE(6,12000) (PERX(J),J=1,NONCLD)
        DO 465 J=1,NONCLD
        IF(NUCLID(J).NE.RADON) GO TO 465
        WRITE(6,20100) NOTE
        IF(REAC(I).EQ.0.0) GO TO 470
        WRITE(6,20400)NUN, REAC
470     CONTINUE
465     CONTINUE
C***    TABLE 7
500     IF(DTABLE(7).EQ.0) RETURN
        DO 510 I=1,7
        DO 510 J=1,NORGN
        SUMX(J,I)=0.0
510     CONTINUE
        DO 550 I=1,4
        DO 550 J=1,NORGN
        DO 550 K=1,NONCLD
        SUMX(J,I)=SUMX(J,I)+ARRAY(J,K,I)
        IF(I.GE.3) GO TO 501
        SUMX(J,5)=SUMX(J,5)+ARRAY(J,K,I)
        GO TO 502
501     SUMX(J,6)=SUMX(J,6)+ARRAY(J,K,I)
502     SUMX(J,7)=SUMX(J,7)+ARRAY(J,K,I)
```

```
550     CONTINUE
        WRITE(6,10000) TITLE,TITL1,TITLA
        WRITE(6,12200)
        WRITE(6,10300) ORC,(ORGN(K),K=1,NORGN)
        WRITE(6,11300)
        DO 575 I=1,4
        WRITE(6,11400) (PATH(N,I),N=1,4),(SUMX(J,I),J=1,NORGN)
        II=5
        IF(I.GE.3) II=6
        DO 560 J=1,NORGN
        PERX(J)=0.0
        IF(SUMX(J,II).NE.0.0) PERX(J)=SUMX(J,I)/SUMX(J,II)*100.
        PERY(J)=0.0
        IF(SUMX(J,7).NE.0.0) PERY(J)=SUMX(J,I)/SUMX(J,7)*100.
560     CONTINUE
        WRITE(6,11500) (PATH(N,II),N=1,4),(PERX(J),J=1,NORGN)
        WRITE(6,11600) (PERY(J),J=1,NORGN)
        WRITE(6,10100)
575     CONTINUE
        DO 590 I=5,6
        WRITE(6,11400) (PATH(N,I),N=1,4),(SUMX(J,I),J=1,NORGN)
        DO 580 J=1,NORGN
        PERX(J)=0.0
        IF(SUMX(J,7).NE.0.0) PERX(J)=SUMX(J,I)/SUMX(J,7)*100.
580     CONTINUE
        WRITE(6,11600) (PERX(J),J=1,NORGN)
        WRITE(6,10100)
590     CONTINUE
        WRITE(6,11700) (SUMX(J,7),J=1,NORGN)
        DO 600 J=1,NONCLD
        IF(NUCLID(J).NE.RADON) GO TO 600
        WRITE(6,20100) NOTE
        IF(REAC(1).EQ.0.0) GO TO 600
        DO 610 L=1,NCREP
610     WLSUM(L)=0.0
        DO 612 JJ=1,1
        DO 612 L=1,NCREP
        WLSUM(L)=WLSUM(L)+REAC(L)
612     CONTINUE
        WRITE(6,10300)ORC, (CREP(L),L=1,NCREP)
        WRITE(6,20400)NUN, (WLSUM(L),L=1,NCREP)
600     CONTINUE
      RETURN
10000 FORMAT(1H1,20X,20A4/21X,10A4/21X,2A4)
10100 FORMAT(1X)
10200 FORMAT('0*** FOR PATHWAY:',4A4//)
10300 FORMAT(1H0,A8,1H:,22X,10(2X,A8)/(33X,10(2X,A8)))
10400 FORMAT(9H0NUCLIDES/)
10500 FORMAT(1X,A8,23X,1P10G10.3/(33X,1P10G10.3))
10600 FORMAT(11H % OF TOTAL,1X,4A4,4X, 1P10G10.3/(33X,1P10G10.3))
10700 FORMAT(11H % OF TOTAL,21X,1P10G10.3/ (33X,1P10G10.3))
10800 FORMAT('0TOTAL      ',21X,1P10G10.3/(33X,1P10G10.3))
10900 FORMAT('0*** FOR ALL PATHWAYS:'//)
11000 FORMAT(' TOTAL',26X,1P10G10.3/(33X,1P10G10.3))
11100 FORMAT('0***FOR',A8,':',A8//)
11200 FORMAT(' NUCLIDES',23X,10(2X,A8)/(33X,10(2X,A8)))
11300 FORMAT(' PATHWAYS'/)
11400 FORMAT(1X,4A4,15X,1P10G10.3/(33X,1P10G10.3))
11500 FORMAT(6H % OF ,1X,4A4,9X,1P10G10.3/ (33X,1P10G10.3))
11600 FORMAT(18H % OF ALL PATHWAYS,14X,1P10G10.3/ (33X,1P10G10.3))
```

```
11700 FORMAT(24H TOTAL OVER ALL PATHWAYS,8X,1P10G10.3/(33X,1P10G10.3))
11800 FORMAT('0FOR NUCLIDE:',A8)
11900 FORMAT(1X,A8,23X,10(2X,A8)/(33X,10(2X,A8)))
12000 FORMAT(11H % OF TOTAL,21X,1P10G10.3/(33X,1P10G10.3))
12100   FORMAT('0***SUMMED OVER ALL',A8)
12200   FORMAT('0***SUMMED OVER ALL NUCLIDES')
20100   FORMAT('0'/////10X,20A4)
20400   FORMAT(1X,8A4,1P10G10.3)
      END
C
C
C
C
      SUBROUTINE CHLOC(PLOC,CONC,GSCFAC,IFLAG)
      REAL*8 CANC,NUC,NUCLID,RADON,OREP,CREP,RREP,PNUC
      DIMENSION CONC(4),FAC(4),IOR(4)
        DATA FAC/2*1.E-5,10.,1000./
        DATA IKP/0/
        DATA BRTHRT/.83E6/
      DATA RADON/8HRN-222  /
      DATA IOR/3,4,1,2/
      COMMON/COMEX/EXPP(20,20,40,4),POP(20,20),POPFAC,TOTFAC, NOL,NOU,
     > NRL,NRU,IDIST(20),ILOC,JLOC
      COMMON/COMCA/CANC(20),NCANC,RELABS(20),RISK(20,40,4,2), RTABLE(7),
     > AGEX,YRLL(20,40,4,2)
        COMMON/COMRE/REF(20,40,4),FTABLE(7)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),IND
        COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20)
     A  ,RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
      COMMON/COMUS/TRISK(20,20),IO(400)
      COMMON/PASS/PNUC(40),PCON1(40),PCON2(40),PCON3(40),
     &       PCON4(40),PPOP,LLIND,LDIST
      DIMENSION SRISK(400),ANGLE(16)
        DATA ANGLE/4HN    ,4HNNE ,4HNE   ,4HENE ,4HE    ,
     A  4HESE ,4HSE   ,4HSSE ,4HS    ,4HSSW ,4HSW   ,4HWSW ,
     B  4HW    ,4HWNW ,4HNW   ,4HNNW /
      EQUIVALENCE(TRISK(1,1),SRISK(1))
        IF (IKP.EQ.0) FAC(4)=FAC(4)*GSCFAC
        IKP = 1
        NOP=JLOC+(ILOC-1)*20
        DO 2 K=1,20
        DO 2 L=1,20
        POP(L,K)=1.0
        WLRN(L,K)=0.0
        TRISK(L,K)=0.0
2       CONTINUE
      DO 10 K=1,40
      DO 10 J=1,20
        DO 5 I=1,4
        DO 5 L=1,20
5       EXPP(L,J,K,I)=0.0
10      CONTINUE
      NOL=1
      NOU=1
      NRL=1
      NRU=1
      DO 90 II=1,NONCLD
      IDIST(I)=LDIST
      IND=LLIND
      NUC=PNUC(II)
```

```
      CONC(1)=PCON1(II)
      CONC(2)=PCON2(II)
      CONC(3)=PCON3(II)
      CONC(4)=PCON4(II)
      DO 30 J=1,NONCLD
      IF (NUC.EQ.NUCLID(J)) GO TO 40
   30 CONTINUE
      GO TO 90
   40 CONTINUE
      IF (NUC.EQ.RADON) GO TO 160
      DO 70 ILO=NOL,NOU
      DO 70 JLO=NRL,NRU
      DO 50 NC=1,NCANC
      DO 50 L=1,4
      DO 50 N=1,2
      TRISK(JLO,ILO)=TRISK(JLO,ILO)+RISK(NC,J,IOR(L),N)*
     A  CONC(L)*FAC(IOR(L))
   50 CONTINUE
      DO 60 I=1,4
      EXPP(JLO,ILO,J,IOR(I))=CONC(I)
   60 CONTINUE
   70 CONTINUE
      POP(1,1)=PPOP
      GO TO 90
  160 CONTINUE
C***    SPECIAL SECTION FOR RADON-222
      DO 190 ILO=NOL,NOU
      DO 190 JLO=NRL,NRU
C     READ(26) WFRAC,WLEVEL
  170 EXPP(JLO,ILO,J,3)=WLEVEL*1.E-6/(10.*WFRAC)
        EXPP(JLO,ILO,J,2)=WLEVEL*BRTHRT*8760./(10.*WFRAC)
        EXPP(JLO,ILO,J,1)=0.0
        EXPP(JLO,ILO,J,4)=0.0
        DO 180 N=1,2
        DO 180 K=1,4
        DO 180 NC=1,NCANC
        TRISK(JLO,ILO)=TRISK(JLO,ILO)+RISK(NC,J,K,N)*EXPP(JLO,ILO,J,K)*
     A  FAC(K)
180     CONTINUE
        WLRN(JLO,ILO)=WLEVEL
        TRISK(JLO,ILO)=TRISK(JLO,ILO)+WLEVEL*RRISK
  190 CONTINUE
        WRITE(6,20100)
20100   FORMAT(' THERE ARE NO GROUND SURFACE CONCENTRATION',
     >  ' OR INGESTION RATE EXPOSURES FOR RN-222.')
   90 CONTINUE
  110 IF (ILOC.NE.0.AND.JLOC.NE.0) GO TO 130
      LENO=NOU-NOL+1
      LENR=NRU-NRL+1
      NLOC=LENO*LENR
      J=0
      DO 120 ILO=NOL,NOU
      DO 120 JLO=NRL,NRU
      IF(IND.EQ.1 .AND. POP(ILO,JLO).NE.0.0)TRISK(JLO,ILO)=
     < TRISK(JLO,ILO)/POP(ILO,JLO)
      J=J+1
      SRISK(J)=TRISK(JLO,ILO)
      IO(J)=J
  120 CONTINUE
      CALL VSORTP(SRISK,NLOC,IO)
```

```
      NOP=NLOC*PLOC*.01+.5
      IF (NOP.GE.NLOC) NOP=NLOC
      IF (NOP.LE.1) NOP=1
      LOC=IO(NOP)
      ILOC=(LOC-1)/LENR+1
      JLOC=LOC-(ILOC-1)*LENR
      IF (JLOC.EQ.0) JLOC=NRU
      ILOC=ILOC+NOL-1
      JLOC=JLOC+NRL-1
  130 POPFAC=1.
        TOTFAC=1.
        IF (IND.NE.1) GO TO 150
      IF (POP(ILOC,JLOC).NE.0.0) POPFAC=1./POP(ILOC,JLOC)
      TOTPOP=0.0
      DO 140 K1=NRL,NRU
      DO 140 K2=NOL,NOU
  140 TOTPOP=TOTPOP+POP(K2,K1)
      TOTFAC=1./TOTPOP
150      ANG=ANGLE(MOD(17-ILOC,16)+1)
      IF (IFLAG.GT.3) WRITE(6,10000) IDIST(JLOC),ANG,SRISK(NOP)
      RETURN
10000   FORMAT('1THE LOCATION USED FOR THE SELECTED INDIVIDUAL',
     > ' EXPOSURE IS ',I7,' METERS ',A4,'FROM THE SOURCE.'/
     >  ' THE FATAL CANCER RISK AT THAT LOCATION IS ',G10.3)
      END
C
C
C
C
      SUBROUTINE VSORTP (A,LA,IR)
C
      DIMENSION A(1),IU(21),IL(21),IR(1)
C
      M=1
      I=1
      J=LA
      R=.375
   10 IF (1.EQ.J) GO TO 100
   20 IF (R.GT..5898437) GO TO 30
      R=R+3.90625E-2
      GO TO 40
   30 R=R-.21875
   40 K=I
C                                   SELECT A CENTRAL ELEMENT OF THE
C                                   ARRAY AND SAVE IT IN LOCATION T
      IJ=1+(J-I)*R
      T=A(IJ)
      IT=IR(IJ)
C                                   IF FIRST ELEMENT OF ARRAY IS GREATER
C                                   THAN T, INTERCHANGE WITH T
      IF (A(1).LE.T) GO TO 50
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
      IR(IJ)=IR(I)
      IR(I)=IT
      IT=IR(IJ)
   50 L=J
C                                   IF LAST ELEMENT OF ARRAY IS LESS THAN
C                                   T, INTERCHANGE WITH T
```

```
      NOP=NLOC*PLOC*.01+.5
      IF (NOP.GE.NLOC) NOP=NLOC
      IF (NOP.LE.1) NOP=1
      LOC=IO(NOP)
      ILOC=(LOC-1)/LENR+1
      JLOC=LOC-(ILOC-1)*LENR
      IF (JLOC.EQ.0) JLOC=NRU
      ILOC=ILOC+NOL-1
      JLOC=JLOC+NRL-1
  130 POPFAC=1.
        TOTFAC=1.
        IF (IND.NE.1) GO TO 150
      IF (POP(ILOC,JLOC).NE.0.0) POPFAC=1./POP(ILOC,JLOC)
      TOTPOP=0.0
      DO 140 K1=NRL,NRU
      DO 140 K2=NOL,NOU
  140 TOTPOP=TOTPOP+POP(K2,K1)
      TOTFAC=1./TOTPOP
150      ANG=ANGLE(MOD(17-ILOC,16)+1)
      IF (IFLAG.GT.3) WRITE(6,10000) IDIST(JLOC),ANG,SRISK(NOP)
      RETURN
10000   FORMAT('1THE LOCATION USED FOR THE SELECTED INDIVIDUAL',
     > ' EXPOSURE IS ',I7,' METERS ',A4,'FROM THE SOURCE.'/
     >  ' THE FATAL CANCER RISK AT THAT LOCATION IS ',G10.3)
      END
C
C
C
C
      SUBROUTINE VSORTP (A,LA,IR)
C
      DIMENSION A(1),IU(21),IL(21),IR(1)
C
      M=1
      I=1
      J=LA
      R=.375
   10 IF (1.EQ.J) GO TO 100
   20 IF (R.GT..5898437) GO TO 30
      R=R+3.90625E-2
      GO TO 40
   30 R=R-.21875
   40 K=I
C                                     SELECT A CENTRAL ELEMENT OF THE
C                                     ARRAY AND SAVE IT IN LOCATION T
      IJ=1+(J-I)*R
      T=A(IJ)
      IT=IR(IJ)
C                                     IF FIRST ELEMENT OF ARRAY IS GREATER
C                                     THAN T, INTERCHANGE WITH T
      IF (A(1).LE.T) GO TO 50
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
      IR(IJ)=IR(I)
      IR(I)=IT
      IT=IR(IJ)
   50 L=J
C                                     IF LAST ELEMENT OF ARRAY IS LESS THAN
C                                     T, INTERCHANGE WITH T
```

```
      IF (A(J).GE.T) GO TO 70
      A(IJ)=A(J)
      A(J)=T
      T=A(IJ)
      IR(IJ)=IR(J)
      IR(J)=IT
      IT=IR(IJ)
C                                   IF FIRST ELEMENT OF ARRAY IS GREATER
C                                   THAN T, INTERCHANGE WITH T
      IF (A(I).LE.T) GO TO 70
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
      IR(IJ)=IR(I)
      IR(I)=IT
      IT=IR(IJ)
      GO TO 70
   60 TT=A(L)
      A(L)=A(K)
      A(K)=TT
      ITT=IR(L)
      IR(L)=IR(K)
      IR(K)=ITT
C                                   FIND AN ELEMENT IN THE SECOND HALF OF
C                                   THE ARRAY WHICH IS SMALLER THAN T
   70 L=L-1
      IF (A(L).GT.T) GO TO 70
C                                   FIND AN ELEMENT IN THE FIRST HALF OF
C                                   THE ARRAY WHICH IS GREATER THAN T
   80 K=K+1
      IF (A(K).LT.T) GO TO 80
C                                   INTERCHANGE THESE ELEMENTS
      IF (K.LE.L) GO TO 60
C                                   SAVE UPPER AND LOWER SUBSCRIPTS OF
C                                   THE ARRAY YET TO BE SORTED
      IF (L-1.LE.J-K) GO TO 90
      IL(M)=I
      IU(M)=L
      I=K
      M=M+1
      GO TO 110
   90 IL(M)=K
      IU(M)=J
      J=L
      M=M+1
      GO TO 110
C                                   BEGIN AGAIN ON ANOTHER PORTION OF
C                                   THE UNSORTED ARRAY
  100 M=M-1
      IF (M.EQ.0) RETURN
      I=IL(M)
      J=IU(M)
  110 IF (M.GT.21) WRITE(6,10000)M
      IF (J-I.GE.1) GO TO 40
      IF (I.EQ.1) GO TO 10
      I=I-1
  120 I=I+1
      IF (I.EQ.J) GO TO 100
      T=A(I+1)
      IT=IR(I+1)
```

```
      IF (A(I).LE.T) GO TO 120
      K=I
  130 A(K+1)=A(K)
      IR(K+1)=IR(K)
      K=K-1
      IF (T.LT.A(K)) GO TO 130
      A(K+1)=T
      IR(K+1)=IT
      GO TO 120
C
10000 FORMAT(' IN VSORTP, M=',I3)
      END
C
C
C
C
      SUBROUTINE MULT(IM,CONFAC,ARRAYI,NOC,NAMNOC,TITLE,TITL1, TABLE,
     > TITL2,NOTE,NUN,RFACI,CREP,NCREP,NDIM,IFLAG)
      INTEGER TABLE
      REAL*8 NUCLID,NAMNOC,CREP,OREP,RREP,FREP,PUL,TBEQ
        COMMON/COMRN/OREP(20),RREP(20),FREP(20),
     A  WLRN(20,20),RRISK,RREF(2),RYRLL,NOREP,NRREP,NFREP
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS(4,40),
     > INDPOP
      COMMON/COMEX/EXPP(20,20,40,4),POP(20,20),POPFAC,TOTFAC, NOL,NOU,
     > NRL,NRU,IDIST(20),ILOC,JLOC
      DIMENSION ARRAYI(NDIM,40,4),ARRAYO(20,40,4),CONFAC(4),TITLE(1),
     > TITL1(1),TITL2(1),NAMNOC(1),TABLE(1),NOTE(1),CREP(20),RFACI(20),
     >  RFACO(20),NUN(1)
      GO TO (10,30,50),IM
   10 DO 20 I=1,4
      DO 20 J=1,NONCLD
      DO 20 K=1,NOC
      ARRAYO(K,J,I)=ARRAYI(K,J,I)*EXPP(JLOC,ILOC,J,I)*CONFAC(I)*POPFAC
   20 CONTINUE
        RFACO(1)=0.0
        IF(NCREP.EQ.0) GO TO 80
        DO 25 I=1,NCREP
25      RFACO(I)=RFACI(I)*WLRN(JLOC,ILOC)*POPFAC
      GO TO 80
   30 DO 40 I=1,4
      DO 40 J=1,NONCLD
      DO 40 K=1,NOC
      ARRAYO(K,J,I)=0.0D0
      DO 40 II=NOL,NOU
      DO 40 JJ=NRL,NRU
      ARRAYO(K,J,I)=ARRAYO(K,J,I)+ARRAYI(K,J,I) *EXPP(JJ,II,J,I)*
     > CONFAC(I)*TOTFAC
   40 CONTINUE
        RFACO(1)=0.0
        RFACO(2)=0.0
        IF(NCREP.EQ.0) GO TO 80
        DO 45 I=1,NCREP
        DO 45 II=NOL,NOU
        DO 45 JJ=NRL,NRU
        RFACO(I)=RFACI(I)*WLRN(JJ,II)*TOTFAC+RFACO(I)
45      CONTINUE
      GO TO 80
   50 DO 70 I=1,4
      DO 70 J=1,NONCLD
```

```
      TEXPP=0.0
      DO 60 II=NOL,NOU
      DO 60 JJ=NRL,NRU
      TEXPP=TEXPP+EXPP(JJ,II,J,I)
   60 CONTINUE
      DO 70 K=1,NOC
        ARRAYO(K,J,I)=ARRAYI(K,J,I)*TEXPP*CONFAC(I)
   70 CONTINUE
        REACO(I)=0.0
        IF(NCREP.EQ.0) GO TO 80
        TWLRN=0.0
        DO 65 II=NOL,NOU
        DO 65 JJ=NRL,NRU
        TWLRN=TWLRN+WLRN(JJ,II)
65      CONTINUE
        DO 75 I=1,NCREP
        REACO(I)=REACI(I)*TWLRN
75      CONTINUE
   80 CALL DRTAB(ARRAYO,NOC,NAMNOC,TITLE,TITL1,TABLE,TITL2,NOTE,
     A  NUN,REACO,CREP,NCREP,IFLAG)
      RETURN
      END
C
C
C
C
      SUBROUTINE RDORGF
      REAL*8 ORGN,ORGB
        COMMON/COMWOR/FACO(20,4)
      DIMENSION ORGB(20),ORGDAT(20),IPATH(20)
      COMMON/COMOR/ORGN(20),NORGN,TIME(20),DOSE(20,40,4,2)
      NAMELIST/ ORGANF/NORGB,ORGB,ORGDAT,IPATH
      READ(26,ORGANF)
      WRITE(6,10000)
      DO 10 J=1,NORGB
      WRITE(6,10100) ORGB(J),ORGDAT(J)
      IF (IPATH(J).NE.5) WRITE(6,10200) IPATH(J)
   10 IF (IPATH(J).EQ.5) WRITE(6,10300)
      DO 80 K=1,NORGN
      DO 30 I=1,4
   30 FACO(K,I)=0.0
      DO 40 J=1,NORGB
      IF (ORGN(K).EQ.ORGB(J)) GO TO 50
   40 CONTINUE
      GO TO 80
   50 IF (IPATH(J).EQ.5) GO TO 60
      FACO(K,IPATH(J))=ORGDAT(J)
      GO TO 80
   60 DO 70 I=1,4
      FACO(K,I)=ORGDAT(J)
   70 CONTINUE
   80 CONTINUE
      RETURN
10000 FORMAT('0ORGAN DOSE WEIGHTING FACTORS'//
     A   ' ORGAN      FACTORS   PATHWAYS'/)
10100 FORMAT (1X,A8,1X,F8.5)
10200 FORMAT('+',19X,I2)
10300 FORMAT('+',19X,' 1 2 3 4')
      END
C
```

```
C
C
C
      SUBROUTINE LOCTAB(IT,RN,PT,OG,FACD,ARRAY,TITLE,TITL1,TITLA,
     <  ORGN,NORGN,NDIM,NO)
        REAL*8 RN,OG,SUM,NUCLID,ORGN,WLOPT(2),OREP,RREP,CREP,PUL,
     A  TBEQ
        COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),RRISK,
     A  RREF(2),RYRLL,NOREP,NRREP,NCREP
        COMMON/COMCA/DUM(6468),AGEX
        INTEGER PT
        DIMENSION TITLE(20),TITLA(2),TITL1(10),ARRAY(NDIM,40,4),
     <  ORGN(1),FACD(1),IPATH(4,7),IDIR(16)
        COMMON/COMUS/OUTPUT(40,40),HOLDC(40),HOLDR(40)
        DATA IDIR/1,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2/
      DATA IPATH/4HINGE,4HSTIO,4HN    ,4H    ,4HINHA,4HLATI,4HON  ,
     > 4H    ,4HAIR ,4HIMME,4HRSIO,4HN    ,4HGROU,4HND S, 4HURFA,4HCE  ,
     > 4HINTE,4HRNAL,4H    ,4H    , 4HEXTE,4HRNAL,4H    ,4H    ,
     > 4HALL ,4H    ,4H    ,4H    /
        DATA SUM/8HSUM     /,WLOPT/8HWORKLEVL,8HWLSUM   /,
     A  PUL/8HPULMNARY/,TBEQ/8HBODY EQ./
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
     > INDPOP
      COMMON/COMEX/EXPP(20,20,40,4),POP(20,20),POPFAC,TOTFAC, NOL,NOU,
     > NRL,NRU,IDIST(20),ILOC,JLOC
        COMMON/COMWOR/WT(20,4)
10000   FORMAT(1H1,20X,20A4/21X,10A4/21X,2A4)
        DO 10 K=1,40
        HOLDR(K)=0.0
        HOLDC(K)=0.0
        DO 10 L=1,40
10      OUTPUT(L,K)=0.0
        TSUM=0.0
        DO 12 J=1,2
        IF(RN.EQ.WLOPT(J)) GO TO 1000
12      CONTINUE
14      CONTINUE
          IF(RN.EQ.SUM) GO TO 75
        IF(RN.EQ.WLOPT(2)) GO TO 75
        DO 50 J=1,NONCLD
        IF(RN.EQ.NUCLID(J)) GO TO 70
50      CONTINUE
        WRITE(6,10500) RN
10500   FORMAT(' RADIONUCLIDE ',A8,
     A  ' IS NOT IN LIST. TABLE WILL BE SKIPPED.')
        RETURN
70      INE=J
        GO TO 80
75      INB=1
        INE=NONCLD
80      CONTINUE
        IF(OG.EQ.SUM) GO TO 175
        DO 150 J=1,NORGN
        IF(OG.EQ.ORGN(J)) GO TO 170
150     CONTINUE
        WRITE(6,10600) OG
10600   FORMAT(' ORGAN ',A8,' IS NOT IN LIST.',
     A  ' TABLE WILL BE SKIPPED.')
        RETURN
170     IOB=J
```

```
      IOE=J
      GO TO 180
175   IOB=1
      IOE=NORGN
      IF(IT.EQ.3) GO TO 180
      IF(IT.EQ.1) GO TO 185
      IOB=NORGN
      IOE=NORGN
      GO TO 180
185   CONTINUE
      GO TO 195
180   DO 190 I=1,4
      DO 190 K=IOB,IOE
      WT(K,I)=1.
190   CONTINUE
195   CONTINUE
      IPT=PT
      IPB=IPT
      IPE=IPT
      IF(IPT.LE.4) GO TO 184
177   CONTINUE
      IPT=IPT-4
      GO TO (181,182,183),IPT
181   IPB=1
      IPE=2
      GO TO 184
182   IPB=3
      IPE=4
      GO TO 184
183   IPB=1
      IPE=4
184   CONTINUE
      DO 300 IPT=IPB,IPE
      DO 300 IN=INB,INE
      DO 300 IO=IOB,IOE
      DO 300 II=NOL,NOU
      DO 300 JJ=NRL,NRU
      OUTPUT(JJ,II)=OUTPUT(JJ,II)+ARRAY(IO,IN,IPT)*FACD(IPT)*
     > EXPP(JJ,II,IN,IPT)
300   CONTINUE
305   IF(IT.EQ.3) GO TO 500
      DO 400 II=NOL,NOU
      DO 400 JJ=NRL,NRU
      IF(POP(II,JJ).EQ.0.0) GO TO 375
      OUTPUT(JJ,II)=OUTPUT(JJ,II)/POP(II,JJ)
      GO TO 400
375   OUTPUT(JJ,II)=0.0
400   CONTINUE
      WRITE(6,10000) TITLE,TITL1,TITLA
      WRITE(6,10100) RN,OG,(TPATH(K,PT),K=1,4)
      DO 600 JJ=NRL,NRU
      WRITE(6,10200) IDIST(JJ),(OUTPUT(JJ,IDIR(II)),II=1,8)
600   CONTINUE
      WRITE(6,10125)
      DO 605 JJ=NRL,NRU
      WRITE(6,10200) IDIST(JJ),(OUTPUT(JJ,IDIR(II)),II=9,16)
605   CONTINUE
      RETURN
500   WRITE(6,10000) TITLE,TITL1,TITLA
      DO 680 II=1,16
```

```
      DO 680 JJ=NRL,NRU
      HOLDC(II)=OUTPUT(JJ,II)+HOLDC(II)
      HOLDR(JJ)=OUTPUT(JJ,II)+HOLDR(JJ)
 680  TSUM=OUTPUT(JJ,II)+TSUM
      WRITE(6,10100)RN,OG,(TPATH(K,PT),K=1,4)
      DO 700 JJ=NRL,NRU
 700  WRITE(6,10200)IDIST(JJ),(OUTPUT(JJ,IDIR(II)),II=1,8)
      WRITE(6,10250)(HOLDC(IDIR(II)),II=1,8)
      WRITE(6,10175)
      DO 710 JJ=NRL,NRU
 710  WRITE(6,10205)IDIST(JJ),(OUTPUT(JJ,IDIR(II)),II=9,16),HOLDR(JJ)
      WRITE(6,10250)(HOLDC(IDIR(II)),II=9,16),TSUM
      RETURN
1000  IF(NDIM.NE.20) RETURN
      IF(OG.EQ.SUM) GO TO 1001
      IF(OG.EQ.PUL) GO TO 1001
      IF(OG.EQ.TBEQ) GO TO 1001
      IF(J.EQ.1) GO TO 305
      GO TO 14
1001  CONTINUE
      IF(NO.NE.1) GO TO 1200
1100  DO 1150 II=NOL,NOU
      DO 1150 JJ=NRL,NRU
      OUTPUT(JJ,II)=WLRN(JJ,II)
1150  CONTINUE
      OG=SUM
      PT=7
      GO TO 305
1200  IF(NO.NE.3) GO TO 1300
      FAC=1.
      IF(IT.EQ.3) FAC=1./AGEX
      DO 1250 II=NOL,NOU
      DO 1250 JJ=NRL,NRU
      OUTPUT(JJ,II)=RRISK*WLRN(JJ,II)*FAC
1250  CONTINUE
      IF(J.EQ.1) GO TO 305
      GO TO 14
1300  IF(OG.NE.PUL) GO TO 1400
      FAC=1.
      IF(IT.EQ.3) FAC=.001
      DO 1350 II=NOL,NOU
      DO 1350 JJ=NRL,NRU
      OUTPUT(JJ,II)=RREF(1)*WLRN(JJ,II)*FAC
1350  CONTINUE
      IF(J.EQ.1) GO TO 500
      GO TO 14
1400  IF(OG.NE.TBEQ) RETURN
      FAC=1.
      IF(IT.EQ.3) FAC=.001
      DO 1450 II=NOL,NOU
      DO 1450 JJ=NRL,NRU
      OUTPUT(JJ,II)=RREF(2)*WLRN(JJ,II)*FAC
1450  CONTINUE
      IF(J.EQ.1) GO TO 305
      GO TO 14
10100 FORMAT(' FOR RADIONUCLIDE : ',A8/
     > ' AND ORGAN/CANCER  :',A8/
     > ' AND PATHWAY : ',4A4/
     > ' DIRECTIONS:',3X,'N',12X,'NNE',10X,'NE',11X,
     > 'ENE',10X,'E',12X,'ESE',10X,'SE',11X,'SSE'/
```

```
     > '  DISTANCE'/'  (METERS):'/)
10125  FORMAT(////15X,'S',12X,'SSW',10X,'SW',11X,'WSW',10X,'W'
     > ,12X,'WNW',10X,'NW',11X,'NNW'/'  DISTANCE'/'  (METERS):')
10175  FORMAT(////15X,'S',12X,'SSW',10X,'SW',11X,'WSW',10X,'W'
     > ,12X,'WNW',10X,'NW',11X,'NNW',10X,'SUM'/'  DISTANCE'/
     > '  (METERS):')
10200  FORMAT(I10,1P8G13.3)
10205  FORMAT(I10,1P9G13.3)
10250  FORMAT('0SUM',6X,1P9G13.3)
       END
C
C
C
C
      SUBROUTINE SUMMRY(TITLE,GSCFAC,IFLAG)
      REAL*8 NUCLID,ORGN,CANC,TOTBOD,RNLOC,OGLOC,GEN,TOTAL,WTSUM,
     A  OREP,RREP,CREP,RN222
        LOGICAL GENEFF,RNWR
      REAL LLET
C
      COMMON/COMEX/EXPP(20,20,40,4),POP(20,20),POPFAC,TOTFAC, NOL,NOU,
     > NRL,NRU,IDIST(20),ILOC,JLOC
      COMMON/COMOR/ORGN(20),NORGN,TIME(20),DOSE(20,40,4,2), DTABLE(7)
        COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),
     A  RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
      COMMON/LETFAC/HLET(20),LLET(20)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
     > INDPOP
        COMMON/COMGEN/GEN(3),NGEN,GDOSE(3,40,4,2),GRISK(3,40,4,2),
     > GENEFF,GRFAC(2),REPPER,GLLET(3),GHLET(3),GREF(3,40,4)
        COMMON/COMUS/STLOW(40),STHIG(40),STCOM(40),STGLO(40),
     A  STGHI(40),STGCO(40)
        DIMENSION DOSFAC(4),GENFAC(4),TITLE(20)
        DATA RN222/8HRN-222  /
        DATA DOSFAC/1.,1.,1.,100./,
     < GENFAC/1.,1.,1.,100./,TOTAL/8HTOTAL   /,WTSUM/8HWT.SUM  /
        DATA IKP/0/
        COMMON/COMWOR/DFAC(20,4)
        IF (IKP.EQ.0) DOSFAC(4)=GSCFAC*DOSFAC(4)
        IF (IKP.EQ.0) GENFAC(4)=GSCFAC*GENFAC(4)
        IKP = 1
        RNWR=.FALSE.
        DO 5 J=1,NONCLD
        IF(NUCLID(J).EQ.RN222) RNWR=.TRUE.
5       CONTINUE
        WLC=0.0
        DO 10 II=NOL,NOU
        DO  10 JJ=NRL,NRU
        WLC=WLC+WLRN(JJ,II)
10      CONTINUE
        WLE=WLC*TOTFAC
C****   DOSE RATES BY ORGAN
        DO 50 J=1,40
        STHIG(J)=0.0
        STLOW(J)=0.0
        STCOM(J)=0.0
        STGLO(J)=0.0
        STGHI(J)=0.0
        STGCO(J)=0.0
50      CONTINUE
```

```
      SUML=0.0
      SUMH=0.0
      SUMC=0.0
      DO 100 L=1,NORGN
      DO 100 K=1,4
      FACNEW=POPFAC*DOSFAC(K)
      FACNE2=POPFAC*GENFAC(K)
      DO 100 J=1,NONCLD
      STHIG(L)=STHIG(L)+DOSE(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
      SUMH=SUMH+DOSE(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)*DFAC(L,K)
      STLOW(L)=STLOW(L)+DOSE(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
      SUML=SUML+DOSE(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)*DFAC(L,K)
      STCOM(L)=STCOM(L)+DOSE(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
     <  *LLET(L)+DOSE(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)*HLET(L)
      SUMC=SUMC+DOSE(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)*
     <  LLET(L)*DFAC(L,K)+DOSE(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)*
     <  HLET(L)*DFAC(L,K)
      IF(L.GT.NGEN) GO TO 100
      STGHI(L)=STGHI(L)+GDOSE(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)
      STGLO(L)=STGLO(L)+GDOSE(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)
      STGCO(L)=STGCO(L)+GDOSE(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)
     <  *GLLET(L)+GDOSE(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)*GHLET(L)
100   CONTINUE
      WLI=WLRN(JLOC,ILOC)*POPFAC
C
C     IF MAXIMUM DOSE ORGAN BY NUCLIDE SUMMARY GO TO 11000
C
     IF ( IFLAG .EQ. 3 ) GO TO 11000
C
C     WRITE(6,10100) TITLE,(ORGN(L),L=1,NORGN),WTSUM
C     WRITE(6,10205) (STLOW(L),L=1,NORGN),SUML
C     WRITE(6,10210) (STHIG(L),L=1,NORGN),SUMH
C     WRITE(6,10215) (STCOM(L),L=1,NORGN),SUMC
C     IF(RNWR)WRITE(6,20216) WLI
20216 FORMAT('ORADON DAUGHTER EXPOSURE:'/
     A ' (WORKING LEVEL)',9X,1PG10.3)
C     WRITE(6,10290) (GEN(L),L=1,NGEN)
C     WRITE(6,10220) (STGLO(L),L=1,NGEN)
C     WRITE(6,10225) (STGHI(L),L=1,NGEN)
C     WRITE(6,10230) (STGCO(L),L=1,NGEN)
10100 FORMAT('1',20A4/30X,'ORGAN DOSE/EXPOSURE SUMMARY'//
     A '0*** SELECTED INDIVIDUAL ***'/
     B  '0DOSE RATES:'/
     > 17X,' ORGANS:',10(2X,A8)/(26X,10(2X,A8)))
10205 FORMAT(' LOW LET (MRAD/Y)',8X,1P10G10.3/
     A (26X,1P10G10.3))
10206 FORMAT(' LOW LET (PERSON RAD/Y)',1X,1P10G10.3/
     A (26X,1P10G10.3))
10210 FORMAT(' HIGH LET (MRAD/Y)',7X,1P10G10.3/
     A (26X,1P10G10.3))
10211 FORMAT(' HIGH LET (PERSON RAD/Y)',1P10G10.3/
     A (26X,1P10G10.3))
10215 FORMAT(' DOSE EQUIVALENT (MREM/Y)',1P10G10.3/
     A (26X,1P10G10.3))
10216 FORMAT(' DOSE EQ. (PERSON REM/Y)',1P10G10.3/
     A (26X,1P10G10.3))
10290 FORMAT('0GONADAL DOSES:'/
     > 17X,' GONADS:',10(2X,A8))
10220 FORMAT(' LOW LET (MRAD)',10X,1P10G10.3/
     A (26X,1P10G10.3))
```

```
10221   FORMAT(' LOW LET (PERSON RAD)',4X,1P10G10.3/
     A  (26X,1P10G10.3))
10225   FORMAT(' HIGH LET (MRAD)',9X,1P10G10.3/
     A  (26X,1P10G10.3))
10226   FORMAT(' HIGH LET (PERSON RAD)',3X,1P10G10.3/
     A  (26X,1P10G10.3))
10230   FORMAT(' DOSE EQUIVALENT (MREM)',2X,1P10G10.3/
     A  (26X,1P10G10.3))
10231   FORMAT(' DOSE EQ. (PERSON REM)',3X,1P10G10.3/
     A  (26X,1P10G10.3))
C
C      IF ANNUAL SUMMARY DOSE CALCULATION RETURN
C
          IF ( IFLAG .EQ. 2 ) RETURN
C
C
        IF(INDPOP.NE.1) GO TO 1000
        DO 150 J=1,40
        STHIG(J)=0.0
        STLOW(J)=0.0
        STCOM(J)=0.0
        STGHI(J)=0.0
        STGLO(J)=0.0
        STGCO(J)=0.0
150     CONTINUE
        SUML=0.0
        SUMH=0.0
        SUMC=0.0
        DO 200 L=1,NORGN
        DO 200 K=1,4
        FACNEW=TOTFAC*DOSFAC(K)
        FACNE2=TOTFAC*GENFAC(K)
        DO 200 J=1,NONCLD
        DO 200 II=NOL,NOU
        DO 200 JJ=NRL,NRU
        STHIG(L)=STHIG(L)+DOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
        SUMH=SUMH+DOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW*DFAC(L,K)
        STLOW(L)=STLOW(L)+DOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
        SUML=SUML+DOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW*DFAC(L,K)
        STCOM(L)=STCOM(L)+DOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
     >  *LLET(L)+DOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW*HLET(L)
        SUMC=SUMC+DOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW*
     >  LLET(L)*DFAC(L,K)+DOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW*
     >  HLET(L)*DFAC(L,K)
        IF(L.GT.NGEN) GO TO 200
        STGHI(L)=STGHI(L)+GDOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2
        STGLO(L)=STGLO(L)+GDOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2
        STGCO(L)=STGCO(L)+GDOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2
     >  *GLLET(L)+GDOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2*GHLET(L)
200     CONTINUE
C       WRITE(6,10400) (ORGN(L),L=1,NORGN),WTSUM
10400   FORMAT(/'0*** MEAN INDIVIDUAL ***'/
     A  '0DOSE RATE:'/
     +  17X,' ORGANS:',10(2X,A8)/(26X,10(2X,A8)))
C       WRITE(6,10205) (STLOW(L),L=1,NORGN),SUML
C       WRITE(6,10210) (STHIG(L),L=1,NORGN),SUMH
C       WRITE(6,10215) (STCOM(L),L=1,NORGN),SUMC
C       IF(RNWR)WRITE(6,20216) WLE
C       WRITE(6,10590) (GEN(L),L=1,NGEN)
10590   FORMAT('0GONADAL DOSES:'/
```

```
     >  17X,' GONADS:',10(2X,A8))
C       WRITE(6,10220) (STGLO(L),L=1,NGEN)
C       WRITE(6,10225) (STGHI(L),L=1,NGEN)
C       WRITE(6,10230) (STGCO(L),L=1,NGEN)
        DO 350 K=1,40
        STLOW(K)=0.0
        STHIG(K)=0.0
        STCOM(K)=0.0
        IF(K.GT.NGEN) GO TO 350
        STGLO(K)=0.0
        STGHI(K)=0.0
        STGCO(K)=0.0
350     CONTINUE
        SUML=0.0
        SUMH=0.0
        SUMC=0.0
        DO 400 K=1,4
        DO 400 J=1,NONCLD
        TEXPP=0.0
        DO 403 II=NOL,NOU
        DO 403 JJ=NRL,NRU
        TEXPP=TEXPP+EXPP(JJ,II,J,K)
403     CONTINUE
        TEXPP=TEXPP*.001
        DO 400 L=1,NORGN
        STLOW(L)=STLOW(L)+DOSE(L,J,K,1)*TEXPP*DOSFAC(K)
        SUML=SUML+DOSE(L,J,K,1)*TEXPP*DOSFAC(K)*DFAC(L,K)
        STHIG(L)=STHIG(L)+DOSE(L,J,K,2)*TEXPP*DOSFAC(K)
        SUMH=SUMH+DOSE(L,J,K,2)*TEXPP*DOSFAC(K)*DFAC(L,K)
        STCOM(L)=STCOM(L)+DOSE(L,J,K,1)*TEXPP*DOSFAC(K)*LLET(L)+
     >  DOSE(L,J,K,2)*TEXPP*DOSFAC(K)*HLET(L)
        SUMC=SUMC+DOSE(L,J,K,1)*TEXPP*DOSFAC(K)*LLET(L)*DFAC(L,K)+
     >  DOSE(L,J,K,2)*TEXPP*DOSFAC(K)*HLET(L)*DFAC(L,K)
        IF(L.GT.NGEN) GO TO 400
        STGLO(L)=STGLO(L)+GDOSE(L,J,K,1)*TEXPP*GENFAC(K)
        STGHI(L)=STGHI(L)+GDOSE(L,J,K,2)*TEXPP*GENFAC(K)
        STGCO(L)=STGCO(L)+GDOSE(L,J,K,1)*TEXPP*GENFAC(K)*GLLET(L)+
     >  GDOSE(L,J,K,2)*TEXPP*GENFAC(K)*GHLET(L)
400     CONTINUE
        WRITE(6,10700) TITLE,(ORGN(L),L=1,NORGN),WTSUM
10700 FORMAT('1',/////,20A4,/,30X,'ORGAN DOSE/EXPOSURE SUMMARY',//,
     &  '0*** COLLECTIVE POPULATION ***',/,'0DOSE RATE:',/,
     >  17X,' ORGANS:',10(2X,A8)/(26X,10(2X,A8)))
        WRITE(6,10206) (STLOW(L),L=1,NORGN),SUML
        WRITE(6,10211) (STHIG(L),L=1,NORGN),SUMH
        WRITE(6,10216) (STCOM(L),L=1,NORGN),SUMC
        IF(RNWR)WRITE(6,20416) WLC
20416   FORMAT('0RADON DAUGHTER EXPOSURE:'/
     A  ' (PERSON WORKING LEVEL)',2X,1PG10.3)
        WRITE(6,10790) (GEN(L),L=1,NGEN)
10790   FORMAT('0GONADAL DOSES:'/
     >  17X,' GONADS:',10(2X,A8))
        WRITE(6,10221) (STGLO(L),L=1,NGEN)
        WRITE(6,10226) (STGHI(L),L=1,NGEN)
        WRITE(6,10231) (STGCO(L),L=1,NGEN)
C****   DOSE RATES BY PATHWAY
1000    DO 1050 J=1,40
        STHIG(J)=0.0
        STLOW(J)=0.0
        STCOM(J)=0.0
```

```
      STGHI(J)=0.0
      STGLO(J)=0.0
      STGCO(J)=0.0
1050  CONTINUE
      DO 1199 K=1,4
      DO 1100 L=1,NORGN
      FACNEW=POPFAC*DOSFAC(K)*DFAC(L,K)
      FACNE2=POPFAC*GENFAC(K)
      DO 1100 J=1,NONCLD
      STHIG(K)=STHIG(K)+DOSE(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STLOW(K)=STLOW(K)+DOSE(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STCOM(K)=STCOM(K)+DOSE(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
     <*LLET(L)+DOSE(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)*HLET(L)
      IF(L.NE.NGEN) GO TO 1100
      STGHI(K)=STGHI(K)+GDOSE(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)
      STGLO(K)=STGLO(K)+GDOSE(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)
      STGCO(K)=STGCO(K)+GDOSE(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)
     <*GLLET(L)+GDOSE(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)*GHLET(L)
1100  CONTINUE
      IF(K.GT.2) GO TO 1101
      STHIG(5)=STHIG(5)+STHIG(K)
      STLOW(5)=STLOW(5)+STLOW(K)
      STCOM(5)=STCOM(5)+STCOM(K)
      STGHI(5)=STGHI(5)+STGHI(K)
      STGLO(5)=STGLO(5)+STGLO(K)
      STGCO(5)=STGCO(5)+STGCO(K)
1101  IF(K.LT.3)GO TO 1102
      STHIG(6)=STHIG(6)+STHIG(K)
      STLOW(6)=STLOW(6)+STLOW(K)
      STCOM(6)=STCOM(6)+STCOM(K)
      STGHI(6)=STGHI(6)+STGHI(K)
      STGLO(6)=STGLO(6)+STGLO(K)
      STGCO(6)=STGCO(6)+STGCO(K)
1102  STHIG(7)=STHIG(7)+STHIG(K)
      STLOW(7)=STLOW(7)+STLOW(K)
      STCOM(7)=STCOM(7)+STCOM(K)
      STGHI(7)=STGHI(7)+STGHI(K)
      STGLO(7)=STGLO(7)+STGLO(K)
      STGCO(7)=STGCO(7)+STGCO(K)
1199  CONTINUE
C     WRITE(6,11100) TITLE
11100 FORMAT('1',20A4/30X,' PATHWAY DOSE/EXPOSURE SUMMARY'/
     A'0*** SELECTED INDIVIDUAL ***'/
     B'0DOSE RATES:'/
     <' WEIGHTED SUMS OF ORGAN DOSE RATES'/
     <'                    PATHWAYS:  INGESTION ',
     <'INHALATION  AIR      GROUND',
     <'     INTERNAL  EXTERNAL  TOTAL'/
     <45X,' IMMERSION  SURFACE')
C     WRITE(6,10205) (STLOW(L),L=1,7)
C     WRITE(6,10210) (STHIG(L),L=1,7)
C     WRITE(6,10215) (STCOM(L),L=1,7)
C     IF(RNWR)WRITE(6,20216) WLI
C     WRITE(6,11290)
11290 FORMAT('0AVERAGE GONADAL DOSES:'/
     <'                    PATHWAYS:  INGESTION ',
     <'INHALATION  AIR      GROUND',
     <'     INTERNAL  EXTERNAL  TOTAL'/
     <45X,' IMMERSION  SURFACE')
C     WRITE(6,10220) (STGLO(L),L=1,7)
```

```
C       WRITE(6,10225) (STGHI(L),L=1,7)
C       WRITE(6,10230) (STGCO(L),L=1,7)
        IF(INDPOP.NE.1) GO TO 11000
        DO 1150 J=1,40
        STHIG(J)=0.0
        STLOW(J)=0.0
        STCOM(J)=0.0
        STGHI(J)=0.0
        STGLO(J)=0.0
        STGCO(J)=0.0
1150    CONTINUE
        DO 1299 K=1,4
        FACNE2=TOTFAC*GENFAC(K)
        DO 1200 L=1,NORGN
        FACNEW=TOTFAC*DOSFAC(K)*DFAC(L,K)
        DO 1200 J=1,NONCLD
        DO 1200 II=NOL,NOU
        DO 1200 JJ=NRL,NRU
        STHIG(K)=STHIG(K)+DOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
        STLOW(K)=STLOW(K)+DOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
        STCOM(K)=STCOM(K)+DOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
     >  *LLET(L)+DOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW*HLET(L)
        IF(L.NE.NGEN) GO TO 1200
        STGHI(K)=STGHI(K)+GDOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2
        STGLO(K)=STGLO(K)+GDOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2
        STGCO(K)=STGCO(K)+GDOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2*
     A  GLLET(L)+GDOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2*GHLET(L)
1200    CONTINUE
1203    IF(K.GT.2) GO TO 1201
        STHIG(5)=STHIG(5)+STHIG(K)
        STLOW(5)=STLOW(5)+STLOW(K)
        STCOM(5)=STCOM(5)+STCOM(K)
        STGHI(5)=STGHI(5)+STGHI(K)
        STGLO(5)=STGLO(5)+STGLO(K)
        STGCO(5)=STGCO(5)+STGCO(K)
1201    IF(K.LT.3) GO TO 1202
        STHIG(6)=STHIG(6)+STHIG(K)
        STLOW(6)=STLOW(6)+STLOW(K)
        STCOM(6)=STCOM(6)+STCOM(K)
        STGHI(6)=STGHI(6)+STGHI(K)
        STGLO(6)=STGLO(6)+STGLO(K)
        STGCO(6)=STGCO(6)+STGCO(K)
1202    STHIG(7)=STHIG(7)+STHIG(K)
        STLOW(7)=STLOW(7)+STLOW(K)
        STCOM(7)=STCOM(7)+STCOM(K)
        STGHI(7)=STGHI(7)+STGHI(K)
        STGLO(7)=STGLO(7)+STGLO(K)
        STGCO(7)=STGCO(7)+STGCO(K)
1299    CONTINUE
C       WRITE(6,11400)
11400   FORMAT(/'0***  MEAN INDIVIDUAL ***'/
     A  '0DOSE RATES:'/
     <  ' WEIGHTED SUMS OF ORGAN DOSE RATES'/
     <  '                    PATHWAYS:  INGESTION ',
     <  'INHALATION  AIR     GROUND',
     <  '     INTERNAL  EXTERNAL  TOTAL'/
     <  45X,' IMMERSION  SURFACE')
C       WRITE(6,10205) (STLOW(L),L=1,7)
C       WRITE(6,10210) (STHIG(L),L=1,7)
C       WRITE(6,10215) (STCOM(L),L=1,7)
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C       IF(RNWR)WRITE(6,20216) WLE
C       WRITE(6,11590)
11590   FORMAT('0AVERAGE GONADAL DOSES:'/
     <  '                    PATHWAYS:  INGESTION ',
     <  'INHALATION  AIR     GROUND',
     <  '     INTERNAL  EXTERNAL  TOTAL'/
     <  45X,' IMMERSION  SURFACE')
C       WRITE(6,10220) (STGLO(L),L=1,7)
C       WRITE(6,10225) (STGHI(L),L=1,7)
C       WRITE(6,10230) (STGCO(L),L=1,7)
        DO 1350 K=1,40
        STLOW(K)=0.0
        STHIG(K)=0.0
        STCOM(K)=0.0
        STGLO(K)=0.0
        STGHI(K)=0.0
        STGCO(K)=0.0
1350    CONTINUE
        DO 1499 K=1,4
        DO 1400 J=1,NONCLD
        TEXPP=0.0
        DO 1404 II=NOL,NOU
        DO 1404 JJ=NRL,NRU
        TEXPP=TEXPP+EXPP(JJ,II,J,K)
1404    CONTINUE
        TEXPP=TEXPP*.001
        DO 1400 L=1,NORGN
        STLOW(K)=STLOW(K)+DOSE(L,J,K,1)*TEXPP*DOSFAC(K)*DFAC(L,K)
        STHIG(K)=STHIG(K)+DOSE(L,J,K,2)*TEXPP*DOSFAC(K)*DFAC(L,K)
        STCOM(K)=STCOM(K)+DOSE(L,J,K,1)*TEXPP*DOSFAC(K)*LLET(L)*
     >  DFAC(L,K)+DOSE(L,J,K,2)*TEXPP*DOSFAC(K)*HLET(L)*DFAC(L,K)
        IF(L.NE.NGEN) GO TO 1400
        STGLO(K)=STGLO(K)+GDOSE(L,J,K,1)*TEXPP*GENFAC(K)
        STGHI(K)=STGHI(K)+GDOSE(L,J,K,2)*TEXPP*GENFAC(K)
        STGCO(K)=STGCO(K)+GDOSE(L,J,K,2)*TEXPP*GENFAC(K)*GHLET(L)+
     A  GDOSE(L,J,K,1)*TEXPP*GENFAC(K)*GLLET(L)
1400    CONTINUE
1403    IF(K.GT.2) GO TO 1401
        STLOW(5)=STLOW(5)+STLOW(K)
        STHIG(5)=STHIG(5)+STHIG(K)
        STCOM(5)=STCOM(5)+STCOM(K)
        STGLO(5)=STGLO(5)+STGLO(K)
        STGHI(5)=STGHI(5)+STGHI(K)
        STGCO(5)=STGCO(5)+STGCO(K)
        GO TO 1402
1401    STLOW(6)=STLOW(6)+STLOW(K)
        STHIG(6)=STHIG(6)+STHIG(K)
        STCOM(6)=STCOM(6)+STCOM(K)
        STGLO(6)=STGLO(6)+STGLO(K)
        STGHI(6)=STGHI(6)+STGHI(K)
        STGCO(6)=STGCO(6)+STGCO(K)
1402    STLOW(7)=STLOW(7)+STLOW(K)
        STHIG(7)=STHIG(7)+STHIG(K)
        STCOM(7)=STCOM(7)+STCOM(K)
        STGLO(7)=STGLO(7)+STGLO(K)
        STGHI(7)=STGHI(7)+STGHI(K)
        STGCO(7)=STGCO(7)+STGCO(K)
1499    CONTINUE
11700 FORMAT('1',/////,20A4,/,30X,'PATHWAY DOSE/EXPOSURE SUMMARY',/,
     &  '0*** COLLECTIVE POPULATION ***',/,'0DOSE RATES:',/,
```

```
     <  ' WEIGHTED SUMS OF ORGAN DOSE RATES'/
     <  '                    PATHWAYS:  INGESTION ',
     <  'INHALATION  AIR     GROUND',
     <  '     INTERNAL  EXTERNAL  TOTAL'/
     <  45X,' IMMERSION  SURFACE')
        WRITE(6,11700) TITLE
        WRITE(6,10206) (STLOW(L),L=1,7)
        WRITE(6,10211) (STHIG(L),L=1,7)
        WRITE(6,10216) (STCOM(L),L=1,7)
        IF(RNWR)WRITE(6,20416) WLC
        WRITE(6,11790)
11790   FORMAT('0AVERAGE GONADAL DOSES:'/
     <  '                    PATHWAYS:  INGESTION ',
     <  'INHALATION  AIR     GROUND',
     <  '     INTERNAL  EXTERNAL  TOTAL'/
     <  45X,' IMMERSION  SURFACE')
        WRITE(6,10221) (STGLO(L),L=1,7)
        WRITE(6,10226) (STGHI(L),L=1,7)
        WRITE(6,10231) (STGCO(L),L=1,7)
C****   DOSE RATES BY NUCLIDE
11000   DO 2050 J=1,40
        STHIG(J)=0.0
        STLOW(J)=0.0
        STCOM(J)=0.0
        STGLO(J)=0.0
        STGHI(J)=0.0
        STGCO(J)=0.0
2050    CONTINUE
        SUML=0.0
        SUMH=0.0
        SUMC=0.0
        SUMGL=0.0
        SUMGH=0.0
        SUMGC=0.0
        DO 2109 J=1,NONCLD
        DO 2100 K=1,4
        FACNE2=POPFAC*GENFAC(K)
        DO 2100 L=1,NORGN
        FACNEW=POPFAC*DOSFAC(K)*DFAC(L,K)
        STHIG(J)=STHIG(J)+DOSE(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
        STLOW(J)=STLOW(J)+DOSE(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
        STCOM(J)=STCOM(J)+DOSE(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
     <  *LLET(L)+DOSE(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)*HLET(L)
        IF(L.NE.NGEN) GO TO 2100
        STGHI(J)=STGHI(J)+GDOSE(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)
        STGLO(J)=STGLO(J)+GDOSE(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)
        STGCO(J)=STGCO(J)+GDOSE(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)*
     A  GLLET(L)+GDOSE(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)*GHLET(L)
2100    CONTINUE
        SUML=SUML+STLOW(J)
        SUMH=SUMH+STHIG(J)
        SUMC=SUMC+STCOM(J)
        SUMGL=SUMGL+STGLO(J)
        SUMGH=SUMGH+STGHI(J)
        SUMGC=SUMGC+STGCO(J)
2109    CONTINUE
C       WRITE(6,12100) TITLE,(NUCLID(L),L=1,NONCLD),TOTAL
12100   FORMAT('1',20A4/30X,'NUCLIDE DOSE/EXPOSURE SUMMARY'//
     A  '0*** SELECTED INDIVIDUAL ***'/
     A  '0DOSE RATES:'/
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```
     A  ' WEIGHTED SUMS OF ORGAN DOSE RATES'/
     A  15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
C       WRITE(6,10205) (STLOW(L),L=1,NONCLD),SUML
C       WRITE(6,10210) (STHIG(L),L=1,NONCLD),SUMH
C       WRITE(6,10215) (STCOM(L),L=1,NONCLD),SUMC
C       IF(RNWR)WRITE(6,20216) WLI
C       WRITE(6,12290) (NUCLID(L),L=1,NONCLD),TOTAL
12290   FORMAT('0AVERAGE GONADAL DOSES:'/
     A  15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
C       WRITE(6,10220) (STGLO(L),L=1,NONCLD),SUMGL
C       WRITE(6,10225) (STGHI(L),L=1,NONCLD),SUMGH
C       WRITE(6,10230) (STGCO(L),L=1,NONCLD),SUMGC
C
C      IF MAXIMUM DOSE ORGAN BY NUCLIDE SUMMARY RETURN
C
      IF ( IFLAG .EQ. 3 ) RETURN
C
C
        IF(INDPOP.NE.1) GO TO 21000
        DO 2150 J=1,40
        STHIG(J)=0.0
        STLOW(J)=0.0
        STCOM(J)=0.0
        STGLO(J)=0.0
        STGHI(J)=0.0
        STGCO(J)=0.0
2150    CONTINUE
        SUML=0.0
        SUMH=0.0
        SUMC=0.0
        SUMGL=0.0
        SUMGH=0.0
        SUMGC=0.0
        DO 2209 J=1,NONCLD
        DO 2200 K=1,4
        FACNE2=TOTFAC*GENFAC(K)
        DO 2200 L=1,NORGN
        FACNEW=TOTFAC*DOSFAC(K)*DFAC(L,K)
        DO 2200 II=NOL,NOU
        DO 2200 JJ=NRL,NRU
        STHIG(J)=STHIG(J)+DOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
        STLOW(J)=STLOW(J)+DOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
        STCOM(J)=STCOM(J)+DOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
     >  *LLET(L)+DOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW*HLET(L)
        IF(L.NE.NGEN) GO TO 2200
        STGLO(J)=STGLO(J)+GDOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2
        STGHI(J)=STGHI(J)+GDOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2
        STGCO(J)=STGCO(J)+GDOSE(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2*
     A  GLLET(L)+GDOSE(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2*GHLET(L)
2200    CONTINUE
        SUML=SUML+STLOW(J)
        SUMH=SUMH+STHIG(J)
        SUMC=SUMC+STCOM(J)
        SUMGL=SUMGL+STGLO(J)
        SUMGH=SUMGH+STGHI(J)
        SUMGC=SUMGC+STGCO(J)
2209    CONTINUE
C       WRITE(6,12400) (NUCLID(L),L=1,NONCLD),TOTAL
12400   FORMAT(/'0*** MEAN INDIVIDUAL ***'/
     A  '0DOSE RATES:'/
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```
     A  ' WEIGHTED SUMS OF ORGAN DOSE RATES'/
     >  15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
C       WRITE(6,10205) (STLOW(L),L=1,NONCLD),SUML
C       WRITE(6,10210) (STHIG(L),L=1,NONCLD),SUMH
C       WRITE(6,10215) (STCOM(L),L=1,NONCLD),SUMC
C       IF(RNWR)WRITE(6,20216) WLE
C       WRITE(6,12590) (NUCLID(L),L=1,NONCLD),TOTAL
12590   FORMAT('0AVERAGE GONADAL DOSES:'/
     >  15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
C       WRITE(6,10220) (STGLO(L),L=1,NONCLD),SUMGL
C       WRITE(6,10225) (STGHI(L),L=1,NONCLD),SUMGH
C       WRITE(6,10230) (STGCO(L),L=1,NONCLD),SUMGC
        DO 2350 K=1,40
        STLOW(K)=0.0
        STHIG(K)=0.0
        STCOM(K)=0.0
        STGLO(K)=0.0
        STGHI(K)=0.0
        STGCO(K)=0.0
2350    CONTINUE
        SUML=0.0
        SUMH=0.0
        SUMC=0.0
        SUMGL=0.0
        SUMGH=0.0
        SUMGC=0.0
        DO 2409 J=1,NONCLD
        DO 2400 K=1,4
        TEXPP=0.0
        DO 2403 II=NOL,NOU
        DO 2403 JJ=NRL,NRU
        TEXPP=TEXPP+EXPP(JJ,II,J,K)
2403    CONTINUE
        TEXPP=TEXPP*.001
        DO 2400 L=1,NORGN
        STLOW(J)=STLOW(J)+DOSE(L,J,K,1)*TEXPP*DOSFAC(K)*DFAC(L,K)
        STHIG(J)=STHIG(J)+DOSE(L,J,K,2)*TEXPP*DOSFAC(K)*DFAC(L,K)
        STCOM(J)=STCOM(J)+DOSE(L,J,K,1)*TEXPP*DOSFAC(K)*LLET(L)*
     >  DFAC(L,K)+DOSE(L,J,K,2)*TEXPP*DOSFAC(K)*HLET(L)*DFAC(L,K)
        IF(L.NE.NGEN) GO TO 2400
        STGLO(J)=STGLO(J)+GDOSE(L,J,K,1)*TEXPP*GENFAC(K)
        STGHI(J)=STGHI(J)+GDOSE(L,J,K,2)*TEXPP*GENFAC(K)
        STGCO(J)=STGCO(J)+GDOSE(L,J,K,1)*TEXPP*GENFAC(K)*GLLET(L)+
     A  GDOSE(L,J,K,2)*TEXPP*GENFAC(K)*GHLET(L)
2400    CONTINUE
        SUML=SUML+STLOW(J)
        SUMH=SUMH+STHIG(J)
        SUMC=SUMC+STCOM(J)
        SUMGL=SUMGL+STGLO(J)
        SUMGH=SUMGH+STGHI(J)
        SUMGC=SUMGC+STGCO(J)
2409    CONTINUE
        WRITE(6,12700) TITLE,(NUCLID(L),L=1,NONCLD),TOTAL
12700 FORMAT('1',/////,20A4,/,30X,'NUCLIDE DOSE/EXPOSURE SUMMARY',//,
     &  '0*** COLLECTIVE POPULATION ***',/,'0DOSE RATES:',/,
     A  ' WEIGHTED SUMS OF ORGAN DOSE RATES'/
     >  15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
        WRITE(6,10206) (STLOW(L),L=1,NONCLD),SUML
        WRITE(6,10211) (STHIG(L),L=1,NONCLD),SUMH
        WRITE(6,10216) (STCOM(L),L=1,NONCLD),SUMC
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      IF(RNWR)WRITE(6,20416) WLC
      WRITE(6,12790) (NUCLID(L),L=1,NONCLD),TOTAL
12790 FORMAT('0AVERAGE GONADAL DOSES:'/
     > 15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
      WRITE(6,10221) (STGLO(L),L=1,NONCLD),SUMGL
      WRITE(6,10226) (STGHI(L),L=1,NONCLD),SUMGH
      WRITE(6,10231) (STGCO(L),L=1,NONCLD),SUMGC
21000 CALL SUMMR2(TITLE,RNWR,GSCFAC)
      RETURN
      END
C
C
C
C
      SUBROUTINE SUMMR2(TITLE,RNWR,GSCFAC)
      REAL*8 NUCLID,ORGN,CANC,TOTBOD,RNLOC,OGLOC,GEN,TOTAL,
     A  OREP,RREP,CREP,PUL
      DATA PUL/8HPULMNARY/
      LOGICAL GENEFF,RNWR
      REAL LLET
C
      COMMON/COMEX/EXPP(20,20,40,4),POP(20,20),POPFAC,TOTFAC, NOL,NOU,
     > NRL,NRU,IDIST(20),ILOC,JLOC
      COMMON/COMRN/OREP(20),RREP(20),CREP(20),WLRN(20,20),
     A  RRISK,RREF(2),RYRLL,NOREP,NRREP,NCREP
      COMMON/COMCA/CANC(20),NCANC,RELABS(20),RISK(20,40,4,2), RTABLE(7),
     > AGEX,YRLL(20,40,4,2)
      COMMON/COMRE/REF(20,40,4),ETABLE(7)
      COMMON/COMNU/NUCLID(40),NONCLD,PSIZE(40),RESP(40),GIABS (4,40),
     > INDPOP
      COMMON/COMGEN/GEN(3),NGEN,GDOSE(3,40,4,2),GRISK(3,40,4,2),
     >  GENEFF,GREAC(2),REPPER,GLLET(3),GHLET(3),GREF(3,40,4)
      COMMON/COMUS/STLOW(40),STHIG(40),STCOM(40),STREQ(40),
     A  STGLO(40),STGHI(40),STGCO(40),STLLL(40),STHLL(40),STCLL(40),
     B  STGRQ(40)
      COMMON/ACCMOD/FICAN(40),CCNR(40),POPD(40),GNR(40),
     &              TFIC,TCCNR,TPOPD,TGNR
      DIMENSION RISFAC(4),REQFAC(4),GENFAC(4),TITLE(20)
      DATA RISFAC/2*1.E-5,10.,1000./,
     <  REQFAC/1.,1.,1.E6,1.E8/,
     <  GENFAC/1.,1.,1.,100./,TOTAL/8HTOTAL   /
      DATA IKP/0/
C****
      RISK RATES BY CANCER
      IF (IKP.EQ.0) RISFAC(4)=RISFAC(4)*GSCFAC
      IF (IKP.EQ.0) REQFAC(4)=REQFAC(4)*GSCFAC
      IF (IKP.EQ.0) GENFAC(4)=GENFAC(4)*GSCFAC
      IKP = 1
      LP=1
      DO 25 K=1,NCANC
      IF(CANC(K).EQ.PUL)LP=K
25    CONTINUE
      DO 50 J=1,40
      STHIG(J)=0.0
      STLOW(J)=0.0
      STCOM(J)=0.0
      STGLO(J)=0.0
      STGHI(J)=0.0
      STGCO(J)=0.0
      STREQ(J)=0.0
      STGRQ(J)=0.0
```

```
      STLLL(J)=0.0
      STHLL(J)=0.0
      STCLL(J)=0.0
50    CONTINUE
      SUML=0.0
      SUMH=0.0
      SUMC=0.0
      SUMLLL=0.0
      SUMHLL=0.0
      SUMCLL=0.0
      TBEQ=0.0
      RLL=0.0
      YRP=RYRLL*WLRN(JLOC,ILOC)*POPFAC
      RR=RRISK*WLRN(JLOC,ILOC)*POPFAC
      IF(WLRN(JLOC,ILOC).NE.0.0)RLL=RYRLL/RRISK
      RP=RR
      DO 109 L=1,NCANC
      DO 100 K=1,4
      FACNEW=POPFAC*RISFAC(K)
      FACNE2=POPFAC*GENFAC(K)
      DO 100 J=1,NONCLD
      STHIG(L)=STHIG(L)+RISK(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STHLL(L)=STHLL(L)+YRLL(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STLOW(L)=STLOW(L)+RISK(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STLLL(L)=STLLL(L)+YRLL(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STCOM(L)=STCOM(L)+RISK(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
     <+RISK(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STCLL(L)=STCLL(L)+YRLL(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
     <+YRLL(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STREQ(L)=STREQ(L)+REF(L,J,K)*POPFAC*REQFAC(K)*EXPP(JLOC,
     <ILOC,J,K)
      IF(L.GT.1) GO TO 100
      TBEQ=TBEQ+REF(NCANC+1,J,K)*POPFAC*REQFAC(K)*EXPP(JLOC,
     <ILOC,J,K)
      STGRQ(L)=STGRQ(L)+GREF(L,J,K)*FACNE2*EXPP(JLOC,ILOC,J,K)
      STGLO(L)=STGLO(L)+GRISK(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)
      STGHI(L)=STGHI(L)+GRISK(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)
      STGCO(L)=STGCO(L)+GRISK(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)+
     A GRISK(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)
100   CONTINUE
      SUML=SUML+STLOW(L)
      SUMH=SUMH+STHIG(L)
      SUMLLL=SUMLLL+STLLL(L)
      SUMHLL=SUMHLL+STHLL(L)
      SUMCLL=SUMCLL+STCLL(L)
      SUMC=SUMC+STCOM(L)
      IF(L.EQ.LP) STCPH=STCLL(L)
      IF(L.EQ.LP)STCCH=STCOM(L)
      IF(STLOW(L).NE.0.0)STLLL(L)=STLLL(L)/STLOW(L)
      IF(STHIG(L).NE.0.0)STHLL(L)=STHLL(L)/STHIG(L)
      IF(STCOM(L).NE.0.0)STCLL(L)=STCLL(L)/STCOM(L)
109   CONTINUE
      IF(SUML.NE.0.0)SUMLLL=SUMLLL/SUML
      IF(SUMH.NE.0.0)SUMHLL=SUMHLL/SUMH
      IF(SUMC.NE.0.0) YRT=(RYRLL*WLRN(JLOC,ILOC)*POPFAC+SUMCLL)/
     A (SUMC+RRISK*POPFAC*WLRN(JLOC,ILOC))
      IF(SUMC.NE.0.0)SUMCLL=SUMCLL/SUMC
      YRP=STCPH+YRP
      RP=RP+STCCH
      IF(RP.NE.0.0) YRP=YRP/RP
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C       WRITE(6,10100) TITLE
C       WRITE(6,10102)(CANC(L),L=1,NCANC),TOTAL
10100   FORMAT('1',20A4/30X,'RISK/RISK EQUIVALENT SUMMARY'//
     A  '0*** SELECTED INDIVIDUAL  ***'/
     B  '0LIFETIME FATAL CANCER RISK:'/)
10102   FORMAT(16X,' CANCERS:',10(2X,A8)/(26X,10(2X,A8)))
C       WRITE(6,10205) (STLOW(L),L=1,NCANC),SUML
C       WRITE(6,10210) (STHIG(L),L=1,NCANC),SUMH
C       WRITE(6,10215) (STCOM(L),L=1,NCANC),SUMC
C       IF(RNWR)WRITE(6,20216) RR
        TT=SUMC+RR
20216   FORMAT('0LUNG CANCER RISK FROM RADON DAUGHTER EXPOSURE ',
     A  8X,1PG10.3)
C       IF(RNWR)WRITE(6,20217) TT
20217   FORMAT(' TOTAL FATAL CANCER RISK FROM ALL EXPOSURES',
     A  12X,1PG10.3)
10205   FORMAT(' LOW LET ',16X,1P10G10.3/(26X,1P10G10.3))
10210   FORMAT(' HIGH LET',16X,1P10G10.3/(26X,1P10G10.3))
10215   FORMAT('  TOTAL',16X,1P10G10.3/(26X,1P10G10.3))
C       WRITE(6,30100)
30100   FORMAT('0AVERAGE LIFE LOSS PER PREMATURE DEATH:')
C       WRITE(6,10102) (CANC(L),L=1,NCANC),TOTAL
C       WRITE(6,10250) (STLLL(L),L=1,NCANC),SUMLLL
C       WRITE(6,10255) (STHLL(L),L=1,NCANC),SUMHLL
C       WRITE(6,10260) (STCLL(L),L=1,NCANC),SUMCLL
C       IF(RNWR)WRITE(6,20218) RLL
20218   FORMAT('0AVG LIFE LOSS FROM RADON DAUGHTER EXPOSURE ',
     A  'FOR LUNG',3X,1PG10.3)
C       IF(RNWR)WRITE(6,20219)YRP
20219   FORMAT(' AVG LIFE LOSS FROM ALL EXPOSURES FOR LUNG',
     A  13X,1PG10.3)
C       IF(RNWR)WRITE(6,20220) YRT
20220   FORMAT(' AVG LIFE LOSS FROM ALL EXPOSURES (TOTAL)  ',
     A  12X,1PG10.3)
10250   FORMAT(' LOW LET (YR)',12X,1P10G10.3/(26X,1P10G10.3))
10255   FORMAT(' HIGH LET (YR)',11X,1P10G10.3/(26X,1P10G10.3))
10260   FORMAT(' COMBINED (YR)',11X,1P10G10.3/(26X,1P10G10.3))
C       WRITE(6,30200)
30200   FORMAT('0FATAL CANCER RISK EQUIVALENT:')
C       WRITE(6,10102) (CANC(L),L=1,NCANC),TOTAL
C       WRITE(6,10220) (STREQ(L),L=1,NCANC),TBEQ
C       WRITE(6,10221) TBEQ
10220   FORMAT(' (MREM/YR)',15X,1P10G10.3/(26X,1P10G10.3))
10221   FORMAT('0WHOLE BODY FATAL CANCER RISK EQ(MREM/YR)',
     >  24X,1PG10.3)
        RQ=RREF(1)*WLRN(JLOC,ILOC)*POPFAC
        RT=RREF(2)*WLRN(JLOC,ILOC)*POPFAC
        TTP=RQ+STREQ(LP)
        TTQ=RT+TBEQ
C       IF(RNWR)WRITE(6,20221) RQ
C       IF(RNWR)WRITE(6,20222) RT
C       IF(RNWR)WRITE(6,20224) TTP
C       IF(RNWR)WRITE(6,20223) TTQ
20221   FORMAT(' LUNG RISK EQUIVALENT(MREM/YR) FROM RADON ',
     A  'DAUGHTER EXPOSURE  ',4X,1PG10.3)
20321   FORMAT(' LUNG RISK EQ. (PERSON REM/YR) FROM RADON ',
     A  'DAUGHTER EXPOSURE',6X,1PG10.3)
20222   FORMAT(' WHOLE BODY RISK EQ (MREM/YR) FROM RADON ',
     A  'DAUGHTER EXPOSURE ',6X,1PG10.3)
20322   FORMAT(' WHOLE BODY RISK EQ (PERSON REM/YR) FROM RADON  ,
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     A  'DAUGHTER EXPOSURE',1X,1PG10.3)
20223   FORMAT(' WHOLE BODY RISK EQ (MREM/YR) FROM ALL EXPOSURES',
     A17X,1PG10.3)
20224   FORMAT(' PULMNARY RISK EQ (MREM/YR) FOR ALL EXPOSURES',
     A  20X,1PG10.3)
20323   FORMAT(' WHOLE BODY RISK EQ (PERSON REM/YR) FROM ALL EXPOSURES',
     A11X,1PG10.3)
20324   FORMAT(' PULMNARY RISK EQ (PERSON REM/YR) FOR ALL EXPOSURES',
     A  14X,1PG10.3)
C       WRITE(6,10190)
10190   FORMAT('0GENETIC RISKS:')
C       WRITE(6,10225) STGLO(1)
10225   FORMAT(' LOW LET (EFFECTS/BIRTH)',1X,1P10G10.3/
     >  (26X,1P10G10.3))
C       WRITE(6,10230) STGHI(1)
10230   FORMAT(' HIGH LET (EFFECTS/BIRTH)',1P10G10.3/
     >  (26X,1P10G10.3))
C       WRITE(6,10235) STGCO(1)
10235   FORMAT(' COMBINED (EFFECTS/BIRTH)',1P10G10.3/
     >  (26X,1P10G10.3))
C       WRITE(6,30300) STGRQ(1)
30300   FORMAT('0GENETIC RISK EQUIVALENT:'/
     A  ' (MREM/YR)',15X,1P10G10.3/(26X,1P10G10.3))
        IF(INDPOP.NE.1) GO TO 1000
        DO 150 J=1,40
        STHIG(J)=0.0
        STLOW(J)=0.0
        STCOM(J)=0.0
        STGLO(J)=0.0
        STGHI(J)=0.0
        STGCO(J)=0.0
        STREQ(J)=0.0
        STLLL(J)=0.0
        STHLL(J)=0.0
        STCLL(J)=0.0
        STGRQ(J)=0.0
150     CONTINUE
        TREQ=0.0
        SUML=0.0
        SUMH=0.0
        SUMC=0.0
        SUMLLL=0.0
        SUMHLL=0.0
        SUMCLL=0.0
        RRM=0.0
        RLL=0.0
        RQM=0.0
        RTM=0.0
        YRP=0.0
        DO 206 II=NOL,NOU
        DO 206 JJ=NRL,NRU
        RQM=RQM+RREF(1)*WLRN(JJ,II)*TOTFAC
        RTM=RTM+RREF(2)*WLRN(JJ,II)*TOTFAC
        RRM=RRISK*WLRN(JJ,II)*TOTFAC+RRM
        YRP=RYRLL*WLRN(JJ,II)*TOTFAC+YRP
206     CONTINUE
        IF(RRM.NE.0.0)RLL=YRP/RRM
        RP=YRP
        DO 209 L=1,NCANC
        DO 200 K=1,4
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      FACNEW=TOTFAC*RISFAC(K)
      FACNE2=TOTFAC*GENFAC(K)
      DO 200 J=1,NONCLD
      DO 200 II=NOL,NOU
      DO 200 JJ=NRL,NRU
      STHIG(L)=STHIG(L)+RISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
      STHLL(L)=STHLL(L)+YRLL(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
      STLOW(L)=STLOW(L)+RISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
      STLLL(L)=STLLL(L)+YRLL(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
      STCOM(L)=STCOM(L)+RISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
     >+RISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
      STCLL(L)=STCLL(L)+YRLL(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
     >+YRLL(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
      STREQ(L)=STREQ(L)+REF(L,J,K)*EXPP(JJ,II,J,K)*TOTFAC
     >*REQFAC(K)
      IF(L.NE.1) GO TO 200
      TREQ=TREQ+REF(NCANC+1,J,K)*EXPP(JJ,II,J,K)*TOTFAC*REQFAC(K)
      STGRQ(L)=STGRQ(L)+GREF(L,J,K)*EXPP(JJ,II,J,K)*TOTFAC*GENFAC(K)
      STGLO(L)=STGLO(L)+GRISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2
      STGHI(L)=STGHI(L)+GRISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2
      STGCO(L)=STGCO(L)+GRISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2+
     A GRISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2
200   CONTINUE
      SUML=SUML+STLOW(L)
      SUMH=SUMH+STHIG(L)
      SUMC=SUMC+STCOM(L)
      SUMLLL=SUMLLL+STLLL(L)
      SUMHLL=SUMHLL+STHLL(L)
      SUMCLL=SUMCLL+STCLL(L)
      IF(L.EQ.LP) STCPH=STCLL(LP)
      IF(L.EQ.LP) STCCH=STCOM(LP)
      IF(STLOW(L).NE.0.0)STLLL(L)=STLLL(L)/STLOW(L)
      IF(STHIG(L).NE.0.0)STHLL(L)=STHLL(L)/STHIG(L)
      IF(STCOM(L).NE.0.0)STCLL(L)=STCLL(L)/STCOM(L)
209   CONTINUE
      IF(SUML.NE.0.0)SUMLLL=SUMLLL/SUML
      IF(SUMH.NE.0.0)SUMHLL=SUMHLL/SUMH
      IF(SUMC.NE.0.0) YRT=(YRP+SUMCLL)/(RRM+SUMC)
      YRP=STCPH+YRP
      RP=RRM+STCCH
      IF(RP.NE.0.0)YRP=YRP/RP
      IF(SUMC.NE.0.0)SUMCLL=SUMCLL/SUMC
C     WRITE(6,10400) TITLE
C     WRITE(6,10402)(CANC(L),L=1,NCANC),TOTAL
10400 FORMAT('1',20A4/30X,'RISK/RISK EQUIVALENT SUMMARY'//
     A '0*** MEAN INDIVIDUAL  ***'/
     B 'OLIFETIME FATAL CANCER RISK:'/)
10402 FORMAT(16X,' CANCERS:',10(2X,A8)/(26X,10(2X,A8)))
C     WRITE(6,10205) (STLOW(L),L=1,NCANC),SUML
C     WRITE(6,10210) (STHIG(L),L=1,NCANC),SUMH
C     WRITE(6,10215) (STCOM(L),L=1,NCANC),SUMC
C     IF(RNWR)WRITE(6,20216) RRM
      TTM=SUMC+RRM
C     IF(RNWR)WRITE(6,20217)TTM
C     WRITE(6,30100)
C     WRITE(6,10102) (CANC(L),L=1,NCANC),TOTAL
C     WRITE(6,10250) (STLLL(L),L=1,NCANC),SUMLLL
C     WRITE(6,10255) (STHLL(L),L=1,NCANC),SUMHLL
C     WRITE(6,10260) (STCLL(L),L=1,NCANC),SUMCLL
C     IF(RNWR)WRITE(6,20218) RLL
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C       IF(RNWR)WRITE(6,20219) YRP
C       IF(RNWR)WRITE(6,20220) YRT
C       WRITE(6,30200)
C       WRITE(6,10102) (CANC(L),L=1,NCANC),TOTAL
C       WRITE(6,10220) (STREQ(L),L=1,NCANC),TBEQ
C       WRITE(6,10221) TBEQ
C       IF(RNWR)WRITE(6,20221) RQM
C       IF(RNWR)WRITE(6,20222) RTM
        TTP=RQM+STREQ(LP)
C       IF(RNWR)WRITE(6,20224) TTP
        TTQM=RTM+TBEQ
C       IF(RNWR)WRITE(6,20223) TTQM
C       WRITE(6,10590)
10590   FORMAT('0GENETIC RISKS:'/)
C       WRITE(6,10225) STGLO(1)
C       WRITE(6,10230) STGHI(1)
C       WRITE(6,10235) STGCO(1)
C       WRITE(6,30300) STGRQ(1)
        DO 350 K=1,40
        STLOW(K)=0.0
        STHIG(K)=0.0
        STCOM(K)=0.0
        STGLO(K)=0.0
        STGHI(K)=0.0
        STGCO(K)=0.0
        STREQ(K)=0.0
        STLLL(K)=0.0
        STHLL(K)=0.0
        STCLL(K)=0.0
        STGRQ(K)=0.0
350     CONTINUE
        SUML=0.0
        TBEQ=0.0
        SUMH=0.0
        SUMC=0.0
        SUMLLL=0.0
        SUMHLL=0.0
        SUMCLL=0.0
        WLT=0.0
        DO 401 II=NOL,NOU
        DO 401 JJ=NRL,NRU
        WLT=WLT+WLRN(JJ,II)
401     CONTINUE
        RRC=RRISK*WLT/AGEX
        RQC=RREF(1)*WLT*.001
        RTC=RREF(2)*WLT*.001
        DO 400 K=1,4
        DO 400 J=1,NONCLD
        TEXPP=0.0
        DO 403 II=NOL,NOU
        DO 403 JJ=NRL,NRU
        TEXPP=TEXPP+EXPP(JJ,II,J,K)
403     CONTINUE
        DO 400 L=1,NCANC
        STLOW(L)=STLOW(L)+RISK(L,J,K,1)*TEXPP*RISFAC(K)/AGEX
        STLLL(L)=STLLL(L)+YRLL(L,J,K,1)*TEXPP*RISFAC(K)/AGEX
        SUML=SUML+RISK(L,J,K,1)*TEXPP*RISFAC(K)/AGEX
        SUMLLL=SUMLLL+YRLL(L,J,K,1)*TEXPP*RISFAC(K)/AGEX
        STHIG(L)=STHIG(L)+RISK(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
        STHLL(L)=STHLL(L)+YRLL(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
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      SUMH=SUMH+RISK(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
      SUMHLL=SUMHLL+YRLL(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
      STCOM(L)=STCOM(L)+RISK(L,J,K,1)*TEXPP*RISFAC(K)/AGEX+
     > RISK(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
      STCLL(L)=STCLL(L)+YRLL(L,J,K,1)*TEXPP*
     > RISFAC(K)/AGEX+
     > YRLL(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
      SUMC=SUMC+RISK(L,J,K,1)*TEXPP*RISFAC(K)/AGEX+
     A RISK(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
      SUMCLL=SUMCLL+YRLL(L,J,K,1)*TEXPP*RISFAC(K)/AGEX+
     A YRLL(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
      STREQ(L)=STREQ(L)+REF(L,J,K)*TEXPP*REQFAC(K)*.001
      IF(L.NE.1) GO TO 400
      TBEQ=TBEQ+REF(NCANC+1,J,K)*TEXPP*REQFAC(K)*.001
      STGRQ(L)=STGRQ(L)+GREF(L,J,K)*TEXPP*GENFAC(K)*.001
      STGLO(L)=STGLO(L)+GRISK(L,J,K,1)*TEXPP*GENFAC(K)*REPPER
      STGHI(L)=STGHI(L)+GRISK(L,J,K,2)*TEXPP*GENFAC(K)*REPPER
      STGCO(L)=STGCO(L)+GRISK(L,J,K,1)*TEXPP*GENFAC(K)*REPPER+
     A GRISK(L,J,K,2)*TEXPP*GENFAC(K)*REPPER
400   CONTINUE
      WRITE(6,10700)TITLE, (CANC(L),L=1,NCANC),TOTAL
10700 FORMAT('1',/////,20A4,/,30X,'RISK/RISK EQUIVALENT SUMMARY',//,
     & '0*** COLLECTIVE POPULATION ***',/,
     A '0COLLECTIVE FATAL CANCER RISK:'/
     A 16X,' CANCERS:',10(2X,A8)/(26X,10(2X,A8)))
      WRITE(6,10705) (STLOW(L),L=1,NCANC),SUML
10705 FORMAT(' LOW LET(DEATHS/YR)',6X,1P10G10.3/
     A (26X,1P10G10.3))
      WRITE(6,10710) (STHIG(L),L=1,NCANC),SUMH
10710 FORMAT(' HIGH LET(DEATHS/YR)',5X,1P10G10.3/
     A (26X,1P10G10.3))
      WRITE(6,10715) (STCOM(L),L=1,NCANC),SUMC
      IF(RNWR)WRITE(6,20316) RRC
      TTC=SUMC+RRC
      IF(RNWR)WRITE(6,20317) TTC
20316 FORMAT('0LUNG CANCER RISK(DEATHS/YR) FROM RADON DAUGHTER',
     > ' EXPOSURE',8X,1PG10.3)
20317 FORMAT(' TOTAL FATAL CANCER RISK(DEATHS/YR) FROM ALL',
     > ' EXPOSURE',12X,1PG10.3)
CWRITE(6,10750) (STLLL(L),L=1,NCANC),SUMLLL
CWRITE(6,10755) (STHLL(L),L=1,NCANC),SUMHLL
CWRITE(6,10760) (STCLL(L),L=1,NCANC),SUMCLL
10750 FORMAT(' LOST LOW LET',12X,1P10G10.3/(26X,1P10G10.3))
10755 FORMAT(' LIFE LOST HIGH LET',6X,1P10G10.3/(26X,1P10G10.3))
10760 FORMAT(' LIFE LOST COMBINED',6X,1P10G10.3/(26X,1P10G10.3))
10715 FORMAT('  TOTAL (DEATHS/YR)',6X,1P10G10.3/
     A (26X,1P10G10.3))
      WRITE(6,30200)
      WRITE(6,10102) (CANC(L),L=1,NCANC),TOTAL
      WRITE(6,10719) (STREQ(L),L=1,NCANC),TBEQ
10719 FORMAT(' (PERSON REM/YR)',9X,1P10G10.3/(26X,1P10G10.3))
      WRITE(6,10321) TBEQ
10321 FORMAT('0WHOLE BODY FATAL CANCER RISK EQ(PERSON REM/YR)',
     1 18X,1PG10.3)
      IF(RNWR)WRITE(6,20321) RQC
      IF(RNWR)WRITE(6,20322) RTC
      TTPC=RQC+STREQ(LP)
      IF(RNWR)WRITE(6,20324) TTPC
      TTQC=RTC+TBEQ
      IF(RNWR)WRITE(6,20323) TTQC
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10720   FORMAT('0GENETIC RISK EQUIVALENT:'/
     1 ' (PERSON REM/YR)',9X,1P10G10.3/
     A  (26X,1P10G10.3))
        WRITE(6,10790)
10790   FORMAT('0GENETIC RISKS:')
        WRITE(6,10725) STGLO(1)
10725   FORMAT(' LOW LET(EFFECTS/YR)',5X,1P10G10.3/
     >  (26X,1P10G10.3))
        WRITE(6,10730) STGHI(1)
10730   FORMAT(' HIGH LET(EFFECTS/YR)',4X,1P10G10.3/
     >  (26X,1P10G10.3))
        WRITE(6,10735) STGCO(1)
10735   FORMAT(' COMBINED(EFFECTS/YR)',4X,1P10G10.3/
     >  (26X,1P10G10.3))
        WRITE(6,10720) STGRQ(1)
C****   RISK RATES BY PATHWAY
1000    DO 1050 J=1,40
        STHIG(J)=0.0
        STLOW(J)=0.0
        STCOM(J)=0.0
        STREQ(J)=0.0
        STGRQ(J)=0.0
        STGLO(J)=0.0
        STGHI(J)=0.0
        STGCO(J)=0.0
1050    CONTINUE
        DO 1199 K=1,4
        DO 1100 L=1,NCANC
        FACNEW=POPFAC*RISFAC(K)
        FACNE2=POPFAC*GENFAC(K)
        DO 1100 J=1,NONCLD
        STHIG(K)=STHIG(K)+RISK(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
        STLOW(K)=STLOW(K)+RISK(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
        STCOM(K)=STCOM(K)+RISK(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
     <  +RISK(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
        IF(L.NE.1) GO TO 1100
        STREQ(K)=STREQ(K)+REF(NCANC+1,J,K)*POPFAC*REQFAC(K)*
     <  EXPP(JLOC,ILOC,J,K)
        STGRQ(K)=STGRQ(K)+GREF(L,J,K)*POPFAC*GENFAC(K)*
     <  EXPP(JLOC,ILOC,J,K)
        STGH1(K)=STGH1(K)+GRISK(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)
        STGLO(K)=STGLO(K)+GRISK(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)
        STGCO(K)=STGCO(K)+GRISK(L,J,K,1)*FACNE2*EXPP(JLOC,ILOC,J,K)+
     A  GRISK(L,J,K,2)*FACNE2*EXPP(JLOC,ILOC,J,K)
1100    CONTINUE
1103    IF(K.GT.2) GO TO 1101
        STHIG(5)=STHIG(5)+STHIG(K)
        STLOW(5)=STLOW(5)+STLOW(K)
        STCOM(5)=STCOM(5)+STCOM(K)
        STGHI(5)=STGHI(5)+STGHI(K)
        STGLO(5)=STGLO(5)+STGLO(K)
        STGCO(5)=STGCO(5)+STGCO(K)
        STGRQ(5)=STGRQ(5)+STGRQ(K)
        STREQ(5)=STREQ(5)+STREQ(K)
1101    IF(K.LT.3)GO TO 1102
        STHIG(6)=STHIG(6)+STHIG(K)
        STLOW(6)=STLOW(6)+STLOW(K)
        STCOM(6)=STCOM(6)+STCOM(K)
        STGRQ(6)=STGRQ(6)+STGRQ(K)
        STREQ(6)=STREQ(6)+STREQ(K)
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      STGHI(6)=STGHI(6)+STGHI(K)
      STGLO(6)=STGLO(6)+STGLO(K)
      STGCO(6)=STGCO(6)+STGCO(K)
1102  STHIG(7)=STHIG(7)+STHIG(K)
      STLOW(7)=STLOW(7)+STLOW(K)
      STCOM(7)=STCOM(7)+STCOM(K)
      STGRQ(7)=STGRQ(7)+STGRQ(K)
      STREQ(7)=STREQ(7)+STREQ(K)
      STGHI(7)=STGHI(7)+STGHI(K)
      STGLO(7)=STGLO(7)+STGLO(K)
      STGCO(7)=STGCO(7)+STGCO(K)
1199  CONTINUE
C     WRITE(6,11100) TITLE
C     WRITE(6,11102)
11100 FORMAT('1',20A4/30X,'PATHWAY RISK/RISK EQUIVALENT SUMMARY'
     A //'0*** SELECTED INDIVIDUAL ***'/
     A '0LIFETIME FATAL CANCER RISK:'/)
11102 FORMAT('                PATHWAYS:  INGESTION ',
     < 'INHALATION    AIR     GROUND',
     < '     INTERNAL  EXTERNAL   TOTAL'/
     < 45X,' IMMERSION  SURFACE')
C     WRITE(6,10205) (STLOW(L),L=1,7)
C     WRITE(6,10210) (STHIG(L),L=1,7)
C     WRITE(6,10215) (STCOM(L),L=1,7)
C     IF(RNWR)WRITE(6,20216) RR
C     IF(RNWR)WRITE(6,20217)TT
C     WRITE(6,30200)
C     WRITE(6,11102)
C     WRITE(6,10220) (STREQ(L) ,L=1,7)
C     IF(RNWR)WRITE(6,20422) RT
20422 FORMAT('0WHOLE BODY RISK EQ(MREM/YR) FROM RADON',
     > ' DAUGHTER  EXPOSURE',7X,1PG10.3)
C     IF(RNWR)WRITE(6,20223) TTQ
C     WRITE(6,10290)
C     WRITE(6,11102)
10290 FORMAT('0GENETIC RISKS:')
C     WRITE(6,10225) (STGLO(L),L=1,7)
C     WRITE(6,10230) (STGHI(L),L=1,7)
C     WRITE(6,10235) (STGCO(L),L=1,7)
C     WRITE(6,30300) (STGRQ(L),L=1,7)
      IF(INDPOP.NE.1) GO TO 11000
      DO 1150 J=1,40
      STHIG(J)=0.0
      STLOW(J)=0.0
      STCOM(J)=0.0
      STREQ(J)=0.0
      STGRQ(J)=0.0
      STGLO(J)=0.0
      STGHI(J)=0.0
      STGCO(J)=0.0
1150  CONTINUE
      TBEQ=0.0
      DO 1299 K=1,4
      FACNEW=TOTFAC*RISFAC(K)
      FACNE2=TOTFAC*GENFAC(K)
      DO 1200 L=1,NCANC
      DO 1200 J=1,NONCLD
      DO 1200 II=NJL,NOU
      DO 1200 JJ=NRL,NRU
      STHIG(K)=STHIG(K)+RISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
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      STLOW(K)=STLOW(K)+RISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
      STCOM(K)=STCOM(K)+RISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
     >+RISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
      IF(L.GT.1) GO TO 1200
      STREQ(K)=STREQ(K)+REF(NCANC+1,J,K)*EXPP(JJ,II,J,K)*
     > TOTFAC*REQFAC(K)
      STGRQ(K)=STGRQ(K)+GREF(L,J,K)*EXPP(JJ,II,J,K)*
     > TOTFAC*GENFAC(K)
      STGHI(K)=STGHI(K)+GRISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2
      STGLO(K)=STGLO(K)+GRISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2
      STGCO(K)=STGCO(K)+GRISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2+
     A GRISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2
1200  CONTINUE
1203  IF(K.GT.2) GO TO 1201
      STHIG(5)=STHIG(5)+STHIG(K)
      STLOW(5)=STLOW(5)+STLOW(K)
      STCOM(5)=STCOM(5)+STCOM(K)
      STGRQ(5)=STGRQ(5)+STGRQ(K)
      STREQ(5)=STREQ(5)+STREQ(K)
      STGLO(5)=STGLO(5)+STGLO(K)
      STGHI(5)=STGHI(5)+STGHI(K)
      STGCO(5)=STGCO(5)+STGCO(K)
1201  IF(K.LT.3) GO TO 1202
      STHIG(6)=STHIG(6)+STHIG(K)
      STLOW(6)=STLOW(6)+STLOW(K)
      STCOM(6)=STCOM(6)+STCOM(K)
      STGRQ(6)=STGRQ(6)+STGRQ(K)
      STREQ(6)=STREQ(6)+STREQ(K)
      STGLO(6)=STGLO(6)+STGLO(K)
      STGHI(6)=STGHI(6)+STGHI(K)
      STGCO(6)=STGCO(6)+STGCO(K)
1202  STHIG(7)=STHIG(7)+STHIG(K)
      STLOW(7)=STLOW(7)+STLOW(K)
      STCOM(7)=STCOM(7)+STCOM(K)
      STGRQ(7)=STGRQ(7)+STGRQ(K)
      STREQ(7)=STREQ(7)+STREQ(K)
      STGLO(7)=STGLO(7)+STGLO(K)
      STGHI(7)=STGHI(7)+STGHI(K)
      STGCO(7)=STGCO(7)+STGCO(K)
1299  CONTINUE
C     WRITE(6,11400)TITLE
C     WRITE(6,11102)
11400 FORMAT(/'1',20A4/
     > 29X,'PATHWAY RISK/RISK EQUIVALENT SUMMARY'//
     A '0***MEAN INDIVIDUAL ***'/
     B '0LIFETIME FATAL CANCER RISK:'/)
C     WRITE(6,10205) (STLOW(L),L=1,7)
C     WRITE(6,10210) (STHIG(L),L=1,7)
C     WRITE(6,10215) (STCOM(L),L=1,7)
C     IF(RNWR)WRITE(6,20216) RRM
C     IF(RNWR)WRITE(6,20217) TTM
C     WRITE(6,30200)
C     WRITE(6,11102)
C     WRITE(6,10220) (STREQ(L),L=1,7)
C     IF(RNWR)WRITE(6,20422) RTM
C     IF(RNWR)WRITE(6,20223) TTQM
C     WRITE(6,11590)
C     WRITE(6,11102)
11590 FORMAT('0GENETIC RISKS:'/)
C     WRITE(6,10225) (STGLO(L),L=1,7)
```

```
C       WRITE(6,10230) (STGHI(L),L=1,7)
C       WRITE(6,10235) (STGCO(L),L=1,7)
C       WRITE(6,30300) (STGRQ(L),L=1,7)
        DO 1350 K=1,40
        STLOW(K)=0.0
        STHIG(K)=0.0
        STCOM(K)=0.0
        STGLO(K)=0.0
        STGHI(K)=0.0
        STGCO(K)=0.0
        STREQ(K)=0.0
        STGRQ(K)=0.0
1350    CONTINUE
        DO 1499 K=1,4
        DO 1400 J=1,NONCLD
        TEXPP=0.0
        DO 1404 II=NOL,NOU
        DO 1404 JJ=NRL,NRU
        TEXPP=TEXPP+EXPP(JJ,II,J,K)
1404    CONTINUE
        DO 1400 L=1,NCANC
        STLOW(K)=STLOW(K)+RISK(L,J,K,1)*TEXPP*RISFAC(K)/AGEX
        STHIG(K)=STHIG(K)+RISK(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
        STCOM(K)=STCOM(K)+RISK(L,J,K,1)*TEXPP*RISFAC(K)/AGEX+
     >  RISK(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
        IF(L.GT.1) GO TO 1400
        STREQ(K)=STREQ(K)+REF(NCANC+1,J,K)*TEXPP*REQFAC(K)*.001
        STGRQ(K)=STGRQ(K)+GREF(L,J,K)*TEXPP*GENFAC(K)*.001
        STGLO(K)=STGLO(K)+GRISK(L,J,K,1)*TEXPP*GENFAC(K)*REPPER
        STGHI(K)=STGHI(K)+GRISK(L,J,K,2)*TEXPP*GENFAC(K)*REPPER
        STGCO(K)=STGCO(K)+GRISK(L,J,K,1)*TEXPP*GENFAC(K)*REPPER+
     A  GRISK(L,J,K,2)*TEXPP*GENFAC(K)*REPPER
1400    CONTINUE
1403    IF(K.GT.2) GO TO 1401
        STLOW(5)=STLOW(5)+STLOW(K)
        STHIG(5)=STHIG(5)+STHIG(K)
        STCOM(5)=STCOM(5)+STCOM(K)
        STGLO(5)=STGLO(5)+STGLO(K)
        STGHI(5)=STGHI(5)+STGHI(K)
        STGCO(5)=STGCO(5)+STGCO(K)
        STGRQ(5)=STGRQ(5)+STGRQ(K)
        STREQ(5)=STREQ(5)+STREQ(K)
        GO TO 1402
1401    STLOW(6)=STLOW(6)+STLOW(K)
        STHIG(6)=STHIG(6)+STHIG(K)
        STCOM(6)=STCOM(6)+STCOM(K)
        STGLO(6)=STGLO(6)+STGLO(K)
        STGHI(6)=STGHI(6)+STGHI(K)
        STGCO(6)=STGCO(6)+STGCO(K)
        STGRQ(6)=STGRQ(6)+STGRQ(K)
        STREQ(6)=STREQ(6)+STREQ(K)
1402    STLOW(7)=STLOW(7)+STLOW(K)
        STHIG(7)=STHIG(7)+STHIG(K)
        STCOM(7)=STCOM(7)+STCOM(K)
        STGRQ(7)=STGRQ(7)+STGRQ(K)
        STREQ(7)=STREQ(7)+STREQ(K)
        STGLO(7)=STGLO(7)+STGLO(K)
        STGHI(7)=STGHI(7)+STGHI(K)
        STGCO(7)=STGCO(7)+STGCO(K)
1499    CONTINUE
```

```
      WRITE(6,11700)TITLE
      WRITE(6,11102)
11700 FORMAT('1',/////,20A4,/,30X,
     & 'PATHWAY RISK/RISK EQUIVALENT SUMMARY',//,
     A '0*** COLLECTIVE POPULATION ***'/
     B '0COLLECTIVE FATAL CANCER RISK:'/)
      WRITE(6,10705) (STLOW(L),L=1,7)
      WRITE(6,10710) (STHIG(L),L=1,7)
      WRITE(6,10715) (STCOM(L),L=1,7)
      IF(RNWR)WRITE(6,20316) RRC
      IF(RNWR)WRITE(6,20317) TTC
      WRITE(6,30200)
      WRITE(6,11102)
      WRITE(6,10719) (STREQ(L),L=1,7)
      IF(RNWR)WRITE(6,20522) RTC
20522 FORMAT('0WHOLE BODY RISK EQ(PERSON REM/YR) FROM RADON ',
     > 'DAUGHTER EXPOSURE',2X,1PG10.3)
      WRITE(6,20323) TTQC
      WRITE(6,11790)
      WRITE(6,11102)
11790 FORMAT('0GENETIC RISKS(PERSON REM/YR):'/)
      WRITE(6,10725) (STGLO(L),L=1,7)
      WRITE(6,10730) (STGHI(L),L=1,7)
      WRITE(6,10735) (STGCO(L),L=1,7)
      WRITE(6,10720) (STGRQ(L),L=1,7)
C****
      RISK RATES BY NUCLIDE
11000 DO 2050 J=1,40
      STHIG(J)=0.0
      STLOW(J)=0.0
      STCOM(J)=0.0
      STGLO(J)=0.0
      STGHI(J)=0.0
      STGCO(J)=0.0
      STREQ(J)=0.0
      STGRQ(J)=0.0
2050  CONTINUE
      SUML=0.0
      SUMH=0.0
      SUMC=0.0
      SUMGL=0.0
      SUMGH=0.0
      SUMGC=0.0
      SUMRQ=0.0
      SUMGQ=0.0
      DO 2109 J=1,NONCLD
      DO 2100 K=1,4
      FACNEW=POPFAC*RISFAC(K)
      FACNE2=POPFAC*GENFAC(K)
      DO 2100 L=1,NCANC
      STHIG(J)=STHIG(J)+RISK(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STLOW(J)=STLOW(J)+RISK(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
      STCOM(J)=STCOM(J)+RISK(L,J,K,1)*FACNEW*EXPP(JLOC,ILOC,J,K)
     < +RISK(L,J,K,2)*FACNEW*EXPP(JLOC,ILOC,J,K)
      IF(L.GT.1) GO TO 2100
      STREQ(J)=STREQ(J)+REF(NCANC+1,J,K)*POPFAC*REQFAC(K)*
     < EXPP(JLOC,ILOC,J,K)
      SUMRQ=SUMRQ+REF(NCANC+1,J,K)*POPFAC*REQFAC(K)*
     < EXPP(JLOC,ILOC,J,K)
      STGRQ(J)=STGRQ(J)+GREF(L,J,K)*POPFAC*GENFAC(K)*
     < EXPP(JLOC,ILOC,J,K)
```

```
      SUMGQ=SUMGQ+GREF(L,J,K)*POPFAC*GENFAC(K)*
     <EXPP(JLOC,ILOC,J,K)
      STGHI(J)=STGHI(J)+GRISK(L,J,K,2)*EXPP(JLOC,ILOC,J,K)*FACNE2
      STGLO(J)=STGLO(J)+GRISK(L,J,K,1)*EXPP(JLOC,ILOC,J,K)*FACNE2
      STGCO(J)=STGCO(J)+GRISK(L,J,K,1)*EXPP(JLOC,ILOC,J,K)*FACNE2+
     A GRISK(L,J,K,2)*EXPP(JLOC,ILOC,J,K)*FACNE2
2100  CONTINUE
      SUML=SUML+STLOW(J)
      SUMH=SUMH+STHIG(J)
      SUMC=SUMC+STCOM(J)
      SUMGL=SUMGL+STGLO(J)
      SUMGH=SUMGH+STGHI(J)
      SUMGC=SUMGC+STGCO(J)
2109  CONTINUE
     DO 305 L=1,NONCLD
  305 FICAN(L)=STCOM(L)
     TFIC=SUMC
C     WRITE(6,12100) TITLE
C     WRITE(6,12102)(NUCLID(L),L=1,NONCLD),TOTAL
12100 FORMAT('1',20A4/30X,'NUCLIDE RISK/RISK EQUIVALENT SUMMARY'/
    1 //'0*** SELECTED INDIVIDUAL ***'/
    A '0LIFETIME FATAL CANCER RISK:')
12102 FORMAT(15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
C     WRITE(6,10205) (STLOW(L),L=1,NONCLD),SUML
C     WRITE(6,10210) (STHIG(L),L=1,NONCLD),SUMH
C     WRITE(6,10215) (STCOM(L),L=1,NONCLD),SUMC
C     IF(RNWR)WRITE(6,20216) RR
C     IF(RNWR)WRITE(6,20217) TT
C     WRITE(6,30200)
C     WRITE(6,12102) (NUCLID(L),L=1,NONCLD),TOTAL
C     WRITE(6,10220) (STREQ(L),L=1,NONCLD),SUMRQ
C     IF(RNWR)WRITE(6,20422) RT
C     IF(RNWR)WRITE(6,20223) TTQ
C     WRITE(6,12290)(NUCLID(L),L=1,NONCLD),TOTAL
12290 FORMAT('0GENETIC RISKS:'/
    A 15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
C     WRITE(6,10225) (STGLO(L),L=1,NONCLD),SUMGL
C     WRITE(6,10230) (STGHI(L),L=1,NONCLD),SUMGH
C     WRITE(6,10235) (STGCO(L),L=1,NONCLD),SUMGC
C     WRITE(6,30300) (STGRQ(L),L=1,NONCLD),SUMGQ
      IF(INDPOP.NE.1) GO TO 21000
      DO 2150 J=1,40
      STHIG(J)=0.0
      STLOW(J)=0.0
      STCOM(J)=0.0
      STREQ(J)=0.0
      STGRQ(J)=0.0
      STGLO(J)=0.0
      STGHI(J)=0.0
      STGCO(J)=0.0
2150  CONTINUE
      SUML=0.0
      SUMH=0.0
      SUMC=0.0
      SUMGL=0.0
      SUMGH=0.0
      SUMGC=0.0
      SUMRQ=0.0
      SUMGQ=0.0
      DO 2209 J=1,NONCLD
```

```
      DO 2200 L=1,NCANC
      DO 2200 K=1,4
      FACNEW=TOTFAC*RISFAC(K)
      FACNE2=TOTFAC*GENFAC(K)
      DO 2200 II=NOL,NOU
      DO 2200 JJ=NRL,NRU
      STHIG(J)=STHIG(J)+RISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
      STLOW(J)=STLOW(J)+RISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
      STCOM(J)=STCOM(J)+RISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNEW
     >+RISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNEW
      IF(L.GT.1) GO TO 2200
      STREQ(J)=STREQ(J)+REF(NCANC+1,J,K)*EXPP(JJ,II,J,K)*TOTFAC*
     > REQFAC(K)
      SUMRQ=SUMRQ+REF(NCANC+1,J,K)*EXPP(JJ,II,J,K)*TOTFAC*
     > REQFAC(K)
      STGRQ(J)=STGRQ(J)+GREF(L,J,K)*EXPP(JJ,II,J,K)*TOTFAC*
     > GENFAC(K)
      SUMGQ=SUMGQ+GREF(L,J,K)*EXPP(JJ,II,J,K)*TOTFAC*
     > GENFAC(K)
      STGHI(J)=STGHI(J)+GRISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2
      STGLO(J)=STGLO(J)+GRISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2
      STGCO(J)=STGCO(J)+GRISK(L,J,K,2)*EXPP(JJ,II,J,K)*FACNE2+
     + GRISK(L,J,K,1)*EXPP(JJ,II,J,K)*FACNE2
2200  CONTINUE
      SUML=SUML+STLOW(J)
      SUMH=SUMH+STHIG(J)
      SUMC=SUMC+STCOM(J)
      SUMGL=SUMGL+STGLO(J)
      SUMGH=SUMGH+STGHI(J)
      SUMGC=SUMGC+STGCO(J)
2209  CONTINUE
C     WRITE(6,12400)TITLE, (NUCLID(L),L=1,NONCLD),TOTAL
12400 FORMAT('1',20A4/
     > 30X,'NUCLIDE RISK/RISK EQUIVALENT SUMMARY'//
     A '0***MEAN INDIVIDUAL ***'/
     B '0LIFETIME FATAL CANCER RISK:'/
     A 15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
C     WRITE(6,10205) (STLOW(L),L=1,NONCLD),SUML
C     WRITE(6,10210) (STHIG(L),L=1,NONCLD),SUMH
C     WRITE(6,10215) (STCOM(L),L=1,NONCLD),SUMC
C     IF(RNWR)WRITE(6,20216) RRM
C     IF(RNWR)WRITE(6,20217) TTM
C     WRITE(6,30200)
C     WRITE(6,12102) (NUCLID(L),L=1,NONCLD),TOTAL
C     WRITE(6,10220) (STREQ(L),L=1,NONCLD),SUMRQ
C     IF(RNWR)WRITE(6,20422) RTM
C     IF(RNWR)WRITE(6,20223) TTQM
C     WRITE(6,12590)(NUCLID(L),L=1,NONCLD),TOTAL
12590 FORMAT('0GENETIC RISKS:'/
     A 15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
C     WRITE(6,10225) (STGLO(L),L=1,NONCLD),SUMGL
C     WRITE(6,10230) (STGHI(L),L=1,NONCLD),SUMGH
C     WRITE(6,10235) (STGCO(L),L=1,NONCLD),SUMGC
C     WRITE(6,30300) (STGRQ(L),L=1,NONCLD),SUMGQ
      DO 2350 K=1,40
      STLOW(K)=0.0
      STHIG(K)=0.0
      STCOM(K)=0.0
      STGLO(K)=0.0
      STGHI(K)=0.0
```

```
      STGCO(K)=0.0
      STREQ(K)=0.0
      STGRQ(K)=0.0
2350  CONTINUE
      SUML=0.0
      SUMH=0.0
      SUMC=0.0
      SUMGL=0.0
      SUMGH=0.0
      SUMGC=0.0
      SUMRQ=0.0
      SUMGQ=0.0
      DO 2409 J=1,NONCLD
      DO 2400 K=1,4
      TEXPP=0.0
      DO 2403 II=NOL,NOU
      DO 2403 JJ=NRL,NRU
      TEXPP=TEXPP+EXPP(JJ,II,J,K)
2403  CONTINUE
      DO 2400 L=1,NCANC
      STLOW(J)=STLOW(J)+RISK(L,J,K,1)*TEXPP*RISFAC(K)/AGEX
      STHIG(J)=STHIG(J)+RISK(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
      STCOM(J)=STCOM(J)+RISK(L,J,K,1)*TEXPP*RISFAC(K)/AGEX+
     > RISK(L,J,K,2)*TEXPP*RISFAC(K)/AGEX
      IF(L.GT.1) GO TO 2400
      STREQ(J)=STREQ(J)+REF(NCANC+1,J,K)*TEXPP*REQFAC(K)*.001
      SUMRQ=SUMRQ+REF(NCANC+1,J,K)*TEXPP*REQFAC(K)*.001
      STGRQ(J)=STGRQ(J)+GREF(L,J,K)*TEXPP*GENFAC(K)*.001
      SUMGQ=SUMGQ+GREF(L,J,K)*TEXPP*GENFAC(K)*.001
      STGLO(J)=STGLO(J)+GRISK(L,J,K,1)*TEXPP*GENFAC(K)*REPPER
      STGHI(J)=STGHI(J)+GRISK(L,J,K,2)*TEXPP*GENFAC(K)*REPPER
      STGCO(J)=STGCO(J)+GRISK(L,J,K,1)*TEXPP*GENFAC(K)*REPPER
     A +GRISK(L,J,K,2)*TEXPP*GENFAC(K)*REPPER
2400  CONTINUE
      SUML=SUML+STLOW(J)
      SUMH=SUMH+STHIG(J)
      SUMC=SUMC+STCOM(J)
      SUMGL=SUMGL+STGLO(J)
      SUMGH=SUMGH+STGHI(J)
      SUMGC=SUMGC+STGLO(J)
2409  CONTINUE
      WRITE(6,12700)TITLE, (NUCLID(L),L=1,NONCLD),TOTAL
12700 FORMAT('1',/////,20A4,/,30X,
     & 'NUCLIDE RISK/RISK EQUIVALENT SUMMARY',//,
     A '0*** COLLECTIVE POPULATION ***'/
     A '0COLLECTIVE FATAL CANCER RISK:'/
     A 15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
      WRITE(6,10705) (STLOW(L),L=1,NONCLD),SUML
      WRITE(6,10710) (STHIG(L),L=1,NONCLD),SUMH
      WRITE(6,10715) (STCOM(L),L=1,NONCLD),SUMC
      IF(RNWR)WRITE(6,20216) RRC
      WRITE(6,20217) TTC
      WRITE(6,30200)
      WRITE(6,12102) (NUCLID(L),L=1,NONCLD),TOTAL
      WRITE(6,10719) (STREQ(L),L=1,NONCLD),SUMRQ
      IF(RNWR)WRITE(6,20522) RTC
      IF(RNWR)WRITE(6,20323) TTQC
      WRITE(6,12790) (NUCLID(L),L=1,NONCLD),TOTAL
12790 FORMAT('0GENETIC RISKS:'/
     A 15X,' NUCLIDES:',10(2X,A8)/(26X,10(2X,A8)))
```

```
      WRITE(6,10725) (STGLO(L),L=1,NONCLD),SUMGL
      WRITE(6,10730) (STGHI(L),L=1,NONCLD),SUMGH
      WRITE(6,10735) (STGCO(L),L=1,NONCLD),SUMGC
      WRITE(6,10720) (STGRQ(L),L=1,NONCLD),SUMGQ
     DO 307 L=1,NONCLD
     CCNR(L)=STCOM(L)
     POPD(L)=STREQ(L)
  307 GNR(L)=STGCO(L)
     TCCNR=SUMC
     TPOPD=SUMRQ
     TGNR=SUMGC
21000 RETURN
      END
?
```

APPENDIX B

SAMPLE PROBLEM OUTPUT

```
1      ** INPUT DATA AS READ IN **

 SITE AREA ..... POP RUN ...,   FACILITY CHARACTER
  SITE AREA
  1000    33     2     1   200    -1          0 1000   100     0     0     1     1 1000
          -1                 20
         0.2        0.3       0.0       0.5       1.0       0.0       0.0       0.0
C
C
C     SITE AREA ...... FACILITY CHARACTER, SUBURBAN SETTING
C
C      5/9/87
C
C
         0.5       2.6       0.6      0.25      0.89        0.         0      0.43
         0.0      0.26
       31.45       20.       0.0        0.        0.       1.0
   7.3 3220.   1.61E+3      27.8      30.5       0.3      0.39      0.35       2.2
         1.0      0.01      2.01       0.1   1.77E+4      300.      0.01
      0.4840 1.080E-11    1.0E-6     -0.15   1.0E-11    4.0E-4      0.24
      1     4
        250.      0.23      0.27      0.30      0.30       1.0
        0.39       1.6   3.57E+5     1003.       0.1
       100.      0.29
        0.67      0.65      240.    0.0021                720.     1440.
          0.     2160.       24.     1440.      336.      336.       1.0      0.83
         50.        6.       48.       96.      480.       9.9       1.0
         0.0       0.0
                  0.40     0.015       60.       8.0       50.
          2.       18.       11.        0.        9.      370.     8000.       25.
H-3               0.99    1.0E-2         0         0   5.65E-2         0         0
H-3               0.01      0.01      0.01      0.01      0.90
H-3               0.20      0.25    4.8E-0    4.8E-0    1.0E-2    1.7E-1    1.2E-2
C-14              0.99    1.0E-2         0         0   1.21E-4         0        0.
C-14              0.01      0.01      0.01      0.01      0.75
C-14              0.20      0.25    5.5E-0    5.5E-0    1.2E-2    1.0E-1    3.1E-2
CR-51             0.99    1.0E-2        0.        0.      9.14        0.        0.
CR-51             200.      200.      200.      200.     0.005
CR-51              0.2      0.25    2.5E-4    5.0E-2    2.2E-3    1.0E-3    2.4E-3
MN-54             0.99    1.0E-2        0.        0.   8.09E-1         0        0.
MN-54              150      150.      150.      150.     0.005
MN-54             0.20      0.25    2.5E-1    5.0E-2    3.5E-4    2.5E-4    4.0E-4
FE-55             0.99    1.0E-2        0.        0.   2.57E-1        0.        0.
FE-55             6000     6000.     6000.     6000.     0.005
FE-55             0.20      0.25    4.0E-3    1.0E-3    2.5E-4    1.3E-4    2.0E-2
CO-58             0.99    1.0E-2         0         0      3.55      100.        0.
CO-58              55.       55.       55.       55.     0.005
CO-58             0.20      0.25    2.0E-2    7.0E-3    2.0E-3    1.0E-3    3.0E-2
NI-59             0.99    1.0E-2         0         0   8.66E-6         0         0
NI-59              150      150.      150       150.     0.005
NI-59             0.20      0.25    6.0E-2    6.0E-2    1.0E-3    6.7E-3    6.0E-3
CO-60             0.99    1.0E-2         0         0   1.32E-1       100         0
CO-60               55       55.       55        55      0.005
CO-60             0.20      0.25    2.0E-2    7.0E-3    2.0E-3    1.0E-3    2.0E-2
NI-63             0.99    1.0E-2         0         0   7.53E-3         0         0
NI-63              150      150.      150.      150.     0.005
NI-63             0.20      0.25    6.0E-2    6.0E-2    1.0E-3    6.7E-3    6.0E-3
SR-90             0.99    1.0E-2         0         0   2.42E-2         0         0
SR-90              150      150.      150        20      0.005
SR-90             0.20      0.25    2.5E+0    2.5E-1    1.5E-3    1.4E-2    3.0E-4
NB-94             0.99    1.0E-2         0         0   3.47E-5         0         0
```

NB-94	350	350.	350	350	0.005		
NB-94	0.20	0.25	2.0E-2	5.0E-3	2.0E-2	2.5E-3	2.5E-1
TC-99	0.99	1.0E-2	0	0	3.25E-6	0	0
TC-99	0.5	0.5	0.5	0.5	0.01		
TC-99	0.20	0.25	9.5E+0	1.5E+0	1.0E-2	2.5E-2	8.5E-3
RU-106	0.99	1.0E-2	0	0	6.89E-1	0	0
RU-106	220	220.	220	220	0.01		
RU-106	0.20	0.25	7.5E-2	2.0E-2	6.0E-7	1.3E-4	2.0E-3
SB-125	0.99	1.0E-2	0	0	2.50E-1	0	0
SB-125	45	45.	45	45	0.005		
SB-125	0.20	0.25	2.0E-1	3.0E-2	1.0E-4	1.5E-3	1.0E-3
I-129	0.99	1.0E-2	0	0	4.08E-8	0	0
I-129	3	3.	3	0.5	0.1		
I-129	0.20	0.25	1.0E+0	1.0E+0	1.0E-2	3.0E-1	7.0E-3
CS-134	0.99	1.0E-2	0	0	3.36E-1	300	0
CS-134	1000	1000.	1000	500	0.005		
CS-134	0.20	0.25	8.0E-2	3.0E-2	7.0E-3	3.0E-1	2.0E-2
CS-135	0.99	1.0E-2	0	0	2.3E-7	0	0
CS-135	1000	1000.	1000	500	0.005		
CS-135	0.2	0.25	8.0E-2	3.0E-2	7.0E-3	3.0E-1	2.0E-2
CS-137	0.99	1.0E-2	0	0	2.31E-2	300	0
CS-137	1000	1000.	1000	500	0.005		
CS-137	0.20	0.25	8.0E-2	3.0E-2	7.0E-3	3.0E-1	2.0E-2
CE-144	0.99	1.0E-2	0	0	8.90E-1	0	0
CE-144	1100	1100.	1100	1100	0.005		
CE-144	0.20	0.25	1.0E-2	4.0E-3	5.0E-6	1.0E-4	7.5E-4
EU-154	0.99	1.0E-2	0	0	4.33E-2	0	0
EU-154	4000	4000.	4000.	4000.	0.005		
EU-154	0.20	0.25	2.5E-3	3.5E-3	2.0E-5	2.0E-5	4.8E-3
U-234	0.99	1.0E-2	0	0	2.83E-6	0	0
U-234	750	750.	750	750	0.005		
U-234	0.20	0.25	8.5E-3	4.0E-3	6.0E-4	5.0E-4	2.0E-4
U-235	0.99	1.0E-2	0	0	9.85E-10	0	0
U-235	750	750.	750	750	0.005		
U-235	0.20	0.25	8.5E-3	4.0E-3	6.0E-4	5.0E-4	2.0E-4
NP-237	0.99	1.0E-2	0	0	3.3E-7	0	0
NP-237	5	5.	5	5	0.005		
NP-237	0.20	0.25	4.3E-3	4.3E-3	5.0E-6	5.0E-6	5.5E-5
U-238	0.99	1.0E-2	0	0	1.55E-10	0	0
U-238	750	750.	750	750	0.005		
U-238	0.20	0.25	8.5E-3	4.0E-3	6.0E-4	5.0E-4	2.0E-4
PU-238	0.99	1.0E-2	0	0	7.90E-3	0	0
PU-238	3500	3500.	3500	3500	0.005		
PU-238	0.20	0.25	4.5E-4	4.5E-5	1.0E-7	1.5E-6	5.0E-7
PU-239	0.99	1.0E-2	0	0	2.87E-5	0	0
PU-239	3500	3500.	3500	3500	0.005		
PU-239	0.20	0.25	4.5E-4	4.5E-5	1.0E-7	1.5E-6	5.0E-7
PU-240	0.99	1.0E-2	0	0	1.06E-4	0	0
PU-240	3500.	3500.	3500.	3500.	0.005		
PU-240	0.20	0.25	4.5E-4	4.5E-4	1.0E-7	1.5E-6	7.0E-7
PU-241	0.99	1.0E-2	0	0	5.25E-2	0	0
PU-241	3500	3500.	3500	3500	0.005		
PU-241	0.20	0.25	4.5E-4	4.5E-5	1.0E-7	2.5E-6	5.0E-7
AM-241	0.99	1.0E-2	0	0	1.51E-3	0	0
AM-241	8.00E+4	8.00E+4	8.00E+4	8.00E+4	0.005		
AM-241	0.20	0.25	5.5E-3	2.5E-4	4.0E-7	0	3.5E-6
PU-242	0.99	1.0E-2	0	0	1.83E-6	0	0
PU-242	3500	3500.	3500	3500	0.005		
PU-242	0.20	0.25	4.5E-4	4.5E-5	1.0E-7	1.5E-6	5.0E-7
AM-243	0.99	1.0E-2	0	0	9.4E-5	0	0
AM-243	8.00E+4	8.00E+4	8.00E+4	8.00E+4	0.005		
AM-243	0.20	0.25	5.5E-3	2.5E-4	4.0E-7	0	3.5E-6
CM-243	0.99	1.0E-2	0	0	2.17E-2	0	0
CM-243	3300	3300.	3300	3300	0.005		

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CM-243          0.20      0.25    8.5E-4    1.5E-5    2.0E-5         0    3.5E-6
CM-244          0.99    1.0E-2         0         0   3.94E-2         0         0
CM-244          3300     3300.      3300      3300     0.005
CM-244          0.20      0.25    8.5E-4    1.5E-5    2.0E-5         0    3.5E-6
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 'S WALL  ','INT WALL','LIVER   ','PANCREAS','KIDNEYS ','OTHER   ',
 TIME=20*70 &END
 &QFACTR HLET=20*20,LLET=20*1 &END
 &CANCER NCANC=11,CANC='LEUKEMIA','BONE    ','THYROID ','BREAST  ','LUNG    ',
 'STOMACH ','BOWEL   ','LIVER   ','PANCREAS','URINARY ','OTHER   ',
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 &GENTIC GENEFF=.TRUE.,NGEN=3,GEN='TESTES  ','OVARIES ','AVERAGE ',
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 'I-129','CS-134','CS-135','CS-137','CE-144', 'EU-154',
 'U-234','U-235','NP-237','U-238','PU-238','PU-239','PU-240',
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 'S WALL  ','INT WALL','LIVER   ','PANCREAS','KIDNEYS ','OTHER   ',
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IPATH=20A5,&END
1                    PRESTO - A MODEL FOR PREDICTING THE MIGRATION OF RADIOACTIVE WASTES
                                FROM SHALLOW TRENCH BURIAL SITES
0
                 SITE AREA ..... POP RUN ...,   FACILITY CHARACTER


     *** CONTROL INFORMATION ***
0         THE BURIAL SITE IS LOCATED AT  SITE AREA
          THE SIMULATION WILL RUN FOR 1000 YEARS AND WILL INCLUDE 33 NUCLIDES
          LEACHING OPTION NUMBER 2 WILL BE USED
          IN YEAR   1 ,0.20 OF THE CAP WILL BE ASSUMED TO FAIL
               THIS WILL CONTINUE UNTIL 0.30 HAS FAILED IN YEAR  200
          CAP MAY ALSO FAIL BY SURFACE EROSION
          LENGTH OF VERTICAL SATURATED ZONE WILL BE SET TO THE TRENCH TO AQUIFER DISTANCE
          POPULATION INDICATOR IS  1
               GENERAL POPULATION EXPOSURE WILL BE USED TO CALCULATE HEALTH EFFECTS
           0.000 OF IRRIGATION WATER WILL BE GOTTEN FROM WELL
           0.500 OF DRINKING WATER FOR ANIMALS WILL BE GOTTEN FROM WELL
           1.000 OF DRINKING WATER FOR HUMANS WILL BE GOTTEN FROM WELL
           0.000 OF IRRIGATION WATER WILL BE GOTTEN FROM STREAM
           0.000 OF DRINKING WATER FOR ANIMALS WILL BE GOTTEN FROM STREAM
           0.000 OF DRINKING WATER FOR HUMANS WILL BE GOTTEN FROM STREAM
1    *** TRENCH INFORMATION ***

          THE TRENCH HAS AN AREA OF  0.5000E+00 SQUARE METERS AND A DEPTH OF  0.2600E+01 METERS
          TRENCH POROSITY IS     0.25
          ANNUAL INFILTRATION FOR THE WATERSHED IS 0.4300 METERS

     *** AQUIFER INFORMATION ***

          THE GROUND WATER HAS A VELOCITY OF     27.800 METERS PER YEAR
          TRENCH TO AQUIFER DISTANCE IS    7.3 METERS
          TRENCH TO WELL DISTANCE IS  1610.00 METERS
          WELL TO STREAM DISTANCE IS 3220.00METERS
          THE AQUIFER THICKNESS IS    30.50 METERS
          THE AQUIFER DISPERSION ANGLE IS   0.3000 RADIANS
          POROSITY OF THE AQUIFER REGION IS  0.39000
          POROSITY BENEATH THE TRENCH IS  0.35000
          PERMEABILITY BENEATH THE TRENCH IS    2.200 METERS/YEAR

1    *** ATMOSPHERIC INFORMATION ***

          SOURCE HEIGHT IS    1.0 METERS
          VELOCITY OF GRAVITATION FALL IS   0.01 METERS/SECOND
          WIND VELOCITY IS   2.01 METERS/SECOND
          DEPOSITION VELOCITY IS   0.10 METERS/SECOND
          GAUGE DISTANCE FROM SOURCE IS 17700.00 METERS
          LID HEIGHT IS   300.00 METERS
          HOSKER ROUGHNESS FACTOR IS   0.01
          TYPE OF STABILITY FORMULATION IS  1
          STABILITY CLASS IS  4
          FRACTION OF TIME WIND BLOWS TOWARD POPULATION IS  0.484000
          RESUSPENSION FACTOR PARAMETERS       0.1000E-05     -0.1500E+00      0.1000E-10
          FROM YEAR    0 TO YEAR    0 THE RESUSPENSION RATE DUE TO MECHANICAL DISTURBANCES WILL BE  4.0000E-04
               THIS WILL OCCUR DURING  2.40 OF EACH YEAR
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*** SURFACE INFORMATION ***

     PARAMETERS FOR UNIVERSAL LOSS EQUATION
          RAINFALL          250.00
          ERODIBILITY         0.23
          STEEPNESS-SLOPE     0.27
          COVER               0.30
          EROSION CONTROL     0.30
          DELIVERY RATIO      1.00
     SOIL POROSITY IS  0.39000
     SOIL BULK DENSITY IS  1.60000 G/CC
     RUNOFF FRACTION IS  0.29000

               STREAM FLOW RATE IS  3.5700E+05 CUBIC METERS PER YEAR
     CROSS SLOPE EXTENT OF SPILLAGE IS  1003.00 METERS
     ACTIVE SOIL DEPTH IS     0.10 METERS
     AVERAGE DOWN SLOPE DISTANCE TO STREAM IS   100.00 METERS
1    *** AIR-FOODCHAIN INFORMATION ***

     AGRICULTURAL PRODUCTIVITY FOR GRASS      0.67 KG/M**2
     AGRICULTURAL PRODUCTIVITY FOR VEGETATION      0.65 KG/M**2
     SURFACE DENSITY FOR SOIL     240.00 KG/M**2
     WEATHER DECAY CONSTANT      0.00 1/HOURS
     PERIOD PASTURE GRASS EXPOSURE GROWING SEASON    720.00 HOURS
     PERIOD CROP/VEGETATION EXPOSURE GROWING SEASON   1440.00 HOURS
     PERIOD BETWEEN HARVEST PASTURE GRASS AND INGESTION BY ANIMAL      0.00 HOURS
     PERIOD BETWEEN STORED FEED AND INGESTION BY ANIMAL   2160.00 HOURS
     PERIOD BETWEEN HARVEST LEAFY VEGETABLES AND INGESTION BY MAN(M.I.E.)     24.00 HOURS
     PERIOD BETWEEN HARVEST PRODUCE AND INGESTION BY MAN(M.I.E.)   1440.00 HOURS
     PERIOD BETWEEN HARVEST LEAFY VEG AND INGESTION BY MAN(G.P.E.)    336.00 HOURS
     PERIOD BETWEEN HARVEST PRODUCE AND INGESTION BY MAN(G.P.E.)    336.00 HOURS
     FRACTION OF YEAR ANIMALS GRAZE ON PASTURE      1.00
     FRACTION OF DAILY FEED THAT IS FRESH GRASS      0.83
     AMOUNT OF FEED CONSUMED BY CATTLE     50.00 KG
     AMOUNT OF FEED CONSUMED BY GOATS      6.00 KG
     TRANSPORT TIME FEED-MILL-RECEPTOR FOR M.I.E.     48.00 HOURS
     TRANSPORT TIME FEED-MILL-RECEPTOR FOR G.P.E.     96.00 HOURS
     TIME FROM SLAUGHTER OF MEAT TO CONSUMPTION    480.00 HOURS
     ABSOLUTE HUMIDITY OF THE ATMOSPHERE      9.90 G/M**3
     FRACTIONAL EQUILIBRIUM RATIO FOR C-14      1.00
1    *** WATER-FOODCHAIN INFORMATION ***


     FRACTION OF YEAR CROPS ARE IRRIGATED      0.40
     IRRIGATION RATE      0.015 L/(M**2-H)
     AMOUNT OF WATER CONSUMED BY COWS      60.00 L/D
     AMOUNT OF WATER CONSUMED BY GOATS      8.00 L/D
     AMOUNT OF WATER CONSUMED BY BEEF CATTLE      50.00 L/D


*** HUMAN INGESTION AND INHALATION RATE INFORMATION ***

     ANNUAL INTAKE OF LEAFY VEG     2.00 KILOGRAMS PER YEAR
     ANNUAL INTAKE OF PRODUCE    18.00 KILOGRAMS PER YEAR
     ANNUAL INTAKE OF COW'S MILK    11.00 LITERS PER YEAR
     ANNUAL INTAKE OF GOAT'S MILK    0.00 LITERS PER YEAR
     ANNUAL INTAKE OF MEAT     9.00 KILOGRAMS PER YEAR
     ANNUAL INTAKE OF DRINKING WATER  370.00 LITERS PER YEAR
     ANNUAL INHALATION RATE OF AIR  8000.00 CUBIC METERS PER YEAR
     A POPULATION OF        25. WILL BE CONSIDERED
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INFORMATION ON INDIVIDUAL NUCLIDES

NUCLIDE	AMT IN TRENCH CI	SPILLAGE CI	STREAM AMT CI	AIR CONCEN CI/M**3	DECAY CONST 1/Y	SOLUBILITY CONST G/ML	DECAY CORRECTION FACTOR
H-3	6.1017E-01	6.1017E-03	0.0000E+00	0.0000E+00	5.6500E-02	0.0000E+00	6.1633E-01
C-14	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	1.2100E-04	0.0000E+00	1.0000E+00
CR-51	5.5223E+00	5.5223E-02	0.0000E+00	0.0000E+00	9.1400E+00	0.0000E+00	5.5781E+00
MN-54	9.4212E-02	9.4212E-04	0.0000E+00	0.0000E+00	8.0900E-01	0.0000E+00	9.5164E-02
FE-55	2.1833E-01	2.1833E-03	0.0000E+00	0.0000E+00	2.5700E-01	0.0000E+00	2.2054E-01
CO-58	1.3281E-01	1.3281E-03	0.0000E+00	0.0000E+00	3.5500E+00	1.0000E+02	1.3415E-01
NI-59	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	8.6600E-06	0.0000E+00	1.0000E+00
CO-60	3.7227E-01	3.7227E-03	0.0000E+00	0.0000E+00	1.3200E-01	1.0000E+02	3.7603E-01
NI-63	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	7.5300E-03	0.0000E+00	1.0000E+00
SR-90	7.9438E-01	7.9438E-03	0.0000E+00	0.0000E+00	2.4200E-02	0.0000E+00	8.0241E-01
NB-94	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	3.4700E-05	0.0000E+00	1.0000E+00
TC-99	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	3.2500E-06	0.0000E+00	1.0000E+00
RU-106	1.0341E-01	1.0341E-03	0.0000E+00	0.0000E+00	6.8900E-01	0.0000E+00	1.0445E-01
SB-125	2.2343E-01	2.2343E-03	0.0000E+00	0.0000E+00	2.5000E-01	0.0000E+00	2.2569E-01
I-129	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	4.0800E-08	0.0000E+00	1.0000E+00
CS-134	1.7488E-01	1.7488E-03	0.0000E+00	0.0000E+00	3.3600E-01	3.0000E+02	1.7665E-01
CS-135	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	2.3000E-07	0.0000E+00	1.0000E+00
CS-137	8.0204E-01	8.0204E-03	0.0000E+00	0.0000E+00	2.3100E-02	3.0000E+02	8.1014E-01
CE-144	8.9684E-02	8.9684E-04	0.0000E+00	0.0000E+00	8.9000E-01	0.0000E+00	9.0590E-02
EU-154	6.7688E-01	6.7688E-03	0.0000E+00	0.0000E+00	4.3300E-02	0.0000E+00	6.8372E-01
U-234	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	2.8300E-06	0.0000E+00	1.0000E+00
U-235	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	9.8500E-10	0.0000E+00	1.0000E+00
NP-237	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	3.3000E-07	0.0000E+00	1.0000E+00
U-238	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	1.5500E-10	0.0000E+00	1.0000E+00
PU-238	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	7.9000E-03	0.0000E+00	1.0000E+00
PU-239	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	2.8700E-05	0.0000E+00	1.0000E+00
PU-240	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	1.0600E-04	0.0000E+00	1.0000E+00
PU-241	6.2929E-01	6.2929E-03	0.0000E+00	0.0000E+00	5.2500E-02	0.0000E+00	6.3565E-01
AM-241	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	1.5100E-03	0.0000E+00	1.0000E+00
PU-242	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	1.8300E-06	0.0000E+00	1.0000E+00
AM-243	9.9000E-01	9.9000E-03	0.0000E+00	0.0000E+00	9.4000E-05	0.0000E+00	1.0000E+00
CM-243	8.1193E-01	8.1193E-03	0.0000E+00	0.0000E+00	2.1700E-02	0.0000E+00	8.2014E-01
CM-244	6.9870E-01	6.9870E-03	0.0000E+00	0.0000E+00	3.9400E-02	0.0000E+00	7.0576E-01

DISTRIBUTION COEFFICIENTS ML/G

NUCLIDE	SURFACE	TRENCH	VERTICAL	AQUIFER
H-3	1.00E-02	1.00E-02	1.00E-02	1.00E-02
C-14	1.00E-02	1.00E-02	1.00E-02	1.00E-02
CR-51	2.00E+02	2.00E+02	2.00E+02	2.00E+02
MN-54	1.50E+02	1.50E+02	1.50E+02	1.50E+02
FE-55	6.00E+03	6.00E+03	6.00E+03	6.00E+03
CO-58	5.50E+01	5.50E+01	5.50E+01	5.50E+01
NI-59	1.50E+02	1.50E+02	1.50E+02	1.50E+02
CO-60	5.50E+01	5.50E+01	5.50E+01	5.50E+01
NI-63	1.50E+02	1.50E+02	1.50E+02	1.50E+02
SR-90	1.50E+02	1.50E+02	1.50E+02	2.00E+01
NB-94	3.50E+02	3.50E+02	3.50E+02	3.50E+02
TC-99	5.00E-01	5.00E-01	5.00E-01	5.00E-01
RU-106	2.20E+02	2.20E+02	2.20E+02	2.20E+02
SB-125	4.50E+01	4.50E+01	4.50E+01	4.50E+01
I-129	3.00E+00	3.00E+00	3.00E+00	5.00E-01
CS-134	1.00E+03	1.00E+03	1.00E+03	5.00E+02
CS-135	1.00E+03	1.00E+03	1.00E+03	5.00E+02

CS-137	1.00E+03	1.00E+03	1.00E+03	5.00E+02
CE-144	1.10E+03	1.10E+03	1.10E+03	1.10E+03
EU-154	4.00E+03	4.00E+03	4.00E+03	4.00E+03
U-234	7.50E+02	7.50E+02	7.50E+02	7.50E+02
U-235	7.50E+02	7.50E+02	7.50E+02	7.50E+02
NP-237	5.00E+00	5.00E+00	5.00E+00	5.00E+00
U-238	7.50E+02	7.50E+02	7.50E+02	7.50E+02
PU-238	3.50E+03	3.50E+03	3.50E+03	3.50E+03
PU-239	3.50E+03	3.50E+03	3.50E+03	3.50E+03
PU-240	3.50E+03	3.50E+03	3.50E+03	3.50E+03
PU-241	3.50E+03	3.50E+03	3.50E+03	3.50E+03
AM-241	8.00E+04	8.00E+04	8.00E+04	8.00E+04
PU-242	3.50E+03	3.50E+03	3.50E+03	3.50E+03
AM-243	8.00E+04	8.00E+04	8.00E+04	8.00E+04
CM-243	3.30E+03	3.30E+03	3.30E+03	3.30E+03
CM-244	3.30E+03	3.30E+03	3.30E+03	3.30E+03

NUCLIDE	RETENTION IN AIR	RETENTION IN WATER	TRANS COEFF SOIL-V CROP D/KG	TRANS COEFF SOIL-R CROP D/KG	TRANS COEFF VEG-COW MILK D/L	TRANS COEFF VEG-GOAT MILK D/L	TRANS COEFF VEG-MEAT D/KG
H-3	2.00E-01	2.50E-01	4.80E+00	4.80E+00	1.00E-02	1.70E-01	1.20E-02
C-14	2.00E-01	2.50E-01	5.50E+00	5.50E+00	1.20E-02	1.00E-01	3.10E-02
CR-51	2.00E-01	2.50E-01	2.50E-04	5.00E-02	2.20E-03	1.00E-03	2.40E-03
MN-54	2.00E-01	2.50E-01	2.50E-01	5.00E-02	3.50E-04	2.50E-04	4.00E-04
FE-55	2.00E-01	2.50E-01	4.00E-03	1.00E-03	2.50E-04	1.30E-04	2.00E-02
CO-58	2.00E-01	2.50E-01	2.00E-02	7.00E-03	2.00E-03	1.00E-03	3.00E-02
NI-59	2.00E-01	2.50E-01	6.00E-02	6.00E-02	1.00E-03	6.70E-03	6.00E-03
CO-60	2.00E-01	2.50E-01	2.00E-02	7.00E-03	2.00E-03	1.00E-03	2.00E-02
NI-63	2.00E-01	2.50E-01	6.00E-02	6.00E-02	1.00E-03	6.70E-03	6.00E-03
SR-90	2.00E-01	2.50E-01	2.50E+00	2.50E-01	1.50E-03	1.40E-02	3.00E-04
NB-94	2.00E-01	2.50E-01	2.00E-02	5.00E-03	2.00E-02	2.50E-03	2.50E-01
TC-99	2.00E-01	2.50E-01	9.50E+00	1.50E+00	1.00E-02	2.50E-02	8.50E-03
RU-106	2.00E-01	2.50E-01	7.50E-02	2.00E-02	6.00E-07	1.30E-04	2.00E-03
SB-125	2.00E-01	2.50E-01	2.00E-01	3.00E-02	1.00E-04	1.50E-03	1.00E-03
I-129	2.00E-01	2.50E-01	1.00E+00	1.00E+00	1.00E-02	3.00E-01	7.00E-03
CS-134	2.00E-01	2.50E-01	8.00E-02	3.00E-02	7.00E-03	3.00E-01	2.00E-02
CS-135	2.00E-01	2.50E-01	8.00E-02	3.00E-02	7.00E-03	3.00E-01	2.00E-02
CS-137	2.00E-01	2.50E-01	8.00E-02	3.00E-02	7.00E-03	3.00E-01	2.00E-02
CE-144	2.00E-01	2.50E-01	1.00E-02	4.00E-03	5.00E-06	1.00E-04	7.50E-04
EU-154	2.00E-01	2.50E-01	2.50E-03	3.50E-03	2.00E-05	2.00E-05	4.80E-03
U-234	2.00E-01	2.50E-01	8.50E-03	4.00E-03	6.00E-04	5.00E-04	2.00E-04
U-235	2.00E-01	2.50E-01	8.50E-03	4.00E-03	6.00E-04	5.00E-04	2.00E-04
NP-237	2.00E-01	2.50E-01	4.30E-03	4.30E-03	5.00E-06	5.00E-06	5.50E-05
U-238	2.00E-01	2.50E-01	8.50E-03	4.00E-03	6.00E-04	5.00E-04	2.00E-04
PU-238	2.00E-01	2.50E-01	4.50E-04	4.50E-05	1.00E-07	1.50E-06	5.00E-07
PU-239	2.00E-01	2.50E-01	4.50E-04	4.50E-05	1.00E-07	1.50E-06	5.00E-07
PU-240	2.00E-01	2.50E-01	4.50E-04	4.50E-04	1.00E-07	1.50E-06	7.00E-07
PU-241	2.00E-01	2.50E-01	4.50E-04	4.50E-05	1.00E-07	2.50E-06	5.00E-07
AM-241	2.00E-01	2.50E-01	5.50E-03	2.50E-04	4.00E-07	0.00E+00	3.50E-06
PU-242	2.00E-01	2.50E-01	4.50E-04	4.50E-05	1.00E-07	1.50E-06	5.00E-07
AM-243	2.00E-01	2.50E-01	5.50E-03	2.50E-04	4.00E-07	0.00E+00	3.50E-06
CM-243	2.00E-01	2.50E-01	8.50E-04	1.50E-05	2.00E-05	0.00E+00	3.50E-06
CM-244	2.00E-01	2.50E-01	8.50E-04	1.50E-05	2.00E-05	0.00E+00	3.50E-06

1 INITIAL CALCULATIONS

NUCLIDE	MASS
H-3	3.
C-14	14.
CR-51	51.
MN-54	54.

FE-55	55.
CO-58	58.
NI-59	59.
CO-60	60.
NI-63	63.
SR-90	90.
NB-94	94.
TC-99	99.
RU-106	106.
SB-125	125.
I-129	129.
CS-134	134.
CS-135	135.
CS-137	137.
CE-144	144.
EU-154	154.
U-234	234.
U-235	235.
NP-237	237.
U-238	238.
PU-238	238.
PU-239	239.
PU-240	240.
PU-241	241.
AM-241	241.
PU-242	242.
AM-243	243.
CM-243	243.
CM-244	244.

OUTPUT FROM SUBROUTINE INFIL
****

INPUT DATA AS READ IN

30.500 0.010 0.020 0.250 0.240 1.200 0.350E-03 0.140E-05 0.100 1.200

DAILY SUNSHINE BY MONTH (HOURS)

10.8 11.2 12.0 12.8 13.4 13.7 13.6 13.0 12.3 11.6 10.9 10.6

DAILY TEMPERATURES (DEGREES CELSIUS):

MONTH= DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	8.88	10.16	6.00	20.92	17.80	25.34	26.30	24.99	21.89	13.96	19.89	19.77
2	8.48	6.81	8.76	19.34	19.45	26.79	25.79	25.92	22.43	19.38	19.56	19.15
3	7.05	7.79	12.65	20.61	20.04	25.34	27.73	25.28	22.71	20.17	19.56	19.73
4	15.27	13.93	14.35	16.68	20.37	23.45	28.48	26.23	18.00	18.79	19.56	19.23
5	6.13	12.14	17.74	11.78	11.90	25.40	25.39	23.77	16.67	20.95	19.56	20.96
6	8.84	13.12	16.25	12.02	20.78	24.17	22.78	23.78	15.04	22.37	19.56	13.86
7	15.54	6.94	10.90	8.20	20.90	23.86	18.01	25.78	15.87	22.63	19.56	11.56
8	15.54	9.23	4.41	8.60	21.38	26.07	12.58	25.85	16.54	21.47	19.56	11.70
9	15.54	13.06	7.93	12.57	20.27	27.60	21.33	25.12	18.09	22.77	19.56	13.60

10	15.54	8.44	13.33	11.21	20.66	25.60	24.66	25.61	19.68	21.45	19.56	8.13
11	15.54	8.13	17.32	12.79	21.81	24.10	25.09	24.93	21.19	17.03	19.56	9.71
12	15.54	4.59	18.87	15.35	22.07	23.99	25.93	24.71	21.44	19.06	19.56	7.16
13	15.54	7.46	21.13	17.93	15.08	23.10	23.91	24.22	24.27	19.10	19.56	0.08
14	15.54	8.97	19.19	20.56	25.52	23.70	24.89	25.27	24.12	15.71	19.56	4.30
15	15.54	14.71	19.25	20.36	25.06	26.20	24.26	24.69	25.82	12.18	19.56	13.68
16	15.54	19.33	12.33	20.93	24.61	26.46	24.17	25.35	25.74	12.97	19.56	13.17
17	15.54	16.27	17.60	21.36	23.36	21.95	24.74	24.29	25.48	10.93	19.56	4.78
18	8.78	8.03	17.04	16.86	22.95	22.49	25.83	22.87	24.45	12.78	19.56	1.99
19	12.54	10.02	20.02	14.26	21.02	25.70	25.59	24.17	23.35	17.31	19.56	2.85
20	16.73	11.90	23.06	19.05	22.92	26.07	26.55	25.24	21.76	18.55	15.42	6.18
21	15.27	14.61	23.56	20.29	23.55	26.62	27.56	26.62	21.76	18.82	17.86	5.16
22	6.46	8.04	17.91	16.27	24.74	24.69	27.67	25.99	21.76	13.71	16.34	4.64
23	8.41	10.49	15.05	11.65	23.82	24.88	24.88	27.02	21.76	10.64	16.61	8.33
24	5.96	16.75	13.29	13.41	23.58	23.50	25.21	27.62	21.76	8.38	16.83	14.85
25	7.04	12.71	16.55	16.35	24.17	24.63	26.21	25.31	21.76	9.97	9.64	17.31
26	2.14	1.94	13.24	20.59	24.16	24.98	28.02	18.80	21.76	13.11	12.35	15.14
27	-1.54	2.03	6.57	18.13	23.39	24.05	29.36	20.31	21.76	11.43	15.29	16.79
28	5.18	3.65	6.58	17.02	25.76	25.13	27.35	25.31	21.76	12.19	13.85	18.56
29	7.55	0.00	11.19	15.51	27.44	25.97	24.49	20.37	21.76	12.27	19.11	13.72
30	11.00	0.00	16.00	15.75	23.84	27.27	25.53	20.49	20.81	14.62	15.48	7.34
31	16.16	0.00	16.25	0.00	24.13	0.00	24.50	20.24	0.00	17.46	0.00	5.07

MONTH,DAY,& RAINFALL AS READ IN (0.1MM/HR):

1 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 3	0.	0.	0.	0.	23.	0.	23.	23.	70.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 4	0.	0.	0.	0.	23.	47.	23.	23.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.
1 14	23.	23.	23.	23.	0.	0.	23.	0.	0.	0.	47.	23.	23.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.
1 19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 20	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	47.	47.	0.	0.	0.	0.	0.	0.
1 31	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	23.	0.	0.	0.	0.
2 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2 2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.
2 3	0.	0.	23.	0.	0.	0.	0.	47.	0.	0.	0.	47.	23.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.
2 9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.
2 12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	93.	0.	47.	23.	0.	0.	0.
2 16	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	23.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.

2 17	0.	23.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2 26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2 27	0.	0.	23.	0.	0.	23.	0.	0.	0.	0.	0.	23.	0.	0.	0.	23.	0.	0.	0.	0.	23.	0.	0.	0.
3 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3 7	23.	0.	0.	0.	0.	0.	0.	0.	47.	0.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3 17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	23.	0.	0.	0.	0.	0.	0.
3 24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4 3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4 5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	70.	23.	0.	0.	0.	0.	0.	0.	0.	0.
4 8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	0.	23.	47.	0.	23.	0.	0.	0.	0.	0.
4 12	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4 17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	0.	0.	140.	0.	0.	0.	23.	0.	0.
4 20	0.	0.	0.	0.	0.	0.	23.	93.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4 25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	70.	93.	93.	23.	23.	0.	0.	0.	0.
4 26	0.	0.	0.	0.	23.	23.	47.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	350.	0.	0.	0.	0.	0.
4 27	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5 17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	70.	23.	0.	0.	23.	0.	23.	0.
5 19	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5 24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	117.	23.	0.	0.	0.	0.	0.
5 27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	326.	186.	23.	0.	0.	0.	0.
5 30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6 3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	0.	0.	0.	0.	0.
6 12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	163.	0.	0.	0.	0.
6 13	0.	0.	0.	0.	0.	23.	0.	0.	93.	47.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6 16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	93.	0.	0.	0.
6 17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	23.	0.	0.	0.	0.	0.	0.	0.	0.
6 22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6 26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6 27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	70.	0.	0.	0.	23.	0.	0.	0.
6 28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	70.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7 4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7 5	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7 7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.
7 9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	117.	70.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7 13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	47.	210.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7 14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	0.	0.	0.	0.	0.
7 15	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	0.	0.	0.	0.	0.
7 16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	70.	23.	0.	0.	0.	0.	0.	0.	0.
7 19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	280.	163.	0.	0.	0.	0.	0.	0.
7 20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	117.	0.	0.	0.
7 23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	210.	23.	23.	0.	0.
7 24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.
7 27	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7 29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8 5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	419.	93.	0.	0.
8 6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8 7	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8 8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.
8 9	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8 12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.
8 18	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	93.	47.	23.	0.	0.	0.	23.	0.	0.
9 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9 10	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.
9 18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	140.	233.	0.	0.	0.
9 19	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	0.	0.	0.	0.	0.	0.	0.
9 21	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	0.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9 26	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10 9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.

10	10	23.	0.	0.	23.	23.	0.	23.	0.	0.	0.	0.	0.	23.	23.	23.	23.	23.	0.	0.	0.	0.	0.	0.	0.
10	24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	23.	0.	0.	0.
10	25	0.	23.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	70.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	26	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	27	0.	0.	0.	0.	47.	0.	0.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	47.	0.
11	20	0.	0.	0.	0.	0.	0.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	24	0.	0.	0.	0.	0.	23.	0.	0.	23.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.
11	30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	0.	23.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.
12	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	23.	70.	93.	0.	0.	23.	0.
12	2	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	14	0.	0.	0.	0.	0.	0.	0.	0.	23.	23.	47.	47.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	15	0.	0.	0.	0.	0.	23.	23.	23.	93.	117.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	18	0.	23.	23.	47.	0.	23.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	24	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	23.	0.
12	25	0.	0.	0.	23.	47.	23.	23.	23.	0.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	47.	163.	0.
12	29	0.	23.	47.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	31	0.	0.	0.	47.	23.	23.	47.	70.	47.	70.	47.	47.	70.	47.	47.	23.	0.	0.	0.	0.	0.	0.	0.	0.

TRENCH CHARACTERISTICS:

SNOWMELT COEFFICIENT = 3.05MM/DEG-DAY
THICKNESS OF TRENCH COVER = 1.20 M
TOTAL WIDTH OF TRENCH COVER = 30.50 M
AVERAGE SLOPE OF TRENCH COVER = 0.01 M/M
PERMEABLITY OF TRENCH CAP = 0.200E-01M/HR
POROSITY FOR PELLIC WATER = 0.24 (UNITLESS)
POROSITY FOR GRAVITY WATER = 0.25(UNITLESS)
EQUIVALENT UPWARD DIFFUSIVITY = 0.35E-03 M**2/HR
EQUIVALENT UPWARD HYDRAULIC CONDUCTIVITY = 0.14E-05 M/HR
TIME STEP FOR MODEL = 1.00 HOURS

YEAR= 1

**********CUMULATIVE ANNUAL VALUES (M)**********

PRECIP	EVAP	RUNOFF	INFIL
1.11E+00	8.99E-01	3.48E-02	1.48E-01

PELLICULAR DEFICIT	GRAVITY DEFICIT	SNOW
1.03E-03	1.20E+00	0.00E+00

CHANGE OF TOTAL ANNUAL INFILTRATION= -1.48E-01

YEAR= 2

**********CUMULATIVE ANNUAL VALUES (M)**********

PRECIP	EVAP	RUNOFF	INFIL
1.11E+00	8.99E-01	3.48E-02	1.72E-01

PELLICULAR DEFICIT	GRAVITY DEFICIT	SNOW
1.03E-03	1.20E+00	0.00E+00

CHANGE OF TOTAL ANNUAL INFILTRATION= 2.38E-02

YEAR= 3

**********CUMULATIVE ANNUAL VALUES (M)**********

PRECIP	EVAP	RUNOFF	INFIL
1.11E+00	8.99E-01	3.48E-02	1.72E-01

PELLICULAR DEFICIT	GRAVITY DEFICIT	SNOW
1.03E-03	1.20E+00	0.00E+00

CHANGE OF TOTAL ANNUAL INFILTRATION= 0.00E+00

DEGREE OF SATURATION = 0.901
RESIDUAL SATURATION = 0.743

1 INITIAL CALCULATIONS

NUCLIDE	VERTICAL RETARDATION	VERTICAL TIME Y	VERTICAL DDETA	HORIZONTAL RETARDATION	HORIZONTAL TIME Y	HORIZONTAL DDETA	DDETA	BREAK THRU TIME Y
H-3	1.0508E+00	7.7455E+00	1.0077E+00	1.0410E+00	6.0290E+01	1.0000E+00	1.0077E+00	6.8035E+01
C-14	1.0508E+00	7.7455E+00	1.0000E+00	1.0410E+00	6.0290E+01	1.0000E+00	1.0000E+00	6.8035E+01
CR-51	1.0161E+03	7.4901E+03	1.0000E+00	8.2151E+02	4.7577E+04	1.0000E+00	1.0000E+00	1.0001E+04
MN-54	7.6233E+02	5.6194E+03	1.0000E+00	6.1638E+02	3.5697E+04	1.0000E+00	1.0000E+00	1.0001E+04
FE-55	3.0454E+04	2.2449E+05	1.0000E+00	2.4616E+04	1.4256E+06	1.0000E+00	1.0000E+00	1.0001E+04
CO-58	2.8015E+02	2.0651E+03	1.0000E+00	2.2664E+02	1.3126E+04	1.0000E+00	1.0000E+00	1.0001E+04
NI-59	7.6233E+02	5.6194E+03	1.0000E+00	6.1638E+02	3.5697E+04	1.0000E+00	1.0000E+00	1.0001E+04
CO-60	2.8015E+02	2.0651E+03	1.0000E+00	2.2664E+02	1.3126E+04	1.0000E+00	1.0000E+00	1.0001E+04
NI-63	7.6233E+02	5.6194E+03	1.0000E+00	6.1638E+02	3.5697E+04	1.0000E+00	1.0000E+00	1.0001E+04
SR-90	7.6233E+02	5.6194E+03	1.0000E+00	8.3051E+01	4.8098E+03	1.0000E+00	1.0000E+00	1.0001E+04
NB-94	1.7774E+03	1.3102E+04	1.0000E+00	1.4369E+03	8.3216E+04	1.0000E+00	1.0000E+00	1.0001E+04
TC-99	3.5378E+00	2.6078E+01	1.0000E+00	3.0513E+00	1.7671E+02	1.0000E+00	1.0000E+00	2.0279E+02
RU-106	1.1176E+03	8.2383E+03	1.0000E+00	9.0356E+02	5.2329E+04	1.0000E+00	1.0000E+00	1.0001E+04
SB-125	2.2940E+02	1.6910E+03	1.0000E+00	1.8562E+02	1.0750E+04	1.0000E+00	1.0000E+00	1.0001E+04

I-129	1.6327E+01	1.1961E+02	1.0000E+00	3.0513E+00	1.7671E+02	1.0000E+00	1.0000E+00	2.9632E+02
CS-134	5.0765E+03	3.7421E+04	1.0000E+00	2.0523E+03	1.1886E+05	1.0000E+00	1.0000E+00	1.0001E+04
CS-135	5.0765E+03	3.7421E+04	1.0000E+00	2.0523E+03	1.1886E+05	1.0000E+00	1.0000E+00	1.0001E+04
CS-137	5.0765E+03	3.7421E+04	1.0000E+00	2.0523E+03	1.1886E+05	1.0000E+00	1.0000E+00	1.0001E+04
CE-144	5.5841E+03	4.1162E+04	1.0000E+00	4.5138E+03	2.6141E+05	1.0000E+00	1.0000E+00	1.0001E+04
EU-154	2.0303E+04	1.4966E+05	1.0000E+00	1.6411E+04	9.5044E+05	1.0000E+00	1.0000E+00	1.0001E+04
U-234	3.8076E+03	2.8067E+04	1.0000E+00	3.0779E+03	1.7825E+05	1.0000E+00	1.0000E+00	1.0001E+04
U-235	3.8076E+03	2.8067E+04	1.0000E+00	3.0779E+03	1.7825E+05	1.0000E+00	1.0000E+00	1.0001E+04
NP-237	2.6378E+01	1.9444E+02	1.0000E+00	2.1513E+01	1.2459E+03	1.0000E+00	1.0000E+00	1.4403E+03
U-238	3.8076E+03	2.8067E+04	1.0000E+00	3.0779E+03	1.7825E+05	1.0000E+00	1.0000E+00	1.0001E+04
PU-238	1.7765E+04	1.3095E+05	1.0000E+00	1.4360E+04	8.3164E+05	1.0000E+00	1.0000E+00	1.0001E+04
PU-239	1.7765E+04	1.3095E+05	1.0000E+00	1.4360E+04	8.3164E+05	1.0000E+00	1.0000E+00	1.0001E+04
PU-240	1.7765E+04	1.3095E+05	1.0000E+00	1.4360E+04	8.3164E+05	1.0000E+00	1.0000E+00	1.0001E+04
PU-241	1.7765E+04	1.3095E+05	1.0000E+00	1.4360E+04	8.3164E+05	1.0000E+00	1.0000E+00	1.0001E+04
AM-241	4.0604E+05	2.9931E+06	1.0000E+00	3.2821E+05	1.9008E+07	1.0000E+00	1.0000E+00	1.0001E+04
PU-242	1.7765E+04	1.3095E+05	1.0000E+00	1.4360E+04	8.3164E+05	1.0000E+00	1.0000E+00	1.0001E+04
AM-243	4.0604E+05	2.9931E+06	1.0000E+00	3.2821E+05	1.9008E+07	1.0000E+00	1.0000E+00	1.0001E+04
CM-243	1.6750E+04	1.2347E+05	1.0000E+00	1.3539E+04	7.8412E+05	1.0000E+00	1.0000E+00	1.0001E+04
CM-244	1.6750E+04	1.2347E+05	1.0000E+00	1.3539E+04	7.8412E+05	1.0000E+00	1.0000E+00	1.0001E+04

ANNUAL SOIL LOSS IS 3.1315E-01 KILOGRAMS PER SQUARE METER
OR 1.9572E-04 METERS IS REMOVED FROM THE SURFACE
ANNUAL INFILTRATION INTO TRENCH IS 0.1722 METERS
VERTICAL WATER VELOCITY IS 0.9903 METERS PER YEAR
NORMALIZED DOWN WIND ATMOSPHERIC EXPOSURE PER UNIT SOURCE RELEASE IS 0.1080E-10 CI/M**3 PER CI/SEC

1 ANNUAL SUMMARY FOR YEAR 1 OF THE SIMULATION

THE TRENCH CAP HAS HAD 20.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.44E-01 METERS
1.7943E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	5.7314E-01	0.0000E+00	3.5079E-03	0.0000E+00
C-14	9.8386E-01	0.0000E+00	6.0216E-03	0.0000E+00
CR-51	5.9246E-04	0.0000E+00	5.2348E-09	0.0000E+00
MN-54	4.1953E-02	0.0000E+00	4.9401E-07	0.0000E+00
FE-55	1.6885E-01	0.0000E+00	4.9798E-08	0.0000E+00
CO-58	3.8148E-03	0.0000E+00	1.2212E-07	0.0000E+00
NI-59	9.8998E-01	0.0000E+00	1.1657E-05	0.0000E+00
CO-60	3.2622E-01	0.0000E+00	1.0443E-05	0.0000E+00
NI-63	9.8256E-01	0.0000E+00	1.1570E-05	0.0000E+00
SR-90	7.7538E-01	0.0000E+00	9.1304E-06	0.0000E+00
NB-94	9.8996E-01	0.0000E+00	5.0012E-06	0.0000E+00
TC-99	9.8775E-01	0.0000E+00	2.2434E-03	0.0000E+00
RU-106	5.1919E-02	0.0000E+00	4.1708E-07	0.0000E+00
SB-125	1.7400E-01	0.0000E+00	6.8003E-06	0.0000E+00
I-129	9.8947E-01	0.0000E+00	5.3397E-04	0.0000E+00
CS-134	1.2497E-01	0.0000E+00	2.2109E-07	0.0000E+00
CS-135	9.9000E-01	0.0000E+00	1.7514E-06	0.0000E+00
CS-137	7.8372E-01	0.0000E+00	1.3865E-06	0.0000E+00
CE-144	3.6829E-02	0.0000E+00	5.9233E-08	0.0000E+00

EU-154	6.4820E-01	0.0000E+00	2.8674E-07	0.0000E+00
U-234	9.8999E-01	0.0000E+00	2.3350E-06	0.0000E+00
U-235	9.9000E-01	0.0000E+00	2.3350E-06	0.0000E+00
NP-237	9.8967E-01	0.0000E+00	3.3174E-04	0.0000E+00
U-238	9.9000E-01	0.0000E+00	2.3350E-06	0.0000E+00
PU-238	9.8221E-01	0.0000E+00	4.9656E-07	0.0000E+00
PU-239	9.8997E-01	0.0000E+00	5.0049E-07	0.0000E+00
PU-240	9.8989E-01	0.0000E+00	5.0045E-07	0.0000E+00
PU-241	5.9710E-01	0.0000E+00	3.0187E-07	0.0000E+00
AM-241	9.8851E-01	0.0000E+00	2.1866E-08	0.0000E+00
PU-242	9.9000E-01	0.0000E+00	5.0050E-07	0.0000E+00
AM-243	9.8991E-01	0.0000E+00	2.1897E-08	0.0000E+00
CM-243	7.9451E-01	0.0000E+00	4.2601E-07	0.0000E+00
CM-244	6.7170E-01	0.0000E+00	3.6016E-07	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	7.1832E-13	7.2660E-08	2.3368E-03	3.1338E-03	4.2147E-15	2.2031E-26	0.0000E+00
C-14	1.2331E-12	1.2473E-07	4.0114E-03	5.3795E-03	7.2349E-15	3.7818E-26	0.0000E+00
CR-51	3.5619E-13	1.8015E-12	5.7937E-08	7.7696E-08	2.0899E-15	1.0924E-26	0.0000E+00
MN-54	2.5021E-11	1.6873E-10	5.4265E-06	7.2771E-06	1.4681E-13	7.6739E-25	0.0000E+00
FE-55	1.0393E-10	1.7522E-11	5.6352E-07	7.5570E-07	6.0981E-13	3.1876E-24	0.0000E+00
CO-58	2.1566E-12	3.9663E-11	1.2756E-06	1.7106E-06	1.2654E-14	6.6143E-26	0.0000E+00
NI-59	5.9043E-10	3.9816E-09	1.2805E-04	1.7172E-04	3.4643E-12	1.8109E-23	0.0000E+00
CO-60	1.8442E-10	3.3918E-09	1.0900E-04	1.4620E-04	1.0821E-12	5.6562E-24	0.0000E+00
NI-63	5.8601E-10	3.9518E-09	1.2709E-04	1.7044E-04	3.4303E-12	1.7973E-23	0.0000E+00
SR-90	4.6245E-10	3.1105E-09	1.0029E-04	1.3450E-04	2.7133E-12	1.4183E-23	0.0000E+00
NB-94	6.0137E-10	1.7380E-09	5.5896E-05	7.4958E-05	3.5284E-12	1.8444E-23	0.0000E+00
TC-99	5.6102E-11	1.1350E-07	3.6502E-03	4.8951E-03	3.2917E-13	1.7207E-24	0.0000E+00
RU-106	3.1282E-11	1.4303E-10	4.6257E-06	6.2032E-06	1.8354E-13	9.5941E-25	0.0000E+00
SB-125	9.6600E-11	2.1714E-09	6.9835E-05	9.3651E-05	5.6679E-13	2.9627E-24	0.0000E+00
I-129	2.3057E-10	7.7741E-08	2.5002E-03	3.3529E-03	1.3528E-12	7.0714E-24	0.0000E+00
CS-134	7.6609E-11	7.7493E-11	2.4922E-06	3.3422E-06	4.4950E-13	2.3496E-24	0.0000E+00
CS-135	6.0687E-10	6.1387E-10	1.9743E-05	2.6476E-05	3.5607E-12	1.8613E-23	0.0000E+00
CS-137	4.8042E-10	4.8596E-10	1.5629E-05	2.0959E-05	2.8188E-12	1.4734E-23	0.0000E+00
CE-144	2.2586E-11	2.0770E-11	6.6798E-07	8.9579E-07	1.3252E-13	6.9273E-25	0.0000E+00
EU-154	3.9881E-10	1.0085E-10	3.2435E-06	4.3497E-06	2.3400E-12	1.2232E-23	0.0000E+00
U-234	6.0588E-10	8.1715E-10	2.6280E-05	3.5243E-05	3.5549E-12	1.8582E-23	0.0000E+00
U-235	6.0588E-10	8.1715E-10	2.6280E-05	3.5243E-05	3.5549E-12	1.8582E-23	0.0000E+00
NP-237	3.0692E-10	6.2092E-08	1.9969E-03	2.6779E-03	1.8008E-12	9.4132E-24	0.0000E+00
U-238	6.0588E-10	8.1715E-10	2.6280E-05	3.5243E-05	3.5549E-12	1.8582E-23	0.0000E+00
PU-238	6.0422E-10	1.7462E-10	5.6161E-06	7.5313E-06	3.5452E-12	1.8531E-23	0.0000E+00
PU-239	6.0899E-10	1.7600E-10	5.6604E-06	7.5909E-06	3.5732E-12	1.8678E-23	0.0000E+00
PU-240	6.0894E-10	1.7599E-10	5.6600E-06	7.5903E-06	3.5729E-12	1.8676E-23	0.0000E+00
PU-241	3.6731E-10	1.0616E-10	3.4141E-06	4.5784E-06	2.1552E-12	1.1266E-23	0.0000E+00
AM-241	6.0891E-10	7.6991E-12	2.4761E-07	3.3206E-07	3.5727E-12	1.8675E-23	0.0000E+00
PU-242	6.0901E-10	1.7601E-10	5.6606E-06	7.5911E-06	3.5733E-12	1.8678E-23	0.0000E+00
AM-243	6.0977E-10	7.7100E-12	2.4796E-07	3.3253E-07	3.5778E-12	1.8702E-23	0.0000E+00
CM-243	4.8871E-10	1.4980E-10	4.8177E-06	6.4607E-06	2.8674E-12	1.4989E-23	0.0000E+00
CM-244	4.1317E-10	1.2665E-10	4.0731E-06	5.4621E-06	2.4242E-12	1.2672E-23	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 100 OF THE SIMULATION

THE TRENCH CAP HAS HAD 24.97 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.62E-01 METERS
2.0265E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	1.0734E-03	0.0000E+00	8.3944E-06	1.1701E-05
C-14	4.8918E-01	0.0000E+00	3.8255E-03	5.2918E-03
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	6.9938E-37	0.0000E+00	1.0370E-41	0.0000E+00
FE-55	1.5056E-12	0.0000E+00	5.6641E-19	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.8782E-01	0.0000E+00	1.4837E-05	0.0000E+00
CO-60	6.8640E-07	0.0000E+00	2.8028E-11	0.0000E+00
NI-63	4.6562E-01	0.0000E+00	6.9937E-06	0.0000E+00
SR-90	7.0542E-02	0.0000E+00	1.0596E-06	0.0000E+00
NB-94	9.8600E-01	0.0000E+00	6.3539E-06	0.0000E+00
TC-99	7.6497E-01	0.0000E+00	2.2176E-03	0.0000E+00
RU-106	1.2338E-31	0.0000E+00	1.2643E-36	0.0000E+00
SB-125	3.0892E-12	0.0000E+00	1.5400E-16	0.0000E+00
I-129	9.3119E-01	0.0000E+00	6.4109E-04	0.0000E+00
CS-134	4.4704E-16	0.0000E+00	1.0088E-21	0.0000E+00
CS-135	9.8977E-01	0.0000E+00	2.2335E-06	0.0000E+00
CS-137	7.9593E-02	0.0000E+00	1.7961E-07	0.0000E+00
CE-144	1.9972E-40	0.0000E+00	4.0972E-46	0.0000E+00
EU-154	8.9122E-03	0.0000E+00	5.0289E-09	0.0000E+00
U-234	9.8945E-01	0.0000E+00	2.9768E-06	0.0000E+00
U-235	9.8973E-01	0.0000E+00	2.9777E-06	0.0000E+00
NP-237	9.5301E-01	0.0000E+00	4.0752E-04	0.0000E+00
U-238	9.8973E-01	0.0000E+00	2.9777E-06	0.0000E+00
PU-238	4.4928E-01	0.0000E+00	2.8973E-07	0.0000E+00
PU-239	9.8710E-01	0.0000E+00	6.3656E-07	0.0000E+00
PU-240	9.7950E-01	0.0000E+00	6.3166E-07	0.0000E+00
PU-241	3.3019E-03	0.0000E+00	2.1293E-09	0.0000E+00
AM-241	8.5124E-01	0.0000E+00	2.4018E-08	0.0000E+00
PU-242	9.8976E-01	0.0000E+00	6.3827E-07	0.0000E+00
AM-243	9.8073E-01	0.0000E+00	2.7672E-08	0.0000E+00
CM-243	9.2697E-02	0.0000E+00	6.3400E-08	0.0000E+00
CM-244	1.3587E-02	0.0000E+00	9.2931E-09	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	7.2601E-11
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.2835E-08
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	1.9513E-47	1.3008E-46	4.1836E-42	5.6104E-42	1.9874E-53	1.0388E-64	0.0000E+00
FE-55	8.5219E-22	1.4203E-22	4.5679E-18	6.1257E-18	8.6797E-28	4.5370E-39	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	2.7919E-11	1.8612E-10	5.9859E-06	8.0273E-06	2.8435E-17	1.4864E-28	0.0000E+00
CO-60	1.2108E-19	2.2014E-18	7.0798E-14	9.4943E-14	1.2332E-25	6.4460E-37	0.0000E+00
NI-63	1.3159E-11	8.7730E-11	2.8215E-06	3.7837E-06	1.3403E-17	7.0061E-29	0.0000E+00
SR-90	1.9938E-12	1.3292E-11	4.2748E-07	5.7326E-07	2.0307E-18	1.0615E-29	0.0000E+00
NB-94	1.5947E-10	4.5563E-10	1.4654E-05	1.9651E-05	1.6242E-16	8.4902E-28	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
RU-106	9.1729E-42	4.1695E-41	1.3410E-36	1.7983E-36	9.3428E-48	4.8836E-59	0.0000E+00
SB-125	9.8016E-26	2.1781E-24	7.0051E-20	9.3941E-20	9.9831E-32	5.2184E-43	0.0000E+00
I-129	7.8970E-49	2.6324E-46	8.4659E-42	1.1353E-41	8.0432E-55	4.2044E-66	0.0000E+00

CS-134	1.7133E-25	1.7133E-25	5.5102E-21	7.3894E-21	1.7451E-31	9.1217E-43	0.0000E+00
CS-135	3.7932E-10	3.7932E-10	1.2199E-05	1.6360E-05	3.8634E-16	2.0195E-27	0.0000E+00
CS-137	3.0505E-11	3.0505E-11	9.8106E-07	1.3156E-06	3.1069E-17	1.6241E-28	0.0000E+00
CE-144	7.9862E-50	7.2602E-50	2.3350E-45	3.1313E-45	8.1341E-56	4.2510E-67	0.0000E+00
EU-154	4.8507E-12	1.2127E-12	3.9001E-08	5.2302E-08	4.9405E-18	2.5825E-29	0.0000E+00
U-234	3.2460E-10	4.3280E-10	1.3919E-05	1.8666E-05	3.3061E-16	1.7282E-27	0.0000E+00
U-235	3.2470E-10	4.3293E-10	1.3924E-05	1.8672E-05	3.3071E-16	1.7287E-27	0.0000E+00
NP-237	1.0190E-37	2.0380E-35	6.5545E-31	8.7897E-31	1.0379E-43	5.4252E-55	0.0000E+00
U-238	3.2470E-10	4.3293E-10	1.3924E-05	1.8672E-05	3.3071E-16	1.7287E-27	0.0000E+00
PU-238	2.4046E-10	6.8702E-11	2.2095E-06	2.9631E-06	2.4491E-16	1.2802E-27	0.0000E+00
PU-239	5.2034E-10	1.5095E-10	4.8548E-06	6.5105E-06	5.3812E-16	2.8129E-27	0.0000E+00
PU-240	5.2427E-10	1.4979E-10	4.8175E-06	6.4604E-06	5.3398E-16	2.7912E-27	0.0000E+00
PU-241	1.7673E-12	5.0496E-13	1.6240E-08	2.1778E-08	1.8001E-18	9.4093E-30	0.0000E+00
AM-241	5.1792E-10	6.4741E-12	2.0821E-07	2.7922E-07	5.2751E-16	2.7574E-27	0.0000E+00
PU-242	5.2976E-10	1.5136E-10	4.8679E-06	6.5281E-06	5.3957E-16	2.8204E-27	0.0000E+00
AM-243	5.9670E-10	7.4588E-12	2.3988E-07	3.2169E-07	6.0775E-16	3.1768E-27	0.0000E+00
CM-243	4.9214E-11	1.4913E-11	4.7963E-07	6.4320E-07	5.0125E-17	2.6202E-28	0.0000E+00
CM-244	7.2138E-12	2.1860E-12	7.0304E-08	9.4280E-08	7.3473E-18	3.8406E-29	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 200 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS
2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	1.5755E-06	0.0000E+00	1.5367E-08	2.4712E-08
C-14	2.0167E-01	0.0000E+00	1.9670E-03	3.1393E-03
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	5.0573E-72	0.0000E+00	9.4565E-77	0.0000E+00
FE-55	1.0383E-23	0.0000E+00	4.8625E-30	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.8530E-01	0.0000E+00	1.8424E-05	0.0000E+00
CO-60	1.2644E-12	0.0000E+00	6.4275E-17	0.0000E+00
NI-63	2.1891E-01	0.0000E+00	4.0933E-06	0.0000E+00
SR-90	6.2620E-03	0.0000E+00	1.1709E-07	0.0000E+00
NB-94	9.8187E-01	0.0000E+00	7.8768E-06	0.0000E+00
TC-99	5.5270E-01	0.0000E+00	1.9960E-03	0.0000E+00
RU-106	1.4710E-61	0.0000E+00	1.8775E-66	0.0000E+00
SB-125	4.2662E-23	0.0000E+00	2.6476E-27	0.0000E+00
I-129	8.6201E-01	0.0000E+00	7.3892E-04	0.0000E+00
CS-134	1.1427E-30	0.0000E+00	3.2101E-36	0.0000E+00
CS-135	9.8950E-01	0.0000E+00	2.7797E-06	0.0000E+00
CS-137	7.8982E-03	0.0000E+00	2.2188E-08	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	1.1734E-04	0.0000E+00	8.2426E-11	0.0000E+00
U-234	9.8884E-01	0.0000E+00	3.7035E-06	0.0000E+00
U-235	9.8940E-01	0.0000E+00	3.7056E-06	0.0000E+00
NP-237	9.0836E-01	0.0000E+00	4.8360E-04	0.0000E+00
U-238	9.8940E-01	0.0000E+00	3.7056E-06	0.0000E+00
PU-238	2.0388E-01	0.0000E+00	1.6368E-07	0.0000E+00
PU-239	9.8420E-01	0.0000E+00	7.9011E-07	0.0000E+00
PU-240	9.6910E-01	0.0000E+00	7.7799E-07	0.0000E+00

PU-241	1.7325E-05	0.0000E+00	1.3909E-11	0.0000E+00
AM-241	7.3193E-01	0.0000E+00	2.5709E-08	0.0000E+00
PU-242	9.8950E-01	0.0000E+00	7.9436E-07	0.0000E+00
AM-243	9.7154E-01	0.0000E+00	3.4125E-08	0.0000E+00
CM-243	1.0583E-02	0.0000E+00	9.0107E-09	0.0000E+00
CM-244	2.6422E-04	0.0000E+00	2.2497E-10	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.5334E-13
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.9479E-08
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	5.4339E-33	9.0565E-34	2.9126E-29	3.9060E-29	5.5345E-39	2.8930E-50	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	1.2882E-12	8.5880E-13	2.7620E-07	3.7039E-07	1.3120E-18	6.8583E-30	0.0000E+00
CO-60	6.4607E-29	1.1747E-27	3.7779E-23	5.0663E-23	6.5803E-35	3.4397E-46	0.0000E+00
NI-63	2.8621E-13	1.9081E-12	6.1365E-08	8.2293E-08	2.9151E-19	1.5238E-30	0.0000E+00
SR-90	8.1874E-15	5.4583E-14	1.7554E-09	2.3541E-09	8.3389E-21	4.3589E-32	0.0000E+00
NB-94	4.1993E-11	1.1998E-10	3.8587E-06	5.1746E-06	4.2770E-17	2.2357E-28	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
RU-106	1.3307E-72	6.0487E-72	1.9453E-67	2.6087E-67	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	7.0615E-41	1.5692E-39	5.0468E-35	6.7679E-35	7.1923E-47	3.7595E-58	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-134	2.7427E-40	2.7427E-40	8.8208E-36	1.1829E-35	2.7935E-46	1.4602E-57	0.0000E+00
CS-135	2.3745E-10	2.3745E-10	7.6366E-06	1.0241E-05	2.4185E-16	1.2642E-27	0.0000E+00
CS-137	1.8957E-12	1.8958E-12	6.0969E-08	8.1762E-08	1.9308E-18	1.0093E-29	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	5.6789E-14	1.4197E-14	4.5660E-10	6.1231E-10	5.7840E-20	3.0234E-31	0.0000E+00
U-234	1.7391E-10	2.3188E-10	7.4576E-06	1.0001E-05	1.7713E-16	9.2590E-28	0.0000E+00
U-235	1.7402E-10	2.3203E-10	7.4622E-06	1.0007E-05	1.7724E-16	9.2648E-28	0.0000E+00
NP-237	1.7954E-65	3.5909E-63	1.1549E-58	1.5487E-58	1.8287E-71	0.0000E+00	0.0000E+00
U-238	1.7402E-10	2.3203E-10	7.4622E-06	1.0007E-05	1.7724E-16	9.2648E-28	0.0000E+00
PU-238	9.5422E-11	2.7263E-11	8.7682E-07	1.1758E-06	9.7189E-17	5.0802E-28	0.0000E+00
PU-239	4.6063E-10	1.3161E-10	4.2326E-06	5.6761E-06	4.6915E-16	2.4524E-27	0.0000E+00
PU-240	4.5356E-10	1.2959E-10	4.1677E-06	5.5890E-06	4.6196E-16	2.4147E-27	0.0000E+00
PU-241	8.1089E-15	2.3168E-15	7.4511E-11	9.9922E-11	8.2590E-21	4.3171E-32	0.0000E+00
AM-241	4.4262E-10	5.5327E-12	1.7794E-07	2.3862E-07	4.5081E-16	2.3565E-27	0.0000E+00
PU-242	4.6311E-10	1.3232E-10	4.2554E-06	5.7067E-06	4.7168E-16	2.4656E-27	0.0000E+00
AM-243	5.8751E-10	7.3439E-12	2.3619E-07	3.1674E-07	5.9839E-16	3.1279E-27	0.0000E+00
CM-243	4.8734E-12	1.4768E-12	4.7495E-08	6.3693E-08	4.9636E-18	2.5946E-29	0.0000E+00
CM-244	1.2168E-13	3.6872E-14	1.1858E-09	1.5902E-09	1.2393E-19	6.4780E-31	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 300 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS
2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH	TRENCH OVERFLOW	TRENCH DRAINAGE	AMOUNT AT WELL

	CI	CI	CI	CI
H-3	2.0994E-09	0.0000E+00	2.0477E-11	3.9925E-11
C-14	7.5475E-02	0.0000E+00	7.3617E-04	1.4245E-03
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	7.1601E-35	0.0000E+00	3.3532E-41	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.8260E-01	0.0000E+00	1.8373E-05	0.0000E+00
CO-60	2.3280E-18	0.0000E+00	1.1834E-22	0.0000E+00
NI-63	1.0290E-01	0.0000E+00	1.9241E-06	0.0000E+00
SR-90	5.5577E-04	0.0000E+00	1.0392E-08	0.0000E+00
NB-94	9.7768E-01	0.0000E+00	7.8431E-06	0.0000E+00
TC-99	3.8528E-01	0.0000E+00	1.3914E-03	2.2187E-03
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	5.8880E-34	0.0000E+00	3.6542E-38	0.0000E+00
I-129	7.9122E-01	0.0000E+00	6.7823E-04	1.0899E-03
CS-134	2.9208E-45	0.0000E+00	8.2051E-51	0.0000E+00
CS-135	9.8919E-01	0.0000E+00	2.7789E-06	0.0000E+00
CS-137	7.8374E-04	0.0000E+00	2.2017E-09	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	1.5449E-06	0.0000E+00	1.0852E-12	0.0000E+00
U-234	9.8818E-01	0.0000E+00	3.7010E-06	0.0000E+00
U-235	9.8902E-01	0.0000E+00	3.7042E-06	0.0000E+00
NP-237	8.6124E-01	0.0000E+00	4.5851E-04	0.0000E+00
U-238	9.8902E-01	0.0000E+00	3.7042E-06	0.0000E+00
PU-238	9.2520E-02	0.0000E+00	7.4274E-08	0.0000E+00
PU-239	9.8130E-01	0.0000E+00	7.8770E-07	0.0000E+00
PU-240	9.5880E-01	0.0000E+00	7.6972E-07	0.0000E+00
PU-241	9.0904E-08	0.0000E+00	7.2977E-14	0.0000E+00
AM-241	6.2934E-01	0.0000E+00	2.2106E-08	0.0000E+00
PU-242	9.8923E-01	0.0000E+00	7.9415E-07	0.0000E+00
AM-243	9.6245E-01	0.0000E+00	3.3806E-08	0.0000E+00
CM-243	1.3082E-03	0.0000E+00	1.0287E-09	0.0000E+00
CM-244	5.1380E-06	0.0000E+00	4.3747E-12	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.4773E-16
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.8390E-09
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	3.4648E-44	5.7747E-45	1.8572E-40	2.4906E-40	3.5290E-50	1.8447E-61	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	5.9438E-14	3.9626E-13	1.2744E-08	1.7090E-08	6.0539E-20	3.1645E-31	0.0000E+00
CO-60	3.4475E-38	6.2682E-37	2.0159E-32	2.7034E-32	3.5113E-44	1.8354E-55	0.0000E+00
NI-63	6.2248E-15	4.1499E-14	1.3346E-09	1.7898E-09	6.3400E-21	3.3141E-32	0.0000E+00
SR-90	3.3621E-17	2.2414E-16	7.2087E-12	9.6671E-12	3.4244E-23	1.7900E-34	0.0000E+00
NB-94	1.1057E-11	3.1593E-11	1.0160E-06	1.3626E-06	1.1262E-17	5.8869E-29	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.3767E-08
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	5.0874E-56	1.1305E-54	3.6359E-50	4.8759E-50	5.1816E-62	2.7085E-73	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.7626E-09
CS-134	4.3906E-55	4.3906E-55	1.4120E-50	1.8936E-50	4.4718E-61	2.3375E-72	0.0000E+00
CS-135	1.4867E-10	1.4867E-10	4.7814E-06	6.4120E-06	1.5142E-16	7.9152E-28	0.0000E+00
CS-137	1.1781E-13	1.1781E-13	3.7890E-09	5.0812E-09	1.1999E-19	6.2724E-31	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	6.6485E-16	1.6621E-16	5.3456E-12	7.1686E-12	6.7716E-22	3.5397E-33	0.0000E+00
U-234	9.3187E-11	1.2425E-10	3.9960E-06	5.3588E-06	9.4912E-17	4.9613E-28	0.0000E+00
U-235	9.3271E-11	1.2436E-10	3.9996E-06	5.3636E-06	9.4998E-17	4.9657E-28	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

U-238	9.3271E-11	1.2436E-10	3.9996E-06	5.3636E-06	9.4998E-17	4.9657E-28	0.0000E+00
PU-238	3.7865E-11	1.0819E-11	3.4794E-07	4.6660E-07	3.8566E-17	2.0159E-28	0.0000E+00
PU-239	4.0159E-10	1.1474E-10	3.6902E-06	4.9486E-06	4.0902E-16	2.1381E-27	0.0000E+00
PU-240	3.9238E-10	1.1211E-10	3.6056E-06	4.8352E-06	3.9965E-16	2.0890E-27	0.0000E+00
PU-241	3.7205E-17	1.0630E-17	3.4187E-13	4.5846E-13	3.7894E-23	1.9808E-34	0.0000E+00
AM-241	3.7826E-10	4.7282E-12	1.5206E-07	2.0392E-07	3.8526E-16	2.0138E-27	0.0000E+00
PU-242	4.0484E-10	1.1567E-10	3.7200E-06	4.9887E-06	4.1234E-16	2.1554E-27	0.0000E+00
AM-243	5.7846E-10	7.2308E-12	2.3255E-07	3.1186E-07	5.8917E-16	3.0797E-27	0.0000E+00
CM-243	4.8259E-13	1.4624E-13	4.7032E-09	6.3071E-09	4.9152E-19	2.5693E-30	0.0000E+00
CM-244	2.0523E-15	6.2192E-16	2.0001E-11	2.6823E-11	2.0903E-21	1.0926E-32	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 400 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS
2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	2.7974E-12	0.0000E+00	2.7286E-14	5.3200E-14
C-14	2.8248E-02	0.0000E+00	2.7552E-04	5.3313E-04
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	4.9376E-46	0.0000E+00	2.3123E-52	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.7991E-01	0.0000E+00	1.8323E-05	0.0000E+00
CO-60	4.2862E-24	0.0000E+00	2.1788E-28	0.0000E+00
NI-63	4.8368E-02	0.0000E+00	9.0441E-07	0.0000E+00
SR-90	4.9327E-05	0.0000E+00	9.2234E-10	0.0000E+00
NB-94	9.7351E-01	0.0000E+00	7.8097E-06	0.0000E+00
TC-99	2.6858E-01	0.0000E+00	9.6995E-04	2.0008E-03
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	8.1264E-45	0.0000E+00	5.0433E-49	0.0000E+00
I-129	7.2624E-01	0.0000E+00	6.2253E-04	6.4526E-04
CS-134	7.4656E-60	0.0000E+00	2.0973E-65	0.0000E+00
CS-135	9.8889E-01	0.0000E+00	2.7780E-06	0.0000E+00
CS-137	7.7771E-05	0.0000E+00	2.1848E-10	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	2.0341E-08	0.0000E+00	1.4289E-14	0.0000E+00
U-234	9.8753E-01	0.0000E+00	3.6986E-06	0.0000E+00
U-235	9.8864E-01	0.0000E+00	3.7027E-06	0.0000E+00
NP-237	8.1656E-01	0.0000E+00	4.3473E-04	0.0000E+00
U-238	9.8864E-01	0.0000E+00	3.7027E-06	0.0000E+00
PU-238	4.1985E-02	0.0000E+00	3.3705E-08	0.0000E+00
PU-239	9.7840E-01	0.0000E+00	7.8545E-07	0.0000E+00
PU-240	9.4862E-01	0.0000E+00	7.6154E-07	0.0000E+00
PU-241	4.7697E-10	0.0000E+00	3.8291E-16	0.0000E+00
AM-241	5.4113E-01	0.0000E+00	1.9007E-08	0.0000E+00
PU-242	9.8896E-01	0.0000E+00	7.9393E-07	0.0000E+00
AM-243	9.5343E-01	0.0000E+00	3.3489E-08	0.0000E+00
CM-243	1.3793E-04	0.0000E+00	1.1744E-10	0.0000E+00
CM-244	9.9913E-08	0.0000E+00	8.5070E-14	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.3010E-19
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.3080E-09
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	2.2093E-55	3.6822E-56	1.1842E-51	1.5881E-51	2.2502E-61	1.1762E-72	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	2.7426E-15	1.8284E-14	5.8803E-10	7.8856E-10	2.7934E-21	1.4601E-32	0.0000E+00
CO-60	1.8396E-47	3.3448E-46	1.0757E-41	1.4426E-41	1.8737E-53	9.7941E-65	0.0000E+00
NI-63	1.3538E-16	9.0256E-16	2.9027E-11	3.8926E-11	1.3789E-22	7.2078E-34	0.0000E+00
SR-90	1.3807E-19	9.2045E-19	2.9603E-14	3.9698E-14	1.4062E-25	7.3507E-37	0.0000E+00
NB-94	2.9117E-12	8.3192E-12	2.6755E-07	3.5880E-07	2.9656E-18	1.5502E-29	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.2415E-08
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	3.6652E-71	8.1449E-70	2.6195E-65	3.5128E-65	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.0038E-09
CS-134	7.0285E-70	7.0285E-70	2.2604E-65	3.0313E-65	7.1586E-76	0.0000E+00	0.0000E+00
CS-135	9.3084E-11	9.3084E-11	2.9937E-06	4.0146E-06	9.4807E-17	4.9558E-28	0.0000E+00
CS-137	7.3217E-15	7.3217E-15	2.3547E-10	3.1578E-10	7.4573E-21	3.8981E-32	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	7.7836E-18	1.9459E-18	6.2582E-14	8.3925E-14	7.9278E-24	4.1440E-35	0.0000E+00
U-234	4.9930E-11	6.6574E-11	2.1411E-06	2.8713E-06	5.0855E-17	2.6583E-28	0.0000E+00
U-235	4.9990E-11	6.6654E-11	2.1437E-06	2.8747E-06	5.0916E-17	2.6615E-28	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-238	4.9990E-11	6.6654E-11	2.1437E-06	2.8747E-06	5.0916E-17	2.6615E-28	0.0000E+00
PU-238	1.5025E-11	4.2928E-12	1.3806E-07	1.8515E-07	1.5303E-17	7.9992E-29	0.0000E+00
PU-239	3.5010E-10	1.0003E-10	3.2171E-06	4.3142E-06	3.5659E-16	1.8639E-27	0.0000E+00
PU-240	3.3944E-10	9.6984E-11	3.1191E-06	4.1828E-06	3.4573E-16	1.8072E-27	0.0000E+00
PU-241	1.7070E-19	4.8773E-20	1.5686E-15	2.1035E-15	1.7386E-25	9.0882E-37	0.0000E+00
AM-241	3.2324E-10	4.0405E-12	1.2995E-07	1.7426E-07	3.2922E-16	1.7209E-27	0.0000E+00
PU-242	3.5388E-10	1.0111E-10	3.2518E-06	4.3608E-06	3.6044E-16	1.8841E-27	0.0000E+00
AM-243	5.6956E-10	7.1195E-12	2.2897E-07	3.0706E-07	5.8010E-16	3.0323E-27	0.0000E+00
CM-243	4.7788E-14	1.4481E-14	4.6573E-10	6.2456E-10	4.8672E-20	2.5442E-31	0.0000E+00
CM-244	3.4617E-17	1.0490E-17	3.3737E-13	4.5242E-13	3.5258E-23	1.8430E-34	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 500 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS
2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	3.7276E-15	0.0000E+00	3.6359E-17	7.0890E-17
C-14	1.0572E-02	0.0000E+00	1.0312E-04	1.9953E-04
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	3.4050E-57	0.0000E+00	1.5946E-63	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.7723E-01	0.0000E+00	1.8273E-05	0.0000E+00

CO-60	7.8916E-30	0.0000E+00	4.0116E-34	0.0000E+00
NI-63	2.2736E-02	0.0000E+00	4.2513E-07	0.0000E+00
SR-90	4.3779E-06	0.0000E+00	8.1860E-11	0.0000E+00
NB-94	9.6935E-01	0.0000E+00	7.7763E-06	0.0000E+00
TC-99	1.8722E-01	0.0000E+00	6.7614E-04	1.4006E-03
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	1.1216E-55	0.0000E+00	6.9606E-60	0.0000E+00
I-129	6.6659E-01	0.0000E+00	5.7141E-04	7.3640E-04
CS-134	1.9083E-74	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	9.8859E-01	0.0000E+00	2.7772E-06	0.0000E+00
CS-137	7.7172E-06	0.0000E+00	2.1679E-11	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	2.6782E-10	0.0000E+00	1.8813E-16	0.0000E+00
U-234	9.8688E-01	0.0000E+00	3.6961E-06	0.0000E+00
U-235	9.8827E-01	0.0000E+00	3.7013E-06	0.0000E+00
NP-237	7.7420E-01	0.0000E+00	4.1218E-04	0.0000E+00
U-238	9.8827E-01	0.0000E+00	3.7013E-06	0.0000E+00
PU-238	1.9053E-02	0.0000E+00	1.5295E-08	0.0000E+00
PU-239	9.7551E-01	0.0000E+00	7.8314E-07	0.0000E+00
PU-240	9.3853E-01	0.0000E+00	7.5345E-07	0.0000E+00
PU-241	2.5026E-12	0.0000E+00	2.0091E-18	0.0000E+00
AM-241	4.6529E-01	0.0000E+00	1.6343E-08	0.0000E+00
PU-242	9.8869E-01	0.0000E+00	7.9371E-07	0.0000E+00
AM-243	9.4450E-01	0.0000E+00	3.3176E-08	0.0000E+00
CM-243	1.5747E-05	0.0000E+00	1.3407E-11	0.0000E+00
CM-244	1.9429E-09	0.0000E+00	1.6543E-15	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.3987E-22
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.2381E-09
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	1.4087E-66	2.3479E-67	7.5510E-63	1.0126E-62	1.4348E-72	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	1.2655E-16	8.4365E-16	2.7132E-11	3.6386E-11	1.2889E-22	6.7373E-34	0.0000E+00
CO-60	9.8164E-57	1.7848E-55	5.7401E-51	7.6977E-51	9.9982E-63	5.2263E-74	0.0000E+00
NI-63	2.9445E-18	1.9630E-17	6.3131E-13	8.4661E-13	2.9990E-24	1.5676E-35	0.0000E+00
SR-90	5.6697E-22	3.7798E-21	1.2156E-16	1.6302E-16	5.7747E-28	3.0186E-39	0.0000E+00
NB-94	7.6670E-13	2.1906E-12	7.0451E-08	9.4478E-08	7.8090E-19	4.0819E-30	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.6907E-09
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.5693E-09
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	5.8277E-11	5.8277E-11	1.8743E-06	2.5134E-06	5.9356E-17	3.1027E-28	0.0000E+00
CS-137	4.5502E-16	4.5502E-16	1.4634E-11	1.9624E-11	4.6344E-22	2.4225E-33	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	9.1126E-20	2.2782E-20	7.3268E-16	9.8255E-16	9.2813E-26	4.8515E-37	0.0000E+00
U-234	2.6753E-11	3.5671E-11	1.1472E-06	1.5384E-06	2.7248E-17	1.4243E-28	0.0000E+00
U-235	2.6793E-11	3.5724E-11	1.1489E-06	1.5408E-06	2.7289E-17	1.4265E-28	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-238	2.6793E-11	3.5724E-11	1.1489E-06	1.5408E-06	2.7289E-17	1.4265E-28	0.0000E+00
PU-238	5.9624E-12	1.7035E-12	5.4788E-08	7.3472E-08	6.0728E-18	3.1744E-29	0.0000E+00
PU-239	3.0522E-10	8.7206E-11	2.8046E-06	3.7611E-06	3.1087E-16	1.6250E-27	0.0000E+00
PU-240	2.9365E-10	8.3899E-11	2.6983E-06	3.6185E-06	2.9908E-16	1.5634E-27	0.0000E+00
PU-241	7.8322E-22	2.2378E-22	7.1969E-18	9.6513E-18	7.9772E-28	4.1698E-39	0.0000E+00
AM-241	2.7622E-10	3.4520E-12	1.1104E-07	1.4891E-07	2.8133E-16	1.4706E-27	0.0000E+00
PU-242	3.0935E-10	8.8386E-11	2.8426E-06	3.8120E-06	3.1508E-16	1.6470E-27	0.0000E+00
AM-243	5.6079E-10	7.0099E-12	2.2544E-07	3.0233E-07	5.7117E-16	2.9856E-27	0.0000E+00

CM-243	4.7322E-15	1.4340E-15	4.6119E-11	6.1847E-11	4.8198E-21	2.5194E-32	0.0000E+00
CM-244	5.8388E-19	1.7693E-19	5.6904E-15	7.6310E-15	5.9469E-25	3.1086E-36	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 600 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS
2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	4.9670E-18	0.0000E+00	4.8448E-20	9.4462E-20
C-14	3.9567E-03	0.0000E+00	3.8593E-05	7.4679E-05
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	2.3481E-68	0.0000E+00	1.0996E-74	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.7456E-01	0.0000E+00	1.8223E-05	0.0000E+00
CO-60	1.4530E-35	0.0000E+00	7.3860E-40	0.0000E+00
NI-63	1.0687E-02	0.0000E+00	1.9984E-07	0.0000E+00
SR-90	3.8855E-07	0.0000E+00	7.2653E-12	0.0000E+00
NB-94	9.6522E-01	0.0000E+00	7.7431E-06	0.0000E+00
TC-99	1.3051E-01	0.0000E+00	4.7132E-04	9.7635E-04
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	1.5479E-66	0.0000E+00	9.6067E-71	0.0000E+00
I-129	6.1185E-01	0.0000E+00	5.2448E-04	6.7592E-04
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	9.8828E-01	0.0000E+00	2.7763E-06	0.0000E+00
CS-137	7.6578E-07	0.0000E+00	2.1512E-12	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	3.5262E-12	0.0000E+00	2.4769E-18	0.0000E+00
U-234	9.8623E-01	0.0000E+00	3.6937E-06	0.0000E+00
U-235	9.8789E-01	0.0000E+00	3.6999E-06	0.0000E+00
NP-237	7.3404E-01	0.0000E+00	3.9080E-04	0.0000E+00
U-238	9.8789E-01	0.0000E+00	3.6999E-06	0.0000E+00
PU-238	8.6460E-03	0.0000E+00	6.9410E-09	0.0000E+00
PU-239	9.7263E-01	0.0000E+00	7.8082E-07	0.0000E+00
PU-240	9.2856E-01	0.0000E+00	7.4544E-07	0.0000E+00
PU-241	1.3131E-14	0.0000E+00	1.0542E-20	0.0000E+00
AM-241	4.0007E-01	0.0000E+00	1.4052E-08	0.0000E+00
PU-242	9.8842E-01	0.0000E+00	7.9350E-07	0.0000E+00
AM-243	9.3566E-01	0.0000E+00	3.2865E-08	0.0000E+00
CM-243	1.7977E-06	0.0000E+00	1.5307E-12	0.0000E+00
CM-244	3.7781E-11	0.0000E+00	3.2169E-17	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	5.8613E-25
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6338E-10
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	8.9839E-78	1.4973E-78	4.8155E-74	6.4578E-74	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	5.8391E-18	3.8927E-17	1.2519E-12	1.6789E-12	5.9472E-24	3.1087E-35	0.0000E+00
CO-60	5.2381E-66	9.5239E-65	3.0630E-60	4.1076E-60	5.3351E-72	0.0000E+00	0.0000E+00
NI-63	6.4039E-20	4.2693E-19	1.3730E-14	1.8413E-14	6.5225E-26	3.4094E-37	0.0000E+00
SR-90	2.3283E-24	1.5522E-23	4.9920E-19	6.6944E-19	2.3714E-30	1.2396E-41	0.0000E+00
NB-94	2.0189E-13	5.7684E-13	1.8552E-08	2.4879E-08	2.0563E-19	1.0749E-30	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.0582E-09
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.1941E-09
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	3.6487E-11	3.6487E-11	1.1735E-06	1.5737E-06	3.7163E-17	1.9426E-28	0.0000E+00
CS-137	2.8277E-17	2.8278E-17	9.0943E-13	1.2196E-12	2.8801E-23	1.5055E-34	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	1.0669E-21	2.6671E-22	8.5778E-18	1.1503E-17	1.0866E-27	3.6799E-39	0.0000E+00
U-234	1.4333E-11	1.9111E-11	6.1461E-07	8.2422E-07	1.4598E-17	7.6308E-29	0.0000E+00
U-235	1.4359E-11	1.9145E-11	6.1573E-07	8.2572E-07	1.4625E-17	7.6447E-29	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-238	1.4359E-11	1.9145E-11	6.1573E-07	8.2572E-07	1.4625E-17	7.6447E-29	0.0000E+00
PU-238	2.3660E-12	6.7600E-13	2.1741E-08	2.9155E-08	2.4098E-18	1.2596E-29	0.0000E+00
PU-239	2.6608E-10	7.6023E-11	2.4450E-06	3.2788E-06	2.7101E-16	1.4166E-27	0.0000E+00
PU-240	2.5401E-10	7.2576E-11	2.3341E-06	3.1301E-06	2.5872E-16	1.3524E-27	0.0000E+00
PU-241	3.5935E-24	1.0267E-24	3.3021E-20	4.4282E-20	3.6601E-30	1.9132E-41	0.0000E+00
AM-241	2.3603E-10	2.9504E-12	9.4887E-08	1.2725E-07	2.4040E-16	1.2566E-27	0.0000E+00
PU-242	2.7040E-10	7.7258E-11	2.4847E-06	3.3321E-06	2.7541E-16	1.4396E-27	0.0000E+00
AM-243	5.5218E-10	6.9022E-12	2.2198E-07	2.9769E-07	5.6240E-16	2.9398E-27	0.0000E+00
CM-243	4.6861E-16	1.4200E-16	4.5669E-12	6.1244E-12	4.7728E-22	2.4949E-33	0.0000E+00
CM-244	9.8484E-21	2.9844E-21	9.5980E-17	1.2871E-16	1.0031E-26	5.2433E-38	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 700 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS
2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	6.6106E-21	0.0000E+00	6.4558E-23	1.2587E-22
C-14	1.4809E-03	0.0000E+00	1.4444E-05	2.7949E-05
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.7189E-01	0.0000E+00	1.8173E-05	0.0000E+00
CO-60	2.6751E-41	0.0000E+00	1.3599E-45	0.0000E+00
NI-63	5.0236E-03	0.0000E+00	9.3934E-08	0.0000E+00
SR-90	3.4485E-08	0.0000E+00	6.4482E-13	0.0000E+00
NB-94	9.6110E-01	0.0000E+00	7.7101E-06	0.0000E+00
TC-99	9.0974E-02	0.0000E+00	3.2854E-04	6.8060E-04
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	2.1404E-77	0.0000E+00	0.0000E+00	0.0000E+00
I-129	5.6160E-01	0.0000E+00	4.8140E-04	6.2041E-04

CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	9.8798E-01	0.0000E+00	2.7754E-06	0.0000E+00
CS-137	7.5988E-08	0.0000E+00	2.1347E-13	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	4.6426E-14	0.0000E+00	3.2612E-20	0.0000E+00
U-234	9.8558E-01	0.0000E+00	3.6913E-06	0.0000E+00
U-235	9.8752E-01	0.0000E+00	3.6985E-06	0.0000E+00
NP-237	6.9596E-01	0.0000E+00	3.7052E-04	0.0000E+00
U-238	9.8752E-01	0.0000E+00	3.6985E-06	0.0000E+00
PU-238	3.9234E-03	0.0000E+00	3.1497E-09	0.0000E+00
PU-239	9.6976E-01	0.0000E+00	7.7852E-07	0.0000E+00
PU-240	9.1869E-01	0.0000E+00	7.3752E-07	0.0000E+00
PU-241	6.8899E-17	0.0000E+00	5.5311E-23	0.0000E+00
AM-241	3.4399E-01	0.0000E+00	1.2083E-08	0.0000E+00
PU-242	9.8816E-01	0.0000E+00	7.9328E-07	0.0000E+00
AM-243	9.2689E-01	0.0000E+00	3.2557E-08	0.0000E+00
CM-243	2.0524E-07	0.0000E+00	1.7475E-13	0.0000E+00
CM-244	7.3469E-13	0.0000E+00	6.2555E-19	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/MAA3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/MAA3	ATMOSPHERE DOWN WIND CI/MAA3	WELL WATER CONC CI/MAA3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	7.8102E-28
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.7342E-10
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	2.6942E-19	1.7961E-18	5.7766E-14	7.7466E-14	2.7441E-25	1.4344E-36	0.0000E+00
CO-60	2.7954E-75	5.0826E-74	1.6346E-69	2.1921E-69	0.0000E+00	0.0000E+00	0.0000E+00
NI-63	1.3928E-21	9.2853E-21	2.9862E-16	4.0047E-16	1.4186E-27	7.4152E-39	0.0000E+00
SR-90	9.5611E-27	6.3741E-26	2.0500E-21	2.7491E-21	9.7381E-33	5.0903E-44	0.0000E+00
NB-94	5.3162E-14	1.5189E-13	4.8850E-09	6.5510E-09	5.4146E-20	2.8303E-31	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.2231E-09
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.8496E-09
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	2.2843E-11	2.2843E-11	7.3465E-07	9.8519E-07	2.3266E-17	1.2161E-28	0.0000E+00
CS-137	1.7573E-18	1.7573E-18	5.6518E-14	7.5792E-14	1.7899E-24	9.3560E-36	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	1.2490E-23	3.1225E-24	1.0042E-19	1.3467E-19	1.2721E-29	6.6496E-41	0.0000E+00
U-234	7.6800E-12	1.0240E-11	3.2933E-07	4.4164E-07	7.8222E-18	4.0888E-29	0.0000E+00
U-235	7.6962E-12	1.0262E-11	3.3002E-07	4.4257E-07	7.8387E-18	4.0974E-29	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-238	7.6962E-12	1.0262E-11	3.3002E-07	4.4257E-07	7.8387E-18	4.0974E-29	0.0000E+00
PU-238	9.3883E-13	2.6824E-13	8.6267E-09	1.1569E-08	9.5621E-19	4.9983E-30	0.0000E+00
PU-239	2.3195E-10	6.6273E-11	2.1314E-06	2.8583E-06	2.3625E-16	1.2349E-27	0.0000E+00
PU-240	2.1974E-10	6.2784E-11	2.0192E-06	2.7078E-06	2.2381E-16	1.1699E-27	0.0000E+00
PU-241	1.6488E-26	4.7108E-27	1.5150E-22	2.0317E-22	1.6793E-32	8.7781E-44	0.0000E+00
AM-241	2.0172E-10	2.5216E-12	8.1096E-08	1.0875E-07	2.0546E-16	1.0740E-27	0.0000E+00
PU-242	2.3634E-10	6.7527E-11	2.1717E-06	2.9124E-06	2.4072E-16	1.2583E-27	0.0000E+00
AM-243	5.4370E-10	6.7962E-12	2.1857E-07	2.9311E-07	5.5376E-16	2.8946E-27	0.0000E+00
CM-243	4.6403E-17	1.4062E-17	4.5224E-13	6.0646E-13	4.7262E-23	2.4705E-34	0.0000E+00
CM-244	1.6611E-22	5.0337E-23	1.6189E-18	2.1710E-18	1.6919E-28	8.8438E-40	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 800 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS

2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	8.8194E-24	0.0000E+00	8.6023E-26	1.6772E-25
C-14	5.5424E-04	0.0000E+00	5.4060E-06	1.0460E-05
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.6923E-01	0.0000E+00	1.8123E-05	0.0000E+00
CO-60	4.9253E-47	0.0000E+00	2.5037E-51	0.0000E+00
NI-63	2.3614E-03	0.0000E+00	4.4154E-08	0.0000E+00
SR-90	3.0606E-09	0.0000E+00	5.7230E-14	0.0000E+00
NB-94	9.5699E-01	0.0000E+00	7.6772E-06	0.0000E+00
TC-99	6.3414E-02	0.0000E+00	2.2901E-04	4.7444E-04
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	5.1547E-01	0.0000E+00	4.4187E-04	5.6946E-04
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	9.8767E-01	0.0000E+00	2.7746E-06	0.0000E+00
CS-137	7.5404E-09	0.0000E+00	2.1183E-14	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	6.1126E-16	0.0000E+00	4.2938E-22	0.0000E+00
U-234	9.8493E-01	0.0000E+00	3.6888E-06	0.0000E+00
U-235	9.8715E-01	0.0000E+00	3.6972E-06	0.0000E+00
NP-237	6.5986E-01	0.0000E+00	3.5130E-04	0.0000E+00
U-238	9.8715E-01	0.0000E+00	3.6972E-06	0.0000E+00
PU-238	1.7805E-03	0.0000E+00	1.4293E-09	0.0000E+00
PU-239	9.6691E-01	0.0000E+00	7.7623E-07	0.0000E+00
PU-240	9.0893E-01	0.0000E+00	7.2968E-07	0.0000E+00
PU-241	3.6151E-19	0.0000E+00	2.9021E-25	0.0000E+00
AM-241	2.9577E-01	0.0000E+00	1.0389E-08	0.0000E+00
PU-242	9.8789E-01	0.0000E+00	7.9307E-07	0.0000E+00
AM-243	9.1821E-01	0.0000E+00	3.2252E-08	0.0000E+00
CM-243	2.3431E-08	0.0000E+00	1.9950E-14	0.0000E+00
CM-244	1.4287E-14	0.0000E+00	1.2164E-20	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0407E-30
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.4907E-11
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	1.2431E-20	8.2876E-20	2.6654E-15	3.5744E-15	1.2662E-26	6.6184E-38	0.0000E+00
CO-60	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-63	3.0292E-23	2.0195E-22	6.4948E-18	8.7098E-18	3.0853E-29	1.6127E-40	0.0000E+00
SR-90	3.9263E-29	2.6175E-28	8.4182E-24	1.1289E-23	3.9990E-35	2.0903E-46	0.0000E+00
NB-94	1.3999E-14	3.9997E-14	1.2864E-09	1.7250E-09	1.4258E-20	7.4531E-32	0.0000E+00

TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9439E-09
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.5335E-09
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	1.4299E-11	1.4299E-11	4.5988E-07	6.1672E-07	1.4564E-17	7.6129E-29	0.0000E+00
CS-137	1.0921E-19	1.0921E-19	3.5124E-15	4.7102E-15	1.1123E-25	5.8144E-37	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	1.4623E-25	3.6556E-26	1.1757E-21	1.5766E-21	1.4893E-31	7.7850E-43	0.0000E+00
U-234	4.1150E-12	5.4867E-12	1.7646E-07	2.3664E-07	4.1912E-18	2.1908E-29	0.0000E+00
U-235	4.1249E-12	5.4999E-12	1.7688E-07	2.3720E-07	4.2013E-18	2.1961E-29	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-238	4.1249E-12	5.4999E-12	1.7688E-07	2.3720E-07	4.2013E-18	2.1961E-29	0.0000E+00
PU-238	3.7256E-13	1.0645E-13	3.4234E-09	4.5909E-09	3.7946E-19	1.9835E-30	0.0000E+00
PU-239	2.0224E-10	5.7784E-11	1.8584E-06	2.4922E-06	2.0599E-16	1.0767E-27	0.0000E+00
PU-240	1.9012E-10	5.4321E-11	1.7470E-06	2.3428E-06	1.9364E-16	1.0122E-27	0.0000E+00
PU-241	7.5649E-29	2.1614E-29	6.9513E-25	9.3219E-25	7.7050E-35	4.0275E-46	0.0000E+00
AM-241	1.7241E-10	2.1551E-12	6.9309E-08	9.2946E-08	1.7560E-16	9.1788E-28	0.0000E+00
PU-242	2.0662E-10	5.9035E-11	1.8986E-06	2.5461E-06	2.1045E-16	1.1000E-27	0.0000E+00
AM-243	5.3535E-10	6.6918E-12	2.1522E-07	2.8861E-07	5.4526E-16	2.8502E-27	0.0000E+00
CM-243	4.5951E-18	1.3925E-18	4.4783E-14	6.0055E-14	4.6802E-24	2.4464E-35	0.0000E+00
CM-244	2.8019E-24	8.4905E-25	2.7306E-20	3.6619E-20	2.8537E-30	1.4917E-41	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 900 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS
2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	1.1752E-26	0.0000E+00	1.1463E-28	2.2349E-28
C-14	2.0743E-04	0.0000E+00	2.0232E-06	3.9150E-06
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.6658E-01	0.0000E+00	1.8074E-05	0.0000E+00
CO-60	9.0683E-53	0.0000E+00	4.6098E-57	0.0000E+00
NI-63	1.1100E-03	0.0000E+00	2.0755E-08	0.0000E+00
SR-90	2.7164E-10	0.0000E+00	5.0793E-15	0.0000E+00
NB-94	9.5291E-01	0.0000E+00	7.6444E-06	0.0000E+00
TC-99	4.4206E-02	0.0000E+00	1.5965E-04	3.3071E-04
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	4.7314E-01	0.0000E+00	4.0557E-04	5.2269E-04
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	9.8737E-01	0.0000E+00	2.7737E-06	0.0000E+00
CS-137	7.4823E-10	0.0000E+00	2.1020E-15	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	8.0480E-18	0.0000E+00	5.6533E-24	0.0000E+00
U-234	9.8428E-01	0.0000E+00	3.6864E-06	0.0000E+00
U-235	9.8678E-01	0.0000E+00	3.6958E-06	0.0000E+00
NP-237	6.2563E-01	0.0000E+00	3.3308E-04	0.0000E+00

U-238	9.8678E-01	0.0000E+00	3.6958E-06	0.0000E+00
PU-238	8.0797E-04	0.0000E+00	6.4863E-10	0.0000E+00
PU-239	9.6406E-01	0.0000E+00	7.7394E-07	0.0000E+00
PU-240	8.9926E-01	0.0000E+00	7.2192E-07	0.0000E+00
PU-241	1.8968E-21	0.0000E+00	1.5227E-27	0.0000E+00
AM-241	2.5431E-01	0.0000E+00	8.9326E-09	0.0000E+00
PU-242	9.8762E-01	0.0000E+00	7.9285E-07	0.0000E+00
AM-243	9.0961E-01	0.0000E+00	3.1950E-08	0.0000E+00
CM-243	2.6749E-09	0.0000E+00	2.2776E-15	0.0000E+00
CM-244	2.7782E-16	0.0000E+00	2.3655E-22	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.3868E-33
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.4292E-11
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	5.7360E-22	3.8240E-21	1.2298E-16	1.6493E-16	5.8422E-28	3.0538E-39	0.0000E+00
CO-60	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-63	6.5882E-25	4.3921E-24	1.4125E-19	1.8943E-19	6.7102E-31	3.5075E-42	0.0000E+00
SR-90	1.6123E-31	1.0749E-30	3.4570E-26	4.6359E-26	1.6422E-37	8.5840E-49	0.0000E+00
NB-94	3.6862E-15	1.0532E-14	3.3872E-10	4.5424E-10	3.7545E-21	1.9625E-32	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.0521E-09
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.2433E-09
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	8.9531E-12	8.9532E-12	2.8794E-07	3.8614E-07	9.1189E-18	4.7666E-29	0.0000E+00
CS-137	6.7871E-21	6.7871E-21	2.1828E-16	2.9272E-16	6.9127E-27	3.6134E-38	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	1.7119E-27	4.2798E-28	1.3764E-23	1.8458E-23	1.7436E-33	9.1142E-45	0.0000E+00
U-234	2.2049E-12	2.9399E-12	9.4549E-08	1.2679E-07	2.2457E-18	1.1739E-29	0.0000E+00
U-235	2.2108E-12	2.9478E-12	9.4804E-08	1.2714E-07	2.2518E-18	1.1770E-29	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-238	2.2108E-12	2.9478E-12	9.4804E-08	1.2714E-07	2.2518E-18	1.1770E-29	0.0000E+00
PU-238	1.4784E-13	4.2240E-14	1.3585E-09	1.8218E-09	1.5058E-19	7.8709E-31	0.0000E+00
PU-239	1.7634E-10	5.0382E-11	1.6203E-06	2.1729E-06	1.7960E-16	9.3881E-28	0.0000E+00
PU-240	1.6449E-10	4.6997E-11	1.5115E-06	2.0269E-06	1.6754E-16	8.7574E-28	0.0000E+00
PU-241	3.4709E-31	9.9169E-32	3.1894E-27	4.2770E-27	3.5352E-37	1.8479E-48	0.0000E+00
AM-241	1.4735E-10	1.8418E-12	5.9235E-08	7.9436E-08	1.5007E-16	7.8447E-28	0.0000E+00
PU-242	1.8064E-10	5.1611E-11	1.6599E-06	2.2259E-06	1.8398E-16	9.6171E-28	0.0000E+00
AM-243	5.2711E-10	6.5888E-12	2.1190E-07	2.8417E-07	5.3686E-16	2.8063E-27	0.0000E+00
CM-243	4.5503E-19	1.3789E-19	4.4346E-15	5.9469E-15	4.6345E-25	2.4226E-36	0.0000E+00
CM-244	4.7259E-26	1.4321E-26	4.6058E-22	6.1765E-22	4.8134E-32	2.5161E-43	0.0000E+00

1 ANNUAL SUMMARY FOR YEAR 1000 OF THE SIMULATION

THE TRENCH CAP HAS HAD 30.00 PER CENT FAILURE
THE MAXIMUM POSSIBLE WATER DEPTH IN TRENCH DURING THE YEAR IS 1.81E-01 METERS
2.2611E-01 CUBIC METERS OF WATER LEFT BOTTOM OF TRENCH
0.0000E+00 CUBIC METERS OF WATER OVERFLOWED TRENCH

NUCLIDE TRANSPORT INFORMATION

NUCLIDE	AMOUNT IN TRENCH CI	TRENCH OVERFLOW CI	TRENCH DRAINAGE CI	AMOUNT AT WELL CI
H-3	1.5659E-29	0.0000E+00	1.5274E-31	2.9781E-31
C-14	7.7633E-05	0.0000E+00	7.5723E-07	1.4652E-06
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	9.6394E-01	0.0000E+00	1.8024E-05	0.0000E+00
CO-60	1.6696E-58	0.0000E+00	8.4874E-63	0.0000E+00
NI-63	5.2176E-04	0.0000E+00	9.7562E-09	0.0000E+00
SR-90	2.4109E-11	0.0000E+00	4.5081E-16	0.0000E+00
NB-94	9.4084E-01	0.0000E+00	7.6110E-06	0.0000E+00
TC-99	3.0816E-02	0.0000E+00	1.1129E-04	2.3053E-04
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	4.3428E-01	0.0000E+00	3.7226E-04	4.7976E-04
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	9.8707E-01	0.0000E+00	2.7729E-06	0.0000E+00
CS-137	7.4247E-11	0.0000E+00	2.0858E-16	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	1.0596E-19	0.0000E+00	7.4434E-26	0.0000E+00
U-234	9.8363E-01	0.0000E+00	3.6840E-06	0.0000E+00
U-235	9.8641E-01	0.0000E+00	3.6944E-06	0.0000E+00
NP-237	5.9318E-01	0.0000E+00	3.1580E-04	0.0000E+00
U-238	9.8641E-01	0.0000E+00	3.6944E-06	0.0000E+00
PU-238	3.6665E-04	0.0000E+00	2.9434E-10	0.0000E+00
PU-239	9.6122E-01	0.0000E+00	7.7166E-07	0.0000E+00
PU-240	8.8971E-01	0.0000E+00	7.1425E-07	0.0000E+00
PU-241	9.9524E-24	0.0000E+00	7.9897E-30	0.0000E+00
AM-241	2.1866E-01	0.0000E+00	7.6804E-09	0.0000E+00
PU-242	9.8735E-01	0.0000E+00	7.9264E-07	0.0000E+00
AM-243	9.0109E-01	0.0000E+00	3.1651E-08	0.0000E+00
CM-243	3.0538E-10	0.0000E+00	2.6002E-16	0.0000E+00
CM-244	5.4025E-18	0.0000E+00	4.5999E-24	0.0000E+00

NUCLIDE	SURFACE SOIL CONC CI/KG	SURFACE WATER CONC CI/M**3	SOLUBLE TO STREAM CI	SOLUBLE TO DEEP LAYERS CI	ATMOSPHERE AT SPILLAGE CI/M**3	ATMOSPHERE DOWN WIND CI/M**3	WELL WATER CONC CI/M**3
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.8479E-36
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	9.0916E-12
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	2.6467E-23	1.7645E-22	5.6746E-18	7.6099E-18	2.6957E-29	1.4091E-40	0.0000E+00
CO-60	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-63	1.4329E-26	9.5526E-26	3.0722E-21	4.1199E-21	1.4594E-32	7.6286E-44	0.0000E+00
SR-90	6.6211E-34	4.4141E-33	1.4196E-28	1.9037E-28	6.7437E-40	3.5250E-51	0.0000E+00
NB-94	9.7068E-16	2.7734E-15	8.9195E-11	1.1961E-10	9.8865E-22	5.1679E-33	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.4304E-09
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9769E-09
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	5.6056E-12	5.6056E-12	1.8028E-07	2.4176E-07	5.7094E-18	2.9844E-29	0.0000E+00
CS-137	4.2179E-22	4.2179E-22	1.3565E-17	1.8191E-17	4.2960E-28	2.2456E-39	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

EU-154	2.0042E-29	5.0105E-30	1.6114E-25	2.1610E-25	2.0413E-35	1.0670E-46	0.0000E+00
U-234	1.1813E-12	1.5751E-12	5.0658E-08	6.7934E-08	1.2032E-18	6.2894E-30	0.0000E+00
U-235	1.1849E-12	1.5799E-12	5.0810E-08	6.8138E-08	1.2068E-18	6.3084E-30	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-238	1.1849E-12	1.5799E-12	5.0810E-08	6.8138E-08	1.2068E-18	6.3084E-30	0.0000E+00
PU-238	5.8663E-14	1.6761E-14	5.3904E-10	7.2288E-10	5.9749E-20	3.1232E-31	0.0000E+00
PU-239	1.5375E-10	4.3928E-11	1.4128E-06	1.8946E-06	1.5659E-16	8.1854E-28	0.0000E+00
PU-240	1.4231E-10	4.0661E-11	1.3077E-06	1.7537E-06	1.4495E-16	7.5767E-28	0.0000E+00
PU-241	1.5925E-33	4.5500E-34	1.4633E-29	1.9624E-29	1.6220E-39	8.4784E-51	0.0000E+00
AM-241	1.2593E-10	1.5741E-12	5.0624E-08	6.7889E-08	1.2826E-16	6.7043E-28	0.0000E+00
PU-242	1.5792E-10	4.5120E-11	1.4511E-06	1.9460E-06	1.6084E-16	8.4077E-28	0.0000E+00
AM-243	5.1898E-10	6.4873E-12	2.0864E-07	2.7979E-07	5.2859E-16	2.7631E-27	0.0000E+00
CM-243	4.5058E-20	1.3654E-20	4.3913E-16	5.8889E-16	4.5892E-26	2.3989E-37	0.0000E+00
CM-244	7.9712E-28	2.4155E-28	7.7686E-24	1.0418E-23	8.1188E-34	4.2439E-45	0.0000E+00

1 AVERAGE CONCENTRATIONS OVER THE YEARS 1 TO 1000 OF THE SIMULATION
MAXIMUM ANNUAL CONCENTRATIONS

NUCLIDE	ATMOSPHERE DOWNWIND			IN WELL			IN STREAM		
	AVERAGE CI/MAA3	MAXIMUM CI/MAA3	YEAR	AVERAGE CI/MAA3	MAXIMUM CI/MAA3	YEAR	AVERAGE CI/MAA3	MAXIMUM CI/MAA3	YEAR
H-3	2.2363E-29	2.2031E-26	1	8.4807E-12	8.6338E-10	70	6.8792E-12	6.5457E-09	1
C-14	3.8423E-29	3.7818E-26	1	6.0323E-09	7.0032E-08	70	1.1844E-11	1.1236E-08	1
CR-51	1.0925E-29	1.0924E-26	1	0.0000E+00	0.0000E+00	0	1.6231E-16	1.6229E-13	1
MN-54	8.8918E-28	7.6739E-25	1	0.0000E+00	0.0000E+00	0	2.6600E-14	1.5200E-11	1
FE-55	4.3020E-27	3.1876E-24	1	0.0000E+00	0.0000E+00	0	6.8638E-15	1.5785E-12	1
CO-58	6.6677E-29	6.6143E-26	1	0.0000E+00	0.0000E+00	0	3.6692E-15	3.5731E-12	1
NI-59	2.7512E-26	1.8109E-23	1	0.0000E+00	0.0000E+00	0	1.1642E-11	3.5869E-10	1
CO-60	7.7770E-27	5.6562E-24	1	0.0000E+00	0.0000E+00	0	1.5693E-12	3.0555E-10	1
NI-63	2.7156E-26	1.7973E-23	1	0.0000E+00	0.0000E+00	0	9.3216E-12	3.5600E-10	1
SR-90	2.1190E-26	1.4183E-23	1	0.0000E+00	0.0000E+00	0	5.1694E-12	2.8094E-10	1
NB-94	2.8478E-26	1.8444E-23	1	0.0000E+00	0.0000E+00	0	1.1607E-11	1.5657E-10	1
TC-99	1.7962E-27	1.7207E-24	1	5.7716E-09	4.4271E-08	204	1.1833E-11	1.0225E-08	1
RU-106	1.1384E-27	9.5941E-25	1	0.0000E+00	0.0000E+00	0	2.5317E-14	1.2957E-11	1
SB-125	3.8656E-27	2.9627E-24	1	0.0000E+00	0.0000E+00	0	6.5758E-13	1.9562E-10	1
I-129	8.1221E-27	7.0714E-24	1	2.7046E-09	2.4125E-08	298	1.1787E-11	7.0034E-09	1
CS-134	3.0741E-27	2.3496E-24	1	0.0000E+00	0.0000E+00	0	2.3923E-14	6.9811E-12	1
CS-135	2.9344E-26	1.8613E-23	1	0.0000E+00	0.0000E+00	0	1.1520E-11	5.5301E-11	1
CS-137	2.2437E-26	1.4734E-23	1	0.0000E+00	0.0000E+00	0	1.5708E-12	4.3779E-11	1
CE-144	7.9560E-28	6.9273E-25	1	0.0000E+00	0.0000E+00	0	3.1486E-15	1.8711E-12	1
EU-154	1.8401E-26	1.2232E-23	1	0.0000E+00	0.0000E+00	0	2.0544E-13	9.0855E-12	1
U-234	2.9100E-26	1.8582E-23	1	0.0000E+00	0.0000E+00	0	1.1603E-11	7.3614E-11	1
U-235	2.9100E-26	1.8582E-23	1	0.0000E+00	0.0000E+00	0	1.1609E-11	7.3615E-11	1
NP-237	1.1330E-26	9.4132E-24	1	0.0000E+00	0.0000E+00	0	1.1764E-11	5.5936E-09	1
U-238	2.9100E-26	1.8582E-23	1	0.0000E+00	0.0000E+00	0	1.1609E-11	7.3615E-11	1
PU-238	2.8797E-26	1.8531E-23	1	0.0000E+00	0.0000E+00	0	1.6799E-12	1.5731E-11	1
PU-239	3.0584E-26	1.8678E-23	1	0.0000E+00	0.0000E+00	0	8.4801E-12	1.5856E-11	1
PU-240	3.0528E-26	1.8676E-23	1	0.0000E+00	0.0000E+00	0	8.2303E-12	1.5854E-11	1
PU-241	1.6843E-26	1.1266E-23	1	0.0000E+00	0.0000E+00	0	1.7950E-13	9.5633E-12	1
AM-241	3.0447E-26	1.8675E-23	1	0.0000E+00	0.0000E+00	0	3.4376E-13	6.9359E-13	1
PU-242	3.0604E-26	1.8678E-23	1	0.0000E+00	0.0000E+00	0	8.5694E-12	1.5856E-11	1
AM-243	3.1800E-26	1.8702E-23	1	0.0000E+00	0.0000E+00	0	6.3205E-13	6.9457E-13	1
CM-243	2.2912E-26	1.4989E-23	1	0.0000E+00	0.0000E+00	0	5.8030E-13	1.3495E-11	1
CM-244	1.9112E-26	1.2672E-23	1	0.0000E+00	0.0000E+00	0	2.8049E-13	1.1409E-11	1

1 RADIONUCLIDE CONCENTRATION IN FOODS DUE TO ATMOSPHERIC DEPOSITION
PICO CURIES PER KILOGRAM

NUCLIDE	LEAFY VEG M.I.E.	PRODUCE M.I.E.	LEAFY VEG G.P.E.	PRODUCE G.P.E.	COW'S MILK M.I.E.	COW'S MILK G.P.E.	GOAT'S MILK M.I.E.	GOAT'S MILK G.P.E.	BEEF MEAT
H-3	8.4710E-16	8.4710E-16	8.4710E-16	8.4710E-16	4.2355E-16	4.2355E-16	8.6404E-16	8.6404E-16	5.0826E-16
C-14	2.6416E-14	2.6416E-14	2.6416E-14	2.6416E-14	1.5849E-14	1.5849E-14	1.5849E-14	1.5849E-14	4.0944E-14
CR-51	3.7139E-13	8.4760E-15	2.6819E-13	2.6820E-14	2.9122E-14	2.7699E-14	1.5885E-15	1.5109E-15	2.0242E-14

MN-54	4.3072E-11	3.8420E-12	4.1849E-11	4.2543E-12	5.1950E-13	5.1720E-13	4.4528E-14	4.4331E-14	5.7049E-13
FE-55	2.1026E-10	2.0488E-11	2.1132E-10	2.1163E-11	1.8004E-12	1.7979E-12	1.1235E-13	1.1219E-13	1.4222E-10
CO-58	2.8404E-12	1.6004E-13	2.5031E-12	2.5033E-13	1.9615E-13	1.9237E-13	1.1769E-14	1.1542E-14	2.4697E-12
NI-59	1.6842E-09	9.9822E-10	1.6842E-09	9.9822E-10	1.1945E-10	1.1945E-10	9.6039E-11	9.6039E-11	7.1671E-10
CO-60	3.8865E-10	3.8801E-11	3.8683E-10	3.9452E-11	2.6509E-11	2.6490E-11	1.5905E-12	1.5894E-12	2.6337E-10
NI-63	1.4775E-09	4.6226E-10	1.4771E-09	4.6270E-10	7.3550E-11	7.3547E-11	5.9134E-11	5.9132E-11	4.4114E-10
SR-90	2.6316E-09	5.4874E-10	2.6293E-09	5.5041E-10	5.4853E-10	5.4846E-10	6.1436E-10	6.1427E-10	1.0958E-10
NB-94	1.6402E-09	2.9242E-10	1.6402E-09	2.9242E-10	1.8721E-09	1.8721E-09	2.8082E-11	2.8082E-11	2.3401E-08
TC-99	9.9631E-11	1.3261E-11	9.9631E-11	1.3261E-11	5.0518E-11	5.0518E-11	1.5155E-11	1.5155E-11	4.2940E-11
RU-106	5.5338E-11	4.9940E-12	5.3996E-11	5.4470E-12	1.1309E-15	1.1267E-15	2.9404E-14	2.9294E-14	3.6439E-12
SB-125	1.9386E-10	1.9306E-11	1.9214E-10	1.9924E-11	6.9229E-13	6.9135E-13	1.2461E-12	1.2444E-12	6.8381E-12
I-129	4.3690E-10	1.2379E-10	4.3690E-10	1.2379E-10	2.0765E-10	2.0765E-10	7.4754E-10	7.4754E-10	1.4535E-10
CS-134	1.5231E-10	1.4911E-11	1.5050E-10	1.5556E-11	3.6650E-11	3.6583E-11	1.8849E-10	1.8814E-10	1.0299E-10
CS-135	2.9309E-09	1.6967E-09	2.9309E-09	1.6967E-09	2.5895E-09	2.5895E-09	1.3317E-08	1.3317E-08	7.3986E-09
CS-137	1.1894E-09	1.8047E-10	1.1884E-09	1.8100E-10	3.6430E-10	3.6425E-10	1.8735E-09	1.8733E-09	1.0397E-09
CE-144	3.8260E-11	3.3176E-12	3.7066E-11	3.7114E-12	6.4855E-15	6.4540E-15	1.5565E-14	1.5490E-14	9.3105E-13
EU-154	9.2239E-10	9.5043E-11	9.2097E-10	9.5563E-11	6.2515E-13	6.2500E-13	7.5018E-14	7.5000E-14	1.4972E-10
U-234	1.5994E-09	3.3139E-10	1.5994E-09	3.3139E-10	4.8084E-11	4.8084E-11	4.8084E-12	4.8084E-12	1.6028E-11
U-235	1.5995E-09	3.3162E-10	1.5995E-09	3.3162E-10	4.8107E-11	4.8107E-11	4.8107E-12	4.8107E-12	1.6036E-11
NP-237	5.6929E-10	5.7740E-11	5.6929E-10	5.7740E-11	9.6129E-14	9.6129E-14	1.1536E-14	1.1536E-14	1.0574E-12
U-238	1.5995E-09	3.3162E-10	1.5995E-09	3.3162E-10	4.8107E-11	4.8107E-11	4.8107E-12	4.8107E-12	1.6036E-11
PU-238	1.4460E-09	1.4466E-10	1.4456E-09	1.4481E-10	4.8924E-15	4.8922E-15	8.8063E-15	8.8059E-15	2.4452E-14
PU-239	1.5452E-09	1.5644E-10	1.5452E-09	1.5644E-10	5.3865E-15	5.3865E-15	9.6958E-15	9.6958E-15	2.6933E-14
PU-240	1.5421E-09	1.8168E-10	1.5421E-09	1.8168E-10	5.3990E-15	5.3990E-15	9.7182E-15	9.7182E-15	3.7793E-14
PU-241	8.4319E-10	8.3628E-11	8.4161E-10	8.4183E-11	2.8417E-15	2.8409E-15	8.5251E-15	8.5226E-15	1.4172E-14
AM-241	1.6014E-09	1.6222E-10	1.6013E-09	1.6225E-10	2.6717E-14	2.6716E-14	0.0000E+00	0.0000E+00	2.3375E-13
PU-242	1.5464E-09	1.5658E-10	1.5464E-09	1.5658E-10	5.3928E-15	5.3928E-15	9.7070E-15	9.7070E-15	2.6964E-14
AM-243	1.7378E-09	1.7775E-10	1.7378E-09	1.7775E-10	3.3062E-14	3.3062E-14	0.0000E+00	0.0000E+00	2.8929E-13
CM-243	1.1494E-09	1.1450E-10	1.1485E-09	1.1481E-10	7.7662E-13	7.7652E-13	0.0000E+00	0.0000E+00	1.3576E-13
CM-244	9.5760E-10	9.5134E-11	9.5625E-10	9.5608E-11	6.4612E-13	6.4598E-13	0.0000E+00	0.0000E+00	1.1285E-13

RADIONUCLIDE CONCENTRATION IN FOODS DUE TO IRRIGATION
PICO CURIES PER KILOGRAM

NUCLIDE	LEAFY VEG M.I.E.	PRODUCE M.I.E.	LEAFY VEG G.P.E.	PRODUCE G.P.E.	COW'S MILK M.I.E.	COW'S MILK G.P.E.	GOAT'S MILK M.I.E.	GOAT'S MILK G.P.E.	BEEF MEAT
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6644E-12	4.6644E-12	1.0092E-11	1.0092E-11	5.5973E-12
C-14	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CR-51	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-60	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-63	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SR-90	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NB-94	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TC-99	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.7315E-09	1.7315E-09	5.7716E-10	5.7716E-10	1.2265E-09
RU-106	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.1138E-10	8.1138E-10	3.2455E-09	3.2455E-09	4.7331E-10
CS-134	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-137	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CE-144	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-234	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-235	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NP-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-238	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

PU-238	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PU-239	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PU-240	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PU-241	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
AM-241	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PU-242	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
AM-243	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CM-243	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CM-244	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

NOTE: G.P.E. - GENERAL POPULATION EXPOSURE
M.I.E. - MAXIMUM INDIVIDUAL EXPOSURE
0 G.P.E. WILL BE USED TO CALCULATE HEALTH EFFECTS

1

NUCLIDE	ANNUAL INTAKE BY INGESTION PCI/Y	ANNUAL INTAKE BY INHALATION PCI/Y
H-3	3.1379E+00	1.7891E-13
C-14	2.2320E+03	3.0738E-13
CR-51	1.5060E-12	8.7397E-14
MN-54	1.7110E-10	7.1135E-12
FE-55	2.1033E-09	3.4416E-11
CO-58	3.3855E-11	5.3341E-13
NI-59	2.9101E-08	2.2010E-10
CO-60	4.1455E-09	6.2216E-11
NI-63	1.6062E-08	2.1724E-10
SR-90	2.2185E-08	1.6952E-10
NB-94	2.3975E-07	2.2783E-10
TC-99	2.1355E+03	1.4369E-11
RU-106	2.3885E-10	9.1073E-12
SB-125	8.1205E-10	3.0925E-11
I-129	1.0007E+03	6.4977E-11
CS-134	1.9104E-09	2.4593E-11
CS-135	1.3147E-07	2.3475E-10
CS-137	1.8998E-08	1.7950E-10
CE-144	1.4939E-10	6.3648E-12
EU-154	4.9164E-09	1.4721E-10
U-234	9.8369E-09	2.3280E-10
U-235	9.8417E-09	2.3280E-10
NP-237	2.1885E-09	9.0706E-11
U-238	9.8417E-09	2.3280E-10
PU-238	5.4979E-09	2.3038E-10
PU-239	5.9066E-09	2.4467E-10
PU-240	6.3548E-09	2.4423E-10
PU-241	3.1987E-09	1.3474E-10
AM-241	6.1256E-09	2.4358E-10
PU-242	5.9114E-09	2.4483E-10
AM-243	6.6780E-09	2.5504E-10
CM-243	4.3733E-09	1.8330E-10
CM-244	3.6416E-09	1.5289E-10

1 AGGREGATED VALUES OF RADIOACTIVITY:

NUCLIDE	PUMPED OUT THE WELL	PUMPED OUT THE STREAM	LEFT BOTTOM OF TRENCH	OVERFLOWED TRENCH	RELEASED TO THE ATMOSPHERE	RELEASED TO BASIN
H-3	1.6686E-06	0.0000E+00	5.9941E-02	0.0000E+00	1.3492E-07	2.4601E-03
C-14	1.1868E-03	0.0000E+00	9.7463E-01	0.0000E+00	2.3181E-07	9.6049E-01
CR-51	0.0000E+00	0.0000E+00	5.2354E-09	0.0000E+00	6.5909E-08	5.7943E-08
MN-54	0.0000E+00	0.0000E+00	8.9245E-07	0.0000E+00	5.3645E-06	9.4963E-06
FE-55	0.0000E+00	0.0000E+00	2.2170E-07	0.0000E+00	2.5954E-05	2.4504E-06
CO-58	0.0000E+00	0.0000E+00	1.2574E-07	0.0000E+00	4.0227E-07	1.3099E-06
NI-59	0.0000E+00	0.0000E+00	1.7560E-02	0.0000E+00	1.6599E-04	4.1560E-03
CO-60	0.0000E+00	0.0000E+00	8.6009E-05	0.0000E+00	4.6919E-05	5.6022E-04
NI-63	0.0000E+00	0.0000E+00	1.9914E-03	0.0000E+00	1.6384E-04	3.3280E-03
SR-90	0.0000E+00	0.0000E+00	4.2409E-04	0.0000E+00	1.2784E-04	1.8456E-03

NB-94	0.0000E+00	0.0000E+00	7.4712E-03	0.0000E+00	1.7183E-04	4.1431E-03
TC-99	1.1355E-03	0.0000E+00	9.5813E-01	0.0000E+00	1.0836E-05	5.2446E-01
RU-106	0.0000E+00	0.0000E+00	8.3985E-07	0.0000E+00	6.8681E-06	9.0382E-06
SB-125	0.0000E+00	0.0000E+00	3.1023E-05	0.0000E+00	2.3321E-05	2.3476E-04
I-129	5.3212E-04	0.0000E+00	5.5561E-01	0.0000E+00	4.9001E-05	4.0810E-02
CS-134	0.0000E+00	0.0000E+00	7.7982E-07	0.0000E+00	1.8546E-05	8.5406E-06
CS-135	0.0000E+00	0.0000E+00	2.6701E-03	0.0000E+00	1.7707E-04	4.1125E-03
CS-137	0.0000E+00	0.0000E+00	6.7792E-05	0.0000E+00	1.3537E-04	5.6075E-04
CE-144	0.0000E+00	0.0000E+00	1.0069E-07	0.0000E+00	4.7999E-06	1.1240E-06
EU-154	0.0000E+00	0.0000E+00	7.1781E-06	0.0000E+00	1.1102E-04	7.3340E-05
U-234	0.0000E+00	0.0000E+00	3.5535E-03	0.0000E+00	1.7559E-04	4.1419E-03
U-235	0.0000E+00	0.0000E+00	3.5587E-03	0.0000E+00	1.7559E-04	4.1439E-03
NP-237	0.0000E+00	0.0000E+00	3.9646E-01	0.0000E+00	6.8405E-05	4.1996E-03
U-238	0.0000E+00	0.0000E+00	3.5587E-03	0.0000E+00	1.7559E-04	4.1439E-03
PU-238	0.0000E+00	0.0000E+00	8.1138E-05	0.0000E+00	1.7376E-04	5.9967E-04
PU-239	0.0000E+00	0.0000E+00	7.5258E-04	0.0000E+00	1.8455E-04	3.0277E-03
PU-240	0.0000E+00	0.0000E+00	7.2335E-04	0.0000E+00	1.8421E-04	2.9386E-03
PU-241	0.0000E+00	0.0000E+00	6.1953E-06	0.0000E+00	1.0162E-04	6.4080E-05
AM-241	0.0000E+00	0.0000E+00	1.6717E-05	0.0000E+00	1.8372E-04	1.2274E-04
PU-242	0.0000E+00	0.0000E+00	7.6309E-04	0.0000E+00	1.8466E-04	3.0596E-03
AM-243	0.0000E+00	0.0000E+00	3.1854E-05	0.0000E+00	1.9236E-04	2.2566E-04
CM-243	0.0000E+00	0.0000E+00	2.2307E-05	0.0000E+00	1.3824E-04	2.0718E-04
CM-244	0.0000E+00	0.0000E+00	9.9484E-06	0.0000E+00	1.1531E-04	1.0014E-04

1 FRACTION OF INGESTION DUE TO WATER

NUCLIDE	FRACTION
H-3	1.0000
C-14	1.0000
CR-51	0.0000
MN-54	0.0000
FE-55	0.0000
CO-58	0.0000
NI-59	0.0000
CO-60	0.0000
NI-63	0.0000
SR-90	0.0000
NB-94	0.0000
TC-99	1.0000
RU-106	0.0000
SB-125	0.0000
I-129	1.0000
CS-134	0.0000
CS-135	0.0000
CS-137	0.0000
CE-144	0.0000
EU-154	0.0000
U-234	0.0000
U-235	0.0000
NP-237	0.0000
U-238	0.0000
PU-238	0.0000
PU-239	0.0000
PU-240	0.0000
PU-241	0.0000
AM-241	0.0000
PU-242	0.0000
AM-243	0.0000
CM-243	0.0000
CM-244	0.0000

1 MAXIMUM ANNUAL EXPOSURE

	CI/M**3		CI/M**2		PERSON.PCI/Y		PERSON.PCI/Y	
H-3	2.2031E-26	1	0.0000E+00	0	7.9863E+03	70	4.4062E-09	1
C-14	3.7818E-26	1	0.0000E+00	0	6.4779E+05	70	7.5637E-09	1
CR-51	1.0924E-26	1	3.6033E-24	1	3.7649E-08	1	2.1848E-09	1
MN-54	7.6739E-25	1	1.0726E-18	1	3.6685E-06	1	1.5348E-07	1
FE-55	3.1876E-24	1	7.8236E-18	2	3.8923E-05	1	6.3752E-07	1
CO-58	6.6143E-26	1	5.9163E-21	1	8.3961E-07	1	1.3229E-08	1
NI-59	1.8109E-23	1	8.3354E-17	7	1.3761E-04	1	3.6217E-06	1
CO-60	5.6562E-24	1	1.7119E-17	2	7.4507E-05	1	1.1312E-06	1
NI-63	1.7973E-23	1	7.9283E-17	5	1.3648E-04	1	3.5946E-06	1
SR-90	1.4183E-23	1	5.8219E-17	4	8.5785E-05	1	2.8366E-06	1
NB-94	1.8444E-23	1	8.7357E-17	8	2.0163E-03	1	3.6888E-06	1
TC-99	1.7207E-24	1	2.1207E-18	1	4.0950E+05	204	3.4413E-07	1
RU-106	9.5941E-25	1	1.5143E-18	1	5.0160E-06	1	1.9188E-07	1
SB-125	2.9627E-24	1	7.1650E-18	1	1.5163E-05	1	5.9254E-07	1
I-129	7.0714E-24	1	1.7979E-17	1	2.2316E+05	298	1.4143E-06	1
CS-134	2.3496E-24	1	5.2915E-18	1	3.5951E-05	1	4.6992E-07	1
CS-135	1.8613E-23	1	8.9723E-17	11	2.9320E-04	1	3.7225E-06	1
CS-137	1.4734E-23	1	6.2364E-17	4	2.3164E-04	1	2.9469E-06	1
CE-144	6.9273E-25	1	8.9654E-19	1	3.2507E-06	1	1.3855E-07	1
EU-154	1.2232E-23	1	4.8154E-17	3	8.0495E-05	1	2.4463E-06	1
U-234	1.8582E-23	1	8.9268E-17	10	9.5270E-05	1	3.7164E-06	1
U-235	1.8582E-23	1	8.9271E-17	10	9.5270E-05	1	3.7165E-06	1
NP-237	9.4132E-24	1	2.6881E-17	2	4.5135E-05	1	1.8826E-06	1
U-238	1.8582E-23	1	8.9271E-17	10	9.5270E-05	1	3.7165E-06	1
PU-238	1.8531E-23	1	8.4738E-17	6	8.8293E-05	1	3.7062E-06	1
PU-239	1.8678E-23	1	9.0754E-17	15	8.9049E-05	1	3.7355E-06	1
PU-240	1.8676E-23	1	9.0645E-17	14	8.9052E-05	1	3.7352E-06	1
PU-241	1.1266E-23	1	4.3137E-17	3	5.3473E-05	1	2.2531E-06	1
AM-241	1.8675E-23	1	8.9517E-17	9	8.9055E-05	1	3.7350E-06	1
PU-242	1.8678E-23	1	9.0795E-17	16	8.9052E-05	1	3.7356E-06	1
AM-243	1.8702E-23	1	9.1336E-17	500	8.9191E-05	1	3.7403E-06	1
CM-243	1.4989E-23	1	6.4005E-17	4	7.1485E-05	1	2.9977E-06	1
CM-244	1.2672E-23	1	5.0465E-17	3	6.0346E-05	1	2.5344E-06	1

1DARTAB INFO
TABLES FOR THE SELECTED INDIVIDUAL WILL BE DONE FOR THE LOCATION HAVING 100.00 % OF THE HIGHEST TOTAL RISK.

DOSE RATE TABLES COMBINING LOW AND HIGH LET WILL BE PRINTED.
HEALTH RISK TABLES COMBINING LOW AND HIGH LET WILL BE PRINTED.
00 INDICATES THE TABLE WILL NOT BE PRINTED
1 INDICATES INDIVIDUAL VALUES WILL BE PRINTED
2 INDICATES MEAN INDIVIDUAL VALUES WILL BE PRINTED
3 INDICATES COLLECTIVE VALUES WILL BE PRINTED
4 INDICATES ALL OF THE ABOVE WILL BE PRINTED

QUANTITY	TABLE NO. 1	2	3	4	5	6	7
1.DOSE RATES	0	0	0	0	0	3	3
2.HEALTH RISKS	0	0	0	0	0	3	3
3.RISK EQUIVALENT FACTOR	0	0	0	0	0	0	0

0THE GROUND SURFACE CORRECTION FACTOR IS 0.50

0THERE ARE 11 ORGANS TO BE OUTPUT. THEY ARE:

ORGAN	TIME	ORGAN	TIME	ORGAN	TIME
R MAR	70.	ENDOST	70.	THYROID	70.
BREAST	70.	*PULA*	70.	S WALL	70.
INT WALL	70.	LIVER	70.	PANCREAS	70.
KIDNEYS	70.	OTHER	70.		

0 ORGAN DOSE EQUIVALENT FACTORS

	LOW LET	HIGH LET
R MAR	1.00000	20.0000
ENDOST	1.00000	20.0000

THYROID	1.00000	20.0000
BREAST	1.00000	20.0000
*PULA	1.00000	20.0000
S WALL	1.00000	20.0000
INT WALL	1.00000	20.0000
LIVER	1.00000	20.0000
PANCREAS	1.00000	20.0000
KIDNEYS	1.00000	20.0000
OTHER	1.00000	20.0000

OTHERE ARE 11 CANCERS TO BE OUTPUT.
A 1 INDICATES ABSOLUTE RISK; A 2 IS RELATIVE RISK.

CANCER		CANCER		CANCER		CANCER	
LEUKEMIA	1.	BONE	1.	THYROID	1.	BREAST	1.
LUNG	1.	STOMACH	1.	BOWEL	1.	LIVER	1.
PANCREAS	1.	URINARY	1.	OTHER	1.		

0GENETIC DOSES ARE PRINTED FOR TESTES OVARIES AVERAGE
THE RISK FACTOR (PER RAD/MILLION BIRTHS) FOR GENETIC DOSE ARE :
260.00000 FOR LOW LET, AND
5200.0000 FOR HIGH LET,
AND THE REPLACEMENT RATE FOR THE POPULATION IS :
.14133E-01 YEAR-1
OTHERE ARE 33 RADIONUCLIDES TO BE OUTPUT.

NUCLIDE	PARTICLE SIZE	CLEARANCE CLASS	G.I. ABSORPTION FRACTION STOMACH	SI	ULI	LLI
H-3	0.00000	*	0.00000	0.95000	0.00000	0.00000
C-14	0.00000	*	0.00000	0.95000	0.00000	0.00000
CR-51	1.00000	W	0.00000	0.10000	0.00000	0.00000
MN-54	1.00000	W	0.00000	0.10000	0.00000	0.00000
FE-55	1.00000	W	0.00000	0.10000	0.00000	0.00000
CO-58	1.00000	Y	0.00000	0.05000	0.00000	0.00000
NI-59	1.00000	W	0.00000	0.05000	0.00000	0.00000
CO-60	1.00000	Y	0.00000	0.05000	0.00000	0.00000
NI-63	1.00000	W	0.00000	0.05000	0.00000	0.00000
SR-90	1.00000	D	0.00000	0.01000	0.00000	0.00000
NB-94	1.00000	Y	0.00000	0.01000	0.00000	0.00000
TC-99	1.00000	W	0.00000	0.80000	0.00000	0.00000
RU-106	1.00000	Y	0.00000	0.05000	0.00000	0.00000
SB-125	1.00000	W	0.00000	0.20000	0.00000	0.00000
I-129	1.00000	D	0.00000	0.95000	0.00000	0.00000
CS-134	1.00000	D	0.00000	0.95000	0.00000	0.00000
CS-135	1.00000	D	0.00000	0.95000	0.00000	0.00000
CS-137	1.00000	D	0.00000	0.00030	0.00000	0.00000
CE-144	1.00000	Y	0.00000	0.00010	0.00000	0.00000
EU-154	1.00000	W	0.00000	0.20000	0.00000	0.00000
U-234	1.00000	W	0.00000	0.00200	0.00000	0.00000
U-235	1.00000	Y	0.00000	0.00200	0.00000	0.00000
NP-237	1.00000	Y	0.00000	0.00100	0.00000	0.00000
U-238	1.00000	W	0.00000	0.00200	0.00000	0.00000
PU-238	1.00000	Y	0.00000	0.00100	0.00000	0.00000
PU-239	1.00000	Y	0.00000	0.00010	0.00000	0.00000
PU-240	1.00000	Y	0.00000	0.00010	0.00000	0.00000
PU-241	1.00000	Y	0.00000	0.00100	0.00000	0.00000
AM-241	1.00000	W	0.00000	0.00100	0.00000	0.00000
PU-242	1.00000	Y	0.00000	0.00010	0.00000	0.00000
AM-243	1.00000	W	0.00000	0.00100	0.00000	0.00000
CM-243	1.00000	W	0.00000	0.00100	0.00000	0.00000
CM-244	1.00000	W	0.00000	0.00100	0.00000	0.00000

0ORGAN DOSE WEIGHTING FACTORS

ORGAN	FACTORS	PATHWAYS
R MAR	0.15520	
+		1 2 3 4
BNDSF	0.00250	

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+                    1 2 3 4
 THYROID   0.09870
+                    1 2 3 4
 BREAST    0.12990
+                    1 2 3 4
 *PULA     0.20750
+                    1 2 3 4
 S WALL    0.08400
+                    1 2 3 4
 INT WALL  0.03900
+                    1 2 3 4
 LIVER     0.08530
+                    1 2 3 4
 PANCREAS  0.05850
+                    1 2 3 4
 KIDNEYS   0.02480
+                    1 2 3 4
 OTHER     0.11360
+                    1 2 3 4
1THE LOCATION USED FOR THE SELECTED INDIVIDUAL EXPOSURE IS   17700 METERS N   FROM THE SOURCE.
 THE FATAL CANCER RISK AT THAT LOCATION IS  0.463E-04
1
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DARTAB INFO
                              ORGAN DOSE/EXPOSURE SUMMARY
0*** COLLECTIVE POPULATION ***
0DOSE RATE:
                  ORGANS:  R MAR     ENDOST    THYROID   BREAST    *PULA     S WALL    INT WALL  LIVER     PANCREAS  KIDNEYS
                            OTHER     WT.SUM
 LOW LET (PERSON RAD/Y)  2.207E-04 4.215E-04 0.217     1.494E-04 7.682E-05 7.520E-04 2.028E-04 9.690E-05 8.567E-05 8.403E-05
                          8.567E-05 2.162E-02
 HIGH LET (PERSON RAD/Y) 1.570E-12 1.941E-11 2.413E-14 2.413E-14 1.772E-12 2.443E-14 3.392E-14 3.950E-12 2.413E-14 3.091E-14
                          2.413E-14 1.030E-12
 DOSE EQ. (PERSON REM/Y) 2.207E-04 4.215E-04 0.217     1.494E-04 7.682E-05 7.520E-04 2.028E-04 9.690E-05 8.567E-05 8.403E-05
                          8.567E-05 2.162E-02
0GONADAL DOSES:
                  GONADS:  TESTES    OVARIES   AVERAGE
 LOW LET (PERSON RAD)     1.938E-03 1.973E-03 1.955E-03
 HIGH LET (PERSON RAD)    1.807E-12 1.809E-12 1.808E-12
 DOSE EQ. (PERSON REM)    1.938E-03 1.973E-03 1.955E-03
1


DARTAB INFO
                              PATHWAY DOSE/EXPOSURE SUMMARY
0*** COLLECTIVE POPULATION ***
0DOSE RATES:
 WEIGHTED SUMS OF ORGAN DOSE RATES
                PATHWAYS:  INGESTION INHALATION  AIR      GROUND    INTERNAL  EXTERNAL  TOTAL
                                                IMMERSION  SURFACE
 LOW LET (PERSON RAD/Y)  2.162E-02 2.543E-14 1.192E-17 8.861E-11 2.162E-02 8.861E-11 2.162E-02
 HIGH LET (PERSON RAD/Y) 1.103E-13 9.198E-13 0.000E+00 0.000E+00 1.030E-12 0.000E+00 1.030E-12
 DOSE EQ. (PERSON REM/Y) 2.162E-02 1.042E-11 1.192E-17 8.861E-11 2.162E-02 8.861E-11 2.162E-02
0AVERAGE GONADAL DOSES:
                PATHWAYS:  INGESTION INHALATION  AIR      GROUND    INTERNAL  EXTERNAL  TOTAL
                                                IMMERSION  SURFACE
 LOW LET (PERSON RAD)     1.955E-03 4.642E-14 3.954E-16 2.933E-09 1.955E-03 2.933E-09 1.955E-03
 HIGH LET (PERSON RAD)    3.226E-13 1.485E-12 0.000E+00 0.000E+00 1.808E-12 0.000E+00 1.808E-12
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DOSE EQ. (PERSON REM)     1.955E-03 2.975E-11 3.954E-16 2.933E-09 1.955E-03 2.933E-09 1.955E-03
1


DARTAB INFO
                                   NUCLIDE DOSE/EXPOSURE SUMMARY

0*** COLLECTIVE POPULATION ***
0DOSE RATES:
 WEIGHTED SUMS OF ORGAN DOSE RATES
                 NUCLIDES:  H-3        C-14       CR-51      MN-54      FE-55      CO-58      NI-59      CO-60      NI-63      SR-90
                             NB-94      TC-99      RU-106     SB-125     I-129      CS-134     CS-135     CS-137     CE-144     EU-154
                             U-234      U-235      NP-237     U-238      PU-238     PU-239     PU-240     PU-241     AM-241     PU-242
                             AM-243     CM-243     CM-244     TOTAL
 LOW LET (PERSON RAD/Y)  6.755E-09 8.595E-05 3.320E-21 2.093E-15 3.622E-17 7.922E-18 7.390E-15 4.007E-13 1.720E-16 3.947E-15
                         6.767E-11 1.023E-04 3.472E-16 1.944E-14 2.143E-02 4.544E-14 2.144E-14 1.364E-16 1.914E-16 1.748E-12
                         4.334E-14 1.082E-11 1.024E-14 3.535E-14 8.626E-15 2.888E-14 5.853E-14 5.660E-17 1.353E-12 5.114E-14
                         5.848E-12 5.023E-13 1.146E-15 2.162E-02
 HIGH LET (PERSON RAD/Y) 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
                         0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
                         5.974E-15 5.244E-14 4.792E-14 5.266E-15 1.227E-13 1.166E-13 1.164E-13 1.036E-15 1.603E-13 1.107E-13
                         1.698E-13 7.330E-14 4.758E-14 1.030E-12
 DOSE EQ. (PERSON REM/Y) 6.755E-09 8.595E-05 3.320E-21 2.093E-15 3.622E-17 7.922E-18 7.390E-15 4.007E-13 1.720E-16 3.947E-15
                         6.767E-11 1.023E-04 3.472E-16 1.944E-14 2.143E-02 4.544E-14 2.144E-14 1.364E-16 1.914E-16 1.748E-12
                         1.628E-13 1.187E-11 9.686E-13 1.407E-13 2.463E-12 2.361E-12 2.387E-12 2.077E-14 4.560E-12 2.265E-12
                         9.243E-12 1.968E-12 9.528E-13 2.162E-02
0AVERAGE GONADAL DOSES:
                 NUCLIDES:  H-3        C-14       CR-51      MN-54      FE-55      CO-58      NI-59      CO-60      NI-63      SR-90
                             NB-94      TC-99      RU-106     SB-125     I-129      CS-134     CS-135     CS-137     CE-144     EU-154
                             U-234      U-235      NP-237     U-238      PU-238     PU-239     PU-240     PU-241     AM-241     PU-242
                             AM-243     CM-243     CM-244     TOTAL
 LOW LET (PERSON RAD)    1.952E-07 1.221E-03 1.076E-19 6.982E-14 6.849E-16 2.801E-16 8.154E-14 1.323E-11 3.455E-15 3.930E-15
                         2.258E-09 3.699E-04 1.055E-15 6.446E-13 3.641E-04 1.496E-12 6.716E-13 3.859E-15 1.258E-15 5.790E-11
                         9.148E-13 3.404E-10 2.560E-13 7.049E-13 1.729E-13 6.426E-13 1.209E-12 6.604E-17 4.563E-11 1.059E-12
                         1.946E-10 1.589E-11 2.402E-14 1.955E-03
 HIGH LET (PERSON RAD)   0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
                         0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
                         4.746E-16 1.867E-16 5.717E-14 4.329E-16 1.522E-13 1.067E-13 1.071E-13 1.208E-15 4.087E-13 1.013E-13
                         4.199E-13 2.600E-13 1.923E-13 1.808E-12
 DOSE EQ. (PERSON REM)   1.952E-07 1.221E-03 1.076E-19 6.982E-14 6.849E-16 2.801E-16 8.154E-14 1.323E-11 3.455E-15 3.930E-15
                         2.250E-09 3.699E-04 1.055E-15 6.446E-13 3.641E-04 1.496E-12 6.716E-13 3.859E-15 1.250E-15 5.790E-11
                         9.243E-13 3.404E-10 1.400E-12 7.136E-13 3.218E-12 2.777E-12 3.351E-12 2.423E-14 5.380E-11 3.084E-12
                         2.030E-10 2.109E-11 3.870E-12 1.955E-03
1


DARTAB INFO
                                   RISK/RISK EQUIVALENT SUMMARY

0*** COLLECTIVE POPULATION ***
0COLLECTIVE FATAL CANCER RISK:
                 CANCERS:   LEUKEMIA   BONE       THYROID    BREAST     LUNG       STOMACH    BOWEL      LIVER      PANCREAS   URINARY
                             OTHER      TOTAL
 LOW LET(DEATHS/YR)      9.593E-09 4.096E-10 6.082E-07 5.436E-09 4.467E-09 1.771E-08 2.219E-09 2.319E-09 1.410E-09 5.844E-10
                         2.737E-09 6.551E-07
 HIGH LET(DEATHS/YR)     2.857E-16 1.847E-16 2.532E-18 2.615E-18 7.794E-16 1.760E-18 1.649E-18 3.235E-16 1.135E-18 8.411E-19
                         2.294E-18 1.586E-15
  TOTAL (DEATHS/YR)      9.593E-09 4.096E-10 6.082E-07 5.436E-09 4.467E-09 1.771E-08 2.219E-09 2.319E-09 1.410E-09 5.844E-10
                         2.737E-09 6.551E-07
0FATAL CANCER RISK EQUIVALENT:
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CANCERS:	LEUKEMIA	BONE	THYROID	BREAST	LUNG	STOMACH	BOWEL	LIVER	PANCREAS	URINARY
	OTHER	TOTAL								
(PERSON REM/YR)	2.203E-04	4.212E-04	2.196E-02	1.492E-04	7.676E-05	7.515E-04	2.026E-04	9.690E-05	8.590E-05	8.394E-05
	8.590E-05	2.335E-03								

0WHOLE BODY FATAL CANCER RISK EQ(PERSON REM/YR) 2.335E-03

0GENETIC RISKS:

LOW LET(EFFECTS/YR)	7.185E-09
HIGH LET(EFFECTS/YR)	1.328E-16
COMBINED(EFFECTS/YR)	7.185E-09

0GENETIC RISK EQUIVALENT:

(PERSON REM/YR)	6.518E-05

1

DARTAB INFO

PATHWAY RISK/RISK EQUIVALENT SUMMARY

0*** COLLECTIVE POPULATION ***

0COLLECTIVE FATAL CANCER RISK:

PATHWAYS:	INGESTION	INHALATION	AIR IMMERSION	GROUND SURFACE	INTERNAL	EXTERNAL	TOTAL
LOW LET(DEATHS/YR)	6.551E-07	4.729E-18	3.346E-21	2.487E-14	6.551E-07	2.487E-14	6.551E-07
HIGH LET(DEATHS/YR)	1.399E-16	1.446E-15	0.000E+00	0.000E+00	1.586E-15	0.000E+00	1.586E-15
TOTAL (DEATHS/YR)	6.551E-07	1.451E-15	3.346E-21	2.487E-14	6.551E-07	2.487E-14	6.551E-07

0FATAL CANCER RISK EQUIVALENT:

PATHWAYS:	INGESTION	INHALATION	AIR IMMERSION	GROUND SURFACE	INTERNAL	EXTERNAL	TOTAL
(PERSON REM/YR)	2.335E-03	5.260E-12	1.193E-17	8.865E-11	2.335E-03	8.865E-11	2.335E-03

WHOLE BODY RISK EQ (PERSON REM/YR) FROM ALL EXPOSURES 2.335E-03

0GENETIC RISKS(PERSON REM/YR):

PATHWAYS:	INGESTION	INHALATION	AIR IMMERSION	GROUND SURFACE	INTERNAL	EXTERNAL	TOTAL
LOW LET(EFFECTS/YR)	7.185E-09	1.706E-19	1.453E-21	1.078E-14	7.185E-09	1.078E-14	7.185E-09
HIGH LET(EFFECTS/YR)	2.371E-17	1.091E-16	0.000E+00	0.000E+00	1.328E-16	0.000E+00	1.328E-16
COMBINED(EFFECTS/YR)	7.185E-09	1.093E-16	1.453E-21	1.078E-14	7.185E-09	1.078E-14	7.185E-09

0GENETIC RISK EQUIVALENT:

(PERSON REM/YR)	6.518E-05 9.916E-13 1.318E-17 9.775E-11 6.518E-05 9.775E-11 6.518E-05

1

DARTAB INFO

NUCLIDE RISK/RISK EQUIVALENT SUMMARY

0*** COLLECTIVE POPULATION ***

0COLLECTIVE FATAL CANCER RISK:

NUCLIDES:	H-3	C-14	CR-51	MN-54	FE-55	CO-58	NI-59	CO-60	NI-63	SR-90
	NB-94	TC-99	RU-106	SB-125	I-129	CS-134	CS-135	CS-137	CE-144	EU-154
	U-234	U-235	NP-237	U-238	PU-238	PU-239	PU-240	PU-241	AM-241	PU-242
	AM-243	CM-243	CM-244	TOTAL						
LOW LET(DEATHS/YR)	1.896E-12	2.411E-08	9.318E-25	5.875E-19	9.692E-21	2.223E-21	2.070E-18	1.124E-16	4.426E-20	1.010E-18
	1.899E-14	2.869E-08	9.574E-20	5.455E-18	6.023E-07	1.275E-17	5.985E-18	3.808E-20	5.304E-20	4.906E-16
	1.216E-17	3.037E-15	2.642E-18	9.889E-18	2.399E-18	8.090E-18	1.640E-17	1.240E-20	3.794E-16	1.433E-17
	1.639E-15	1.407E-16	3.143E-19	6.551E-07						
HIGH LET(DEATHS/YR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	1.339E-17	1.114E-16	7.525E-17	1.180E-17	2.060E-16	1.922E-16	1.920E-16	9.548E-19	1.989E-16	1.825E-16
	2.069E-16	1.137E-16	8.119E-17	1.586E-15						
TOTAL (DEATHS/YR)	1.896E-12	2.411E-08	9.318E-25	5.875E-19	9.692E-21	2.223E-21	2.070E-18	1.124E-16	4.426E-20	1.010E-18

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                    1.899E-14 2.869E-08 9.574E-20 5.455E-18 6.023E-07 1.275E-17 5.985E-18 3.808E-20 5.304E-20 4.906E-16
                    2.555E-17 3.149E-15 7.790E-17 2.169E-17 2.084E-16 2.003E-16 2.084E-16 9.672E-19 5.783E-16 1.968E-16
                    1.846E-15 2.544E-16 8.150E-17 6.551E-07
 TOTAL FATAL CANCER RISK FROM ALL EXPOSURES              6.551E-07
OFATAL CANCER RISK EQUIVALENT:
                NUCLIDES:  H-3       C-14      CR-51     MN-54     FE-55     CO-58     NI-59     CO-60     NI-63     SR-90
                            NB-94     TC-99     RU-106    SB-125    I-129     CS-134    CS-135    CS-137    CE-144    EU-154
                            U-234     U-235     NP-237    U-238     PU-238    PU-239    PU-240    PU-241    AM-241    PU-242
                            AM-243    CM-243    CM-244    TOTAL
 (PERSON REM/YR)           6.759E-09 8.594E-05 3.321E-21 2.094E-15 3.455E-17 7.925E-18 7.379E-15 4.008E-13 1.578E-16 3.600E-15
                           6.770E-11 1.023E-04 3.413E-16 1.945E-14 2.147E-03 4.545E-14 2.133E-14 1.357E-16 1.891E-16 1.749E-12
                           1.377E-13 1.122E-11 2.777E-13 1.190E-13 7.427E-13 7.140E-13 7.428E-13 3.448E-15 2.061E-12 7.016E-13
                           6.581E-12 9.070E-13 2.905E-13 2.335E-03
OGENETIC RISKS:
                NUCLIDES:  H-3       C-14      CR-51     MN-54     FE-55     CO-58     NI-59     CO-60     NI-63     SR-90
                            NB-94     TC-99     RU-106    SB-125    I-129     CS-134    CS-135    CS-137    CE-144    EU-154
                            U-234     U-235     NP-237    U-238     PU-238    PU-239    PU-240    PU-241    AM-241    PU-242
                            AM-243    CM-243    CM-244    TOTAL
 LOW LET(EFFECTS/YR)       7.173E-13 4.487E-09 3.953E-25 2.566E-19 2.517E-21 1.029E-21 2.996E-19 4.861E-17 1.269E-20 1.444E-20
                           8.299E-15 1.359E-09 3.877E-21 2.369E-18 1.338E-09 5.495E-18 2.468E-18 1.418E-20 4.622E-21 2.128E-16
                           3.361E-18 1.251E-15 9.408E-19 2.590E-18 6.353E-19 2.361E-18 4.443E-18 2.427E-22 1.677E-16 3.892E-18
                           7.152E-16 5.840E-17 8.826E-20 7.185E-09
 HIGH LET(EFFECTS/YR)      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
                           0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
                           3.488E-20 1.372E-20 4.202E-18 3.182E-20 1.119E-17 7.841E-18 7.871E-18 8.878E-20 3.003E-17 7.441E-18
                           3.086E-17 1.911E-17 1.413E-17 1.328E-16
 COMBINED(EFFECTS/YR)      7.173E-13 4.487E-09 3.953E-25 2.566E-19 2.517E-21 1.029E-21 2.996E-19 4.861E-17 1.269E-20 1.444E-20
                           8.299E-15 1.359E-09 3.877E-21 2.369E-18 1.338E-09 5.495E-18 2.468E-18 1.418E-20 4.622E-21 2.128E-16
                           3.396E-18 1.251E-15 5.143E-18 2.622E-18 1.182E-17 1.020E-17 1.231E-17 8.902E-20 1.977E-16 1.133E-17
                           7.461E-16 7.751E-17 1.422E-17 7.185E-09
OGENETIC RISK EQUIVALENT:
 (PERSON REM/YR)           6.507E-09 4.071E-05 3.586E-21 2.327E-15 2.283E-17 9.336E-18 2.718E-15 4.410E-13 1.152E-16 1.310E-16
                           7.528E-11 1.233E-05 3.517E-17 2.149E-14 1.214E-05 4.985E-14 2.239E-14 1.286E-16 4.193E-17 1.930E-12
                           3.081E-14 1.135E-11 4.665E-14 2.379E-14 1.073E-13 9.255E-14 1.117E-13 8.075E-16 1.793E-12 1.028E-13
                           6.768E-12 7.031E-13 1.290E-13 6.518E-05
1                   DARTAB INFO
                    COLLECTIVE DOSE EQ.  (PERSON REM /YEAR)

0***SUMMED OVER ALL ORGAN
 NUCLIDES                  H-3       C-14      CR-51     MN-54     FE-55     CO-58     NI-59     CO-60     NI-63     SR-90
                            NB-94     TC-99     RU-106    SB-125    I-129     CS-134    CS-135    CS-137    CE-144    EU-154
                            U-234     U-235     NP-237    U-238     PU-238    PU-239    PU-240    PU-241    AM-241    PU-242
                            AM-243    CM-243    CM-244    TOTAL
 INGESTION                 6.755E-09 8.595E-05 1.950E-21 6.850E-18 2.488E-17 8.835E-19 1.087E-16 5.986E-16 1.482E-16 3.117E-1
                           1.631E-14 1.023E-04 6.699E-17 0.000E+00 2.143E-02 3.156E-15 2.142E-14 0.000E+00 0.000E+00 0.000E+
                           2.074E-15 2.116E-15 1.723E-13 1.945E-15 3.966E-13 5.070E-14 5.443E-14 6.043E-15 5.282E-13 4.819E-
                           5.809E-13 2.243E-13 1.421E-13 2.162E-02
 % OF  INTERNAL            100.      100.      62.0      76.6      93.9      73.1      91.9      49.0      86.2      79.0
                            83.1      100.      19.3      0.000E+00 100.      99.1      99.9      0.000E+00 0.000E+00 0.000E+
                            1.74      0.201     17.9      1.83      16.2      2.17      2.34      29.1      16.5      2.18
                            17.1      15.3      14.9      100.
 % OF ALL PATHWAYS         100.      100.      50.7      0.327     68.7      11.2      1.47      0.149     86.2      79.0
                           2.411E-02 100.      19.3      0.000E+00 100.      6.95      99.9      0.000E+00 0.000E+00 0.000E+
                            1.27      1.782E-02 17.8      1.38      16.1      2.15      2.28      29.1      11.6      2.13
                            6.28      11.4      14.9      100.

 INHALATION                5.561E-22 8.363E-23 1.195E-21 2.098E-18 1.623E-18 3.246E-19 9.592E-18 6.218E-16 2.382E-17 8.298E-1
                           3.320E-15 7.837E-18 2.802E-16 2.147E-17 9.251E-16 2.746E-17 2.662E-17 1.364E-16 1.531E-16 1.238E-
                           1.174E-13 1.049E-12 7.084E-13 1.043E-13 2.058E-12 2.281E-12 2.275E-12 1.473E-14 2.680E-12 2.166E-
                           2.825E-12 1.244E-12 8.097E-13 1.842E-11
 % OF  INTERNAL            8.232E-17 9.730E-17 38.0      23.4      6.13      26.9      8.11      50.9      13.8      21.0
                            16.9      7.662E-12 80.7      100.      4.316E-12 0.862     0.124     100.      100.      100.
                            98.3      99.8      82.1      98.2      83.8      97.8      97.7      70.9      83.5      97.8
                            82.9      84.7      85.1      8.519E-08
```

% OF ALL PATHWAYS	8.232E-12	9.730E-17	36.0	0.100	4.48	4.10	0.130	0.155	13.8	21.0
	4.906E-03	7.662E-12	80.7	0.110	4.316E-12	6.042E-02	0.124	100.	80.0	7.081E-
	72.1	8.84	81.4	74.1	83.6	96.6	95.3	70.9	58.8	95.6
	30.6	63.2	85.0	8.519E-08						
AIR IMMERSION	0.000E+00	0.000E+00	3.766E-23	8.613E-20	9.386E-24	7.454E-21	1.005E-22	2.249E-18	0.000E+00	0.000E+(
	5.171E-18	9.559E-26	0.000E+00	1.810E-19	5.480E-21	5.446E-19	0.000E+00	0.000E+00	1.484E-21	2.649E-
	4.229E-22	4.758E-19	2.608E-20	2.812E-22	2.258E-22	2.468E-22	2.349E-22	0.000E+00	5.410E-20	2.008E-
	1.589E-19	3.087E-19	1.393E-22	1.192E-17						
% OF EXTERNAL	0.000E+00	0.000E+00	21.6	4.132E-03	9.655E-05	0.111	1.382E-06	5.631E-04	0.000E+00	0.000E+(
	7.644E-06	4.190E-03	0.000E+00	9.320E-04	2.903E-04	1.289E-03	0.000E+00	0.000E+00	3.874E-03	1.516E-
	9.767E-07	4.397E-06	3.285E-04	8.157E-07	2.702E-06	8.595E-07	4.031E-07	0.000E+00	4.003E-06	3.943E-
	2.722E-06	6.173E-05	1.310E-05	1.345E-05						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	1.13	4.115E-03	2.591E-05	9.409E-02	1.360E-06	5.614E-04	0.000E+00	0.000E+(
	7.642E-06	9.346E-20	0.000E+00	9.310E-04	2.557E-17	1.198E-03	0.000E+00	0.000E+00	7.754E-04	1.515E-
	2.597E-07	4.008E-06	2.692E-06	1.999E-07	9.169E-09	1.045E-08	9.838E-09	0.000E+00	1.186E-06	8.862E-
	1.719E-06	1.568E-05	1.462E-08	5.513E-14						
GROUND SURFACE	0.000E+00	0.000E+00	1.368E-22	2.084E-15	9.721E-18	6.707E-18	7.272E-15	3.994E-13	0.000E+00	0.000E+(
	6.765E-11	2.281E-21	0.000E+00	1.942E-14	1.888E-15	4.226E-14	0.000E+00	0.000E+00	3.831E-17	1.747E-
	4.330E-14	1.082E-11	7.939E-15	3.448E-14	8.359E-15	2.871E-14	5.827E-14	0.000E+00	1.351E-12	5.091E-
	5.837E-12	5.001E-13	1.064E-15	8.861E-11						
% OF EXTERNAL	0.000E+00	0.000E+00	78.4	100.	100.	99.9	100.	100.	0.000E+00	0.000E+(
	100.	100.	0.000E+00	100.	100.	100.	0.000E+00	0.000E+00	100.	100.
	100.	100.	100.	100.	100.	100.	100.	0.000E+00	100.	100.
	100.	100.	100.	100.						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	4.12	99.6	26.8	84.7	98.4	99.7	0.000E+00	0.000E+(
	100.	2.230E-15	0.000E+00	99.9	8.807E-12	93.0	0.000E+00	0.000E+00	20.0	99.9
	26.6	91.1	0.820	24.5	0.339	1.22	2.44	0.000E+00	29.6	2.25
	63.2	25.4	0.112	4.098E-07						
INTERNAL	6.755E-09	8.595E-05	3.146E-21	8.947E-18	2.650E-17	1.208E-18	1.183E-16	1.220E-15	1.720E-16	3.947E-1
	1.963E-14	1.023E-04	3.472E-16	2.147E-17	2.143E-02	3.184E-15	2.144E-14	1.364E-16	1.531E-16	1.238E-
	1.195E-13	1.051E-12	9.607E-13	1.062E-13	2.455E-12	2.332E-12	2.329E-12	2.077E-14	3.208E-12	2.215E-
	3.406E-12	1.468E-12	9.518E-13	2.162E-02						
% OF ALL PATHWAYS	100.	100.	94.7	0.427	73.2	15.2	1.60	0.305	100.	100.
	2.901E-02	100.	100.	0.110	100.	7.01	100.	100.	80.0	7.081E-
	73.4	8.86	99.2	75.5	99.7	98.8	97.6	100.	70.4	97.8
	36.8	74.6	99.9							
EXTERNAL	0.000E+00	0.000E+00	1.744E-22	2.084E-15	9.721E-18	6.714E-18	7.272E-15	3.994E-13	0.000E+00	0.000E+(
	6.765E-11	2.281E-21	0.000E+00	1.942E-14	1.888E-15	4.226E-14	0.000E+00	0.000E+00	3.832E-17	1.747E-
	4.330E-14	1.082E-11	7.939E-15	3.448E-14	8.359E-15	2.871E-14	5.827E-14	0.000E+00	1.351E-12	5.091E-
	5.837E-12	5.001E-13	1.064E-15	8.861E-11						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	5.25	99.6	26.8	84.8	98.4	99.7	0.000E+00	0.000E+(
	100.	2.230E-15	0.000E+00	99.9	8.807E-12	93.0	0.000E+00	0.000E+00	20.0	99.9
	26.6	91.1	0.820	24.5	0.339	1.22	2.44	0.000E+00	29.6	2.25
	63.2	25.4	0.112							
TOTAL OVER ALL PATHWAYS	6.755E-09	8.595E-05	3.320E-21	2.093E-15	3.622E-17	7.922E-18	7.390E-15	4.007E-13	1.720E-16	3.947E-1
	6.767E-11	1.023E-04	3.472E-16	1.944E-14	2.143E-02	4.544E-14	2.144E-14	1.364E-16	1.914E-16	1.748E-
	1.628E-13	1.187E-11	9.686E-13	1.407E-13	2.463E-12	2.361E-12	2.387E-12	2.077E-14	4.560E-12	2.266E-
	9.243E-12	1.968E-12	9.528E-13	2.162E-02						
% OF TOTAL	3.124E-05	0.397	1.535E-17	9.681E-12	1.675E-13	3.664E-14	3.418E-11	1.853E-09	7.957E-13	1.825E-1
	3.130E-07	0.473	1.606E-12	8.989E-11	99.1	2.102E-10	9.916E-11	6.308E-13	8.852E-13	8.086E-
	7.529E-10	5.490E-08	4.479E-09	6.506E-10	1.139E-08	1.092E-08	1.104E-08	9.605E-11	2.109E-08	1.048E-
	4.274E-08	9.103E-09	4.406E-09							

1 DARTAB INFO
COLLECTIVE GENETIC DOSE EQ. (PERSON REM)

0***SUMMED OVER ALL GONAD

NUCLIDES										
	H-3	C-14	CR-51	MN-54	FE-55	CO-58	NI-59	CO-60	NI-63	SR-90
	NB-94	TC-99	RU-106	SB-125	I-129	CS-134	CS-135	CS-137	CE-144	EU-15
	U-234	U-235	NP-237	U-238	PU-238	PU-239	PU-240	PU-241	AM-241	PU-24

	AM-243	CM-243	CM-244	TOTAL						
INGESTION	1.952E-07	1.221E-03	9.839E-20	2.694E-16	5.639E-16	5.574E-17	2.517E-15	2.280E-14	3.323E-15	2.795E-1
	7.651E-13	3.699E-04	1.024E-15	0.000E+00	3.641E-04	8.522E-14	6.708E-13	0.000E+00	0.000E+00	0.000E+
	2.637E-15	5.979E-15	4.472E-13	2.613E-15	1.191E-12	1.298E-13	1.398E-13	8.591E-15	1.412E-12	1.232E-
	1.505E-12	8.628E-13	6.360E-13	1.955E-03						
% OF INTERNAL	100.	100.	96.5	96.6	97.3	99.0	97.9	97.9	96.2	71.1
	99.8	100.	97.1	0.000E+00	100.	99.2	99.9	0.000E+00	0.000E+00	0.000E+
	27.7	80.4	39.0	29.6	39.1	6.08	6.53	35.5	17.3	6.08
	17.9	16.6	16.5	100.						
% OF ALL PATHWAYS	100.	100.	91.5	0.386	82.3	19.9	3.09	0.172	96.2	71.1
	3.388E-02	100.	97.1	0.000E+00	100.	5.70	99.9	0.000E+00	0.000E+00	0.000E+
	0.285	1.756E-03	31.9	0.366	37.0	4.67	4.17	35.5	2.62	3.99
	0.741	4.09	16.4	100.						
INHALATION	1.671E-20	1.235E-21	3.566E-21	9.414E-18	1.553E-17	5.358E-19	5.478E-17	4.967E-16	1.314E-16	1.135E-1
	1.785E-15	1.663E-18	3.080E-17	1.953E-17	1.554E-17	7.272E-16	7.958E-16	3.859E-15	3.744E-18	2.860E-
	6.893E-15	1.455E-15	7.004E-13	6.222E-15	1.854E-12	2.004E-12	2.002E-12	1.563E-14	6.765E-12	1.902E-
	6.922E-12	4.346E-12	3.210E-12	2.975E-11						
% OF INTERNAL	8.557E-12	1.011E-16	3.50	3.38	2.68	0.952	2.13	2.13	3.80	28.9
	0.233	4.496E-13	2.92	100.	4.267E-12	0.846	0.118	100.	100.	100.
	72.3	19.6	61.0	70.4	60.9	93.9	93.5	64.5	82.7	93.9
	82.1	83.4	83.5	1.521E-06						
% OF ALL PATHWAYS	8.557E-12	1.011E-16	3.31	1.348E-02	2.27	0.191	6.717E-02	3.754E-03	3.80	28.9
	7.903E-05	4.496E-13	2.92	3.030E-03	4.267E-12	4.862E-02	0.118	100.	0.298	4.940E-
	0.746	4.274E-04	50.0	0.872	57.6	72.2	59.8	64.5	12.6	61.7
	3.41	20.6	83.0	1.521E-06						
AIR IMMERSION	0.000E+00	0.000E+00	1.216E-21	2.873E-18	1.019E-22	2.489E-19	1.094E-21	7.435E-17	0.000E+00	0.000E+(
	1.727E-16	3.138E-24	0.000E+00	6.007E-18	2.231E-19	1.813E-17	0.000E+00	0.000E+00	4.802E-20	8.783E-
	1.219E-20	1.502E-17	8.558E-19	7.817E-21	5.394E-21	7.070E-21	5.706E-21	0.000E+00	1.893E-18	4.934E-
	5.352E-18	9.855E-18	3.386E-21	3.954E-16						
% OF EXTERNAL	0.000E+00	0.000E+00	21.6	4.132E-03	9.655E-05	0.111	1.386E-06	5.630E-04	0.000E+00	0.000E+(
	7.640E-06	4.190E-03	0.000E+00	9.320E-04	2.894E-04	1.286E-03	0.000E+00	0.000E+00	3.829E-03	1.517E-
	1.333E-06	4.413E-06	3.396E-04	1.109E-06	3.126E-06	1.100E-06	4.720E-07	0.000E+00	4.148E-06	4.660E-
	2.750E-06	6.204E-05	1.430E-05	1.348E-05						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	1.13	4.116E-03	1.488E-05	8.885E-02	1.342E-06	5.620E-04	0.000E+00	0.000E+(
	7.646E-06	8.483E-19	0.000E+00	9.319E-04	6.128E-14	1.212E-03	0.000E+00	0.000E+00	3.818E-03	1.517E-
	1.319E-06	4.412E-06	6.115E-05	1.095E-06	1.676E-07	2.546E-07	1.703E-07	0.000E+00	3.518E-06	1.600E-
	2.636E-06	4.672E-05	8.751E-08	2.022E-11						
GROUND SURFACE	0.000E+00	0.000E+00	4.411E-21	6.954E-14	1.055E-16	2.236E-16	7.897E-14	1.321E-11	0.000E+00	0.000E+(
	2.258E-09	7.488E-20	0.000E+00	6.446E-13	7.710E-14	1.410E-12	0.000E+00	0.000E+00	1.254E-15	5.790E-
	9.147E-13	3.404E-10	2.520E-13	7.047E-13	1.725E-13	6.425E-13	1.209E-12	0.000E+00	4.562E-11	1.059E-
	1.946E-10	1.589E-11	2.369E-14	2.933E-09						
% OF EXTERNAL	0.000E+00	0.000E+00	78.4	100.	100.	99.9	100.	100.	0.000E+00	0.000E+(
	100.	100.	0.000E+00	100.	100.	100.	0.000E+00	0.000E+00	100.	100.
	100.	100.	100.	100.	100.	100.	100.	0.000E+00	100.	100.
	100.	100.	100.	100.						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	4.10	99.6	15.4	79.8	96.8	99.8	0.000E+00	0.000E+(
	100.	2.024E-14	0.000E+00	100.	2.117E-08	94.3	0.000E+00	0.000E+00	99.7	100.
	99.0	100.	18.0	98.8	5.36	23.1	36.1	0.000E+00	84.8	34.3
	95.8	75.3	0.612	1.500E-04						
INTERNAL	1.952E-07	1.221E-03	1.020E-19	2.789E-16	5.794E-16	5.627E-17	2.571E-15	2.330E-14	3.455E-15	3.930E-
	7.669E-13	3.699E-04	1.055E-15	1.953E-17	3.641E-04	8.595E-14	6.716E-13	3.859E-15	3.744E-18	2.860E-
	9.530E-15	7.433E-15	1.148E-12	8.835E-15	3.045E-12	2.134E-12	2.142E-12	2.423E-14	8.177E-12	2.025E-
	8.427E-12	5.209E-12	3.846E-12	1.955E-03						
% OF ALL PATHWAYS	100.	100.	94.8	0.399	84.6	20.1	3.15	0.176	100.	100.
	3.396E-02	100.	100.	3.030E-03	100.	5.75	100.	100.	0.298	4.940E-
	1.03	2.184E-03	82.0	1.24	94.6	76.9	63.9	100.	15.2	65.7
	4.15	24.7	99.4							
EXTERNAL	0.000E+00	0.000E+00	5.627E-21	6.954E-14	1.055E-16	2.238E-16	7.897E-14	1.321E-11	0.000E+00	0.000E+(
	2.258E-09	7.488E-20	0.000E+00	6.446E-13	7.710E-14	1.410E-12	0.000E+00	0.000E+00	1.254E-15	5.790E-

```
                                 9.147E 13 3.404E-10 2.520E-13 7.047E-13 1.725E-13 6.425E-13 1.209E-12 0.000E+00 4.562E-11 1.059E-
                                 1.946E-10 1.589E-11 2.369E-14 2.933E-09
% OF ALL PATHWAYS               0.000E+00 0.000E+00  5.23      99.6      15.4      79.9      96.8      99.8      0.000E+00 0.000E+(
                                  100.     2.024E-14 0.000E+00  100.     2.117E-08  94.3     0.000E+00 0.000E+00  99.7      100.
                                  99.0      100.      18.0      98.8      5.36      23.1      36.1      0.000E+00  84.8      34.3
                                  95.8      75.3     0.612

TOTAL OVER ALL PATHWAYS         1.952E-07 1.221E-03 1.076E-19 6.982E-14 6.849E-16 2.801E-16 8.154E-14 1.323E-11 3.455E-15 3.930E-1
                                 2.258E-09 3.699E-04 1.055E-15 6.446E-13 3.641E-04 1.496E-12 6.716E-13 3.859E-15 1.258E-15 5.790E-
                                 9.243E-13 3.404E-10 1.400E-12 7.136E-13 3.218E-12 2.777E-12 3.351E-12 2.423E-14 5.380E-11 3.084E-
                                 2.030E-10 2.109E-11 3.870E-12 1.955E-03
% OF TOTAL                      9.983E-03  62.5     5.502E-15 3.571E-09 3.503E-11 1.432E-11 4.170E-09 6.766E-07 1.767E-10 2.010E-1
                                 1.155E-04  18.9     5.395E-11 3.296E-08  18.6     7.648E-08 3.435E-08 1.974E-10 6.432E-11 2.961E-
                                 4.727E-08 1.741E-05 7.157E-08 3.649E-08 1.645E-07 1.420E-07 1.714E-07 1.239E-09 2.751E-06 1.577E-
                                 1.030E-05 1.079E-06 1.979E-07
1                   OARIAB INFO
                    FATAL CANCER RATE (DEATH/YR)
                    COMB.LET
0***SUMMED OVER ALL CANCER
 NUCLIDES                        H-3       C-14      CR-51     MN-54     FE-55     CO-58     NI-59     CO-60     NI-63     SR-90
                                  NB-94     TC-99     RU-106    SB-125    I-129     CS-134    CS-135    CS-137    CE-144    EU-154
                                  U-234     U-235     NP-237    U-238     PU-238    PU-239    PU-240    PU-241    AM-241    PU-242
                                  AM-243    CM-243    CM-244    TOTAL
INGESTION                       1.896E-12 2.411E-08 5.474E-25 1.923E-21 6.523E-21 2.479E-22 2.736E-20 1.622E-19 3.773E-20 8.052E-1
                                 4.555E-18 2.869E-08 1.863E-20 0.000E+00 6.023E-07 8.824E-19 5.978E-18 0.000E+00 0.000E+00 0.000E-
                                 2.307E-19 2.658E-19 1.017E-17 2.303E-19 2.551E-17 3.017E-18 3.243E-18 2.688E-19 3.168E-17 2.868E-
                                 3.437E-17 1.687E-17 1.176E-17 6.551E-07
% OF  INTERNAL                  100.      100.      62.0      76.6      93.6      73.1      91.3      49.4      85.3      79.7
                                  84.3      100.      19.5     0.000E+00  100.      99.1      99.9     0.000E+00 0.000E+00 0.000E-
                                  1.72     0.237      13.4      1.92      12.4      1.57      1.69      27.8      15.9      1.57
                                  16.5      14.8      14.5      100.
% OF ALL PATHWAYS               100.      100.      58.7     0.327      67.3      11.2      1.32     0.144      85.3      79.7
                                 2.398E-02  100.      19.5     0.000E+00  100.      6.92      99.9     0.000E+00 0.000E+00 0.000E-
                                 0.903     8.443E-03  13.1      1.06      12.2      1.51      1.56      27.8      5.48      1.46
                                  1.86      6.63      14.4      100.

INHALATION                      1.561E-25 2.346E-26 3.355E-25 5.883E-22 4.424E-22 9.102E-23 2.620E-21 1.664E-19 6.525E-21 2.048E-1
                                 8.466E-19 2.198E-21 7.711E-20 6.024E-21 2.608E-20 7.676E-21 7.431E-21 3.808E-20 4.229E-20 3.023E-
                                 1.317E-17 1.119E-16 6.549E-17 1.179E-17 1.805E-16 1.892E-16 1.888E-16 6.984E-19 1.674E-16 1.797E-
                                 1.739E-16 9.722E-17 6.945E-17 1.451E-15
% OF  INTERNAL                  8.232E-12 9.730E-17  38.0      23.4      6.35      26.9      8.74      50.6      14.7      20.3
                                  15.7     7.663E-12  80.5      100.     4.330E-12 0.862     0.124      100.      100.      100.
                                  98.3      99.8      86.6      98.1      87.6      98.4      98.3      72.2      84.1      98.4
                                  83.5      85.2      85.5     2.215E-07
% OF ALL PATHWAYS               8.232E-12 9.730E-17  36.0     0.100      4.56      4.09     0.127     0.148      14.7      20.3
                                 4.457E-03 7.663E-12  80.5     0.110     4.330E-12 6.020E-02 0.124      100.      79.7     6.161E-
                                  51.6      3.55      84.1      54.3      86.6      94.5      90.6      72.2      28.9      91.3
                                  9.42      38.2      85.2     2.215E-07

AIR IMMERSION                   0.000E+00 0.000E+00 1.057E-26 2.417E-23 2.633E-27 2.092E-24 2.820E-26 6.312E-22 0.000E+00 0.000E+(
                                 1.451E-21 2.683E-29 0.000E+00 5.079E-23 1.538E-24 1.528E-22 0.000E+00 0.000E+00 4.165E-25 7.436E-
                                 1.187E-25 1.334E-22 7.317E-24 7.891E-26 6.336E-26 6.926E-26 6.589E-26 0.000E+00 1.518E-23 5.633E-
                                 4.457E-23 8.655E-23 3.909E-26 3.346E-21
% OF  EXTERNAL                  0.000E+00 0.000E+00  21.6     4.132E-03 9.655E-05 0.111     1.382E-06 5.631E-04 0.000E+00 0.000E+(
                                 7.644E-06 4.190E-03 0.000E+00 9.320E-04 2.903E-04 1.289E-03 0.000E+00 0.000E+00 3.873E-03 1.516E-
                                 9.768E-07 4.392E-06 3.284E-04 8.158E-07 2.702E-06 8.596E-07 4.031E-07 0.000E+00 4.003E-06 3.943E-
                                 2.721E-06 6.167E-05 1.310E-05 1.345E-05
% OF ALL PATHWAYS               0.000E+00 0.000E+00  1.13     4.115E-03 2.717E-05 9.409E-02 1.362E-06 5.614E-04 0.000E+00 0.000E+(
                                 7.642E-06 9.350E-20 0.000E+00 9.310E-04 2.553E-16 1.199E-03 0.000E+00 0.000E+00 7.852E-04 1.516E-
                                 4.644E-07 4.235E-06 9.393E-06 3.638E-07 3.041E-08 3.458E-08 3.162E-08 0.000E+00 2.625E-06 2.862E-
                                 2.414E-06 3.401E-05 4.796E-08 5.107E-13

GROUND SURFACE                  0.000E+00 0.000E+00 3.838E-26 5.850E-19 2.727E-21 1.882E-21 2.040E-18 1.121E-16 0.000E+00 0.000E+(
                                 1.899E-14 6.402E-25 0.000E+00 5.449E-18 5.297E-19 1.186E-17 0.000E+00 0.000E+00 1.075E-20 4.903E-
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	1.215E-17	3.036E-15	2.228E-18	9.673E-18	2.345E-18	8.056E-18	1.635E-17	0.000E+00	3.792E-16	1.428E-
	1.630E-15	1.403E-16	2.984E-19	2.487E-14						
% OF EXTERNAL	0.000E+00	0.000E+00	78.4	100.	100.	99.9	100.	100.	0.000E+00	0.000E+(
	100.	100.	0.000E+00	100.	100.	100.	0.000E+00	0.000E+00	100.	100.
	100.	100.	100.	100.	100.	100.	100.	0.000E+00	100.	100.
	100.	100.	100.	100.						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	4.12	99.6	28.1	84.7	98.6	99.7	0.000E+00	0.000E+(
	100.	2.231E-15	0.000E+00	99.9	8.795E-11	93.0	0.000E+00	0.000E+00	20.3	99.9
	47.5	96.4	2.86	44.6	1.13	4.02	7.84	0.000E+00	65.6	7.26
	88.7	55.2	0.366	3.796E-06						
INTERNAL	1.896E-12	2.411E-08	8.828E-25	2.511E-21	6.965E-21	3.389E-22	2.998E-20	3.286E-19	4.426E-20	1.010E-1
	5.401E-18	2.869E-08	9.574E-20	6.024E-21	6.023E-07	8.901E-19	5.985E-18	3.808E-20	4.229E-20	3.023E-
	1.340E-17	1.121E-16	7.567E-17	1.202E-17	2.060E-16	1.922E-16	1.920E-16	9.672E-19	1.991E-16	1.825E-
	2.083E-16	1.141E-16	8.121E-17	6.551E-07						
% OF ALL PATHWAYS	100.	100.	94.7	0.427	71.9	15.2	1.45	0.292	100.	100.
	2.844E-02	100.	100.	0.110	100.	6.98	100.	100.	79.7	6.161E-
	52.5	3.56	97.1	55.4	98.9	96.0	92.2	100.	34.4	92.7
	11.3	44.8	99.6							
EXTERNAL	0.000E+00	0.000E+00	4.895E-26	5.850E-19	2.727E-21	1.884E-21	2.040E-18	1.121E-16	0.000E+00	0.000E+(
	1.899E-14	6.402E-25	0.000E+00	5.449E-18	5.297E-19	1.186E-17	0.000E+00	0.000E+00	1.075E-20	4.903E-
	1.215E-17	3.036E-15	2.228E-18	9.673E-18	2.345E-18	8.056E-18	1.635E-17	0.000E+00	3.792E-16	1.428E-
	1.630E-15	1.403E-16	2.984E-19	2.487E-14						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	5.25	99.6	28.1	84.8	98.6	99.7	0.000E+00	0.000E+(
	100.	2.231E-15	0.000E+00	99.9	8.795E-11	93.0	0.000E+00	0.000E+00	20.3	99.9
	47.5	96.4	2.86	44.6	1.13	4.02	7.84	0.000E+00	65.6	7.26
	88.7	55.2	0.366							
TOTAL OVER ALL PATHWAYS	1.896E-12	2.411E-08	9.318E-25	5.875E-19	9.692E-21	2.223E-21	2.070E-18	1.124E-16	4.426E-20	1.010E-1
	1.899E-14	2.869E-08	9.574E-20	5.455E-18	6.023E-07	1.275E-17	5.985E-18	3.808E-20	5.304E-20	4.906E-
	2.555E-17	3.149E-15	7.790E-17	2.169E-17	2.084E-16	2.003E-16	2.084E-16	9.672E-19	5.783E-16	1.968E-
	1.846E-15	2.544E-16	8.150E-17	6.551E-07						
% OF TOTAL	2.894E-04	3.68	1.422E-16	8.968E-11	1.480E-12	3.394E-13	3.160E-10	1.716E-08	6.756E-12	1.542E-1
	2.899E-06	4.38	1.462E-11	8.328E-10	91.9	1.946E-09	9.137E-10	5.813E-12	8.097E-12	7.490E-
	3.900E-09	4.807E-07	1.189E-08	3.312E-09	3.181E-08	3.058E-08	3.181E-08	1.476E-10	8.828E-08	3.005E-
	2.818E-07	3.884E-08	1.244E-08							

1 DARTAB INFO
COLLECTIVE GENETIC EFFECT(EFFECTS/YR)
COMB.LET
0***SUMMED OVER ALL GONAD

NUCLIDES	H-3	C-14	CR-51	MN-54	FE-55	CO-58	NI-59	CO-60	NI-63	SR-90
	NB-94	IC-99	RU-106	SB-125	I-129	CS-134	CS-135	CS-137	CE-144	EU-15
	U-234	U-235	NP-237	U-238	PU-238	PU-239	PU-240	PU-241	AM-241	PU-24
	AM-243	CM-243	CM-244	TOTAL						
INGESTION	7.173E-13	4.487E-09	3.615E-25	9.901E-22	2.072E-21	2.048E-22	9.247E-21	8.378E-20	1.221E-20	1.027E-1
	2.811E-18	1.359E-09	3.764E-21	0.000E+00	1.338E-09	3.132E-19	2.465E-18	0.000E+00	0.000E+00	0.000E
	9.689E-21	2.197E-20	1.643E-18	9.601E-21	4.376E-18	4.769E-19	5.137E-19	3.157E-20	5.188E-18	4.527E-
	5.531E-18	3.171E-18	2.337E-18	7.185E-09						
% OF INTERNAL	100.	100.	96.5	96.6	97.3	99.0	97.9	97.9	96.2	71.1
	99.8	100.	97.1	0.000E+00	100.	99.2	99.9	0.000E+00	0.000E+00	0.000E
	27.7	80.4	39.0	29.6	39.1	6.08	6.53	35.5	17.3	6.08
	17.9	16.6	16.5	100.						
% OF ALL PATHWAYS	100.	100.	91.5	0.386	82.3	19.9	[illegible].09	0.172	96.2	71.1
	3.388E-02	100.	97.1	0.000E+00	100.	5.70	99.9	0.000E+00	0.000E+00	0.000E
	0.285	1.756E-03	31.9	0.366	37.0	4.67	4.17	35.5	2.62	3.99
	0.741	4.09	16.4	100.						
INHALATION	6.139E-26	4.536E-27	1.310E-26	3.459E-23	5.706E-23	1.969E-24	2.013E-22	1.825E-21	4.827E-22	4.170E-1
	6.559E-21	6.110E-24	1.132E-22	7.176E-23	5.709E-23	2.672E-21	2.924E-21	1.418E-20	1.376E-23	1.051E-
	2.533E-20	5.346E-21	2.574E-18	2.286E-20	6.813E-18	7.365E-18	7.358E-18	5.745E-20	2.486E-17	6.989E-
	2.543E-17	1.597E-17	1.180E-17	1.093E-16						
% OF INTERNAL	8.557E-12	1.011E-16	3.50	3.38	2.68	0.952	2.13	2.13	3.80	28.9
	0.233	4.496E-13	2.92	100.	4.267E-12	0.846	0.118	100.	100.	100.

	72.3	19.6	61.0	70.4	60.9	93.9	93.5	64.5	82.7	93.9
	82.1	83.4	83.5	1.521E-06						
% OF ALL PATHWAYS	8.557E-12	1.011E-16	3.31	1.348E-02	2.27	0.191	6.717E-02	3.754E-03	3.80	28.9
	7.903E-05	4.496E-13	2.92	3.030E-03	4.267E-12	4.862E-02	0.118	100.	0.298	4.940E-
	0.746	4.274E-04	50.0	0.872	57.6	72.2	59.8	64.5	12.6	61.7
	3.41	20.6	83.0	1.521E-06						
AIR IMMERSION	0.000E+00	0.000E+00	4.467E-27	1.056E-23	3.745E-28	9.145E-25	4.022E-27	2.732E-22	0.000E+00	0.000E+(
	6.349E-22	1.153E-29	0.000E+00	2.207E-23	8.199E-25	6.661E-23	0.000E+00	0.000E+00	1.765E-25	3.227E-
	4.481E-26	5.519E-23	3.145E-24	2.872E-26	1.982E-26	2.598E-26	2.097E-26	0.000E+00	6.955E-24	1.813E-
	1.967E-23	3.621E-23	1.244E-26	1.453E-21						
% OF EXTERNAL	0.000E+00	0.000E+00	21.6	4.132E-03	9.655E-05	0.111	1.386E-06	5.630E-04	0.000E+00	0.000E+(
	7.648E-06	4.190E-03	0.000E+00	9.320E-04	2.894E-04	1.286E-03	0.000E+00	0.000E+00	3.829E-03	1.517E-
	1.333E-06	4.413E-06	3.396E-04	1.109E-06	3.126E-06	1.100E-06	4.720E-07	0.000E+00	4.148E-06	4.660E-
	2.750E-06	6.204E-05	1.430E-05	1.348E-05						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	1.13	4.116E-03	1.488E-05	8.885E-02	1.342E-06	5.620E-04	0.000E+00	0.000E+(
	7.646E-06	8.483E-19	0.000E+00	9.319E-04	6.128E-14	1.212E-03	0.000E+00	0.000E+00	3.818E-03	1.517E-
	1.319E-06	4.412E-06	6.115E-05	1.095E-06	1.676E-07	2.546E-07	1.703E-07	0.000E+00	3.518E-06	1.600E-
	2.636E-06	4.672E-05	8.751E-08	2.022E-11						
GROUND SURFACE	0.000E+00	0.000E+00	1.621E-26	2.555E-19	3.878E-22	8.215E-22	2.902E-19	4.853E-17	0.000E+00	0.000E+(
	8.296E-15	2.751E-25	0.000E+00	2.368E-18	2.833E-19	5.180E-18	0.000E+00	0.000E+00	4.608E-21	2.127E-
	3.361E-18	1.251E-15	9.259E-19	2.590E-18	6.340E-19	2.361E-18	4.442E-18	0.000E+00	1.676E-16	3.891E-
	7.151E-16	5.837E-17	8.704E-20	1.078E-14						
% OF EXTERNAL	0.000E+00	0.000E+00	78.4	100.	100.	99.9	100.	100.	0.000E+00	0.000E+(
	100.	100.	0.000E+00	100.	100.	100.	0.000E+00	0.000E+00	100.	100.
	100.	100.	100.	100.	100.	100.	100.	0.000E+00	100.	100.
	100.	100.	100.	100.						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	4.10	99.6	15.4	79.8	96.8	99.8	0.000E+00	0.000E+(
	100.	2.024E-14	0.000E+00	100.	2.117E-08	94.3	0.000E+00	0.000E+00	99.7	100.
	99.0	100.	18.0	98.8	5.36	23.1	36.1	0.000E+00	84.8	34.3
	95.8	75.3	0.612	1.500E-04						
INTERNAL	7.173E-13	4.487E-09	3.746E-25	1.025E-21	2.129E-21	2.068E-22	9.448E-21	8.561E-20	1.269E-20	1.444E-2
	2.818E-18	1.359E-09	3.877E-21	7.176E-23	1.338E-09	3.158E-19	2.468E-18	1.418E-20	1.376E-23	1.051E-
	3.502E-20	2.731E-20	4.217E-18	3.247E-20	1.119E-17	7.842E-18	7.872E-18	8.902E-20	3.005E-17	7.442E-
	3.097E-17	1.914E-17	1.413E-17	7.185E-09						
% OF ALL PATHWAYS	100.	100.	94.8	0.399	84.6	20.1	3.15	0.176	100.	100.
	3.396E-02	100.	100.	3.030E-03	100.	5.75	100.	100.	0.298	4.940E-
	1.03	2.184E-03	82.0	1.24	94.6	76.9	63.9	100.	15.2	65.7
	4.15	24.7	99.4							
EXTERNAL	0.000E+00	0.000E+00	2.068E-26	2.555E-19	3.878E-22	8.224E-22	2.902E-19	4.853E-17	0.000E+00	0.000E+(
	8.296E-15	2.752E-25	0.000E+00	2.369E-18	2.833E-19	5.180E-18	0.000E+00	0.000E+00	4.608E-21	2.127E-
	3.361E-18	1.251E-15	9.259E-19	2.590E-18	6.340E-19	2.361E-18	4.442E-18	0.000E+00	1.676E-16	3.891E-
	7.151E-16	5.837E-17	8.704E-20	1.078E-14						
% OF ALL PATHWAYS	0.000E+00	0.000E+00	5.23	99.6	15.4	79.9	96.8	99.8	0.000E+00	0.000E+(
	100.	2.024E-14	0.000E+00	100.	2.117E-08	94.3	0.000E+00	0.000E+00	99.7	100.
	99.0	100.	18.0	98.8	5.36	23.1	36.1	0.000E+00	84.8	34.3
	95.8	75.3	0.612							
TOTAL OVER ALL PATHWAYS	7.173E-13	4.487E-09	3.953E-25	2.566E-19	2.517E-21	1.029E-21	2.996E-19	4.861E-17	1.269E-20	1.444E-2
	8.299E-15	1.359E-09	3.877E-21	2.369E-18	1.338E-09	5.495E-18	2.468E-18	1.418E-20	4.622E-21	2.128E-
	3.396E-18	1.251E-15	5.143E-18	2.622E-18	1.182E-17	1.020E-17	1.231E-17	8.902E-20	1.977E-16	1.133E-
	7.461E-16	7.751E-17	1.422E-17	7.185E-09						
% OF TOTAL	9.983E-03	62.5	5.502E-15	3.571E-09	3.503E-11	1.432E-11	4.170E-09	6.766E-07	1.767E-10	2.010E-1
	1.155E-04	18.9	5.395E-11	3.296E-08	18.6	7.648E-08	3.435E-08	1.974E-10	6.432E-11	2.961E-
	4.727E-08	1.741E-05	7.157E-08	3.649E-08	1.645E-07	1.420E-07	1.714E-07	1.239E-09	2.751E-06	1.577E-
	1.038E-05	1.079E-06	1.979E-07							

1 RESIDUAL RADIOACTIVITY RELEASED OUTSIDE THE BASIN
WITH THE STREAM WATER

NUCLIDE	FIRST MILLENNIUM	SECOND MILLENNIUM	THIRD MILLENNIUM	FOURTH MILLENNIUM	FIFTH MILLENNIUM	SIXTH MILLENNIUM	SEVENTH MILLENNIUM	EIGHTH MILLENNIUM	NINTH MILLENNIUM	TENTH MILLENNIUM

H-3	0.2460E-02	0.3412E-26	0.6683E-57	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
C-14	0.9605E+00	0.9266E-03	0.2564E-07	0.1385E-11	0.1036E-33	0.1975E-62	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CR-51	0.5794E-07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MN-54	0.9496E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FE-55	0.2450E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CO-58	0.1310E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-59	0.4156E-02	0.1817E-15	0.7946E-29	0.2487E-01	0.2441E-01	0.2124E-01	0.1825E-01	0.1544E-01	0.1282E-01	0.1039E-01
CO-60	0.5602E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NI-63	0.3328E-02	0.7872E-19	0.186[illegible]E-35	0.2947E-12	0.2909E-15	0.1376E-18	0.6431E-22	0.2963E-25	0.1341E-28	0.5939E-32
SR-90	0.1846E-02	0.2513E-26	0.3427E-50	0.3279E-35	0.8015E-45	0.2185E-55	0.5886E-66	0.0000E+00	0.0000E+00	0.0000E+00
NB-94	0.4143E-02	0.6638E-08	0.1064E-13	0.2304E-01	0.2476E-01	0.2262E-01	0.2056E-01	0.1856E-01	0.1662E-01	0.1473E-01
TC-99	0.5245E+00	0.4653E+00	0.6000E-02	0.1671E-03	0.1562E-08	0.1060E-18	0.8888E-30	0.6109E-42	0.1996E-55	0.1470E-70
RU-106	0.9038E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SB-125	0.2348E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
I-129	0.4081E-01	0.6369E+00	0.1849E+00	0.1232E+00	0.1305E-01	0.5119E-04	0.1234E-06	0.1667E-09	0.1113E-12	0.3113E-16
CS-134	0.8541E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
CS-135	0.4112E-02	0.3805E-04	0.3520E-06	0.2263E-01	0.3073E-01	0.3023E-01	0.2960E-01	0.2892E-01	0.2817E-01	0.2735E-01
CS-137	0.5607E-03	0.4815E-15	0.4137E-27	0.3219E-34	0.7921E-43	0.7296E-53	0.6639E-63	0.0000E+00	0.0000E+00	0.0000E+00
CE-144	0.1124E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EU-154	0.7334E-04	0.3543E-23	0.1714E-42	0.1117E-61	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-234	0.4142E-02	0.8077E-05	0.1575E-07	0.2387E-01	0.3011E-01	0.2928E-01	0.2838E-01	0.2744E-01	0.2643E-01	0.2533E-01
U-235	0.4144E-02	0.8105E-05	0.1585E-07	0.2411E-01	0.3049E-01	0.2974E-01	0.2891E-01	0.2803E-01	0.2707E-01	0.2603E-01
NP-237	0.4200E-02	0.0000E+00	0.0000E+00	0.3190E-01	0.3927E+00	0.2356E+00	0.1650E+00	0.1626E+00	0.5509E-02	0.1395E-03
U-238	0.4144E-02	0.8105E-05	0.1585E-07	0.2411E-01	0.3049E-01	0.2974E-01	0.2891E-01	0.2803E-01	0.2707E-01	0.2603E-01
PU-238	0.5997E-03	0.5805E-07	0.5619E-11	0.1804E-13	0.5683E-16	0.2596E-19	0.1005E-22	0.3750E-26	0.1385E-29	0.5102E-33
PU-239	0.3028E-02	0.7682E-03	0.1949E-03	0.1149E-01	0.2336E-01	0.2572E-01	0.2565E-01	0.2497E-01	0.2415E-01	0.2330E-01
PU-240	0.2939E-02	0.6901E-03	0.1621E-03	0.8661E-02	0.1647E-01	0.1680E-01	0.1551E-01	0.1398E-01	0.1251E-01	0.1117E-01
PU-241	0.6408E-04	0.2645E-27	0.1094E-50	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
AM-241	0.1227E-03	0.2550E-04	0.5300E-05	0.4333E-05	0.3113E-05	0.1137E-05	0.3446E-06	0.9552E-07	0.2513E-07	0.6388E-08
PU-242	0.3060E-02	0.7974E-03	0.2078E-03	0.1267E-01	0.2637E-01	0.2981E-01	0.3053E-01	0.3054E-01	0.3034E-01	0.3007E-01
AM-243	0.2257E-03	0.1932E-03	0.1654E-03	0.7067E-03	0.1788E-02	0.2610E-02	0.3217E-02	0.3649E-02	0.3940E-02	0.4115E-02
CM-243	0.2072E-03	0.1877E-13	0.1702E-23	0.1087E-32	0.1783E-40	0.8354E-50	0.3279E-59	0.1230E-68	0.0000E+00	0.0000E+00
CM-244	0.1001E-03	0.1864E-21	0.3475E-39	0.1320E-56	0.7456E-72	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

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	RESIDUAL RADIOACTIVITY IN TRANSIT IN YEAR 10000	REMAINING IN TRENCH	RELEASED TO THE ATMOSPHERE
H-3	0.0000E+00	0.0000E+00	0.1349E-06
C-14	0.0000E+00	0.2395E-76	0.2318E-06
CR-51	0.0000E+00	0.0000E+00	0.6591E-07
MN-54	0.0000E+00	0.0000E+00	0.5365E-05
FE-55	0.0000E+00	0.0000E+00	0.2595E-04
CO-58	0.0000E+00	0.0000E+00	0.4023E-06
NI-59	0.6528E+00	0.1357E+00	0.1050E-03
CO-60	0.0000E+00	0.0000E+00	0.4692E-04
NI-63	0.1413E-32	0.2929E-33	0.1638E-03
SR-90	0.0000E+00	0.0000E+00	0.1278E-03
NB-94	0.3739E+00	0.2028E+00	0.2210E-03
TC-99	0.0000E+00	0.4261E-76	0.1084E-04
RU-106	0.0000E+00	0.0000E+00	0.6868E-05
SB-125	0.0000E+00	0.0000E+00	0.2332E-04
I-129	0.2875E-20	0.3297E-23	0.4900E-04
CS-134	0.0000E+00	0.0000E+00	0.1855E-04
CS-135	0.3855E+00	0.3957E+00	0.3739E-03
CS-137	0.0000E+00	0.0000E+00	0.1354E-03
CE-144	0.0000E+00	0.0000E+00	0.4800E-05
EU-154	0.0000E+00	0.0000E+00	0.1110E-03
U-234	0.4048E+00	0.3639E+00	0.3181E-03
U-235	0.4164E+00	0.3744E+00	0.3207E-03
NP-237	0.2529E-05	0.2024E-14	0.6841E-04
U-238	0.4164E+00	0.3744E+00	0.3207E-03
PU-238	0.1472E-34	0.2197E-34	0.1738E-03
PU-239	0.2241E+00	0.3372E+00	0.7418E-03
PU-240	0.1034E+00	0.1555E+00	0.5191E-03

PU-241	0.0000E+00	0.0000E+00	0.1016E-03
AM-241	0.1563E-07	0.1300E-06	0.1869E-03
PU-242	0.2931E+00	0.4410E+00	0.8529E-03
AM-243	0.2205E-01	0.1839E+00	0.1820E-02
CM-243	0.0000E+00	0.0000E+00	0.1382E-03
CM-244	0.0000E+00	0.0000E+00	0.1153E-03

HEALTH EFFECTS RESULTING FROM RESIDUAL
RADIOACTIVITY RELEASED IN 1000 YEARS

NUCLIDE	RESIDUAL ACTIVITY	CONVERSION FACTOR	HEALTH EFFECTS
H-3	2.4601E-03	0.0000E+00	0.0000E+00
C-14	9.6049E-01	0.0000E+00	0.0000E+00
CR-51	5.7943E-08	0.0000E+00	0.0000E+00
MN-54	9.4963E-06	0.0000E+00	0.0000E+00
FE-55	2.4504E-06	0.0000E+00	0.0000E+00
CO-58	1.3099E-06	0.0000E+00	0.0000E+00
NI-59	4.1560E-03	0.0000E+00	0.0000E+00
CO-60	5.6022E-04	0.0000E+00	0.0000E+00
NI-63	3.3280E-03	0.0000E+00	0.0000E+00
SR-90	1.8456E-03	0.0000E+00	0.0000E+00
NB-94	4.1431E-03	0.0000E+00	0.0000E+00
TC-99	5.2446E-01	0.0000E+00	0.0000E+00
RU-106	9.0382E-06	0.0000E+00	0.0000E+00
SB-125	2.3476E-04	0.0000E+00	0.0000E+00
I-129	4.0810E-02	0.0000E+00	0.0000E+00
CS-134	8.5406E-06	0.0000E+00	0.0000E+00
CS-135	4.1125E-03	0.0000E+00	0.0000E+00
CS-137	5.6075E-04	0.0000E+00	0.0000E+00
CE-144	1.1240E-06	0.0000E+00	0.0000E+00
EU-154	7.3340E-05	0.0000E+00	0.0000E+00
U-234	4.1419E-03	0.0000E+00	0.0000E+00
U-235	4.1439E-03	0.0000E+00	0.0000E+00
NP-237	4.1996E-03	0.0000E+00	0.0000E+00
U-238	4.1439E-03	0.0000E+00	0.0000E+00
PU-238	5.9967E-04	0.0000E+00	0.0000E+00
PU-239	3.0277E-03	0.0000E+00	0.0000E+00
PU-240	2.9386E-03	0.0000E+00	0.0000E+00
PU-241	6.4080E-05	0.0000E+00	0.0000E+00
AM-241	1.2274E-04	0.0000E+00	0.0000E+00
PU-242	3.0596E-03	0.0000E+00	0.0000E+00
AM-243	2.2566E-04	0.0000E+00	0.0000E+00
CM-243	2.0718E-04	0.0000E+00	0.0000E+00
CM-244	1.0014E-04	0.0000E+00	0.0000E+00

HEALTH EFFECTS RESULTING FROM RESIDUAL
RADIOACTIVITY RELEASED IN 10000 YEARS

NUCLIDE	RESIDUAL ACTIVITY	CONVERSION FACTOR	HEALTH EFFECTS
H-3	2.4601E-03	0.0000E+00	0.0000E+00
C-14	9.6141E-01	0.0000E+00	0.0000E+00
CR-51	5.7943E-08	0.0000E+00	0.0000E+00
MN-54	9.4963E-06	0.0000E+00	0.0000E+00
FE-55	2.4504E-06	0.0000E+00	0.0000E+00

CO-58	1.3099E-06	0.0000E+00	0.0000E+00
NI-59	1.3158E-01	0.0000E+00	0.0000E+00
CO-60	5.6022E-04	0.0000E+00	0.0000E+00
NI-63	3.3280E-03	0.0000E+00	0.0000E+00
SR-90	1.8456E-03	0.0000E+00	0.0000E+00
NB-94	1.4503E-01	0.0000E+00	0.0000E+00
TC-99	9.9589E-01	0.0000E+00	0.0000E+00
RU-106	9.0382E-06	0.0000E+00	0.0000E+00
SB-125	2.3476E-04	0.0000E+00	0.0000E+00
I-129	9.9895E-01	0.0000E+00	0.0000E+00
CS-134	8.5406E-06	0.0000E+00	0.0000E+00
CS-135	2.0178E-01	0.0000E+00	0.0000E+00
CS-137	5.6075E-04	0.0000E+00	0.0000E+00
CE-144	1.1240E-06	0.0000E+00	0.0000E+00
EU-154	7.3340E-05	0.0000E+00	0.0000E+00
U-234	1.9498E-01	0.0000E+00	0.0000E+00
U-235	1.9853E-01	0.0000E+00	0.0000E+00
NP-237	9.9768E-01	0.0000E+00	0.0000E+00
U-238	1.9853E-01	0.0000E+00	0.0000E+00
PU-238	5.9973E-04	0.0000E+00	0.0000E+00
PU-239	1.6263E-01	0.0000E+00	0.0000E+00
PU-240	9.8909E-02	0.0000E+00	0.0000E+00
PU-241	6.4080E-05	0.0000E+00	0.0000E+00
AM-241	1.6259E-04	0.0000E+00	0.0000E+00
PU-242	1.9440E-01	0.0000E+00	0.0000E+00
AM-243	2.0611E-02	0.0000E+00	0.0000E+00
CM-243	2.0718E-04	0.0000E+00	0.0000E+00
CM-244	1.0014E-04	0.0000E+00	0.0000E+00

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TABLE FOR ACCOUNTING MODEL -- YEAR 1000

COLUMN 1: INDIVIDUAL CANCER RISK (UNITLESS)
COLUMN 2: POPULATION DOSE (PERSON-REM/YEAR)
COLUMN 3: COLLECTIVE CANCER RISK (DEATHS/YEAR)
COLUMN 4: GENETIC RISK (EFFECTS/YEAR)
COLUMN 5: R-ACTIVITY PUMPED OUT THE WELL 1ST 1000 YEARS (CI)
COLUMN 6: R-ACTIVITY PUMPED OUT THE STREAM 1ST 1000 YEARS (CI)
COLUMN 7: R-ACTIVITY RELEASED TO ATMOSPHERE 1ST 1000 YEARS (CI)
COLUMN 8: R-ACTIVITY RELEASED DOWNSTREAM 1ST 1000 YEARS (CI)
COLUMN 9: R-ACTIVITY RELEASED DOWNSTREAM LAST 9000 YEARS (CI)
COLUMN 10: R-ACTIVITY IN TRENCH AFTER 10000 YEARS ASSUMING PERFECT CONTAINMENT (CI)

H-3	5.3663E-12	6.7586E-09	1.8961E-12	7.1733E-13	1.6686E-06	0.0000E+00	1.3492E-07	2.4601E-03	3.4116E-27	0.0000E+00
C-14	6.8240E-08	8.5945E-05	2.4111E-08	4.4872E-09	1.1868E-03	0.0000E+00	2.3181E-07	9.6049E-01	9.2666E-04	2.9522E-01
CR-51	2.6372E-24	3.3214E-21	9.3176E-25	3.9532E-25	0.0000E+00	0.0000E+00	6.5909E-08	5.7943E-08	0.0000E+00	0.0000E+00
MN-54	1.6628E-18	2.0942E-15	5.8749E-19	2.5655E-19	0.0000E+00	0.0000E+00	5.3645E-06	9.4963E-06	0.0000E+00	0.0000E+00
FE-55	2.7432E-20	3.4549E-17	9.6923E-21	2.5168E-21	0.0000E+00	0.0000E+00	2.5954E-05	2.4504E-06	0.0000E+00	0.0000E+00
CO-58	6.2927E-21	7.9253E-18	2.2234E-21	1.0292E-21	0.0000E+00	0.0000E+00	4.0227E-07	1.3099E-06	0.0000E+00	0.0000E+00
NI-59	5.8589E-18	7.3791E-15	2.0701E-18	2.9964E-19	0.0000E+00	0.0000E+00	1.6599E-04	4.1560E-03	1.2740E-01	9.0787E-01
CO-60	3.1822E-16	4.0079E-13	1.1244E-16	4.8614E-17	0.0000E+00	0.0000E+00	4.6919E-05	5.6022E-04	0.0000E+00	0.0000E+00
NI-63	1.2525E-19	1.5775E-16	4.4255E-20	1.2694E-20	0.0000E+00	0.0000E+00	1.6384E-04	3.3280E-03	2.9503E-13	1.9646E-33
SR-90	2.8587E-18	3.6004E-15	1.0100E-18	1.4442E-20	0.0000E+00	0.0000E+00	1.2784E-04	1.8456E-03	2.5130E-27	0.0000E+00
NB-94	5.3753E-14	6.7699E-11	1.8992E-14	8.2990E-15	0.0000E+00	0.0000E+00	1.7183E-04	4.1431E-03	1.4089E-01	6.9974E-01
TC-99	8.1199E-08	1.0227E-04	2.8690E-08	1.3592E-09	1.1355E-03	0.0000E+00	1.0836E-05	5.2446E-01	4.7142E-01	9.5834E-01
RU-106	2.7097E-19	3.4127E-16	9.5739E-20	3.8767E-21	0.0000E+00	0.0000E+00	6.8681E-06	9.0382E-06	0.0000E+00	0.0000E+00
SB-125	1.5439E-17	1.9445E-14	5.4551E-18	2.3686E-18	0.0000E+00	0.0000E+00	2.3321E-05	2.3476E-04	0.0000E+00	0.0000E+00
I-129	1.7046E-06	2.1468E-03	6.0226E-07	1.3381E-09	5.3212E-04	0.0000E+00	4.9001E-05	4.0810E-02	9.5814E-01	9.8960E-01
CS-134	3.6088E-17	4.5451E-14	1.2751E-17	5.4954E-18	0.0000E+00	0.0000E+00	1.8546E-05	8.5406E-06	0.0000E+00	0.0000E+00
CS-135	1.6940E-17	2.1335E-14	5.9853E-18	2.4679E-18	0.0000E+00	0.0000E+00	1.7707E-04	4.1125E-03	1.9767E-01	9.8773E-01
CS-137	1.0777E-19	1.3574E-16	3.8079E-20	1.4181E-20	0.0000E+00	0.0000E+00	1.3537E-04	5.6075E-04	4.8146E-16	0.0000E+00
CE-144	1.5012E-19	1.8907E-16	5.3041E-20	4.6217E-21	0.0000E+00	0.0000E+00	4.7999E-06	1.1240E-06	0.0000E+00	0.0000E+00
EU-154	1.3887E-15	1.7489E-12	4.9064E-16	2.1276E-16	0.0000E+00	0.0000E+00	1.1102E-04	7.3340E-05	3.5431E-24	0.0000E+00
U-234	7.2312E-17	1.3766E-13	2.5550E-17	3.3962E-18	0.0000E+00	0.0000E+00	1.7559E-04	4.1419E-03	1.9083E-01	9.6238E-01

U-235	8.9114E-15	1.1223E-11	3.1486E-15	1.2508E-15	0.0000E+00	0.0000E+00	1.7559E-04	4.1439E-03	1.9439E-01	9.8999E-01
NP-237	2.2047E-16	2.7767E-13	7.7896E-17	5.1427E-18	0.0000E+00	0.0000E+00	6.8405E-05	4.1996E-03	9.9348E-01	9.8674E-01
U-238	6.1397E-17	1.1898E-13	2.1693E-17	2.6221E-18	0.0000E+00	0.0000E+00	1.7559E-04	4.1439E-03	1.9439E-01	9.9000E-01
PU-238	5.8969E-16	7.4269E-13	2.0835E-16	1.1823E-17	0.0000E+00	0.0000E+00	1.7376E-04	5.9967E-04	5.8051E-08	4.8571E-35
PU-239	5.6688E-16	7.1396E-13	2.0029E-16	1.0203E-17	0.0000E+00	0.0000E+00	1.8455E-04	3.0277E-03	1.5960E-01	7.4301E-01
PU-240	5.8977E-16	7.4279E-13	2.0838E-16	1.2314E-17	0.0000E+00	0.0000E+00	1.8421E-04	2.9386E-03	9.5971E-02	3.4299E-01
PU-241	2.7374E-18	3.4476E-15	9.6719E-19	8.9020E-20	0.0000E+00	0.0000E+00	1.0162E-04	6.4080E-05	2.6451E-28	0.0000E+00
AM-241	1.6366E-15	2.0613E-12	5.7827E-16	1.9770E-16	0.0000E+00	0.0000E+00	1.8372E-04	1.2274E-04	3.9856E-05	2.7402E-07
PU-242	5.5708E-16	7.0162E-13	1.9683E-16	1.1333E-17	0.0000E+00	0.0000E+00	1.8466E-04	3.0596E-03	1.9134E-01	9.7205E-01
AM-243	5.2253E-15	6.5811E-12	1.8462E-15	7.4610E-16	0.0000E+00	0.0000E+00	1.9236E-04	2.2566E-04	2.0385E-02	3.8672E-01
CM-243	7.2015E-16	9.0700E-13	2.5445E-16	7.7511E-17	0.0000E+00	0.0000E+00	1.3824E-04	2.0718E-04	1.8771E-14	0.0000E+00
CM-244	2.3068E-16	2.9053E-13	8.1505E-17	1.4220E-17	0.0000E+00	0.0000E+00	1.1531E-04	1.0014E-04	1.8643E-22	0.0000E+00
TOTALS:	1.8540E-06	2.3350E-03	6.5506E-07	7.1852E-09						

0 MESSAGE SUMMARY: MESSAGE NUMBER - COUNT
0 208 511 OR OVER
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*U.S. Government Printing Office 1988 - 516-002/80053