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Incentives for Partitioning High-Level Waste

November 1975

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Pacific Northwest Laboratories

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INCENTIVES FOR PARTITIONING
HIGH-LEVEL WASTE

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November 1975

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EXECUTIVE SUMMARY

The incentives for separating and eliminating various elements (but particularly the transuranics) from radioactive waste prior to final geologic storage were investigated. Exposure pathways to man were defined, and potential radiation doses to an individual living within the region of influence of the underground storage site were calculated. The accumulated high-level waste (i.e., the fission product waste produced by reprocessing spent fuel) from the U.S. nuclear power economy through the Year 2000 was the assumed radionuclide source, and western U.S. desert subsoil was the assumed geologic medium.

The results of the study showed that for reasonable storage conditions the potential incremental radiation doses would be of the same order as, or less than, doses from natural sources. We therefore concluded that for the situations investigated the incentives for special effort to remove any elements, including the transuranics, from high-level waste are vanishingly small. The study results also showed that incentives exist for converting high-level calcine into glass.

The study required numerous assumptions concerned with the transport of radioactivity from the geologic storage site to man. The assumptions used, on the whole, maximized the estimated potential radiation doses. Thus incentives for removing elements from the waste tended to be maximized. Incentives were also maximized by assuming that elements removed from the waste could be eliminated from the earth without risk.

The conclusion that partitioning incentives are nonexistent--despite assumptions tending to maximize them--is based on comparison of predicted potential radiation doses with routine doses from natural sources. The study found that there are feasible conditions of geologic emplacement where the predicted incremental dose to man is calculated to be as low as one tenth of "background." Although "background" varies with geographic location and consensus standards of allowable incremental dose have not yet been fully established, we concluded that high-level waste in a glass form can safely be placed in selected geologic media.

The methods used in this study can be extended to evaluate any combination of waste type and geologic medium at sites that are candidates for final geologic storage.

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1.0 INTRODUCTION

The projected U.S. nuclear power economy for the 20th and 21st centuries will generate wastes which remain radioactive to some extent for millions of years. Because these wastes are a risk to present and future man, technology for their final storage is currently under development.⁽¹⁾ The final disposition alternatives seek either to isolate the waste from man's environment until the nuclides have decayed to innocuous levels or to eliminate the potentially hazardous long-lived nuclides from the waste. The isolation alternatives include geologic, seabed, and ice sheet final storage; the elimination alternatives include extraterrestrial disposal and transmutation.

For a given waste type (e.g., high-level, cladding hulls, low-level alpha, ore tailings, etc.) and any of these alternatives, there may be some safety incentive* for separating the waste into two or more fractions (partitioning) so that each fraction could be disposed of separately. For example, two frequently proposed alternatives for high-level waste would separate the usually long-lived actinides from the generally short-lived fission products. The actinides would then be eliminated by extraterrestrial disposal or recycled through an existing or specially designed nuclear reactor and transmuted to nuclides with shorter half-lives. The aim of such alternatives would be to reduce the overall risk for high-level waste by eliminating the actinides.

This document reports work to develop a general method for estimating the safety incentives for partitioning nuclear power economy wastes and to apply that method to a single waste type (accumulated high-level waste through the Year 2000 plus all tritium, carbon, and iodine from spent fuel), a single geosphere pathway (leach incident), and a specific set of biosphere pathways. The application of the methodology results in an estimated 50-year accumulated dose (in units of mrem) to an individual living within the region of influence of the underground waste disposal site. A sensitivity analysis was performed on the important geosphere parameters (path length, leach rate, and

* This document evaluates partitioning incentives for minimizing a negative aspect of the waste (its risk to health) but does not evaluate partitioning incentives for maximizing a positive aspect of the waste (its potential resource value).

time of initial release) and on the value for the publicly acceptable release consequences to define the boundaries of the region where incentives exist for various specific partitioning alternatives. Conclusions are drawn from the results, and recommendations for future work are made.

2.0 GENERAL EVALUATION METHOD

A complete evaluation of partitioning incentives requires considering all wastes from the U.S. nuclear power economy, all activities of the waste management system, and all pathways by which the waste can reach man. More specifically such an evaluation requires definition and analysis of each operation related to the disposition of partitioned and unpartitioned wastes from the point where partitioning is contemplated to terminal storage. This evaluation requires analyses of the probabilities of all events or series of events which could release wastes from containment, analyses of the transport of the released nuclides through the geosphere and biosphere, and analyses of the radiation doses to man. Only with such a thorough analysis does one get an estimate of the actual risk to man from partitioned and unpartitioned wastes.

Considering the total waste from the U.S. nuclear power economy, an incentive for partitioning exists only when the sum of the risks for all unpartitioned waste types is both greater than the publicly acceptable risk and greater than the sum of the risks for all partitioned fractions of all waste types. These conditions are expressed by the two inequalities shown below:

$$\sum_{\substack{\text{all} \\ \text{waste} \\ \text{types} \\ i}} R_i > R_a \quad (1)$$

$$\sum_{\substack{\text{all} \\ \text{waste} \\ \text{types} \\ i}} R_i > \sum_{\substack{\text{all} \\ \text{waste} \\ \text{types} \\ i}} \sum_{\substack{\text{all} \\ \text{fractions} \\ j}} R_{ij} \quad (2)$$

where: R_a = publicly acceptable risk
 R_i = risk from unpartitioned waste of type i
 R_{ij} = risk from partitioned waste fraction ij .

The publicly acceptable risk is that risk value which is marginally acceptable to the public at large. The risk for a given unpartitioned waste type or partitioned waste fraction is the sum over all release pathways of the products of the release probability for each pathway multiplied by the release consequences for that pathway. These equalities are expressed by the equations

$$R_i = \sum_k^{\text{waste management activities}} \sum_l^{\text{all release paths from each activity}} P_{ikl} \times C_{ikl} \quad (3)$$

$$R_{ij} = \sum_k^{\text{waste management activities}} \sum_l^{\text{all release paths from each activity}} P_{ijk l} \times C_{ijk l} \quad (4)$$

where: P_{ikl} = probability of release by path l from activity k of unpartitioned waste type i

C_{ikl} = consequences of release by path l from activity k of unpartitioned waste type i

$P_{ijk l}$ = probability of release by path l from activity k of partitioned waste fraction ij

$C_{ijk l}$ = consequences of release by path l from activity k of partitioned waste fraction ij .

The probabilities for the various release paths (P_{ikl} and $P_{ijk l}$) are obtained by fault tree analyses or other similar techniques for all release events from the partitioning operation in the process scheme through terminal storage (or perhaps temporary storage for some wastes). Figure 1 shows high-level waste management schemes for three situations: 1) no partitioning, 2) partitioning and transmutation, and 3) partitioning and extra-terrestrial disposal. As shown, there will generally be more potential release paths from a waste management alternative with partitioning because additional processing steps are involved. In addition the transmutation

FIGURE 1. Diagrams of Several Waste Management Alternatives for High-Level Waste

alternative creates new wastes (transmuted actinides) which do not necessarily have a lower risk than the actinides themselves. Thus the risk from any given waste type can actually be increased rather than decreased by partitioning.

The consequences for the various release paths (C_{ikl} and C_{ijkl}) are obtained by modeling the transport of the radionuclides through the geosphere and biosphere and calculating their radiation dose to man. The consequences of release by any given path are a function of such things as the radioactive source, waste form, weather conditions, remoteness from man, release event severity, and man's living habits. Thus the consequences of waste release are a strong function of the characteristics of the waste management alternative and an accurate assessment of these consequences can be made only by considering specific alternatives.

The general evaluation method described here represents one extreme in the spectrum of possible methods, i.e., an assessment of the actual risk. At the other extreme are methods which assess the potential hazard from various waste types and compare that hazard to some arbitrary standard in terms of a hazard index.⁽²⁾ For the hazard index analyses no consideration is given to the probabilities of release or the paths by which the nuclides reach man. For solid and liquid wastes the hazard index from a given waste fraction is characterized by the quantity of water required to dilute each nuclide to its Radiation Concentration Guide value (RCG) for unrestricted water use. For gaseous wastes the hazard index is characterized by the quantity of air required to dilute each individual nuclide to its RCG value for unrestricted use as breathing air. Using the hazard index of naturally occurring ores or high-grade pitchblende as a basis, relative hazards can be calculated for a given waste type at any time after reprocessing.

Evaluating actual risk is a better method for assessing the incentives for partitioning than evaluating potential hazard but requires significant time and manpower and much more data. Therefore, the application of a risk method first on a limited scale, as is done in this study, seems warranted. The results can then support tentative conclusions which can in turn guide more sophisticated evaluations of partitioning incentives and evaluations of conceptual partitioning alternatives should incentives exist.

3.0 SIMPLIFYING AND APPLYING THE METHOD

The general method can be simplified by considering only that waste management activity in Figure 1 which has the greatest risk. This study assumes that the release pathways of greatest risk for partitioned and unpartitioned waste originate from the waste in its final storage setting. Thus attention focuses on the "final storage" blocks in the waste management alternatives shown in Figure 1, and the risks from prestorage processing and transportation are assumed to be insignificant relative to the risk from the stored waste.

The final storage risks result from very low frequency events which can occur over geologic time periods while the prestorage risks result from higher (but still low) frequency events which can occur over only a very short time period (50 to 100 years). A typical final storage event would release a large amount of radioactivity from containment, but because the waste is isolated the dose received by man can be small. A typical prestorage event would release only a small amount of radioactivity from containment, but because the waste is less isolated the dose received by man can be large. These very different characteristics of the final storage and prestorage risks make comparison of their risks difficult. Thus, the validity of the assumption that final storage risks are much greater than prestorage risks may be incapable of unambiguous evaluation. Moreover, focusing on the waste management activity which has the longest time span of occurrence would seem to favor the existence of partitioning incentives, since partitioning followed by either transmutation or extraterrestrial disposal eliminates long-lived nuclides. Thus focusing on the final storage risks makes it unlikely that any partitioning incentive will be overlooked.

Final storage is assumed in geologic media rather than seabed or ice sheet. The superiority of geologic media for the safe final storage of nuclear wastes has not been shown. However, much information exists to suggest that geologic media (as a generic class) are favorable media for waste storage. This fact plus the relatively well developed emplacement

technology, the absence of international political constraints, and the relatively low projected implementation costs make geologic final storage the most likely candidate.

Figure 2 shows release pathways for geologic disposal. Of the three types of geologic formations shown, non-salt formations surrounded by particulate media are assumed for this study. The superiority of non-salt particulate media has not been shown, but the high sorption capacity of such media make them favorable candidates for waste storage. The highest risk path from the storage site through the geosphere to the biosphere is assumed to be the leach incident pathway. The relative risks of the various pathways from final geologic storage have not been evaluated, but the leach incident appears to be the highest probability release event. The previous two assumptions restrict consideration to a geologic formation and a release pathway for which a nuclide migration model has been previously developed.⁽³⁾ A migration model for salt formations is still under development and cannot be applied at present to evaluating incentives for partitioning.^(4,5)

High-level waste is assumed to be the type most likely to have partitioning incentives. All partitioning process alternatives are assumed to be feasible, and all nuclides partitioned from the waste are assumed to have been completely eliminated by extraterrestrial disposal or transmuted to other nuclides, with negligible risk in either case. This latter assumption clearly maximizes the likelihood that partitioning incentives will exist and thus tends to bias the analysis in favor of partitioning. The probability of release from the storage site is given the value "1" so that the analysis considers only release consequences.

Having made the foregoing assumptions, the method applied here estimates "maximum" incentives for partitioning high-level waste disposed in a non-salt particulate geologic medium and released by the leach incident-water transport pathway. The actual incentives would be somewhat less than

FIGURE 2. Release Pathways from Geologic Disposal

this analysis shows. The existence conditions for partitioning incentives (inequalities 1 and 2) reduce thus:

$$C > C_a \quad (5)$$

$$C > C_\ell^* \quad (6)$$

where: C = consequences from unpartitioned high-level waste released by the leach incident pathway
 C_a = publicly acceptable release consequences
 C_ℓ = consequences from the low-risk fraction of the partitioned high-level waste.

Evaluating the existence conditions for partitioning incentives requires knowledge both of the publicly acceptable release consequences and the consequences for the release of partitioned and unpartitioned waste from the actual disposal site. At present neither the publicly acceptable release consequences nor the characteristics of the waste management system are known. However, the absence of this crucial information need not deter application of a method for calculating release consequences. After the release consequences have been estimated for a range of values for the important unknowns, "reasonable" values for those unknowns can be assumed and a "best" estimate of partitioning incentives can be made. Furthermore, when needed information is known with more certainty, the calculations necessary for the partitioning decision will already have been made.

* Using the present method, this inequality will always be satisfied in the strict sense since the high risk fraction has been eliminated without risk. What is really meant here is that the consequences of the unpartitioned waste are significantly greater than those of the partitioned waste. Thus this inequality is satisfied unless the element partitioned has a negligible contribution to the release consequences. We clearly do not want to remove an element which does not contribute significantly to the consequences.

3.1 GEOSPHERE TRANSPORT MODEL

The high-level waste* from the U.S. nuclear power economy through the Year 2000 (see Appendix A for a complete nuclide source inventory) is assumed to be in an underground final storage site in some geologic formation with a surface water body nearby. The geologic formation could be subsoil, porous rock, or faulted rock; but subsoil is assumed here because the retardation of nuclides by subsoil is apparently much greater than that by other types of geologic formations. (See Appendix A for listing of the sorption equilibrium constants.) Thus the presence of other geologic formations at the site can be accounted for by shortening the effective distance between the terminal storage site and man's environment.

Important phenomena of the transport process through soil include: 1) convection, 2) axial and transverse dispersion, 3) radioactive decay, 4) adsorption, 5) ion exchange, 6) colloid filtration, 7) reversible precipitation, and 8) irreversible mineralization. Because studies of groundwater flow in soils suggest that axial convection and dispersion are much greater than transverse convection and dispersion, a one-dimensional transport path (soil column) between the final storage site and the surface water body is assumed. Further, because present methods for measuring the retardation of nuclides for a given soil type combine the effects of the latter five phenomena into one empirical constant for each nuclide, these effects are considered together under the term "sorption."

At some arbitrary time after the waste is deposited, the contents of the site are released at a specified rate to an underground water stream which flows at a constant velocity directly through the soil column to the surface water body. All nuclides are assumed to be soluble, to be present at all times in the same chemical species, and to be in sorption equilibrium at all points in the soil column. The latter assumption should be descriptive of most nuclides since the groundwater moves so slowly (<1 ft/day) that the rates of sorption and desorption are very large relative to the rate of

* Includes all tritium, carbon, and iodine from the spent fuel leaving the reactors as well as the activation products present in the cladding.

convective transport. The nuclides decay both while adsorbed on the soil and while in solution. A constant axial dispersion coefficient is assumed. Trace concentrations of the dissolved nuclides are assumed in order that the sorption equilibrium constants will be independent of concentration. For reasonable soil column cross-sectional areas this assumption may be invalid very near the soil column inlet (i.e., near the terminal storage site) but should have negligible effect on the predicted nuclide migration rates for soil column lengths of 0.1 mile and greater.

Radionuclides decay in first order chains. Therefore the description of the migration of any given chain member requires the simultaneous description of the migration of all precursors to that chain member. A model for chain migration which embodies all of the preceding assumptions has been developed and solved for both impulse and band releases at the terminal storage site for two and three-member chains.⁽³⁾ Solutions were also obtained for the special cases when axial dispersion is negligible and two or more chain members have the same sorption equilibrium constant.

The model used for this study assumed band release with axial dispersion for initial inventory contributions only. Thus dispersion is applied only to those nuclides which were at the site at the time of the release incident. Band release assumes that all nuclides are released at the same constant rate from the site. This assumption implies that the waste form retains its original shape (although the waste form gets progressively smaller), and the waste form matrix remains intact as the nuclides are leached out. Thus the resistance to nuclide diffusion through the waste-depleted matrix near the waste form surface is so large that the leach rate of the waste form matrix itself controls the leach rate of the contained nuclides. Neglecting axial dispersion for nuclides created by decay of precursors after the precursors have left the disposal site greatly reduces the numerical difficulties during computer solution of analytical results (see Reference 3, p. 20). This assumption has a negligible effect on the nuclide discharge rates at the exit of the soil column because the differences in migration rates between chain members spread the discharge peaks much more than does axial dispersion. The differential equations, boundary

conditions, and analytical results for single nuclides, two-member chains, and three-member chains used in this study are given in Appendix B.

The nuclides of interest to geosphere migration studies for high-level waste include four large branched, but noninteracting actinide decay systems. The migration of these complex chains was modeled using combinations of single nuclide, two-member chain, and three-member chain calculations. The simplifications used for each of the actinide decay chains are discussed in Appendix C.

The BASIC language computer program GETOUT (GEosphere Transport [out] Of Underground [waste] Treasuries) was used to perform the migration calculations. A general description is provided in Appendix D and a sample output for a complete run is given in Appendix I. The details of this program will be reported in the near future.

Figure 3 shows the radionuclide discharge from the soil column for a typical case. Because the physicochemical nuclide-soil interactions vary for the nuclides, the single nuclide discharges are separated into sharp chromatographic peaks. The peaks for nuclides in the actinide decay chains are more complicated. Figure 4 shows the plutonium peak in detail. In addition to the contributions from the initial inventories of plutonium isotopes, there are contributions from the decay of plutonium precursors, contributions from plutonium descendents, contributions from the descendents of other nuclides, and a contribution from the initial inventory of another nuclide (^{93}Zr) which migrates with the same velocity as plutonium. The biosphere migration calculations and dose results are obtained by looking at the maxima of the peaks, one at a time, and assuming the biosphere receives the inventory of nuclides discharging at the time of the peak maximum. The dotted line in Figure 4 shows this.

FIGURE 3. Simplified Chromatogram for Typical Nuclide Discharge from Soil Column

FIGURE 4. Plutonium Peak in Detail

3.2 BIOSPHERE TRANSPORT MODEL

The biosphere transport model follows the pathways of the nuclides from the surface water body to man and calculates the radiation dose. The nuclides are assumed to be diluted by the surface water body (a 10,000 cfs river in this case) and are assumed to reach man by the pathways shown in Figure 5.^(6,7) As shown, these pathways include external exposure from shoreline activities and recreation on and in the river and internal exposures from drinking the water, consumption of aquatic food, and consumption of foods grown or raised using river water for irrigation.

The doses are calculated for a so-called "maximum" individual whose dietary and living habits as well as his proximity to the discharge from the soil column maximize those doses. Table 1 summarizes the assumed standard usages of this "maximum" individual. When calculating the dose to the "maximum" individual for each discharge peak, the nuclides are assumed to accumulate in the biosphere for 50 years at those peak discharge rates. The individual is then assumed to be exposed to the accumulated nuclides for the 50 years following that initial 50-year buildup period. Thus the biosphere model likens the surface water body and local biosphere to a large tank with a 100-year holdup time (50-year accumulation and 50-year exposure). At the end of this 100-year period, the contents of this tank are assumed to be dispersed into the regional, national and international biosphere in a manner such that dose consequences are negligible. The long-term accumulation and dispersion of nuclides in the biosphere has not been investigated. Thus, although the assumption made here seems conservative, additional research is needed in this area. The biosphere transport model in the present context implicitly assumes that man's dietary and living habits remain constant throughout geologic time. Appendices E, F, G, and H contain details of the biosphere transport model, dose factors, transfer factors, and a description of the BASIC language computing scheme used for the dose calculations, respectively. The details of the codes used in the computing scheme are reported elsewhere.^(7,8)

FIGURE 5. Schematic Diagram of Biosphere Transport Pathways

TABLE 1. Standard Usages of the Maximum Individual

Pathway	Annual Usage	Remarks
River Fish, kg	18	
River Invertebrates, kg	18	Divided equally between molluscs and crustaceans
Drinking Water from River, liter	730	
Shoreline Sediments, hr	500	
Water Recreation, hr	200	Divided equally between swimming and boating
Irrigated Produce		
Fresh Leafy Vegetables, kg	30	On basis of 72 kg/yr over 5-month growing season
Other Fresh Aboveground Vegetables, kg	30	On basis of 72 kg/yr over 5-month growing season
Potatoes, kg	110	
Root Vegetables, kg	72	
Berries, kg	30	
Melons, kg	40	
Orchard fruit, kg	265	
Wheat, kg	80	
Other Grain, kg	8.3	On basis of 20 kg/yr over 5-month growing season.
Eggs, kg	30	
Milk & Products, liter	274	On basis of 1 l/d over 9-month grazing season
Meat		
Beef, kg	40	
Pork, kg	40	
Poultry, kg	18	

4.0 RESULTS AND DISCUSSION

4.1 GEOSPHERE-BIOSPHERE TRANSPORT CALCULATIONS

Calculations using the integrated geosphere-biosphere transport model were performed for a base case and parametric variations from that base case. The base case assumed: 1) high-level waste from the U.S. nuclear power economy through the Year 2000 (including all tritium, carbon, and iodine from the spent fuel and the activation products from the cladding), 2) underground disposal in western U.S. desert soil with no salt present, 3) the release begins in the year 2100, 4) a 10 mile path length, 5) a 0.3 wt%/yr leach rate, 6) a water velocity of 1 ft/day, and 7) an axial dispersion coefficient of $0.008 \text{ cm}^2/\text{min}$. Assumptions 3, 5, and 6 are all conservative by orders of magnitude from values expected (i.e., the release would not likely occur for at least 1000 to 10,000 years after the Year 2000, a leach rate of 0.001%/yr would be expected for a monolithic borosilicate glass waste form, and a 0.1 ft/day water velocity is typical of western U.S. desert aquifers). The sorption equilibrium constants assumed here (implied by Assumption 2) are best estimates from existing laboratory data for western U.S. desert soils (see Appendix A). These data are limited, particularly for the actinides, and research is needed in this area. Assumption 4 may not be conservative but is near the upper limit of path lengths that would reasonably be expected.*

The values of the parameters used for the geosphere transport calculations are summarized in Table 2. The three parameters varied are measures of variables over which man has some degree of selection or control when designing a management system for nuclear wastes, and it is appropriate to consider incentives for partitioning in that context. The time of initial release from the disposal site after the Year 2000 is a measure of canister integrity and site stability from water penetration; the leach rate is a measure of waste form effectiveness; and the path length is a measure of geosphere isolation.

* Note that geospheric path length is not necessarily equal to geographic surface distance. The length of the subsoil column separating the underground site from the surface water body can be smaller than the surface distance because of subterranean open channels or larger because of an indirect path of migration.

TABLE 2. Parameter Values of Geosphere Transport Calculations

<u>Time of Initial Release after Year 2000, yr</u>	<u>Leach Rate, %/yr</u>	<u>Path Length, miles</u>
100	0.3	10
100	0.3	3
100	0.3	1
100	0.3	0.3
100	0.3	0.1
100	0.3	0
100,000	0.3	0
100	0.03	10
100	0.003	10
100	0.0003	10
100	0.03	0.1
100	0.003	0.1
100	0.0003	0.1
100	0.0003	1
100	0.00003	0.3
100	0.00003	1
100	0.00003	3
0	0.3	10
1,000	0.3	10
10,000	0.3	10
100,000	0.3	10
1,000,000	0.3	10

4.2 DOSE RESULTS

Tables 3 through 18 detail dose results for the parametric variations. They present the 50-year accumulated skin, body, and incremental organ doses* for the various peaks shown in Figure 3. The time that each peak occurs (starting from Year 2000) is shown along with the critical organ and the controlling nuclides for that organ. Background dose ($120 \text{ mrem/yr} \times 50 \text{ yr} = 6000 \text{ mrem}$) and the National Council on Radiation Protection and Measurement (NCRP) dose limit for organs ($1500 \text{ mrem/yr} \times 50 \text{ yr} = 75,000 \text{ mrem}$) are listed for comparison. As shown, the critical organ is usually bone, but occasionally the GI-LLI, thyroid, or liver dose is greater.

For the base case (Table 3) the doses are above background only for ^{99}Tc and ^{129}I at 250 years, ^{14}C at 1550 years, and ^{237}Np at 14,600 years. Nuclides which are slightly below background levels are ^{126}Sn at 161,000 years and ^{226}Ra at 2,070,000 years. The ^{14}C dose is the most significant at about 50 times background. The combined effects of sorption, decay, and dispersion reduce the doses from actinides other than ^{237}Np and from fission products like ^{90}Sr to below background levels.

4.3 EFFECTS OF IMPORTANT PARAMETERS

Figure 6, a graph of the results from Tables 3, 5, 7, and 8 shows the effect of path length on the incremental bone dose versus time curve. Results are shown for 0, 0.1, 1, and 10 mile path lengths. To make the graph more readable, results for 0.3 and 3 miles (Tables 4 and 6) have not been plotted. The background and NCRP dose limit lines are superimposed for comparison. For a zero path length (a disposal site located in the surface water body itself), all nuclides discharge simultaneously with a bone dose of 600,000 times background, controlled by ^{90}Sr . For a path length of 0.1 miles, incremental doses are at or above background over most of the 100,000-year period required for complete discharge of all nuclides to the biosphere. The largest dose results from ^{90}Sr at 250 years

* The doses calculated in this study and discussed in this report are incremental doses; i.e., they are in addition to natural background dose. Thus actual doses are obtained from the results in Tables 3 through 18 by adding the background dose to the table entries.

TABLE 3. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.3%/Yr Path Length: 10 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
2.50E2	³ H, ⁹⁹ Tc, ¹²⁹ I	1.3E1	2.3E2	2.6E4	1.4E4	5.4E2	8.0E2	7.5E0	1.7E1	GI-LLI: 100% ⁹⁹ Tc
1.55E3	¹⁴ C	8.0E-3	6.3E4	3.8E4	6.2E4	3.1E5	6.2E4	6.2E4	6.2E4	Bone: 100% ¹⁴ C
3.73E3	⁹³ Mo	4.4E-7	3.5E-1	2.1E0	2.5E-7	2.5E-7	1.3E1	2.5E-7	2.5E-7	Liver: 100% ⁹³ Mo
1.46E4	⁴¹ Ca, ⁷⁹ Se, ²³⁷ Np, ⁹⁰ Sr	3.1E2	1.3E3	2.0E3	2.7E2	1.2E4	3.5E3	2.7E2	2.7E2	Bone: 96% ²³⁷ Np+D
4.85E4	¹⁰ Be, ⁶⁰ Co, ⁵⁹ Ni	1.0E-2	4.5E1	2.0E1	8.6E-3	2.7E2	9.5E1	8.6E-3	2.2E-2	Bone: 100% ⁵⁹ Ni
7.26E4	⁸⁷ Rb, ²²⁶ Ra	6.2E-3	9.1E-2	7.1E-2	5.1E-3	5.7E-1	1.2E-1	5.1E-3	1.7E-2	Bone: 58% ²²⁹ Th, 31% ²²⁵ Ra+D
1.45E5	¹³⁵ Cs	6.7E-3	3.5E2	2.0E1	3.8E-3	9.4E2	8.4E2	6.5E2	1.2E-2	Bone, Liver, Lung: 100% ¹³⁵ Cs
1.61E5	¹⁰⁷ Pd, ¹²⁶ Sn	7.5E2	8.2E2	2.4E3	7.2E2	4.6E3	8.6E2	7.0E2	7.0E2	Bone: 100% ¹²⁶ Sn+D
3.62E5	¹⁶⁶ Ho	1.8E-3	2.1E-2	2.7E-2	1.5E-3	2.3E-1	5.5E-3	1.5E-3	4.8E-3	Bone: 61% ²²⁹ Th, 33% ²²⁵ Ra+D
4.82E5	²⁴⁷ Cm	1.3E-3	1.3E-2	1.7E-2	1.1E-3	1.4E-1	7.5E-3	1.1E-3	3.1E-3	Bone: 56% ²²⁹ Th, 31% ²²⁵ Ra+D
1.45E6	⁹³ Zr, ¹¹³ Md, ²⁴³ Am, ²⁴⁴ Pu	3.5E-3	7.5E-1	6.6E2	4.4E-4	7.5E0	1.8E0	4.4E-4	2.8E-1	GI-LLI: 100% ⁹³ Mn; Bone: 56% ⁹³ Mn, 34% ²⁴² Pu
2.07E6	²³⁸ U	8.9E-1	1.1E3	2.9E1	7.5E-1	2.4E3	2.9E2	7.5E-1	1.2E1	Bone: 86% ²²⁶ Ra+D, 7% ²¹⁰ Pb+D
2.41E6	²³¹ Pa	2.4E-2	3.4E1	7.3E-1	2.1E-2	6.8E1	8.7E0	2.1E-2	2.1E-2	Bone: 88% ²²⁶ Ra+D, 7% ²¹⁰ Pb+D
7.23E6	²³² Th	2.5E-4	6.3E-3	3.7E-2	2.3E-4	9.6E-2	3.1E-3	2.3E-4	2.3E-4	Bone: 44% ²³² Th+D, 35% ²²⁴ Ra+D 21% ²³⁸ Th+D

*LST008 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

**TABLE 4. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.3%/Yr Path Length: 3 Mile**

Years Since Burial	Peak Nuclides	Dose, mrem						Remarks		
		Skin	Body	GI-LLI	Thyroid	Bone	Liver		Lung	Kidney
1.4E2	³ H, ⁹⁹ Tc, ¹²⁹ I	1.3E1	2.3E2	2.6E4	1.4E4	5.4E2	8.0E2	9.6E0	1.9E1	GI-LLI: 100% ⁹⁹ Tc
5.4E2	¹⁴ C	9.0E-3	7.1E4	4.3E4	7.0E4	3.5E5	7.0E4	7.0E4	7.0E4	Bone: 100% ¹⁴ C
1.2E3	⁹³ Mo	8.0E-7	6.4E-1	3.8E0	4.5E-7	4.5E-7	2.4E1	4.5E-7	4.5E-7	Liver: 100% ⁹⁹ Mo
4.5E3	⁴¹ Ca, ⁷⁹ Se, ⁹⁰ Sr, ²³⁷ Np	3.1E2	1.4E3	2.1E3	2.7E2	1.2E4	3.8E3	2.7E2	2.7E2	Bone: 96% ²³⁷ Np+D
1.5E4	¹⁰ Be, ⁶⁰ Co, ¹⁵⁹ Ni	3.0E-2	6.1E1	2.7E1	2.6E-2	3.6E2	1.3E2	2.6E-2	4.0E-2	Bone: ~100% ⁵⁹ Ni
2.2E4	⁸⁷ Rb, ²²⁶ Ra	1.9E-2	1.7E-1	1.5E-1	1.6E-2	1.2E0	1.8E-1	1.6E-2	3.0E-2	Bone: 38% ²³⁷ Np+D, 32% ²²⁹ Th, 17% ²²⁵ Ra+D
4.4E4	¹³⁵ Cs	1.9E-2	4.0E2	2.3E1	1.4E-2	1.1E3	9.7E2	7.3E2	2.4E-2	Bone: 99% ¹³⁵ Cs
4.8E4	¹⁰⁷ Pd, ¹²⁶ Sn	2.0E3	2.0E3	5.3E3	1.8E3	1.2E4	2.0E3	1.8E3	1.8E3	Bone: ~100% ¹²⁶ Sn+D
1.1E5	¹⁶⁶ Mn	4.5E-1	5.6E1	9.0E-1	3.9E-2	1.1E2	8.8E0	3.9E-2	4.5E-2	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
1.4E5	²⁴⁷ Cm	7.9E-1	1.0E2	1.6E0	6.8E-2	2.1E2	1.6E1	6.8E-2	1.2E-1	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
4.3E5	⁹³ Zr, ^{113m} Cd, ²⁴³ Am, ²⁴⁴ Pu	3.3E0	4.6E3	2.5E3	2.8E0	9.2E3	7.3E2	2.8E0	5.9E0	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
6.2E5	²³⁸ U	3.9E1	4.9E4	7.9E2	3.2E1	9.9E4	7.8E3	3.2E1	2.4E2	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
7.2E5	²³¹ Pa	2.3E1	3.3E4	4.7E2	2.0E1	6.5E4	5.0E3	2.0E1	2.0E1	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
2.2E6	²³² Th	4.6E-4	1.1E-2	6.6E-2	4.1E-4	1.8E-1	5.6E-3	4.1E-4	4.1E-4	Bone: 46% ²³² Th+D, 34% ²²⁴ Ra+D, 20% ²²⁸ Th+D

*LST020 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 5. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.3%/Yr Path Length: 1 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
1.2E2	³ H, ⁹⁹ Tc, ¹²⁹ I	1.3E1	2.4E2	2.6E4	1.4E4	5.4E2	8.1E2	1.9E1	2.8E1	GI-LLI: 100% ⁹⁹ Tc; Thyroid: 100% ¹²⁹ I
2.5E2	¹⁴ C	1.3E1	7.4E4	7.0E4	8.7E4	3.7E5	7.4E4	7.4E4	7.4E4	Bone: 100% ¹⁴ C
4.7E2	⁹³ Mo	9.5E-3	7.1E4	4.3E4	7.1E4	3.6E5	7.1E4	7.1E4	7.1E4	Bone: 100% ¹⁴ C
1.6E3	⁴¹ Ca, ⁷⁹ Se, ⁹⁰ Sr, ²³⁷ Np	2.9E2	1.3E3	2.0E3	2.6E2	1.1E4	3.8E3	2.6E2	2.6E2	Bone: 96% ²³⁷ Np+D
5.0E3	¹⁰ Be, ⁵⁹ Ni, ⁶⁰ Co	2.0E-1	6.6E1	3.0E1	1.7E-1	4.0E2	1.4E2	1.7E-1	1.9E-1	Bone: 98% ⁵⁹ Ni
7.4E3	²²⁶ Ra	6.1E-2	9.1E0	4.5E-1	5.3E-2	2.1E1	1.7E0	5.3E-2	6.7E-2	Bone: 82% ²²⁶ Ra+D, 9% ²³⁷ Np+D
7.5E3	⁸⁷ Rb	7.1E-2	3.6E1	7.9E-1	6.2E-2	2.3E1	5.8E0	6.2E-2	7.6E-2	Bone: 90% ²²⁶ Ra+D, 5% ²¹⁰ Pb+D
1.5E4	¹³⁵ Cs	2.1E0	3.5E3	6.7E1	2.0E0	7.3E3	1.5E3	7.3E2	2.0E0	Bone: 79% ²²⁶ Ra+D, 15% ¹³⁵ Cs
1.6E4	¹⁰⁷ Pd, ¹²⁶ Sn	2.5E3	6.4E3	6.6E3	2.3E3	2.2E4	3.1E3	2.2E3	2.2E3	Bone: 65% ¹²⁶ Sn+D, 32% ²²⁶ Ra+D
3.6E4	¹⁶⁶ Mn	8.3E0	1.2E4	1.7E2	7.5E0	2.4E4	1.9E3	7.5E0	7.5E0	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
4.8E4	²⁴⁷ Cm	2.0E1	1.8E4	3.7E2	1.6E1	3.6E4	3.1E3	1.6E1	1.9E2	Bone: 90% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
1.4E5	⁹³ Zr, ¹¹³ Md, ²⁴³ Am, ²⁴⁴ Pu	5.6E1	7.7E4	6.2E3	4.8E1	1.6E5	1.2E4	4.8E1	1.2E2	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
2.1E5	²³⁸ U	1.3E2	1.6E5	2.5E3	1.1E2	3.3E5	2.6E4	1.1E2	5.9E2	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
2.4E5	²³¹ Pa	8.2E1	1.1E5	1.6E3	7.1E1	2.2E5	1.8E4	7.1E1	7.1E1	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
7.2E5	²³² Th	2.7E-3	2.6E0	1.5E-1	2.4E-3	5.5E0	4.1E-1	2.4E-3	2.4E-3	Bone: 88% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D

*LST012 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 6. Summary of 50 Year Accumulated Dose to Maximum Individual*
 Time of Initial Release After Yr-2000: 100 Yr
 Leach Rate: 0.3%/Yr Path Length: 0.3 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
1.0E2	^3H , ^{99}Tc , ^{129}I	1.3E1	2.5E2	2.6E4	1.4E4	5.4E2	8.2E2	2.7E1	3.7E1	GI-LLI: 100% ^{99}Tc
1.4E2	^{14}C	1.3E1	7.4E4	7.0E4	8.8E4	3.7E5	7.5E4	7.5E4	7.5E4	Bone: 100% ^{14}C
2.1E2	^{93}Mo	1.3E1	7.4E4	7.0E4	8.7E4	3.7E5	7.4E4	7.4E4	7.4E4	Bone: 100% ^{14}C
5.4E2	^{90}Sr , ^{41}Ca , ^{79}Se , ^{237}Np	3.1E2	2.5E4	4.5E3	2.7E2	1.1E5	3.9E3	2.7E2	2.7E2	Bone: 89% ^{90}Sr , 11% $^{237}\text{Np}+\text{D}$
1.6E3	^{10}Be , ^{59}Ni	6.5E0	8.5E1	6.5E1	6.0E1	6.6E2	1.7E2	6.0E0	6.0E0	Bone: 61% ^{59}Ni , 38% $^{237}\text{Np}+\text{D}$
1.7E3	^{60}Co	4.6E0	7.9E1	5.4E1	4.0E0	5.8E2	1.6E2	4.0E0	4.0E0	Bone: 70% ^{59}Ni , 30% $^{237}\text{Np}+\text{D}$
2.3E3	^{226}Ra	2.2E0	4.2E1	1.2E1	1.9E0	1.3E2	1.5E1	1.9E0	1.9E0	Bone: 64% $^{237}\text{Np}+\text{D}$, 31% $^{226}\text{Ra}+\text{D}$
2.4E3	^{87}Rb	1.9E0	2.9E2	1.3E1	1.7E0	6.5E2	5.4E1	1.7E0	1.7E0	Bone: 84% $^{226}\text{Ra}+\text{D}$, 9% $^{237}\text{Np}+\text{D}$
4.5E3	^{135}Cs	3.4E0	5.0E3	9.0E1	2.9E0	1.0E4	1.7E3	7.3E2	2.8E0	Bone: 83% $^{226}\text{Ra}+\text{D}$, 11% ^{135}Cs
5.0E3	^{107}Pd , ^{126}Sn	2.7E3	8.3E3	7.1E3	2.4E3	2.6E4	3.6E3	2.4E3	2.4E3	Bone: 58% $^{126}\text{Sn}+\text{D}$, 38% $^{226}\text{Ra}+\text{D}$
1.1E4	$^{166}\text{M}_\text{Ho}$	1.3E1	1.8E4	2.5E2	1.1E1	3.5E4	2.8E3	1.1E1	1.2E1	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
1.5E4	^{247}Cm	1.5E2	2.6E4	2.6E3	1.2E2	6.5E4	1.1E4	1.2E2	3.3E3	Bone: 71% $^{226}\text{Ra}+\text{D}$, 12% $^{245}\text{Cm}+\text{D}$, 9% ^{241}Am
4.4E4	^{93}Zr , $^{113}\text{M}_\text{Cd}$, ^{243}Am , ^{244}Pu	2.1E2	2.1E4	1.5E4	1.6E2	6.7E4	1.0E4	1.6E2	2.1E3	Bone: 56% $^{226}\text{Ra}+\text{D}$, 26% ^{239}Pu , 12% $^{243}\text{Am}+\text{D}$
6.2E4	^{238}U	3.9E2	3.3E5	1.0E4	3.3E2	7.1E5	5.3E4	3.1E2	1.9E3	Bone: 86% $^{226}\text{Ra}+\text{D}$, 5% ^{229}Th
7.3E4	^{231}Pa	4.2E2	5.6E5	7.7E3	3.5E2	1.1E6	8.7E4	3.5E2	3.5E2	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
2.2E5	^{232}Th	8.7E-2	8.7E1	1.4E0	7.5E-2	1.7E2	1.4E1	7.5E-2	7.5E-2	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$

*LST018 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 7. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.3%/Yr Path Length: 0.1 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
1.0E2	³ H, ⁹⁹ Tc, ¹²⁹ I	1.3E1	2.5E2	2.6E4	1.4E4	5.4E2	8.2E2	2.7E1	3.7E1	GI-LLI: 100% ⁹⁹ Tc
1.2E2	¹⁴ C	1.3E1	7.4E4	7.0E4	8.8E4	3.7E5	7.5E4	1.8E1	2.8E1	Bone: 100% ¹⁴ C
1.4E2	⁹³ Mo	1.3E1	7.4E4	7.0E4	8.8E4	3.7E5	7.5E4	1.0E1	2.0E1	Bone: 100% ¹⁴ C
2.5E2	⁴¹ Ca, ⁷⁹ Se, ⁹⁰ Sr, ²³⁷ Np	3.2E2	2.6E7	2.6E6	8.8E4	1.0E8	7.8E4	2.6E2	2.7E2	Bone: 100% ⁹⁰ Sr
5.8E2	⁶⁰ Co	1.8E1	1.5E2	1.4E2	1.5E1	2.6E3	3.0E2	1.5E1	1.5E1	Bone: 64% ⁶³ Ni, 25% ²³⁷ Np+D
6.0E2	¹⁰ Be, ⁵⁹ Ni	1.7E1	1.8E2	1.5E2	1.5E1	3.1E3	3.6E2	1.5E1	1.5E1	Bone: 66% ⁶³ Ni, 21% ²³⁷ Np+D, 13% ⁵⁹ Ni
8.4E2	²²⁶ Ra	1.2E1	1.9E2	9.8E1	1.0E1	1.3E3	2.3E2	1.0E1	1.0E1	Bone: 33% ²³⁷ Np+D, 31% ⁵⁹ Ni, 29% ⁶³ Ni
9.9E2	⁸⁷ Rb	9.8E0	6.1E2	5.6E1	8.3E0	1.6E3	1.3E2	8.3E0	8.4E0	Bone: 68% ²²⁶ Ra+D, 22% ²³⁷ Np+D
1.6E3	¹³⁵ Cs	6.9E0	5.2E3	1.2E2	6.0E0	1.1E4	1.7E3	7.3E2	6.0E0	Bone: 83% ²²⁶ Ra+D, 10% ¹³⁵ Cs
1.8E3	¹²⁶ Sn, ¹⁰⁷ Pd	2.7E3	9.1E3	7.3E3	2.5E3	2.9E4	4.7E3	3.1E3	2.4E3	Bone: 56% ¹²⁶ Sn+D, 37% ²²⁶ Ra+D
3.8E3	¹⁶⁶ MHo	1.5E1	2.0E4	2.9E2	1.3E1	4.1E4	3.2E3	1.3E1	1.3E1	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
5.1E3	²⁴⁷ Cm	3.0E2	3.1E4	5.5E3	2.4E2	9.4E4	2.0E4	2.4E2	7.2E3	Bone: 59% ²²⁶ Ra+D, 19% ²⁴⁵ Cm+D, 15% ²⁴¹ Am
1.5E4	⁹³ Zr, ²⁴³ Am, ²⁴⁴ Pu, ¹¹³ Mcd	3.8E3	1.2E5	6.9E4	3.2E3	4.3E5	1.1E5	3.2E3	9.5E3	Bone: 41% ²⁴³ Am+D, 43% ²²⁶ Ra+D, 9% ²³⁹ Pu
2.1E4	²³⁸ U	1.4E2	8.2E4	1.8E3	1.2E2	1.7E5	1.3E4	1.2E2	2.3E3	Bone: 87% ²²⁶ Ra+D, 5% ²³⁴ U
2.4E4	²³¹ Pa	1.1E2	7.5E4	2.5E3	9.1E1	1.5E5	1.2E4	9.1E1	9.1E1	Bone: 88% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
7.3E4	²³² Th	8.5E-1	7.6E2	1.1E1	7.4E-1	1.5E3	1.2E2	7.4E-1	7.4E-1	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D

*LST013 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 8. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.3%/Yr Path Length: 0 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
1.0E2	A17	1.2E7	9.7E8	1.3E8	9.7E6	3.6E9	1.6E8	9.6E6	6.7E7	Bone: 96% ⁹⁰ Sr

*LST017 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 9. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.03%/Yr Path Length: 10 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
2.5E2	^3H , ^{99}Tc , ^{129}I	1.3E0	2.3E1	2.6E3	1.4E3	5.4E1	8.0E0	7.5E-1	1.7E0	GI-LLI: 100% ^{99}Tc
1.6E3	^{14}C	8.0E-4	6.2E3	3.8E3	6.2E3	3.1E4	6.2E3	---	---	Bone: 100% ^{14}C
3.7E3	^{93}Mo	6.5E-4	4.8E3	2.9E3	4.8E3	2.4E4	4.8E3	2.5E-8	2.5E-8	Bone: 100% ^{14}C
1.5E4	^{41}Ca , ^{79}Se , ^{237}Np , ^{90}Sr	3.0E1	1.3E2	2.0E2	2.6E1	1.1E3	3.4E2	2.6E1	2.6E1	Bone: 96% $^{237}\text{Np}+\text{D}$
4.9E4	^{10}Be , ^{59}Ni , ^{60}Co	8.6E-3	4.6E0	2.0E0	7.2E-3	2.7E1	9.4E0	7.2E-3	1.9E-2	Bone: 98% ^{59}Ni
7.3E4	^{226}Ra , ^{87}Rb	5.3E-3	4.2E-2	4.6E-2	4.4E-3	4.0E-1	2.3E-2	4.4E-3	1.5E-2	Bone: 55% ^{229}Th , 30% $^{225}\text{Ra}+\text{D}$
1.4E5	^{135}Cs	4.2E-3	3.8E1	2.3E0	3.3E-3	1.0E2	9.7E1	7.2E1	1.1E-2	Bone, Liver, Lung: 100% ^{135}Cs
1.6E5	^{107}Pd , ^{126}Sn	9.0E1	9.3E1	2.8E2	8.3E1	5.3E2	9.8E1	8.0E1	8.0E1	Bone: 100% $^{126}\text{Sn}+\text{D}$
3.6E5	$^{166}\text{M}_\text{Ho}$	1.5E-3	1.6E-2	2.0E-2	1.3E-3	1.8E-1	4.4E-3	1.3E-3	4.2E-3	Bone: 60% ^{229}Th , 33% $^{225}\text{Ra}+\text{D}$
4.8E5	^{247}Cm	9.9E-4	9.8E-3	1.2E-2	7.9E-4	1.1E-1	3.7E-3	7.9E-4	2.5E-3	Bone: 59% ^{229}Th , 32% $^{225}\text{Ra}+\text{D}$
1.4E6	^{93}Zr , $^{113}\text{M}_\text{Cd}$, ^{243}Am , ^{244}Pu	2.5E-3	5.5E-1	4.3E2	3.4E-4	5.1E0	1.2E0	3.4E-4	1.9E-1	GI-LLI: 100% $^{93}\text{M}_\text{Nb}$; Bone 55% $^{93}\text{M}_\text{Nb}$, 36% ^{242}Pu
2.1E6	^{238}U	9.0E-1	1.2E3	2.4E1	7.3E-1	2.4E3	2.2E2	7.3E-1	7.9E0	Bone: 90% $^{226}\text{Ra}+\text{D}$, 5% $^{210}\text{Pb}+\text{D}$
2.4E6	^{231}Pa	2.4E-2	3.3E1	5.7E-1	2.1E-2	6.5E1	6.2E0	2.1E-2	2.4E-2	Bone: 91% $^{226}\text{Ra}+\text{D}$, 5% $^{210}\text{Pb}+\text{D}$
7.2E6	^{232}Th	2.5E-4	6.2E-3	3.7E-2	2.2E-4	9.5E-2	3.1E-3	2.2E-4	2.2E-4	Bone: 44% $^{232}\text{Th}+\text{D}$, 35% $^{224}\text{Ra}+\text{D}$, 21% $^{228}\text{Th}+\text{D}$

*LST009 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 10. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.003%/Yr Path Length: 10 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
2.5E2	^3H , ^{99}Tc , ^{129}I	1.3E-1	2.3E0	2.6E2	1.4E2	5.4E0	8.0E0	7.5E-2	1.7E-1	GI-LLI: 100% ^{99}Tc
1.7E3	^{14}C	8.0E-5	6.1E2	3.7E2	6.1E2	3.0E3	6.1E2	---	---	Bone: 100% ^{14}C
3.9E3	^{93}Mo	6.0E-5	4.7E2	2.9E2	4.7E2	2.4E3	4.7E2	2.4E-9	2.4E-9	Bone: 100% ^{14}C
1.5E4	^{41}Ca , ^{79}Se , ^{237}Np	3.3E0	1.4E2	9.7E1	1.3E2	7.5E2	1.6E2	2.9E0	2.9E0	Bone: 83% ^{14}C , 16% $^{237}\text{Np}+\text{D}$
3.1E4	^{90}Sr	2.9E0	2.9E1	2.9E1	2.0E1	2.2E2	4.8E1	2.5E0	2.5E0	Bone: 54% $^{237}\text{Np}+\text{D}$, 44% ^{14}C
4.8E4	^{10}Be , ^{59}Ni	7.7E-3	5.0E-1	2.6E-1	6.4E-3	3.2E0	9.6E-1	6.4E-3	1.8E-2	Bone: 83% ^{59}Ni , 8% ^{229}Th
6.5E4	^{60}Co	6.2E-3	4.4E-1	2.3E-1	5.1E-3	2.8E0	8.3E-1	5.1E-3	1.6E-2	Bone: 83% ^{59}Ni , 9% ^{229}Th
7.3E4	^{226}Ra	5.7E-3	4.1E-1	2.2E-1	4.7E-3	2.7E0	7.8E-1	4.7E-3	1.6E-2	Bone: 82% ^{59}Ni , 10% ^{229}Th
8.9E4	^{87}Rb	5.1E-3	4.3E-2	5.2E-2	4.1E-3	4.5E-1	1.3E-2	4.1E-3	1.4E-2	Bone: 57% ^{229}Th , 32% $^{225}\text{Ra}+\text{D}$, 10% ^{233}U
1.4E5	^{135}Cs	4.0E-3	3.9E0	2.7E-1	3.3E-3	1.1E1	9.7E0	7.2E0	1.1E-2	Body, Bone, Liver, Lung: ~100% ^{135}Cs
1.6E5	^{107}Pd , ^{126}Sn	9.0E0	1.3E1	2.8E1	8.3E0	6.4E1	1.9E1	1.5E1	8.0E0	Bone: 83% $^{126}\text{Sn}+\text{D}$, 16% ^{135}Cs
3.8E5	^{166}M ^{166}Ho	1.4E-3	1.5E-2	1.8E-2	1.2E-3	1.6E-1	3.9E-3	1.2E-3	4.0E-3	Bone: 60% ^{229}Th , 32% $^{225}\text{Ra}+\text{D}$
4.8E5	^{247}Cm	9.1E-4	9.3E-3	1.1E-2	7.8E-4	9.9E-2	2.6E-3	7.8E-4	2.6E-3	Bone: 60% ^{229}Th , 32% $^{225}\text{Ra}+\text{D}$
1.5E6	^{93}Zr , ^{113}M ^{113}Cd , ^{243}Am , ^{244}Pu	4.3E-4	2.8E-1	4.9E1	1.8E-4	1.0E0	1.8E-1	1.8E-4	2.1E-2	GI-LLI: 100% ^{93}M ^{93}Nb ; Bone: 45% $^{226}\text{Ra}+\text{D}$, 31% ^{93}M ^{93}Nb , 19% ^{242}Pu
2.1E6	^{238}U	7.1E-1	1.0E3	1.7E1	6.3E-1	2.0E3	1.9E2	6.3E-1	1.6E0	Bone: 91% $^{226}\text{Ra}+\text{D}$, 5% $^{210}\text{Pb}+\text{D}$
2.4E6	^{231}Pa	2.2E-2	3.2E1	5.3E-1	1.9E-2	6.3E1	5.8E0	1.9E-2	2.2E-2	Bone: 91% $^{226}\text{Ra}+\text{D}$, 5% $^{210}\text{Pb}+\text{D}$
7.2E6	^{232}Th	9.3E-5	2.3E-3	1.4E-2	8.2E-5	3.6E-2	1.2E-3	8.2E-5	8.2E-5	Bone: 45% $^{232}\text{Th}+\text{D}$, 35% $^{224}\text{Ra}+\text{D}$, 21% $^{228}\text{Th}+\text{D}$

*LST010 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 11. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.0003%/Yr Path Length: 10 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
2.5E2	³ H, ⁹⁹ Tc, ¹²⁹ I	1.3E-2	2.3E-1	2.6E-1	1.4E-1	5.4E-1	8.0E-1	7.5E-3	1.7E-2	GI-LLI: 100% ⁹⁹ Tc
2.0E3	¹⁴ C	1.3E-2	5.9E1	6.1E1	7.3E1	3.0E2	6.0E1	7.5E-3	1.7E-2	Bone: 100% ¹⁴ C
4.0E3	⁹³ Mo	1.3E-2	4.5E1	5.3E1	5.9E1	2.2E2	4.6E1	7.5E-3	1.7E-2	Bone: 100% ¹⁴ C
1.6E4	⁴¹ Ca, ⁷⁹ Se, ²³⁷ Np	3.0E-1	1.2E1	3.3E1	2.5E+1	6.4E1	1.5E1	2.6E-1	2.7E-1	Bone: 82% ¹⁴ C, 17% ²³⁷ Np+D
5.0E4	¹⁰ Be, ⁵⁹ Ni	3.0E-1	1.5E0	2.5E1	1.5E+1	1.3E1	3.7E0	2.6E-1	2.7E-1	Bone: 84% ²³⁷ Np+D
7.4E4	⁸⁷ Rb	2.9E-1	1.3E0	2.4E1	1.4E1	1.2E1	3.1E0	2.5E-1	2.6E-1	Bone: 90% ²³⁷ Np+D
1.5E5	¹³⁵ Cs	2.9E-1	1.4E0	2.0E1	1.4E1	1.2E1	3.2E0	9.6E-1	2.6E-1	Bone: 84% ²³⁷ Np+D, 8% ¹³⁵ Cs
1.6E5	¹⁰⁷ Pd, ¹²⁶ Sn	1.2E0	2.3E0	2.2E1	1.5E0	1.7E1	4.1E0	1.8E0	1.1E0	Bone: 59% ²³⁷ Np+D, 30% ¹²⁶ Sn+D
1.8E5	⁹⁰ Sr	1.0E0	2.2E0	2.0E1	1.5E1	1.7E1	3.9E0	1.7E0	9.6E-1	Bone: 62% ²³⁷ Np+D, 27% ¹²⁶ Sn+D
2.2E5	⁶⁰ Co	8.8E-1	1.9E0	1.8E1	1.5E1	1.5E1	3.5E0	1.5E0	8.1E-1	Bone: 65% ²³⁷ Np+D, 24% ¹²⁶ Sn+D
2.4E5	²²⁶ Ra	7.7E-1	1.7E0	3.3E0	7.1E-1	1.5E1	2.8E0	1.4E0	7.1E-1	Bone: 69% ²³⁷ Np+D, 21% ¹²⁶ Sn+D
4.8E5	²⁴⁷ Cm	9.7E-2	1.2E-1	7.9E-1	8.9E-2	7.6E-1	1.8E-1	8.7E-2	9.0E-2	Bone: 75% ¹²⁶ Sn+D, 8% ²²⁵ Ra+D
5.3E5	¹⁶⁶ Ho	1.5E-3	1.5E-2	1.8E-2	1.2E-3	1.6E-1	4.0E-3	1.2E-3	4.1E-3	Bone: 59% ²²⁹ Th, 33% ²²⁵ Ra+D
1.4E6	⁹³ Zr, ²⁴⁴ Pu	9.8E-5	7.2E-2	4.9E0	6.4E-5	2.0E-1	2.6E-2	6.4E-5	2.2E-3	GI-LLI: 100% ^{93M} Nb Bone: 66% ²²⁶ Ra+D, 16% ^{93M} Nb
1.6E6	^{113M} Cd, ²⁴³ Am	4.2E-4	5.4E-1	4.4E0	3.5E-4	1.1E0	1.1E-1	3.5E-4	1.9E-3	GI-LLI: 100% ^{93M} Nb Bone: 88% ²²⁶ Ra+D
2.1E6	²³⁸ U	1.8E-1	2.5E2	4.3E0	1.5E-1	5.0E2	4.7E1	1.5E-1	2.5E-1	Bone: 91% ²²⁶ Ra+D
2.4E6	²³¹ Pa	1.2E-1	1.8E2	2.9E0	1.1E-1	3.5E2	3.2E1	1.1E-1	1.1E-1	Bone: 91% ²²⁶ Ra
7.3E6	²³² Th	9.3E-6	2.4E-4	1.4E-3	8.2E-6	3.6E-3	1.2E-4	8.2E-6	8.2E-6	Bone: 45% ²³² Th+D, 35% ²²⁴ Ra+D, 21% ²²⁸ Th+D

*LST011 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

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*LST014 Dose Input File

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 13. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.003%/Yr Path Length: 0.1 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
1.0E2	^3H , ^{99}Tc , ^{129}I	3.0E0	7.3E2	7.1E2	8.6E2	3.7E3	7.6E2	7.6E2	7.6E2	Bone: 96% ^{14}C
2.5E2	^{90}Sr	3.2E0	2.6E5	2.6E4	8.4E2	1.0E6	7.5E2	7.5E2	7.5E2	Bone: 99% ^{90}Sr
5.0E2	^{14}C , ^{93}Mo	3.0E0	1.4E3	7.7E2	8.5E2	6.5E3	7.6E2	7.6E2	7.6E2	Bone: 55% ^{14}C , 43% ^{90}Sr
6.0E2	^{60}Co , ^{79}Se , ^{41}Ca , ^{237}Np , ^{10}Be , ^{59}Ni	3.0E0	7.7E2	7.1E2	8.4E2	3.8E3	7.5E2	7.5E2	7.5E2	Bone: 91% ^{14}C , 6% ^{90}Sr
1.2E3	^{226}Ra , ^{87}Rb	3.1E0	6.9E2	6.7E2	7.9E2	3.4E3	7.0E2	7.0E2	7.0E2	Bone: 95% ^{14}C
1.7E3	^{135}Cs	3.0E1	7.3E2	7.2E2	7.8E2	3.5E3	7.2E2	7.2E2	7.2E2	Bone: 87% ^{14}C , 5% $^{126}\text{Sn}+\text{D}$
1.5E3	^{107}Pd , ^{126}Sn	3.0E1	7.4E2	7.1E2	7.6E2	3.6E3	7.0E2	7.0E2	7.0E2	Bone: 84% ^{14}C , 8% $^{226}\text{Ra}+\text{D}$ 5% $^{126}\text{Sn}+\text{D}$
3.8E3	$^{166}\text{M}_\text{Ho}$	3.0E1	1.5E3	6.4E2	6.4E2	4.6E3	7.1E2	7.1E2	7.1E2	Bone: 51% ^{14}C , 39% $^{226}\text{Ra}+\text{D}$
5.3E3	^{247}Cm	3.4E1	2.7E3	6.7E2	6.6E2	7.0E3	9.8E2	3.7E1	9.9E1	Bone: 58% $^{226}\text{Ra}+\text{D}$, 29% ^{14}C
1.5E4	^{93}Zr , ^{243}Am , ^{244}Pu	8.5E1	2.3E4	1.4E3	3.3E2	4.7E4	4.7E3	2.8E1	1.8E2	Bone: 86% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$, 4% $^{243}\text{Am}+\text{D}$
2.2E4	^{238}U	8.1E1	4.4E4	1.5E3	2.6E2	9.2E4	7.7E3	6.9E1	1.8E2	Bone: 90% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
2.5E4	^{231}Pa	8.5E1	5.6E4	1.5E3	2.4E2	1.1E5	9.3E3	8.1E1	1.8E2	Bone: 91% $^{226}\text{Ra}+\text{D}$, 5% $^{210}\text{Pb}+\text{D}$
3.1E4	$^{113}\text{M}_\text{Cd}$	9.6E1	8.2E4	1.8E3	2.2E2	1.7E5	1.3E4	9.0E1	1.5E2	Bone: 92% $^{226}\text{Ra}+\text{D}$, 5% $^{210}\text{Pb}+\text{D}$
7.6E4	^{232}Th	1.2E1	1.6E4	2.2E2	1.0E1	3.2E4	2.5E3	1.0E1	1.0E1	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$

*LST015 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 14. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.0003%/Yr Path Length: 0.1 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-III	Thyroid	Bone	Liver	Lung	Kidney	
1.0E2	³ H, ⁹⁹ Tc, ¹²⁹ I	3.0E-1	4.8E1	5.5E1	6.0E1	2.4E2	5.0E1	5.0E1	5.0E1	Bone: 95% ¹⁴ C
2.5E2	⁹⁰ Sr	3.2E-1	2.5E4	2.5E3	6.0E1	1.0E5	5.0E1	5.0E1	5.0E1	Bone: ~100% ⁹⁰ Sr
5.9E2	⁶⁰ Co	3.0E-1	5.6E1	5.6E1	6.0E1	2.8E2	5.1E1	5.1E1	5.1E1	Bone: 83% ¹⁴ C, 12% ⁹⁰ Sr
6.4E2	⁵⁹ Ni	3.0E-1	6.0E1	5.6E1	6.0E1	2.5E2	5.1E1	5.1E1	5.1E1	Bone: 91% ¹⁴ C, 4% ²³⁷ Np+D, 4% ⁹⁰ Sr
8.2E2	⁸⁷ Rb	3.0E-1	5.0E1	5.6E1	6.0E1	2.5E2	5.1E1	5.1E1	5.1E1	Bone: 91% ¹⁴ C, 4% ²³⁷ Np+D, 4% ⁹⁰ Sr
1.6E3	¹³⁵ Cs	3.0E-1	4.8E1	5.5E1	6.0E1	2.4E2	5.2E1	5.2E1	5.2E1	Bone: 94% ¹⁴ C, 4% ²³⁷ Np+D
1.8E3	¹⁰⁷ Pd, ¹²⁶ Sn	3.0E0	5.1E1	6.3E1	6.3E1	2.6E2	5.4E1	5.4E1	5.4E1	Bone: 89% ¹⁴ C, 6% ¹²⁶ Sn+D
4.0E3	¹⁶⁶ Ho, ¹⁴ C, ⁹⁹ Mo	3.0E0	5.1E1	6.2E1	6.3E1	2.6E2	5.4E1	5.4E1	5.4E1	Bone: 89% ¹⁴ C, 6% ¹²⁶ Sn+D
5.1E3	⁷⁹ Se, ¹⁰ Be, ²²⁶ Ra, ⁴¹ Ca, ²³⁷ Np, ²⁴⁷ Cm	3.0E0	4.6E1	5.9E1	5.8E1	2.3E2	5.0E1	5.0E1	5.0E1	Bone: 88% ¹⁴ C, 7% ¹²⁶ Sn+D
1.6E4	²⁴³ Am, ²⁴⁴ Pu, ⁹³ Zr, ¹¹³ M Cd	7.7E0	2.4E3	1.4E2	3.2E1	5.1E3	4.8E2	7.5E0	1.3E1	Bone: 87% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
2.3E4	²³⁸ U	6.1E0	5.3E3	1.5E2	2.4E1	1.1E4	8.8E2	5.2E0	1.2E1	Bone: 91% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
2.6E4	²³¹ Pa	6.5E0	6.4E3	1.5E2	2.3E1	1.3E4	1.0E3	5.7E0	1.3E1	Bone: 91% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D
7.9E4	²³² Th	2.1E1	2.8E4	4.1E2	3.2E1	5.5E4	4.3E3	1.8E1	2.1E1	Bone: 92% ²²⁶ Ra+D, 4% ²¹⁰ Pb+D

*LST016 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 15. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 100 Yr
Leach Rate: 0.0003%/Yr Path Length: 1 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
1.2E2	^3H , ^{99}Tc , ^{129}I	3.0E-1	4.8E1	5.5E1	6.0E1	2.4E2	5.1E1	5.1E1	5.1E1	Bone: 95% ^{14}C
4.1E3	^{14}C , ^{93}Mo	3.0E-1	4.8E1	5.5E1	6.0E1	2.4E2	5.1E1	5.1E1	5.1E1	Bone: 95% ^{14}C
5.1E3	^{41}Ca , ^{79}Se , ^{237}Np	3.0E-1	4.3E1	5.2E1	5.6E1	2.2E2	4.6E1	4.6E1	4.6E1	Bone: 94% ^{14}C
5.2E3	^{10}Be , ^{59}Ni	3.0E-1	4.3E1	5.2E1	5.6E1	2.2E2	4.6E1	4.6E1	4.6E1	Bone: 94% ^{14}C
1.0E4	^{226}Ra	3.0E-1	2.4E1	4.0E1	3.7E1	1.2E2	2.7E1	2.7E1	2.7E1	Bone: 90% ^{14}C , 9% $^{237}\text{Np}+\text{D}$
1.1E4	^{87}Rb	3.1E-1	3.6E1	3.9E1	3.4E1	1.4E2	2.6E1	2.6E1	2.6E1	Bone: 71% ^{14}C , 19% $^{226}\text{Ra}+\text{D}$
1.8E4	^{135}Cs , ^{107}Pd , ^{126}Sn	2.7E0	8.9E1	3.9E1	2.5E1	2.3E2	2.8E1	3.2E0	2.4E0	Bone: 63% $^{226}\text{Ra}+\text{D}$, 19% ^{14}C , 6% $^{126}\text{Sn}+\text{D}$
5.0E4	^{247}Cm	2.7E0	1.1E3	4.3E1	1.7E1	2.2E3	1.8E2	3.1E0	2.6E0	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
1.5E5	^{93}Zr , ^{243}Am , ^{244}Pu	1.0E1	1.2E4	2.0E2	2.0E1	2.5E4	1.9E3	9.4E0	8.9E0	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
2.0E5	$^{166}\text{M}_{\text{Ho}}$	2.1E1	3.0E4	4.1E2	3.2E1	5.7E4	4.5E3	1.9E1	1.8E1	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
2.1E5	^{238}U	2.4E1	3.1E4	4.5E2	3.4E1	6.3E4	4.9E3	2.1E1	2.2E1	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
2.4E5	^{231}Pa	2.9E1	4.1E4	5.7E2	4.0E1	8.2E4	6.5E3	2.7E1	2.7E1	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
3.1E5	$^{113}\text{M}_{\text{Cd}}$	3.4E1	4.9E4	6.7E2	4.5E1	9.7E4	7.7E3	3.1E1	3.2E1	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$
7.3E5	^{232}Th	1.4E1	2.0E4	2.7E2	1.2E1	3.9E4	3.1E3	1.2E1	1.2E1	Bone: 92% $^{226}\text{Ra}+\text{D}$, 4% $^{210}\text{Pb}+\text{D}$

*LST019 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 16. Summary of 50 Year Accumulated Dose to Maximum Individual*
Time of Initial Release After Yr-2000: 10,000
Leach Rate: 0.3%/Yr Path Length: 10 Mile

Years Since Burial	Peak Nuclides	Dose, mrem							Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	
1.0E4	³ H, ⁹⁹ Tc, ¹²⁹ I	1.3E1	2.2E2	2.5E4	1.4E4	5.2E2	7.7E2	7.5E0	GI-LLI: 100% ⁹⁹ Tc
1.1E4	¹⁴ C	2.5E-3	1.9E4	1.1E4	1.9E4	9.4E4	1.9E4	1.9E4	Bone: 100% ¹⁴ C
1.4E4	⁹³ Mo	2.1E-7	1.7E-1	1.0E0	1.2E-7	1.2E-7	6.1E0	1.2E-7	Liver: 100% ⁹³ Mo
2.5E4	⁹⁰ Sr, ⁴¹ Ca, ⁷⁹ Se, ²³⁷ Np	3.5E2	1.4E3	2.2E3	3.0E2	1.3E4	3.4E3	3.0E2	Bone: 97% ²³⁷ Np+D
5.8E4	⁵⁹ Ni, ¹⁰ Be, ⁶⁰ Co	8.9E-3	4.2E1	1.8E1	7.1E-3	2.5E2	8.7E1	7.1E-3	Bone: 100% ⁵⁹ Ni
8.2E4	⁸⁷ Rb, ²²⁶ Ra	5.8E-3	7.2E-2	4.8E-2	4.8E-3	3.6E-1	1.2E-1	4.8E-3	Bone: 53% ²²⁹ Th, 29% ²²⁵ Ra+D, 15% ²³³ U
1.6E5	¹³⁵ Cs	6.5E-3	3.3E2	1.9E1	3.8E-3	8.7E2	8.4E2	6.3E2	Bone: 100% ¹³⁵ Cs
1.7E5	¹²⁶ Sn, ¹⁰⁷ Pd	7.0E2	7.6E2	2.3E3	6.7E2	4.3E3	8.0E2	6.5E2	Bone: 100% ¹²⁶ Sn+D
4.9E5	²⁴⁷ Cm	1.3E-3	1.1E-2	1.4E-2	1.1E-3	1.2E-1	7.0E-3	1.1E-3	Bone: 55% ²²⁹ Th, 30% ²²⁵ Ra+D
1.5E6	²⁴⁴ Pu, ⁹³ Zr, ^{113M} Cd, ²⁴³ Am	3.6E-3	8.6E-1	6.6E2	5.2E-4	7.6E0	1.8E0	5.2E-4	Bone: 55% ^{93M} Nb, 35% ²⁴² Pu
2.1E6	²³⁸ U	1.2E0	1.7E3	2.9E1	1.0E0	3.4E3	3.0E2	1.0E0	Bone: 91% ²²⁶ Ra+D, 5% ²¹⁰ Pb+D
7.2E6	²³² Th	2.5E-4	6.2E-3	3.7E-2	2.2E-4	9.5E-2	3.1E-3	2.2E-4	Bone: 44% ²³² Th+D, 35% ²²⁴ Ra+D, 21% ²²⁸ Th+D

*LST004 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 17. Summary of 50 Year Accumulated Dose to Maximum Individual*
 Time of Initial Release After Yr-2000: 100,000
 Leach Rate: 0.3%/Yr Path Length: 10 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
1.0E5	^3H , ^{99}Tc , ^{129}I	1.3E1	1.7E2	1.8E4	1.4E4	3.9E2	5.8E2	7.5E0	1.7E1	GI-LLI: 100% ^{99}Tc
1.01E5	^{14}C	4.6E-8	3.5E-1	2.1E-1	3.5E-1	1.8E0	3.5E-1	3.5E-1	3.5E-1	Bone: 100% ^{14}C
1.2E5	^{90}Sr , ^{41}Ca , ^{79}Se , ^{237}Np	3.3E2	1.0E3	1.9E3	2.9E2	1.3E4	2.2E3	2.9E2	2.9E2	Bone: 98% $^{237}\text{Np}+\text{D}$
1.5E5	^{59}Ni , ^{60}Co , ^{10}Be	5.9E-3	1.9E1	8.5E0	5.0E-3	1.1E2	4.0E1	5.0E-3	1.8E-2	Bone: 100% ^{59}Ni
2.4E5	^{135}Cs	6.4E-3	3.3E2	1.9E1	3.6E-3	8.7E2	8.4E2	6.1E2	1.2E-2	Bone, Liver: 100% ^{135}Cs
2.6E5	^{126}Sn , ^{107}Pd	3.9E2	4.1E2	1.1E3	3.6E2	2.3E3	4.7E2	3.5E2	3.5E2	Bone: 100% $^{126}\text{Sn}+\text{D}$
2.17E6	^{238}U	1.1E0	1.4E3	2.6E1	9.5E-1	2.9E3	2.5E2	9.5E-1	9.9E0	Bone: 90% $^{226}\text{Ra}+\text{D}$, 5% $^{210}\text{Pb}+\text{D}$

*LST005 Dose Input file

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

TABLE 18. Summary of 50 Year Accumulated Dose to Maximum Individual*
 Time of Initial Release After Yr-2000: 1,000,000
 Leach Rate: 0.3%/Yr Path Length: 10 Mile

Years Since Burial	Peak Nuclides	Dose, mrem								Remarks
		Skin	Body	GI-LLI	Thyroid	Bone	Liver	Lung	Kidney	
1.0E6	^3H , ^{99}Tc , ^{129}I	1.3E1	2.7E1	9.8E2	1.4E4	3.2E1	4.1E1	7.5E0	1.6E1	Thyroid: 100% ^{129}I
1.01E6	^{41}Ca , ^{79}Se , ^{90}Sr , ^{237}Np	2.5E2	5.9E2	1.3E3	2.2E2	9.3E3	1.0E3	2.2E2	2.2E2	Bone: 100% $^{237}\text{Np}+\text{D}$
1.05E6	^{10}Be , ^{60}Co , ^{59}Ni	4.2E-3	2.6E-2	2.5E-2	3.4E-3	2.2E-1	2.2E-2	3.4E-3	1.2E-2	Bone: 38% ^{229}Th , 21% ^{59}Ni , 21% $^{225}\text{Ra}+\text{D}$, 20% ^{233}U
1.14E6	^{135}Cs	4.9E-3	2.7E2	1.6E1	2.7E-3	7.2E2	6.5E2	5.0E2	9.2E-3	Bone: 100% ^{135}Cs
1.16E6	^{107}Pd , ^{126}Sn	7.5E-1	5.3E0	4.3E2	7.3E-1	4.8E0	7.0E1	7.0E-1	7.1E-1	GI-LLI: 100% ^{107}Pd
3.07E6	^{238}U	5.6E-1	5.7E2	1.3E1	4.6E-1	9.3E2	1.1E2	4.6E-1	8.8E0	Bone: 85% $^{226}\text{Ra}+\text{D}$, 7% $^{210}\text{Pb}+\text{D}$

*LST006 Dose Input File

Background: 6000 mrem

NCRP Radiation Limit for Organs: 75,000 mrem

FIGURE 6. The Effect of Path Length on the Bone Dose Versus Time Curve

(17,000 times background). At a 1-mile path length the bone doses are above background over large time periods, but the incremental doses are never greater than the ^{14}C dose (50 times background) which occurs between 250 and 500 years after year 2000. For the 10-mile path length, only the bone dose from ^{14}C (50 times background) at 1500 years and the bone dose from ^{237}Np (2 times background) at 14,600 years are above background. Thus as the distance between the terminal storage site and the biosphere increases, the nuclides discharge to the surface water body over longer time periods and the incremental doses decrease. In particular, the highest incremental dose level was reduced by a factor of 12,000 ($600,000/50$) by increasing the path length from 0 miles to 10 miles. These results confirm that isolation of the waste from the biosphere can greatly reduce consequences of waste release from containment at the terminal storage site.

Figure 7, a graph of the results from Tables 3, 9, 10, and 11, shows the effect of leach rate on the incremental bone dose versus time curve. Leach rate values shown are 0.3, 0.03, 0.003, and 0.0003%/yr. As before, the background and the NCRP radiation limit lines are superimposed for comparison. The 0.3%/yr curve in Figure 7 (the base case) is exactly the same case as the 10-mile curve in Figure 6. When the leach rate is decreased an order of magnitude to 0.03%/yr, the ^{14}C and ^{237}Np bone doses are decreased an order of magnitude. The ^{14}C dose is now 5 times background. However, the ^{14}C now discharges to the biosphere over a 3333-year period ($1/0.03$) instead of the 333-year period for the base case. Thus, although the incremental dose to a "maximum" individual is reduced by a factor of 10, there are presumably 10 times as many such "maximum" individuals receiving that incremental dose compared with the base case. For the 0.003%/yr leach rate, the incremental doses are always below background, and the ^{14}C dose is spread out over a 33,333-year period. The results for the 0.0003%/yr leach rate show further redistribution of the doses so that more individuals get lower doses. However, because of radioactive decay the total integrated doses over all time decrease as leach rate decreases.

An interesting and important phenomenon can be understood by examining the bone dose results for the uranium peak at 2.07×10^6 years. As the

FIGURE 7. The Effect of Leach Rate on the Bone Dose
 Versus Time Curve

leach rate is decreased from 0.3 to 0.003%/yr, no change is observed in the incremental dose, which is controlled by ^{226}Ra . This happens because the ^{226}Ra is created predominately by decay of the precursors ^{234}U and ^{238}Pu after they have left the final storage site. Because of the differences in the migration rates of radium, uranium, and plutonium, the ^{226}Ra discharge to the biosphere is spread over large time periods and is thus unaffected by leach rate until the leach rate is 0.0003%/yr or less (i.e., until the leach time begins to approach the migration time for uranium). Thus, decreasing the leachability of the waste form greatly reduces the consequences of single nuclide releases from the site but does not reduce the consequences from chain members created after their precursors left the disposal site unless the leach time approaches the migration time of those nuclides through the geosphere.

The results from Tables 3, 16, 17, and 18 are plotted in Figure 8, which shows the effect of the time of initial release after Year 2000 on the controlling doses to critical organs. These results show that increased canister integrity and disposal site stability cannot reduce the base case incremental doses (Table 3) below background unless containment at the disposal site can be reasonably assured for periods of greater than 1,000,000 years. Although the ^{14}C and ^{99}Tc doses disappear if the release can be delayed by 100,000 years and 1,000,000 years, respectively, the ^{129}I and ^{237}Np doses remain at above background levels. However, the results shown in Figure 8 assume a 10-mile path length. As path length decreases, the importance of canister integrity and site stability increases.

4.4 PARTITIONING INCENTIVES

The combined effects of the three waste management control variables shown in Figures 6, 7, and 8 on the incentives for partitioning can best be shown with three-dimensional plots such as Figure 9. The three variables (path length, leach time, and the time of initial release after Year 2000) are plotted on the three axes. Thus an increase in the magnitude of any of the parameters results in greater isolation of the waste from man's

FIGURE 8. The Effect of the Time of Initial Release from the Disposal Site on the 50-Year Accumulated Dose

FIGURE 9. Waste Management Control Surface for Incremental Background Dose with No Partitioning

environment. A surface can be located in this three-dimensional space which corresponds to any assumed incremental dose level (e.g., background or NCRP radiation limit). Figure 9 shows such a surface with background as the assumed incremental dose level. Combinations of path length, leach time, and time of initial release which define points located inside or under the surface (i.e., between the surface and the origin) have incremental doses above background; combinations located outside or over have incremental doses below background.

For example, if the waste management system had a borosilicate glass waste form with a leach time of 100,000 years (a 1 ft diameter monolithic cylinder with about a 10^{-6} g/cm²/day surface flux) and a site located 10 miles from the biosphere in western U.S. desert soil or equivalent, the doses would always be below background regardless of when the release from the disposal site began. Likewise, if the same waste form were contained by a canister which prevented water from contacting the waste form for 10,000 years (but not 100,000 years) the incremental doses would again always be below background even for surface stored waste. On the other hand, a waste management system with a 0.1 mile path length, a 10,000 year leach time, and an initial release 1000 years after Year 2000 would have incremental doses above background.

When plotting these waste management control surfaces, the incremental dose need only be greater than the assumed criterion (e.g., background) at one time during the entire time the waste discharges to the biosphere to cause that point to be inside the surface.

The topographic features of the waste management control surface can be conveniently named according to which nuclides cause them. The ⁹⁰Sr spire occurs at small path lengths and small times of initial release and reflects the large leach times (small leach rates) required to lower the controlling ⁹⁰Sr dose to background. The ²²⁶Ra ridge occurs at intermediate path lengths and initial release times and denotes the region of the surface where the dose is controlled by the ²²⁶Ra created predominately by decay of ²³⁸Pu and ²³⁴U after they have been released from the disposal site. The ¹⁴C ledge and ¹²⁹I plateau are named in similar fashion.

Figure 9 (or similar graphs) can be used together with the two existence conditions (inequalities 5 and 6 for the simplified treatment here) to determine the partitioning incentives for separation of various elements from the waste. As discussed previously, two things must be known: 1) the publicly acceptable release consequences* must be known and 2) the waste management control variables for the final storage system must be known. Thus the question of "how safe is safe enough?" must be answered and the terminal storage site, container, and waste form must be selected. Using the given value for the publicly acceptable release consequences, a graph similar to Figure 9 is drawn. Then using the given values of the control variables, the point characteristic of the chosen waste management system is located on the graph. If that point is above the control surface, the release consequences are below the publicly acceptable consequences, Inequality 5 is not satisfied, and no partitioning incentive exists. If that point is below the control surface, Inequality 5 is satisfied, and an incentive to partition something from the waste exists if Inequality 6 is also satisfied. What must be separated from the waste and eliminated depends upon where the system characterization point for the chosen system is located under the surface. Therefore, the objective of the partitioning alternative is to separate selected elements from the waste until Inequality 5 is no longer satisfied.

This method can be illustrated by assuming that incremental doses of the order of natural background are the publicly acceptable consequences and the waste management system characterization point is located at a path length of 1 mile, a leach time of 333 years, and an initial release time of 0 years after Year 2000. Since this hypothetical point is below the surface in Figure 9, Inequality 5 is satisfied and incentives for partitioning will exist for separation and elimination of nuclides which lower the release consequences (satisfy Inequality 6).

* In a complete analysis, which looks at all release paths and their probabilities of occurrence, "consequences" would be replaced by "risk" in this sentence.

If 99% (100 DF) of the plutonium* and uranium (^{238}Pu and ^{234}U) are removed from the waste at the Year 2000, the ^{226}Ra ridge on the waste management control surface disappears as shown in Figure 10. The ^{14}C ledge now becomes much wider in the path length-leach time plane. As shown in Figure 10, elimination of 99% of the plutonium and uranium moves the control surface down toward the characterization point. Thus incentives for partitioning of plutonium and uranium exist for the hypothetical situation.

If a 99% (100 DF) separation of americium (^{241}Am and ^{243}Am) is also made at the Year 2000, the waste management control surface is lowered at very short path lengths (0 to 0.1 miles) and intermediate initial release times (1000 to 100,000 years) as shown in Figure 11. However, the effect of americium separation disappears at a path length of 0.1 miles and thus cannot influence consequences of release from the hypothetical system (which has a 1-mile path). Therefore, Inequality 6 is not satisfied and an incentive for partitioning americium does not exist for this situation.

Figure 12 shows the waste management control surface for 99% elimination of uranium, plutonium, americium, and the remaining actinides. The surface in Figure 12 is identical to that in Figure 11, showing the negligible effect of partitioning actinides other than uranium, plutonium and americium. After 99% of the uranium, plutonium, and americium has been eliminated, ^{90}Sr controls the incremental dose in the initial release time-leach time plane for a 100-year initial release time, ^{14}C controls for a 1000 and 10,000-year release time, ^{99}Tc controls for a 100,000-year release time, and ^{129}I controls for 1,000,000-year release time. In the path length-leach time plane ^{90}Sr controls for path lengths of 0.1 mile and smaller while ^{14}C controls for path lengths greater than 0.1 mile.

Figures 11 and 12 show no incentives for removing and eliminating americium and the remaining actinides. Thus Figure 13 shows the effect of 99% carbon (^{14}C) removal and elimination on the waste management control surface after only uranium and plutonium have been previously removed. The

* 99.5% of the uranium and plutonium in the spent fuel was removed at the reprocessing operation. After the 99% removal here only 0.005% of the spent fuel uranium and plutonium remains in the waste.

FIGURE 10. Waste Management Control Surface for Incremental Background Dose with 99% Elimination of Uranium and Plutonium

FIGURE 11. Waste Management Control Surface for Incremental Background Dose with 99% Elimination of Uranium, Plutonium, and Americium

FIGURE 12. Waste Management Control Surface for Incremental Background Dose with 99% Elimination of Uranium, Plutonium, Americium and the Remaining Actinides

FIGURE 13. Waste Management Control Surface for Incremental Background Dose with 99% Elimination of Uranium, Plutonium and Carbon

height of the control surface above the characterization point is significantly reduced, and hence partitioning incentives exist for carbon. With current reprocessing schemes the ^{14}C would likely leave the reprocessing plant as gaseous carbon dioxide and hence not be included in high-level waste by current definitions, but the significant doses shown here for ^{14}C suggest that carbon is a candidate for isolation from reprocessor off-gas streams.

Figures 14, 15, and 16 show the effects of removing and eliminating sequentially 99% of the technetium, (^{99}Tc) iodine, (^{129}I) and neptunium, (^{237}Np) after prior removal of 99% of uranium, plutonium, and carbon. Technetium removal moves the surface downward slightly on the leach time axis for path lengths 0.3 mile and larger and initial release times 10,000 years and smaller. Iodine (like carbon, a reprocessor off-gas product not currently included in high-level waste) removal changes the surface at all path lengths up to 100 miles for initial release times greater than 1,000,000 years and greater. The prior elimination of technetium and iodine make possible the neptunium elimination effect, greatly decreasing the total volume under the waste management control curve. After having eliminated uranium, plutonium, carbon, technetium, iodine, and neptunium, the characterization point is above the control surface for the assumed publicly acceptable incremental dose, and incentives for additional partitioning do not exist for this hypothetical situation. Now, ^{126}Sn controls the incremental dose for path lengths greater than 0.1 and initial release times up to 100,000 years.

Figure 17 is the equivalent of Figure 16 except that the NCRP radiation limit is assumed to be the publicly acceptable consequences instead of background. The waste management control surface in Figure 17 looks much like that in Figure 16 but closer to the origin at all points, reflecting the dose differences between the two criteria (6000 mrem for background and 75,000 mrem for the NCRP radiation limit for organs). Similar figures can be drawn for other values of the publicly acceptable release consequences.

The previous discussion considered the partitioning incentives for a hypothetical waste management system deliberately chosen to maximize those

FIGURE 14. Waste Management Control Surface for Incremental Background Dose with 99% Elimination of Uranium, Plutonium, Carbon and Technetium

FIGURE 15. Waste Management Control Surface for Incremental Background Dose with 99% Elimination of Uranium, Plutonium, Carbon, Technetium and Iodine

FIGURE 16. Waste Management Control Surface for Incremental Background Dose with 99% Elimination of Uranium, Plutonium, Carbon, Technetium, Iodine and Neptunium

FIGURE 17. Waste Management Control Surface for NCRP Radiation Limit with 99% Elimination of Uranium, Plutonium, Carbon, Technetium, Iodine and Neptunium

incentives. Consideration now is given to waste management systems chosen to make the partitioning incentives marginal. If the final storage site is separated from the biosphere by at least 5 miles of western U.S. desert soil or equivalent, the waste form has a leach time of at least 15,000 years (1 ft diam x 10 ft long monolithic borosilicate glass waste form with a surface flux of slightly less than 10^{-5} g/cm²/day), the waste containment fails at the Year 2000, and the publicly acceptable consequence to an individual is an incremental background dose or more, the system characterization point would be located on Figure 9 about at the intersection of the carbon ledge and the radium ridge. Thus no partitioning incentives would exist for this scenario.

Likewise, if publicly acceptable incremental dose is one-tenth of background (which raises the control surface in Figure 9 by one order of magnitude at the point where the carbon ledge and radium ridge intersect), the migration path consists of at least 5 miles of western U.S. desert subsoil or equivalent, the leach time is at least 150,000 years (surface flux of slightly less than 10^{-6} g/cm²/day), and no credit is taken for the integrity of the container or the stability of the site from water penetration, then no partitioning incentives exist.

At first glance it is tempting to argue that there are actually no partitioning incentives even if one one-hundredth of background is the publicly acceptable release consequences for the situation described above because the spent fuel carbon (which controls the dose in the region of interest) is not actually present in the waste. However, as inspection of the bone dose column of Table 11 shows, the ²²⁶Ra dose at the uranium and protactinium peaks ($\sim 2 \times 10^6$ years after the Year 2000) would still be above one one-hundredth of background values even if the carbon were not present.

The preceding scenarios seem quite reasonable. It seems very likely that a terminal storage site in a nonsalt formation can be found in the United States where 5 miles or more of western U.S. desert soil or equivalent separate the site from the biosphere. Leach rates as low as 10^{-7} g/cm²/day have been measured for sample borosilicate glass waste forms, so that the assumed range of 10^{-5} to 10^{-6} g/cm²/day seems conservative. Much evidence

exists to show that current containers can last 100 years or more and that almost any reasonable site could be expected to be stable from water penetration for 1000 years or more. Thus taking no credit for canister integrity or the water penetration stability of the site seems very conservative. The assumption that the publicly acceptable incremental consequences are one-tenth of background also seems conservative particularly when background varies by more than a factor of two in the United States (i.e., background at some locations is greater than 240 mrem/yr compared with the 120 mrem/yr assumed for this study). Thus, given the accuracy of the assumptions made in developing and applying the method for this study, incentives for partitioning high-level waste do not exist.

The results of this study are applicable to the evaluation of incentives for conversion of high-level calcine into glass. Calcine is very soluble in water and has a large surface to volume ratio, so that the leach time might be less than one year and would probably not be greater than 100 years. Thus calcine waste forms would be below the waste management control surface in Figure 9 for an incremental background dose (and much below a similar surface for a one-tenth of background incremental dose) even if the release does not occur for 10,000,000 years. Thus if the leach incident is the highest risk pathway to man from high-level waste, there is an incentive to convert calcine into glass.

5.0 ASSUMPTIONS AND CONCLUSIONS

Assumptions:

1. The radionuclide source is all of the high-level U.S. nuclear power economy waste through the Year 2000, including all tritium, carbon, and iodine from spent fuel and the activation products from the cladding.
2. The waste has no value as a mineral resource.
3. The release pathways with the greatest risk to man originate from the waste after ultimate disposal.
4. A nonsalt particulate geologic medium characterizes the terminal storage site.
5. The geologic medium is western U.S. desert subsoil.
6. The highest risk pathway from the site to the biosphere is the leach incident pathway.
7. All partitioning schemes are feasible.
8. The high risk fractions from all partitioning schemes are eliminated with negligible risk.
9. All nuclides are soluble in groundwater and the dissolved nuclides do not change speciation during migration.
10. The migrating nuclides are in sorption equilibrium at all points.
11. Estimates of the sorption equilibrium constants are used.
12. Transverse convection and dispersion are neglected.
13. The nuclides are dissolved in the groundwater in trace concentrations.
14. The water velocity and the axial dispersion coefficient are constant.
15. The waste form maintains its original shape as nuclides are leached out.
16. Doses are calculated for a "maximum" individual.

17. For all dose calculations the discharging nuclides accumulate in the biosphere for 50 years, the "maximum" individual is exposed to that accumulation for another 50 years, and the nuclides are dispersed into the biosphere with no dose after the 100-year accumulation and exposure period.
18. Man's dietary and living habits will remain constant throughout geologic time.

Conclusions:

1. Increasing geosphere isolation (longer path length between the terminal storage site and man's environment) decreases the dose from single nuclides and greatly decreases the dose from nuclides in actinide decay chains.
2. Increasing waste form effectiveness (smaller leach rates) decreases the dose from single nuclides but does not decrease the dose from nuclides created by decay after their precursors have left the site unless the leach rate becomes very small.
3. Increasing canister integrity and site stability does not significantly change the doses for long soil columns unless release from the disposal is delayed for 10,000 years and more. (Of course, any release delay at the repository postpones the radiation exposure to later geologic times.)
4. Elements which could have partitioning incentives under some circumstances are: 1) plutonium (^{238}Pu), 2) uranium (^{234}U), 3) carbon (^{14}C), 4) technetium (^{99}Tc), 5) iodine (^{129}I), and 6) neptunium (^{237}Np).
5. If an incremental background dose (6000 mrem for a 50-year accumulated dose) is the publicly acceptable release consequences, 5 miles or more of western U.S. desert subsoil separate the final storage site from the biosphere, the leach time is 15,000 years or more (monolithic waste form with leach rate of slightly less than 10^{-5} g/cm²/day), and the initial release occurs in the Year 2000 or later, there is no incentive to partition anything from high-level waste.

6. If one-tenth of background is the publicly acceptable release consequences, the path length is 5 miles or more, the leach time is 150,000 years (monolithic waste form with a leach rate of slightly less than 10^{-6} g/cm²/day), and the initial release occurs in the Year 2000 or later, there are no partitioning incentives for high-level waste.
7. If the leach incident is the highest risk pathway to man from high-level waste, there is an incentive to convert high-level calcine into glass.

6.0 RECOMMENDATIONS

1. Because the present analysis shows no incentive for partitioning, further work developing specific partitioning processes seems unwarranted at this time.
2. A general evaluation of partitioning incentives should be made which removes or justifies the assumptions made for this study and which includes an evaluation of the waste as a mineral resource. To accomplish this task, the general study must consider:
 - a) all wastes from the nuclear fuel cycle
 - b) all steps in the waste management scheme for each waste both with and without partitioning
 - c) all pathways to man from each step.
3. In support of Recommendation 2, further work should:
 - a) complete development of the nuclide migration model for a particulate medium with salt present and extend the present model to describe the faulted monolith type of geologic formation
 - b) measure in the laboratory and in situ the sorption equilibrium constants for nuclides in the various geologic media with and without the presence of salt and develop a better fundamental understanding of actinide migration phenomena.
 - c) improve the biosphere transport model to include the long-term (>100 years) accumulation and dispersion of nuclides in the biosphere.

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APPENDIX A

DATA FILES:

Nuclide Source Inventory

Estimated Sorption Equilibrium Constants for Western U.S.
Desert Soil

Estimated Groundwater Composition for Western U.S. Desert

TABLE A.1. Nuclide Source Inventory*

100	TIME	0.00E+00	1.00E+02	1.00E+03	1.00E+04	1.00E+05	1.00E+06
110	H3	7.23E+02	2.29E+06	0.	0.	0.	0.
120	TC99	2.86E+06	2.83E+06	2.82E+06	2.74E+06	2.04E+05	1.08E+05
130	I129	8.04E+03	8.04E+03	8.04E+03	8.04E+03	8.01E+03	7.72E+03
140	C14	1.03E+06	1.02E+06	9.15E+05	3.08E+05	5.77E+00	0.
150	MO93	5.22E+03	5.18E+03	4.84E+03	2.42E+03	2.37E+00	0.
160	CA41	6.85E+02	6.85E+02	6.80E+02	6.29E+02	2.88E+02	1.19E-01
170	SE78	9.72E+04	9.71E+04	9.62E+04	8.74E+04	3.35E+04	2.28E+00
180	SR90	1.29E+10	1.10E+09	2.52E-01	0.	0.	0.
190	BF10	4.04E+02	4.04E+02	4.04E+02	4.03E+02	3.93E+02	3.06E+02
200	CO60	7.70E+07	1.46E+02	0.	0.	0.	0.
210	NI59	2.07E+05	2.06E+05	2.05E+05	1.89E+05	8.69E+04	3.57E+01
220	NI63	6.67E+06	3.14E+06	3.57E+03	0.	0.	0.
230	RB87	4.67E+00	4.67E+00	4.67E+00	4.67E+00	4.67E+00	4.67E+00
240	CS135	8.59E+04	8.59E+04	8.59E+04	8.57E+04	8.40E+04	6.82E+04
250	CS137	1.85E+10	1.84E+09	1.72E+00	0.	0.	0.
260	PD107	2.28E+04	2.28E+04	2.28E+04	2.28E+04	2.26E+04	2.06E+04
270	SN126	1.28E+05	1.28E+05	1.27E+05	1.19E+05	6.39E+04	1.25E+02
280	SM151	3.10E+08	1.40E+08	1.08E+05	0.	0.	0.
290	H0166M1	1.00E+02	9.47E+01	5.63E+01	3.11E-01	0.	0.
300	EU152	1.61E+06	5.00E+03	0.	0.	0.	0.
310	EU154	9.32E+08	1.09E+07	1.29E-10	0.	0.	0.
320	ZR93	4.03E+05	4.03E+05	4.02E+05	4.00E+05	3.84E+05	2.53E+05
330	CD113M4	6.7E+06	3.31E+04	1.49E-15	0.	0.	0.
340	CM248	5.01E-01	5.01E-01	5.00E-01	4.91E-01	4.11E-01	6.99E-02
350	PU244	5.36E-05	5.40E-05	5.74E-05	9.16E-05	4.02E-04	1.72E-03
360	CM244	4.71E+08	1.02E+07	8.58E-08	1.19E-07	5.23E-07	2.24E-06
370	PU240	1.93E+06	3.13E+06	2.88E+06	1.15E+06	1.13E+02	1.72E-03
380	U236	5.58E+03	5.59E+03	5.67E+03	6.16E+03	6.47E+03	6.30E+03
390	TH232	7.80E+00	7.80E+00	7.80E+00	7.80E+00	7.83E+00	8.11E+00
400	U232	2.50E+04	9.75E+03	1.69E+00	0.	0.	0.
410	CM245	1.38E+05	1.37E+05	1.27E+05	5.97E+04	3.15E+01	0.
420	PU241	2.64E+08	2.58E+06	1.27E+05	5.98E+04	3.16E+01	0.
430	AM241	8.56E+07	8.08E+07	1.93E+07	5.98E+04	3.33E+01	0.
440	NP237	8.07E+04	8.34E+04	9.59E+04	9.98E+04	9.71E+04	7.26E+04
450	U233	1.88E+04	1.88E+04	1.91E+04	2.21E+04	4.65E+04	7.73E+04
460	TH229	1.74E+01	1.95E+02	1.73E+03	1.27E+04	4.72E+04	7.73E+04
470	CM246	2.68E+04	2.64E+04	2.31E+04	6.15E+03	1.09E-02	3.84E-25
480	PU242	9.26E+03	9.46E+03	9.82E+03	9.87E+03	8.44E+03	1.63E+03
490	U238	2.44E+02	2.44E+02	2.44E+02	2.44E+02	2.44E+02	2.45E+02
500	CM242	3.61E+08	3.87E+06	6.40E+04	9.71E-14	0.	0.
510	AM242M7	4.45E+06	4.72E+06	7.80E+04	1.18E-13	0.	0.
520	PU238	3.97E+08	1.86E+08	2.32E+05	2.34E-13	0.	0.
530	U234	2.27E+04	1.01E+05	1.70E+05	1.65E+05	1.29E+05	1.05E+04
540	TH230	5.55E+00	6.33E+01	1.38E+03	1.38E+04	8.43E+04	1.55E+04
550	RA226	3.47E-01	1.56E+00	2.47E+02	1.08E+04	8.44E+04	1.55E+04
560	CM247	1.29E-01	1.29E-01	1.29E-01	1.29E-01	1.29E-01	1.24E-01
570	AM243	5.12E+06	5.07E+06	4.67E+06	2.07E+06	5.95E+02	1.24E-01
580	CM243	4.03E+06	4.63E+05	1.59E-03	0.	0.	0.
590	PU239	9.69E+05	9.86E+05	1.08E+06	1.55E+06	1.93E+05	1.24E-01
600	U235	2.26E+01	2.27E+01	2.36E+01	3.57E+01	1.15E+02	1.21E+02
610	PA231	1.57E+04	1.57E+04	1.54E+04	1.27E+04	1.95E+03	1.21E+02
620	CM250	5.59E-08	5.57E-08	5.37E-08	3.75E-08	1.04E-09	2.82E-25
630	CF250	1.31E+01	6.53E-02	5.37E-08	3.75E-08	1.04E-09	2.83E-25
640	CF248	7.82E+00	6.53E+00	1.11E+00	2.24E-08	0.	0.
650	CF251	2.20E-01	2.04E-01	1.02E-01	9.99E-05	0.	0.
660	CF252	3.73E+00	1.58E-11	0.	0.	0.	0.

* Includes all high-level waste from the U.S. nuclear power economy through Year 2000 plus all tritium, carbon, and iodine from spent fuel and activation products from the cladding. The columns show the inventories of each nuclide in curie units at various times after Year 2000. Thus, the first column shows the inventories at the Year 2000, the second column at the Year 2100, the third at the Year 3000, etc.

TABLE A.2. Estimated Sorption Equilibrium Constants for Western U.S. Desert Soil*

Element	K^{-1**}
Tritium	1
Beryllium	3×10^{-3}
Carbon	1×10^{-1}
Sodium	2×10^{-2}
Chlorine	1
Argon	1
Potassium	6×10^{-3}
Calcium	1×10^{-2}
Iron	3×10^{-4}
Cobalt	3×10^{-3}
Nickel	3×10^{-3}
Selenium	1×10^{-2}
Krypton	1
Rubidium	2×10^{-3}
Strontium	1×10^{-2}
Yttrium	1×10^{-4}
Zirconium	1×10^{-4}
Niobium	1×10^{-4}
Molybdenum	4×10^{-2}
Technetium	1
Palladium	9×10^{-4}
Cadmium	1×10^{-4}
Tin	9×10^{-4}
Antimony	1×10^{-2}
Iodine	1
Cesium	1×10^{-3}
Promethium	4×10^{-4}
Samarium	4×10^{-4}
Europium	4×10^{-4}
Holmium	4×10^{-4}
Thallium	1×10^{-1}
Lead	6×10^{-5}
Bismuth	2×10^{-2}
Polonium	9×10^{-3}
Astatine	1
Radon	1
Francium	1×10^{-3}
Radium	2×10^{-3}
Actinium	2×10^{-4}
Thorium	2×10^{-5}
Protactinium	6×10^{-5}
Uranium	7×10^{-5}
Neptunium	1×10^{-2}
Plutonium	1×10^{-4}
Americium	1×10^{-4}
Curium	3×10^{-4}
Berkelium	3×10^{-4}

* Reference 1, p. 3.54.

** K^{-1} = nuclide velocity/water velocity

TABLE A.3. Estimated Groundwater Composition for Western U.S. Desert*

pH = 6.8-8.2

<u>Ion</u>	<u>Composition (ppm)</u>
Na ⁺	20
K ⁺	5
Ca ⁺⁺	25
Mg ⁺⁺	5
SO ₄ ⁼	15
NO ₃ ⁻	1
Cl ⁻	8
HCO ₃ ⁻	125

* Reference 1, p. 3.54

APPENDIX B

CHAIN MIGRATION EQUATIONS

APPENDIX B - CHAIN MIGRATION EQUATIONS

The linear partial differential equations which describe the material balances of the "i"th chain member and all preceding chain members over a differential volume of the soil column are:

$$D \frac{\partial^2 N_1}{\partial Z^2} - V \frac{\partial N_1}{\partial Z} - K_1 \frac{\partial N_1}{\partial t} - K_1 \lambda_1 N_1 = 0 \quad (1)$$

$$D \frac{\partial^2 N_2}{\partial Z^2} - V \frac{\partial N_2}{\partial Z} - K_2 \frac{\partial N_2}{\partial t} - K_2 \lambda_2 N_2 + K_1 \lambda_1 N_1 = 0 \quad (2)$$

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$$D \frac{\partial^2 N_i}{\partial Z^2} - V \frac{\partial N_i}{\partial Z} - K_i \frac{\partial N_i}{\partial t} - K_i \lambda_i N_i + K_{i-1} \lambda_{i-1} N_{i-1} = 0 \quad (3)$$

where N is the nuclide migration rate, Z is distance, t is time, D is the dispersion coefficient, V is the water velocity, and λ is the decay constant. K is the sorption equilibrium constant and is defined by $K = 1 + K_d \rho/\epsilon$ where K_d is the distribution coefficient, ρ is the soil density, and ϵ is the soil porosity.

The boundary conditions for band release are shown in Table B.1. The analytical solution for band release is obtained by superposing the results for a step increase in nuclide release at the time leaching begins and a step decrease to zero release based on the inventories at the time the repository becomes empty. For a three-member chain, this result is expressed as:

$$N_1^b = N_1^s (\theta) - N_1^s (\theta - TV/L) \quad (4)$$

$$N_2^b = N_2^s (\theta) - N_2^s (\theta - TV/L) \quad (5)$$

$$N_3^b = N_3^s (\theta) - N_3^s (\theta - TV/L) \quad (6)$$

TABLE B.1. Boundary Conditions for Band Release

Initial $t = 0, \text{ all } Z$	$0 < t < T, Z = 0$	Inlet	$t > T, Z = 0$	Outlet $t > 0, Z = \infty$ *
$N_1 = 0$	$N_1 = \frac{N_1^0}{T} \text{EXP} (-\lambda_1 t)$		$N_1 = 0$	$N_1 = \text{finite}$
$N_2 = 0$	$N_2 = \frac{N_2^0}{T} \text{EXP} (-\lambda_2 t)$		$N_2 = 0$	$N_2 = \text{finite}$
	$+ \frac{\lambda_1}{\lambda_2 - \lambda_1} \frac{N_1^0}{T} \left(\text{EXP} (-\lambda_1 t) - \text{EXP} (-\lambda_2 t) \right)$			
	$\vdots$			
	$\vdots$			
$N_i = 0$	$N_i = \lambda_1 \lambda_2 \dots \lambda_{i-1} \frac{N_1^0}{T} \sum_{j=1}^i \frac{\text{EXP} (-\lambda_j t)}{\prod_{k \neq j} (\lambda_k - \lambda_j)}$		$N_i = 0$	$N_i = \text{finite}$
	$+ \lambda_2 \lambda_3 \dots \lambda_{i-1} \frac{N_2^0}{T} \sum_{j=2}^i \frac{\text{EXP} (-\lambda_j t)}{\prod_{k \neq j} (\lambda_k - \lambda_j)}$			
	$\vdots$			
	$\vdots$			
	$\frac{N_i^0}{T} \text{EXP} (-\lambda_i t)$			

where T is the leach time

* This boundary condition implies an infinite soil column with the groundwater leaving the column and entering the surface water at a distance L from the inlet.

The analytical result used in this study simplified the general result for single nuclides, two-member chains, and three-member chains by including the effects of axial dispersion for initial inventory contributions only (i.e., dispersion is applied only to those nuclides which were at the disposal site at the time of the release incident.)⁽³⁾ The expressions for step release follow:

$$N_1^S = G_1(1) \quad (7)$$

$$N_2^S = G_1(2) + G_2(1,2) G_3(1,2) G_{12}(1,2) G_{13}(2) \quad (8)$$

$$+ G_2(1,2) \left[G_4(1,2) G_9(1) G_{13}(1) - G_9(2) G_{13}(2) \right]$$

$$+ G_2(1,2) G_4(1,2) G_{11}(1,2,2) \left[G_{13}(2) - G_{13}(1) \right]$$

$$N_3^S = G_1(3) + G_2(2,3) G_3(2,3) G_{12}(2,3) G_{13}(3) \quad (9)$$

$$+ G_2(2,3) \left[G_4(2,3) G_9(2) G_{13}(2) - G_9(3) G_{13}(3) \right]$$

$$+ G_2(2,3) G_4(2,3) G_{11}(2,3,3) \left[G_{13}(3) - G_{13}(2) \right]$$

$$+ G_{14}(1,2) G_{13}(3) \left[\frac{G_{12}(1,3)}{G_7(1,2) G_7(1,3)} + \frac{G_{12}(2,3)}{G_7(2,1) G_7(2,3)} \right.$$

$$\left. + \frac{G_9(3)}{G_7(3,1) G_7(3,2)} \right]$$

$$+ \frac{G_5(1,2,3)}{G_7(1,2) G_8(1,2,3)} \left[G_{12}(1,3) G_{13}(3) - G_{12}(1,2) G_{13}(2) \right]$$

$$+ \frac{G_5(1,2,3)}{G_7(2,1) G_8(2,2,3)} \left[G_{12}(2,3) G_{13}(3) - G_9(2) G_{13}(2) \right]$$

$$+ \frac{G_5(1,2,3)}{G_8(1,2,3) G_8(2,2,3)} G_{11}(2,3,3) \left[G_{13}(3) - G_{13}(2) \right]$$

$$\begin{aligned}
& + \frac{G_6(1,2,3,2)}{G_8(1,1,2) G_8(1,2,3)} \left[G_{12}(1,3) G_{13}(3) - G_{12}(1,2) G_{13}(2) \right] \\
& + \frac{G_6(1,2,3,2)}{G_8(1,1,2) G_{10}(2,3,1,2)} \left[G_{11}(1,2,3) G_{13}(3) - G_{11}(1,2,2) G_{13}(2) \right] \\
& + \frac{G_6(1,2,3,2)}{G_8(1,2,3) G_{10}(1,2,2,3)} G_{11}(2,3,3) \left[G_{13}(3) - G_{13}(2) \right] \\
& - \frac{G_6(1,2,3,1)}{G_8(1,1,2) G_8(1,1,3)} \left[G_{12}(1,3) G_{13}(3) - G_9(1) G_{13}(1) \right] \\
& - \frac{G_6(1,2,3,1)}{G_8(1,1,2) G_{10}(1,3,1,2)} \left[G_{11}(1,2,3) G_{13}(3) - G_{11}(1,2,1) G_{13}(1) \right] \\
& - \frac{G_6(1,2,3,1)}{G_8(1,1,3) G_{10}(1,2,1,3)} G_{11}(1,3,3) \left[G_{13}(3) - G_{13}(1) \right]
\end{aligned}$$

where:

$$\begin{aligned}
G_1(i) &= \frac{N_i}{2T} \exp \left(-R_i \Theta + \frac{P_\eta}{2} \right) \left[\exp \left(-\frac{P_\eta}{2} \right) \operatorname{erfc} \left(\frac{\eta \sqrt{K_i P}}{2 \sqrt{\Theta}} - \sqrt{\frac{P \Theta}{4 K_i}} \right) \right. \\
&\quad \left. + \exp \left(\frac{P_\eta}{2} \right) \operatorname{erfc} \left(\frac{\eta \sqrt{K_i P}}{2 \sqrt{\Theta}} + \sqrt{\frac{P \Theta}{4 K_i}} \right) \right]
\end{aligned}$$

$$G_2(i,j) = \frac{N_i^0}{T} \frac{R_i}{(R_j - R_i)}$$

$$G_3(i,j) = 1 - \frac{K_i}{K_j}$$

$$G_4(i,j) = \frac{K_i}{K_j}$$

$$G_5(i,j,k) = \frac{N_i^0}{T} \frac{K_j R_i R_j}{(K_j - K_k)}$$

$$G_6(i,j,k,\ell) = \frac{N_i^0 K_i K_j R_i R_j}{T(K_i - K_j)(K_\ell - K_k)}$$

$$G_7(i,j) = R_j - R_i$$

$$G_8(i,j,k) = \frac{R_j K_j - R_k K_k}{K_j - K_k} - R_i$$

$$G_9(i) = \exp(-R_i \Theta)$$

$$G_{10}(i,j,k,\ell) = \frac{R_k K_k - R_\ell K_\ell}{K_k - K_\ell} - \frac{R_i K_i - R_j K_j}{K_i - K_j}$$

$$G_{11}(i,j,k) = \exp \left\{ -\frac{R_i K_i - R_j K_j}{K_i - K_j} \Theta - \left[R_k K_k - \frac{K_k (R_i K_i - R_j K_j)}{(K_i - K_j)} \right] \eta \right\}$$

$$G_{12}(i,j) = \exp \left[-R_i \Theta - K_j (R_j - R_i) \eta \right]$$

$$G_{13}(i) = u(\Theta - K_i \eta)$$

$$G_{14}(i,j) = \frac{N_i}{T} R_i R_j$$

$u()$ = unit step function

N^0 = the nuclide inventory at the time the release begins (for the step decrease result used for band release, this symbol represents the nuclide inventory if the total inventories of all the nuclides had remained at the storage site and decayed until the time of the step decrease).

$P=VL/D$ = Peclet Number

$R=\lambda L/V$ = Decay Number

$\eta=Z/L$ = Dimensionless distance

$\Theta=tV/L$ = Dimensionless time

As listed above, N_2^S includes the contributions to the second chain number from the initial inventories of both the first and second members. However, if the $G_1(2)$ term is removed, the remaining terms describe the migration of second member created by decay the first member after the release has begun. Likewise, if the first four terms are removed from N_3^S , the remaining terms describe the migration of third member created by decay of the first member after the release has begun.

APPENDIX C

TREATMENT OF ACTINIDE DECAY CHAINS

APPENDIX C - TREATMENT OF ACTINIDE DECAY CHAINS

The nuclides of interest in geosphere migration studies for high-level waste include four, large, branched, but noninteracting actinide decay system. The migration of these complex chains was approximately modeled using combinations of two- and three-membered chains. The approximation techniques can be understood by considering the chains themselves. The Figures which follow show the chains schematically and include the half-lives and Year 2000 inventories for each nuclide. The very short half-life members of each chain are assumed to travel in secular decay equilibrium with their parents. The Tables which follow treat the nuclides in each chain one at a time, and the sub-chains necessary to describe each nuclide are shown. When a nuclide's initial inventory is used in the calculation, that nuclide is underlined.

FIGURE C.1. Schematic Diagram of 4N Decay Chain

TABLE C.1. Treatment of the 4N Decay Chain

Nuclide	Treatment	Remarks
^{248}Cm	$\underline{^{248}\text{Cm}}$	Includes ^{248}Cm from Decay of ^{252}Cf
^{244}Pu	$\underline{^{248}\text{Cm}} \longrightarrow \underline{^{244}\text{Pu}}$	
^{244}Cm	$\underline{^{244}\text{Cm}}$	
^{240}Pu	$\underline{^{244}\text{Cm}} \longrightarrow \underline{^{240}\text{Pu}}$	
	+ $\underline{^{248}\text{Cm}} \longrightarrow \underline{^{244}\text{Pu}}$	$T_{1/2}^{^{240}\text{Pu}} \ll T_{1/2}^{^{244}\text{Pu}}$
^{236}U	$\underline{^{244}\text{Cm}} \longrightarrow \underline{^{240}\text{Pu}} \longrightarrow \underline{^{236}\text{U}}$	
	+ $\underline{^{244}\text{Pu}} \longrightarrow \underline{^{236}\text{U}}$	$T_{1/2}^{^{240}\text{Pu}} \ll T_{1/2}^{^{244}\text{Pu}}$
	+ $\underline{^{248}\text{Cm}} \longrightarrow \underline{^{244}\text{Pu}} \longrightarrow \underline{^{236}\text{U}}$	$T_{1/2}^{^{240}\text{Pu}} \ll T_{1/2}^{^{244}\text{Pu}}$
^{232}U	$\underline{^{232}\text{U}}$	
^{232}Th	$\left(\underline{^{244}\text{Cm}} + \underline{^{240}\text{Pu}} \right) \longrightarrow \underline{^{236}\text{U}}$ $\longrightarrow \underline{^{232}\text{Th}}$	^{248}Cm and ^{244}Pu initial inventories are negligible weight ^{240}Pu initial inventory
^{228}Th	$\underline{^{232}\text{U}} \longrightarrow \underline{^{228}\text{Th}}$	
	+ $\underline{^{240}\text{Pu}} \longrightarrow \underline{^{236}\text{U}} \longrightarrow \underline{^{232}\text{Th}}$	$T_{1/2}^{^{228}\text{Th}} \ll T_{1/2}^{^{232}\text{Th}}$

NOTE: ^{244}Ra and its progeny are assumed to be in secular equilibrium with ^{228}Th during migration through the geosphere.

FIGURE C.2. Schematic Diagram of 4N+1 Decay Chain

TABLE C.2. Treatment of 4N+1 Decay Chain

Nuclide	Treatment	Remarks
^{245}Cm	^{245}Cm	Includes ^{245}Cm from Decay of ^{249}Cf
^{241}Pu	^{241}Pu	
	+ ^{245}Cm	$T_{1/2}^{241}\text{Pu} \ll T_{1/2}^{245}\text{Cm}$
^{241}Am	$^{241}\text{Pu} \rightarrow ^{241}\text{Am}$	
	+ ^{245}Cm	$T_{1/2}^{241}\text{Pu} \ll T_{1/2}^{245}\text{Cm}$
^{237}Np	$(^{241}\text{Pu} + ^{241}\text{Am}) \rightarrow ^{237}\text{Np}$	$T_{1/2}^{241}\text{Pu} < T_{1/2}^{241}\text{Am}$ and $K^{241}\text{Pu} = K^{241}\text{Am}$
	+ $^{245}\text{Cm} \rightarrow ^{237}\text{Np}$	$T_{1/2}^{241}\text{Pu}$ and $T_{1/2}^{241}\text{Am}$ $\ll T_{1/2}^{245}\text{Cm}$
^{233}U	$^{237}\text{Np} \rightarrow ^{233}\text{U}$	
	+ $(^{241}\text{Pu} + ^{241}\text{Am}) \rightarrow ^{237}\text{Np}$	$T_{1/2}^{241}\text{Pu} < T_{1/2}^{241}\text{Am}$ and $K^{241}\text{Pu} = K^{241}\text{Am}$
	$\rightarrow ^{233}\text{U}$	
	+ $^{245}\text{Cm} \rightarrow ^{237}\text{Np} \rightarrow ^{233}\text{U}$	$T_{1/2}^{241}\text{Pu}$ and $T_{1/2}^{241}\text{Am}$ $\ll T_{1/2}^{245}\text{Cm}$
^{229}Th	$^{237}\text{Np} \rightarrow ^{233}\text{U} \rightarrow ^{229}\text{Th}$	
	+ $(^{241}\text{Pu} + ^{241}\text{Am}) \rightarrow ^{237}\text{Np}$	$T_{1/2}^{229}\text{Th} \ll T_{1/2}^{233}\text{U}$
	$\rightarrow ^{233}\text{U}$	
	+ $^{245}\text{Cm} \rightarrow ^{237}\text{Np} \rightarrow ^{233}\text{U}$	$T_{1/2}^{229}\text{Th} \ll T_{1/2}^{233}\text{U}$

Note: ^{225}Ra and its progeny are assumed to be in secular equilibrium with ^{229}Th during migration through the geosphere.

FIGURE C.3. Schematic Diagram of the 4N+2 Chain

TABLE C.3. Treatment of 4N+2 Decay Chain

Nuclide	Treatment	Remarks
^{246}Cm	$\underline{^{246}\text{Cm}}$	Includes ^{246}Cm from Decay of ^{250}Cm and ^{250}Cf .
^{242}Pu	$\underline{^{246}\text{Cm}} \rightarrow \underline{^{242}\text{Pu}}$	
^{238}U	$\underline{^{246}\text{Cm}} \rightarrow \underline{^{242}\text{Pu}} \rightarrow \underline{^{238}\text{U}}$	
$^{242\text{m}}\text{Am}$	$\underline{^{242\text{m}}\text{Am}}$	
^{242}Cm	$\underline{^{242\text{m}}\text{Am}} \rightarrow \underline{^{242}\text{Cm}}$	
^{238}Pu	$\underline{^{242}\text{Cm}} + \underline{^{238}\text{Pu}}$	$^{242\text{m}}\text{Am}$ initial inventories are negligible with respect to ^{238}Pu
^{234}U	$\left(\underline{^{242}\text{Cm}} + \underline{^{238}\text{Pu}} \right) \rightarrow \underline{^{234}\text{U}}$ $+ \underline{^{238}\text{U}} \rightarrow \underline{^{234}\text{U}}$ $+ \underline{^{242}\text{Pu}} \rightarrow \underline{^{238}\text{U}}$ $+ \underline{^{246}\text{Cm}} \rightarrow \underline{^{242}\text{Pu}} \rightarrow \underline{^{238}\text{U}}$ $+ \underline{^{242\text{m}}\text{Am}} \rightarrow \underline{^{234}\text{U}}$	$T_{1/2}^{^{242}\text{Cm}} \ll T_{1/2}^{^{238}\text{Pu}}$ $T_{1/2}^{^{234}\text{U}} \ll T_{1/2}^{^{238}\text{U}}$ $T_{1/2}^{^{234}\text{U}} \ll T_{1/2}^{^{238}\text{U}}$
^{230}Th	$\left(\underline{^{242}\text{Cm}} + \underline{^{238}\text{Pu}} + \underline{^{234}\text{U}} \right)$ $\rightarrow \underline{^{230}\text{Th}}$ $+ \underline{^{238}\text{U}} \rightarrow \underline{^{230}\text{Th}}$ $+ \underline{^{242}\text{Pu}} \rightarrow \underline{^{238}\text{U}}$ $+ \underline{^{246}\text{Cm}} \rightarrow \underline{^{242}\text{Pu}} \rightarrow \underline{^{238}\text{U}}$ $+ \underline{^{242\text{m}}\text{Am}} \rightarrow \underline{^{234}\text{U}} \rightarrow \underline{^{230}\text{Th}}$	$T_{1/2}^{^{242}\text{Cm}}$ and $T_{1/2}^{^{238}\text{Pu}}$ $\ll T_{1/2}^{^{234}\text{U}}$ $K^{^{238}\text{U}} = K^{^{234}\text{U}}$. Use Bateman equation to convert ^{238}U inventory to pseudo ^{234}U inventory. $T_{1/2}^{^{234}\text{U}}$ and $T_{1/2}^{^{230}\text{Th}}$ $\ll T_{1/2}^{^{238}\text{U}}$

TABLE C.3. (contd)

Nuclide	Treatment	Remarks
^{226}Ra	$\begin{aligned} & \left(^{238}\text{Pu} + ^{234}\text{U} \right) \longrightarrow ^{230}\text{Th} \\ & \longrightarrow ^{226}\text{Ra} \\ & + ^{238}\text{U} \longrightarrow ^{230}\text{Th} \longrightarrow ^{226}\text{Ra} \end{aligned}$	$K ^{238}\text{U} = K ^{234}\text{U}$. Use Bateman equation to convert ^{238}U inventory to pseudo ^{234}U inventory.
	$+ ^{242}\text{Pu} \longrightarrow ^{238}\text{U}$	
	$+ ^{246}\text{Cm} \longrightarrow ^{242}\text{Pu} \longrightarrow ^{238}\text{U}$	$T_{1/2} ^{234}\text{U}, T_{1/2} ^{230}\text{Th}, \text{ and } T_{1/2} ^{226}\text{Ra} \ll T_{1/2} ^{238}\text{U}$
	$+ ^{242\text{m}}\text{Am} \longrightarrow ^{234}\text{U} \longrightarrow ^{230}\text{Th}$	$T_{1/2} ^{226}\text{Ra} \ll T_{1/2} ^{230}\text{Th}$

NOTE: ^{222}Rn and its progeny are assumed to be in secular equilibrium with ^{226}Ra during migration through the geosphere.

FIGURE C.4. Schematic Diagram of the 4N+3 Chain

TABLE C.4. Treatment of 4N+3 Decay Chain

Nuclide	Treatment	Remarks
^{247}Cm	$\underline{^{247}\text{Cm}}$	Includes ^{247}Cm from Decay of ^{257}Cf
^{243}Am	$\underline{^{247}\text{Cm}} \rightarrow \underline{^{243}\text{Am}}$	
^{239}Pu	$\underline{^{243}\text{Cm}} + \underline{^{239}\text{Pu}}$ + $\underline{^{243}\text{Am}} \rightarrow \underline{^{239}\text{Pu}}$ + $\underline{^{247}\text{Cm}} \rightarrow \underline{^{239}\text{Pu}}$	$T_{1/2} \text{ } ^{243}\text{Am} \ll \text{ } ^{247}\text{Cm}$
^{235}U	$(\underline{^{243}\text{Am}} + \underline{^{243}\text{Cm}} + \underline{^{239}\text{Pu}})$ $\rightarrow \underline{^{235}\text{U}}$ + $\underline{^{247}\text{Cm}} \rightarrow \underline{^{235}\text{U}}$	$T_{1/2} \text{ } ^{243}\text{Am}$ and $T_{1/2} \text{ } ^{243}\text{Cm}$ $\ll T_{1/2} \text{ } ^{239}\text{Pu}$
^{231}Pa	$(\underline{^{243}\text{Am}} + \underline{^{243}\text{Cm}} + \underline{^{239}\text{Pu}})$ $\rightarrow \underline{^{235}\text{U}} \rightarrow \underline{^{231}\text{Pa}}$ + $\underline{^{247}\text{Cm}} \rightarrow \underline{^{235}\text{U}}$	$T_{1/2} \text{ } ^{231}\text{Pa} \ll T_{1/2} \text{ } ^{235}\text{U}$

NOTE: ^{227}Ac and its progeny are assumed to be in secular equilibrium with ^{231}Pa during migration through the geosphere.

APPENDIX D

DESCRIPTION OF THE BASIC LANGUAGE COMPUTER PROGRAM GETOUT

APPENDIX D - DESCRIPTION OF THE BASIC LANGUAGE
COMPUTER PROGRAM GETOUT

GETOUT is an integration of several independent programs as shown in Figure D.1. AQCAL8 does the migration calculations for single nuclides; CHAIN4 does the migration calculations for two- and three-member chains; and RPEAK2 does the migration calculations for four or more membered chains using combinations of two- and three-membered chains. INVEN5 contains the nuclide inventories at the final storage site. OTHER2 contains peak information from AQCAL8 used by CHAIN4 to reduce the number of time increments needed for the two- and three-member chain calculations. MIG001, MIG002, and MIG003 contain the migration output files for single nuclides, two-member chains and three-member chains, respectively. LST001 contains the migration calculation output in the input format of the biosphere model. KSOMIG is a master key file which oversees the execution of the entire program, while KEAQC4, KCHIN4, and KCHAN4 are key files which oversee the execution of the migration calculations for single nuclides, two-member chains, and three-member chains, respectively.

FIGURE D.1. Flow Diagram for BASIC Language Geosphere Transport Code: GETOUT

APPENDIX E

DOSE CALCULATION EQUATIONS

APPENDIX E - DOSE CALCULATION EQUATIONS

The fundamental relation for calculating radiation dose to man from a given biosphere pathway is:⁽⁷⁾

$$R_{ipr} = C_{ip} U_p D_{ipr} \quad (1)$$

where R_{ipr} = the dose rate to organ r from nuclide i via pathway p

C_{ip} = the concentration of nuclide i in the media of pathway p

U_p = the exposure rate or intake rate associated with pathway p, the usage rate

D_{ipr} = a number specific to nuclide i, pathway p, and organ r which can be used to calculate the radiation dose rate from the exposure rate to a given concentration of the nuclide or the intake rate of that nuclide, the dose factor.*

The specific relationships used for the drinking water, aquatic foods, shoreline deposition, swimming, and irrigated food products follow.

Drinking Water

The dose from ingestion of water is given by

$$R_{pr} = 1119 \sum_{i=1}^n \frac{Q_i N_i}{F} M_p \exp(-\lambda_i t_p) U_p D_{ipr} \quad (2)$$

where R_{pr} = total dose rate to organ r from n nuclides i via pathway p (mrem/yr)

N_i = the reconcentration factor⁽⁷⁾ (dimensionless)

Q_i = the release rate of nuclide i (Ci/yr)

F = the flow rate of the liquid effluent (ft³/sec)

* Dose factors are listed in Appendix F.

M_p = the mixing ratio at the point of exposure (or the point of withdrawal of drinking water or point of harvest of aquatic food)

λ_i = radiological decay constant of nuclide i (hr^{-1})

t_p = the transit time required for nuclides to reach the point of exposure. For internal dose, t_p is the total time elapsed between release of the nuclides and ingestion of food or water (hr)

1119 = a constant which converts from $(\text{Ci/yr})/(\text{ft}^3/\text{sec})$ to pCi/liter .

The summation process adds the dose contribution from each of the nuclides for which dose factors have been derived to yield the total dose for the pathway-organ combination selected.

The first three terms in Equation 1, $\frac{Q_i N_i}{p}$, define the concentration of nuclide i in the effluent at the point of discharge. The expression $\frac{Q_i N_i}{F} M_p \exp(-\lambda_i t_p)$ yields the concentration at the time that the water is consumed.

Aquatic Foods

Concentrations of radionuclides in aquatic foods (fish, crustaceans and molluscs) are directly related to the concentrations of the nuclides in water. Equilibrium ratios between the two concentrations (bioaccumulation factors) are those for freshwater organisms. Inclusion of the bioaccumulation factor B_{ip} in Equation 1 converts it to Equation 2 below, which is suitable for calculation of internal dose from consumption of aquatic foods.

$$R_{pr} = 1119 \frac{U_p M_p}{F} \sum_{i=1}^n Q_i N_i B_{ip} D_{ipr} \exp(-\lambda_i t_p) \quad (3)$$

where B_{ip} = the bioaccumulation factor for nuclide i via pathway p^*
(pCi/kg per pCi/liter).

* Bioaccumulation factors are listed in Appendix G.

Shoreline Deposits

The equation used for estimating the radiation dose from shoreline sediments is given below.⁽⁷⁾

$$R_{pr} = 111,900 \sum_{i=1}^n \tau_i \frac{Q_i N_i}{F} M_p e^{-\lambda_i t_p} W (1 - e^{-\lambda_i t_s}) U_p D_{ipr} . \quad (4)$$

where: W = shore width factor for correction from infinite plane surface to shoreline; taken to be 0.2 for river shoreline.⁽⁷⁾

Swimming

The equation for calculation of external dose to the skin and total body from swimming (water immersion) is:⁽⁷⁾

$$R_{pr} = 1119 \sum_{i=1}^n \frac{Q_i N_i}{FK_p} M_p e^{-\lambda_i t_p} U_p D_{ipr} . \quad (5)$$

where: K_p = a geometry correction factor equal to 1 for swimming and 2 for boating.

Irrigated Food Products

The concentration of radioactive material in vegetation results from deposition onto the plant foliage and from uptake from the soil of prior depositions on the ground.⁽⁸⁾ The equation for the model is presented below. The first term in brackets relates to the concentration derived from direct foliar deposition* during the growing season whereas the second term relates to uptake from soil and reflects the deposition throughout the total time of the dose accumulation (50 years). Thus, for a uniform release rate

* This study assumes that water is applied to the crops by sprinkler rather than surface methods such as furrow or drip. Thus contaminated water deposits directly onto foliage as well as onto the ground continuously over the whole year.

$$C_{iv} = d_i \left[\frac{r T_v (1 - e^{-\lambda_{Ei} t_e})}{Y_v \lambda_{Ei}} + \frac{B_{iv} (1 - e^{-\lambda_i t_b})}{P \lambda_i} \right] e^{-\lambda_i t_h} \quad (6)$$

where C_{iv} = concentration of radionuclide i in edible portion of plant v (pCi/kg)

d_i = deposition rate [pCi/m² hr]

r = fraction of deposition retained on plant (dimensionless), taken to be 0.25

T_v = factor for the translocation of externally deposited radionuclide to edible parts of plants (dimensionless). Assumed to be independent of radionuclide and taken to be 1 for leafy vegetables and fresh forage, and 0.1 for all other produce, including grain

λ_{Ei} = effective removal constant of radionuclide i from plant (hr⁻¹)

$\lambda_{Ei} = \lambda_i + \lambda_w$, where λ_w = weathering removal constant = 0.693/14 day⁻¹

t_e = time of aboveground exposure of crop to contamination during growing season (hr)

Y_v = plant yield [kg (wet weight)/m²]

B_{iv} = concentration factor for plant uptake of nuclide i from soil to the edible part of the plant [pCi/kg (wet weight)/pCi/kg (dry soil)]

t_b = time for buildup of radionuclide in soil (hr), taken to be 50 years

P = soil "surface density" [kg(dry soil)/m²]. Assuming a uniform mixing of all radionuclides in a plow layer of 15 cm depth, P has a value of about 224 kg/m², and

t_h = holdup time (hr), the time between the time from harvest to consumption of the food.

The deposition rate d_i from irrigation water is defined by the relation

$$d_i = C_{iw} I \quad (7)$$

where C_{iw} = Concentration of radionuclide i in water used for irrigation (pCi/l), and

I = irrigation rate [l/(m².hr)]. Amount of water sprinkled on unit area of field in 1 hr.

The dose rate in mrem/yr to a particular organ r would then be given by Equation 1 for n radionuclides i via a particular vegetable pathway v :

$$R_{vr} = \sum_{i=1}^n C_{iv} U_v D_{ivr} \quad (8)$$

The radionuclide concentration in an animal product such as meat, milk or eggs depends on the amount of contaminated feed or forage eaten by the animal and its uptake of contaminated water. The following equation describes this model for the concentration in animal products

$$C_{ia} = S_{ia} \left[C_{iF} Q_F + C_{iaw} Q_{aw} \right] \quad (9)$$

where C_{ia} = concentration in animal product (pCi/l) or (pCi/kg)
 S_{ia} = transfer coefficient of radionuclide i from daily intake of animal to edible portion of animal product [pCi/l (milk) per pCi/day] or [pCi/kg (animal product) per pCi/day]
 C_{iF} = concentration of nuclide i in feed or forage (pCi/kg) calculated from Equation 5, previously
 Q_F = consumption rate of contaminated feed or forage by animal (kg/day)
 C_{iaw} = concentration of nuclide i in water consumed by animals (pCi/l), assumed to be equal to C_{iw} , and
 Q_{aw} = consumption rate of contaminated water by animal (l/day).

The dose from the consumption of animal products is given by Equation 7 with C_{ia} substituted for C_{iv} .

For a cow grazing on fresh forage, t_e in Equation 5 is set equal to 720 hr (30 days), the typical time for a cow to return to a particular portion of a grazing site.

Values for the various plant concentration factors and animal product transfer coefficients for the elements considered are given in Appendix G. Table E.1 gives values for the various animal consumption parameters of Equation 9.

TABLE E.1. Animal Consumption Rates⁽⁸⁾

	Q_F		Q_{AW}
	Feed of Forage		Water
	(kg/day)		(l/day)
Milk Cow	55	(Fresh Forage)	60
Beef Cattle	68	(feed) ^(a)	50
Pig	4.2	(feed) ^(b)	10
Poultry (chickens)	0.12	(feed) ^(c)	0.3

a. Assumed to be 50% Barley, 25% Alfalfa, and 25% Silage

b. Assumed to be 100% Barley

c. Assumed to be 50% Wheat and 50% Barley

APPENDIX F

DOSE FACTORS

APPENDIX F - DOSE FACTORS

Equations for calculating internal dose factors, $D_{i,pr}$, were derived from those given by the ICRP for body burden and MPC and have previously been published.⁽⁹⁾ Effective decay energies for the radionuclides were calculated from the ICRP model, which assumes all of the radionuclide is in the center of a spherical organ with an appropriate effective radius. These dose factors have units of mrem/yr per pCi/yr ingested and represent the first year's dose from one year's intake.

The dose factors for external exposure to water were derived by assuming that the contaminated medium is large enough to be considered an "infinite volume" relative to the range of the emitted radiations. Under that assumption the energy emitted per gram of media is equivalent to the energy absorbed per gram of media. The MeV per disintegration per gram is then converted to rem, and the differences in energy adsorption between air or water and tissue are corrected as well as for physical geometry of each specific exposure situation.

The dose from water immersion is an external dose either to the skin or to both the skin and total body, depending on the penetrating power of the radiation emitted by the airborne radionuclides. Only beta and gamma radiation, which could penetrate 7 mg/cm^2 of tissue, was considered in calculating skin dose. Gamma radiation dose at a 5-cm depth in tissue was used for calculating external dose to the total body (and for internal organs). These dose factors have units of mrem/hr per pCi/liter water.

Material deposited from the river onto the shoreline represents a fairly large, nearly uniform, thin sheet of contamination. The factors for converting surface contamination in pCi/m^2 to gamma dose at 1 m above a uniformly contaminated plane have been described.⁽⁹⁾ Dose factors for exposure river sediment have units of mrem/hr per pCi/m^2 surface.

Table F.1 lists the dose factors for the various organs and pathways considered in this investigation.

The total dose to the individual accumulated from continued ingestion and shoreline exposure throughout 50 years of residing in the same area and retaining the same dietary and recreational habits have been estimated by multiplying the first-year dose factor by the 50-year dose accumulation factor (DAF). The DAF is a function of effective organ half-life (τ) and is given by the equation:

$$DAF_{50} = \sum_{i=1}^{50} 1 + (50 - i) e^{-i\lambda} \quad (1)$$

where λ = effective decay constant = $\frac{0.693}{\tau}$.

The above relation can be shown to be equal to a geometric series

$$\sum_{i=1}^{50} \frac{(1 - e^{-i\lambda})}{\lambda},$$

which can be written in the closed form:

$$DAF_{50} = \frac{50 (1 - e^{-\lambda}) + 1 - e^{-\lambda 50}}{(1 - e^{-\lambda})(1 - e^{-\lambda 50})}. \quad (2)$$

Figure F.1 is a plot of this relation versus τ .

TABLE F.1. Dose Factors

ISOTOPE	DECAY	CONSTANT	GI-LLI	BODY	THYROID	BONE	LIVER	LUNG	KIDNEY	SKIN	SHORE	D.F.	SWIM	SKIN	BODY	D.F.
1																
2																
101	4-3	6.43E-06	1.27E-07	6.40E-06	1.27E-07	0.0E+00	1.27E-07	1.26E-07	1.26E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
102	3E-10	3.16E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
103	C-14	1.38E-08	5.29E-07	3.20E-07	5.29E-07	2.64E-06	5.29E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
104	NA-22	3.04E-05	1.77E-05	3.26E-06	1.77E-05	1.75E-05	1.75E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
105	NA-24	4.62E-02	1.71E-06	3.73E-06	1.71E-06	1.71E-06	1.71E-06	1.71E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
106	P-32	2.02E-03	7.44E-06	2.15E-05	0.0E+00	1.93E-04	1.20E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
107	CA-41	1.00E-09	3.96E-05	3.07E-06	0.0E+00	8.40E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
108	CR-51	1.04E-03	2.67E-09	6.69E-07	1.59E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
109	WN-54	9.53E-05	8.68E-07	1.38E-05	0.0E+00	0.0E+00	4.62E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
110	FE-55	3.04E-05	1.48E-07	8.41E-07	0.0E+00	6.78E-07	7.44E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
111	FE-59	6.42E-04	3.68E-06	3.31E-05	0.0E+00	4.12E-06	1.01E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
112	CO-57	1.07E-04	2.92E-07	4.47E-06	0.0E+00	0.0E+00	1.76E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
113	CO-58	4.05E-04	1.67E-06	1.51E-05	0.0E+00	0.0E+00	7.66E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
114	CO-60	1.50E-05	4.70E-06	3.94E-05	0.0E+00	0.0E+00	2.11E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
115	NI-59	9.96E-10	5.14E-07	6.90E-07	0.0E+00	2.65E-06	1.33E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
116	NI-63	8.60E-07	1.20E-06	1.61E-06	0.0E+00	3.02E-05	3.10E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
117	ZN-65	1.18E-04	5.08E-06	9.78E-06	0.0E+00	3.46E-06	1.48E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
118	SE-79	1.26E-09	4.40E-07	5.38E-07	0.0E+00	0.0E+00	2.63E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
119	BR-82	1.99E-02	2.24E-06	2.53E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
120	KR-85	7.35E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
121	RB-87	1.60E-15	4.27E-06	5.76E-07	0.0E+00	0.0E+00	1.21E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
122	SR-89	5.55E-04	9.13E-06	4.98E-05	0.0E+00	3.20E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
123	SR-90	2.81E-06	8.95E-05	1.23E-04	0.0E+00	3.36E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
124	SR-90D	2.81E-06	2.65E-10	1.05E-04	0.0E+00	9.80E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
125	SR-91	7.17E-02	2.43E-07	2.87E-05	0.0E+00	5.81E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
126	Y-90	1.08E-02	2.65E-10	1.05E-04	0.0E+00	9.86E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
127	Y-91M	8.32E-01	3.49E-12	2.93E-10	0.0E+00	8.89E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
128	Y-91	4.91E-04	3.60E-09	7.90E-05	0.0E+00	1.35E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
129	Zr-93D	5.25E-11	4.71E-10	2.43E-06	0.0E+00	9.36E-09	1.10E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
130	Zr-95	4.44E-04	6.34E-09	2.93E-05	0.0E+00	2.70E-08	7.83E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
131	Zr-95D	4.44E-04	1.81E-09	2.03E-05	0.0E+00	5.56E-09	7.83E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
132	NB-93M	5.81E-06	6.66E-10	3.84E-06	0.0E+00	6.84E-09	2.51E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
133	NB-95	8.25E-04	1.81E-09	2.03E-05	0.0E+00	5.56E-09	3.29E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
134	MO-93	7.90E-09	2.07E-07	1.25E-06	0.0E+00	0.0E+00	7.65E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
135	MO-99D	1.03E-02	7.88E-07	9.85E-06	0.0E+00	0.0E+00	4.30E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
136	MO-99D	1.03E-02	2.01E-08	2.01E-06	0.0E+00	1.75E-09	2.43E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
137	TC-99M	1.16E-01	2.01E-08	2.01E-06	0.0E+00	1.75E-09	2.43E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
138	TC-99	3.73E-10	4.44E-08	5.34E-06	0.0E+00	1.11E-07	1.65E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
139	RJ-103D	7.29E-04	7.87E-08	2.09E-05	0.0E+00	1.72E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
140	RJ-106D	7.87E-05	3.56E-07	1.81E-04	0.0E+00	2.79E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
141	PO-107	1.11E-11	9.41E-09	9.11E-07	0.0E+00	0.0E+00	1.47E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
142	AG-110M	1.14E-04	8.70E-08	5.82E-05	0.0E+00	1.46E-07	1.44E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
143	CD-113M	5.65E-06	6.59E-08	2.30E-05	0.0E+00	0.0E+00	2.09E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
144	SN-126D	7.81E-10	2.40E-06	2.43E-05	4.79E-07	7.78E-05	1.63E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
145	SB-125	2.93E-05	4.17E-07	1.86E-05	1.72E-09	0.0E+00	1.57E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

146	SA-126	2.31E-03	9.17E-07	9.40E-05	6.92E-09	1.16E-06	2.36E-08	.00E+00	.00E+00	1.00E-08	8.90E-09	3.30E-06	2.40E-06
147	TE-125M	4.98E-04	3.49E-07	1.05E-05	7.42E-07	2.72E-06	9.47E-07	.00E+00	.00E+00	4.80E-11	3.50E-11	1.59E-08	3.60E-09
148	FE-127M	2.65E-04	7.52E-07	2.10E-05	1.61E-06	6.40E-06	2.25E-06	.00E+00	.00E+00	1.70E-12	1.10E-12	1.60E-09	2.60E-10
149	TE-127	7.37E-02	2.21E-08	8.13E-04	7.53E-08	1.03E-07	3.70E-08	.00E+00	.00E+00	1.10E-11	1.00E-11	1.70E-07	2.80E-09
150	TE-129	4.65E-12	6.01E-06	3.07E-07	7.05E-03	2.49E-06	1.76E-06	.00E+00	5.03E-06	7.50E-10	4.50E-10	1.30E-07	1.70E-08
151	1-130	5.59E-02	8.76E-07	1.89E-06	2.50E-04	7.41E-07	2.20E-06	.00E+00	.00E+00	1.70E-08	1.40E-08	4.80E-06	3.90E-06
152	1-131	3.59E-03	3.36E-07	1.53E-04	1.82E-03	3.93E-06	5.67E-06	.00E+00	1.02E-05	3.40E-09	2.80E-09	9.30E-07	7.80E-07
153	1-132	3.01E-01	1.29E-07	1.07E-07	7.33E-05	2.10E-07	5.25E-07	.00E+00	.00E+00	2.40E-08	1.70E-08	5.50E-06	4.40E-06
154	1-133	3.30E-02	7.64E-07	2.25E-06	4.81E-04	1.43E-06	2.84E-06	.00E+00	.00E+00	4.50E-09	3.70E-09	1.50E-06	9.60E-07
155	1-134	8.00E-01	1.02E-07	2.60E-10	3.73E-05	1.07E-07	2.87E-07	.00E+00	.00E+00	1.90E-08	1.60E-08	5.50E-06	4.20E-06
156	1-135	1.03E-04	4.51E-07	1.81E-04	1.76E-06	5.00E-07	1.25E-06	.00E+00	.00E+00	1.90E-08	1.20E-08	4.00E-06	3.30E-06
157	CS-134	3.86E-05	1.00E-04	2.56E-06	.00E+00	5.29E-05	.00E+00	1.30E-05	4.82E-05	1.40E-08	1.20E-08	7.50E-06	2.90E-06
158	CS-135	2.63E-11	5.66E-06	3.71E-07	.00E+00	1.44E-05	1.49E-05	1.00E-05	.00E+00	.00E+00	.00E+00	1.10E-08	6.60E-11
159	CS-136	2.22E-03	1.53E-05	2.86E-06	.00E+00	6.24E-06	2.53E-05	.00E+00	.00E+00	1.70E-08	1.50E-08	4.80E-06	4.10E-06
160	CS-137	2.64E-05	5.60E-05	2.05E-06	.00E+00	6.37E-05	9.96E-05	.00E+00	3.71E-05	4.90E-09	4.20E-09	1.40E-06	1.00E-06
161	CS-138	1.29E+00	7.42E-08	4.75E-13	.00E+00	5.65E-08	1.10E-07	.00E+00	.00E+00	2.40E-08	2.10E-08	5.70E-06	4.00E-06
162	SA-140	2.26E-03	1.33E-05	6.02E-05	.00E+00	2.62E-05	2.54E-08	.00E+00	.00E+00	1.70E-08	1.50E-08	5.30E-06	4.10E-06
163	SA-140D	2.26E-03	3.34E-10	9.32E-05	.00E+00	2.43E-09	1.22E-09	.00E+00	.00E+00	1.70E-08	1.50E-08	5.30E-06	4.10E-06
164	CE-141	8.75E-04	6.92E-16	2.28E-05	.00E+00	8.41E-04	6.13E-09	.00E+00	2.87E-09	5.20E-10	5.50E-10	2.40E-07	1.90E-07
165	CE-144+0	1.02E-04	1.98E-08	1.69E-04	.00E+00	3.27E-07	1.73E-07	.00E+00	.00E+00	3.70E-10	3.20E-10	1.40E-06	9.60E-08
166	PR-144	2.41E+00	1.59E-12	4.51E-18	.00E+00	3.13E-11	1.40E-11	.00E+00	.00E+00	2.30E-10	2.00E-10	1.30E-06	5.60E-08
167	SA-147	3.02E-05	1.22E-09	7.93E-06	.00E+00	2.36E-06	3.01E-09	.00E+00	6.37E-09	.00E+00	.00E+00	1.30E-08	7.50E-11
168	SA-148	5.75E-03	6.11E-10	9.83E-05	.00E+00	7.29E-09	1.20E-09	.00E+00	.00E+00	5.30E-09	4.60E-09	2.00E-06	1.10E-06
169	SA-151	9.03E-07	9.29E-10	5.25E-04	.00E+00	1.12E-04	8.84E-09	.00E+00	.00E+00	2.10E-10	4.80E-11	1.90E-09	2.60E-10
170	EU-152	6.36E-06	1.42E-08	2.56E-05	.00E+00	3.28E-06	3.87E-07	.00E+00	.00E+00	5.53E-09	7.80E-09	2.10E-06	1.80E-06
171	EU-154	4.90E-06	2.61E-09	8.03E-05	.00E+00	2.34E-07	1.01E-07	.00E+00	.00E+00	9.00E-09	7.80E-09	2.70E-06	2.10E-06
172	EU-155	4.37E-05	2.94E-09	9.40E-04	.00E+00	2.05E-04	9.88E-04	.00E+00	.00E+00	4.33E-10	3.81E-10	1.10E-07	9.90E-05
173	40-156M	6.56E-08	1.84E-08	2.55E-05	.00E+00	6.05E-08	2.12E-08	.00E+00	.00E+00	1.00E-08	8.90E-09	2.80E-06	2.40E-06
174	23-210+0	3.75E-06	1.01E-04	5.42E-05	.00E+00	1.47E-04	6.49E-04	.00E+00	.00E+00	1.70E-11	1.30E-11	3.60E-07	3.07E-09
175	41-154	3.76E-03	3.96E-05	4.75E-05	.00E+00	4.74E-07	3.23E-05	.00E+00	.00E+00	.00E+00	.00E+00	3.60E-07	2.70E-09
176	20-210	2.17E-08	8.82E-05	6.46E-05	.00E+00	3.58E-06	7.57E-04	.00E+00	.00E+00	6.20E-10	5.40E-10	1.70E-11	1.50E-11
177	20-222+0	7.55E-03	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	7.40E-09	6.40E-09	3.10E-06	1.80E-06
178	SA-223+0	2.53E-03	5.15E-04	3.21E-04	.00E+00	4.98E-03	7.66E-06	.00E+00	.00E+00	1.40E-09	1.50E-09	1.30E-06	4.07E-07
179	SA-224+0	7.93E-03	2.94E-04	3.60E-04	.00E+00	1.62E-03	3.90E-06	.00E+00	.00E+00	1.00E-08	8.90E-09	3.50E-06	2.50E-06
180	SA-225+0	1.95E-03	1.31E-03	3.06E-04	.00E+00	6.57E-03	7.79E-06	.00E+00	.00E+00	1.20E-10	8.40E-11	6.30E-06	1.90E-06
181	SA-226+0	4.94E-05	7.69E-03	3.32E-04	.00E+00	1.17E-02	5.75E-06	.00E+00	.00E+00	7.40E-09	6.40E-09	3.10E-06	1.80E-06
182	SA-226+0	1.30E-05	1.12E-02	5.64E-05	.00E+00	1.91E-02	3.12E-06	.00E+00	.00E+00	1.40E-09	1.20E-09	4.80E-06	3.60E-06
183	AC-225	2.49E-03	2.96E-07	4.07E-04	.00E+00	4.41E-06	6.09E-06	.00E+00	.00E+00	1.90E-09	1.60E-09	1.10E-06	4.00E-07
184	AC-227+0	3.44E-06	5.24E-06	7.94E-05	.00E+00	7.88E-05	3.19E-05	.00E+00	.00E+00	2.40E-09	2.00E-09	6.30E-07	4.40E-07
185	14-227+0	1.49E-03	3.89E-07	5.39E-04	.00E+00	1.33E-05	2.42E-07	.00E+00	.00E+00	6.50E-10	5.10E-10	1.60E-07	1.30E-07
186	14-228+0	4.14E-05	7.01E-06	5.63E-04	.00E+00	1.52E-04	2.57E-06	.00E+00	.00E+00	1.00E-08	8.90E-09	3.50E-06	2.60E-06
187	14-229	1.04E-08	4.75E-06	5.12E-04	.00E+00	3.06E-04	4.79E-06	.00E+00	.00E+00	2.70E-09	2.20E-09	1.30E-06	5.80E-06
188	14-230+0	9.64E-10	1.24E-06	6.02E-05	.00E+00	4.52E-05	2.66E-06	.00E+00	.00E+00	.00E+00	6.50E-09	3.10E-06	1.60E-06
189	14-231+0	5.66E-15	1.93E-06	1.24E-06	.00E+00	3.92E-05	2.66E-06	.00E+00	.00E+00	4.00E-09	3.60E-09	4.80E-06	3.60E-06
190	14-232	1.20E-04	1.13E-04	1.13E-04	.00E+00	8.03E-08	4.73E-09	.00E+00	.00E+00	1.30E-10	1.10E-10	7.70E-07	2.80E-05
191	SA-231+0	2.92E-09	3.79E-06	6.77E-04	.00E+00	9.01E-05	3.46E-06	.00E+00	.00E+00	2.70E-09	2.20E-09	2.00E-07	5.00E-07
192	SA-233	1.17E-03	7.11E-10	1.54E-05	.00E+00	5.27E-07	1.36E-09	.00E+00	.00E+00	1.40E-09	1.30E-09	4.00E-07	3.40E-07

193	U-232+D	1.10E-06	2.72E-04	6.72E-05	.00E+00	2.38E-03	.00E+00	.00E+00	4.48E-04	2.69E-11	2.59E-12	1.10E-09	4.56E-10
194	U-233	4.88E-10	4.86E-05	6.27E-05	.00E+00	4.97E-04	.00E+00	.00E+00	2.09E-04	2.80E-09	2.30E-09	1.40E-06	5.90E-07
195	U-234	3.20E-10	4.77E-05	6.14E-05	.00E+00	4.77E-04	.00E+00	.00E+00	1.99E-04	2.00E-11	7.40E-13	4.70E-09	1.70E-10
196	U-235+D	1.11E-13	4.48E-05	7.81E-05	.00E+00	4.57E-04	.00E+00	.00E+00	1.87E-04	4.00E-09	3.20E-09	3.30E-07	2.70E-07
197	U-236	3.31E-12	4.57E-05	5.76E-05	.00E+00	4.57E-04	.00E+00	.00E+00	1.91E-04	1.80E-11	2.10E-14	4.30E-09	4.50E-12
198	U-237	4.28E-03	1.47E-08	1.94E-05	.00E+00	5.53E-08	.00E+00	.00E+00	1.36E-07	1.30E-09	1.00E-09	3.40E-07	2.60E-07
199	U-238+D	1.81E-14	4.18E-05	1.66E-04	.00E+00	4.37E-04	.00E+00	.00E+00	1.75E-04	1.50E-10	1.10E-10	8.80E-07	2.80E-08
200	NP-237+D	3.69E-11	1.31E-06	7.94E-05	.00E+00	3.00E-05	2.70E-06	.00E+00	.00E+00	1.60E-09	1.40E-09	4.50E-07	3.60E-07
201	NP-239	1.23E-02	6.46E-11	2.40E-05	.00E+00	1.20E-09	1.18E-10	.00E+00	.00E+00	1.10E-09	9.50E-10	3.70E-07	2.40E-07
202	PU-238	9.20E-07	4.39E-07	7.30E-05	.00E+00	1.76E-05	2.70E-06	.00E+00	2.04E-06	1.80E-11	1.30E-12	4.00E-09	1.50E-10
203	PU-239	3.25E-09	4.12E-07	6.66E-05	.00E+00	1.65E-05	2.54E-06	.00E+00	1.92E-06	7.70E-12	7.90E-13	1.70E-09	1.20E-10
204	PU-240	1.20E-08	4.16E-07	6.78E-05	.00E+00	1.65E-05	2.57E-06	.00E+00	1.92E-06	1.80E-11	1.30E-12	4.00E-09	1.40E-10
205	PU-241	5.99E-06	4.21E-10	6.78E-07	.00E+00	1.44E-08	2.60E-09	.00E+00	4.07E-10	6.80E-12	4.60E-12	9.50E-11	6.10E-11
206	PU-242	2.09E-10	3.92E-07	6.53E-05	.00E+00	1.57E-05	2.42E-06	.00E+00	1.82E-06	1.60E-11	1.10E-12	3.60E-09	1.10E-10
207	PU-244	9.88E-13	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00
208	AM-241	1.73E-07	1.46E-06	7.42E-05	.00E+00	1.83E-05	2.04E-05	.00E+00	1.02E-05	2.60E-10	1.80E-10	6.10E-08	3.90E-08
209	AM-242M+	5.20E-07	1.62E-06	9.34E-05	.00E+00	2.01E-05	2.12E-05	.00E+00	.00E+00	1.80E-10	2.60E-11	1.60E-07	5.10E-09
210	AM-243+D	9.96E-09	1.41E-06	9.73E-05	.00E+00	1.77E-05	1.97E-05	.00E+00	.00E+00	1.50E-09	1.30E-09	4.60E-07	3.10E-07
211	CM-242	1.77E-04	8.26E-07	7.92E-05	.00E+00	1.25E-05	1.32E-05	.00E+00	3.84E-06	2.30E-11	5.50E-12	4.70E-09	3.40E-10
212	CM-243	2.50E-06	1.58E-06	7.81E-05	.00E+00	2.38E-05	2.51E-05	.00E+00	.00E+00	2.90E-09	2.30E-09	3.10E-07	2.30E-07
213	CM-244	4.49E-06	1.51E-06	7.55E-05	.00E+00	2.28E-05	2.40E-05	.00E+00	7.06E-06	1.80E-11	2.90E-12	3.90E-09	2.60E-10
214	CM-245+D	8.49E-09	1.49E-06	7.04E-05	.00E+00	2.24E-05	2.36E-05	.00E+00	.00E+00	1.20E-09	9.50E-10	1.30E-07	9.60E-08
215	CM-246	1.44E-08	1.49E-06	6.91E-05	.00E+00	2.23E-05	2.36E-05	.00E+00	.00E+00	1.50E-11	1.00E-12	3.30E-09	1.10E-10
216	CM-247+D	4.90E-12	1.46E-06	9.09E-05	.00E+00	2.16E-05	2.32E-05	.00E+00	.00E+00	2.60E-09	2.20E-09	7.50E-07	4.70E-07
217	CM-248	1.68E-10	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00	.00E+00

FIGURE F.1. 50 Yr Dose Accumulation Factor as a Function of Effective Half-Life

APPENDIX G

TRANSFER FACTORS

APPENDIX G - TRANSFER FACTORS

Bioaccumulation Factors, B_{ip}

Bioaccumulation (concentration factors) for aquatic organisms in equilibrium with their surroundings and which are postulated to be consumed by the individual are listed in Table G.1.⁽⁷⁾ These factors of pCi/kg wet weight of organism per pCi/liter of water.

Produce, B_{iv} , and Animal Product, S_{ia} , Transfer Factors

Transfer factors for produce and animal products are given in Table G.2 in units of pCi/kg (wet weight) per pCi/kg (dry soil) for the plant/soil concentration factor and pCi/kg (animal product) per pCi/day (intake) for the animal product/forage transfer factor except for eggs which is in units of pCi/egg per pCi/day.⁽⁷⁾

TABLE G.1. Bioaccumulation Factors for Freshwater Organisms

Element	Bip (pCi/kg Organism Per pCi/Liter Water)		
	Fish	Crustacea	Molluscs
H	.9	.9	.9
BE	10	10	20
C	4600.0	9100.0	9100.0
VA	100.0	200.0	200.0
P	100000	20000.0	20000.0
CA	40.0	330.0	330.0
CR	20.0	2000.0	2000.0
MN	400.0	90000.0	90000.0
FE	100.0	3200.0	3200.0
CO	50.0	200.0	200.0
NI	100.0	100.0	100.0
ZN	2000.0	10000.0	10000.0
SE	170.0	170.0	170.0
BR	420.0	330.0	330.0
KR	1.0	1.0	1.0
RB	2000.0	1000.0	1000.0
SR	30.0	100.0	100.0
Y	25.0	1000.0	1000.0
ZR	3.3	6.7	6.7
VB	30000.0	100.0	100.0
MO	10.0	10.0	10.0
TC	15.0	5.0	5.0
RJ	10.0	300.0	300.0
PD	10.0	300.0	300.0
AG	2.3	770.0	770.0
CD	200.0	2000.0	2000.0
SN	3000.0	1000.0	1000.0
SB	1.0	10.0	10.0
TE	400.0	75.0	75.0
I	15.0	5.0	5.0
CS	2000.0	100.0	100.0
BA	4.0	200.0	200.0
CE	1.0	1000.0	1000.0
PR	25.0	1000.0	1000.0
PM	25.0	1000.0	1000.0
SM	25.0	1000.0	1000.0
EU	25.0	1000.0	1000.0
HO	25.0	1000.0	1000.0
PB	100.0	100.0	100.0
BI	15.0	10.0	10.0
PO	500.0	20000.0	20000.0
RN	57.0	1.0	1.0
RA	50.0	250.0	250.0
AC	25.0	1000.0	1000.0
TH	30.0	500.0	500.0
PA	11.0	110.0	110.0
U	2.0	60.0	60.0
NP	10.0	400.0	400.0
PU	3.5	100.0	100.0
AM	25.0	1000.0	1000.0
CM	25.0	1000.0	1000.0

TABLE G.2. Plant Concentration Factors and Animal Product Transfer Factors

	FILE FOR FOOD PROGRAM:				TRANSFER FACTORS.		
	NUK	PLANT	EGG	MILK	BEEF	PORK	POULTRY
100							
110							
120							
130	BE	4.0E-04	1.0E-03	5.0E-05	8.0E-04	1.0E-02	4.0E-01
140	C-	5.5E+00	1.0E+00	7.5E-03	1.0E+00	1.0E+00	1.0E+00
150	NA	5.0E-02	1.0E-02	2.5E-02	5.0E-02	1.0E-01	1.0E-02
160	P-	1.1E+00	1.0E+00	1.2E-02	3.3E-02	5.4E-01	1.9E-01
170	CA	3.6E-02	1.0E-04	8.0E-03	9.0E-04	9.0E-04	9.0E-04
180	CR	2.5E-04	9.0E-04	1.1E-03	9.0E-04	9.0E-04	9.0E-04
190	MN	2.9E-02	5.0E-03	1.2E-04	5.0E-03	1.0E-02	1.0E-03
200	FE	4.0E-04	5.0E-03	6.0E-04	1.0E-03	5.0E-03	1.0E-03
210	CO	9.4E-03	5.0E-03	5.0E-04	1.0E-03	5.0E-03	1.0E-03
220	VI	1.9E-02	5.0E-03	3.4E-03	1.0E-03	5.0E-03	1.0E-03
230	ZN	4.0E-01	2.0E-04	2.0E-02	2.0E-03	5.0E-03	2.0E-03
240	SE	1.3E+00	1.0E-02	2.3E-02	9.0E-04	9.0E-04	9.0E-04
245	BR	7.6E-1	3.0E-01	2.5E-02	2.0E-02	9.0E-02	4.0E-03
250	KR	.0E+00	.0E+00	1.0E-02	.0E+00	.0E+00	.0E+00
260	QB	1.3E-01	9.0E-04	1.5E-02	9.0E-04	9.0E-04	9.0E-04
270	SR	2.0E-01	7.0E-03	1.0E-03	2.0E-03	8.0E-03	9.0E-04
280	Y	2.5E-03	1.0E-05	1.0E-05	6.0E-03	1.0E-02	4.0E-03
290	ZR	1.7E-04	6.0E-05	2.5E-06	5.0E-04	1.0E-03	1.0E-04
300	NB	9.4E-03	2.0E-05	1.2E-03	5.0E-04	1.0E-03	1.0E-04
310	MO	1.3E-01	7.0E-03	3.8E-03	1.0E-02	2.0E-02	2.0E-03
320	TC	2.5E-01	9.0E-04	1.2E-02	9.0E-04	9.0E-04	9.0E-04
330	RU	1.0E-02	7.0E-05	5.0E-07	1.0E-03	5.0E-03	3.0E-04
340	PD	5.0E+00	9.0E-04	5.0E-03	9.0E-04	9.0E-04	9.0E-04
350	AG	1.5E-01	9.0E-04	2.5E-02	9.0E-04	9.0E-04	9.0E-04
360	CD	3.0E-01	1.0E-03	6.2E-05	9.0E-04	9.0E-04	9.0E-04
370	SN	2.5E-03	1.0E-05	2.5E-03	2.5E-03	5.0E-03	2.0E-03
380	SB	1.1E-02	9.0E-04	7.5E-04	9.0E-04	9.0E-04	9.0E-04
390	TE	1.3E+00	7.0E-03	5.0E-04	5.0E-03	1.0E-02	1.0E-02
400	I-	2.0E-02	3.0E-02	1.0E-02	2.0E-02	9.0E-02	4.0E-03
410	CS	3.0E-03	2.0E-02	7.0E-03	3.0E-02	4.0E-02	4.0E-01
415	BA	5.0E-03	6.0E-03	3.0E-04	5.0E-04	2.0E-03	5.0E-04
420	CE	5.0E-04	5.0E-05	1.0E-05	1.0E-03	5.0E-03	6.0E-04
430	PR	2.5E-03	4.0E-05	2.5E-06	5.0E-03	1.0E-02	4.0E-03
440	PM	2.5E-03	4.0E-05	2.5E-06	5.0E-03	1.0E-02	4.0E-03
450	SM	2.5E-03	4.0E-05	2.5E-06	5.0E-03	1.0E-02	4.0E-03
460	EU	2.5E-03	4.0E-05	2.5E-06	5.0E-03	1.0E-02	4.0E-03
470	HO	2.6E-03	1.0E-05	2.5E-06	9.0E-04	9.0E-04	9.0E-04
480	PB	6.8E-02	1.0E-04	3.1E-04	9.0E-04	9.0E-04	9.0E-04
490	BI	1.5E-01	1.0E-03	2.5E-04	9.0E-04	9.0E-04	9.0E-04
500	PO	1.0E+00	9.0E-04	1.5E-03	9.0E-04	9.0E-04	9.0E-04
510	RN	.0E+00	.0E+00	1.0E-02	.0E+00	.0E+00	.0E+00
520	RA	3.1E-04	1.0E-06	8.0E-03	9.0E-04	9.0E-04	9.0E-04
530	AC	2.5E-03	1.0E-04	5.0E-06	5.0E-03	1.0E-02	4.0E-03
540	TH	4.2E-03	1.0E-04	5.0E-06	5.0E-03	1.0E-02	4.0E-03

550	PA	2.5E-03	1.0E-04	5.0E-06	5.0E-03	1.0E-02	4.0E-03
560	U-	2.5E-03	1.0E-04	5.0E-04	5.0E-03	1.0E-02	4.0E-03
570	NP	2.5E-03	1.0E-04	5.0E-06	5.0E-03	1.0E-02	4.0E-03
580	PU	2.5E-04	1.0E-04	1.5E-06	5.0E-03	1.0E-02	4.0E-03
590	AM	2.5E-04	1.0E-04	5.0E-06	5.0E-03	1.0E-02	4.0E-03
600	CM	2.5E-03	1.0E-04	5.0E-06	5.0E-03	1.0E-02	4.0E-03

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APPENDIX H - DESCRIPTION OF THE BASIC LANGUAGE

COMPUTER PROGRAM FOR DOSE CALCULATIONS

Figure H.1 shows the computing scheme for calculating radiological doses using the LST001 file from the geosphere transport code GETOUT as input. The program ARRGWX calculates doses from the aquatic and drinking water pathways, and the program FOOD2 calculates doses from irrigated foods and food products. SUMDOS integrates the dose results from ARRGWX and FOOD2 and summarizes the accumulated dose. The files F00EX, ARGEX2, and TAUS7 contain the dose factors, the transfer factors, and the accumulation factors, respectively. The AWMARG and AWMFD files contain the dose results from ARRGWX and FOOD2. The key file KAWML oversees the running of the programs for a given peak from the LST001 file. KEKE is a master key file which oversees the execution of KAWML.

FIGURE H.1. Flow Diagram for BASIC Language Dose Calculation Scheme

APPENDIX I

SAMPLE OUTPUT FROM THE INTEGRATED GEOSPHERE-
BIOSPHERE TRANSPORT MODEL

APPENDIX I - SAMPLE OUTPUT FROM THE INTEGRATED

GEOSPHERE-BIOSPHERE TRANSPORT MODEL

The single nuclide, two-member chain, and three-member chain migration results, the geosphere transport output file (the biosphere transport input file), and the accumulated dose summary for the base case (10 mile path length, 0.3%/yr leach rate, and 100 yr initial release time after the year 2000) are shown below.

I.1 Single Nuclide Migration Results

A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

1

[illegible]

RADIO/NUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: BE10

HALF LIFE: 1.60E+06 YEARS

NUCLIDE VELOCITY/WATER VELOCITY= .003000

INVENTORY IN WASTE AT YEAR 2000= 4.04E+02 CURIES

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT= 4.04E+02 CURIES

NUCLIDE FLOW RATE INTO AQUIFER = 1.21E+00 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION

INITIAL: 1.19E+00 CURIES PER YEAR AT 48319 YEARS

FINAL : 1.19E+00 CURIES PER YEAR AT 48653 YEARS

LEACH RATE= .003000 FRACTION PER YEAR

LEACH DURATION= 333 YEARS

LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 47897 YEARS

PEAK DISCHARGE RATE= 1.19E+00 CURIES PER YEAR AT 48068 YEARS

RAND WIDTH= 1175 YEARS WITH TAIL END AT 49072 YEARS

DISPERSION FRAC/NO-DISPERSION PEAK = 1.00E+00

TIME*YR DISCHARGE RATE*CI/YR DISP/NO-DISP PULSE/SQUARE

NO DISPERSION NO DISP.

46135	1.324E-08	.000E+00	1.116E-08	5.842E+01
48151	1.912E-07	.000E+00	1.611E-07	5.370E+01
48167	2.200E-06	.000E+00	1.854E-06	4.897E+01
48183	2.022E-05	.000E+00	1.703E-05	4.427E+01
48199	1.486E-04	.000E+00	1.252E-04	3.960E+01
48214	8.760E-04	.000E+00	7.380E-04	3.499E+01
48230	4.152E-03	.000E+00	3.498E-03	3.043E+01
48246	1.589E-02	.000E+00	1.338E-02	2.598E+01
48262	4.933E-02	.000E+00	4.156E-02	2.165E+01
48278	1.252E-01	.000E+00	1.055E-01	1.750E+01
48294	2.622E-01	.000E+00	2.209E-01	1.359E+01
48310	4.591E-01	.000E+00	3.668E-01	1.000E+01
48326	6.846E-01	1.187E+00	5.768E-01	6.859E+00
48341	8.904E-01	1.187E+00	7.501E-01	4.277E+00
48357	1.040E+00	1.187E+00	8.762E-01	2.356E+00
48373	1.127E+00	1.187E+00	9.492E-01	1.111E+00
48389	1.167E+00	1.187E+00	9.829E-01	4.348E-01
48405	1.181E+00	1.187E+00	9.953E-01	1.382E-01
48421	1.186E+00	1.187E+00	9.990E-01	3.519E-02
48437	1.187E+00	1.187E+00	9.998E-01	7.137E-03
48453	1.187E+00	1.187E+00	1.000E+00	1.151E-03
48468	1.187E+00	1.187E+00	1.000E+00	1.475E-04
48484	1.187E+00	1.187E+00	1.000E+00	1.503E-05
48500	1.187E+00	1.187E+00	1.000E+00	1.218E-06
48516	1.187E+00	1.187E+00	1.000E+00	7.844E-08
48532	1.187E+00	1.187E+00	9.999E-01	4.019E-09
48548	1.186E+00	1.187E+00	9.993E-01	1.640E-10
48564	1.183E+00	1.187E+00	9.965E-01	5.333E-12
48580	1.171E+00	1.187E+00	9.865E-01	1.391E-13
48595	1.137E+00	1.187E+00	9.582E-01	2.943E-15
48611	1.061E+00	1.187E+00	8.941E-01	5.163E-17
48627	9.239E-01	1.187E+00	7.785E-01	7.731E-19
48643	7.267E-01	1.187E+00	6.123E-01	1.021E-20
48659	5.012E-01	.000E+00	4.223E-01	1.225E-22
48675	2.957E-01	.000E+00	2.491E-01	1.369E-24
48691	1.464E-01	.000E+00	1.234E-01	1.454E-26
48707	6.004E-02	.000E+00	5.059E-02	1.487E-28
48722	2.018E-02	.000E+00	1.701E-02	1.478E-30
48738	5.523E-03	.000E+00	4.654E-03	1.441E-32
48754	1.224E-03	.000E+00	1.032E-03	1.384E-34
48770	2.191E-04	.000E+00	1.846E-04	.000E+00
48786	3.155E-05	.000E+00	2.658E-05	.000E+00
48802	3.650E-06	.000E+00	3.076E-06	.000E+00
48818	3.387E-07	.000E+00	2.854E-07	.000E+00
48834	2.518E-08	.000E+00	2.122E-08	.000E+00
48849	1.499E-09	.000E+00	1.263E-09	.000E+00
48865	7.140E-11	.000E+00	6.017E-11	.000E+00
48881	2.719E-12	.000E+00	2.292E-12	.000E+00
48897	8.274E-14	.000E+00	6.976E-14	.000E+00
48913	2.614E-15	.000E+00	1.697E-15	.000E+00
48929	3.914E-17	.000E+00	3.299E-17	.000E+00
48945	6.078E-19	.000E+00	5.122E-19	.000E+00
48961	7.538E-21	.000E+00	6.352E-21	.000E+00
48977	7.468E-23	.000E+00	6.244E-23	.000E+00

48992	4.999E+25	.000E+00	4.999E+25	.000E+00	1548	2.562E+03	2.562E+03	1.000E+00	.000E+00
49004	3.174E-27	.000E+00	3.174E-27	.000E+00	1573	2.561E+03	2.561E+03	1.000E+00	.000E+00
49024	1.888E-29	.000E+00	1.888E-29	.000E+00	1574	2.559E+03	2.559E+03	1.000E+00	.000E+00
49046	7.601E-32	.000E+00	6.466E-32	.000E+00	1582	2.558E+03	2.558E+03	1.000E+00	.000E+00
49056	2.445E+34	.000E+00	2.064E-34	.000E+00	1587	2.556E+03	2.556E+03	1.000E+00	.000E+00
49072	6.301E-37	.000E+00	5.310E-37	.000E+00	1592	2.555E+03	2.555E+03	1.000E+00	.000E+00
49088	.000E+00	.000E+00	.000E+00	.000E+00	1594	2.553E+03	2.553E+03	1.000E+00	.000E+00
					1601	2.552E+03	2.552E+03	1.000E+00	.000E+00
					1606	2.550E+03	2.550E+03	1.000E+00	.000E+00
					1611	2.549E+03	2.549E+03	1.000E+00	.000E+00
					1615	2.547E+03	2.547E+03	1.000E+00	.000E+00
					1620	2.546E+03	2.546E+03	1.000E+00	.000E+00
					1625	2.545E+03	2.545E+03	1.000E+00	.000E+00
					1630	2.543E+03	2.543E+03	1.000E+00	.000E+00
					1634	2.542E+03	2.542E+03	1.000E+00	.000E+00
					1639	2.540E+03	2.540E+03	1.000E+00	.000E+00
					1644	2.539E+03	2.539E+03	1.000E+00	.000E+00
					1649	2.537E+03	2.537E+03	1.000E+00	.000E+00
					1653	2.536E+03	2.536E+03	1.000E+00	.000E+00
					1658	2.534E+03	2.534E+03	1.000E+00	.000E+00
					1663	2.533E+03	2.533E+03	1.000E+00	.000E+00
					1668	2.531E+03	2.531E+03	1.000E+00	.000E+00
					1672	2.530E+03	2.530E+03	1.000E+00	.000E+00
					1677	2.529E+03	2.529E+03	1.000E+00	.000E+00
					1682	2.527E+03	2.527E+03	1.000E+00	.000E+00
					1687	2.526E+03	2.526E+03	1.000E+00	.000E+00
					1691	2.524E+03	2.524E+03	1.000E+00	.000E+00
					1701	2.521E+03	2.521E+03	1.000E+00	.000E+00
					1706	2.520E+03	2.520E+03	1.000E+00	.000E+00
					1710	2.518E+03	2.518E+03	1.000E+00	.000E+00
					1715	2.517E+03	2.517E+03	1.000E+00	.000E+00
					1720	2.516E+03	2.516E+03	1.000E+00	.000E+00
					1725	2.514E+03	2.514E+03	1.000E+00	.000E+00
					1729	2.513E+03	2.513E+03	1.000E+00	.000E+00
					1734	2.511E+03	2.511E+03	1.000E+00	.000E+00
					1739	2.510E+03	2.510E+03	1.000E+00	.000E+00
					1744	2.508E+03	2.508E+03	1.000E+00	.000E+00
					1748	2.507E+03	2.507E+03	1.000E+00	.000E+00
					1753	2.505E+03	2.505E+03	1.000E+00	.000E+00
					1758	2.504E+03	2.504E+03	1.000E+00	.000E+00
					1762	2.503E+03	2.503E+03	1.000E+00	.000E+00
					1767	2.501E+03	2.501E+03	1.000E+00	.000E+00
					1772	2.500E+03	2.500E+03	1.000E+00	.000E+00
					1777	2.498E+03	2.498E+03	1.000E+00	.000E+00
					1781	2.497E+03	2.497E+03	1.000E+00	.000E+00
					1786	2.495E+03	2.495E+03	1.000E+00	.000E+00
					1791	2.494E+03	2.494E+03	1.000E+00	.000E+00
					1796	2.493E+03	2.493E+03	1.000E+00	.000E+00
					1800	2.491E+03	2.491E+03	1.000E+00	.000E+00
					1805	2.490E+03	2.490E+03	1.000E+00	.000E+00
					1810	2.488E+03	2.488E+03	1.000E+00	.000E+00
					1815	2.487E+03	2.487E+03	1.000E+00	.000E+00
					1819	2.485E+03	2.485E+03	1.000E+00	.000E+00

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: C14

HALF LIFE: 5.73E+03 YEARS

NUCLIDE VELOCITY/WATER VELOCITY= .100000

INVENTORY IN WASTE AT YEAR 0: 1.03E+06 Curies

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.02E+06 Curies

NUCLIDE FLOW RATE INTO ADJUTER=3.04E+03 Curies/yr

NUCLIDE DISCHARGE RATE FROM ADJUTER WITH NO DISPERSION

INITIAL: 2.57E+03 Curies PER YEAR AT 1547 YEARS

FINAL: 2.47E+03 Curies PER YEAR AT 1800 YEARS

LEACH CAPACITY: .000000 FRACTION PER YEAR

LEACH OPERATIONS: 333 YEARS

LENGTH OF ADJUTER: 10.00 MILES

WATER VELOCITY: 1.000 FT/Day

WATER TRAVEL TIME: 145 YEARS

AXIAL DISPERSION COEFFICIENT: .00000 CM²/MIN

NUCLIDE DISCHARGE RATE FROM ADJUTER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 1535 YEARS

PEAK DISCHARGE RATE: 2.57E+03 Curies PER YEAR AT 1554 YEARS

END OF LEACH: 350 YEARS WITH TAIL FNC AT 1891 YEARS

DISPERSION PEAK/NO-DISPERSION PEAK = 9.99E-01

TIME, YR	DISCHARGE RATE, C/yr	DISP/NO-DISP	PULS/SQUARE
100	.000E+00	.000E+00	.000E+00
1530	.000E+00	.000E+00	.000E+00
1535	1.071E-29	.000E+00	1.978E+03
1540	1.435E-29	.000E+00	5.471E+03
1544	2.770E+01	.000E+00	1.078E+02
1549	2.552E+03	9.93E+01	6.001E+00
1554	2.567E+03	1.000E+00	4.366E-10
1559	2.565E+03	1.000E+00	4.716E-10
1563	2.564E+03	1.000E+00	.000E+00

1824 2.484E+03 2.484E+03 1.000E+00 .000E+00
 1829 2.483E+03 2.483E+03 1.000E+00 .000E+00
 1834 2.481E+03 2.481E+03 1.000E+00 .000E+00
 1838 2.480E+03 2.480E+03 1.000E+00 .000E+00
 1843 2.478E+03 2.478E+03 1.000E+00 .000E+00
 1848 2.477E+03 2.477E+03 1.000E+00 .000E+00
 1853 2.475E+03 2.475E+03 1.000E+00 .000E+00
 1857 2.474E+03 2.474E+03 1.000E+00 .000E+00
 1862 2.473E+03 2.473E+03 1.000E+00 .000E+00
 1867 2.471E+03 2.471E+03 1.000E+00 .000E+00
 1872 2.470E+03 2.470E+03 1.000E+00 .000E+00
 1876 2.468E+03 2.468E+03 9.999E-01 .000E+00
 1881 3.063E+02 .000E+00 1.242E-01 .000E+00
 1886 3.606E-06 .000E+00 1.473E-09 .000E+00
 1891 1.244E-23 .000E+00 5.064E-27 .000E+00
 1895 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: C41
 HALF LIFE: 1.30E+05 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .010000
 INVENTORY IN WASTE AT YEAR 2000= 6.95E+02 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT= 6.85E+02 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER = 2.06E+00 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 1.90E+00 CURIES PER YEAR AT 14566 YEARS
 FINAL : 1.90E+00 CURIES PER YEAR AT 14899 YEARS

LEACH WASTE: .003000 FRACTION PER YEAR
 LEACH DURATION: 333 YEARS
 LENGTH OF AQUIFER: 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 14463 YEARS
 MEAN DISCHARGE RATE 1.50E+00 CURIES PER YEAR AT 14615 YEARS
 PEAK WIDTH= 576 YEARS WITH TAIL END AT 15019 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = 1.00E+00

TIME/YR DISCHARGE RATE/C/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DIED.

1800 .000E+00 .000E+00 .000E+00 .000E+00
 1805 .000E+00 .000E+00 .000E+00 .000E+00
 1810 .000E+00 .000E+00 .000E+00 .000E+00
 1815 .000E+00 .000E+00 .000E+00 .000E+00
 1820 .000E+00 .000E+00 .000E+00 .000E+00
 1825 .000E+00 .000E+00 .000E+00 .000E+00
 1830 .000E+00 .000E+00 .000E+00 .000E+00
 1835 .000E+00 .000E+00 .000E+00 .000E+00
 1840 .000E+00 .000E+00 .000E+00 .000E+00
 1845 .000E+00 .000E+00 .000E+00 .000E+00
 1850 .000E+00 .000E+00 .000E+00 .000E+00
 1855 .000E+00 .000E+00 .000E+00 .000E+00
 1860 .000E+00 .000E+00 .000E+00 .000E+00
 1865 .000E+00 .000E+00 .000E+00 .000E+00
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 1885 .000E+00 .000E+00 .000E+00 .000E+00
 1890 .000E+00 .000E+00 .000E+00 .000E+00
 1895 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: C600
 HALF LIFE: 5.27E+00 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .003000
 INVENTORY IN WASTE AT YEAR 2000= 7.70E+07 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT= 1.46E+02 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER = 4.39E-01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .000E+00 CURIES PER YEAR AT 48319 YEARS
 FINAL : .000E+00 CURIES PER YEAR AT 48653 YEARS

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 48486 YEARS
 BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: SET4
 HALF LIFE: 6.50E+04 YEARS
 NUCLIDE VELOCITY/WATER VELOCITY= .010000
 INVENTORY IN WASTE AT YEAR 2000= 9.72E+04 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=9.71E+04 CURIES
 NUCLIDE FLOW RATE INTO AQUIFER =2.91E+02 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 2.50E+02 CURIES PER YEAR AT 14566 YEARS
 FINAL : 2.49E+02 CURIES PER YEAR AT 14899 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 14443 YEARS
 PEAK DISCHARGE RATE= 2.50E+02 CURIES PER YEAR AT 14615 YEARS
 BAND WIDTH= 576 YEARS WITH TAIL END AT 15019 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK =9.99E-01

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00
 14423 .000E+00 .000E+00 .000E+00 .000E+00
 14443 8.46E-34 .000E+00 3.44E-36 4.15E+02
 14462 5.34E-24 .000E+00 2.53E-26 3.54E+02
 14481 1.022E-15 .000E+00 4.09E-18 2.92E+02

48671 5.00E+01 1.234E-01 1.454E-26
 48707 6.05E+01 5.05E-02 1.487E-24
 48722 6.89E+00 1.701E-02 1.478E-30
 48739 1.367E+00 4.654E-03 1.441E-32
 48754 4.183E-01 1.032E-03 1.384E-34
 48770 7.483E-02 1.848E-04 .000E+00
 48786 1.077E-02 2.658E-05 .000E+00
 48802 1.246E-03 3.076E-06 .000E+00
 48818 1.157E-04 2.854E-07 .000E+00
 48834 8.59E-06 2.12E-08 .000E+00
 48849 5.11E-07 1.253E-09 .000E+00
 48865 2.437E-08 6.017E-11 .000E+00
 48881 9.280E-10 2.292E-12 .000E+00
 48897 2.825E-11 6.976E-14 .000E+00
 48913 6.872E-13 1.697E-15 .000E+00
 48929 1.335E-14 3.299E-17 .000E+00
 48945 2.073E-16 5.122E-19 .000E+00
 48961 2.571E-18 6.352E-21 .000E+00
 48977 2.547E-20 6.294E-23 .000E+00
 48992 2.015E-22 4.940E-25 .000E+00
 49008 1.273E-24 3.147E-27 .000E+00
 49024 6.425E-27 .000E+00 1.588E-29 .000E+00
 49040 2.591E-29 .000E+00 6.406E-32 .000E+00
 49056 8.344E-32 .000E+00 2.064E-34 .000E+00
 49072 2.147E-34 .000E+00 5.310E-37 .000E+00
 49088 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: N163
 HALF LIFE: 1.00E+02 YEARS
 NUCLIDE VELOCITY/WATER VELOCITY= .003000
 INVENTORY IN WASTE AT YEAR 2000= 6.67E+06 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=3.14E+06 CURIES
 NUCLIDE FLOW RATE INTO AQUIFER =9.42E+03 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 48319 YEARS
 FINAL : .00E+00 CURIES PER YEAR AT 48653 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

WAIVER TRAVEL TIME = 145 YEARS
 AXIAL DISPERSION COEFFICIENT = .0000 CM²/MIN
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 7100 YEARS
 PEAK DISCHARGE RATE = 1.40E-02 Curies per year AT 72593 YEARS
 BAND WIDTH = 1570 YEARS WITH TAIL END AT 73378 YEARS
 DISPERSION PFAK/NO-DISPERSION PEAK = 9.99E-01

TIME, YR	DISCHARGE RATE, C/YR	DISP/NO-DISP	PULSE/SQUARE
100	.000E+00	.000E+00	.000E+00
71764	.000E+00	.000E+00	.000E+00
71804	.000E+00	.000E+00	.000E+00
71832	.000E+00	.000E+00	.000E+00
71854	.000E+00	.000E+00	.000E+00
71860	.000E+00	.000E+00	.000E+00
71903	.000E+00	.000E+00	.000E+00
71927	.000E+00	.000E+00	.000E+00
71951	.000E+00	.000E+00	.000E+00
71975	.000E+00	.000E+00	.000E+00
71994	.000E+00	.000E+00	.000E+00
72022	.000E+00	.000E+00	.000E+00
72046	.000E+00	.000E+00	.000E+00
72070	.000E+00	.000E+00	.000E+00
72094	.000E+00	.000E+00	.000E+00
72117	.000E+00	.000E+00	.000E+00
72141	.000E+00	.000E+00	.000E+00
72165	.000E+00	.000E+00	.000E+00
72189	.000E+00	.000E+00	.000E+00
72213	.000E+00	.000E+00	.000E+00
72236	.000E+00	.000E+00	.000E+00
72260	.000E+00	.000E+00	.000E+00
72284	.000E+00	.000E+00	.000E+00
72308	.000E+00	.000E+00	.000E+00
72332	.000E+00	.000E+00	.000E+00
72355	.000E+00	.000E+00	.000E+00
72379	.000E+00	.000E+00	.000E+00
72403	.000E+00	.000E+00	.000E+00
72427	.000E+00	.000E+00	.000E+00
72450	.000E+00	.000E+00	.000E+00
72474	.000E+00	.000E+00	.000E+00
72498	.000E+00	.000E+00	.000E+00
72522	.000E+00	.000E+00	.000E+00
72545	.000E+00	.000E+00	.000E+00
72569	.000E+00	.000E+00	.000E+00
72593	.000E+00	.000E+00	.000E+00
72617	.000E+00	.000E+00	.000E+00
72641	.000E+00	.000E+00	.000E+00
72665	.000E+00	.000E+00	.000E+00
72689	.000E+00	.000E+00	.000E+00
72712	.000E+00	.000E+00	.000E+00

TIME OF LEACH INCIDENT: 100 YEARS
 NUCLEIDE: 5947
 HALF LIFE: 4.70E+10 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY = .702000
 INVENTORY IN WASTE AT YEAR 2000 = 4.67E+00 Curies
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 4.67E+00 Curies
 NUCLEIDE FLOW RATE INTO AQUIFER = 1.40E-02 Curies/YR
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 1.40E-02 Curies per year AT 72429 YEARS
 FINAL: 1.40E-02 Curies per year AT 72762 YEARS
 LEACH RATE = .003600 FRACTION PER YEAR
 LEACH DURATION = 33.5 YEARS
 LENGTH OF AQUIFER = 10.00 MILES
 WATER VELOCITY = 1.000 FT/DAY

WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .000E+00 CURIES PER YEAR AT 14732 YEARS
 BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .000E+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DTSP PULSE/SQUARE
 DISPERSION NO DISP.
 100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS
 NUCLEIDE: Z493
 HALF LIFE: 9.50E+05 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000100
 INVENTORY IN WASTE AT YEAR 2000= 4.03E+05 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=4.03E+05 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =1.21E+03 CURIES/YR

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 4.21E+02 CURIES PER YEAR AT 1446675 YEARS
 FINAL : 4.21E+02 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 1433980 YEARS
 PEAK DISCHARGE RATE= 5.62E+01 CURIES PER YEAR AT 1446797 YEARS
 BAND WIDTH= 25634 YEARS WITH TAIL END AT 1459614 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK =1.34E-01

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DTSP PULSE/SQUARE
 DISPERSION NO DISP.
 100 .000E+00 .000E+00 .000E+00 .000E+00
 1433980 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS
 NUCLEIDE: S990
 HALF LIFE: 8.90E+01 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .010000
 INVENTORY IN WASTE AT YEAR 2000= 1.29E+10 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.10E+09 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =3.50E+06 CURIES/YR

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 14586 YEARS
 FINAL : .00E+00 CURIES PER YEAR AT 14599 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY

1459614 1.534E-34 .000E+00 3.660E-37 5.682E-02
1460089 .000E+00 .000E+00 .000E+00 .000E+00

RAUIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: MO93
HALF LIFE: 3.00E+13 YEARS
NUCLIDE VELOCITY/WATER VELOCITY= .040000
INVENTORY IN WASTE AT YEAR 2000= 5.22E+03 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=5.18E+03 CURIES
NUCLIDE FLOW RATE INTO AQUIFER =1.55E+01 CURIES/YK

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: 6.74E+00 CURIES PER YEAR AT 3716 YEARS
FINAL : 6.24E+00 CURIES PER YEAR AT 4050 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 3689 YEARS
PEAK DISCHARGE RATE= 6.72E+00 CURIES PER YEAR AT 3727 YEARS
HAND WIDTH= 388 YEARS WITH TAIL END AT 4076 YEARS
DISPERSION PLANK/NO-DISPERSION PEAK =9.98E-01

TIME.YN	DISCHARGE RATE,CI/YN	DISP/NO-DISP	PULSE/SQUARE
100	.000E+00	.000E+00	.000E+00
3682	.000E+00	.000E+00	.000E+00
3689	2.981E-29	.000E+00	4.396E-30
3701	2.296E-18	.000E+00	1.077E-18
3708	2.349E-09	.000E+00	3.474E-10
3714	1.117E-03	.000E+00	1.654E-04
3720	1.063E+00	.000E+00	1.547E-01
3727	6.327E+00	6.723E+00	9.397E-01
3733	6.723E+00	6.723E+00	1.000E+00
3739	6.713E+00	6.713E+00	1.117E-08
3746	6.703E+00	6.703E+00	1.656E-17
3752	6.693E+00	6.693E+00	3.777E-29
3758	6.683E+00	6.683E+00	.000E+00
4050	6.673E+00	6.673E+00	.000E+00

1.161E-35 .000E+00 2.733E-38 4.272E+00
5.390E-33 .000E+00 1.270E-35 4.180E+00
2.002E-30 .000E+00 4.718E-33 4.038E+00
5.881E-28 .000E+00 1.386E-30 3.897E+00
1.367E-25 .000E+00 3.222E-28 3.755E+00
2.513E-23 .000E+00 8.927E-26 3.615E+00
3.456E-21 .000E+00 8.627E-24 3.474E+00
4.213E-19 .000E+00 9.943E-22 3.335E+00
3.463E-17 .000E+00 9.075E-20 3.196E+00
2.778E-15 .000E+00 6.563E-18 3.059E+00
1.592E-13 .000E+00 3.761E-16 2.922E+00
7.227E-12 .000E+00 1.708E-14 2.787E+00
2.602E-10 .000E+00 6.153E-13 2.654E+00
7.432E-09 .000E+00 1.758E-11 2.522E+00
1.884E-07 .000E+00 3.984E-10 2.392E+00
3.028E-06 .000E+00 7.167E-09 2.264E+00
4.323E-05 .000E+00 1.023E-07 2.140E+00
4.900E-04 .000E+00 1.161E-06 2.017E+00
4.412E-03 .000E+00 1.045E-05 1.898E+00
3.155E-02 .000E+00 7.401E-05 1.782E+00
1.794E-01 .000E+00 4.254E-04 1.669E+00
4.107E-01 .000E+00 1.923E-03 1.561E+00
2.912E-00 .000E+00 6.909E-03 1.456E+00
8.318E+00 .000E+00 1.974E-02 1.356E+00
1.890E+01 .000E+00 4.487E-02 1.260E+00
3.415E+01 .000E+00 9.112E-02 1.168E+00
4.912E+01 .000E+00 1.167E-01 1.081E+00
5.427E+01 .000E+00 1.336E-01 9.981E-01
5.123E+01 .000E+00 1.218E-01 9.197E-01
3.711E+01 .000E+00 8.842E-02 8.457E-01
2.464E+01 .000E+00 5.112E-02 7.760E-01
9.891E+00 .000E+00 2.354E-02 7.106E-01
3.628E+00 .000E+00 6.638E-03 6.494E-01
1.060E+00 .000E+00 2.526E-03 5.923E-01
2.471E-01 .000E+00 5.887E-04 5.392E-01
6.901E-03 .000E+00 1.094E-04 4.898E-01
8.036E-04 .000E+00 1.621E-05 4.440E-01
7.577E-05 .000E+00 1.917E-06 4.017E-01
5.703E-06 .000E+00 1.804E-07 3.628E-01
3.422E-07 .000E+00 8.171E-10 2.941E-01
1.640E-08 .000E+00 3.917E-11 2.640E-01
1.490E-12 .000E+00 1.490E-12 2.366E-01
4.582E-14 .000E+00 4.582E-14 2.114E-01
1.118E-15 .000E+00 1.118E-15 1.892E-01
2.180E-17 .000E+00 2.180E-17 1.687E-01
1.503E-01 .000E+00 1.503E-01 1.503E-01
4.224E-21 .000E+00 4.224E-21 1.336E-01
4.198E-23 .000E+00 4.198E-23 1.187E-01
3.536E-25 .000E+00 3.536E-25 1.052E-01
2.119E-27 .000E+00 2.119E-27 9.324E-02
1.075E-29 .000E+00 1.075E-29 8.252E-02
4.564E-32 .000E+00 4.564E-32 7.294E-02
1.4417E-34 .000E+00 1.4417E-34 6.441E-02

A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: 1099

HALF LIFE: 2.13E+05 YEARS

NUCLIDE VELOCITY/WATER VELOCITY= 1.000000

INVENTORY IN WASTE AT YEAR 2000= 2.86E+06 CURIES

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=2.83E+06 CURIES

NUCLIDE FLOW RATE INTO AQUIFER =4.49E+03 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: 8.49E+03 CURIES PER YEAR AT 245 YEARS
FINAL : 8.48E+03 CURIES PER YEAR AT 578 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 245 YEARS
PEAK DISCHARGE RATE= 8.49E+03 CURIES PER YEAR AT 250 YEARS
9AND WIDTH= 330 YEARS WITH TAIL END AT 575 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK =1.00E+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
245	.000E+00	.000E+00	.000E+00	.000E+00
245	8.48E+03	8.48E+03	9.997E-01	.000E+00
250	8.48E+03	8.48E+03	1.000E+00	.000E+00
255	8.48E+03	8.48E+03	1.000E+00	.000E+00
260	8.48E+03	8.48E+03	1.000E+00	.000E+00
265	8.48E+03	8.48E+03	1.000E+00	.000E+00
270	8.48E+03	8.48E+03	1.000E+00	.000E+00
275	8.48E+03	8.48E+03	1.000E+00	.000E+00
280	8.48E+03	8.48E+03	1.000E+00	.000E+00
285	8.48E+03	8.48E+03	1.000E+00	.000E+00
290	8.48E+03	8.48E+03	1.000E+00	.000E+00
295	8.48E+03	8.48E+03	1.000E+00	.000E+00
300	8.48E+03	8.48E+03	1.000E+00	.000E+00
305	8.48E+03	8.48E+03	1.000E+00	.000E+00
310	8.48E+03	8.48E+03	1.000E+00	.000E+00
315	8.48E+03	8.48E+03	1.000E+00	.000E+00
320	8.48E+03	8.48E+03	1.000E+00	.000E+00
325	8.48E+03	8.48E+03	1.000E+00	.000E+00

3655	6.664E+00	1.000E+00	.000E+00	.000E+00
3771	6.654E+00	1.000E+00	.000E+00	.000E+00
3771	6.644E+00	1.000E+00	.000E+00	.000E+00
3784	6.634E+00	1.000E+00	.000E+00	.000E+00
3790	6.625E+00	1.000E+00	.000E+00	.000E+00
3797	6.615E+00	1.000E+00	.000E+00	.000E+00
3803	6.605E+00	1.000E+00	.000E+00	.000E+00
3809	6.596E+00	1.000E+00	.000E+00	.000E+00
3816	6.586E+00	1.000E+00	.000E+00	.000E+00
3822	6.576E+00	1.000E+00	.000E+00	.000E+00
3828	6.567E+00	1.000E+00	.000E+00	.000E+00
3835	6.557E+00	1.000E+00	.000E+00	.000E+00
3841	6.547E+00	1.000E+00	.000E+00	.000E+00
3847	6.538E+00	1.000E+00	.000E+00	.000E+00
3854	6.528E+00	1.000E+00	.000E+00	.000E+00
3860	6.519E+00	1.000E+00	.000E+00	.000E+00
3866	6.509E+00	1.000E+00	.000E+00	.000E+00
3873	6.499E+00	1.000E+00	.000E+00	.000E+00
3879	6.490E+00	1.000E+00	.000E+00	.000E+00
3885	6.480E+00	1.000E+00	.000E+00	.000E+00
3892	6.471E+00	1.000E+00	.000E+00	.000E+00
3899	6.461E+00	1.000E+00	.000E+00	.000E+00
3905	6.452E+00	1.000E+00	.000E+00	.000E+00
3911	6.442E+00	1.000E+00	.000E+00	.000E+00
3917	6.433E+00	1.000E+00	.000E+00	.000E+00
3924	6.424E+00	1.000E+00	.000E+00	.000E+00
3930	6.414E+00	1.000E+00	.000E+00	.000E+00
3936	6.405E+00	1.000E+00	.000E+00	.000E+00
3943	6.395E+00	1.000E+00	.000E+00	.000E+00
3949	6.386E+00	1.000E+00	.000E+00	.000E+00
3955	6.377E+00	1.000E+00	.000E+00	.000E+00
3962	6.367E+00	1.000E+00	.000E+00	.000E+00
3968	6.358E+00	1.000E+00	.000E+00	.000E+00
3975	6.348E+00	1.000E+00	.000E+00	.000E+00
3981	6.339E+00	1.000E+00	.000E+00	.000E+00
3987	6.330E+00	1.000E+00	.000E+00	.000E+00
3994	6.321E+00	1.000E+00	.000E+00	.000E+00
4000	6.311E+00	1.000E+00	.000E+00	.000E+00
4006	6.302E+00	1.000E+00	.000E+00	.000E+00
4013	6.293E+00	1.000E+00	.000E+00	.000E+00
4019	6.284E+00	1.000E+00	.000E+00	.000E+00
4025	6.274E+00	1.000E+00	.000E+00	.000E+00
4032	6.265E+00	1.000E+00	.000E+00	.000E+00
4038	6.256E+00	1.000E+00	.000E+00	.000E+00
4044	6.247E+00	1.000E+00	.000E+00	.000E+00
4051	6.238E+00	1.000E+00	.000E+00	.000E+00
4057	6.229E+00	1.000E+00	.000E+00	.000E+00
4063	6.220E+00	1.000E+00	.000E+00	.000E+00
4070	6.211E+00	1.000E+00	.000E+00	.000E+00
4076	6.202E+00	1.000E+00	.000E+00	.000E+00
4083	6.193E+00	1.000E+00	.000E+00	.000E+00

NUCLIDE IN DISCHARGE RATE FROM AQUIFER AFTER

A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE									
TIME OF LEACH INCIDENT: 100 YEARS									
NUCLIDE: PU107									
HALF LIFE: 6.50E+06 YEARS									
NUCLIDE VELOCITY/WATER VELOCITY= .000900									
INVENTORY IN WASTE AT YEAR 2000= 2.28E+04 CURIES									
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=2.28E+04 CURIES									
NUCLIDE FLOW RATE INTO AQUIFER =6.44E+01 CURIES/YR									
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION									
INITIAL: 6.72E+01 CURIES PER YEAR AT 160R31 YEARS									
FINAL : 6.72E+01 CURIES PER YEAR AT 161164 YEARS									
LEACH WATER .003000 FRACTION PER YEAR									
LEACH DURATION= 333 YEARS									
LENGTH OF AQUIFER= 10.00 MILES									
WATER VELOCITY= 1.000 FT/DAY									
WATER TRAVEL TIME= 145 YEARS									
AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN									
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION									
INITIAL BREAKTHROUGH AT 159408 YEARS									
PEAK DISCHARGE RATE= 5.85E+01 CURIES PER YEAR AT 160992 YEARS									
HAND WIDTH= 3168 YEARS WITH TAIL END AT 162576 YEARS									
DISPERSION PEAK/NO-DISPERSION PEAK =8.70E-01									
TIME/YR	DISCHARGE RATE-CI/YR	DISP/NO-DISP	PULSE/SQUARE	TIME/YR	DISCHARGE RATE-CI/YR	DISP/NO-DISP	PULSE/SQUARE	TIME/YR	DISCHARGE RATE-CI/YR
100	.000E+00	.000E+00	.000E+00	100	.000E+00	.000E+00	.000E+00	100	.000E+00
159354	.000E+00	.000E+00	.000E+00	159354	.000E+00	.000E+00	.000E+00	159354	.000E+00
159408	4.627E-37	.000E+00	6.481E-39	159408	4.627E-37	.000E+00	6.481E-39	159408	.000E+00
159461	2.308E-34	.000E+00	3.432E-36	159461	2.308E-34	.000E+00	3.432E-36	159461	3.738E+01
159514	9.094E-32	.000E+00	1.352E-33	159514	9.094E-32	.000E+00	1.352E-33	159514	3.605E+01
159567	2.834E-29	.000E+00	4.215E-31	159567	2.834E-29	.000E+00	4.215E-31	159567	3.469E+01
159620	6.988E-27	.000E+00	1.039E-28	159620	6.988E-27	.000E+00	1.039E-28	159620	3.333E+01
159672	1.354E-24	.000E+00	2.024E-26	159672	1.354E-24	.000E+00	2.024E-26	159672	3.197E+01
159725	2.106E-22	.000E+00	3.132E-24	159725	2.106E-22	.000E+00	3.132E-24	159725	3.060E+01
159778	2.576E-20	.000E+00	3.831E-22	159778	2.576E-20	.000E+00	3.831E-22	159778	2.922E+01
159831	2.497E-18	.000E+00	3.714E-20	159831	2.497E-18	.000E+00	3.714E-20	159831	2.783E+01
159884	1.919E-16	.000E+00	2.854E-18	159884	1.919E-16	.000E+00	2.854E-18	159884	2.643E+01
159936	1.170E-14	.000E+00	1.740E-16	159936	1.170E-14	.000E+00	1.740E-16	159936	2.503E+01
159989	5.658E-13	.000E+00	8.414E-15	159989	5.658E-13	.000E+00	8.414E-15	159989	2.363E+01
160042	2.174E-11	.000E+00	3.232E-13	160042	2.174E-11	.000E+00	3.232E-13	160042	2.222E+01
160095	6.636E-10	.000E+00	9.469E-12	160095	6.636E-10	.000E+00	9.469E-12	160095	2.080E+01
160148	1.611E-08	.000E+00	2.396E-10	160148	1.611E-08	.000E+00	2.396E-10	160148	1.939E+01
160200	3.114E-07	.000E+00	4.631E-09	160200	3.114E-07	.000E+00	4.631E-09	160200	1.797E+01
160253	4.795E-06	.000E+00	7.131E-08	160253	4.795E-06	.000E+00	7.131E-08	160253	1.655E+01

WATER/NUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER

160305 5.591E-05 .000E+00 8.761E-07 1.514E+01
 160359 5.782E-04 .000E+00 8.598E-06 1.373E+01
 160411 4.541E-03 .000E+00 6.754E-05 1.233E+01
 160444 2.461E-02 .000E+00 4.255E-04 1.094E+01
 160517 1.449E-01 .000E+00 2.155E-03 9.574E+00
 160570 5.925E-01 .000E+00 8.612E-03 8.230E+00
 160623 1.304E+00 .000E+00 2.921E-02 6.922E+00
 160675 5.313E+00 .000E+00 7.901E-02 5.660E+00
 160728 1.182E+01 .000E+00 1.759E-01 4.463E+00
 160781 2.191E+01 .000E+00 3.259E-01 3.355E+00
 160834 3.432E+01 6.724E+01 5.105E-01 2.368E+00
 160887 4.633E+01 6.724E+01 6.691E-01 1.541E+00
 160939 5.502E+01 5.724E+01 8.183E-01 9.048E-01
 160992 5.850E+01 5.724E+01 8.701E-01 4.715E-01
 161045 5.612E+01 6.724E+01 8.347E-01 2.164E-01
 161098 4.832E+01 6.724E+01 7.186E-01 4.795E-02
 161151 3.674E+01 6.724E+01 5.464E-01 3.218E-02
 161203 2.417E+01 .000E+00 3.594E-01 1.082E-02
 161255 1.349E+01 .000E+00 2.007E-01 3.409E-03
 161309 6.292E+00 .000E+00 9.359E-02 1.023E-03
 161362 2.423E+00 .000E+00 3.604E-02 2.958E-04
 161415 7.616E-01 .000E+00 1.136E-02 8.317E-05
 161467 1.958E-01 .000E+00 2.912E-03 2.289E-05
 161520 4.064E-02 .000E+00 6.045E-04 1.192E-06
 161573 6.809E-03 .000E+00 1.013E-04 1.053E-06
 161626 9.187E-04 .000E+00 1.366E-05 4.365E-07
 161679 8.962E-05 .000E+00 1.482E-07 2.970E-08
 161731 8.572E-06 .000E+00 1.290E-07 2.970E-08
 161784 6.953E-07 .000E+00 5.036E-10 1.973E-09
 161837 3.385E-08 .000E+00 2.245E-11 5.051E-10
 161890 1.514E-09 .000E+00 8.084E-13 1.288E-10
 161943 5.835E-11 .000E+00 2.319E-14 3.279E-11
 161995 1.559E-12 .000E+00 5.321E-16 8.317E-12
 162048 3.577E-14 .000E+00 9.765E-18 2.106E-12
 162101 6.565E-16 .000E+00 1.433E-19 5.325E-13
 162154 9.833E-18 .000E+00 1.461E-21 1.345E-13
 162207 1.130E-19 .000E+00 1.574E-23 3.391E-14
 162259 1.761E-21 .000E+00 1.184E-25 .000E+00
 162312 7.957E-24 .000E+00 7.160E-28 .000E+00
 162365 4.773E-26 .000E+00 3.405E-30 .000E+00
 162418 2.249E-28 .000E+00 1.306E-32 .000E+00
 162470 8.782E-31 .000E+00 4.008E-35 .000E+00
 162523 2.694E-33 .000E+00 9.833E-38 .000E+00
 162576 5.617E-36 .000E+00 .000E+00 .000E+00
 162629 .000E+00 .000E+00 .000E+00 .000E+00

RADIOISOTOPE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE
 TIME OF LEACH INCIDENT: 100 YEARS

NUCLEIDE: SN126
 HALF LIFE: 1.00E+05 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000900
 INVENTORY IN WASTE AT YEAR 2000= 1.28E+05 Curies
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.28E+05 Curies
 NUCLEIDE FLOW RATE INTO AQUIFER =3.84E+02 Curies/Yr

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 1.26E+02 Curies per year at 160831 YEARS
 FINAL : 1.26E+02 Curies per year at 161164 YEARS
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

NUCLEIDE: SN126
 HALF LIFE: 1.00E+05 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000900
 INVENTORY IN WASTE AT YEAR 2000= 1.28E+05 Curies
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.28E+05 Curies
 NUCLEIDE FLOW RATE INTO AQUIFER =3.84E+02 Curies/Yr

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 1.26E+02 Curies per year at 160831 YEARS
 FINAL : 1.26E+02 Curies per year at 161164 YEARS
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DA
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 159408 YEARS
PEAK DISCHARGE RATE= 1.10E+02 CURIES PER YEAR AT 160992 YEARS
HAZARD WIDTH= 3168 YEARS WITH TAIL END AT 162576 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK =8.69E-01

TIME*YR	DISCHARGE RATE*CI/YR	DISP/NO-DISP	PULSE/SQUARE
159354	.000E+00	.000E+00	.000E+00
159408	.759E+37	.000E+00	3.873E+01
159461	4.366E+34	.000E+00	3.738E+01
159514	1.720E+31	.000E+00	3.605E+01
159567	5.358E+29	.000E+00	3.469E+01
159620	1.321E+26	.000E+00	3.333E+01
159672	2.576E+24	.000E+00	3.197E+01
159725	3.977E+22	.000E+00	3.060E+01
159778	4.803E+20	.000E+00	2.922E+01
159831	4.713E+18	.000E+00	2.783E+01
159884	3.621E+16	.000E+00	2.643E+01
159936	2.066E+14	.000E+00	1.740E+16
159949	1.067E+12	.000E+00	8.414E+15
160002	4.094E+11	.000E+00	2.232E+13
160055	1.250E+09	.000E+00	9.866E+12
160108	3.034E+08	.000E+00	2.394E+10
160200	5.862E+07	.000E+00	4.631E+09
160253	0.023E+06	.000E+00	7.131E+08
160305	1.108E+04	.000E+00	8.761E+07
160359	1.087E+03	.000E+00	8.594E+06
160411	8.537E+02	.000E+00	6.754E+05
160464	5.376E+02	.000E+00	4.255E+04
160517	2.723E+01	.000E+00	2.155E+03
160570	1.113E+00	.000E+00	8.812E+02
160623	3.087E+00	.000E+00	2.921E+02
160675	9.969E+00	.000E+00	7.901E+02
160728	2.213E+01	.000E+00	1.759E+01
160781	4.104E+01	.000E+00	3.259E+01
160834	6.434E+01	1.260E+02	5.109E+01
160887	3.681E+01	1.260E+02	6.891E+01
160939	1.031E+02	1.259E+02	8.183E+01
160992	1.095E+02	1.259E+02	8.701E+01
161045	1.050E+02	1.258E+02	8.347E+01
161098	4.841E+01	1.258E+02	7.184E+01
161151	4.471E+01	1.258E+02	5.464E+01
161203	4.514E+01	.000E+00	3.594E+01
161256	2.521E+01	.000E+00	2.007E+01
161309	1.144E+01	.000E+00	9.359E+02
161362	4.525E+02	.000E+00	3.404E+02

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 159408 YEARS
PEAK DISCHARGE RATE= 1.10E+02 CURIES PER YEAR AT 160992 YEARS
HAZARD WIDTH= 3168 YEARS WITH TAIL END AT 162576 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK =8.69E-01

WATER VELOCITY= 1.000 FT/DA
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: 2.41E+01 CURIES PER YEAR AT 245 YEARS
FINAL : 2.41E+01 CURIES PER YEAR AT 578 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES
WATER VELOCITY= 1.000 FT/DA
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 159408 YEARS
PEAK DISCHARGE RATE= 1.10E+02 CURIES PER YEAR AT 160992 YEARS
HAZARD WIDTH= 3168 YEARS WITH TAIL END AT 162576 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK =8.69E-01

[illegible]

INITIAL REFERENCE AT 143494 YFARS

PEAK DISCHARGE RATE= 2.24E+02 CURIES PER YEAR AT 144920 YEARS
 BAND WIDTH= 2899 YEARS WITH TAIL END AT 146393 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK =9.08E-01

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

1400	.000E+00	.000E+00	.000E+00
143447	.000E+00	.000E+00	.000E+00
143494	1.509E-35	.000E+00	6.112E-38
143542	6.936E-33	.000E+00	2.810E-35
143589	2.522E-30	.000E+00	1.022E-32
143637	7.248E-28	.000E+00	2.937E-30
143684	1.648E-25	.000E+00	6.680E-28
143732	2.967E-23	.000E+00	1.202E-25
143779	4.225E-21	.000E+00	1.713E-23
143827	4.771E-19	.000E+00	1.933E-21
143874	4.267E-17	.000E+00	1.729E-19
143922	3.026E-15	.000E+00	1.226E-17
143969	1.702E-13	.000E+00	6.899E-16
144017	7.603E-12	.000E+00	3.081E-14
144064	2.696E-10	.000E+00	1.093E-12
144112	7.603E-09	.000E+00	3.081E-11
144159	1.705E-07	.000E+00	6.910E-10
144207	3.045E-06	.000E+00	1.234E-08
144254	4.334E-05	.000E+00	1.756E-07
144302	4.923E-04	.000E+00	1.995E-06
144349	4.471E-03	.000E+00	1.627E-05
144397	3.251E-02	.000E+00	1.317E-04
144444	1.897E-01	.000E+00	7.690E-04
144492	8.915E-01	.000E+00	3.613E-03
144540	3.386E-00	.000E+00	1.372E-02
144587	1.044E+01	.000E+00	4.233E-02
144635	2.636E+01	.000E+00	1.068E-01
144682	5.495E+01	.000E+00	2.227E-01
144730	9.589E+01	.000E+00	3.887E-01
144777	1.425E+02	2.467E+02	5.777E-01
144825	1.844E+02	2.467E+02	7.476E-01
144872	2.129E+02	2.467E+02	8.631E-01
144920	2.239E+02	2.467E+02	9.076E-01
144967	2.164E+02	2.467E+02	8.773E-01
145015	1.911E+02	2.467E+02	7.746E-01
145062	1.512E+02	2.467E+02	6.128E-01
145110	1.046E+02	.000E+00	4.241E-01
145157	6.194E+01	.000E+00	2.511E-01
145205	3.080E+01	.000E+00	1.249E-01
145252	1.270E+01	.000E+00	5.147E-02
145300	4.295E+00	.000E+00	1.741E-02
145347	1.184E+00	.000E+00	4.800E-03
145395	2.647E-01	.000E+00	1.073E-03
145442	4.760E-02	.000E+00	1.938E-04
145490	6.956E-03	.000E+00	2.820E-05
145537	8.141E-04	.000E+00	3.301E-06

145585	7.651E-05	.000E+00	3.102E-07	3.422E-09
145632	5.767E-06	.000E+00	2.338E-08	7.555E-10
145680	3.484E-07	.000E+00	1.413E-09	1.659E-10
145728	1.686E-08	.000E+00	6.834E-11	3.629E-11
145775	6.528E-10	.000E+00	2.647E-12	7.908E-12
145823	2.023E-11	.000E+00	8.202E-14	1.718E-12
145870	5.015E-13	.000E+00	2.034E-15	3.725E-13
145918	9.943E-15	.000E+00	4.032E-17	8.059E-14
145965	1.577E-16	.000E+00	6.394E-19	1.740E-14
146013	1.999E-18	.000E+00	8.107E-21	3.753E-15
146060	2.026E-20	.000E+00	8.217E-23	8.085E-16
146108	1.643E-22	.000E+00	6.660E-25	.000E+00
146155	1.064E-24	.000E+00	4.316E-27	.000E+00
146203	5.515E-27	.000E+00	2.236E-29	.000E+00
146250	2.285E-29	.000E+00	9.264E-32	.000E+00
146298	7.570E-32	.000E+00	3.070E-34	.000E+00
146345	2.006E-34	.000E+00	8.133E-37	.000E+00
146393	4.251E-37	.000E+00	1.724E-39	.000E+00
146440	.000E+00	.000E+00	.000E+00	.000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: C5137
 HALF LIFE: 3.01E+01 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .001000
 INVENTORY IN WASTE AT YEAR 2000= 1.85E+10 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.84E+09 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =5.52E+06 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 144758 YEARS
 FINAL: .00E+00 CURIES PER YEAR AT 145091 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 144924 YEARS
 BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: SM131
HALF LIFE: 4.30E+01 YEARS
NUCLIDE VELOCITY/WATER VELOCITY= .000400
INVENTORY IN WASTE AT YEAR 2000= 3.10E+09 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.40E+08 CURIES
NUCLIDE FLOW RATE INTO AQUIFER =4.20E+05 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: .00E+00 CURIES PER YEAR AT 361744 YEARS
FINAL : .00E+00 CURIES PER YEAR AT 362077 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 0 YEARS
PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 361911 YEARS
BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME.YR DISCHARGE RATE.CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: H0166M
HALF LIFE: 1.20E+03 YEARS

NUCLIDE VELOCITY/WATER VELOCITY= .000400
INVENTORY IN WASTE AT YEAR 2000= 1.00E+02 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=9.47E+01 CURIES
NUCLIDE FLOW RATE INTO AQUIFER =2.84E+01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: .00E+00 CURIES PER YEAR AT 361744 YEARS
FINAL : .00E+00 CURIES PER YEAR AT 362077 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 0 YEARS
PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 361911 YEARS
BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME.YR DISCHARGE RATE.CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: E015P
HALF LIFE: 1.30E+01 YEARS
NUCLIDE VELOCITY/WATER VELOCITY= .000400
INVENTORY IN WASTE AT YEAR 2000= 1.61E+06 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=5.00E+03 CURIES
NUCLIDE FLOW RATE INTO AQUIFER =1.50E+01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: .00E+00 CURIES PER YEAR AT 361744 YEARS
FINAL : .00E+00 CURIES PER YEAR AT 362077 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 0 YEARS
PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 361911 YEARS
HAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME/YR DISCHARGE RATE+CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: E3154

HALF LIFE: 8.60E+00 YEARS

NUCLIDE VELOCITY/WATER VELOCITY= .000400

INVENTORY IN WASTE AT YEAR 2000= 8.32E+08 CURIES

NUCLIDE FLOW RATE INTO AQUIFER = 3.27E+04 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION

INITIAL: .00E+00 CURIES PER YEAR AT 361744 YEARS
FINAL: .00E+00 CURIES PER YEAR AT 362077 YEARS

LEACH RATE: .003000 FRACTION PER YEAR

LEACH DURATION= 333 YEARS

LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 0 YEARS
PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 361911 YEARS
HAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME/YR DISCHARGE RATE+CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: CM249

HALF LIFE: 3.50E+05 YEARS

NUCLIDE VELOCITY/WATER VELOCITY= .000300

INVENTORY IN WASTE AT YEAR 2000= 5.01E-01 CURIES

NUCLIDE FLOW RATE INTO AQUIFER = 1.50E-03 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION

INITIAL: 5.78E-04 CURIES PER YEAR AT 482292 YEARS
FINAL: 5.78E-04 CURIES PER YEAR AT 482625 YEARS

LEACH RATE: .003000 FRACTION PER YEAR

LEACH DURATION= 333 YEARS

LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 478328 YEARS
PEAK DISCHARGE RATE= 2.23E-04 CURIES PER YEAR AT 482443 YEARS
HAND WIDTH= 4369 YEARS WITH TAIL END AT 486717 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = 3.86E-01

TIME/YR DISCHARGE RATE+CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00
478170 .000E+00 .000E+00 2.03E-36 1.250E+01
478324 4.74E-37 .000E+00 8.13E-34 1.205E+01
478487 1.50E-34 .000E+00 2.57E-31 1.160E+01
478645 3.76E-32 .000E+00 6.46E-29 1.115E+01
478803 7.46E-30 .000E+00 1.28E-26 1.049E+01
478961 1.17E-27 .000E+00 2.01E-24 1.024E+01
479120 1.46E-25 .000E+00 2.50E-22 9.780E+00
479278 1.44E-23 .000E+00 2.47E-20 9.319E+00
479436 1.12E-21 .000E+00 1.93E-18 8.854E+00
479594 6.99E-20 .000E+00 1.20E-16 8.388E+00
479753 3.44E-18 .000E+00 5.92E-15 7.921E+00
479911 1.34E-16 .000E+00 2.32E-13 7.451E+00
480069 4.19E-15 .000E+00 7.21E-12 5.983E+00
480228 1.03E-13 .000E+00 1.78E-10 5.513E+00
480386 2.04E-12 .000E+00 3.51E-09 5.044E+00
480544 3.20E-11 .000E+00 5.52E-08 5.576E+00
480702 4.01E-10 .000E+00 6.91E-07 5.111E+00

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 1.60E-07 CURIES PER YEAR AT 1446675 YEARS
 FINAL : 1.60E-07 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 1435404 YEARS
 PEAK DISCHARGE RATE= 2.14E-08 CURIES PER YEAR AT 1446797 YEARS
 BAYO WIDTH= 23261 YEARS WITH TAIL END AT 1458665 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = 1.34E-01

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
1434929	.000E+00	.000E+00	4.718E-33	4.038E+00
1435404	2.219E-37	.000E+00	1.386E-30	3.897E+00
1435878	5.158E-35	.000E+00	3.222E-28	3.755E+00
1436353	9.487E-33	.000E+00	5.927E-26	3.615E+00
1436828	1.381E-30	.000E+00	8.627E-24	3.474E+00
1437303	1.592E-28	.000E+00	9.943E-22	3.335E+00
1437777	1.453E-26	.000E+00	9.075E-20	3.196E+00
1438252	1.050E-24	.000E+00	6.563E-18	3.059E+00
1438727	6.020E-23	.000E+00	3.761E-16	2.922E+00
1439201	2.734E-21	.000E+00	1.708E-14	2.787E+00
1439676	9.849E-20	.000E+00	6.153E-13	2.654E+00
1440151	2.814E-18	.000E+00	1.758E-11	2.522E+00
1440626	6.377E-17	.000E+00	3.984E-10	2.392E+00
1441100	1.147E-15	.000E+00	7.167E-09	2.264E+00
1441575	1.638E-14	.000E+00	1.023E-07	2.140E+00
1442050	1.858E-13	.000E+00	1.161E-06	2.017E+00
1442524	1.673E-12	.000E+00	1.045E-05	1.898E+00
1442999	1.197E-11	.000E+00	7.481E-05	1.782E+00
1443474	6.809E-11	.000E+00	4.254E-04	1.669E+00
1443949	3.078E-10	.000E+00	1.923E-03	1.561E+00
1444423	1.106E-09	.000E+00	6.909E-03	1.456E+00
1444898	3.160E-08	.000E+00	1.974E-02	1.356E+00
1445373	7.181E-07	.000E+00	4.487E-02	1.260E+00
1445847	1.298E-06	.000E+00	8.112E-02	1.168E+00
1446322	1.868E-06	.000E+00	1.167E-01	1.081E+00
1446797	2.139E-06	1.601E-07	1.336E-01	9.981E-01
1447272	1.950E-06	.000E+00	1.218E-01	9.197E-01
1447746	1.615E-06	.000E+00	8.842E-02	8.457E-01
1448221	8.181E-06	.000E+00	5.112E-02	7.760E-01
1448696	3.768E-06	.000E+00	2.354E-02	7.106E-01

440861	4.006E-09	.000E+00	6.906E-06	4.650E+00
441019	3.198E-08	.000E+00	5.516E-05	4.196E+00
441177	2.044E-07	.000E+00	3.526E-04	3.750E+00
441335	1.047E-06	.000E+00	1.806E-03	3.317E+00
441494	4.303E-06	.000E+00	7.427E-03	2.899E+00
441652	1.422E-05	.000E+00	2.455E-02	2.501E+00
441810	3.783E-05	.000E+00	6.535E-02	2.126E+00
441969	8.118E-05	.000E+00	1.403E-01	1.779E+00
442127	1.407E-04	.000E+00	2.431E-01	1.464E+00
442285	1.971E-04	.000E+00	3.407E-01	1.183E+00
442443	2.234E-04	5.782E-04	3.863E-01	9.387E-01
442602	2.049E-04	5.781E-04	3.544E-01	7.309E-01
442760	1.522E-04	.000E+00	2.634E-01	5.587E-01
442918	9.147E-05	.000E+00	1.583E-01	4.196E-01
443076	4.445E-05	.000E+00	7.696E-02	3.098E-01
443235	1.744E-05	.000E+00	3.022E-02	2.252E-01
443393	5.525E-06	.000E+00	9.573E-03	1.613E-01
443551	1.410E-06	.000E+00	2.444E-03	1.141E-01
443710	2.898E-07	.000E+00	5.024E-04	7.976E-02
443868	4.788E-08	.000E+00	8.304E-05	5.518E-02
444026	6.356E-09	.000E+00	1.103E-05	3.783E-02
444184	6.773E-10	.000E+00	1.175E-06	2.573E-02
444343	5.749E-11	.000E+00	1.005E-07	1.738E-02
444501	3.966E-12	.000E+00	6.887E-09	1.166E-02
444659	2.177E-13	.000E+00	3.781E-10	7.785E-03
444817	9.567E-15	.000E+00	1.662E-11	5.173E-03
444976	3.366E-16	.000E+00	5.851E-13	3.422E-03
445134	9.479E-18	.000E+00	1.648E-14	2.255E-03
445292	2.135E-19	.000E+00	3.714E-16	1.482E-03
445450	3.848E-21	.000E+00	6.695E-18	9.707E-04
445609	5.548E-23	.000E+00	9.655E-20	6.344E-04
445767	6.398E-25	.000E+00	1.114E-21	4.135E-04
445925	5.901E-27	.000E+00	1.028E-23	2.690E-04
446084	4.353E-29	.000E+00	7.582E-26	1.747E-04
446242	2.568E-31	.000E+00	4.475E-28	1.133E-04
446400	1.212E-33	.000E+00	2.113E-30	7.335E-05
446558	4.577E-36	.000E+00	7.981E-33	4.743E-05
446717	1.382E-38	.000E+00	2.411E-35	.000E+00
446875	.000E+00	.000E+00	5.826E-38	.000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: Pu244
 HALF LIFE: 8.30E+07 YEARS
 NUCLIDE VELOCITY/WATER VELOCITY= .000100
 INVENTORY IN WASTE AT YEAR 2000= 5.36E-05 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENTS=5.40E-05 CURIES
 NUCLIDE FLOW RATE INTO AQUIFER = 1.62E-07 CURIES/YR

DISPERSION PLAK/NO-DISPERSION PEAK = .00E+00

TIME*YR DISCHARGE RATE*CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PU240
HALF LIFE: 6.54E+03 YEARS
NUCLIDE VELOCITY/WATER VELOCITY= .000100
INVENTORY IN WASTE AT YEAR 2000= 1.93E+06 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=3.13E+06 CURIES
NUCLIDE FLOW RATE INTO AQUIFER=9.39E+03 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: .00E+00 CURIES PER YEAR AT 1446675 YEARS
FINAL : .00E+00 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 0 YEARS
PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446842 YEARS
9AND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME*YR DISCHARGE RATE*CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: CM244
HALF LIFE: 1.79E+01 YEARS
NUCLIDE VELOCITY/WATER VELOCITY= .000300
INVENTORY IN WASTE AT YEAR 2000= 4.71E+08 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.02E+07 CURIES
NUCLIDE FLOW RATE INTO AQUIFER= 3.06E+04 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: .00E+00 CURIES PER YEAR AT 482292 YEARS
FINAL : .00E+00 CURIES PER YEAR AT 482625 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 323 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 0 YEARS
PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 482458 YEARS
9AND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS

1449170 1.382E-04 .00E+00 8.638E-03 8.494E-01
1449645 1.043E-10 .00E+00 2.526E-03 5.923E-01
1450120 9.423E-11 .00E+00 5.887E-04 5.392E-01
1450595 1.751E-11 .00E+00 1.094E-04 4.898E-01
1451069 3.593E-12 .00E+00 1.621E-05 4.440E-01
1451544 3.668E-13 .00E+00 1.417E-06 4.017E-01
1452019 2.693E-14 .00E+00 1.808E-07 3.628E-01
1452493 2.177E-15 .00E+00 1.360E-08 3.270E-01
1452968 1.305E-16 .00E+00 8.171E-10 2.941E-01
1453443 6.265E-18 .00E+00 3.917E-11 2.640E-01
1453917 2.400E-19 .00E+00 1.499E-12 2.366E-01
1454392 7.134E-21 .00E+00 4.582E-14 2.118E-01
1454867 1.790E-22 .00E+00 1.118E-15 1.892E-01
1455342 3.489E-24 .00E+00 2.180E-17 1.687E-01
1455816 5.433E-26 .00E+00 3.395E-19 1.503E-01
1456291 6.760E-28 .00E+00 4.224E-21 1.336E-01
1456766 6.720E-30 .00E+00 4.199E-23 1.187E-01
1457240 5.340E-32 .00E+00 3.336E-25 1.052E-01
1457715 3.391E-34 .00E+00 2.119E-27 9.324E-02
1458190 1.721E-36 .00E+00 1.075E-29 8.252E-02
1458665 6.988E-39 .00E+00 4.366E-32 7.294E-02
1459139 .000E+00 .000E+00 1.417E-34 6.441E-02

NUCLIDE: U235
 HALF LIFE: 2.34E+07 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000070
 INVENTORY IN WASTE AT YEAR 2000= 5.58E+03 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=5.59E+03 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =1.08E+01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 1.08E+01 CURIES PER YEAR AT 2066636 YEARS
 FINAL : 1.08E+01 CURIES PER YEAR AT 2066670 YEARS

LEACH RATE= .003000 FRICTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILFS

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00400 CM/2/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 2044429 YEARS
 PEAK DISCHARGE RATE= 1.44E+00 CURIES PER YEAR AT 2066738 YEARS
 BAND WIDTH= 30619 YEARS WITH TAIL END AT 2085048 YEARS
 DISPERSION PLANK/NO-DISPERSION PEAK =9.38E-02

TIME,YR	DISCHARGE RATE,C/1/YR	DISP/NO-DISP	PULSE/SQUARE
100	.000E+00	.000E+00	.000E+00
2047750	.000E+00	.000E+00	.000E+00
2048429	2.234E-37	.000E+00	1.418E-38
2049107	1.027E-34	.000E+00	6.507E-36
2049785	3.894E-32	.000E+00	2.467E-33
2050463	1.167E-29	.000E+00	7.397E-31
2051141	2.767E-27	.000E+00	1.753E-28
2051819	5.168E-25	.000E+00	3.287E-26
2052497	7.692E-23	.000E+00	4.874E-24
2053176	1.024E-21	.000E+00	5.721E-22
2053854	3.387E-19	.000E+00	5.314E-20
2054532	3.168E-17	.000E+00	3.909E-18
2055210	3.592E-15	.000E+00	2.276E-16
2055888	1.635E-13	.000E+00	1.050E-14
2056566	6.050E-12	.000E+00	3.441E-13
2057244	1.756E-10	.000E+00	1.113E-11
2057921	6.034E-09	.000E+00	2.557E-10
2058599	7.349E-08	.000E+00	4.657E-09
2059277	1.092E-06	.000E+00	6.730E-08
2059955	1.217E-05	.000E+00	7.716E-07
2060633	1.107E-04	.000E+00	7.019E-06
2061311	7.497E-04	.000E+00	5.068E-05
2061989	4.554E-03	.000E+00	2.905E-04
2062667	2.084E-02	.000E+00	1.342E-03

TIME OF LEACH INCIDENT:	100 YEARS
2063148	7.542E-02
2064026	2.166E-01
2064704	4.941E-01
2065382	3.958E-01
2066060	1.291E-00
2066738	1.479E+00
2067416	1.344E+00
2068094	3.764E-01
2068773	5.632E-01
2069451	2.584E-01
2070129	9.437E-02
2070807	2.744E-02
2071485	6.352E-03
2072163	1.171E-03
2072842	1.721E-04
2073520	2.015E-05
2074198	1.881E-06
2074876	1.400E-07
2075554	4.305E-09
2076232	3.931E-10
2076910	1.484E-11
2077588	4.472E-13
2078267	1.075E-14
2078945	2.064E-16
2079623	3.163E-18
2080301	3.870E-20
2080979	3.782E-22
2081657	2.952E-24
2082335	1.842E-26
2083014	9.178E-29
2083692	2.654E-31
2084370	1.164E-33
2085048	2.565E-36
2085726	.000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

NUCLIDE: TH232
 HALF LIFE: 1.40E+10 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000020
 INVENTORY IN WASTE AT YEAR 2000= 7.40E+00 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=7.40E+00 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =2.34E-02 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 2.34E-02 CURIES PER YEAR AT 7232977 YEARS
 FINAL : 2.34E-02 CURIES PER YEAR AT 7233310 YEARS

LEACH RATE = .00300 FRACTION PER YEAR
 LEACH DURATION = 333 YEARS
 LENGTH OF AQUIFER = 10.00 MILES

WATER VELOCITY = 1.000 FT/DAY
 WATER TRAVEL TIME = 145 YEARS
 AXIAL DISPERSION COEFFICIENT = .00800 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 71710 YEARS
 PEAK DISCHARGE RATE = 6.28E-04 CURIES PER YEAR AT 7232917 YEARS
 BAND WIDTH = 123414 YEARS WITH TAIL END AT 7294624 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = 2.64E-02

TIME, YR DISCHARGE RATE, CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

TIME	DISCHARGE RATE	DISP/NO-DISP	PULSE/SQUARE
100	.000E+00	.000E+00	.000E+00
716837	.000E+00	.000E+00	1.461E+00
7171210	3.203E-34	.000E+00	1.444E+00
7173584	1.241E-35	.000E+00	1.428E+00
7175957	3.802E-33	.000E+00	1.411E+00
7178331	9.199E-31	.000E+00	1.394E+00
7180704	1.759E-28	.000E+00	1.378E+00
7183077	2.659E-26	.000E+00	1.361E+00
7185451	3.178E-24	.000E+00	1.344E+00
7187824	3.805E-22	.000E+00	1.328E+00
7190197	2.247E-20	.000E+00	1.311E+00
7192571	1.330E-18	.000E+00	1.294E+00
7194944	6.231E-17	.000E+00	1.277E+00
7197317	2.311E-15	.000E+00	1.260E+00
7199691	6.749E-14	.000E+00	1.243E+00
7202064	1.579E-12	.000E+00	1.225E+00
7204437	2.311E-11	.000E+00	1.208E+00
7206811	4.252E-10	.000E+00	1.191E+00
7209184	4.923E-09	.000E+00	1.173E+00
7211557	4.520E-08	.000E+00	1.156E+00
7213931	3.290E-07	.000E+00	1.138E+00
7216304	1.900E-06	.000E+00	1.120E+00
7218677	8.702E-06	.000E+00	1.103E+00
7221051	3.162E-05	.000E+00	1.085E+00
7223424	9.121E-05	.000E+00	1.068E+00
7225797	2.068E-04	.000E+00	1.051E+00
7228171	3.795E-04	.000E+00	1.034E+00
7230544	5.478E-04	.000E+00	1.016E+00
7232917	6.280E-04	.000E+00	1.001E+00
7235291	5.720E-04	.000E+00	9.849E-01
7237664	4.140E-04	.000E+00	9.688E-01
7240037	2.382E-04	.000E+00	9.530E-01
7242411	1.084E-04	.000E+00	9.373E-01
7244784	3.362E-05	.000E+00	9.219E-01
7247157	1.146E-05	.000E+00	9.066E-01
7249531	2.634E-06	.000E+00	8.915E-01

7251904	4.831E-07	.000E+00	2.065E-05	8.765E-01
7254277	7.043E-08	.000E+00	3.011E-06	8.615E-01
7256651	8.175E-09	.000E+00	3.495E-07	8.466E-01
7259024	7.558E-10	.000E+00	3.231E-08	8.317E-01
7261397	5.567E-11	.000E+00	2.380E-09	8.168E-01
7263771	3.267E-12	.000E+00	1.397E-10	8.021E-01
7266144	1.524E-13	.000E+00	6.532E-12	7.873E-01
7268517	5.695E-15	.000E+00	2.435E-13	7.726E-01
7270891	1.693E-16	.000E+00	7.237E-15	7.579E-01
7273264	4.013E-18	.000E+00	1.716E-16	7.434E-01
7275637	7.586E-20	.000E+00	3.244E-18	7.289E-01
7278011	1.144E-21	.000E+00	4.892E-20	7.149E-01
7280384	1.377E-23	.000E+00	5.689E-22	7.007E-01
7282758	1.323E-25	.000E+00	5.654E-24	6.867E-01
7285131	1.015E-27	.000E+00	4.338E-26	6.728E-01
7287504	6.213E-30	.000E+00	2.656E-28	6.592E-01
7289878	3.038E-32	.000E+00	1.299E-30	6.458E-01
7292251	1.187E-34	.000E+00	5.074E-33	6.326E-01
7294624	3.703E-37	.000E+00	1.583E-35	6.197E-01
7296998	.000E+00	.000E+00	3.448E-38	6.068E-01

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: U232
 HALF LIFE: 7.20E+01 YEARS
 NUCLEON VELOCITY/WATER VELOCITY = .000070
 INVENTORY IN WASTE AT YEAR 2000 = 2.50E+04 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 9.75E+03 CURIES
 NUCLEON FLOW RATE INTO AQUIFER = 2.93E+01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .000E+00 CURIES PER YEAR AT 2066636 YEARS
 FINAL: .000E+00 CURIES PER YEAR AT 2066970 YEARS

LEACH RATE = .003000 FRACTION PER YEAR
 LEACH DURATION = 333 YEARS
 LENGTH OF AQUIFER = 10.00 MILES

WATER VELOCITY = 1.000 FT/DAY
 WATER TRAVEL TIME = 145 YEARS
 AXIAL DISPERSION COEFFICIENT = .00800 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE = .000E+00 CURIES PER YEAR AT 2066803 YEARS
 BAND WIDTH = 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR DISCHARGE RATE, CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: C-245
HALF LIFE: 8.50E+03 YEARS
NUCLIDE VELOCITY/WATER VELOCITY= .000300
INVENTORY IN WASTE AT YEAR 2000= 1.37E+05 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.37E+05 CURIES
NUCLIDE FLOW RATE INTO AQUIFER =4.11E+02 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: 3.44E-15 CURIES PER YEAR AT 482925 YEARS
FINAL : 3.35E-15 CURIES PER YEAR AT 482625 YEARS

LEACH RATE: .003000 FRACTION PER YEAR
LEACH DURATION: 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 478961 YEARS
PEAK DISCHARGE RATE= 1.31E-15 CURIES PER YEAR AT 482443 YEARS
ROAD WIDTH= 6964 YEARS WITH TAIL END AT 485925 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK =3.82E-01

TIME, YR DISCHARGE RATE, CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

478963 .000E+00 .000E+00 .000E+00 .000E+00

478961 9.102E-39 .000E+00 1.292E-26 1.06E+01

479120 1.119E-36 .000E+00 2.015E-24 1.024E+01

479278 1.696E-36 .000E+00 2.509E-22 9.780E+00

479436 8.416E-33 .000E+00 2.475E-20 9.319E+00

479594 5.150E-23 .000E+00 1.937E-18 6.834E+00

479753 2.510E-24 .000E+00 1.204E-16 8.344E+00

479911 9.638E-28 .000E+00 5.927E-15 7.921E+00

480069 2.478E-26 .000E+00 2.320E-13 7.451E+00

480227 7.276E-26 .000E+00 7.219E-12 6.943E+00

480385 7.276E-26 .000E+00 1.766E-10 6.513E+00

480543 1.415E-23 .000E+00 .000E+00 .000E+00

480544 2.192E-22 .000E+00 .000E+00 .000E+00

480702 2.708E-21 .000E+00 .000E+00 .000E+00

480861 2.672E-20 .000E+00 .000E+00 .000E+00

481019 2.106E-19 .000E+00 .000E+00 .000E+00

481177 1.329E-18 .000E+00 .000E+00 .000E+00

481335 6.722E-18 .000E+00 .000E+00 .000E+00

481494 7.239E-17 .000E+00 .000E+00 .000E+00

481652 8.905E-17 .000E+00 .000E+00 .000E+00

481810 2.340E-16 .000E+00 .000E+00 .000E+00

481969 4.954E-16 .000E+00 .000E+00 .000E+00

482127 8.483E-16 .000E+00 .000E+00 .000E+00

482285 1.174E-15 .000E+00 .000E+00 .000E+00

482443 1.314E-15 .000E+00 .000E+00 .000E+00

482602 1.190E-15 .000E+00 .000E+00 .000E+00

482760 6.728E-16 .000E+00 .000E+00 .000E+00

482918 5.179E-16 .000E+00 .000E+00 .000E+00

483076 2.495E-16 .000E+00 .000E+00 .000E+00

483235 9.632E-17 .000E+00 .000E+00 .000E+00

483393 3.012E-17 .000E+00 .000E+00 .000E+00

483551 7.593E-18 .000E+00 .000E+00 .000E+00

483710 1.541E-18 .000E+00 .000E+00 .000E+00

483869 2.514E-19 .000E+00 .000E+00 .000E+00

484028 3.295E-20 .000E+00 .000E+00 .000E+00

484186 3.468E-21 .000E+00 .000E+00 .000E+00

484343 2.927E-22 .000E+00 .000E+00 .000E+00

484501 1.980E-23 .000E+00 .000E+00 .000E+00

484659 1.073E-24 .000E+00 .000E+00 .000E+00

484817 4.657E-26 .000E+00 .000E+00 .000E+00

484976 1.618E-27 .000E+00 .000E+00 .000E+00

485134 4.500E-29 .000E+00 .000E+00 .000E+00

485292 1.001E-30 .000E+00 .000E+00 .000E+00

485451 1.701E-32 .000E+00 .000E+00 .000E+00

485609 2.536E-34 .000E+00 .000E+00 .000E+00

485767 2.888E-36 .000E+00 .000E+00 .000E+00

485925 2.630E-38 .000E+00 .000E+00 .000E+00

486084 .000E+00 .000E+00 .000E+00 .000E+00

3.518E-09 6.044E+00

5.522E-08 5.576E+00

6.911E-07 5.111E+00

6.906E-06 4.650E+00

5.514E-05 4.194E+00

3.526E-04 3.750E+00

1.804E-03 3.317E+00

7.427E-03 2.894E+00

2.455E-02 2.501E+00

6.535E-02 2.126E+00

1.403E-01 1.779E+00

2.431E-01 1.464E+00

3.407E-01 1.183E+00

3.863E-01 9.387E-01

3.546E-01 7.309E-01

2.534E-01 5.587E-01

1.583E-01 4.196E-01

7.696E-02 3.094E-01

3.022E-02 2.252E-01

9.573E-03 1.613E-01

2.444E-03 1.141E-01

5.024E-04 7.976E-02

8.304E-05 5.518E-02

1.103E-05 3.783E-02

1.175E-06 2.573E-02

1.005E-07 1.738E-02

6.887E-09 1.166E-02

3.781E-10 7.785E-03

1.662E-11 5.173E-03

5.851E-13 3.422E-03

1.648E-14 2.255E-03

3.714E-16 1.482E-03

6.695E-18 9.707E-04

9.655E-20 6.344E-04

1.114E-21 4.135E-04

1.024E-23 2.690E-04

7.582E-26 1.747E-04

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION

INITIAL: .00E+00 CURIES PER YEAR AT 1446675 YEARS
 FINAL: .00E+00 CURIES PER YEAR AT 1447009 YEARS
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES
 WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446842 YEARS
 RAYD WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00
 TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.
 100 .000E+00 .000E+00 .000E+00 .000E+00
 RADIONUCLEIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE
 100 .000E+00 .000E+00 .000E+00 .000E+00
 TIME OF LEACH INCIDENT: 100 YEARS
 NUCLEIDE: NP237
 HALF LIFE: 2.14E+06 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .010000
 INVENTORY IN WASTE AT YEAR 2000= 8.07E+04 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT= 8.34E+04 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER = 2.50E+02 CURIES/YR
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 2.44E+02 CURIES PER YEAR AT 14566 YEARS
 FINAL: 2.49E+02 CURIES PER YEAR AT 14899 YEARS
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES
 WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 14463 YEARS
 PEAK DISCHARGE RATE= 2.49E+02 CURIES PER YEAR AT 14615 YEARS
 RAYD WIDTH= 576 YEARS WITH TAIL END AT 15019 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = 1.00E+00
 TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.
 100 .000E+00 .000E+00 .000E+00 .000E+00
 14423 .000E+00 .000E+00 .000E+00 .000E+00
 14423 8.632E-34 .000E+00 3.446E-36 4.154E+02
 14462 6.320E-24 .000E+00 2.538E-26 3.545E+02
 14481 1.019E-15 .000E+00 4.091E-18 2.524E+02
 14500 3.734E-09 .000E+00 1.500E-11 2.292E+02
 14519 3.262E-04 .000E+00 1.310E-06 1.655E+02
 14539 7.355E-01 .000E+00 2.954E-03 1.032E+02
 14554 5.207E+01 .000E+00 2.091E-01 4.636E+01

INITIAL: .00E+00 CURIES PER YEAR AT 1446675 YEARS
 FINAL: .00E+00 CURIES PER YEAR AT 1447009 YEARS
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES
 WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446842 YEARS
 RAYD WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00
 TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.
 100 .000E+00 .000E+00 .000E+00 .000E+00
 RADIONUCLEIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE
 100 .000E+00 .000E+00 .000E+00 .000E+00
 TIME OF LEACH INCIDENT: 100 YEARS
 NUCLEIDE: NP241
 HALF LIFE: 4.33E+02 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .070100
 INVENTORY IN WASTE AT YEAR 2000= 8.56E+07 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT= 8.08E+07 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER = 2.42E+05 CURIES/YR
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 1446675 YEARS
 FINAL: .00E+00 CURIES PER YEAR AT 1447009 YEARS
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES
 WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446842 YEARS
 RAYD WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS

CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: AM241 FROM PU241
 HALF LIFE OF AM241: 4.33E+02 YR HALF LIFE OF PU241: 1.50E+01 YR
 NUCLEIDE VELOCITY/WATER VELOCITY= .000100
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=2.58E+06 CURIES
 PU241 FLOW RATE INTO AQUIFER =7.74E+03 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 1446675 YEARS
 FINAL: .00E+00 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446842 YEARS
 BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00F+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 100 .000E+00 .000E+00 .000E+00 .000F+00
 DISPERSION NO DISP.

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: CM246
 HALF LIFE: 4.76E+03 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000300
 INVENTORY IN WASTE AT YEAR 2000= 2.64E+04 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=2.64E+04 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =7.92E+01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 2.54E-29 CURIES PER YEAR AT 482292 YEARS
 FINAL: 2.44E-29 CURIES PER YEAR AT 482625 YEARS

2074267 4.22E-18 .00E+00 6.81E-16 3.29E-01
 2074945 8.08E-20 .00E+00 1.30E-17 3.05E-01
 2079623 1.23E-21 .00E+00 2.00E-19 2.83E-01
 2080301 1.50E-23 .00E+00 2.45E-21 2.62E-01
 2080979 1.46E-25 .00E+00 2.39E-23 2.42E-01
 2081657 1.14E-27 .00E+00 1.87E-25 2.24E-01
 2082335 7.10E-30 .00E+00 1.16E-27 2.07E-01
 2083014 3.53E-32 .00E+00 5.82E-30 1.91E-01
 2083692 1.40E-34 .00E+00 2.31E-32 1.76E-01
 2084370 4.45E-37 .00E+00 7.38E-35 1.62E-01
 2085048 .000E+00 .000E+00 1.68E-37 1.50E-01

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: TM229
 HALF LIFE: 7.34E+03 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000020
 INVENTORY IN WASTE AT YEAR 2000= 1.74E+01 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.95E+02 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =5.85E-01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 7232977 YEARS
 FINAL: .00E+00 CURIES PER YEAR AT 7233310 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 7233143 YEARS
 BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 100 .000E+00 .000E+00 .000E+00 .000F+00
 DISPERSION NO DISP.

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY

A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: A2242M
HALF LIFE: 1.52E+02 YEARS
NUCLIDE VELOCITY/WATER VELOCITY= .000100
INVENTORY IN WASTE AT YEAR 2000= 7.45E+05 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=4.72E+06 CURIES
NUCLIDE FLOW RATE INTO AQUIFER =1.42E+04 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: .00E+00 CURIES PER YEAR AT 1446675 YEARS
FINAL: .00E+00 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE= .003100 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES
WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00800 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 0 YEARS
PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446842 YEARS
BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: C2242
HALF LIFE: 4.47E+01 YEARS
NUCLIDE VELOCITY/WATER VELOCITY= .000300
INVENTORY IN WASTE AT YEAR 2000= 3.61E+08 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=3.87E+06 CURIES
NUCLIDE FLOW RATE INTO AQUIFER =1.16E+04 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: .00E+00 CURIES PER YEAR AT 482292 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES
WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00800 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 480228 YEARS
PEAK DISCHARGE RATE= 5.59E-30 CURIES PER YEAR AT 482443 YEARS
BAND WIDTH= 4432 YEARS WITH TAIL END AT 484659 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK =3.79E-01

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
480069	.000E+00	.000E+00	.000E+00	.000E+00
480228	6.114E-35	.000E+00	7.218E-12	6.943E+00
480386	1.174E-37	.000E+00	1.778E-10	6.513E+00
480544	1.306E-36	.000E+00	3.518E-09	6.044E+00
480702	2.209E-35	.000E+00	5.522E-08	5.576E+00
480861	2.157E-34	.000E+00	6.911E-07	5.111E+00
481019	1.684E-33	.000E+00	4.906E-06	4.650E+00
481177	1.052E-32	.000E+00	4.194E+00	4.194E+00
481335	5.265E-32	.000E+00	3.526E-04	3.750E+00
481494	2.116E-31	.000E+00	1.806E-03	3.317E+00
481652	7.836E-31	.000E+00	7.427E-03	2.899E+00
481810	1.774E-30	.000E+00	2.455E-02	2.501E+00
481969	3.729E-30	.000E+00	6.535E-02	2.126E+00
482127	6.316E-30	.000E+00	1.403E-01	1.779E+00
482285	8.649E-30	.000E+00	2.431E-01	1.464E+00
482443	9.683E-30	.000E+00	3.407E-01	1.143E+00
482602	8.595E-30	2.451E-29	3.863E-01	9.387E-01
482760	6.240E-30	2.424E-29	3.546E-01	7.309E-01
482918	3.665E-30	.000E+00	2.634E-01	5.587E-01
483076	1.741E-30	.000E+00	1.583E-01	4.196E-01
483235	6.680E-31	.000E+00	7.696E-02	3.094E-01
483393	2.049E-31	.000E+00	3.022E-02	2.252E-01
483551	5.167E-32	.000E+00	9.573E-03	1.613E-01
483710	1.036E-32	.000E+00	2.444E-03	1.141E-01
483868	1.674E-33	.000E+00	5.024E-04	7.976E-02
484026	2.172E-34	.000E+00	4.304E-05	5.518E-02
484184	2.263E-35	.000E+00	1.103E-05	3.783E-02
484343	1.941E-36	.000E+00	1.175E-06	2.573E-02
484501	1.266E-37	.000E+00	1.005E-07	1.734E-02
484659	6.792E-39	.000E+00	6.587E-09	1.166E-02
484817	.000E+00	.000E+00	3.781E-10	7.785E-03
			1.662E-11	5.173E-03

NUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER

1452241 6.831E-21 .000E+00 4.224E-21 1.336E-01
 1456765 8.771E-23 .000E+00 4.199E-23 1.187E-01
 1457240 6.960E-25 .000E+00 3.336E-25 1.052E-01
 1457715 6.418E-27 .000E+00 2.119E-27 9.324E-02
 1458190 2.241E-29 .000E+00 1.075E-29 8.252E-02
 1458665 9.096E-32 .000E+00 4.366E-32 7.294E-02
 1459139 2.948E-34 .000E+00 1.417E-34 6.441E-02
 1459614 7.649E-37 .000E+00 3.640E-37 5.642E-02
 1460089 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PU238
 HALF LIFE: 8.74E+01 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000100
 INVENTORY IN WASTE AT YEAR 2000= 3.97E+08 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=1.46E+08 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =5.59E+05 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 1446675 YEARS
 FINAL: .00E+00 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446442 YEARS
 BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS
 NUCLEIDE: U238
 HALF LIFE: 4.47E+09 YEARS
 NUCLEIDE VELOCITY/WATER VELOCITY= .000070
 INVENTORY IN WASTE AT YEAR 2000= 2.44E+02 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=2.44E+02 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =7.32E-01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 7.32E-01 CURIES PER YEAR AT 2066636 YEARS
 FINAL: 7.32E-01 CURIES PER YEAR AT 2066970 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 2048429 YEARS
 PEAK DISCHARGE RATE= 5.46E-02 CURIES PER YEAR AT 2066736 YEARS
 BAND WIDTH= 35619 YEARS WITH TAIL END AT 2085048 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK =9.38E-02

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00
 2047750 .000E+00 .000E+00 .000E+00 .000E+00
 2048429 1.038E-38 .000E+00 1.418E-38 .000E+00
 2049107 4.762E-36 .000E+00 6.507E-36 3.047E+00
 2049785 1.805E-33 .000E+00 2.467E-33 2.956E+00
 2050463 5.413E-31 .000E+00 7.397E-31 2.865E+00
 2051141 1.263E-28 .000E+00 1.753E-28 2.775E+00
 2051819 3.405E-26 .000E+00 3.287E-26 2.664E+00
 2052497 3.567E-24 .000E+00 4.874E-24 2.596E+00
 2053175 4.186E-22 .000E+00 5.721E-22 2.507E+00
 2053854 3.889E-20 .000E+00 5.314E-20 2.419E+00
 2054532 2.860E-18 .000E+00 3.909E-18 2.333E+00
 2055210 1.654E-16 .000E+00 2.276E-16 2.246E+00
 2055888 7.687E-15 .000E+00 1.050E-14 2.161E+00
 2056566 2.410E-13 .000E+00 3.841E-13 2.077E+00
 2057244 8.14E-12 .000E+00 1.113E-11 1.994E+00
 2057923 1.471E-10 .000E+00 2.557E-10 1.912E+00
 2058601 3.408E-09 .000E+00 4.657E-09 1.832E+00
 2059279 4.925E-08 .000E+00 6.730E-08 1.752E+00
 2059957 5.646E-07 .000E+00 7.716E-07 1.675E+00
 2060635 5.138E-06 .000E+00 7.019E-06 1.598E+00
 2061313 3.760E-05 .000E+00 5.048E-05 1.524E+00

FINAL : 8.54E-01 CURIES PER YEAR AT 2066970 YEARS
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES
 WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN
 NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 2048429 YEARS
 PEAK DISCHARGE RATE= 8.01E-02 CURIES PER YEAR AT 2066738 YEARS
 BASE WIDTH= 38619 YEARS WITH TAIL END AT 2085048 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = 9.37E-02

TIME+YR	DISCHARGE RATE, CI/YR	DISP/NO-DISP	PULSE/SQUARE
2041991	2.126E-04	.000E+00	1.451E+00
2042669	9.677E-04	.000E+00	1.380E+00
2043348	3.498E-03	.000E+00	1.312E+00
2044026	1.005E-02	.000E+00	1.245E+00
2044704	2.942E-02	.000E+00	1.181E+00
2045382	4.158E-02	.000E+00	1.118E+00
2046060	5.986E-02	.000E+00	1.058E+00
2046738	7.318E-02	.000E+00	1.001E+00
2047416	8.544E-02	.000E+00	9.451E-01
2048094	9.677E-02	.000E+00	8.917E-01
2048772	1.070E-01	.000E+00	8.405E-01
2049450	1.163E-01	.000E+00	7.914E-01
2050128	1.245E-01	.000E+00	7.445E-01
2050806	1.312E-01	.000E+00	6.997E-01
2051484	1.373E-01	.000E+00	6.569E-01
2052162	1.428E-01	.000E+00	6.161E-01
2052840	1.478E-01	.000E+00	5.771E-01
2053518	1.524E-01	.000E+00	5.400E-01
2054196	1.566E-01	.000E+00	5.048E-01
2054874	1.605E-01	.000E+00	4.713E-01
2055552	1.641E-01	.000E+00	4.396E-01
2056230	1.673E-01	.000E+00	4.095E-01
2056908	1.702E-01	.000E+00	3.812E-01
2057586	1.728E-01	.000E+00	3.544E-01
2058264	1.751E-01	.000E+00	3.291E-01
2058942	1.771E-01	.000E+00	3.054E-01
2059620	1.788E-01	.000E+00	2.832E-01
2060298	1.802E-01	.000E+00	2.623E-01
2060976	1.814E-01	.000E+00	2.427E-01
2061654	1.824E-01	.000E+00	2.244E-01
2062332	1.832E-01	.000E+00	2.074E-01
2063010	1.838E-01	.000E+00	1.915E-01
2063688	1.842E-01	.000E+00	1.767E-01
2064366	1.845E-01	.000E+00	1.629E-01
2065044	1.847E-01	.000E+00	1.501E-01
2065722	1.848E-01	.000E+00	.000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS
 HALF LIFE: 4234
 NUCLIDE VELOCITY/WATER VELOCITY= .000070
 INVENTORY IN WASTE AT YEAR 2000= 2.27E+04 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT= 1.01E+05 CURIES
 NUCLIDE FLOW RATE INTO AQUIFER = 3.03E+02 CURIES/YR
 NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 8.55E-01 CURIES PER YEAR AT 2066636 YEARS

PEAK DISCHARGE RATE = 2.70E+31 CURIES PER YEAR AT 7232917 YEARS
 HAND WITHE 56260 YEARS WITH TAIL END AT 7261397 YEARS
 DISPERSION FRAX/NO-DISPERSION PEAK = 2.69E-02

TIME, YR DISCHARGE RATE, C/1/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
7202064	.000E+00	.000E+00	.000E+00	.000E+00
7204437	1.513E-38	.000E+00	1.244E-09	1.208E+00
7206811	2.310E-37	.000E+00	1.014E-08	1.191E+00
7209184	2.618E-36	.000E+00	2.105E-07	1.173E+00
7211557	2.352E-35	.000E+00	1.432E-06	1.146E+00
7213931	1.676E-34	.000E+00	1.407E-05	1.134E+00
7216304	9.475E-34	.000E+00	9.122E-05	1.120E+00
7218677	4.248E-33	.000E+00	3.720E-04	1.103E+00
7221051	1.511E-32	.000E+00	1.352E-03	1.085E+00
7223424	4.266E-32	.000E+00	4.899E-03	1.068E+00
7225797	5.561E-32	.000E+00	8.927E-03	1.051E+00
7228171	1.701E-31	.000E+00	1.622E-02	1.034E+00
7230544	2.403E-31	.000E+00	2.342E-02	1.018E+00
7232917	2.697E-31	.000E+00	2.685E-02	1.001E+00
7235291	2.440E-31	.000E+00	2.445E-02	9.848E-01
7237664	1.704E-31	.000E+00	1.770E-02	9.688E-01
7240037	9.593E-32	.000E+00	1.014E-02	9.530E-01
7242411	4.229E-32	.000E+00	4.657E-03	9.373E-01
7244784	1.524E-32	.000E+00	1.694E-03	9.210E-01
7247157	4.330E-33	.000E+00	4.900E-04	9.048E-01
7249531	9.750E-34	.000E+00	1.128E-04	8.915E-01
7251904	1.749E-34	.000E+00	2.065E-05	8.765E-01
7254277	2.495E-35	.000E+00	3.011E-06	8.615E-01
7256651	2.834E-36	.000E+00	3.495E-07	8.465E-01
7259024	2.566E-37	.000E+00	3.231E-08	8.317E-01
7261397	1.850E-38	.000E+00	2.970E-09	8.168E-01
7263771	.000E+00	.000E+00	1.497E-10	8.021E-01

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: R4226

HALF LIFE: 1.60E+03 YEARS

NUCLIDE VELOCITY/WATER VELOCITY = .002003

INVENTORY IN WASTE AT YEAR 2000 = 3.47E+01 CURIES

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 1.58E+00 CURIES

NUCLIDE FLOW RATE INTO AQUIFER = 4.03E-03 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 1.10E-10 CURIES PER YEAR AT 7242411 YEARS

2070129	5.064E-03	.000E+00	5.983E-03	7.445E-01
2070407	1.470E-03	.000E+00	1.740E-03	6.997E-01
2071485	3.395E-04	.000E+00	4.027E-04	6.569E-01
2072163	6.250E-05	.000E+00	7.427E-05	6.161E-01
2072842	9.165E-06	.000E+00	1.091E-05	5.771E-01
2073520	1.071E-06	.000E+00	1.274E-06	5.400E-01
2074194	9.974E-08	.000E+00	1.193E-07	5.048E-01
2074876	7.411E-09	.000E+00	8.875E-09	4.713E-01
2075554	4.389E-10	.000E+00	5.264E-10	4.396E-01
2076232	2.073E-11	.000E+00	2.492E-11	4.095E-01
2076910	7.815E-13	.000E+00	9.412E-13	3.812E-01
2077588	2.350E-14	.000E+00	2.836E-14	3.544E-01
2078267	5.640E-16	.000E+00	6.819E-16	3.291E-01
2078945	1.080E-17	.000E+00	1.309E-17	3.054E-01
2079623	1.653E-19	.000E+00	2.066E-19	2.832E-01
2080301	2.014E-21	.000E+00	2.454E-21	2.623E-01
2080979	1.968E-23	.000E+00	2.398E-23	2.427E-01
2081657	1.534E-25	.000E+00	1.872E-25	2.244E-01
2082335	9.549E-28	.000E+00	1.168E-27	2.074E-01
2083014	4.750E-30	.000E+00	5.821E-30	1.915E-01
2083692	1.889E-32	.000E+00	2.319E-32	1.767E-01
2084370	6.002E-35	.000E+00	7.344E-35	1.629E-01
2085048	1.524E-37	.000E+00	1.881E-37	1.501E-01
2085726	.000E+00	.000E+00	.000E+00	.000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: TH230

HALF LIFE: 7.70E+04 YEARS

NUCLIDE VELOCITY/WATER VELOCITY = .000020

INVENTORY IN WASTE AT YEAR 2000 = 5.55E+00 CURIES

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 6.38E+01 CURIES

NUCLIDE FLOW RATE INTO AQUIFER = 1.90E-01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION

INITIAL: 1.07E-29 CURIES PER YEAR AT 7232917 YEARS

FINAL: 1.00E-29 CURIES PER YEAR AT 723310 YEARS

LEACH RATE = .003000 FRACTION PER YEAR

LEACH DURATION = 333 YEARS

LENGTH OF AQUIFER = 0.00 MILES

WATER VELOCITY = 1.000 FT/DAY

WATER TRAVEL TIME = 145 YEARS

AXIAL DISPERSION COEFFICIENT = .00800 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 7204437 YEARS

FINAL 1 9.59E-17 CURIES PER YEAR AT 72762 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 71951 YEARS
PEAK DISCHARGE RATE= 1.09E-16 CURIES PER YEAR AT 72546 YEARS
BAND WIDTH= 1285 YEARS WITH TAIL END AT 73235 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = 9.42E-01

TIME, YR DISCHARGE RATE, CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
71927	.000E+00	.000E+00	1.304E-24	6.853E+01
71951	2.374E+38	.000E+00	1.673E-22	6.545E+01
71975	2.386E+36	.000E+00	1.699E-20	6.238E+01
71998	1.800E+34	.000E+00	1.367E-18	5.927E+01
72022	1.199E+32	.000E+00	8.717E-17	5.616E+01
72046	6.003E+31	.000E+00	4.409E-15	5.304E+01
72070	2.365E+29	.000E+00	1.770E-13	4.990E+01
72094	7.524E+28	.000E+00	5.641E-12	4.674E+01
72117	1.887E+26	.000E+00	1.429E-10	4.361E+01
72141	3.752E+25	.000E+00	2.879E-09	4.046E+01
72165	5.974E+24	.000E+00	4.619E-08	3.730E+01
72189	7.561E+23	.000E+00	5.908E-07	3.415E+01
72213	7.639E+22	.000E+00	6.030E-06	3.101E+01
72236	6.172E+21	.000E+00	4.923E-05	2.789E+01
72260	3.945E+20	.000E+00	3.220E-04	2.480E+01
72284	2.078E+19	.000E+00	1.692E-03	2.175E+01
72308	5.711E+18	.000E+00	7.144E-03	1.875E+01
72332	2.957E+18	.000E+00	2.457E-02	1.583E+01
72355	8.175E+18	.000E+00	6.865E-02	1.300E+01
72379	1.857E+17	.000E+00	1.575E-01	1.031E+01
72403	3.503E+17	.000E+00	3.003E-01	7.809E+00
72427	5.576E+17	.000E+00	4.830E-01	5.501E+00
72450	7.549E+17	1.143E-16	6.843E-01	3.647E+00
72474	9.284E+17	1.131E-16	8.209E-01	2.145E+00
72498	1.029E+16	1.119E-16	9.191E-01	1.097E+00
72522	1.075E+16	1.108E-16	9.699E-01	4.730E-01
72546	1.087E+16	1.097E-16	9.509E-01	1.673E-01
72569	1.083E+16	1.085E-16	9.977E-01	4.769E-02
72593	1.073E+16	1.074E-16	9.992E-01	1.086E-02
72617	1.061E+16	1.063E-16	9.983E-01	1.971E-03
72641	1.045E+16	1.052E-16	9.929E-01	2.856E-04
72665	1.016E+16	1.042E-16	9.758E-01	3.331E-05
72689	9.610E+17	1.031E-16	9.322E-01	3.178E-06

72712	8.611E-17	1.020E-16	8.440E-01	2.546E-07
72736	7.088E-17	1.010E-16	7.010E-01	1.767E-08
72760	5.193E-17	9.95E-17	5.195E-01	1.096E-09
72783	3.294E-17	6.03E-00	3.329E-01	6.255E-11
72807	1.770E-17	.000E+00	1.668E-01	3.354E-12
72831	7.930E-17	.000E+00	4.183E-02	1.719E-13
72855	2.624E-17	.000E+00	3.052E-02	8.510E-14
72879	8.833E-17	.000E+00	5.304E-03	4.109E-14
72902	2.165E-19	.000E+00	2.364E-03	1.547E-17
72926	4.291E-20	.000E+00	4.614E-04	9.089E-19
72950	6.860E-21	.000E+00	7.453E-05	4.197E-20
72974	8.821E-22	.000E+00	9.683E-06	1.921E-21
72998	9.112E-23	.000E+00	1.011E-06	8.724E-23
73021	7.548E-24	.000E+00	4.458E-08	3.947E-24
73045	5.011E-25	.000E+00	5.674E-09	1.777E-25
73069	2.663E-26	.000E+00	3.047E-10	7.974E-27
73093	1.133E-27	.000E+00	1.304E-11	.000E+00
73116	3.855E-29	.020E+00	4.502E-13	.000E+00
73140	1.049E-30	.000E+00	1.434E-14	.000E+00
73164	2.282E-32	.000E+00	2.720E-16	.000E+00
73188	3.967E-34	.000E+00	4.774E-18	.000E+00
73212	5.513E-36	.000E+00	6.704E-20	.000E+00
73235	6.122E-38	.000E+00	7.567E-22	.000E+00
73259	.000E+00	.000E+00	8.769E-24	.000E+00

RADIATION DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER REPOSITORY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: P238 FROM AM242M

HAIF LIFE OF P238: 4.75E+01 YR
HAIF LIFE OF AM242: 4.75E+02 YR
NUCLIDE VELOCITY/WATER VELOCITY: .000100
INVENTORY OF AM242 IN WASTE AT YEAR 2000: 7.45E+30 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT: 4.72E+04 CURIES
AM242 FLOW RATE INTO AQUIFER = 1.42E+04 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION

INITIAL: .70E+00 CURIES PER YEAR AT 145000 YEARS
FINAL: .000E+00 CURIES PER YEAR AT 144700 YEARS

LEACH RATE= .00000 FRACTION PER YEAR

LEACH DURATION= 333 YEARS

LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 0 YEARS

PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446842 YEARS
 HAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME.YR DISCHARGE RATE.CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00
 RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: U234 FROM U238
 HALF LIFE OF U234 : 2.44E+05 YR HALF LIFE OF U238 : 4.47E+09 YR
 NUCLIDE VELOCITY/WATER VELOCITY= .000070
 INVENTORY OF U238 IN WASTE AT YEAR 2000= 2.44E+02 CURIES
 INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=2.44E+02 CURIES
 U238 FLOW RATE INTO AQUIFER =7.32E-01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: 7.30E-01 CURIES PER YEAR AT 2066636 YEARS
 FINAL : 7.30E-01 CURIES PER YEAR AT 2066970 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 2048429 YEARS

PEAK DISCHARGE RATE= 6.84E-02 CURIES PER YEAR AT 2066738 YEARS
 HAND WIDTH= 3609 YEARS WITH TAIL END AT 2085048 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK =9.38E-02

TIME.YR DISCHARGE RATE.CI/YR DISP/NO-DISP PULSE/SQUARE
 DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00
 2047750 .000E+00 .000E+00 .000E+00 .000E+00
 2048429 1.035E-38 .000E+00 1.418E-38 .000E+00
 2049107 4.748E-36 .000E+00 6.507E-36 3.047E+00
 2049785 1.800E-33 .000E+00 2.467E-33 3.000E+00
 2050463 5.397E-31 .000E+00 7.397E-31 2.855E+00
 2051141 1.279E-28 .000E+00 1.753E-28 2.775E+00

2051819 2.398E-26 .000E+00 3.287E-26 2.684E+00
 2052447 3.555E-24 .000E+00 4.874E-24 2.594E+00
 2053176 4.174E-22 .000E+00 5.721E-22 2.507E+00
 2053854 3.878E-20 .000E+00 5.314E-20 2.419E+00
 2054532 2.852E-18 .000E+00 3.909E-18 2.333E+00
 2055210 1.661E-16 .000E+00 2.276E-16 2.264E+00
 2055888 7.865E-15 .000E+00 1.050E-14 2.161E+00
 2056566 2.402E-13 .000E+00 3.841E-13 2.077E+00
 2057244 4.121E-12 .000E+00 1.113E-11 1.994E+00
 2057923 1.865E-10 .000E+00 2.557E-10 1.912E+00
 2058601 3.399E-09 .000E+00 4.657E-09 1.832E+00
 2059279 4.911E-08 .000E+00 6.730E-08 1.752E+00
 2059957 5.630E-07 .000E+00 7.716E-07 1.675E+00
 2060635 5.127E-06 .000E+00 7.019E-06 1.598E+00
 2061313 3.698E-05 .000E+00 5.068E-05 1.524E+00
 2061991 2.120E-04 .000E+00 2.905E-04 1.451E+00
 2062669 4.650E-04 .000E+00 1.322E-03 1.380E+00
 2063348 3.449E-03 .000E+00 4.781E-03 1.312E+00
 2064026 1.002E-02 .000E+00 1.373E-02 1.245E+00
 2064704 2.286E-02 .000E+00 3.132E-02 1.181E+00
 2065382 4.144E-02 .000E+00 5.679E-02 1.114E+00
 2066060 5.972E-02 .000E+00 8.184E-02 1.054E+00
 2066738 6.843E-02 7.297E-01 9.377E-02 1.001E+00
 2067416 6.235E-02 .000E+00 8.544E-02 9.451E-01
 2068095 4.519E-02 .000E+00 6.192E-02 8.917E-01
 2068773 2.400E-02 .000E+00 3.570E-02 8.405E-01
 2069451 1.194E-02 .000E+00 1.638E-02 7.914E-01
 2070129 4.354E-03 .000E+00 5.983E-03 7.445E-01
 2070807 1.269E-03 .000E+00 1.740E-03 6.997E-01
 2071485 2.939E-04 .000E+00 4.027E-04 6.569E-01
 2072163 5.428E-05 .000E+00 7.427E-05 6.161E-01
 2072842 7.964E-06 .000E+00 1.091E-05 5.771E-01
 2073520 9.324E-07 .000E+00 1.278E-06 5.400E-01
 2074199 5.703E-08 .000E+00 1.143E-07 5.048E-01
 2074875 4.477E-09 .000E+00 8.875E-09 4.713E-01
 2075554 3.843E-10 .000E+00 5.246E-10 4.394E-01
 2076232 1.819E-11 .000E+00 2.492E-11 4.095E-01
 2076910 6.869E-13 .000E+00 9.412E-13 3.812E-01
 2077589 2.070E-14 .000E+00 2.836E-14 3.544E-01
 2078267 4.974E-16 .000E+00 6.815E-16 3.291E-01
 2078945 4.551E-18 .000E+00 1.309E-17 3.054E-01
 2079623 1.464E-19 .000E+00 2.004E-19 2.832E-01
 2080301 1.791E-21 .000E+00 2.454E-21 2.623E-01
 2080979 1.750E-23 .000E+00 2.398E-23 2.427E-01
 2081657 1.366E-25 .000E+00 1.872E-25 2.264E-01
 2082335 8.524E-28 .000E+00 1.168E-27 2.074E-01
 2083014 4.244E-30 .000E+00 5.821E-30 1.915E-01
 2083692 1.649E-32 .000E+00 2.197E-32 1.767E-01
 2084370 5.359E-35 .000E+00 7.384E-35 1.629E-01
 2085048 1.373E-37 .000E+00 1.881E-37 1.501E-01
 2085726 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER

A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: C247

HALF LIFE: 1.54E+07 YEARS

NUCLIDE VELOCITY/WATER VELOCITY = .000300

INVENTORY IN WASTE AT YEAR 2000 = 1.29E-01 Curies

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 1.29E-01 Curies

NUCLIDE FLOW RATE INTO AQUIFER = 3.87E-04 Curies/yr

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION

INITIAL: 3.79E-04 Curies per year at 48232 YEARS

FINAL: 3.79E-04 Curies per year at 482625 YEARS

LEACH RATE = .003000 FRACTION PER YEAR

LEACH DURATION = 333 YEARS

LENGTH OF AQUIFER = 10.00 MILES

WATER VELOCITY = 1.000 FT/DAY

WATER TRAVEL TIME = 145 YEARS

AXIAL DISPERSION COEFFICIENT = .00800 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 478328 YEARS

PEAK DISCHARGE RATE = 1.46E-04 Curies per year at 482443 YEARS

HAZARD WIDTH = 8384 YEARS WITH TAIL END AT 486717 YEARS

DISPERSION PEAK/NO-DISPERSION PEAK = 3.86E-01

TIME, YR DISCHARGE RATE, CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
478170	.000E+00	2.031E-36	1.250E+01	.000E+00
478324	3.061E-37	8.135E-34	1.205E+01	1.250E+01
478487	9.762E-35	.000E+00	2.577E-31	1.160E+01
478645	2.467E-32	.000E+00	6.461E-29	1.115E+01
478803	4.857E-30	.000E+00	1.262E-26	1.069E+01
478961	7.632E-28	.000E+00	2.015E-24	1.024E+01
479120	9.502E-26	.000E+00	2.509E-22	9.780E+00
479278	9.376E-24	.000E+00	2.475E-20	9.319E+00
479435	7.337E-22	.000E+00	1.4737E-18	8.854E+00
479594	4.555E-20	.000E+00	1.203E-16	8.388E+00
479753	2.245E-18	.000E+00	5.927E-15	7.921E+00
479911	8.706E-17	.000E+00	2.320E-13	7.451E+00
480069	2.733E-15	.000E+00	7.218E-12	6.983E+00
480228	6.765E-14	.000E+00	1.786E-10	6.513E+00
480386	1.333E-12	.000E+00	3.518E-09	6.044E+00
480544	2.091E-11	.000E+00	5.522E-08	5.576E+00
480702	2.617E-10	.000E+00	6.931E-07	5.111E+00
480861	2.615E-09	.000E+00	6.906E-06	4.650E+00

481019	2.089E-08	.000E+00	5.216E-05	4.174E+00
481177	1.335E-07	.001E+00	3.526E-04	3.756E+00
481335	6.840E-07	.001E+00	1.806E-03	3.317E+00
481494	2.813E-06	.000E+00	7.427E-03	2.899E+00
481652	9.294E-06	.000E+00	2.455E-02	2.501E+00
481810	2.475E-05	.000E+00	6.539E-02	2.124E+00
481969	5.312E-05	.000E+00	1.403E-01	1.779E+00
482127	9.207E-05	.000E+00	2.431E-01	1.454E+00
482285	1.290E-04	.000E+00	3.407E-01	1.183E+00
482443	1.463E-04	3.787E-04	3.543E-01	9.367E-01
482602	1.343E-04	3.787E-04	2.546E-01	7.309E-01
482760	9.975E-05	.000E+00	2.534E-01	5.474E-01
482919	5.996E-05	.000E+00	1.583E-01	4.194E-01
483075	2.914E-05	.000E+00	7.656E-02	3.094E-01
483233	1.144E-05	.000E+00	3.022E-02	2.252E-01
483393	3.625E-06	.000E+00	9.573E-03	1.613E-01
483551	9.256E-07	.000E+00	2.444E-03	1.141E-01
483710	1.902E-07	.000E+00	5.024E-04	7.974E-02
483868	3.144E-08	.000E+00	8.304E-05	5.514E-02
484026	4.175E-09	.000E+00	1.103E-05	3.783E-02
484184	4.451E-10	.000E+00	1.175E-06	2.573E-02
484343	3.805E-11	.000E+00	1.005E-07	1.734E-02
484501	2.608E-12	.000E+00	6.887E-09	1.156E-02
484659	1.432E-13	.000E+00	3.741E-10	7.785E-03
484817	5.294E-15	.000E+00	1.662E-11	5.173E-03
484975	2.215E-14	.000E+00	6.851E-13	3.422E-03
485134	6.240E-18	.000E+00	1.648E-14	2.255E-03
485292	1.404E-19	.000E+00	3.716E-16	1.482E-03
485451	2.535E-21	.000E+00	6.895E-18	8.707E-04
485609	3.656E-23	.000E+00	9.644E-20	5.364E-04
485767	4.217E-27	.001E+00	1.747E-21	9.135E-04
485925	3.491E-27	.000E+00	1.028E-23	2.690E-04
486084	2.971E-29	.000E+00	7.582E-25	1.747E-04
486242	1.694E-31	.000E+00	4.475E-26	1.133E-04
486400	9.000E-34	.000E+00	2.113E-30	7.135E-05
486558	3.002E-36	.000E+00	7.461E-33	4.744E-05
486717	9.127E-39	.000E+00	2.411E-35	.000E+00
486875	.000E+00	.000E+00	5.824E-37	.000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: C247

HALF LIFE: 1.54E+07 YEARS

NUCLIDE VELOCITY/WATER VELOCITY = .000300

INVENTORY IN WASTE AT YEAR 2000 = 1.29E-01 Curies

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 1.29E-01 Curies

NUCLIDE FLOW RATE INTO AQUIFER = 3.87E-04 Curies/yr

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 1446675 YEARS
 FINAL : .00E+00 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 1446842 YEARS
 RAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100 .000E+00 .000E+00 .000E+00 .000E+00

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PU239

HALF LIFE: 2.44E+04 YEARS

NUCLIDE VELOCITY/WATER VELOCITY= .003100

INVENTORY IN WASTE AT YEAR 2000= 9.69E+05 CURIES

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=9.86E+05 CURIES

NUCLIDE FLOW RATE INTO AQUIFER =2.96E+03 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION

INITIAL: 4.14E-15 CURIES PER YEAR AT 1446675 YEARS

FINAL : 4.10E-15 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE= .003000 FRACTION PER YEAR

LEACH DURATION= 333 YEARS

LENGTH OF AQUIFER= 10.00 MILES

WATER VELOCITY= 1.000 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .00800 CM12/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 1436828 YEARS

PEAK DISCHARGE RATE= 5.51E-16 CURIES PER YEAR AT 1446797 YEARS

RAND WIDTH= 19938 YEARS WITH TAIL END AT 1446796 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK =1.33E-01

TIME,YR DISCHARGE RATE,CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
1436353	.000E+00	.000E+00	.000E+00	.000E+00
1436828	4.72E-38	.000E+00	.000E+00	3.61E+00
1437003	5.31E-36	.000E+00	.000E+00	3.47E+00
1437177	4.83E-34	.000E+00	.000E+00	3.33E+00
1438252	3.45E-32	.000E+00	.000E+00	3.14E+00
1438727	1.95E-30	.000E+00	.000E+00	3.05E+00
1439201	8.76E-29	.000E+00	.000E+00	2.92E+00
1439676	3.10E-27	.000E+00	.000E+00	2.76E+00
1440151	8.75E-26	.000E+00	.000E+00	2.65E+00
1440626	1.95E-24	.000E+00	.000E+00	2.52E+00
1441100	3.47E-23	.000E+00	.000E+00	2.39E+00
1441575	4.87E-22	.000E+00	.000E+00	2.26E+00
1442050	5.47E-21	.000E+00	.000E+00	2.14E+00
1442524	4.86E-20	.000E+00	.000E+00	2.01E+00
1442999	3.43E-19	.000E+00	.000E+00	1.89E+00
1443474	1.92E-18	.000E+00	.000E+00	1.78E+00
1443949	8.59E-18	.000E+00	.000E+00	1.66E+00
1444423	3.04E-17	.000E+00	.000E+00	1.56E+00
1444898	8.54E-17	.000E+00	.000E+00	1.45E+00
1445373	1.92E-16	.000E+00	.000E+00	1.35E+00
1445847	3.43E-15	.000E+00	.000E+00	1.26E+00
1446322	4.87E-14	.000E+00	.000E+00	1.18E+00
1446797	5.51E-13	4.17E-15	.000E+00	1.08E+00
1447272	4.95E-12	.000E+00	.000E+00	9.98E-01
1447746	3.55E-11	.000E+00	.000E+00	9.17E-01
1448221	2.02E-10	.000E+00	.000E+00	8.42E-01
1448695	2.19E-09	.000E+00	.000E+00	7.76E-01
1449170	3.33E-08	.000E+00	.000E+00	7.10E-01
1449645	9.60E-07	.000E+00	.000E+00	6.44E-01
1450120	2.09E-06	.000E+00	.000E+00	5.79E-01
1450595	4.03E-05	.000E+00	.000E+00	5.14E-01
1451069	5.92E-04	.000E+00	.000E+00	4.49E-01
1451544	6.90E-03	.000E+00	.000E+00	3.84E-01
1452019	6.92E-02	.000E+00	.000E+00	3.19E-01
1452493	4.71E-01	.000E+00	.000E+00	2.54E-01
1452968	2.82E-00	.000E+00	.000E+00	1.89E-01
1453443	1.33E-01	.000E+00	.000E+00	1.24E-01
1453917	5.05E-02	.000E+00	.000E+00	8.00E-02
1454392	1.52E-02	.000E+00	.000E+00	5.11E-02
1454867	3.67E-03	.000E+00	.000E+00	3.11E-02
1455342	7.15E-04	.000E+00	.000E+00	1.86E-02
1455816	1.04E-03	.000E+00	.000E+00	1.15E-02
1456291	1.33E-03	.000E+00	.000E+00	7.34E-03
1456766	1.40E-03	.000E+00	.000E+00	4.24E-03
1457240	.000E+00	.000E+00	.000E+00	2.18E-03

RADIATION DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: U235

HALF LIFE: 7.04E+08 YEARS

NUCLIDE VELOCITY/WATER VELOCITY = .000070

INVENTORY IN WASTE AT YEAR 2000 = 2.26E+01 CURIES

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 2.27E+01 CURIES

NUCLIDE FLOW RATE INTO AQUIFER = 6.81E-02 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL: 6.80E-02 CURIES PER YEAR AT 2066970 YEARS
FINAL: 6.80E-02 CURIES PER YEAR AT 2066970 YEARS

LEACH RATE = .003000 FRACTION PER YEAR

LEACH DURATION = 331 YEARS

LENGTH OF AQUIFER = 10.00 MILES

WATER VELOCITY = 1.000 FT/DAY

WATER TRAVEL TIME = 145 YEARS

AXIAL DISPERSION COEFFICIENT = .00000 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 2054107 YEARS

PEAK DISCHARGE RATE = 6.37E-03 CURIES PER YEAR AT 2066736 YEARS

ROAD WIDTH = 35941 YEARS WITH TAIL END AT 2085048 YEARS

DISPERSION PLATEAU/NO-DISPERSION PEAK = 9.38E-02

TIME/YR DISCHARGE RATE/CI/YR DISP/NO-DISP PULSE/SQUARE

DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
2044429	.000E+00	.000E+00	1.418E-38	3.000E+00
2049107	4.422E-37	.000E+00	6.507E-36	3.047E+00
2049785	1.677E-34	.000E+00	2.467E-33	2.936E+00
2050463	5.027E-32	.000E+00	7.397E-31	2.865E+00
2051141	1.192E-29	.000E+00	1.753E-28	2.775E+00
2051819	2.23E-27	.000E+00	3.287E-26	2.684E+00
2052497	3.313E-25	.000E+00	4.674E-24	2.596E+00
2053175	3.066E-23	.000E+00	5.721E-22	2.507E+00
2053853	3.617E-21	.000E+00	5.314E-20	2.410E+00
2054531	2.456E-19	.000E+00	3.909E-18	2.333E+00
2055210	1.547E-17	.000E+00	2.276E-16	2.266E+00
2055888	7.139E-15	.000E+00	1.058E-14	2.161E+00
2056566	2.610E-14	.000E+00	3.841E-13	2.077E+00
2057244	7.564E-13	.000E+00	1.113E-11	1.994E+00
2057923	1.737E-11	.000E+00	2.557E-10	1.912E+00
2058601	3.165E-10	.000E+00	4.657E-09	1.832E+00

2059279	4.574E-09	.000E+00	6.730E-08	1.752E+00
2059957	5.264E-08	.000E+00	7.014E-07	1.674E+00
2060635	4.770E-07	.000E+00	7.019E-06	1.594E+00
2061313	3.444E-06	.000E+00	5.064E-05	1.524E+00
2061991	1.975E-05	.000E+00	2.905E-04	1.451E+00
2062669	8.948E-05	.000E+00	1.322E-03	1.380E+00
2063348	3.269E-04	.000E+00	4.741E-03	1.312E+00
2064026	9.330E-04	.000E+00	1.373E-02	1.245E+00
2064704	2.157E-03	.000E+00	3.132E-02	1.181E+00
2065382	3.859E-03	.000E+00	5.679E-02	1.118E+00
2066060	5.562E-03	.000E+00	8.164E-02	1.054E+00
2066738	6.373E-03	.000E+00	9.377E-02	1.001E+00
2067416	5.806E-03	.000E+00	8.544E-02	9.451E-01
2068095	4.206E-03	.000E+00	6.192E-02	8.917E-01
2068773	2.427E-03	.000E+00	3.570E-02	8.405E-01
2069451	1.113E-03	.000E+00	1.638E-02	7.914E-01
2070129	4.066E-04	.000E+00	5.983E-03	7.445E-01
2070807	1.162E-04	.000E+00	1.740E-03	6.997E-01
2071485	2.737E-05	.000E+00	4.027E-04	6.569E-01
2072163	5.047E-06	.000E+00	7.427E-05	6.161E-01
2072842	7.416E-07	.000E+00	1.091E-05	5.771E-01
2073520	8.683E-08	.000E+00	1.278E-06	5.406E-01
2074198	8.104E-09	.000E+00	1.193E-07	5.044E-01
2074876	6.031E-10	.000E+00	8.875E-09	4.713E-01
2075554	3.579E-11	.000E+00	5.264E-10	4.398E-01
2076232	1.634E-12	.000E+00	2.492E-11	4.095E-01
2076910	6.397E-14	.000E+00	9.412E-13	3.812E-01
2077588	1.927E-15	.000E+00	2.534E-14	3.544E-01
2078267	4.634E-17	.000E+00	6.219E-16	3.291E-01
2078945	4.844E-19	.000E+00	1.309E-17	3.054E-01
2079623	1.363E-20	.000E+00	2.006E-19	2.832E-01
2080301	1.688E-22	.000E+00	2.454E-21	2.623E-01
2080979	1.630E-24	.000E+00	2.394E-23	2.427E-01
2081657	1.272E-26	.000E+00	1.872E-25	2.246E-01
2082335	7.937E-29	.000E+00	1.168E-27	2.074E-01
2083013	3.956E-31	.000E+00	5.621E-30	1.915E-01
2083692	1.576E-33	.000E+00	2.314E-32	1.757E-01
2084370	5.014E-36	.000E+00	7.464E-35	1.629E-01
2085048	1.278E-38	.000E+00	1.851E-37	1.501E-01
2085726	.000E+00	.000E+00	.000E+00	.000E+00

HAZARDOUS DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: Pu231

HALF LIFE: 3.25E+04 YEARS

NUCLIDE VELOCITY/WATER VELOCITY = .000000

INVENTORY IN WASTE AT YEAR 2000 = 1.57E+04 CURIES

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 1.57E+04 CURIES

NUCLIDE FLOW RATE INTO AQUIFER = 4.71E+01 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL : 2.20E-21 CURIES PER YEAR AT 2411059 YEARS
FINAL : 2.18E-21 CURIES PER YEAR AT 2411392 YEARS

LEACH RATE = .003000 FRACTION PER YEAR
LEACH DURATION = 333 YEARS
LENGTH OF AQUIFER = 10.00 MILES

WATER VELOCITY = 1.000 FT/DAY
WATER TRAVEL TIME = 145 YEARS
AXIAL DISPERSION COEFFICIENT = .00800 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 2396910 YEARS
PEAK DISCHARGE RATE = 1.76E-22 CURIES PER YEAR AT 2411150 YEARS

BAND WIDTH = 28481 YEARS WITH TAIL END AT 2425391 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = 0.03E-02

TIME/YR DISCHARGE RATE CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
2396910	.000E+00	.000E+00	4.34E-20	2.178E+00
2396910	9.531E-34	.000E+00	3.210E-18	2.107E+00
2397701	5.483E-37	.000E+00	1.878E-16	2.036E+00
2398492	2.498E-35	.000E+00	8.701E-15	1.967E+00
2399283	9.017E-34	.000E+00	3.194E-13	1.898E+00
2400074	2.579E-32	.000E+00	9.291E-12	1.830E+00
2400865	5.847E-31	.000E+00	2.142E-10	1.763E+00
2401655	1.051E-29	.000E+00	3.916E-09	1.696E+00
2402446	1.497E-28	.000E+00	5.675E-08	1.631E+00
2403239	1.693E-27	.000E+00	6.525E-07	1.567E+00
2404030	1.558E-26	.000E+00	5.951E-06	1.504E+00
2404821	1.080E-25	.000E+00	4.308E-05	1.442E+00
2405612	6.103E-25	.000E+00	2.475E-04	1.381E+00
2406403	2.736E-24	.000E+00	1.128E-03	1.322E+00
2407194	9.742E-24	.000E+00	4.085E-03	1.265E+00
2407985	2.754E-23	.000E+00	1.175E-02	1.209E+00
2408777	6.184E-23	.000E+00	2.683E-02	1.154E+00
2409568	1.103E-22	.000E+00	4.867E-02	1.102E+00
2410359	1.564E-22	.000E+00	7.018E-02	1.051E+00
2411150	1.762E-22	.000E+00	8.042E-02	1.001E+00
2411941	1.579E-22	.000E+00	7.327E-02	9.533E-01
2412733	1.125E-22	.000E+00	5.308E-02	9.071E-01
2413524	6.373E-23	.000E+00	3.059E-02	8.625E-01
2414315	2.872E-23	.000E+00	1.402E-02	8.195E-01
2415106	1.030E-23	.000E+00	5.115E-03	7.781E-01
2415897	2.841E-24	.000E+00	1.485E-03	7.383E-01
2416688	6.683E-25	.000E+00	3.432E-04	6.999E-01
2417479	1.209E-25	.000E+00	6.316E-05	6.629E-01
2418271	1.743E-26	.000E+00	9.259E-06	6.275E-01

2419062	2.002E-27	.000E+00	1.062E-06	5.935E-01
2419853	1.433E-28	.000E+00	1.007E-07	5.607E-01
2420644	1.337E-29	.000E+00	7.449E-09	5.294E-01
2421435	7.777E-31	.000E+00	4.418E-10	4.993E-01
2422226	3.606E-32	.000E+00	2.084E-11	4.706E-01
2423017	1.334E-33	.000E+00	7.940E-13	4.430E-01
2423809	3.938E-35	.000E+00	2.354E-14	4.168E-01
2424600	9.272E-37	.000E+00	5.639E-16	3.919E-01
2425391	1.743E-38	.000E+00	1.077E-17	3.681E-01
2426182	.000E+00	.000E+00	1.644E-19	3.455E-01

RADIONUCLIDE DISCHARGE RATE FROM AN AQUIFER AFTER
A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PU239 FROM AM243
HALF LIFE OF PU239 : 2.44E+04 YR HALF LIFE OF AM243 : 7.37E+03 YR
NUCLIDE VELOCITY/WATER VELOCITY = .000100
INVENTORY OF AM243 IN WASTE AT YEAR 2000 = 5.12E+06 CURIES
INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT = 5.07E+06 CURIES
AM243 FLOW RATE INTO AQUIFER = 1.52E+04 CURIES/YR

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
INITIAL : 9.271E-15 CURIES PER YEAR AT 1446675 YEARS
FINAL : 9.413E-15 CURIES PER YEAR AT 1447009 YEARS

LEACH RATE = .003000 FRACTION PER YEAR
LEACH DURATION = 333 YEARS
LENGTH OF AQUIFER = 10.00 MILES

WATER VELOCITY = 1.000 FT/DAY
WATER TRAVEL TIME = 145 YEARS
AXIAL DISPERSION COEFFICIENT = .00800 CM²/MIN

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 1436675 YEARS
PEAK DISCHARGE RATE = 1.23E-15 CURIES PER YEAR AT 1446797 YEARS
BAND WIDTH = 20413 YEARS WITH TAIL END AT 1457240 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = 1.33E-01

TIME/YR DISCHARGE RATE CI/YR DISP/NO-DISP PULSE/SQUARE
DISPERSION NO DISP.

100	.000E+00	.000E+00	.000E+00	.000E+00
1436675	.000E+00	.000E+00	6.427E-26	3.615E+00
1436829	1.052E-37	.000E+00	0.627E-24	3.474E+00
1437003	1.117E-37	.000E+00	6.843E-23	3.311E+00
1437177	1.077E-33	.000E+00	4.115E-20	3.111E+00
1436852	7.683E-32	.000E+00	6.553E-18	2.913E+00

INVENTORY IN WASTE AT BEGINNING OF LEACH INCIDENT=4.63E+05 CURIES
 NUCLEIDE FLOW RATE INTO AQUIFER =1.00E+03 CURIES/YR
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH NO DISPERSION
 INITIAL: .00E+00 CURIES PER YEAR AT 482458 YEARS
 FINAL: .00E+00 CURIES PER YEAR AT 482625 YEARS
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 LENGTH OF AQUIFER= 10.00 MILES
 WATER VELOCITY= 1.000 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .00000 CM²/MIN
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= .00E+00 CURIES PER YEAR AT 482458 YEARS
 BAND WIDTH= 0 YEARS WITH TAIL END AT 0 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00
 TIME*YR DISCHARGE RATE*CI/YR DISP/NO-DISP PULSE/SQUARE
 100 .00E+00 .000E+00 .000E+00 .000E+00
 DISPERSION NO DISP.

1438727	4.344E-30	.000E+00	3.761E-16	2.922E+00
1439201	1.947E-28	.000E+00	1.708E-14	2.787E+00
1439676	6.918E-27	.000E+00	6.153E-13	2.654E+00
1440151	1.950E-25	.000E+00	1.758E-11	2.522E+00
1440626	4.360E-24	.000E+00	3.984E-10	2.392E+00
1441100	7.739E-23	.000E+00	7.167E-09	2.264E+00
1441575	1.090E-21	.000E+00	1.023E-07	2.140E+00
1442050	1.220E-20	.000E+00	1.161E-06	2.017E+00
1442524	1.084E-19	.000E+00	1.045E-05	1.898E+00
1442999	7.653E-19	.000E+00	7.461E-05	1.782E+00
1443474	4.294E-18	.000E+00	4.254E-04	1.669E+00
1443949	1.915E-17	.000E+00	1.923E-03	1.561E+00
1444423	6.788E-17	.000E+00	6.909E-03	1.456E+00
1444898	1.914E-16	.000E+00	1.974E-02	1.356E+00
1445373	4.290E-16	.000E+00	4.487E-02	1.260E+00
1445847	7.653E-16	.000E+00	8.112E-02	1.168E+00
1446322	1.986E-15	.000E+00	1.167E-01	1.081E+00
1446797	1.227E-15	9.183E-15	1.336E-01	9.981E-01
1447272	1.104E-15	.000E+00	1.218E-01	9.197E-01
1447746	7.904E-16	.000E+00	8.842E-02	8.457E-01
1448221	4.508E-16	.000E+00	5.112E-02	7.760E-01
1448696	2.048E-16	.000E+00	2.354E-02	7.106E-01
1449170	7.415E-17	.000E+00	8.638E-03	6.494E-01
1449645	2.139E-17	.000E+00	2.526E-03	5.923E-01
1450120	4.919E-18	.000E+00	5.887E-04	5.392E-01
1450595	9.015E-19	.000E+00	1.094E-04	4.898E-01
1451069	1.319E-19	.000E+00	1.621E-05	4.440E-01
1451544	1.538E-20	.000E+00	1.917E-06	4.017E-01
1452019	1.431E-21	.000E+00	1.808E-07	3.628E-01
1452493	1.063E-22	.000E+00	1.360E-08	3.270E-01
1452968	6.297E-24	.000E+00	8.171E-10	2.941E-01
1453443	2.978E-25	.000E+00	3.917E-11	2.640E-01
1453917	1.125E-26	.000E+00	1.499E-12	2.366E-01
1454392	3.391E-28	.000E+00	4.582E-14	2.118E-01
1454867	6.165E-30	.000E+00	1.114E-15	1.992E-01
1455342	1.570E-31	.000E+00	2.180E-17	1.887E-01
1455816	2.413E-33	.000E+00	3.395E-19	1.803E-01
1456291	2.962E-35	.000E+00	4.224E-21	1.736E-01
1456766	2.905E-37	.000E+00	4.199E-23	1.678E-01
1457240	2.277E-39	.000E+00	3.336E-25	1.652E-01
1457715	.000E+00	.000E+00	2.119E-27	9.324E-02

NUCLEONUCLEIDE DISCHARGE RATE FROM AN AQUIFER AFTER
 A LEACH INCIDENT IN AN UNDERGROUND REPOSITORY
 CONTAINING YEAR 2000 NUCLEAR POWER ECONOMY WASTE

TIME OF LEACH INCIDENT: 100 YEARS

NUCLEIDE: C1243

HALF LIFE: 2.80E+01 YEARS

NUCLEIDE VELOCITY/WATER VELOCITY= .000300

INVENTORY IN WASTE AT YEAR 2000= 4.03E+06 CURIES

I.2 Two-Member Chain Migration Results

1.2 Two-Member Chain Migration Results

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PU244 FROM CM249

NUCLIDE CM249 P244
HALF LIFE, YR 3.50E+05 9.30E+07 .00E+00
DECAY NUMBER 2.86E+04 1.21E+04 .00E+00
DISTRIB COEF 3.33E+03 1.00E+00 .00E+00
YR 2000 CURIES 5.01E+01 .00E+00 .00E+00
PULSE G-ATOMS 4.90E+01 .00E+00 .00E+00
NUCL VEL, MI/YR 2.07E+05 6.91E+05 .00E+00
DISCH TIME, YR 4.82E+05 1.45E+06 .00E+00
DIM DISC TIME 3.33E+03 1.00E+04 .00E+00
LEACH RATE = .61E+00 FRACTION PER YEAR

LEACH DURATION = 333 YEARS
PATH LENGTH = 10.00 MILES
DIMENSIONLESS DISTANCE = 1.00
WATER VELOCITY = 1.00 FT/DAY
WATER TRAVEL TIME = 145 YEARS
AXIAL DISPERSION COEFFICIENT = .0000 CM²/MIN
PFCET NUMBER = 4.26E+05
NUCLIDE DISCHARGE RATE FROM ADJUTER WITH AXIAL DISPERSION
INITIAL REACTOR THERM AT 482443 YEARS

PEAK DISCHARGE RATE = 2.82E+09 CURIES PER YEAR AT 1446797 YEARS
PAND WIDTH = 564354 YEARS WITH TAIL END AT 1446797 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YE DISC RATE, CI/YR PULSE RATE BAND DATE DIM TIME

478534	.00E+00	.00E+00	.00E+00	3307
478739	.00E+00	1.61E+36	.00E+00	3329
479445	.00E+00	1.21E+33	.00E+00	3310
479151	.00E+00	6.16E+31	.00E+00	3312
479357	.00E+00	2.12E+28	.00E+00	3313
479563	.00E+00	4.94E+25	.00E+00	3314
479764	.00E+00	7.80E+24	.00E+00	3316
479974	.00E+00	8.37E+22	.00E+00	3317
480180	.00E+00	6.10E+20	.00E+00	3319
480385	.00E+00	3.03E+18	.00E+00	3320
480591	.00E+00	1.02E+16	.00E+00	3322
480797	.00E+00	2.94E+15	.00E+00	3323
481003	.00E+00	3.79E+14	.00E+00	3324
481208	.00E+00	4.16E+13	.00E+00	3326
481414	.00E+00	3.17E+12	.00E+00	3327
481620	.00E+00	1.69E+11	.00E+00	3329

481826	.00E+00	6.37E+11	.00E+00	3331
482031	3.55E+10	1.77E+10	3.65E+10	3332
482237	3.55E+10	3.50E+10	3.65E+10	3333
482443	3.65E+10	5.64E+10	3.65E+10	3334
482657	4.04E+10	6.74E+10	4.04E+10	3335
482870	4.04E+10	7.73E+10	4.04E+10	3336
483084	4.04E+10	7.73E+10	4.04E+10	3337
483298	4.04E+10	7.73E+10	4.04E+10	3338
483511	4.04E+10	7.73E+10	4.04E+10	3339
483725	4.04E+10	7.73E+10	4.04E+10	3340
483939	4.04E+10	7.73E+10	4.04E+10	3341
484153	4.04E+10	7.73E+10	4.04E+10	3342
484364	4.04E+10	7.73E+10	4.04E+10	3343
484580	4.04E+10	7.73E+10	4.04E+10	3344
484794	4.04E+10	7.73E+10	4.04E+10	3345
485007	4.04E+10	7.73E+10	4.04E+10	3346
485221	4.04E+10	7.73E+10	4.04E+10	3347
485435	4.04E+10	7.73E+10	4.04E+10	3348
485649	4.04E+10	7.73E+10	4.04E+10	3349
485862	4.04E+10	7.73E+10	4.04E+10	3350
486076	4.04E+10	7.73E+10	4.04E+10	3351
486290	4.04E+10	7.73E+10	4.04E+10	3352
486503	4.04E+10	7.73E+10	4.04E+10	3353
486717	4.04E+10	7.73E+10	4.04E+10	3354
486931	4.04E+10	7.73E+10	4.04E+10	3355
487145	4.04E+10	7.73E+10	4.04E+10	3356
487359	4.04E+10	7.73E+10	4.04E+10	3357
487573	4.04E+10	7.73E+10	4.04E+10	3358
487787	4.04E+10	7.73E+10	4.04E+10	3359
488000	4.04E+10	7.73E+10	4.04E+10	3360
488214	4.04E+10	7.73E+10	4.04E+10	3361
488428	4.04E+10	7.73E+10	4.04E+10	3362
488642	4.04E+10	7.73E+10	4.04E+10	3363
488856	4.04E+10	7.73E+10	4.04E+10	3364
489069	4.04E+10	7.73E+10	4.04E+10	3365
489283	4.04E+10	7.73E+10	4.04E+10	3366
489497	4.04E+10	7.73E+10	4.04E+10	3367
489711	4.04E+10	7.73E+10	4.04E+10	3368
489925	4.04E+10	7.73E+10	4.04E+10	3369
490139	4.04E+10	7.73E+10	4.04E+10	3370
490353	4.04E+10	7.73E+10	4.04E+10	3371
490567	4.04E+10	7.73E+10	4.04E+10	3372
490781	4.04E+10	7.73E+10	4.04E+10	3373
490995	4.04E+10	7.73E+10	4.04E+10	3374
491209	4.04E+10	7.73E+10	4.04E+10	3375
491423	4.04E+10	7.73E+10	4.04E+10	3376
491637	4.04E+10	7.73E+10	4.04E+10	3377
491851	4.04E+10	7.73E+10	4.04E+10	3378
492065	4.04E+10	7.73E+10	4.04E+10	3379
492279	4.04E+10	7.73E+10	4.04E+10	3380
492493	4.04E+10	7.73E+10	4.04E+10	3381
492707	4.04E+10	7.73E+10	4.04E+10	3382
492921	4.04E+10	7.73E+10	4.04E+10	3383
493135	4.04E+10	7.73E+10	4.04E+10	3384
493349	4.04E+10	7.73E+10	4.04E+10	3385
493563	4.04E+10	7.73E+10	4.04E+10	3386
493777	4.04E+10	7.73E+10	4.04E+10	3387
493991	4.04E+10	7.73E+10	4.04E+10	3388
494205	4.04E+10	7.73E+10	4.04E+10	3389
494419	4.04E+10	7.73E+10	4.04E+10	3390
494633	4.04E+10	7.73E+10	4.04E+10	3391
494847	4.04E+10	7.73E+10	4.04E+10	3392
495061	4.04E+10	7.73E+10	4.04E+10	3393
495275	4.04E+10	7.73E+10	4.04E+10	3394
495489	4.04E+10	7.73E+10	4.04E+10	3395
495703	4.04E+10	7.73E+10	4.04E+10	3396
495917	4.04E+10	7.73E+10	4.04E+10	3397
496131	4.04E+10	7.73E+10	4.04E+10	3398
496345	4.04E+10	7.73E+10	4.04E+10	3399
496559	4.04E+10	7.73E+10	4.04E+10	3400
496773	4.04E+10	7.73E+10	4.04E+10	3401
496987	4.04E+10	7.73E+10	4.04E+10	3402
497201	4.04E+10	7.73E+10	4.04E+10	3403
497415	4.04E+10	7.73E+10	4.04E+10	3404
497629	4.04E+10	7.73E+10	4.04E+10	3405
497843	4.04E+10	7.73E+10	4.04E+10	3406
498057	4.04E+10	7.73E+10	4.04E+10	3407
498271	4.04E+10	7.73E+10	4.04E+10	3408
498485	4.04E+10	7.73E+10	4.04E+10	3409
498699	4.04E+10	7.73E+10	4.04E+10	3410
498913	4.04E+10	7.73E+10	4.04E+10	3411
499127	4.04E+10	7.73E+10	4.04E+10	3412
499341	4.04E+10	7.73E+10	4.04E+10	3413
499555	4.04E+10	7.73E+10	4.04E+10	3414
499769	4.04E+10	7.73E+10	4.04E+10	3415
500000	4.04E+10	7.73E+10	4.04E+10	3416

WATER VELOCITY= 1.00 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .0080 CM²/MIN
 PECLET NUMBER= 4.23E+06
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 1717556 YEARS
 PEAK DISCHARGE RATE= 1.61E-01 Curies per year at 2066730 YEARS
 HAND WIDTH= 347182 YEARS WITH TAIL END AT 2066730 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR DISC RATE, CI/YR PULSE RATE HAND DATE GIM TIME

1687477	.000E+00	.000E+00	.000E+00	11665
1717556	5.001E-39	7.214E-39	6.401E-39	11873
1747635	1.065E-35	1.223E-35	1.085E-35	12081
1777715	1.840E-32	2.074E-32	1.840E-32	12284
1807794	3.119E-29	3.515E-29	3.119E-29	12494
1837873	5.268E-26	5.960E-26	5.268E-26	12704
1867953	8.955E-23	1.010E-22	8.955E-23	12912
1898032	1.520E-19	1.713E-19	1.520E-19	13120
1928111	2.577E-16	2.904E-16	2.577E-16	13324
1958191	4.369E-13	4.924E-13	4.369E-13	13536
1988270	7.407E-10	8.368E-10	7.407E-10	13744
2018350	1.256E-05	1.419E-06	1.256E-06	13952
2048429	2.125E-03	2.394E-03	2.125E-03	14160
2068494	3.607E-03	3.009E-03	3.607E-03	14368
2088569	5.264E-03	4.731E-03	5.264E-03	14576
2108644	7.407E-03	8.368E-03	7.407E-03	14784
2128719	1.010E-02	1.151E-02	1.010E-02	14992
2148794	1.520E-02	1.713E-02	1.520E-02	15200
2168869	2.577E-02	2.904E-02	2.577E-02	15408
2188944	4.369E-02	4.924E-02	4.369E-02	15616
2209019	7.407E-02	8.368E-02	7.407E-02	15824
2229094	1.256E-01	1.419E-01	1.256E-01	16032
2249169	2.125E-01	2.394E-01	2.125E-01	16240
2269244	3.607E-01	3.009E-01	3.607E-01	16448
2289319	5.264E-01	4.731E-01	5.264E-01	16656
2309394	7.407E-01	8.368E-01	7.407E-01	16864
2329469	1.010E-00	1.151E-00	1.010E-00	17072
2349544	1.520E-00	1.713E-00	1.520E-00	17280
2369619	2.577E-00	2.904E-00	2.577E-00	17488
2389694	4.369E-00	4.924E-00	4.369E-00	17696
2409769	7.407E-00	8.368E-00	7.407E-00	17904
2429844	1.256E-00	1.419E-00	1.256E-00	18112
2449919	2.125E-00	2.394E-00	2.125E-00	18320
2470000	3.607E-00	3.009E-00	3.607E-00	18528
2490075	5.264E-00	4.731E-00	5.264E-00	18736
2510150	7.407E-00	8.368E-00	7.407E-00	18944
2530225	1.010E-00	1.151E-00	1.010E-00	19152
2550300	1.520E-00	1.713E-00	1.520E-00	19360
2570375	2.577E-00	2.904E-00	2.577E-00	19568
2590450	4.369E-00	4.924E-00	4.369E-00	19776
2610525	7.407E-00	8.368E-00	7.407E-00	19984
2630600	1.256E-00	1.419E-00	1.256E-00	20192
2650675	2.125E-00	2.394E-00	2.125E-00	20400
2670750	3.607E-00	3.009E-00	3.607E-00	20608
2690825	5.264E-00	4.731E-00	5.264E-00	20816
2710900	7.407E-00	8.368E-00	7.407E-00	21024
2730975	1.010E-00	1.151E-00	1.010E-00	21232
2751050	1.520E-00	1.713E-00	1.520E-00	21440
2771125	2.577E-00	2.904E-00	2.577E-00	21648
2791200	4.369E-00	4.924E-00	4.369E-00	21856
2811275	7.407E-00	8.368E-00	7.407E-00	22064
2831350	1.256E-00	1.419E-00	1.256E-00	22272
2851425	2.125E-00	2.394E-00	2.125E-00	22480
2871500	3.607E-00	3.009E-00	3.607E-00	22688
2891575	5.264E-00	4.731E-00	5.264E-00	22896
2911650	7.407E-00	8.368E-00	7.407E-00	23104
2931725	1.010E-00	1.151E-00	1.010E-00	23312
2951800	1.520E-00	1.713E-00	1.520E-00	23520
2971875	2.577E-00	2.904E-00	2.577E-00	23728
2991950	4.369E-00	4.924E-00	4.369E-00	23936
3012025	7.407E-00	8.368E-00	7.407E-00	24144
3032100	1.256E-00	1.419E-00	1.256E-00	24352
3052175	2.125E-00	2.394E-00	2.125E-00	24560
3072250	3.607E-00	3.009E-00	3.607E-00	24768
3092325	5.264E-00	4.731E-00	5.264E-00	24976
3112400	7.407E-00	8.368E-00	7.407E-00	25184
3132475	1.010E-00	1.151E-00	1.010E-00	25392
3152550	1.520E-00	1.713E-00	1.520E-00	25600
3172625	2.577E-00	2.904E-00	2.577E-00	25808
3192700	4.369E-00	4.924E-00	4.369E-00	26016
3212775	7.407E-00	8.368E-00	7.407E-00	26224
3232850	1.256E-00	1.419E-00	1.256E-00	26432
3252925	2.125E-00	2.394E-00	2.125E-00	26640
3273000	3.607E-00	3.009E-00	3.607E-00	26848
3293075	5.264E-00	4.731E-00	5.264E-00	27056
3313150	7.407E-00	8.368E-00	7.407E-00	27264
3333225	1.010E-00	1.151E-00	1.010E-00	27472
3353300	1.520E-00	1.713E-00	1.520E-00	27680
3373375	2.577E-00	2.904E-00	2.577E-00	27888
3393450	4.369E-00	4.924E-00	4.369E-00	28096
3413525	7.407E-00	8.368E-00	7.407E-00	28304
3433600	1.256E-00	1.419E-00	1.256E-00	28512
3453675	2.125E-00	2.394E-00	2.125E-00	28720
3473750	3.607E-00	3.009E-00	3.607E-00	28928
3493825	5.264E-00	4.731E-00	5.264E-00	29136
3513900	7.407E-00	8.368E-00	7.407E-00	29344
3533975	1.010E-00	1.151E-00	1.010E-00	29552
3554050	1.520E-00	1.713E-00	1.520E-00	29760
3574125	2.577E-00	2.904E-00	2.577E-00	29968
3594200	4.369E-00	4.924E-00	4.369E-00	30176
3614275	7.407E-00	8.368E-00	7.407E-00	30384
3634350	1.256E-00	1.419E-00	1.256E-00	30592
3654425	2.125E-00	2.394E-00	2.125E-00	30800
3674500	3.607E-00	3.009E-00	3.607E-00	31008
3694575	5.264E-00	4.731E-00	5.264E-00	31216
3714650	7.407E-00	8.368E-00	7.407E-00	31424
3734725	1.010E-00	1.151E-00	1.010E-00	31632
3754800	1.520E-00	1.713E-00	1.520E-00	31840
3774875	2.577E-00	2.904E-00	2.577E-00	32048
3794950	4.369E-00	4.924E-00	4.369E-00	32256
3815025	7.407E-00	8.368E-00	7.407E-00	32464
3835100	1.256E-00	1.419E-00	1.256E-00	32672
3855175	2.125E-00	2.394E-00	2.125E-00	32880
3875250	3.607E-00	3.009E-00	3.607E-00	33088
3895325	5.264E-00	4.731E-00	5.264E-00	33296
3915400	7.407E-00	8.368E-00	7.407E-00	33504
3935475	1.010E-00	1.151E-00	1.010E-00	33712
3955550	1.520E-00	1.713E-00	1.520E-00	33920
3975625	2.577E-00	2.904E-00	2.577E-00	34128
3995700	4.369E-00	4.924E-00	4.369E-00	34336
4015775	7.407E-00	8.368E-00	7.407E-00	34544
4035850	1.256E-00	1.419E-00	1.256E-00	34752
4055925	2.125E-00	2.394E-00	2.125E-00	34960
4076000	3.607E-00	3.009E-00	3.607E-00	35168
4096075	5.264E-00	4.731E-00	5.264E-00	35376
4116150	7.407E-00	8.368E-00	7.407E-00	35584
4136225	1.010E-00	1.151E-00	1.010E-00	35792
4156300	1.520E-00	1.713E-00	1.520E-00	36000
4176375	2.577E-00	2.904E-00	2.577E-00	36208
4196450	4.369E-00	4.924E-00	4.369E-00	36416
4216525	7.407E-00	8.368E-00	7.407E-00	36624
4236600	1.256E-00	1.419E-00	1.256E-00	36832
4256675	2.125E-00	2.394E-00	2.125E-00	37040
4276750	3.607E-00	3.009E-00	3.607E-00	37248
4296825	5.264E-00	4.731E-00	5.264E-00	37456
4316900	7.407E-00	8.368E-00	7.407E-00	37664
4336975	1.010E-00	1.151E-00	1.010E-00	37872
4357050	1.520E-00	1.713E-00	1.520E-00	38080
4377125	2.577E-00	2.904E-00	2.577E-00	38288
4397200	4.369E-00	4.924E-00	4.369E-00	38496
4417275	7.407E-00	8.368E-00	7.407E-00	38704
4437350	1.256E-00	1.419E-00	1.256E-00	38912
4457425	2.125E-00	2.394E-00	2.125E-00	39120
4477500	3.607E-00	3.009E-00	3.607E-00	39328
4497575	5.264E-00	4.731E-00	5.264E-00	39536
4517650	7.407E-00	8.368E-00	7.407E-00	39744
4537725	1.010E-00	1.151E-00	1.010E-00	39952
4557800	1.520E-00	1.713E-00	1.520E-00	40160
4577875	2.577E-00	2.904E-00	2.577E-00	40368
4597950	4.369E-00	4.924E-00	4.369E-00	40576
4618025	7.407E-00	8.368E-00	7.407E-00	40784
4638100	1.256E-00	1.419E-00	1.256E-00	40992
4658175	2.125E-00	2.394E-00	2.125E-00	41200
4678250	3.607E-00	3.009E-00	3.607E-00	41408
4698325	5.264E-00	4.731E-00	5.264E-00	41616
4718400	7.407E-00	8.368E-00	7.407E-00	41824
4738475	1.010E-00	1.151E-00	1.010E-00	42032
4758550	1.520E-00	1.713E-00	1.520E-00	42240
4778625	2.577E-00	2.904E-00	2.577E-00	42448
4798700	4.369E-00	4.924E-00	4.369E-00	42656
4818775	7.407E-00	8.368E-00	7.407E-00	42864
4838850	1.256E-00	1.419E-00	1.256E-00	43072
4858925	2.125E-00	2.394E-00	2.125E-00	43280
4879000	3.607E-00	3.009E-00	3.607E-00	43488
4899075	5.264E-00	4.731E-00	5.264E-00	43696
4919150	7.407E-00	8.368E-00	7.407E-00	43904
4939225	1.010E-00	1.151E-00	1.010E-00	44112
4959300	1.520E-00	1.713E-00	1.520E-00	44320
4979375	2.577E-00	2.904E-00	2.577E-00	44528
4999450	4.369E-00	4.924E-00	4.369E-00	44736
5019525	7.407E-00	8.368E-00	7.407E-00	44944
5039600	1.256E-00	1.419E-00	1.256E-00	45152
5059675	2.125E-00	2.394E-00	2.125E-00	45360
5079750	3.607E-00	3.009E-00	3.607E-00	45568
5099825	5.264E-00	4.731E-00	5.264E-00	45776
5119900	7.407E-00	8.368E-00	7.407E-00	45984
5139975	1.010E-00	1.151E-00	1.010E-00	46192
5160050	1.520E-00	1.713E-00	1.520E-00	46400
5180125	2.577E-00	2.904E-00	2.577E-00	46608
5200200	4.369E-00	4.924E-00	4.369E-00	46816
5220275	7.407E-00	8.368E-00	7.407E-00	47024
5240350	1.256E-00	1.419E-00	1.256E-00	47232
5260425	2.125E-00	2.394E-00	2.125E-00	47440
5280500	3.607E-00	3.009E-00	3.607E-00	47648
5300575	5.264E-00	4.731E-00	5.264E-00	

[illegible]

PECLT NUMHEW= 4.26E+06
 NUCLEOL DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 1446797 YEARS
 PEAK DISCHARGE RATE= 3.68E-12 CURIES PER YEAP AT 1447390 YEARS
 BAND WIDTH= 619940 YEARS WITH TAIL END AT 2066737 YEARS
 DISPERSION PFAK/NO+DISPERSION PEAK = .00E+00

TIME, YR	DISC RATE, CI/YR	PULSE RATE	BAND PATE	DIM TIME
1435404	.000E+00	.000E+00	.000E+00	9922
1435974	.000E+00	4.452E-39	.000E+00	9926
1436543	.000E+00	2.094E-36	.000E+00	9930
1437113	.000E+00	7.056E-34	.000E+00	9934
1437683	.000E+00	1.703E-31	.000E+00	9938
1438252	.000E+00	2.950E-29	.000E+00	9942
1438822	.000E+00	3.667E-27	.000E+00	9946
1439391	.000E+00	3.273E-25	.000E+00	9950
1439961	.000E+00	2.104E-23	.000E+00	9954
1440531	.000E+00	9.734E-22	.000E+00	9958
1441100	.000E+00	3.250E-20	.000E+00	9961
1441670	.000E+00	7.836E-19	.000E+00	9965
1442240	.000E+00	1.370E-17	.000E+00	9969
1442809	.000E+00	1.738E-16	.000E+00	9973
1443379	.000E+00	1.607E-15	.000E+00	9977
1443949	.000E+00	1.086E-14	.000E+00	9981
1444518	.000E+00	5.425E-14	.000E+00	9985
1445088	.000E+00	2.010E-13	.000E+00	9989
1445658	1.344E-12	5.608E-13	1.344E-12	9993
1446227	1.344E-12	1.199E-12	1.344E-12	9997
1446797	1.344E-12	2.022E-12	1.344E-12	10001
1447366	3.683E-12	2.816E-12	3.683E-12	10005
1447936	3.682E-12	3.399E-12	3.682E-12	10009
1448505	3.682E-12	3.682E-12	3.682E-12	10013
1449075	3.682E-12	3.682E-12	3.682E-12	10017
1449644	3.682E-12	3.682E-12	3.682E-12	10021
1450214	3.682E-12	3.682E-12	3.682E-12	10025
1450783	3.682E-12	3.682E-12	3.682E-12	10029
1451353	3.682E-12	3.682E-12	3.682E-12	10033
1451922	3.682E-12	3.682E-12	3.682E-12	10037
1452492	3.682E-12	3.682E-12	3.682E-12	10041
1453061	3.682E-12	3.682E-12	3.682E-12	10045
1453631	3.682E-12	3.682E-12	3.682E-12	10049
1454200	3.682E-12	3.682E-12	3.682E-12	10053
1454770	3.682E-12	3.682E-12	3.682E-12	10057
1455339	3.682E-12	3.682E-12	3.682E-12	10061
1455909	3.682E-12	3.682E-12	3.682E-12	10065
1456478	3.682E-12	3.682E-12	3.682E-12	10069
1457048	3.682E-12	3.682E-12	3.682E-12	10073
1457617	3.682E-12	3.682E-12	3.682E-12	10077
1458187	3.682E-12	3.682E-12	3.682E-12	10081
1458756	3.682E-12	3.682E-12	3.682E-12	10085
1459326	3.682E-12	3.682E-12	3.682E-12	10089
1459895	3.682E-12	3.682E-12	3.682E-12	10093
1460465	3.682E-12	3.682E-12	3.682E-12	10097
1461034	3.682E-12	3.682E-12	3.682E-12	10101
1461604	3.682E-12	3.682E-12	3.682E-12	10105
1462173	3.682E-12	3.682E-12	3.682E-12	10109
1462743	3.682E-12	3.682E-12	3.682E-12	10113
1463312	3.682E-12	3.682E-12	3.682E-12	10117
1463882	3.682E-12	3.682E-12	3.682E-12	10121
1464451	3.682E-12	3.682E-12	3.682E-12	10125
1465021	3.682E-12	3.682E-12	3.682E-12	10129
1465590	3.682E-12	3.682E-12	3.682E-12	10133
1466160	3.682E-12	3.682E-12	3.682E-12	10137
1466729	3.682E-12	3.682E-12	3.682E-12	10141
1467299	3.682E-12	3.682E-12	3.682E-12	10145
1467868	3.682E-12	3.682E-12	3.682E-12	10149
1468438	3.682E-12	3.682E-12	3.682E-12	10153
1469007	3.682E-12	3.682E-12	3.682E-12	10157
1469577	3.682E-12	3.682E-12	3.682E-12	10161
1470146	3.682E-12	3.682E-12	3.682E-12	10165
1470716	3.682E-12	3.682E-12	3.682E-12	10169
1471285	3.682E-12	3.682E-12	3.682E-12	10173
1471855	3.682E-12	3.682E-12	3.682E-12	10177
1472424	3.682E-12	3.682E-12	3.682E-12	10181
1472994	3.682E-12	3.682E-12	3.682E-12	10185
1473563	3.682E-12	3.682E-12	3.682E-12	10189
1474133	3.682E-12	3.682E-12	3.682E-12	10193
1474702	3.682E-12	3.682E-12	3.682E-12	10197
1475272	3.682E-12	3.682E-12	3.682E-12	10201
1475841	3.682E-12	3.682E-12	3.682E-12	10205
1476411	3.682E-12	3.682E-12	3.682E-12	10209
1476980	3.682E-12	3.682E-12	3.682E-12	10213
1477550	3.682E-12	3.682E-12	3.682E-12	10217
1478119	3.682E-12	3.682E-12	3.682E-12	10221
1478689	3.682E-12	3.682E-12	3.682E-12	10225
1479258	3.682E-12	3.682E-12	3.682E-12	10229
1479828	3.682E-12	3.682E-12	3.682E-12	10233
1480397	3.682E-12	3.682E-12	3.682E-12	10237
1480967	3.682E-12	3.682E-12	3.682E-12	10241
1481536	3.682E-12	3.682E-12	3.682E-12	10245
1482105	3.682E-12	3.682E-12	3.682E-12	10249
1482675	3.682E-12	3.682E-12	3.682E-12	10253
1483244	3.682E-12	3.682E-12	3.682E-12	10257
1483814	3.682E-12	3.682E-12	3.682E-12	10261
1484383	3.682E-12	3.682E-12	3.682E-12	10265
1484953	3.682E-12	3.682E-12	3.682E-12	10269
1485522	3.682E-12	3.682E-12	3.682E-12	10273
1486092	3.682E-12	3.682E-12	3.682E-12	10277
1486661	3.682E-12	3.682E-12	3.682E-12	10281
1487231	3.682E-12	3.682E-12	3.682E-12	10285
1487800	3.682E-12	3.682E-12	3.682E-12	10289
1488370	3.682E-12	3.682E-12	3.682E-12	10293
1488939	3.682E-12	3.682E-12	3.682E-12	10297
1489509	3.682E-12	3.682E-12	3.682E-12	10301
1490078	3.682E-12	3.682E-12	3.682E-12	10305
1490648	3.682E-12	3.682E-12	3.682E-12	10309
1491217	3.682E-12	3.682E-12	3.682E-12	10313
1491787	3.682E-12	3.682E-12	3.682E-12	10317
1492356	3.682E-12	3.682E-12	3.682E-12	10321
1492926	3.682E-12	3.682E-12	3.682E-12	10325
1493495	3.682E-12	3.682E-12	3.682E-12	10329
1494065	3.682E-12	3.682E-12	3.682E-12	10333
1494634	3.682E-12	3.682E-12	3.682E-12	10337
1495204	3.682E-12	3.682E-12	3.682E-12	10341
1495773	3.682E-12	3.682E-12	3.682E-12	10345
1496343	3.682E-12	3.682E-12	3.682E-12	10349
1496912	3.682E-12	3.682E-12	3.682E-12	10353
1497482	3.682E-12	3.682E-12	3.682E-12	10357
1498051	3.682E-12	3.682E-12	3.682E-12	10361
1498621	3.682E-12	3.682E-12	3.682E-12	10365
1499190	3.682E-12	3.682E-12	3.682E-12	10369
1499760	3.682E-12	3.682E-12	3.682E-12	10373
1500329	3.682E-12	3.682E-12	3.682E-12	10377
1500899	3.682E-12	3.682E-12	3.682E-12	10381
1501468	3.682E-12	3.682E-12	3.682E-12	10385
1502038	3.682E-12	3.682E-12	3.682E-12	10389
1502607	3.682E-12	3.682E-12	3.682E-12	10393
1503177	3.682E-12	3.682E-12	3.682E-12	10397
1503746	3.682E-12	3.682E-12	3.682E-12	10401
1504316	3.682E-12	3.682E-12	3.682E-12	10405
1504885	3.682E-12	3.682E-12	3.682E-12	10409
1505455	3.682E-12	3.682E-12	3.682E-12	10413
1506024	3.682E-12	3.682E-12	3.682E-12	10417
1506594	3.682E-12	3.682E-12	3.682E-12	10421
1507163	3.682E-12	3.682E-12	3.682E-12	10425
1507733	3.682E-12	3.682E-12	3.682E-12	10429
1508302	3.682E-12	3.682E-12	3.682E-12	10433
1508872	3.682E-12	3.682E-12	3.682E-12	10437
1509441	3.682E-12	3.682E-12	3.682E-12	10441
1509999	3.682E-12	3.682E-12	3.682E-12	10445
1510569	3.682E-12	3.682E-12	3.682E-12	10449
1511138	3.682E-12	3.682E-12	3.682E-12	10453
1511708	3.682E-12	3.682E-12	3.682E-12	10457
1512277	3.682E-12	3.682E-12	3.682E-12	10461
1512847	3.682E-12	3.682E-12	3.682E-12	10465
1513416	3.682E-12	3.682E-12	3.682E-12	10469
1513986	3.682E-12	3.682E-12	3.682E-12	10473
1514555	3.682E-12	3.682E-12	3.682E-12	10477
1515125	3.682E-12	3.682E-12	3.682E-12	10481
1515694	3.682E-12	3.682E-12	3.682E-12	10485
1516264	3.682E-12	3.682E-12	3.682E-12	10489
1516833	3.682E-12	3.682E-12	3.682E-12	10493
1517403	3.682E-12	3.682E-12	3.682E-12	10497
1517972	3.682E-12	3.682E-12	3.682E-12	10501
1518542	3.682E-12	3.682E-12	3.682E-12	10505
1519111	3.682E-12	3.682E-12	3.682E-12	10509
1519681	3.682E-12	3.682E-12	3.682E-12	10513
1520250	3.682E-12	3.682E-12	3.682E-12	10517
1520820	3.682E-12	3.682E-12	3.682E-12	10521
1521389	3.682E-12	3.682E-12	3.682E-12	10525
1521959	3.682E-12	3.682E-12	3.682E-12	10529
1522528	3.682E-12	3.682E-12	3.682E-12	10533
1523098	3.682E-12	3.682E-12	3.682E-12	10537
1523667	3.682E-12	3.682E-12	3.682E-12	10541
1524237	3.682E-12	3.682E-12	3.682E-12	10545
1524806	3.682E-12	3.682E-12	3.682E-12	10549
1525376	3.682E-12	3.682E-12	3.682E-12	10553
1525945	3.682E-12	3.682E-12	3.682E-12	10557
1526515	3.682E-12	3.682E-12	3.682E-12	10561
1527084	3.682E-12	3.682E-12	3.682E-12	10565
1527654	3.682E-12	3.682E-12	3.682E-12	10569
1528223	3.682E-12	3.682E-12	3.682E-12	10573
1528793	3.682E-12	3.682E-12	3.682E-12	10577
1529362	3.682E-12	3.682E-12	3.682E-12	10581
1529932	3.682E-12	3.682E-12	3.682E-12	10585
1530501	3.682E-12	3.682E-12	3.682E-12	10589
1531071	3.682E-12	3.682E-12	3.682E-12	10593
1531640	3.682E-12	3.682E-12	3.682E-12	10597
1532210	3.682E-12	3.682E-12	3.682E-12	10601
1532779	3.682E-12	3.682E-12	3.682E-12	10605
1533349	3.682E-12	3.682E-12	3.682E-12	10609
1533918	3.682E-12	3.682E-12	3.682E-12	10613
1534488	3.682E-12	3.682E-12	3.682E-12	10617
1535057	3.682E-12	3.682E-12	3.682E-12	10621
1535627	3.682E-12	3.682E-12	3.682E-12	10625
1536196				

20R2301 .000E+00 .000E+00 .000E+00 14394

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: NP237 FROM AM241

NUCLIDE AM241 NP237
HALF LIFE, YR 4.33E+02 2.14E+06 .00E+00
DECAY NUMBER 2.32E-01 4.69E-05 .00E+00
DISTIR COEF 1.00E+04 1.00E+02 .00E+00
YR 2000 CURIES 8.56E+07 .00E+00 .00E+00
PULSE G-ATONS 9.74E+04 .00E+00 .00E+00
NUCL VEL, MI/YR 6.91E-06 6.91E-04 .00E+00
DISCH TIME, YR 1.45E+06 1.45E+04 .00E+00
DIM DISC TIME 1.00E+04 1.00E+02 .00E+00
LFACH RATE = .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
PATH LENGTH= 10.00 MILES
DIMENSIONLESS DISTANCE= 1.00
WATER VELOCITY= 1.00 FT/DAY
WATER TRAVEL TIME= 1.95 YEARS
AXIAL DISPERSION COEFFICIENT= .0000 CM²/MIN
PECLET NUMBER= 4.26E+06
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 0 YEARS
PEAK DISCHARGE RATE= 1.52E+01 CURIES PER YEAR AT 14906 YEARS
BAND WIDTH= 43655 YEARS WITH TAIL END AT 43655 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR DISC RATE, CI/YR PULSE RATE, BAND DATE DIM TIME

14443	.000E+00	2.301E-34	.000E+00	99
14444	.000E+00	1.725E-32	.000E+00	99
14445	.000E+00	1.142E-30	.000E+00	99
14453	.000E+00	6.691E-29	.000E+00	99
14457	.000E+00	3.471E-27	.000E+00	99
14460	.000E+00	1.591E-25	.000E+00	99
14464	.000E+00	6.467E-24	.000E+00	99
14467	.000E+00	2.324E-22	.000E+00	99
14471	.000E+00	7.404E-21	.000E+00	99
14474	.000E+00	2.048E-19	.000E+00	99
14477	.000E+00	5.217E-18	.000E+00	99
14481	.000E+00	1.155E-16	.000E+00	99
14484	.000E+00	2.262E-15	.000E+00	99
14488	.000E+00	3.932E-14	.000E+00	99
14491	.000E+00	6.053E-13	.000E+00	99

14495	.000E+00	8.244E-12	.000E+00	103
14498	.000E+00	1.002E-10	.000E+00	103
14501	.000E+00	1.076E-09	.000E+00	103
14505	.000E+00	1.020E-08	.000E+00	103
14508	.000E+00	8.642E-08	.000E+00	103
14512	.000E+00	6.512E-07	.000E+00	103
14515	.000E+00	4.364E-06	.000E+00	103
14519	.000E+00	2.594E-05	.000E+00	103
14522	.000E+00	1.469E-04	.000E+00	103
14526	.000E+00	6.438E-04	.000E+00	103
14529	.000E+00	2.693E-03	.000E+00	103
14532	.000E+00	1.005E-02	.000E+00	103
14536	.000E+00	3.364E-02	.000E+00	103
14539	.000E+00	9.962E-02	.000E+00	103
14543	.000E+00	2.652E-01	.000E+00	103
14546	.000E+00	6.325E-01	.000E+00	103
14550	.000E+00	1.357E+00	.000E+00	103
14553	.000E+00	2.622E+00	.000E+00	103
14557	.000E+00	4.584E+00	.000E+00	103
14560	.000E+00	7.274E+00	.000E+00	103
14563	.000E+00	1.056E+01	.000E+00	103
14906	1.522E+01	1.714E+01	1.522E+01	103
14916	1.502E+01	1.493E+01	1.502E+01	103
14922	1.483E+01	1.479E+01	1.483E+01	103
14930	1.464E+01	1.460E+01	1.464E+01	103
14934	1.445E+01	1.441E+01	1.445E+01	103
14946	1.426E+01	1.422E+01	1.426E+01	103
14956	1.407E+01	1.403E+01	1.407E+01	103
14959	1.389E+01	1.385E+01	1.389E+01	103
14971	1.371E+01	1.367E+01	1.371E+01	103
14979	1.353E+01	1.349E+01	1.353E+01	103
14987	1.335E+01	1.331E+01	1.335E+01	103
14995	1.317E+01	1.313E+01	1.317E+01	103
15003	1.300E+01	1.296E+01	1.300E+01	103
15011	1.282E+01	1.278E+01	1.282E+01	103
15019	1.264E+01	1.260E+01	1.264E+01	103
43655	9.846E-20	9.823E-20	9.846E-20	301
72292	.000E+00	.000E+00	.000E+00	444

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: NP237 FROM NP237

NUCLIDE	NP237	1.43E+01	1.43E+01
HALF LIFE, YR	2.14E+06	1.43E+01	1.43E+01
DECAY NUMBER	4.69E-05	1.43E+01	1.43E+01
DISTIR COEF	1.00E+02	1.43E+01	1.43E+01
YR 2000 CURIES	8.56E+07	1.43E+01	1.43E+01

PULSE G-ATOMS	4.99E+05	.00E+00	.00E+00	14857	2.245E-03	2.564E-03	2.245E-03	102
NUCL VEL./MI/YR	6.91E-04	4.84E-06	.00E+00	14874	2.400E-03	2.564E-03	2.400E-03	102
DISCH TIME/YR	1.45E+04	2.07E+06	.00E+00	14894	2.555E-03	2.563E-03	2.555E-03	102
DIM DISC TIME	1.00E+02	1.43E+04	.00E+00	14918	2.565E-03	2.563E-03	2.565E-03	103
LEACH RATE=	.003000	FRACTION PER YEAR		14938	2.565E-03	2.563E-03	2.565E-03	103
LEACH DURATION=	333 YEARS			14958	2.564E-03	2.563E-03	2.564E-03	103
PATH LENGTH=	10.00 MILES			14979	2.564E-03	2.562E-03	2.564E-03	103
DIMENSIONLESS DISTANCE=	1.00			14999	2.564E-03	2.562E-03	2.564E-03	103
WATER VELOCITY=	1.00 FT/DAY			15019	2.564E-03	2.562E-03	2.564E-03	103
WATER TRAVEL TIME=	145 YEARS			116723	1.636E-03	1.635E-03	1.636E-03	R06
AXIAL DISPERSION COEFFICIENT=	.0080 CM ² /MIN			218428	1.044E-03	1.044E-03	1.044E-03	1509
PECLLET NUMBER=	4.28E+06			320132	6.64E-04	6.64E-04	6.64E-04	2915
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION				421837	4.253E-04	4.250E-04	4.253E-04	3618
INITIAL BREAKTHROUGH AT	14572 YEARS			523541	2.714E-04	2.713E-04	2.714E-04	4322
PEAK DISCHARGE RATE=	2.56E-03 Curies per year			625245	1.732E-04	1.731E-04	1.732E-04	5025
BAND WIDTH=	2051284 YEARS WITH TAIL END AT			726950	1.108E-04	1.105E-04	1.108E-04	5025
DISPERSION PEAK/NU-DISPERSION PEAK =	.00E+00			828654	7.054E-05	7.051E-05	7.054E-05	5728
TIME,YR	DISC RATE,CI/YR	PULSE RATE	BAND RATE	01M TIME				
14443	.000E+00	2.249E-38	.000E+00	99	4.503E-05	4.500E-05	4.503E-05	6431
14452	.000E+00	8.66E-34	.000E+00	1032063	2.874E-05	2.872E-05	2.874E-05	7134
14460	.000E+00	1.556E-29	.000E+00	1133767	1.834E-05	1.833E-05	1.834E-05	7837
14469	.000E+00	1.302E-25	.000E+00	1235472	1.171E-05	1.170E-05	1.171E-05	8540
14477	.000E+00	5.099E-22	.000E+00	1337176	7.471E-06	7.466E-06	7.471E-06	9243
14486	.000E+00	9.359E-19	.000E+00	1438881	4.768E-06	4.765E-06	4.768E-06	9946
14495	.000E+00	8.084E-16	.000E+00	1540585	3.041E-06	3.041E-06	3.041E-06	10649
14503	.000E+00	3.300E-13	.000E+00	1642289	1.942E-06	1.941E-06	1.942E-06	11352
14512	.000E+00	6.347E-11	.000E+00	1743994	1.239E-06	1.239E-06	1.239E-06	12055
14520	.000E+00	5.920E-09	.000E+00	1845698	7.910E-07	7.905E-07	7.910E-07	12758
14529	.000E+00	2.640E-07	.000E+00	1947403	5.048E-07	5.045E-07	5.048E-07	13461
14538	.000E+00	5.744E-06	.000E+00	2049107	3.222E-07	3.220E-07	3.222E-07	14165
14546	.000E+00	6.215E-05	.000E+00	2049988	3.209E-07	3.207E-07	3.209E-07	14171
14555	.000E+00	3.453E-04	.000E+00	2050870	3.197E-07	3.195E-07	3.197E-07	14177
14563	.000E+00	1.043E-03	.000E+00	2051752	3.184E-07	3.182E-07	3.184E-07	14183
14572	.000E+00	1.888E-03	.000E+00	2052633	3.172E-07	3.170E-07	3.172E-07	14189
14581	.000E+00	1.143E-04	.000E+00	2053515	3.160E-07	3.158E-07	3.160E-07	14195
14589	.000E+00	2.394E-03	.000E+00	2054396	3.147E-07	3.145E-07	3.147E-07	14201
14598	.000E+00	2.565E-03	.000E+00	2055278	3.135E-07	3.133E-07	3.135E-07	14207
14606	.000E+00	2.567E-03	.000E+00	2056159	3.123E-07	3.121E-07	3.123E-07	14213
14615	.000E+00	2.567E-03	.000E+00	2057041	3.111E-07	3.109E-07	3.111E-07	14219
14635	.000E+00	3.792E-04	.000E+00	2057922	3.097E-07	3.095E-07	3.097E-07	14225
14635	.000E+00	2.566E-03	.000E+00	2058804	3.087E-07	3.085E-07	3.087E-07	14232
14655	.000E+00	2.566E-03	.000E+00	2059685	3.075E-07	3.073E-07	3.075E-07	14238
14676	.000E+00	2.566E-03	.000E+00	2060567	3.063E-07	3.061E-07	3.063E-07	14244
14696	.000E+00	2.566E-03	.000E+00	2061449	3.051E-07	3.049E-07	3.051E-07	14250
14716	.000E+00	2.566E-03	.000E+00	2062330	3.039E-07	3.037E-07	3.039E-07	14256
14736	.000E+00	2.566E-03	.000E+00	2063212	3.027E-07	3.025E-07	3.027E-07	14262
14756	.000E+00	2.566E-03	.000E+00	2064093	3.016E-07	3.014E-07	3.016E-07	14268
14776	.000E+00	2.566E-03	.000E+00	2064975	3.004E-07	3.002E-07	3.004E-07	14274
14796	.000E+00	2.566E-03	.000E+00	2065856	2.992E-07	2.990E-07	2.992E-07	14280
14817	.000E+00	2.566E-03	.000E+00	2066738	.000E+00	1.404E-07	.000E+00	14286
14837	.000E+00	2.566E-03	.000E+00	2067619	.000E+00	7.235E-08	.000E+00	14293
				2068501	.000E+00	2.781E-08	.000E+00	14299
				2069383	.000E+00	7.750E-09	.000E+00	14305
				2070264	.000E+00	1.538E-09	.000E+00	14311
				2071145	.000E+00	2.147E-10	.000E+00	14317

2072027 .000E+00 2.093E-11 .000E+00 14323
 2072909 .000E+00 1.417E-12 .000E+00 14329
 2073791 .000E+00 6.637E-14 .000E+00 14335
 2074672 .000E+00 2.146E-15 .000E+00 14341
 2075554 .000E+00 4.783E-17 .000E+00 14347
 2076435 .000E+00 7.336E-19 .000E+00 14353
 2077317 .000E+00 7.734E-21 .000E+00 14360
 2078199 .000E+00 5.613E-23 .000E+00 14366
 2079080 .000E+00 2.795E-25 .000E+00 14372
 2079962 .000E+00 9.954E-28 .000E+00 14378
 2080843 .000E+00 2.244E-30 .000E+00 14384
 2081725 .000E+00 3.622E-33 .000E+00 14390
 2082607 .000E+00 4.013E-36 .000E+00 14396
 2083488 .000E+00 3.054E-39 .000E+00 14402
 2084370 .000E+00 .000E+00 .000E+00 14408

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
 FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
 POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: TH229 FROM U233

NUCLIDE U233 TH229
 HALF LIFE, YR 1.58E+05 7.34E+03 .00E+00
 DECAY NUMBER 6.35E+04 1.37E+02 .00E+00
 DISTRIB COEF 1.43E+04 5.00E+04 .00E+00
 YR 2000 CURIES 1.88E+04 .00E+00 .00E+00
 PULSE G-ATOMS 8.30E+03 .00E+00 .00E+00
 NUCL VEL, MI/YR 4.84E-06 1.38E-06 .00E+00
 DISCH TIME, YR 2.07E+06 7.23E+06 .00E+00
 DIM DISC TIME 1.43E+04 5.00E+04 .00E+00
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 PATH LENGTH= 10.00 MILES
 DIMENSIONLESS DISTANCE= 1.00
 WATER VELOCITY= 1.00 FT/DAY
 AXIAL DISPERSION COEFFICIENT= .0080 CM²/MIN
 PELET NUMBER= 4.26E+06
 NUCLE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 2066738 YEARS
 PEAK DISCHARGE RATE= 7.37E-05 CURIES PER YEAR AT 2067620 YEARS
 BAND WIDTH= 532509 YEARS WITH TAIL END AT 2599247 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR DISC RATE, CI/YR PULSE RATE BAND RATE DIM TIME

2049107 .000E+00 .000E+00 .000E+00 14165

2049989 .000E+00 1.708E-36 .000E+00 14171
 2050870 .000E+00 2.413E-33 .000E+00 14177
 2051752 .000E+00 2.299E-30 .000E+00 14183
 2052633 .000E+00 1.477E-27 .000E+00 14189
 2053515 .000E+00 6.427E-25 .000E+00 14195
 2054396 .000E+00 1.892E-22 .000E+00 14201
 2055278 .000E+00 3.774E-20 .000E+00 14207
 2056159 .000E+00 5.103E-18 .000E+00 14213
 2057041 .000E+00 4.684E-16 .000E+00 14219
 2057922 .000E+00 2.920E-14 .000E+00 14225
 2058804 .000E+00 1.245E-12 .000E+00 14232
 2059686 .000E+00 3.622E-11 .000E+00 14238
 2060567 .000E+00 7.209E-10 .000E+00 14244
 2061449 .000E+00 9.862E-09 .000E+00 14250
 2062330 .000E+00 9.308E-08 .000E+00 14256
 2063212 .000E+00 6.103E-07 .000E+00 14262
 2064093 .000E+00 2.803E-06 .000E+00 14268
 2064975 .000E+00 9.110E-06 .000E+00 14274
 2065856 .000E+00 2.150E-05 .000E+00 14280
 2066738 .000E+00 3.764E-05 .000E+00 14286
 2067620 .000E+00 5.110E-05 .000E+00 14293
 2068501 .000E+00 5.702E-05 .000E+00 14299
 2069383 .000E+00 5.597E-05 .000E+00 14305
 2070264 .000E+00 5.148E-05 .000E+00 14311
 2071146 .000E+00 4.623E-05 .000E+00 14317
 2072027 .000E+00 4.147E-05 .000E+00 14323
 2072909 .000E+00 3.697E-05 .000E+00 14329
 2073791 .000E+00 3.295E-05 .000E+00 14335
 2074672 .000E+00 2.937E-05 .000E+00 14341
 2075554 .000E+00 2.618E-05 .000E+00 14347
 2076435 .000E+00 2.333E-05 .000E+00 14353
 2077317 .000E+00 2.080E-05 .000E+00 14360
 2078199 .000E+00 1.854E-05 .000E+00 14366
 2079080 .000E+00 1.653E-05 .000E+00 14372
 2079962 .000E+00 1.473E-05 .000E+00 14378
 2080843 .000E+00 1.313E-05 .000E+00 14384
 2081725 .000E+00 1.170E-05 .000E+00 14390
 2082607 .000E+00 1.043E-05 .000E+00 14396
 2083488 .000E+00 9.300E-06 .000E+00 14402
 2084370 .000E+00 8.247E-06 .000E+00 14408
 2341308 .000E+00 2.154E-20 .000E+00 15188
 2599247 .000E+00 5.599E-35 .000E+00 17968
 2856686 .000E+00 .000E+00 .000E+00 19747

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
 FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
 POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: NP237 FROM CM245

NUCLIDE CM245 NP237
 HALF LIFE, YR 8.50E+03
 DECAY NUMBER 1.14E+06
 DISTRIB COEF 3.33E+03
 YR 2000 CRIES 1.38E+05
 PULSE G-ATOMS 3.25E+03
 NUCLEI VEL/M/YR 2.07E+05
 DISCH TIME/YR 4.82E+05
 DIM DISC TIME 3.33E+03
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 PATH LENGTH= 10.00 MILES
 DIMENSIONLESS DISTANCE= 1.00
 WATER VELOCITY= 1.00 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .0080 CM/2/MIN
 PECLIDE NUMBER= 4.26E+06
 INITIAL BREAKTHROUGH AT 0 YEARS
 PEAK DISCHARGE RATE= 4.43E-02 CRIES PER YEAR AT 14906 YEARS
 BAND WIDTH= 482234 YEARS WITH TAIL END AT 482234 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR DISC RATE, CI/YR PULSE RATE BAND RATE DIM TIME
 14443 .000E+00 3.989E-37 .000E+00 99
 14446 .000E+00 2.985E-35 .000E+00 99
 14450 .000E+00 1.979E-33 .000E+00 99
 14453 .000E+00 1.159E-31 .000E+00 99
 14457 .000E+00 6.011E-30 .000E+00 99
 14460 .000E+00 2.758E-28 .000E+00 99
 14464 .000E+00 1.121E-26 .000E+00 99
 14467 .000E+00 4.029E-25 .000E+00 99
 14471 .000E+00 1.283E-23 .000E+00 99
 14474 .000E+00 3.520E-22 .000E+00 99
 14477 .000E+00 9.837E-21 .000E+00 99
 14481 .000E+00 2.000E-19 .000E+00 99
 14484 .000E+00 3.920E-18 .000E+00 99
 14488 .000E+00 6.813E-17 .000E+00 99
 14491 .000E+00 1.050E-15 .000E+00 99
 14495 .000E+00 1.434E-14 .000E+00 100
 14498 .000E+00 1.737E-13 .000E+00 100
 14501 .000E+00 1.866E-12 .000E+00 100
 14505 .000E+00 1.781E-11 .000E+00 100
 14508 .000E+00 1.507E-10 .000E+00 100
 14512 .000E+00 1.133E-09 .000E+00 100
 14515 .000E+00 7.573E-09 .000E+00 100
 14519 .000E+00 4.500E-08 .000E+00 100
 14522 .000E+00 2.377E-07 .000E+00 100
 14526 .000E+00 1.114E-06 .000E+00 100
 14529 .000E+00 4.840E-06 .000E+00 100
 14532 .000E+00 1.747E-05 .000E+00 100

14536 .000E+00 5.820E-05 .000E+00 100
 14539 .000E+00 1.732E-04 .000E+00 100
 14543 .000E+00 4.614E-04 .000E+00 100
 14546 .000E+00 1.102E-03 .000E+00 100
 14550 .000E+00 2.364E-03 .000E+00 100
 14553 .000E+00 4.571E-03 .000E+00 100
 14557 .000E+00 7.997E-03 .000E+00 100
 14560 .000E+00 1.271E-02 .000E+00 100
 14563 .000E+00 1.848E-02 .000E+00 100
 14566 .000E+00 4.427E-02 .000E+00 100
 14569 .000E+00 4.425E-02 .000E+00 102
 14572 .000E+00 4.424E-02 .000E+00 102
 14575 .000E+00 4.421E-02 .000E+00 102
 14578 .000E+00 4.418E-02 .000E+00 103
 14581 .000E+00 4.415E-02 .000E+00 103
 14584 .000E+00 4.412E-02 .000E+00 103
 14587 .000E+00 4.409E-02 .000E+00 103
 14590 .000E+00 4.406E-02 .000E+00 103
 14593 .000E+00 4.403E-02 .000E+00 103
 14596 .000E+00 4.400E-02 .000E+00 103
 14599 .000E+00 4.397E-02 .000E+00 103
 14602 .000E+00 4.394E-02 .000E+00 103
 14605 .000E+00 4.391E-02 .000E+00 103
 14608 .000E+00 4.388E-02 .000E+00 103
 14611 .000E+00 4.385E-02 .000E+00 103
 14614 .000E+00 4.382E-02 .000E+00 103
 14617 .000E+00 4.379E-02 .000E+00 103
 14620 .000E+00 4.376E-02 .000E+00 103
 14623 .000E+00 4.373E-02 .000E+00 103
 14626 .000E+00 4.370E-02 .000E+00 103
 14629 .000E+00 4.367E-02 .000E+00 103
 14632 .000E+00 4.364E-02 .000E+00 103
 14635 .000E+00 4.361E-02 .000E+00 103
 14638 .000E+00 4.358E-02 .000E+00 103
 14641 .000E+00 4.355E-02 .000E+00 103
 14644 .000E+00 4.352E-02 .000E+00 103
 14647 .000E+00 4.349E-02 .000E+00 103
 14650 .000E+00 4.346E-02 .000E+00 103
 14653 .000E+00 4.343E-02 .000E+00 103
 14656 .000E+00 4.340E-02 .000E+00 103
 14659 .000E+00 4.337E-02 .000E+00 103
 14662 .000E+00 4.334E-02 .000E+00 103
 14665 .000E+00 4.331E-02 .000E+00 103
 14668 .000E+00 4.328E-02 .000E+00 103
 14671 .000E+00 4.325E-02 .000E+00 103
 14674 .000E+00 4.322E-02 .000E+00 103
 14677 .000E+00 4.319E-02 .000E+00 103
 14680 .000E+00 4.316E-02 .000E+00 103
 14683 .000E+00 4.313E-02 .000E+00 103
 14686 .000E+00 4.310E-02 .000E+00 103
 14689 .000E+00 4.307E-02 .000E+00 103
 14692 .000E+00 4.304E-02 .000E+00 103
 14695 .000E+00 4.301E-02 .000E+00 103
 14698 .000E+00 4.298E-02 .000E+00 103
 14701 .000E+00 4.295E-02 .000E+00 103
 14704 .000E+00 4.292E-02 .000E+00 103
 14707 .000E+00 4.289E-02 .000E+00 103
 14710 .000E+00 4.286E-02 .000E+00 103
 14713 .000E+00 4.283E-02 .000E+00 103
 14716 .000E+00 4.280E-02 .000E+00 103
 14719 .000E+00 4.277E-02 .000E+00 103
 14722 .000E+00 4.274E-02 .000E+00 103
 14725 .000E+00 4.271E-02 .000E+00 103
 14728 .000E+00 4.268E-02 .000E+00 103
 14731 .000E+00 4.265E-02 .000E+00 103
 14734 .000E+00 4.262E-02 .000E+00 103
 14737 .000E+00 4.259E-02 .000E+00 103
 14740 .000E+00 4.256E-02 .000E+00 103
 14743 .000E+00 4.253E-02 .000E+00 103
 14746 .000E+00 4.250E-02 .000E+00 103
 14749 .000E+00 4.247E-02 .000E+00 103
 14752 .000E+00 4.244E-02 .000E+00 103
 14755 .000E+00 4.241E-02 .000E+00 103
 14758 .000E+00 4.238E-02 .000E+00 103
 14761 .000E+00 4.235E-02 .000E+00 103
 14764 .000E+00 4.232E-02 .000E+00 103
 14767 .000E+00 4.229E-02 .000E+00 103
 14770 .000E+00 4.226E-02 .000E+00 103
 14773 .000E+00 4.223E-02 .000E+00 103
 14776 .000E+00 4.220E-02 .000E+00 103
 14779 .000E+00 4.217E-02 .000E+00 103
 14782 .000E+00 4.214E-02 .000E+00 103
 14785 .000E+00 4.211E-02 .000E+00 103
 14788 .000E+00 4.208E-02 .000E+00 103
 14791 .000E+00 4.205E-02 .000E+00 103
 14794 .000E+00 4.202E-02 .000E+00 103
 14797 .000E+00 4.199E-02 .000E+00 103
 14800 .000E+00 4.196E-02 .000E+00 103
 14803 .000E+00 4.193E-02 .000E+00 103
 14806 .000E+00 4.190E-02 .000E+00 103
 14809 .000E+00 4.187E-02 .000E+00 103
 14812 .000E+00 4.184E-02 .000E+00 103
 14815 .000E+00 4.181E-02 .000E+00 103
 14818 .000E+00 4.178E-02 .000E+00 103
 14821 .000E+00 4.175E-02 .000E+00 103
 14824 .000E+00 4.172E-02 .000E+00 103
 14827 .000E+00 4.169E-02 .000E+00 103
 14830 .000E+00 4.166E-02 .000E+00 103
 14833 .000E+00 4.163E-02 .000E+00 103
 14836 .000E+00 4.160E-02 .000E+00 103
 14839 .000E+00 4.157E-02 .000E+00 103
 14842 .000E+00 4.154E-02 .000E+00 103
 14845 .000E+00 4.151E-02 .000E+00 103
 14848 .000E+00 4.148E-02 .000E+00 103
 14851 .000E+00 4.145E-02 .000E+00 103
 14854 .000E+00 4.142E-02 .000E+00 103
 14857 .000E+00 4.139E-02 .000E+00 103
 14860 .000E+00 4.136E-02 .000E+00 103
 14863 .000E+00 4.133E-02 .000E+00 103
 14866 .000E+00 4.130E-02 .000E+00 103
 14869 .000E+00 4.127E-02 .000E+00 103
 14872 .000E+00 4.124E-02 .000E+00 103
 14875 .000E+00 4.121E-02 .000E+00 103
 14878 .000E+00 4.118E-02 .000E+00 103
 14881 .000E+00 4.115E-02 .000E+00 103
 14884 .000E+00 4.112E-02 .000E+00 103
 14887 .000E+00 4.109E-02 .000E+00 103
 14890 .000E+00 4.106E-02 .000E+00 103
 14893 .000E+00 4.103E-02 .000E+00 103
 14896 .000E+00 4.100E-02 .000E+00 103
 14899 .000E+00 4.097E-02 .000E+00 103
 14902 .000E+00 4.094E-02 .000E+00 103
 14905 .000E+00 4.091E-02 .000E+00 103
 14908 .000E+00 4.088E-02 .000E+00 103
 14911 .000E+00 4.085E-02 .000E+00 103
 14914 .000E+00 4.082E-02 .000E+00 103
 14917 .000E+00 4.079E-02 .000E+00 103
 14920 .000E+00 4.076E-02 .000E+00 103
 14923 .000E+00 4.073E-02 .000E+00 103
 14926 .000E+00 4.070E-02 .000E+00 103
 14929 .000E+00 4.067E-02 .000E+00 103
 14932 .000E+00 4.064E-02 .000E+00 103
 14935 .000E+00 4.061E-02 .000E+00 103
 14938 .000E+00 4.058E-02 .000E+00 103
 14941 .000E+00 4.055E-02 .000E+00 103
 14944 .000E+00 4.052E-02 .000E+00 103
 14947 .000E+00 4.049E-02 .000E+00 103
 14950 .000E+00 4.046E-02 .000E+00 103
 14953 .000E+00 4.043E-02 .000E+00 103
 14956 .000E+00 4.040E-02 .000E+00 103
 14959 .000E+00 4.037E-02 .000E+00 103
 14962 .000E+00 4.034E-02 .000E+00 103
 14965 .000E+00 4.031E-02 .000E+00 103
 14968 .000E+00 4.028E-02 .000E+00 103
 14971 .000E+00 4.025E-02 .000E+00 103
 14974 .000E+00 4.022E-02 .000E+00 103
 14977 .000E+00 4.019E-02 .000E+00 103
 14980 .000E+00 4.016E-02 .000E+00 103
 14983 .000E+00 4.013E-02 .000E+00 103
 14986 .000E+00 4.010E-02 .000E+00 103
 14989 .000E+00 4.007E-02 .000E+00 103
 14992 .000E+00 4.004E-02 .000E+00 103
 14995 .000E+00 4.001E-02 .000E+00 103
 14998 .000E+00 3.998E-02 .000E+00 103
 15001 .000E+00 3.995E-02 .000E+00 103
 15004 .000E+00 3.992E-02 .000E+00 103
 15007 .000E+00 3.989E-02 .000E+00 103
 15010 .000E+00 3.986E-02 .000E+00 103
 15013 .000E+00 3.983E-02 .000E+00 103
 15016 .000E+00 3.980E-02 .000E+00 103
 15019 .000E+00 3.977E-02 .000E+00 103
 15022 .000E+00 3.974E-02 .000E+00 103
 15025 .000E+00 3.971E-02 .000E+00 103
 15028 .000E+00 3.968E-02 .000E+00 103
 15031 .000E+00 3.965E-02 .000E+00 103
 15034 .000E+00 3.962E-02 .000E+00 103
 15037 .000E+00 3.959E-02 .000E+00 103
 15040 .000E+00 3.956E-02 .000E+00 103
 15043 .000E+00 3.953E-02 .000E+00 103
 15046 .000E+00 3.950E-02 .000E+00 103
 15049 .000E+00 3.947E-02 .000E+00 103
 15052 .000E+00 3.944E-02 .000E+00 103
 15055 .000E+00 3.941E-02 .000E+00 103
 15058 .000E+00 3.938E-02 .000E+00 103
 15061 .000E+00 3.935E-02 .000E+00 103
 15064 .000E+00 3.932E-02 .000E+00 103
 15067 .000E+00 3.929E-02 .000E+00 103
 15070 .000E+00 3.926E-02 .000E+00 103
 15073 .000E+00 3.923E-02 .000E+00 103
 15076 .000E+00 3.920E-02 .000E+00 103
 15079 .000E+00 3.917E-02 .000E+00 103
 15082 .000E+00 3.914E-02 .000E+00 103
 15085 .000E+00 3.911E-02 .000E+00 103
 15088 .000E+00 3.908E-02 .000E+00 103
 15091 .000E+00 3.905E-02 .000E+00 103
 15094 .000E+00 3.902E-02 .000E+00 103
 15097 .000E+00 3.899E-02 .000E+00 103
 15100 .000E+00 3.896E-02 .000E+00 103
 15103 .000E+00 3.893E-02 .000E+00 103
 15106 .000E+00 3.890E-02 .000E+00 103
 15109 .000E+00 3.887E-02 .000E+00 103
 15112 .000E+00 3.884E-02 .000E+00 103
 15115 .000E+00 3.881E-02 .000E+00 103
 15118 .000E+00 3.878E-02 .000E+00 103
 15121 .000E+00 3.875E-02 .000E+00 103
 15124 .000E+00 3.872E-02 .000E+00 103
 15127 .000E+00 3.869E-02 .000E+00 103
 15130 .000E+00 3.866E-02 .000E+00 103
 15133 .000E+00 3.863E-02 .000E+00 103
 15136 .000E+00 3.860E-02 .000E+00 103
 15139 .000E+00 3.857E-02 .000E+00 103
 15142 .000E+00 3.854E-02 .000E+00 103
 15145 .000E+00 3.851E-02 .000E+00 103
 15148 .000E+00 3.848E-02 .000E+00 103
 15151 .000E+00 3.845E-02 .000E+00 103
 15154 .000E+00 3.842E-02 .000E+00 103
 15157 .000E+00 3.839E-02 .000E+00 103
 15160 .000E+00 3.836E-02 .000E+00 103
 15163 .000E+00 3.833E-02 .000E+00 103
 15166 .000E+00 3.830E-02 .000E+00 103
 15169 .000E+00 3.827E-02 .000E+00 103
 15172 .000E+00 3.824E-02 .000E+00 103
 15175 .000E+00 3.821E-02 .000E+00 103
 15178 .000E+00 3.818E-02 .000E+00 103
 15181 .000E+00 3.815E-02 .000E+00 103
 15184 .000E+00 3.812E-02 .000E+00 103
 15187 .000E+00 3.809E-02 .000E+00 103
 15190 .000E+00 3.806E-02 .000E+00 103
 15193 .000E+00 3.803E-02 .000E+00 103
 15196 .000E+00 3.800E-02 .000E+00 103
 15199 .000E+00 3.797E-02 .000E+00 103
 15202 .000E+00 3.794E-02 .000E+00 103
 15205 .000E+00 3.791E-02 .000E+00 103
 15208 .000E+00 3.788E-02 .000E+00 103
 15211 .000E+00 3.785E-02 .000E+00 103
 15214 .000E+00 3.782E-02 .000E+00 103
 15217 .000E+00 3.779E-02 .000E+00 103
 15220 .000E+00 3.776E-02 .000E+00 103
 15223 .000E+00 3.773E-02 .000E+00 103
 15226 .000E+00 3.770E-02 .000E+00 103
 15229 .000E+00 3.767E-02 .000E+00 103
 15232 .000E+00 3.764E-02 .000E+00 103
 15235 .000E+00 3.761E-02 .000E+00 103
 15238 .000E+00 3.758E-02 .000E+00 103
 15241 .000E+00 3.755E-02 .000E+00 103
 15244 .000E+00 3.752E-02 .000E+00 103
 15247 .000E+00 3.749E-02 .000E+00 103
 15250 .000E+00 3.746E-02 .000E+00 103
 15253 .000E+00 3.743E-02 .000E+00 103
 15256 .000E+00 3.740E-02 .000E+00 103
 15259 .000E+00 3.737E-02 .000E+00 103
 15262 .000E+00 3.734E-02 .000E+00 103
 15265 .000E+00 3.731E-02 .000E+00 103
 15268 .000E+00 3.728E-02 .000E+00 103
 15271 .000E+00 3.725E-02 .000E+00 103
 15274 .000E+00 3.722E-02 .000E+00 103
 15277 .000E+00 3.719E-02 .000E+00 103
 15280 .000E+00 3.716E-02 .000E+00 103
 15283 .000E+00 3.713E-02 .000E+00 103
 15286 .000E+00 3.710E-02 .000E+00 103
 15289 .000E+00 3.707E-02 .000E+00 103
 15292 .000E+00 3.704E-02 .000E+00 103
 15295 .000E+00 3.701E-02 .000E+00 103
 15298 .000E+00 3.698E-02 .000E+00 103
 15301 .000E+00 3.695E-02 .000E+00 103
 15304 .000E+00 3.692E-02 .000E+00 103
 15307 .000E+00 3.689E-02 .000E+00 103
 15310 .000E+00 3.686E-02 .000E+00 103
 15313 .000E+00 3.683E-02 .000E+00 103
 15316 .000E+00 3.680E-02 .000E+00 103
 15319 .000E+00 3.677E-02 .000E+00 103
 15322 .000E+00 3.674E-02 .000E+00 103
 15325 .000E+00 3.671E-02 .000E+00 103
 15328 .000E+00 3.668E-02 .000E+00 103
 15331 .000E+00 3.665E-02 .000E+00 103
 15334 .000E+00 3.662E-02 .000E+00 103
 15337 .000E+00 3.659E-02 .000E+00 103
 15340 .000E+00 3.656E-02 .000E+00 103
 15343 .000E+00 3.653E-02 .000E+00 103
 15346 .000E+00 3.650E-02 .000E+00 103
 15349 .000E+00 3.647E-02 .000E+00 103
 15352 .000E+00 3.644

302663	1.384E-12	1.383E-12	1.384E-12	4.134E-19	4.117E-19	4.134E-19	3327
311942	6.342E-13	6.342E-13	6.342E-13	4.107E-19	4.081E-19	4.107E-19	3328
321221	2.909E-13	2.909E-13	2.909E-13	4.086E-19	4.037E-19	4.086E-19	3328
330500	1.333E-13	1.333E-13	1.333E-13	4.060E-19	3.981E-19	4.060E-19	3329
339778	6.111E-14	6.111E-14	6.111E-14	4.036E-19	3.909E-19	4.036E-19	3329
349057	2.802E-14	2.802E-14	2.802E-14	4.012E-19	3.814E-19	4.012E-19	3330
358336	1.285E-14	1.285E-14	1.285E-14	3.989E-19	3.690E-19	3.989E-19	3330
367615	5.887E-15	5.887E-15	5.887E-15	3.966E-19	3.531E-19	3.966E-19	3331
376894	2.700E-15	2.698E-15	2.700E-15	3.945E-19	3.334E-19	3.945E-19	3331
386173	1.237E-15	1.237E-15	1.237E-15	3.914E-19	3.094E-19	3.914E-19	3331
395451	5.672E-16	5.672E-16	5.672E-16	3.897E-19	2.824E-19	3.897E-19	3332
404730	2.601E-16	2.595E-16	2.601E-16	3.874E-19	2.520E-19	3.874E-19	3332
414009	1.193E-16	1.192E-16	1.193E-16	3.851E-19	2.194E-19	3.851E-19	3333
423288	5.644E-17	5.463E-17	5.644E-17	.000E+00	1.861E-19	.000E+00	3333
432567	2.505E-17	2.504E-17	2.505E-17	.000E+00	1.534E-19	.000E+00	3334
441846	1.148E-17	1.148E-17	1.148E-17	.000E+00	1.226E-19	.000E+00	3334
451124	5.264E-18	5.263E-18	5.264E-18	.000E+00	9.496E-20	.000E+00	3335
460403	2.414E-18	2.412E-18	2.414E-18	.000E+00	7.110E-20	.000E+00	3335
469682	1.107E-18	1.106E-18	1.107E-18	.000E+00	5.142E-20	.000E+00	3336
478961	5.071E-19	5.070E-19	5.071E-19	.000E+00	3.587E-20	.000E+00	3336
479031	5.044E-19	5.040E-19	5.044E-19	.000E+00	2.412E-20	.000E+00	3337
479100	5.011E-19	5.011E-19	5.011E-19	.000E+00	1.562E-20	.000E+00	3337
479170	4.983E-19	4.982E-19	4.983E-19	.000E+00	9.735E-21	.000E+00	3338
479240	4.956E-19	4.952E-19	4.956E-19	.000E+00	5.834E-21	.000E+00	3338
479309	4.924E-19	4.924E-19	4.924E-19	.000E+00	3.362E-21	.000E+00	3339
479379	4.895E-19	4.895E-19	4.895E-19	.000E+00	1.861E-21	.000E+00	3339
479448	4.867E-19	4.866E-19	4.867E-19	.000E+00	9.898E-22	.000E+00	3340
479518	4.839E-19	4.838E-19	4.839E-19	.000E+00	5.054E-22	.000E+00	3340
479588	4.811E-19	4.810E-19	4.811E-19	.000E+00	2.477E-22	.000E+00	3341
479657	4.783E-19	4.782E-19	4.783E-19	.000E+00	1.164E-22	.000E+00	3341
479727	4.755E-19	4.754E-19	4.755E-19	.000E+00	5.254E-23	.000E+00	3342
479797	4.730E-19	4.726E-19	4.730E-19	.000E+00	2.275E-23	.000E+00	3342
479866	4.699E-19	4.698E-19	4.699E-19	.000E+00	9.440E-24	.000E+00	3343
479936	4.675E-19	4.671E-19	4.675E-19	.000E+00	3.757E-24	.000E+00	3343
480004	4.645E-19	4.644E-19	4.645E-19	.000E+00	1.434E-24	.000E+00	3344
480075	4.617E-19	4.617E-19	4.617E-19	.000E+00	5.245E-25	.000E+00	3344
480145	4.591E-19	4.590E-19	4.591E-19	.000E+00	1.839E-25	.000E+00	3344
480214	4.566E-19	4.563E-19	4.566E-19	.000E+00	6.185E-26	.000E+00	3345
480284	4.537E-19	4.536E-19	4.537E-19	.000E+00	1.992E-26	.000E+00	3345
480354	4.511E-19	4.510E-19	4.511E-19	.000E+00	6.148E-27	.000E+00	3346
480423	4.484E-19	4.483E-19	4.484E-19	.000E+00	1.819E-27	.000E+00	3346
480493	4.458E-19	4.457E-19	4.458E-19	.000E+00	5.156E-28	.000E+00	3347
480563	4.432E-19	4.431E-19	4.432E-19	.000E+00	1.401E-28	.000E+00	3347
480632	4.405E-19	4.405E-19	4.405E-19	.000E+00	3.644E-29	.000E+00	3348
480702	4.380E-19	4.380E-19	4.380E-19	.000E+00	9.084E-30	.000E+00	3348
480772	4.355E-19	4.354E-19	4.355E-19	.000E+00	2.1169E-30	.000E+00	3349
480841	4.330E-19	4.329E-19	4.330E-19	.000E+00	4.966E-31	.000E+00	3349
480911	4.304E-19	4.303E-19	4.304E-19	.000E+00	1.089E-31	.000E+00	3350
480980	4.282E-19	4.279E-19	4.282E-19	.000E+00	2.255E-32	.000E+00	3350
481050	4.254E-19	4.253E-19	4.254E-19	.000E+00	4.597E-33	.000E+00	3351
481120	4.229E-19	4.229E-19	4.229E-19	.000E+00	8.859E-34	.000E+00	3351
481193	4.207E-19	4.207E-19	4.207E-19	.000E+00	1.636E-34	.000E+00	3352
481259	4.180E-19	4.176E-19	4.180E-19	.000E+00	2.892E-35	.000E+00	3352
481329	4.156E-19	4.144E-19	4.156E-19	.000E+00	4.499E-36	.000E+00	3353

485159 .000E+00 7.948E-37 .000E+00 3353
485228 .000E+00 1.235E-37 .000E+00 3354
485298 .000E+00 1.839E-38 .000E+00 3354
485368 .000E+00 2.621E-39 .000E+00 3355
485437 .000E+00 .000E+00 .000E+00 3355

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BANG RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PU242 FROM CM246

NUCLIDE CM246 PU242
HALF LIFE, YR 4.76E+03 3.87E+05 .00E+00
DECAY NUMBER 2.11E-02 2.59E-04 .00E+00
DISTRIB COEF 3.33E+03 1.00E+04 .00E+00
YR 2000 CURIES 2.88E+04 .00E+00 .00E+00
PULSE G-ATOMS 3.51E+02 .00E+00 .00E+00
NUCL VEL, MI/YR 2.07E-05 6.91E-06 .00E+00
DISCH TIME, YR 4.82E+05 1.45E+06 .00E+00
DIM DISC TIME 3.33E+03 1.00E+04 .00E+00
LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
PATH LENGTH= 10.00 MILES
DIMENSIONLESS DISTANCE= 1.00
WATER VELOCITY= 1.00 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .0080 CM²/MIN
PECLT NUMBER= 4.26E+06
NUCLIDE DISCHARGE RATE FROM ADOUTER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 48232 YEARS
PEAK DISCHARGE RATE= 1.65E-03 CURIES PER YEAR AT 1446156 YEARS
BAND WIDTH= 963824 YEARS WITH TAIL END AT 1446156 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR DISC RATE, CI/YR PULSE RATE BAND DATE DIM TIME

480560 .000E+00 .000E+00 .000E+00 3321
480671 .000E+00 4.369E-39 .000E+00 3322
480782 .000E+00 2.264E-34 .000E+00 3323
480892 .000E+00 1.052E-37 .000E+00 3324
481003 .000E+00 4.346E-37 .000E+00 3324
481114 .000E+00 1.643E-36 .000E+00 3325
481225 .000E+00 5.532E-36 .000E+00 3326
481335 .000E+00 1.676E-35 .000E+00 3327
481446 .000E+00 4.573E-35 .000E+00 3327
481557 .000E+00 1.126E-34 .000E+00 3328
481668 .000E+00 2.507E-34 .000E+00 3329

481778 .000E+00 5.056E-34 .000E+00 3330
481889 .000E+00 7.269E-34 .000E+00 3331
482000 .000E+00 1.550E-33 .000E+00 3331
482111 9.176E-34 2.374E-33 9.176E-34 3332
482221 9.176E-34 3.351E-33 9.176E-34 3333
482332 9.176E-34 4.390E-33 9.176E-34 3334
482443 3.415E-33 5.381E-33 3.415E-33 3334
482554 5.893E-33 6.232E-33 5.893E-33 3335
482665 7.498E-33 7.498E-33 7.498E-33 3336
482775 7.556E-33 7.361E-33 7.556E-33 3337
482886 7.669E-33 7.615E-33 7.669E-33 3337
482997 7.675E-33 7.866E-33 7.675E-33 3338
483108 7.735E-33 7.992E-33 7.735E-33 3339
483219 7.795E-33 8.157E-33 7.795E-33 3340
483329 7.856E-33 8.157E-33 7.856E-33 3341
483440 7.917E-33 8.224E-33 7.917E-33 3341
483551 7.979E-33 8.290E-33 7.979E-33 3342
483662 8.041E-33 8.355E-33 8.041E-33 3343
483773 8.104E-33 8.420E-33 8.104E-33 3344
483883 8.167E-33 8.486E-33 8.167E-33 3344
483994 8.231E-33 8.552E-33 8.231E-33 3345
484105 8.295E-33 8.619E-33 8.295E-33 3346
484216 8.360E-33 8.686E-33 8.360E-33 3347
484327 8.425E-33 8.753E-33 8.425E-33 3348
484437 8.490E-33 8.822E-33 8.490E-33 3349
484548 8.557E-33 8.891E-33 8.557E-33 3350
484659 8.623E-33 8.960E-33 8.623E-33 3350
532125 2.405E-31 2.405E-31 2.405E-31 3678
579591 6.710E-30 6.972E-30 6.710E-30 4006
627057 1.872E-28 1.945E-28 1.872E-28 4334
674523 5.222E-27 5.425E-27 5.222E-27 4662
721949 1.457E-25 1.513E-25 1.457E-25 4990
769455 4.063E-24 4.222E-24 4.063E-24 5318
816921 1.133E-22 1.178E-22 1.133E-22 5647
864367 3.162E-21 3.285E-21 3.162E-21 5975
911853 8.820E-20 9.164E-20 8.820E-20 6303
959319 2.460E-18 2.558E-18 2.460E-18 6631
1006785 6.863E-17 7.131E-17 6.863E-17 6959
1054251 1.914E-15 1.989E-15 1.914E-15 7287
1101719 5.341E-14 5.549E-14 5.341E-14 7615
1149184 1.490E-12 1.548E-12 1.490E-12 7943
1196650 4.156E-11 4.318E-11 4.156E-11 8272
1244116 1.159E-09 1.205E-09 1.159E-09 8600
1291582 3.234E-08 3.360E-08 3.234E-08 8928
1339048 9.021E-07 9.373E-07 9.021E-07 9256
1386514 2.516E-05 2.613E-05 2.516E-05 9584
1433980 7.020E-04 7.294E-04 7.020E-04 9912
1434621 7.342E-04 7.629E-04 7.342E-04 9917
1435262 7.680E-04 7.979E-04 7.680E-04 9921
1435902 8.033E-04 8.346E-04 8.033E-04 9926
1436543 8.402E-04 8.730E-04 8.402E-04 9930
1437184 8.788E-04 9.131E-04 8.788E-04 9934
1437825 9.192E-04 9.551E-04 9.192E-04 9939
1438466 9.614E-04 9.990E-04 9.614E-04 9943

1439107	1.006E-03	1.045E-03	1.006E-03	9948	LEACH DURATION=	333 YEARS
1439747	1.052E-03	1.093E-03	1.052E-03	9952	PATH LENGTH=	10.00 MILES
1440388	1.100E-03	1.143E-03	1.100E-03	9957	DIMENSIONLESS DISTANCE=	1.00
1441029	1.151E-03	1.196E-03	1.151E-03	9961	WATER VELOCITY=	1.00 FT/DAY
1441670	1.204E-03	1.251E-03	1.204E-03	9965	WATER TRAVEL TIME=	145 YEARS
1442311	1.259E-03	1.308E-03	1.259E-03	9970	AXIAL DISPERSION COEFFICIENT=	.0080 CM ² /MIN
1442952	1.317E-03	1.368E-03	1.317E-03	9974	PECLT NUMBER=	4.26E+06
1443593	1.377E-03	1.429E-03	1.377E-03	9979	NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION	
1444233	1.441E-03	1.484E-03	1.441E-03	9983	INITIAL BREAKTHROUGH AT	1446/97 YEARS
1444874	1.507E-03	1.503E-03	1.507E-03	9988	PEAK DISCHARGE RATE=	3.41E-06 Curies PER YEAR AT 2065822 YEARS
1445515	1.576E-03	1.415E-03	1.576E-03	9992	BAND WIDTH=	619941 YEARS WITH TAIL END AT 2066738 YEARS
1446156	1.649E-03	1.156E-03	1.649E-03	9996	DISPERSION PEAK/NO-DISPERSION PEAK =	.00E+00
1446797	.000E+00	7.582E-04	.000E+00	10001		
1447438	.000E+00	3.757E-04	.000E+00	10005		
1448078	.000E+00	1.346E-04	.000E+00	10010		
1448719	.000E+00	3.388E-05	.000E+00	10014		
1449360	.000E+00	5.896E-06	.000E+00	10019		
1450001	.000E+00	6.973E-07	.000E+00	10023		
1450642	.000E+00	5.595E-08	.000E+00	10027		
1451283	.000E+00	3.024E-09	.000E+00	10032		
1451923	.000E+00	1.098E-10	.000E+00	10036		
1452564	.000E+00	2.649E-12	.000E+00	10041		
1453205	.000E+00	4.335E-14	.000E+00	10045		
1453845	.000E+00	4.711E-16	.000E+00	10050		
1454487	.000E+00	3.413E-18	.000E+00	10054		
1455128	.000E+00	1.650E-20	.000E+00	10058		
1455769	.000E+00	5.318E-23	.000E+00	10063		
1456409	.000E+00	1.144E-25	.000E+00	10067		
1457050	.000E+00	1.940E-28	.000E+00	10072		
1457691	.000E+00	1.568E-31	.000E+00	10076		
1458332	.000E+00	9.791E-35	.000E+00	10081		
1458973	.000E+00	4.249E-38	.000E+00	10085		
1459614	.000E+00	.000E+00	.000E+00	10089		

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM			
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR			
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY			
TIME OF LEACH INCIDENT: 100 YEARS			
NUCLIDE: U238 FROM PU242			
NUCLIDE	PU242	U238 F	
HALF LIFE, YR	3.87E+05	4.47E+09	.00E+00
DECAY NUMBER	2.59E-04	2.24E-08	.00E+00
DISTRIB COEF	1.00E+04	1.43E+04	.00E+00
YR 2000 CURIES	9.24E+03	.00E+00	.00E+00
PULSE G-ATOMS	1.02E+04	.00E+00	.00E+00
NUCL VEL, M/YR	6.91E-06	.00E+00	.00E+00
DISCH TIME, YR	1.45E+06	2.07E+04	.00E+00
DIM DISC TIME	1.00E+04	1.43E+04	.00E+00
LEACH RATE= .000000 FRACTION PER YEAR			

1434621	.000E+00	.000E+00	.000E+00	9917
1435262	.000E+00	9.020E-38	.000E+00	9921
1435903	.000E+00	1.431E-34	.000E+00	9926
1436543	.000E+00	1.487E-31	.000E+00	9930
1437184	.000E+00	1.011E-28	.000E+00	9934
1437825	.000E+00	4.516E-26	.000E+00	9939
1438466	.000E+00	1.323E-23	.000E+00	9943
1439107	.000E+00	2.552E-21	.000E+00	9948
1439748	.000E+00	3.240E-19	.000E+00	9952
1440388	.000E+00	2.713E-17	.000E+00	9957
1441029	.000E+00	1.503E-15	.000E+00	9961
1441670	.000E+00	5.518E-14	.000E+00	9965
1442311	.000E+00	1.346E-12	.000E+00	9970
1442952	.000E+00	2.192E-11	.000E+00	9974
1443593	.000E+00	2.395E-10	.000E+00	9979
1444233	.000E+00	1.768E-09	.000E+00	9983
1444874	.000E+00	8.915E-09	.000E+00	9988
1445515	9.353E-08	7.737E-08	9.353E-08	9992
1446156	9.353E-08	1.415E-07	9.353E-08	9996
1446797	2.571E-07	2.009E-07	2.571E-07	10001
1447438	2.578E-07	2.340E-07	2.578E-07	10005
1448079	2.585E-07	2.537E-07	2.585E-07	10010
1448719	2.592E-07	2.586E-07	2.592E-07	10014
1449360	2.599E-07	2.600E-07	2.599E-07	10019
1450001	2.606E-07	2.606E-07	2.606E-07	10023
1450642	2.613E-07	2.613E-07	2.613E-07	10027
1451283	2.619E-07	2.619E-07	2.619E-07	10032
1451924	2.627E-07	2.627E-07	2.627E-07	10036
1452564	2.634E-07	2.634E-07	2.634E-07	10041
1453205	2.641E-07	2.641E-07	2.641E-07	10045
1453846	2.648E-07	2.648E-07	2.648E-07	10050
1454487	2.655E-07	2.655E-07	2.655E-07	10054
1455128	2.662E-07	2.662E-07	2.662E-07	10058
1455769	2.669E-07	2.669E-07	2.669E-07	10063
1456410	2.676E-07	2.676E-07	2.676E-07	10067
1457050	2.684E-07	2.684E-07	2.684E-07	10072
1457691	2.691E-07	2.691E-07	2.691E-07	10076

1458332	2.691E-07	2.694E-07	2.691E-07	10081	2077723	.000E+00	1.607E-20	.000E+00	14362
1458973	2.698E-07	2.701E-07	2.698E-07	10085	2078639	.000E+00	5.032E-23	.000E+00	14369
1459614	2.705E-07	2.708E-07	2.705E-07	10089	2079554	.000E+00	1.676E-25	.000E+00	14375
1489055	3.059E-07	3.062E-07	3.059E-07	10293	2080470	.000E+00	3.720E-28	.000E+00	14381
1518495	3.460E-07	3.463E-07	3.460E-07	10496	2081385	.000E+00	5.511E-31	.000E+00	14388
1547936	3.913E-07	3.916E-07	3.913E-07	10700	2082301	.000E+00	5.438E-34	.000E+00	14394
1577377	4.425E-07	4.428E-07	4.425E-07	10904	2083216	.000E+00	3.586E-37	.000E+00	14400
1606817	5.004E-07	5.007E-07	5.004E-07	11107	2084132	.000E+00	.000E+00	.000E+00	14407
1636258	5.659E-07	5.662E-07	5.659E-07	11311	MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY				
1665699	6.400E-07	6.403E-07	6.400E-07	11514					
1695140	7.238E-07	7.241E-07	7.238E-07	11718					
1724580	8.184E-07	8.187E-07	8.184E-07	11921					
1754021	9.257E-07	9.260E-07	9.257E-07	12125					
1783462	1.047E-06	1.049E-06	1.047E-06	12328					
1812903	1.184E-06	1.186E-06	1.184E-06	12532					
1842343	1.339E-06	1.341E-06	1.339E-06	12735					
1871784	1.514E-06	1.516E-06	1.514E-06	12939					
1901225	1.712E-06	1.714E-06	1.712E-06	13142					
1930666	1.937E-06	1.939E-06	1.937E-06	13346	TIME OF LEACH INCIDENT: 100 YEARS				
1960106	2.190E-06	2.192E-06	2.190E-06	13549					
1989547	2.477E-06	2.479E-06	2.477E-06	13753					
2018988	2.801E-06	2.804E-06	2.801E-06	13956					
2048429	3.168E-06	3.171E-06	3.168E-06	14160					
2049344	3.180E-06	3.183E-06	3.180E-06	14166					
2050260	3.192E-06	3.195E-06	3.192E-06	14173					
2051175	3.204E-06	3.207E-06	3.204E-06	14179					
2052091	3.217E-06	3.220E-06	3.217E-06	14185					
2053006	3.229E-06	3.232E-06	3.229E-06	14191					
2053921	3.241E-06	3.244E-06	3.241E-06	14198	NUCLIDE: U234 FROM PU238				
2054837	3.254E-06	3.257E-06	3.254E-06	14204					
2055752	3.266E-06	3.269E-06	3.266E-06	14210					
2056668	3.279E-06	3.282E-06	3.279E-06	14217					
2057583	3.291E-06	3.294E-06	3.291E-06	14223					
2058499	3.304E-06	3.307E-06	3.304E-06	14229					
2059414	3.317E-06	3.320E-06	3.317E-06	14236					
2060329	3.329E-06	3.332E-06	3.329E-06	14242					
2061245	3.342E-06	3.345E-06	3.342E-06	14248					
2062160	3.355E-06	3.358E-06	3.355E-06	14255					
2063076	3.368E-06	3.371E-06	3.368E-06	14261	NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION INITIAL BREAKTHROUGH AT 2063076 YEARS PEAK DISCHARGE RATE= 4.90E-01 CURIES PER YEAR AT 2066738 YEARS BAND WIDTH= 3662 YEARS WITH TAIL END AT 2066738 YEARS DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00				
2063991	3.381E-06	3.384E-06	3.381E-06	14267					
2064907	3.394E-06	3.397E-06	3.394E-06	14274					
2065822	3.407E-06	3.410E-06	3.407E-06	14280					
2066738	3.420E-06	3.423E-06	3.420E-06	14286					
2067653	3.433E-06	3.436E-06	3.433E-06	14293					
2068569	3.446E-06	3.449E-06	3.446E-06	14299					
2069484	3.459E-06	3.462E-06	3.459E-06	14305					
2070400	3.472E-06	3.475E-06	3.472E-06	14312					
2071315	3.485E-06	3.488E-06	3.485E-06	14318					
2072231	3.498E-06	3.501E-06	3.498E-06	14324	1446842	.000E+00	.000E+00	.000E+00	10001
2073146	3.511E-06	3.514E-06	3.511E-06	14331	1476921	.000E+00	.000E+00	.000E+00	10209
2074062	3.524E-06	3.527E-06	3.524E-06	14337	1507001	.000E+00	.000E+00	.000E+00	10417
2074977	3.537E-06	3.540E-06	3.537E-06	14343	1537080	.000E+00	.000E+00	.000E+00	10625
2075893	3.550E-06	3.553E-06	3.550E-06	14350	1567159	.000E+00	.000E+00	.000E+00	10833
2076808	3.563E-06	3.566E-06	3.563E-06	14356	1597239	.000E+00	.000E+00	.000E+00	11041
2077723	3.576E-06	3.579E-06	3.576E-06	14362	1627318	.000E+00	.000E+00	.000E+00	11249
2078639	3.589E-06	3.592E-06	3.589E-06	14368	1657397	.000E+00	.000E+00	.000E+00	11457

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORRING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: TH230 FROM U234

NUCLIDE TH230
HALF LIFE, YR 2.44E+05 7.70E+04 .00E+00
DECAY NUMBER 4.11E-04 1.30E-03 .00E+00
DISTRIB COEF 1.43E+04 5.00E+04 .00E+00
YR 2000 CURIES 2.27E+04 .00E+00 .00E+00
PULSE G-ATOMS 6.89E+04 .00E+00 .00E+00
NUCL VEL, MI/YR 4.84E-06 1.38E-06 .00E+00
DISCH TIME, YR 2.07E+06 7.23E+06 .00E+00
DIM DISC TIME 1.43E+04 5.00E+04 .00E+00
LEACH RATE= .003000 FRACTION PER YEAR

LEACH DURATION= 373 YEARS

PATH LENGTH= 10.00 MILES

DIMENSIONLESS DISTANCE= 1.00

WATER VELOCITY= 1.00 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .0080 CM²/MIN

PECKET NUMBER= 4.26E+06

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 2066/38 YEARS

PEAK DISCHARGE RATE= 1.02E-03 CURIES PER YEAR AT 2067653 YEARS

RAND WIDTH= 5166179 YEARS WITH TAIL END AT 7232917 YEARS

DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR DISC RATE, CI/YR PULSE RATE BAND RATE DIM TIME

2046429 .00E+00 .00E+00 .00E+00 .00E+00 14160
2049344 .00E+00 .00E+00 .00E+00 .00E+00 14166
2050260 .00E+00 .00E+00 .00E+00 .00E+00 14173
2051175 .00E+00 .00E+00 .00E+00 .00E+00 14179
2052091 .00E+00 .00E+00 .00E+00 .00E+00 14185
2053005 .00E+00 .00E+00 .00E+00 .00E+00 14191
2053922 .00E+00 .00E+00 .00E+00 .00E+00 14198
2054837 .00E+00 .00E+00 .00E+00 .00E+00 14204
2055753 .00E+00 .00E+00 .00E+00 .00E+00 14210
2056668 .00E+00 .00E+00 .00E+00 .00E+00 14217
2057583 .00E+00 .00E+00 .00E+00 .00E+00 14223
2058499 .00E+00 .00E+00 .00E+00 .00E+00 14229
2059414 .00E+00 .00E+00 .00E+00 .00E+00 14236
2060330 .00E+00 .00E+00 .00E+00 .00E+00 14242
2061245 .00E+00 .00E+00 .00E+00 .00E+00 14248
2062161 .00E+00 .00E+00 .00E+00 .00E+00 14255
2063076 .00E+00 .00E+00 .00E+00 .00E+00 14261

11665 .00E+00 .00E+00 .00E+00 .00E+00
11673 .00E+00 .00E+00 .00E+00 .00E+00
12081 .00E+00 .00E+00 .00E+00 .00E+00
12288 .00E+00 .00E+00 .00E+00 .00E+00
12496 .00E+00 .00E+00 .00E+00 .00E+00
12704 .00E+00 .00E+00 .00E+00 .00E+00
12912 .00E+00 .00E+00 .00E+00 .00E+00
13120 .00E+00 .00E+00 .00E+00 .00E+00
13328 .00E+00 .00E+00 .00E+00 .00E+00
13536 .00E+00 .00E+00 .00E+00 .00E+00
13744 .00E+00 .00E+00 .00E+00 .00E+00
13952 .00E+00 .00E+00 .00E+00 .00E+00
14160 .00E+00 .00E+00 .00E+00 .00E+00
14166 .00E+00 .00E+00 .00E+00 .00E+00
14173 .00E+00 .00E+00 .00E+00 .00E+00
14179 .00E+00 .00E+00 .00E+00 .00E+00
14185 .00E+00 .00E+00 .00E+00 .00E+00
14191 .00E+00 .00E+00 .00E+00 .00E+00
14194 .00E+00 .00E+00 .00E+00 .00E+00
14204 .00E+00 .00E+00 .00E+00 .00E+00
14210 .00E+00 .00E+00 .00E+00 .00E+00
14217 .00E+00 .00E+00 .00E+00 .00E+00
14223 .00E+00 .00E+00 .00E+00 .00E+00
14229 .00E+00 .00E+00 .00E+00 .00E+00
14236 .00E+00 .00E+00 .00E+00 .00E+00
14242 .00E+00 .00E+00 .00E+00 .00E+00
14248 .00E+00 .00E+00 .00E+00 .00E+00
14255 .00E+00 .00E+00 .00E+00 .00E+00
14261 .00E+00 .00E+00 .00E+00 .00E+00
14267 .00E+00 .00E+00 .00E+00 .00E+00
14274 .00E+00 .00E+00 .00E+00 .00E+00
14280 .00E+00 .00E+00 .00E+00 .00E+00
14286 .00E+00 .00E+00 .00E+00 .00E+00
14293 .00E+00 .00E+00 .00E+00 .00E+00
14299 .00E+00 .00E+00 .00E+00 .00E+00
14305 .00E+00 .00E+00 .00E+00 .00E+00
14312 .00E+00 .00E+00 .00E+00 .00E+00
14318 .00E+00 .00E+00 .00E+00 .00E+00
14324 .00E+00 .00E+00 .00E+00 .00E+00
14331 .00E+00 .00E+00 .00E+00 .00E+00
14337 .00E+00 .00E+00 .00E+00 .00E+00
14343 .00E+00 .00E+00 .00E+00 .00E+00
14350 .00E+00 .00E+00 .00E+00 .00E+00
14356 .00E+00 .00E+00 .00E+00 .00E+00
14362 .00E+00 .00E+00 .00E+00 .00E+00
14369 .00E+00 .00E+00 .00E+00 .00E+00
14375 .00E+00 .00E+00 .00E+00 .00E+00
14381 .00E+00 .00E+00 .00E+00 .00E+00
14388 .00E+00 .00E+00 .00E+00 .00E+00
14394 .00E+00 .00E+00 .00E+00 .00E+00
14400 .00E+00 .00E+00 .00E+00 .00E+00
14407 .00E+00 .00E+00 .00E+00 .00E+00
14413 .00E+00 .00E+00 .00E+00 .00E+00

2063991	3.124E-04	3.173E-05	.000E+00	14267	7220100	2.232E-29	2.219E-29	2.232E-29	49911
2064907	3.124E-04	1.137E-04	3.124E-04	14274	7221525	2.196E-29	2.171E-29	2.196E-29	49921
2065822	3.124E-04	2.485E-04	3.124E-04	14280	7222949	2.160E-29	2.112E-29	2.160E-29	49931
2066738	3.124E-04	5.368E-04	3.124E-04	14286	7224372	2.125E-29	2.037E-29	2.125E-29	49941
2067653	1.016E-03	7.706E-04	1.016E-03	14293	7225796	2.090E-29	1.938E-29	2.090E-29	49950
2068569	1.005E-03	9.151E-04	1.005E-03	14299	7227221	2.056E-29	1.807E-29	2.056E-29	49960
2069484	9.945E-04	9.704E-04	9.945E-04	14305	7228645	2.023E-29	1.642E-29	2.023E-29	49970
2070400	9.841E-04	9.787E-04	9.841E-04	14312	7230068	1.991E-29	1.642E-29	1.991E-29	49980
2071315	9.738E-04	9.720E-04	9.738E-04	14318	7231492	1.959E-29	1.217E-29	1.959E-29	49990
2072231	9.637E-04	9.623E-04	9.637E-04	14324	7232917	1.927E-29	9.808E-30	1.927E-29	50000
2073146	9.535E-04	9.523E-04	9.535E-04	14331	7234340	.000E+00	7.503E-30	.000E+00	50009
2074062	9.436E-04	9.424E-04	9.436E-04	14337	7235764	.000E+00	5.423E-30	.000E+00	50019
2074977	9.338E-04	9.325E-04	9.338E-04	14343	7237189	.000E+00	3.687E-30	.000E+00	50029
2075893	9.240E-04	9.228E-04	9.240E-04	14350	7238613	.000E+00	2.352E-30	.000E+00	50039
2076808	9.143E-04	9.132E-04	9.143E-04	14356	7240035	.000E+00	1.402E-30	.000E+00	50049
2077724	9.048E-04	9.036E-04	9.048E-04	14362	7241456	.000E+00	7.805E-31	.000E+00	50059
2078639	8.953E-04	8.942E-04	8.953E-04	14369	7242885	.000E+00	4.045E-31	.000E+00	50068
2079555	8.860E-04	8.849E-04	8.860E-04	14375	7244308	.000E+00	1.949E-31	.000E+00	50078
2080470	8.767E-04	8.756E-04	8.767E-04	14381	7245732	.000E+00	8.726E-32	.000E+00	50088
2081386	8.676E-04	8.665E-04	8.676E-04	14388	7247156	.000E+00	3.624E-32	.000E+00	50098
2082301	8.585E-04	8.574E-04	8.585E-04	14394	7248581	.000E+00	1.395E-32	.000E+00	50108
2083217	8.496E-04	8.485E-04	8.496E-04	14400	7250005	.000E+00	4.976E-33	.000E+00	50118
2084132	8.407E-04	8.396E-04	8.407E-04	14407	7251428	.000E+00	1.643E-33	.000E+00	50128
2085048	8.320E-04	8.308E-04	8.320E-04	14413	7252852	.000E+00	5.022E-34	.000E+00	50137
2341017	4.420E-05	4.414E-05	4.420E-05	16162	7254277	.000E+00	1.419E-34	.000E+00	50147
2852956	1.348E-06	2.348E-06	2.348E-06	19522	7255701	.000E+00	3.710E-35	.000E+00	50157
3108926	6.628E-09	1.246E-07	1.246E-07	19721	7257124	.000E+00	8.966E-36	.000E+00	50167
3364463	3.521E-10	3.517E-10	3.521E-10	21451	7258548	.000E+00	2.002E-36	.000E+00	50177
3876834	1.671E-11	1.668E-11	1.671E-11	23260	7259973	.000E+00	4.130E-37	.000E+00	50187
4132803	9.941E-13	9.927E-13	9.941E-13	25730	7261397	.000E+00	7.475E-38	.000E+00	50196
4386773	2.406E-15	2.402E-15	2.406E-15	28569					
4644742	1.491E-16	1.489E-16	1.491E-16	30338					
4903712	7.920E-18	7.909E-18	7.920E-18	32108					
5156661	4.208E-19	4.202E-19	4.208E-19	33877					
5412650	2.235E-20	2.232E-20	2.235E-20	35647					
5668620	1.161E-21	1.161E-21	1.161E-21	37416					
5924587	3.353E-24	3.348E-24	3.353E-24	39186					
6140559	1.751E-25	1.749E-25	1.751E-25	40955					
6436529	9.450E-27	9.450E-27	9.450E-27	42725					
6692493	5.021E-28	5.021E-28	5.021E-28	44594					
6948467	2.670E-29	2.667E-29	2.670E-29	46264					
7204437	2.670E-29	2.667E-29	2.670E-29	48033					
7205861	2.565E-29	2.562E-29	2.565E-29	49813					
7207284	2.540E-29	2.538E-29	2.540E-29	49822					
7208708	2.502E-29	2.500E-29	2.502E-29	49832					
7210133	2.462E-29	2.460E-29	2.462E-29	49842					
7211557	2.418E-29	2.416E-29	2.418E-29	49852					
7212980	2.379E-29	2.377E-29	2.379E-29	49862					
7214404	2.340E-29	2.338E-29	2.340E-29	49872					
7215829	2.305E-29	2.303E-29	2.305E-29	49881					
7217253	2.269E-29	2.267E-29	2.269E-29	49891					
7218675				49901					

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND HADU RELEASE OF ALL OF THE YP 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 10 YEARS

NUCLIDE: HA226 FROM TH230

NUCLIDE: TH230 HA226
 HALF LIFE, YR: 7.70E+04
 DECAY NUMBER: 1.20E+03
 DISTIP COEF: 5.00E+02
 YR 2000 CURIES: 5.55E+00
 PULSE G-ATOMS: 1.36E+01
 NUCL VFLA I/YR: 1.36E+06
 DISCH TIME/YR: 7.23E+06
 DIM DISC TIME: 5.00E+04
 LEACH RATE: .003000 FRACTION PER YEAR
 LEACH DURATION: 353 YEARS
 PATH LE 3TH: 10.00 MILES
 DIMENSIONLESS DISTANCE: 1.00

WATER VELOCITY= 1.00 FT/DAY									
WATER TRAVEL TIME= 145 YEARS									
AXIAL DISPERSION COEFFICIENT= .0080 CM12/MIN									
PECLET NUMBER= 4.26E+06									
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION									
INITIAL BREAKTHROUGH AT 72457 YEARS									
PEAK DISCHARGE RATE= 1.27E-15 Curies per year AT 72753 YEARS									
BAND WIDTH= 7160460 YEARS WITH TAIL END AT 7232917 YEARS									
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00									
TIME,YR	DISC RATE,CI/YR	PULSE RATE	BAND RATE	BAND RATE	DIM	TIME	DISC RATE,CI/YR	PULSE RATE	BAND RATE
71951	.000E+00	1.729E-37	.000E+00	.000E+00	497	73235	6.796E-16	6.803E-16	6.796E-16
71981	.000E+00	5.198E-35	.000E+00	.000E+00	497	73235	6.796E-16	6.803E-16	6.796E-16
72010	.000E+00	1.087E-32	.000E+00	.000E+00	497	73235	6.796E-16	6.803E-16	6.796E-16
72040	.000E+00	1.585E-30	.000E+00	.000E+00	497	73235	6.796E-16	6.803E-16	6.796E-16
72070	.000E+00	1.611E-28	.000E+00	.000E+00	498	73235	6.796E-16	6.803E-16	6.796E-16
72100	.000E+00	1.143E-26	.000E+00	.000E+00	498	73235	6.796E-16	6.803E-16	6.796E-16
72130	.000E+00	5.677E-25	.000E+00	.000E+00	498	73235	6.796E-16	6.803E-16	6.796E-16
72159	.000E+00	1.975E-23	.000E+00	.000E+00	498	73235	6.796E-16	6.803E-16	6.796E-16
72189	.000E+00	4.822E-22	.000E+00	.000E+00	498	73235	6.796E-16	6.803E-16	6.796E-16
72219	.000E+00	8.291E-21	.000E+00	.000E+00	499	73235	6.796E-16	6.803E-16	6.796E-16
72248	.000E+00	1.007E-19	.000E+00	.000E+00	499	73235	6.796E-16	6.803E-16	6.796E-16
72278	.000E+00	8.683E-19	.000E+00	.000E+00	499	73235	6.796E-16	6.803E-16	6.796E-16
72308	.000E+00	5.345E-18	.000E+00	.000E+00	499	73235	6.796E-16	6.803E-16	6.796E-16
72338	.000E+00	2.364E-17	.000E+00	.000E+00	499	73235	6.796E-16	6.803E-16	6.796E-16
72367	.000E+00	7.660E-17	.000E+00	.000E+00	500	73235	6.796E-16	6.803E-16	6.796E-16
72397	1.138E-16	1.840E-16	1.138E-16	1.138E-16	500	73235	6.796E-16	6.803E-16	6.796E-16
72427	1.138E-16	3.375E-16	1.138E-16	1.138E-16	500	73235	6.796E-16	6.803E-16	6.796E-16
72457	1.138E-16	4.923E-16	1.138E-16	1.138E-16	500	73235	6.796E-16	6.803E-16	6.796E-16
72487	2.341E-16	6.022E-16	2.341E-16	2.341E-16	500	73235	6.796E-16	6.803E-16	6.796E-16
72516	3.533E-16	6.573E-16	3.533E-16	3.533E-16	501	73235	6.796E-16	6.803E-16	6.796E-16
72546	4.717E-16	6.747E-16	4.717E-16	4.717E-16	501	73235	6.796E-16	6.803E-16	6.796E-16
72580	6.081E-16	6.817E-16	6.081E-16	6.081E-16	501	73235	6.796E-16	6.803E-16	6.796E-16
72615	7.433E-16	6.823E-16	7.433E-16	7.433E-16	501	73235	6.796E-16	6.803E-16	6.796E-16
72649	8.775E-16	6.822E-16	8.775E-16	8.775E-16	502	73235	6.796E-16	6.803E-16	6.796E-16
72684	1.011E-15	6.821E-16	1.011E-15	1.011E-15	502	73235	6.796E-16	6.803E-16	6.796E-16
72718	1.143E-15	6.820E-16	1.143E-15	1.143E-15	502	73235	6.796E-16	6.803E-16	6.796E-16
72753	1.274E-15	6.819E-16	1.274E-15	1.274E-15	502	73235	6.796E-16	6.803E-16	6.796E-16
72787	6.812E-16	6.818E-16	6.812E-16	6.812E-16	502	73235	6.796E-16	6.803E-16	6.796E-16
72822	6.810E-16	6.817E-16	6.810E-16	6.810E-16	503	73235	6.796E-16	6.803E-16	6.796E-16
72856	6.810E-16	6.815E-16	6.810E-16	6.810E-16	503	73235	6.796E-16	6.803E-16	6.796E-16
72890	6.808E-16	6.814E-16	6.808E-16	6.808E-16	503	73235	6.796E-16	6.803E-16	6.796E-16
72925	6.807E-16	6.813E-16	6.807E-16	6.807E-16	503	73235	6.796E-16	6.803E-16	6.796E-16
72959	6.805E-16	6.812E-16	6.805E-16	6.805E-16	504	73235	6.796E-16	6.803E-16	6.796E-16
72994	6.804E-16	6.811E-16	6.804E-16	6.804E-16	504	73235	6.796E-16	6.803E-16	6.796E-16
73028	6.803E-16	6.810E-16	6.803E-16	6.803E-16	504	73235	6.796E-16	6.803E-16	6.796E-16
73063	6.802E-16	6.809E-16	6.802E-16	6.802E-16	504	73235	6.796E-16	6.803E-16	6.796E-16
73097	6.802E-16	6.808E-16	6.802E-16	6.802E-16	505	73235	6.796E-16	6.803E-16	6.796E-16
73132	6.800E-16	6.807E-16	6.800E-16	6.800E-16	505	73235	6.796E-16	6.803E-16	6.796E-16
73164	6.800E-16	6.805E-16	6.800E-16	6.800E-16	505	73235	6.796E-16	6.803E-16	6.796E-16
73201	6.799E-16	6.804E-16	6.799E-16	6.799E-16	505	73235	6.796E-16	6.803E-16	6.796E-16

7252853 .000E+00 3.796E-35 .000E+00 50137
7254277 .000E+00 1.073E-35 .000E+00 50147
7255701 .000E+00 2.806E-36 .000E+00 50157
7257125 .000E+00 6.785E-37 .000E+00 50167
7258549 .000E+00 1.515E-37 .000E+00 50177
7259973 .000E+00 3.129E-38 .000E+00 50187
7261397 .000E+00 5.965E-39 .000E+00 50196

MIGRATION OF RADIOCLUIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YD 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIOE: TH230 VIA PSEUDO U234 FROM U238

NUCLIOE U238 TH230
HALF LIFE YR 4.47E+09 7.70E+04 .00E+00
DECAY NUMBER 2.24E-08 1.30E-03 .00E+00
DISTRIB COEF 1.43E+04 5.00E+00 .00E+00
YR 2000 CURIES 2.44E+02 .00E+00 .00E+00
PULSE G-ATOMS 3.05E+06 .00E+00 .00E+00
NUCL VEL M/YR 4.84E-06 1.38E-06 .00E+00
DISCH VEL M/YR 2.07E+06 7.23E+06 .00E+00
DIM DISC TIME 1.43E+04 5.00E+04 .00E+00
LEACH RATE = .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
PATH LENGTH= 10.00 MILES
DIMENSIONLESS DISTANCE= 1.00
WATER VELOCITY= 1.00 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .0080 CM12/MIN
PECLT NUMBER= 4.26E+06
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 2066/38 YEARS
PEAK DISCHARGE RATE= 8.69E-04 CURIES PER YEAR AT 2067653 YEARS
BAND WIDTH= 510.179 YEARS WITH TAIL END AT 7232917 YEARS
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME*YR DISC RATE*CI/YR PULSE RATE BAND RATE UJM TIME

2044423 .000E+00 .000E+00 .000E+00 14160
2044344 .000E+00 4.67E-34 .000E+00 14166
2050260 .000E+00 1.67E-34 .000E+00 14173
2051175 .000E+00 2.74E-31 .000E+00 14179
2052091 .000E+00 2.95E-28 .000E+00 14184
2053006 .000E+00 2.07E-25 .000E+00 14191
2053922 .000E+00 9.57E-23 .000E+00 14193
2054437 .000E+00 2.80E-20 .000E+00 14204
2054755 .000E+00 5.78E-18 .000E+00 14210

2056668 .000E+00 7.592E-16 .000E+00 14217
2057583 .000E+00 6.573E-14 .000E+00 14223
2058499 .000E+00 3.763E-12 .000E+00 14229
2059414 .000E+00 1.427E-10 .000E+00 14236
2060330 .000E+00 3.596E-09 .000E+00 14242
2061245 .000E+00 6.042E-08 .000E+00 14248
2062161 .000E+00 6.811E-07 .000E+00 14255
2063076 .000E+00 5.184E-06 .000E+00 14261
2063991 .000E+00 2.690E-05 .000E+00 14267
2064907 .000E+00 9.661E-05 .000E+00 14274
2065822 .000E+00 2.456E-04 .000E+00 14280
2066738 .000E+00 4.575E-04 .000E+00 14286
2067653 .000E+00 6.575E-04 .000E+00 14293
2068569 .000E+00 7.809E-04 .000E+00 14299
2069484 .000E+00 8.279E-04 .000E+00 14305
2070400 .000E+00 8.394E-04 .000E+00 14312
2071315 .000E+00 8.298E-04 .000E+00 14318
2072231 .000E+00 8.187E-04 .000E+00 14324
2073146 .000E+00 8.093E-04 .000E+00 14331
2074062 .000E+00 8.015E-04 .000E+00 14337
2074977 .000E+00 7.923E-04 .000E+00 14343
2075893 .000E+00 7.818E-04 .000E+00 14350
2076808 .000E+00 7.728E-04 .000E+00 14356
2077724 .000E+00 7.639E-04 .000E+00 14362
2078639 .000E+00 7.552E-04 .000E+00 14369
2079555 .000E+00 7.465E-04 .000E+00 14375
2080470 .000E+00 7.379E-04 .000E+00 14381
2081386 .000E+00 7.295E-04 .000E+00 14388
2082301 .000E+00 7.211E-04 .000E+00 14394
2083217 .000E+00 7.128E-04 .000E+00 14400
2084132 .000E+00 7.047E-04 .000E+00 14407
2085048 .000E+00 6.966E-04 .000E+00 14413
2341017 .000E+00 2.772E-05 .000E+00 14418
2596987 .000E+00 1.099E-06 .000E+00 17952
4.373E-08 4.373E-08 1.737E-09 17921
1.737E-09 1.737E-09 1.737E-09 21491
6.900E-11 6.900E-11 6.900E-11 23260
2.741E-12 2.741E-12 2.741E-12 25030
1.089E-13 1.089E-13 1.089E-13 26799
4.324E-15 4.324E-15 4.324E-15 28569
1.718E-16 1.718E-16 1.718E-16 30338
6.822E-18 6.822E-18 6.822E-18 32108
2.710E-19 2.710E-19 2.710E-19 33877
1.077E-20 1.077E-20 1.077E-20 35647
4.268E-22 4.268E-22 4.268E-22 37416
1.695E-23 1.695E-23 1.695E-23 39186
6.733E-25 6.733E-25 6.733E-25 40955
2.674E-26 2.674E-26 2.674E-26 42725
1.064E-27 1.064E-27 1.064E-27 44494
4.220E-29 4.220E-29 4.220E-29 46264
1.679E-30 1.679E-30 1.679E-30 48033
6.657E-32 6.657E-32 6.657E-32 49803
6.535E-32 6.535E-32 6.535E-32 49813
6.423E-32 6.423E-32 6.423E-32 49822

7208708	6.321E-32	6.308E-32	6.321E-32	49832	NUCL VEL*MI/YR	4.84E-06	1.38E-06	.00E+00	
7210133	6.208E-32	6.196E-32	6.208E-32	49842	DISCH TIME*YR	2.07E+06	7.23E+06	.00E+00	
7211557	6.096E-32	6.086E-32	6.096E-32	49852	DIM DISC TIME	1.43E+04	5.09E+04	.00E+00	
7212980	5.989E-32	5.978E-32	5.989E-32	49862	LEACH RATE=	.003000	FRACTION PER YEAR		
7214404	5.883E-32	5.871E-32	5.883E-32	49872	LEACH DURATION=	333	YEARS		
7215829	5.778E-32	5.765E-32	5.778E-32	49881	PATH LENGTH=	10.00	MILES		
7218676	5.674E-32	5.660E-32	5.674E-32	49891	DIMENSIONLESS DISTANCE=	1.00			
7220100	5.575E-32	5.553E-32	5.575E-32	49901	WATER VELOCITY=	1.00	FT/DAY		
7221525	5.474E-32	5.440E-32	5.474E-32	49911	WATER TRAVEL TIME=	145	YEARS		
7222949	5.378E-32	5.314E-32	5.378E-32	49921	AXIAL DISPERSION COEFFICIENT=	.0080	CM ² /MIN		
7224372	5.281E-32	5.164E-32	5.281E-32	49931	PELLET NUMBER=	4.25E+06			
7225796	5.188E-32	4.973E-32	5.188E-32	49941	NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION				
7227221	5.095E-32	4.724E-32	5.095E-32	49950	INITIAL BREAKTHROUGH AT	2066738	YEARS		
7228645	5.005E-32	4.401E-32	5.005E-32	49960	PEAK DISCHARGE RATE=	2.45E-06	CURIES PER YEAR AT	2067653	YEARS
7230068	4.915E-32	3.993E-32	4.915E-32	49970	BAND WIDTH=	5166179	YEARS WITH TAIL END AT	7232917	YEARS
7231492	4.829E-32	3.505E-32	4.829E-32	49980	DISPERSION PEAK/NO-DISPERSION PEAK =	.00E+00			
7232917	4.742E-32	2.956E-32	4.742E-32	49990					
7234340	4.659E-32	2.380E-32	4.659E-32	50000	TIME*YR	DISC RATE*CI/YR	PULSF RATE	BAND RATE	DIM TIME
7235764	.000E+00	1.820E-32	.000E+00	50009	2049344	.000E+00	.000E+00	.000E+00	14166
7237189	.000E+00	1.315E-32	.000E+00	50019	2050260	.000E+00	4.952E-37	.000E+00	14173
7238613	.000E+00	8.937E-33	.000E+00	50029	2051175	.000E+00	8.107E-34	.000E+00	14179
7240036	.000E+00	5.697E-33	.000E+00	50039	2052091	.000E+00	8.682E-31	.000E+00	14185
7241460	.000E+00	3.397E-33	.000E+00	50049	2053006	.000E+00	6.093E-28	.000E+00	14191
7242885	.000E+00	1.890E-33	.000E+00	50059	2053922	.000E+00	2.805E-25	.000E+00	14198
7244309	.000E+00	9.792E-34	.000E+00	50068	2054837	.000E+00	8.477E-23	.000E+00	14204
7245732	.000E+00	4.719E-34	.000E+00	50078	2055753	.000E+00	1.685E-20	.000E+00	14210
7247156	.000E+00	2.111E-34	.000E+00	50088	2056668	.000E+00	2.206E-18	.000E+00	14217
7248581	.000E+00	8.770E-35	.000E+00	50098	2057583	.000E+00	1.905E-16	.000E+00	14223
7250005	.000E+00	3.577E-35	.000E+00	50108	2058499	.000E+00	1.088E-14	.000E+00	14229
7251428	.000E+00	1.204E-35	.000E+00	50118	2059414	.000E+00	4.114E-13	.000E+00	14236
7252852	.000E+00	3.974E-36	.000E+00	50128	2060330	.000E+00	1.034E-11	.000E+00	14242
7254277	.000E+00	1.214E-36	.000E+00	50137	2061245	.000E+00	1.734E-10	.000E+00	14248
7255701	.000E+00	8.974E-38	.000E+00	50147	2062161	.000E+00	1.950E-09	.000E+00	14255
7257124	.000E+00	2.169E-38	.000E+00	50157	2063076	.000E+00	1.480E-08	.000E+00	14261
7258544	.000E+00	4.842E-39	.000E+00	50167	2063991	.000E+00	7.666E-08	.000E+00	14267
7259973	.000E+00	.000E+00	.000E+00	50187	2064907	7.547E-07	2.747E-07	7.547E-07	14274
					2065822	7.547E-07	6.971E-07	7.547E-07	14280
					2066738	7.547E-07	1.297E-06	7.547E-07	14286
					2067653	2.454E-06	1.862E-06	2.454E-06	14293
					2068569	2.428E-06	2.211E-06	2.428E-06	14299
					2069484	2.403E-06	2.345E-06	2.403E-06	14305
					2070400	2.378E-06	2.365E-06	2.378E-06	14312
					2071315	2.353E-06	2.348E-06	2.353E-06	14318
					2072231	2.328E-06	2.325E-06	2.328E-06	14324
					2073146	2.304E-06	2.301E-06	2.304E-06	14331
					2074062	2.279E-06	2.277E-06	2.279E-06	14337
					2074977	2.256E-06	2.253E-06	2.256E-06	14343
					2075893	2.232E-06	2.229E-06	2.232E-06	14350
					2076808	2.209E-06	2.206E-06	2.209E-06	14356
					2077724	2.186E-06	2.183E-06	2.186E-06	14362
					2078639	2.163E-06	2.160E-06	2.163E-06	14369

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: T-230 VIA -PSEUDO H-234 FROM H-238

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

NUCLIDE
HALF LIFE, YR 2.44E+05
DECAY NUMBER 4.11E-04
DISTRIB COEF 1.43E+04
YR 2000 CURIES 2.44E+02
PULSF G-ATOMS 1.66E+02

T-230
2.44E+05
4.11E-04
1.43E+04
2.44E+02
1.66E+02

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT:	100 YEARS
NUCLIDE: I-230 VIA PSEUDO I-234 FROM I-238	
NUCLIDE	I-230
HALF LIFE*YR	2.44E+05
DECAY NUM*Z	4.11E-04
DISTRIB COEF	1.43E+04
YR 2000 CURIES	2.44E+02
PULSE G-ATOMS	1.66E+02

2079555	2.141E-06	2.138E-06	2.141E-06	14375	7244309	.000E+00	4.709E-34	.000E+00	50078
2080470	2.118E-06	2.115E-06	2.118E-06	14381	7245732	.000E+00	2.108E-34	.000E+00	50088
2081386	2.096E-06	2.093E-06	2.096E-06	14388	7247156	.000E+00	8.755E-35	.000E+00	50098
2082301	2.074E-06	2.071E-06	2.074E-06	14394	7248581	.000E+00	3.371E-35	.000E+00	50108
2083217	2.053E-06	2.050E-06	2.053E-06	14400	7250005	.000E+00	1.202E-35	.000E+00	50118
2084132	2.031E-06	2.028E-06	2.031E-06	14407	7251428	.000E+00	3.969E-36	.000E+00	50128
2085048	2.010E-06	2.007E-06	2.010E-06	14413	7252852	.000E+00	1.213E-36	.000E+00	50137
2341017	1.068E-07	1.066E-07	1.068E-07	14182	7254277	.000E+00	3.429E-37	.000E+00	50147
2596987	5.673E-09	5.666E-09	5.673E-09	17952	7255701	.000E+00	8.962E-38	.000E+00	50157
2852956	3.014E-10	3.010E-10	3.014E-10	17921	7257124	.000E+00	2.166E-38	.000E+00	50167
3108926	1.601E-11	1.599E-11	1.601E-11	21491	7258548	.000E+00	4.837E-39	.000E+00	50177
3364895	4.507E-13	4.497E-13	4.507E-13	23260	7259973	.000E+00	.000E+00	.000E+00	50187
3620864	4.520E-14	4.514E-14	4.520E-14	25030					
3876834	2.402E-15	2.398E-15	2.402E-15	26799					
4132803	1.276E-16	1.274E-16	1.276E-16	28569					
4388773	6.770E-18	6.770E-18	6.770E-18	30338					
4644742	3.601E-19	3.597E-19	3.601E-19	32108					
4900712	1.911E-20	1.911E-20	1.911E-20	33877					
5156681	1.017E-21	1.015E-21	1.017E-21	35647					
5412650	5.400E-23	5.394E-23	5.400E-23	37416					
5668620	2.869E-24	2.866E-24	2.869E-24	39186					
5924589	1.524E-25	1.522E-25	1.524E-25	40955					
6180559	8.100E-27	8.088E-27	8.100E-27	42725					
6434528	4.303E-28	4.297E-28	4.303E-28	44494					
6692498	2.286E-29	2.283E-29	2.286E-29	46264					
6948467	1.214E-30	1.213E-30	1.214E-30	48033					
7204437	5.451E-32	5.444E-32	5.451E-32	49803					
7205861	6.347E-32	6.340E-32	6.347E-32	49813					
7207284	6.246E-32	6.237E-32	6.246E-32	49822					
7208708	6.145E-32	6.136E-32	6.145E-32	49832					
7210133	6.045E-32	6.037E-32	6.045E-32	49842					
7211557	5.948E-32	5.939E-32	5.948E-32	49852					
7212980	5.851E-32	5.843E-32	5.851E-32	49862					
7214404	5.756E-32	5.748E-32	5.756E-32	49872					
7215829	5.661E-32	5.654E-32	5.661E-32	49881					
7217253	5.570E-32	5.560E-32	5.570E-32	49891					
7218676	5.481E-32	5.473E-32	5.481E-32	49901					
7220100	5.393E-32	5.385E-32	5.393E-32	49911					
7221525	5.305E-32	5.297E-32	5.305E-32	49921					
7222949	5.219E-32	5.213E-32	5.219E-32	49931					
7224372	5.133E-32	5.128E-32	5.133E-32	49941					
7225794	5.050E-32	5.046E-32	5.050E-32	49950					
7227221	4.968E-32	4.964E-32	4.968E-32	49960					
7228645	4.888E-32	4.884E-32	4.888E-32	49970					
7230068	4.810E-32	4.806E-32	4.810E-32	49980					
7231492	4.732E-32	4.728E-32	4.732E-32	49990					
7232917	4.650E-32	4.646E-32	4.650E-32	50000					
7234340	.000E+00	1.813E-32	.000E+00	50009					
7235764	.000E+00	1.310E-32	.000E+00	50019					
7237189	.000E+00	8.909E-33	.000E+00	50029					
7238613	.000E+00	5.681E-33	.000E+00	50039					
7240036	.000E+00	3.348E-33	.000E+00	50049					
7241460	.000E+00	1.826E-33	.000E+00	50059					
7242885	.000E+00	9.773E-34	.000E+00	50068					

1446842 .000E+00 .000E+00 .000E+00 10001
 1476921 .000E+00 .000E+00 .000E+00 10204
 1507001 .000E+00 .000E+00 .000E+00 10417
 1537080 .000E+00 .000E+00 .000E+00 10625

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
 FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
 POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: U234 FROM AM242M

NUCLEIDE AM242M U234 F
 HALF LIFE, YR 1.52E+02 2.44E+05 .00E+00
 DECAY NUMBER 6.60E-01 4.11E-04 .00E+00
 DISTRI COEF 1.00E+04 1.43E+04 .00E+00
 YR 2000 CURIES 7.45E+06 .00E+00 .00E+00
 PULSE G-ATOMS 2.01E+03 .00E+00 .00E+00
 NUCL VFL, M/YR 6.91E-06 4.84E-06 .00E+00
 DISCH TIME, YR 1.45E+06 2.07E+06 .00E+00
 DIM DISC TIME 1.00E+04 1.43E+04 .00E+00
 LEACH RATE= .003000 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 PATH LENGTH= 10.00 MILES
 DIMENSIONLESS DISTANCE= 1.00
 WATER VELOCITY= 1.00 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .0000 CM12/MIN
 PECLET NUMBER= 4.26E+06
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 2059414 YEARS
 PEAK DISCHARGE RATE= 1.99E-02 CURIES PER YEAR AT 2066738 YEARS
 BAND WIDTH= 7324 YEARS WITH TAIL END AT 2066738 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR DISC RATE, CI/YR PULSE RATE BAND RATE DIM TIME

1567159	.000E+00	.000E+00	.000E+00	.000E+00	2083217	.000E+00	.000E+00	.000E+00	14400
1597239	.000E+00	.000E+00	.000E+00	.000E+00	2084132	.000E+00	.000E+00	.000E+00	14407
1627318	.000E+00	.000E+00	.000E+00	.000E+00	2085048	.000E+00	.000E+00	.000E+00	14413
1657337	.000E+00	.000E+00	.000E+00	.000E+00					
1687477	.000E+00	.000E+00	.000E+00	.000E+00	MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM				
1717556	.000E+00	.000E+00	.000E+00	.000E+00	FOR IMPULSE AND HAND RELEASE OF ALL OF THE YR 2000 NUCLEAR				
1747635	.000E+00	.000E+00	.000E+00	.000E+00	POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY				
1777715	.000E+00	.000E+00	.000E+00	.000E+00					
1807794	.000E+00	.000E+00	.000E+00	.000E+00					
1837873	.000E+00	.000E+00	.000E+00	.000E+00					
1867953	.000E+00	.000E+00	.000E+00	.000E+00					
1898032	.000E+00	.000E+00	.000E+00	.000E+00					
1928111	.000E+00	.000E+00	.000E+00	.000E+00					
1958191	.000E+00	.000E+00	.000E+00	.000E+00					
1988270	.000E+00	.000E+00	.000E+00	.000E+00					
2018350	.000E+00	.000E+00	.000E+00	.000E+00					
2048429	.000E+00	.000E+00	.000E+00	.000E+00					
2049344	.000E+00	.000E+00	.000E+00	.000E+00					
2050260	.000E+00	.000E+00	.000E+00	.000E+00					
2051175	.000E+00	.000E+00	.000E+00	.000E+00					
2052091	.000E+00	.000E+00	.000E+00	.000E+00					
2053004	.000E+00	.000E+00	.000E+00	.000E+00					
2053922	.000E+00	.000E+00	.000E+00	.000E+00					
2054837	.000E+00	.000E+00	.000E+00	.000E+00					
2055752	.000E+00	.000E+00	.000E+00	.000E+00					
2056668	.000E+00	.000E+00	.000E+00	.000E+00					
2057583	.000E+00	.000E+00	.000E+00	.000E+00					
2058493	.000E+00	.000E+00	.000E+00	.000E+00					
2059414	.000E+00	.000E+00	.000E+00	.000E+00					
2060330	.000E+00	.000E+00	.000E+00	.000E+00					
2061245	.000E+00	.000E+00	.000E+00	.000E+00					
2062160	.000E+00	.000E+00	.000E+00	.000E+00					
2063076	.000E+00	.000E+00	.000E+00	.000E+00					
2063991	.000E+00	.000E+00	.000E+00	.000E+00					
2064907	.000E+00	.000E+00	.000E+00	.000E+00					
2065822	.000E+00	.000E+00	.000E+00	.000E+00					
2066738	.000E+00	.000E+00	.000E+00	.000E+00					
2067653	.000E+00	.000E+00	.000E+00	.000E+00					
2068569	.000E+00	.000E+00	.000E+00	.000E+00					
2069484	.000E+00	.000E+00	.000E+00	.000E+00					
2070400	.000E+00	.000E+00	.000E+00	.000E+00					
2071315	.000E+00	.000E+00	.000E+00	.000E+00					
2072231	.000E+00	.000E+00	.000E+00	.000E+00					
2073146	.000E+00	.000E+00	.000E+00	.000E+00					
2074062	.000E+00	.000E+00	.000E+00	.000E+00					
2074977	.000E+00	.000E+00	.000E+00	.000E+00					
2075893	.000E+00	.000E+00	.000E+00	.000E+00					
2076803	.000E+00	.000E+00	.000E+00	.000E+00					
2077724	.000E+00	.000E+00	.000E+00	.000E+00					
2078639	.000E+00	.000E+00	.000E+00	.000E+00					
2079555	.000E+00	.000E+00	.000E+00	.000E+00					
2080470	.000E+00	.000E+00	.000E+00	.000E+00					
2081386	.000E+00	.000E+00	.000E+00	.000E+00					
2082301	.000E+00	.000E+00	.000E+00	.000E+00					

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PU239 FROM CM247

NUCLIDE CM247 PU239

HALF LIFE, YR 1.54E+07 2.44E+04 .00E+00

DECAY NUMBER 9.51E-06 4.11E-03 .00E+00

DISTRIB COEF 3.33E+03 1.00E+04 .00E+00

YR 2000 CURIES 1.29E+01 .00E+00 .00E+00

PULSE G-ATOMS 5.55E+01 .00E+00 .00E+00

NUCL VEL, MI/YR 2.07E-05 6.91E-06 .00E+00

DISCH TIME, YR 4.82E+05 1.45E+06 .00E+00

DIM DISC TIME 3.33E+03 1.00E+04 .00E+00

LEACH RATE= .003000 FRACTION PER YEAR

LEACH DURATION= 333 YEARS

PATH LENGTH= 10.00 MILES

DIMENSIONLESS DISTANCE= 1.00

WATER VELOCITY= 1.00 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .0080 CM12/MIN

PECLT NUMBER= 4.26E+06

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 482443 YEARS

PEAK DISCHARGE RATE= 1.78E-06 CURIES PER YEAR AT 482657 YEARS

BAVD WIDTH= 963855 YEARS WITH TAIL END AT 1446298 YEARS

DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR	DISC RATE, CI/YR	PULSE RATE	HAND RATE	DIM TIME
478328	.000E+00	1.927E-39	.000E+00	3306
478534	.000E+00	3.115E-36	.000E+00	3307
478739	.000E+00	3.557E-33	.000E+00	3309
478945	.000E+00	2.678E-30	.000E+00	3310
479151	.000E+00	1.363E-27	.000E+00	3312
479357	.000E+00	4.692E-25	.000E+00	3313
479563	.000E+00	1.094E-22	.000E+00	3314
479768	.000E+00	1.729E-20	.000E+00	3316
479974	.000E+00	1.854E-18	.000E+00	3317
480180	.000E+00	1.351E-16	.000E+00	3319
480386	.000E+00	6.709E-15	.000E+00	3320
480591	.000E+00	2.274E-13	.000E+00	3322
480797	.000E+00	5.272E-12	.000E+00	3323

481003	.000E+00	8.398E-11	.000E+00	3324	1440317	3.386E-24	3.363E-24	3.386E-24	9956
481208	.000E+00	9.219E-10	.000E+00	3326	1440815	3.315E-24	3.292E-24	3.315E-24	9959
481414	.000E+00	7.023E-09	.000E+00	3327	1441314	3.246E-24	3.223E-24	3.246E-24	9963
481620	.000E+00	3.741E-08	.000E+00	3329	1441812	3.177E-24	3.155E-24	3.177E-24	9966
481826	.000E+00	1.410E-07	.000E+00	3330	1442311	3.111E-24	3.089E-24	3.111E-24	9970
482031	8.111E-07	3.833E-07	8.111E-07	3332	1442809	3.045E-24	3.024E-24	3.045E-24	9973
482237	8.111E-07	7.712E-07	8.111E-07	3333	1443308	2.919E-24	2.893E-24	2.919E-24	9977
482443	8.111E-07	1.196E-06	8.111E-07	3334	1443806	2.857E-24	2.815E-24	2.857E-24	9980
482657	1.779E-06	1.523E-06	1.779E-06	3336	1444304	2.797E-24	2.699E-24	2.797E-24	9984
482870	1.762E-06	1.678E-06	1.762E-06	3337	1444803	2.739E-24	2.500E-24	2.739E-24	9987
483084	1.747E-06	1.719E-06	1.747E-06	3339	1445301	2.681E-24	2.171E-24	2.681E-24	9991
483298	1.731E-06	1.716E-06	1.731E-06	3340	1445800	2.625E-24	1.703E-24	2.625E-24	9994
483511	1.715E-06	1.703E-06	1.715E-06	3342	1446298	.000E+00	1.166E-24	.000E+00	9997
483725	1.699E-06	1.688E-06	1.699E-06	3343	1446797	.000E+00	1.166E-24	.000E+00	10001
483939	1.684E-06	1.672E-06	1.684E-06	3345	1447295	.000E+00	6.760E-25	.000E+00	10004
484153	1.669E-06	1.657E-06	1.669E-06	3346	1447794	.000E+00	3.247E-25	.000E+00	10008
484365	1.654E-06	1.642E-06	1.654E-06	3348	1448292	.000E+00	1.271E-25	.000E+00	10011
484580	1.639E-06	1.627E-06	1.639E-06	3349	1448790	.000E+00	4.007E-26	.000E+00	10015
484794	1.624E-06	1.612E-06	1.624E-06	3351	1449289	.000E+00	1.010E-26	.000E+00	10018
485007	1.609E-06	1.598E-06	1.609E-06	3352	1449787	.000E+00	2.022E-27	.000E+00	10022
485221	1.595E-06	1.583E-06	1.595E-06	3354	1450286	.000E+00	3.202E-28	.000E+00	10025
485435	1.580E-06	1.569E-06	1.580E-06	3355	1450784	.000E+00	4.003E-29	.000E+00	10028
485648	1.566E-06	1.555E-06	1.566E-06	3357	1451283	.000E+00	3.938E-30	.000E+00	10032
485862	1.552E-06	1.541E-06	1.552E-06	3358	1451781	.000E+00	3.046E-31	.000E+00	10035
486076	1.537E-06	1.527E-06	1.537E-06	3359	1452279	.000E+00	1.849E-32	.000E+00	10039
486290	1.524E-06	1.513E-06	1.524E-06	3361	1452778	.000E+00	8.811E-34	.000E+00	10042
486503	1.510E-06	1.499E-06	1.510E-06	3362	1453276	.000E+00	3.289E-35	.000E+00	10046
486717	1.496E-06	1.486E-06	1.496E-06	3364	1453775	.000E+00	9.622E-37	.000E+00	10049
534223	1.977E-07	1.963E-07	1.977E-07	3692	1454273	.000E+00	2.024E-38	.000E+00	10053
581728	2.611E-08	2.593E-08	2.611E-08	4021	1454772	.000E+00	.000E+00	.000E+00	10056
620234	3.450E-09	3.426E-09	3.450E-09	4349					
676739	4.588E-10	4.527E-10	4.588E-10	4674					
724245	6.023E-11	5.951E-11	6.023E-11	5066					
771750	7.957E-12	7.902E-12	7.957E-12	5334					
819256	1.051E-12	1.044E-12	1.051E-12	5663					
866761	1.399E-13	1.379E-13	1.389E-13	5991					
914267	1.835E-14	1.822E-14	1.835E-14	6320					
961772	2.425E-15	2.404E-15	2.425E-15	6648					
1009279	3.203E-16	3.181E-16	3.203E-16	6976					
1056784	4.232E-17	4.203E-17	4.232E-17	7305					
1106269	5.592E-18	5.553E-18	5.592E-18	7633					
1151795	7.386E-19	7.336E-19	7.386E-19	7962					
1199300	9.740E-20	9.693E-20	9.740E-20	8290					
1246606	1.270E-20	1.261E-20	1.270E-20	8618					
1296311	1.704E-21	1.692E-21	1.704E-21	8947					
1341817	2.251E-22	2.235E-22	2.251E-22	9275					
1389322	2.974E-23	2.953E-23	2.974E-23	9604					
1436629	3.929E-24	3.902E-24	3.929E-24	9932					
1437325	3.847E-24	3.820E-24	3.847E-24	9935					
1437625	3.766E-24	3.740E-24	3.766E-24	9939					
1438523	3.687E-24	3.661E-24	3.687E-24	9942					
1438622	3.609E-24	3.584E-24	3.609E-24	9946					
1439320	3.533E-24	3.509E-24	3.533E-24	9949					
1439619	3.459E-24	3.435E-24	3.459E-24	9953					

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: AM243 FROM CM247

NUCLIDE CM247 AM243
HALF LIFE, YR 1.54E+07 7.37E+03
DECAY NUMBER 6.51E+06 1.36E+02
DISTAL COEF 3.33E+03 1.00E+04
YR 2000 CURIES 1.29E+01 .00E+00
PULSE G-ATOMS 5.55E+00 .00E+00
NUCL VEL, MI/YR 2.07E-05 6.51E-06
DISCH TIME, YR 4.82E+05 1.45E+06
DIM DISC TIME 3.33E+03 1.00E+04
LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
PATH LENGTH= 10.00 MILES
DIMENSIONLESS DISTANCE= 1.00

WATER VELOCITY= 1.00 FT/DAY
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .0080 CM12/MIN
 PECLT NUMBER= 4.26E+06
 NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 482443 YEARS
 PEAK DISCHARGE RATE= 5.77E-06 CURIES PER YEAR AT 482657 YEARS
 HAND WIDTH= 532343 YEARS WITH TAIL END AT 1014786 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME*YR DISC RATE*CI/YR PULSE RATE HAND RATE DIM TIME

478329	.000E+00	6.360E-39	.000E+00	3306
478534	.000E+00	1.052E-35	.000E+00	3307
478739	.000E+00	1.174E-32	.000E+00	3309
478945	.000E+00	8.839E-30	.000E+00	3310
479151	.000E+00	4.498E-27	.000E+00	3312
479357	.000E+00	1.548E-24	.000E+00	3313
479563	.000E+00	3.608E-22	.000E+00	3314
479768	.000E+00	5.695E-20	.000E+00	3316
479974	.000E+00	6.110E-18	.000E+00	3317
480180	.000E+00	4.450E-16	.000E+00	3319
480386	.000E+00	2.209E-14	.000E+00	3320
480591	.000E+00	7.482E-13	.000E+00	3322
480797	.000E+00	1.734E-11	.000E+00	3323
481003	.000E+00	2.755E-10	.000E+00	3324
481208	.000E+00	3.025E-09	.000E+00	3326
481414	.000E+00	2.301E-08	.000E+00	3327
481620	.000E+00	1.223E-07	.000E+00	3329
481825	.000E+00	4.600E-07	.000E+00	3330
482031	2.664E-06	1.245E-06	2.664E-06	3332
482237	2.664E-06	2.492E-06	2.664E-06	3333
482443	2.664E-06	3.836E-06	2.664E-06	3334
482657	5.773E-06	4.825E-06	5.773E-06	3336
482870	5.601E-06	5.234E-06	5.601E-06	3337
483084	5.435E-06	5.264E-06	5.435E-06	3339
483298	5.274E-06	5.149E-06	5.274E-06	3340
483511	5.117E-06	5.002E-06	5.117E-06	3342
483725	4.965E-06	4.855E-06	4.965E-06	3343
483939	4.818E-06	4.710E-06	4.818E-06	3345
484153	4.675E-06	4.571E-06	4.675E-06	3346
484366	4.536E-06	4.435E-06	4.536E-06	3348
484580	4.401E-06	4.303E-06	4.401E-06	3349
484794	4.270E-06	4.175E-06	4.270E-06	3351
485007	4.144E-06	4.051E-06	4.144E-06	3352
485221	4.021E-06	3.931E-06	4.021E-06	3354
485435	3.901E-06	3.814E-06	3.901E-06	3355
485649	3.785E-06	3.701E-06	3.785E-06	3357
485862	3.673E-06	3.591E-06	3.673E-06	3358
486076	3.564E-06	3.485E-06	3.564E-06	3359
486290	3.458E-06	3.381E-06	3.458E-06	3361
486503	3.355E-06	3.281E-06	3.355E-06	3362

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
 FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
 POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: U235 FROM PU239

NUCLIDE	U239	U235 F
HALF LIFE, YR	2.44E+04	7.04E+08
DECAY NUMBER	4.11E-03	1.42E-07
DISTRIB COEF	1.00E+04	1.43E+04
YR 2000 CURIES	9.69E+05	.00E+00
PULSF G-ATONS	6.72E+04	.00E+00
NUCL VFL*YR	6.91E+06	4.84E+06
DISCH TIME*YR	1.45E+06	2.07E+06
DIM DISC TIME	1.00E+04	1.43E+04
LEACH RATE	.003000	FRACTION PER YEAR
LEACH DURATION	333 YEARS	
PATH LENGTH	10.00 MILES	
DIMENSIONLESS DISTANCE	1.00	
WATER VELOCITY	1.00 FT/CAY	
WATER TRAVEL TIME	145 YEARS	
AXIAL DISPERSION COEFFICIENT	.0080 CM12/MIN	
PECLT NUMBER	4.26E+06	
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION		
INITIAL BREAKTHROUGH AT	1446797 YEARS	
PEAK DISCHARGE RATE	2.11E-03 CURIES PER YEAR AT 2065856 YEARS	
HAND WIDTH	619041 YEARS WITH TAIL END AT 2066737 YEARS	
DISPERSION PEAK/NO-DISPERSION PEAK	= .00E+00	

TIME*YR DISC RATE*CI/YR PULSE RATE HAND RATE DIM TIME

1437825	.000E+00	.000E+00	.000E+00	9939
1438323	.000E+00	6.044E-38	.000E+00	9942
1438822	.000E+00	3.982E-36	.000E+00	9946

1439320	.000E+00	2.039E-34	.000E+00	9949	2019489	9.764E-05	9.964E-05	9.764E-05	13960
1439319	.000E+00	8.106E-33	.000E+00	9953	2049106	6.959E-04	7.101E-04	6.959E-04	14165
1440317	.000E+00	2.507E-31	.000E+00	9956	2049106	7.378E-04	7.524E-04	7.378E-04	14171
1440816	.000E+00	6.039E-30	.000E+00	9959	2050870	8.292E-04	8.462E-04	8.292E-04	14177
1441314	.000E+00	1.133E-28	.000E+00	9963	2051751	8.292E-04	8.462E-04	8.292E-04	14183
1441812	.000E+00	1.660E-27	.000E+00	9966	2052633	8.792E-04	8.972E-04	8.792E-04	14189
1442311	.000E+00	1.901E-26	.000E+00	9970	2053514	9.322E-04	9.512E-04	9.322E-04	14195
1442809	.000E+00	1.705E-25	.000E+00	9973	2054396	9.322E-04	9.512E-04	9.322E-04	14195
1443308	.000E+00	1.200E-24	.000E+00	9977	2055277	1.048E-03	1.069E-03	1.048E-03	14201
1443806	.000E+00	6.659E-24	.000E+00	9980	2056159	1.111E-03	1.133E-03	1.111E-03	14207
1444305	.000E+00	2.921E-23	.000E+00	9984	2057040	1.178E-03	1.202E-03	1.178E-03	14213
1444803	.000E+00	1.019E-22	.000E+00	9987	2057922	1.249E-03	1.274E-03	1.249E-03	14219
1445301	.000E+00	2.850E-22	.000E+00	9991	2058803	1.324E-03	1.351E-03	1.324E-03	14225
1445800	1.157E-21	6.455E-22	1.157E-21	9994	2059685	1.403E-03	1.432E-03	1.403E-03	14232
1446298	1.157E-21	1.202E-21	1.157E-21	9997	2060567	1.488E-03	1.518E-03	1.488E-03	14238
1446797	1.157E-21	1.879E-21	1.157E-21	10001	2061448	1.577E-03	1.609E-03	1.577E-03	14244
1447295	3.360E-21	2.534E-21	3.360E-21	10004	2062330	1.672E-03	1.704E-03	1.672E-03	14250
1447794	3.360E-21	3.048E-21	3.360E-21	10008	2063211	1.773E-03	1.791E-03	1.773E-03	14256
1448292	3.473E-21	3.393E-21	3.473E-21	10011	2064093	1.833E-03	1.833E-03	1.833E-03	14262
1448791	3.589E-21	3.615E-21	3.589E-21	10015	2064974	1.933E-03	1.749E-03	1.880E-03	14268
1449289	3.710E-21	3.774E-21	3.710E-21	10018	2065856	2.113E-03	1.458E-03	1.993E-03	14274
1449787	3.835E-21	3.910E-21	3.835E-21	10022	2066737	1.847E-03	9.929E-04	2.113E-03	14280
1450286	3.964E-21	4.044E-21	3.964E-21	10025	2067653	.000E+00	5.064E-04	1.847E-03	14286
1450784	4.097E-21	4.180E-21	4.097E-21	10028	2068568	.000E+00	1.871E-04	.000E+00	14299
1451283	4.234E-21	4.321E-21	4.234E-21	10032	2069484	.000E+00	4.861E-05	.000E+00	14305
1451781	4.377E-21	4.466E-21	4.377E-21	10035	2070399	.000E+00	8.721E-06	.000E+00	14312
1452280	4.524E-21	4.616E-21	4.524E-21	10039	2071315	.000E+00	1.068E-06	.000E+00	14318
1452774	4.676E-21	4.771E-21	4.676E-21	10042	2072230	.000E+00	8.854E-06	.000E+00	14324
1453276	4.833E-21	4.931E-21	4.833E-21	10046	2073146	.000E+00	4.946E-09	.000E+00	14331
1453775	4.995E-21	5.097E-21	4.995E-21	10049	2074061	.000E+00	1.856E-10	.000E+00	14337
1454273	5.163E-21	5.266E-21	5.163E-21	10053	2074977	.000E+00	4.862E-12	.000E+00	14343
1454772	5.337E-21	5.445E-21	5.337E-21	10056	2075892	.000E+00	7.833E-14	.000E+00	14350
1455270	5.516E-21	5.628E-21	5.516E-21	10059	2076808	.000E+00	8.793E-16	.000E+00	14356
1455769	5.701E-21	5.818E-21	5.701E-21	10063	2077723	.000E+00	6.589E-18	.000E+00	14362
1456267	5.893E-21	6.013E-21	5.893E-21	10066	2078639	.000E+00	3.292E-20	.000E+00	14369
1456765	6.091E-21	6.215E-21	6.091E-21	10070	2079554	.000E+00	1.097E-22	.000E+00	14375
1457260	6.341E-20	4.429E-20	4.341E-20	10274	2080470	.000E+00	2.440E-25	.000E+00	14381
1457617	3.094E-19	3.157E-19	3.094E-19	10479	2081385	.000E+00	3.614E-28	.000E+00	14388
1458170	2.205E-18	2.250E-18	2.205E-18	10684	2082301	.000E+00	3.572E-31	.000E+00	14394
1458673	1.571E-17	1.603E-17	1.571E-17	10889	2083215	.000E+00	2.357E-34	.000E+00	14400
1459171	1.120E-16	1.143E-16	1.120E-16	11093	2084132	.000E+00	1.035E-37	.000E+00	14407
1459674	7.981E-16	8.144E-16	7.981E-16	11298	2085047	.000E+00	.000E+00	.000E+00	14413
1460171	5.680E-15	5.804E-15	5.680E-15	11503					
1460674	4.054E-14	4.136E-14	4.054E-14	11708					
1461177	2.869E-13	2.944E-13	2.869E-13	11912					
1461679	2.056E-12	2.101E-12	2.056E-12	12117					
1462182	1.467E-11	1.497E-11	1.467E-11	12322					
1462685	1.067E-10	1.067E-10	1.067E-10	12527					
1463188	7.604E-10	7.604E-10	7.604E-10	12731					
1463691	5.311E-09	5.420E-09	5.311E-09	12936					
1464194	3.745E-08	3.862E-08	3.745E-08	13141					
1464697	2.668E-07	2.753E-07	2.668E-07	13346					
1465199	1.962E-06	1.962E-06	1.962E-06	13550					
1465702	1.370E-05	1.370E-05	1.370E-05	13755					

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND HAND RELEASE OF ALL OF THE YP 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PA231 FROM 1235

NUCLIDE U235 PA231

HALF LIFE, YR	7.04E+08	3.25E+04	.00E+00	2074062	9.809E-04	9.784E-04	8.534E-04	8.534E-04	14337
DECAY NUMBER	1.42E-07	3.09E-03	.00E+00	2074977	8.556E-04	8.534E-04	8.534E-04	8.534E-04	14343
DISTRIB COEF	1.43E+04	1.67E+04	.00E+00	2075893	7.463E-04	7.444E-04	7.444E-04	7.444E-04	14350
YR 2000 CURIES	2.26E+01	.00E+00	.00E+00	2076808	6.509E-04	6.493E-04	6.493E-04	6.493E-04	14356
PULSE G-ATOMS	4.47E+04	.00E+00	.00E+00	2077724	5.678E-04	5.663E-04	5.663E-04	5.663E-04	14362
NUCL VEL, M/YR	4.84E-06	4.15E-06	.00E+00	2078639	4.953E-04	4.940E-04	4.940E-04	4.940E-04	14369
DISCH TIME, YR	2.07E+06	2.41E+06	.00E+00	2079555	4.320E-04	4.309E-04	4.309E-04	4.309E-04	14375
DIM DISC TIME	1.43E+04	1.67E+04	.00E+00	2080470	3.768E-04	3.758E-04	3.758E-04	3.758E-04	14381
LEACH RATE=	.003000	FRACTION PER YEAR		2081366	3.287E-04	3.278E-04	3.278E-04	3.278E-04	14388
LEACH DURATION=	333 YEARS			2082301	2.867E-04	2.860E-04	2.860E-04	2.860E-04	14394
PATH LENGTH=	10.00 MILES			2083217	2.501E-04	2.494E-04	2.494E-04	2.494E-04	14400
DIMENSIONLESS DISTANCE=	1.00			2084132	2.181E-04	2.176E-04	2.176E-04	2.176E-04	14407
WATER VELOCITY=	1.00 FT/DAY			2085048	1.903E-04	1.898E-04	1.898E-04	1.898E-04	14413
WATER TRAVEL TIME=	145 YEARS			2100641	1.859E-04	1.850E-05	1.850E-05	1.850E-05	14529
AXIAL DISPERSION COEFFICIENT=	.0080 CM ² /MIN			2116234	1.809E-06	1.804E-06	1.804E-06	1.804E-06	14629
PEQLET NUMBER=	4.26E+06			2131827	1.764E-07	1.759E-07	1.759E-07	1.759E-07	14736
NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION				2147420	1.720E-08	1.715E-08	1.715E-08	1.715E-08	14844
INITIAL BREAKTHROUGH AT 2066/78 YEARS				2163013	1.672E-09	1.672E-09	1.672E-09	1.672E-09	14952
PEAK DISCHARGE RATE= 2.55E-03 CURIES PER YEAR AT 2067453 YEARS				2178607	1.631E-10	1.631E-10	1.631E-10	1.631E-10	15060
RAND WIDTH= 344412 YEARS WITH TAIL END AT 2411150 YEARS				2194200	1.594E-11	1.590E-11	1.590E-11	1.590E-11	15168
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00				2209793	1.556E-12	1.550E-12	1.550E-12	1.550E-12	15275
				2225386	1.516E-13	1.512E-13	1.512E-13	1.512E-13	15383
				2240979	1.474E-14	1.474E-14	1.474E-14	1.474E-14	15491
				2256572	1.441E-15	1.437E-15	1.437E-15	1.437E-15	15599
				2272165	1.405E-16	1.401E-16	1.401E-16	1.401E-16	15707
				2287758	1.370E-17	1.366E-17	1.366E-17	1.366E-17	15814
				2303351	1.336E-18	1.332E-18	1.332E-18	1.332E-18	15922
				2318944	1.302E-19	1.299E-19	1.299E-19	1.299E-19	16030
				2334537	1.270E-20	1.267E-20	1.267E-20	1.267E-20	16138
				2350131	1.238E-21	1.235E-21	1.235E-21	1.235E-21	16245
				2365724	1.207E-22	1.204E-22	1.204E-22	1.204E-22	16353
				2381317	1.174E-23	1.174E-23	1.174E-23	1.174E-23	16461
				2396910	1.148E-24	1.145E-24	1.145E-24	1.145E-24	16569
				2397622	1.032E-24	1.029E-24	1.029E-24	1.029E-24	16574
				2398334	9.280E-25	9.256E-25	9.256E-25	9.256E-25	16579
				2399045	8.345E-25	8.323E-25	8.323E-25	8.323E-25	16584
				2399758	7.503E-25	7.484E-25	7.484E-25	7.484E-25	16589
				2400470	6.747E-25	6.729E-25	6.729E-25	6.729E-25	16593
				2401182	6.050E-25	6.050E-25	6.050E-25	6.050E-25	16598
				2401894	5.454E-25	5.440E-25	5.440E-25	5.440E-25	16603
				2402606	4.905E-25	4.892E-25	4.892E-25	4.892E-25	16608
				2403318	4.410E-25	4.399E-25	4.399E-25	4.399E-25	16613
				2404030	3.965E-25	3.955E-25	3.955E-25	3.955E-25	16618
				2404742	3.565E-25	3.556E-25	3.556E-25	3.556E-25	16623
				2405454	3.206E-25	3.197E-25	3.197E-25	3.197E-25	16628
				2406166	2.883E-25	2.873E-25	2.873E-25	2.873E-25	16633
				2406878	2.592E-25	2.577E-25	2.577E-25	2.577E-25	16638
				2407590	2.331E-25	2.300E-25	2.300E-25	2.300E-25	16643
				2410438	1.964E-25	1.964E-25	1.964E-25	1.964E-25	16648
				2411150	1.725E-26	1.725E-26	1.725E-26	1.725E-26	16653
				2411862	.000E+00	.000E+00	.000E+00	.000E+00	16658
				2412574	.000E+00	.000E+00	.000E+00	.000E+00	16663
				2413286	.000E+00	.000E+00	.000E+00	.000E+00	16668
				2413998	.000E+00	.000E+00	.000E+00	.000E+00	16673

2414710	.000F+00	1.843E-27	.000E+00	16492	478945	.000F+00	5.656E-35	.000E+00	3310
2415422	.000E+00	5.503E-28	.000E+00	16497	479151	.000F+00	2.879E-32	.000E+00	3312
2416134	.000E+00	1.390E-28	.000E+00	16702	479357	.000E+00	9.910E-30	.000E+00	3313
2416846	.000F+00	2.961E-29	.000E+00	16707	479563	.000E+00	2.310E-27	.000E+00	3314
2417554	.000E+00	5.306E-30	.000E+00	16712	479769	.000E+00	3.650E-25	.000E+00	3316
2418270	.000F+00	7.948E-31	.000E+00	16717	479974	.000E+00	3.918E-23	.000E+00	3317
2418982	.000E+00	1.009E-31	.000E+00	16721	480180	.000E+00	2.855E-21	.000E+00	3319
2419694	.000E+00	1.048E-32	.000E+00	16726	480385	.000E+00	1.418E-19	.000E+00	3320
2420406	.000E+00	9.464E-34	.000E+00	16731	480591	.000E+00	4.808E-18	.000E+00	3322
2421118	.000F+00	7.018E-35	.000E+00	16736	480797	.000E+00	1.115E-16	.000E+00	3323
2421830	.000F+00	4.353E-36	.000E+00	16741	481003	.000E+00	1.777E-15	.000E+00	3324
2422542	.000E+00	2.257E-37	.000E+00	16746	481208	.000E+00	1.951E-14	.000E+00	3326
2423254	.000E+00	9.792E-39	.000E+00	16751	481414	.000E+00	1.487E-13	.000E+00	3327
2423966	.000E+00	.000E+00	.000E+00	16756	481620	.000E+00	7.930E-13	.000E+00	3329
					481826	.000E+00	2.993E-12	.000E+00	3330
					482031	1.714E-11	8.148E-12	1.714E-11	3332
					482237	1.714E-11	1.643E-11	1.714E-11	3333
					482443	1.714E-11	2.558E-11	1.714E-11	3334
					482657	3.783E-11	3.273E-11	3.783E-11	3336
					482870	3.780E-11	3.631E-11	3.780E-11	3337
					483084	3.783E-11	3.751E-11	3.783E-11	3339
					483298	3.781E-11	3.778E-11	3.781E-11	3340
					483511	3.781E-11	3.782E-11	3.781E-11	3342
					483725	3.781E-11	3.783E-11	3.781E-11	3343
					483939	3.781E-11	3.783E-11	3.781E-11	3345
					484153	3.781E-11	3.783E-11	3.781E-11	3346
					484366	3.781E-11	3.783E-11	3.781E-11	3348
					484580	3.781E-11	3.783E-11	3.781E-11	3349
					484794	3.783E-11	3.783E-11	3.783E-11	3351
					485007	3.783E-11	3.783E-11	3.783E-11	3352
					485221	3.783E-11	3.783E-11	3.783E-11	3354
					485435	3.783E-11	3.783E-11	3.783E-11	3355
					485649	3.783E-11	3.783E-11	3.783E-11	3357
					485862	3.781E-11	3.783E-11	3.781E-11	3358
					486075	3.781E-11	3.783E-11	3.781E-11	3359
					486290	3.781E-11	3.783E-11	3.781E-11	3361
					486503	3.781E-11	3.783E-11	3.781E-11	3362
					486717	3.783E-11	3.783E-11	3.783E-11	3364
					544636	3.784E-11	3.786E-11	3.784E-11	3904
					642956	3.790E-11	3.790E-11	3.790E-11	4444
					721075	3.793E-11	3.793E-11	3.793E-11	4984
					799195	3.797E-11	3.797E-11	3.797E-11	5524
					877314	3.799E-11	3.799E-11	3.799E-11	6064
					955434	3.805E-11	3.805E-11	3.805E-11	6604
					1033553	3.807E-11	3.807E-11	3.807E-11	7144
					1111673	3.811E-11	3.812E-11	3.811E-11	7684
					1187992	3.814E-11	3.816E-11	3.814E-11	8224
					1267912	3.817E-11	3.820E-11	3.817E-11	8764
					1346031	3.823E-11	3.823E-11	3.823E-11	9304
					1424151	3.825E-11	3.827E-11	3.825E-11	9844
					1502270	3.830E-11	3.831E-11	3.830E-11	10384
					1580390	3.834E-11	3.834E-11	3.834E-11	10924
					1658509	3.839E-11	3.838E-11	3.839E-11	11464
					1736629	3.840E-11	3.842E-11	3.840E-11	12004

MIGRATION OF RADIOISOTOPE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND HAND RELEASE OF ALL OF THE YP 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS
NUCLIDE: U235 FROM CM247

NUCLIDE U235 F U235 F
HALF LIFE, YR 1.54E+07 7.04E+08 .00E+00
DECAY NUMBER 6.51E-06 1.42E-07 .00E+00
DISTRIB COEF 3.33E+03 1.43E+04 .00E+00
YR 2000 CURIES 1.29E-01 .00E+00 .00E+00
PULSE G-AT/MY 2.55E+00 .00E+00 .00E+00
NUCL VEL/MY 2.07E-05 4.84E-06 .00E+00
DISCH TIME/YR 4.82E+05 2.07E+06 .00E+00
DIM DISC TIME 3.33E+03 1.43E+04 .00E+00
LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
PATH LENGTH= 10.00 MILES
DIMENSIONLESS DISTANCE= 1.00
WATER VELOCITY= 1.00 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .0000 CM12/MIN
PELLET NUMBER= 4.26E+06
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 482443 YEARS
PEAK DISCHARGE RATE= 3.78E-11 CURIES PER YEAR AT 482457 YEARS
HAND MUTE= 1583413 YEARS WITH TAIL END AT 2065456 YEARS
DISPERSION PEAK/NU-CLIDE DISPERSION PEAK = .00E+00

TIME, YR DISC RATE, CT/YR PULSE RATE HAND RATE DIM TIME
474534 .000F+00 .000E+00 .000E+00 3307
474739 .000E+00 7.511E-38 .000E+00 3309

1814748	3.845E-11	3.846E-11	3.845E-11	12544	DISTRIB COEF	3.33E+03	1.00E+04	.00E+00
1892868	3.849E-11	3.849E-11	3.849E-11	13084	YR 2000 CURIES	4.03E+04	.00E+00	.00E+00
1970987	3.852E-11	3.852E-11	3.852E-11	13625	PULSE G-AT045	3.62E-01	.00E+00	.00E+00
2049107	3.855E-11	3.855E-11	3.855E-11	14165	NUCL VEL/MI/YR	2.07E-05	6.91E-06	.00E+00
2049989	3.855E-11	3.855E-11	3.855E-11	14171	DISCH TIME/YR	4.52E-05	1.45E-06	.00E+00
2050870	3.857E-11	3.857E-11	3.857E-11	14177	DIM DISC TIME	3.33E+03	1.00E+04	.00E+00
2051752	3.857E-11	3.857E-11	3.857E-11	14183	LEACH RATE=	.003000	FRACTION PER YEAR	
2052633	3.855E-11	3.855E-11	3.855E-11	14189	LEACH DURATION=	333 YEARS		
2053515	3.855E-11	3.855E-11	3.855E-11	14195	PATH LENGTH=	10.00 MILES		
2054396	3.857E-11	3.857E-11	3.857E-11	14201	DIMENSIONLESS DISTANCE=	1.00		
2055278	3.857E-11	3.857E-11	3.857E-11	14207	WATER VELOCITY=	1.00 FT/DAY		
2057061	3.855E-11	3.855E-11	3.855E-11	14219	AXIAL DISPERSION COEFFICIENT=	.0080 CM12/MIN		
2057922	3.855E-11	3.855E-11	3.855E-11	14225	NUCLEIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION			
2058804	3.855E-11	3.855E-11	3.855E-11	14232	PEAK DISCHARGE RATE AT 1443308 YEARS			
2060567	3.855E-11	3.855E-11	3.855E-11	14244	INITIAL BREAKTHROUGH AT 1443308 YEARS			
2061449	3.855E-11	3.855E-11	3.855E-11	14250	PEAK DISCHARGE RATE= 2.15E-18 CURIES PER YEAR AT 1446797 YEARS			
2062330	3.857E-11	3.857E-11	3.857E-11	14256	BAND WIDTH=	3489 YEARS WITH TAIL END AT 1446797 YEARS		
2063212	3.858E-11	3.858E-11	3.858E-11	14262	DISPERSION PFAK/NO-DISPERSION PEAK = .00E+00			
2064093	3.857E-11	3.857E-11	3.857E-11	14268				
2064975	3.855E-11	3.855E-11	3.855E-11	14274				
2065856	3.855E-11	3.855E-11	3.855E-11	14280				
2066738	.000E+00	1.81E-11	.000E+00	14286				
2067653	.000E+00	9.11E-12	.000E+00	14293				
2068459	.000E+00	3.32E-12	.000E+00	14299				
2069454	.000E+00	8.57E-13	.000E+00	14305				
2070400	.000E+00	1.53E-13	.000E+00	14312				
2071315	.000E+00	1.54E-14	.000E+00	14318				
2072231	.000E+00	1.54E-15	.000E+00	14324				
2073146	.000E+00	8.58E-17	.000E+00	14331				
2074062	.000E+00	3.21E-18	.000E+00	14337				
2074977	.000E+00	8.05E-20	.000E+00	14343				
2075893	.000E+00	1.35E-21	.000E+00	14350				
2076808	.000E+00	1.51E-23	.000E+00	14356				
2077724	.000E+00	1.174E-25	.000E+00	14362				
2078634	.000E+00	5.661E-28	.000E+00	14369				
2079555	.000E+00	1.88E-30	.000E+00	14375				
2080470	.000E+00	4.18E-33	.000E+00	14381				
2081386	.000E+00	6.20E-36	.000E+00	14388				
2082301	.000E+00	6.123E-39	.000E+00	14394				
2083217	.000E+00	.000E+00	.000E+00	14400				

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PU239 FRM CM243

NUCLIDE	CM243	PU239
HALF LIFE, YR	2.48E+01	2.44E+04
DECAY NUMBER	3.58E+00	4.11E+03
		.00E+00
		.00E+00

1441812	.000E+00	3.48E-24	.000E+00	9956
1442311	6.781E-37	3.38E-23	6.781E-37	9970
1442809	6.781E-37	2.55E-22	6.781E-37	9973
1443308	6.781E-37	1.50E-21	6.781E-37	9977
1443806	3.174E-34	6.88E-21	3.174E-34	9980
1444305	1.484E-31	2.44E-20	1.484E-31	9984
1444803	6.947E-29	6.77E-20	6.947E-29	9997
1445301	3.250E-26	1.45E-19	3.250E-26	9991
1445800	1.521E-23	2.437E-19	1.521E-23	9994
1446298	7.115E-21	3.172E-19	7.115E-21	9997
1446797	2.152E-18	3.20E-19	2.152E-18	10001
1447295	.000E+00	2.52E-19	.000E+00	10004
1447794	.000E+00	.000E+00	.000E+00	10008
1448292	.000E+00	.000E+00	.000E+00	10011
1448791	.000E+00	.000E+00	.000E+00	10015
1449289	.000E+00	.000E+00	.000E+00	10018
1449787	.000E+00	.000E+00	.000E+00	10022
1450285	.000E+00	.000E+00	.000E+00	10025
1450784	.000E+00	.000E+00	.000E+00	10028
1451283	.000E+00	.000E+00	.000E+00	10032
1451781	.000E+00	.000E+00	.000E+00	10035
1452280	.000E+00	.000E+00	.000E+00	10039
1452778	.000E+00	.000E+00	.000E+00	10042
1453276	.000E+00	.000E+00	.000E+00	10046
1453775	.000E+00	.000E+00	.000E+00	10049
1454273	.000E+00	.000E+00	.000E+00	10053
1454772	.000E+00	.000E+00	.000E+00	10056
1455270	.000E+00	.000E+00	.000E+00	10059
1455769	.000E+00	.000E+00	.000E+00	10063
1456267	.000E+00	.000E+00	.000E+00	10066
1456765	.000E+00	.000E+00	.000E+00	10070

I.3 Three-Member Chain Migration Results

I.3 Three-Member Chain Migration Results

MIGRATION OF RADIOISOTOPE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YD 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: U236 VIA PU240 FROM CM244

NUCLIDE CM244 PU240 U236 V
HALF LIFE YR 1.79E+01 6.54E+03 2.34E+07
DECAY NUMBER 5.60E+00 1.53E-02 4.24E-06
DISTRIB COEF 3.33E+03 1.00E+04 1.43E+04
YR 2000 CURIES 4.71E+08 .00E+00 .00E+00
PULSE G-ATOMS 5.10E+02 6.91E-06 4.84E-06
NUCL VEL*MI/YR 2.07E-05 1.45E-04 2.07E-06
DISCH TIME/YR 4.82E+05 1.00E+04 1.43E+04
DIM DISC TIME 3.34E+03 1.00E+04 1.43E+04
LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
PATH LENGTH 10.00 MILES
DIMENSIONLESS DISTANCE= 1.00
WATER VELOCITY= 1.00 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .0080 CM²/MIN
PECLT NUMBER= 4.26E+06
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 1747635 YEARS
PEAK DISCHARGE RATE= 1.17E-04 CURIES PER YEAR AT 2065822 YEARS
HAND WIDTH= 318187 YEARS WITH TAIL END AT 2065822 YEARS
DISPERSION PPAK/NO-DISPERSION PEAK = .00E+00

TIME*YR DISC RATE*CI/YR PULSE RATE BAND RATE DIM TIME

1717558	.000E+00	.000E+00	.000E+00	11873
1747635	8.04E-39	1.11E-37	8.06E-39	12080
1777715	1.36E-35	1.84E-34	1.36E-35	12288
1807794	2.31E-32	3.20E-31	2.31E-32	12496
1837873	3.93E-29	5.43E-28	3.93E-29	12704
1867953	6.66E-26	9.20E-25	6.66E-26	12912
1898032	1.13E-22	1.561E-21	1.13E-22	13120
1928111	1.91E-19	2.64E-18	1.91E-19	13328
1958191	3.24E-16	4.68E-15	3.24E-16	13536
1988270	5.50E-13	7.80E-12	5.50E-13	13744
2018349	9.33E-10	1.24E-08	9.33E-10	13952
2048428	1.50E-06	2.07E-05	1.50E-06	14160
2078507	2.41E-03	3.38E-02	2.41E-03	14368
2108586	3.82E-00	5.43E-00	3.82E-00	14576
2138665	5.83E-03	8.33E-03	5.83E-03	14784
2168744	8.74E-06	1.25E-06	8.74E-06	14992
2198823	1.31E-09	1.87E-09	1.31E-09	15200
2228902	2.00E-12	2.90E-12	2.00E-12	15408
2258981	3.00E-15	4.35E-15	3.00E-15	15616
2289060	4.50E-18	6.52E-18	4.50E-18	15824
2319139	6.75E-21	9.78E-21	6.75E-21	16032
2349218	1.01E-24	1.46E-24	1.01E-24	16240
2379297	1.52E-27	2.19E-27	1.52E-27	16448
2409376	2.28E-30	3.28E-30	2.28E-30	16656
2439455	3.42E-33	4.92E-33	3.42E-33	16864
2469534	5.13E-36	7.23E-36	5.13E-36	17072
2499613	7.70E-39	1.08E-38	7.70E-39	17280
2529692	1.15E-42	1.62E-42	1.15E-42	17488
2559771	1.73E-45	2.43E-45	1.73E-45	17696
2589850	2.59E-48	3.65E-48	2.59E-48	17904
2619929	3.88E-51	5.47E-51	3.88E-51	18112
2650008	5.82E-54	8.20E-54	5.82E-54	18320
2680087	8.73E-57	1.23E-56	8.73E-57	18528
2710166	1.31E-60	1.84E-59	1.31E-60	18736
2740245	1.96E-63	2.76E-62	1.96E-63	18944
2770324	2.94E-66	4.14E-65	2.94E-66	19152
2800403	4.41E-69	6.21E-68	4.41E-69	19360
2830482	6.61E-72	9.32E-71	6.61E-72	19568
2860561	9.91E-75	1.39E-74	9.91E-75	19776
2890640	1.48E-78	2.09E-77	1.48E-78	19984
2920719	2.22E-81	3.14E-80	2.22E-81	20192
2950798	3.33E-84	4.71E-83	3.33E-84	20400
2980877	5.00E-87	6.99E-86	5.00E-87	20608
3010956	7.50E-90	1.04E-89	7.50E-90	20816
3041035	1.12E-93	1.56E-92	1.12E-93	21024
3071114	1.68E-96	2.34E-95	1.68E-96	21232
3101193	2.52E-99	3.51E-98	2.52E-99	21440
3131272	3.78E-102	5.26E-101	3.78E-102	21648
3161351	5.67E-105	7.77E-104	5.67E-105	21856
3191430	8.50E-108	1.16E-107	8.50E-108	22064
3221509	1.27E-111	1.74E-110	1.27E-111	22272
3251588	1.91E-114	2.61E-113	1.91E-114	22480
3281667	2.86E-117	3.91E-116	2.86E-117	22688
3311746	4.29E-120	5.86E-119	4.29E-120	22896
3341825	6.43E-123	8.79E-122	6.43E-123	23104
3371904	9.65E-126	1.32E-125	9.65E-126	23312
3401983	1.44E-129	1.98E-128	1.44E-129	23520
3432062	2.16E-132	2.97E-131	2.16E-132	23728
3462141	3.24E-135	4.46E-134	3.24E-135	23936
3492220	4.86E-138	6.69E-137	4.86E-138	24144
3522299	7.29E-141	1.01E-140	7.29E-141	24352
3552378	1.09E-144	1.51E-143	1.09E-144	24560
3582457	1.63E-147	2.26E-146	1.63E-147	24768
3612536	2.45E-150	3.39E-149	2.45E-150	24976
3642615	3.68E-153	5.11E-152	3.68E-153	25184
3672694	5.52E-156	7.52E-155	5.52E-156	25392
3702773	8.28E-159	1.13E-158	8.28E-159	25600
3732852	1.24E-162	1.70E-161	1.24E-162	25808
3762931	1.86E-165	2.55E-164	1.86E-165	26016
3793010	2.79E-168	3.82E-167	2.79E-168	26224
3823089	4.18E-171	5.67E-170	4.18E-171	26432
3853168	6.27E-174	8.41E-173	6.27E-174	26640
3883247	9.41E-177	1.26E-176	9.41E-177	26848
3913326	1.41E-180	1.87E-179	1.41E-180	27056
3943405	2.12E-183	2.79E-182	2.12E-183	27264
3973484	3.18E-186	4.18E-185	3.18E-186	27472
4003563	4.77E-189	6.27E-188	4.77E-189	27680
4033642	7.15E-192	9.20E-191	7.15E-192	27888
4063721	1.07E-195	1.37E-194	1.07E-195	28096
4093800	1.61E-198	2.05E-197	1.61E-198	28304
4123879	2.41E-201	3.08E-200	2.41E-201	28512
4153958	3.59E-204	4.62E-203	3.59E-204	28720
4184037	5.38E-207	6.81E-206	5.38E-207	28928
4214116	8.06E-210	1.02E-209	8.06E-210	29136
4244195	1.21E-213	1.51E-212	1.21E-213	29344
4274274	1.81E-216	2.26E-215	1.81E-216	29552
4304353	2.71E-219	3.39E-218	2.71E-219	29760
4334432	4.06E-222	5.00E-221	4.06E-222	29968
4364511	6.09E-225	7.35E-224	6.09E-225	30176
4394590	9.07E-228	1.09E-227	9.07E-228	30384
4424669	1.36E-231	1.62E-230	1.36E-231	30592
4454748	2.04E-234	2.39E-233	2.04E-234	30800
4484827	3.06E-237	3.58E-236	3.06E-237	31008
4514906	4.55E-240	5.26E-239	4.55E-240	31216
4544985	6.82E-243	7.77E-242	6.82E-243	31424
4575064	1.02E-246	1.16E-245	1.02E-246	31632
4605143	1.52E-249	1.74E-248	1.52E-249	31840
4635222	2.25E-252	2.55E-251	2.25E-252	32048
4665301	3.38E-255	3.82E-254	3.38E-255	32256
4695380	5.06E-258	5.67E-257	5.06E-258	32464
4725459	7.50E-261	8.41E-260	7.50E-261	32672
4755538	1.11E-264	1.26E-263	1.11E-264	32880
4785617	1.66E-267	1.87E-266	1.66E-267	33088
4815696	2.49E-270	2.71E-269	2.49E-270	33296
4845775	3.71E-273	4.00E-272	3.71E-273	33504
4875854	5.52E-276	5.86E-275	5.52E-276	33712
4905933	8.28E-279	8.79E-278	8.28E-279	33920
4936012	1.24E-282	1.32E-281	1.24E-282	34128
4966091	1.86E-285	2.05E-284	1.86E-285	34336
4996170	2.79E-288	3.08E-287	2.79E-288	34544
5026249	4.18E-291	4.62E-290	4.18E-291	34752
5056328	6.27E-294	6.81E-293	6.27E-294	34960
5086407	9.41E-297	1.02E-296	9.41E-297	35168
5116486	1.41E-300	1.51E-299	1.41E-300	35376
5146565	2.12E-303	2.26E-302	2.12E-303	35584
5176644	3.18E-306	3.39E-305	3.18E-306	35792
5206723	4.77E-309	5.00E-308	4.77E-309	36000
5236802	7.15E-312	7.35E-311	7.15E-312	36208
5266881	1.07E-315	1.09E-314	1.07E-315	36416
5296960	1.61E-318	1.62E-317	1.61E-318	36624
5327039	2.41E-321	2.39E-320	2.41E-321	36832
5357118	3.59E-324	3.58E-323	3.59E-324	37040
5387197	5.38E-327	5.26E-326	5.38E-327	37248
5417276	8.06E-330	7.77E-329	8.06E-330	37456
5447355	1.21E-333	1.16E-332	1.21E-333	37664
5477434	1.81E-336	1.74E-335	1.81E-336	37872
5507513	2.71E-339	2.55E-338	2.71E-339	38080
5537592	4.06E-342	3.82E-341	4.06E-342	38288
5567671	6.09E-345	5.67E-344	6.09E-345	38496
5597750	9.07E-348	8.41E-347	9.07E-348	38704
5627829	1.36E-351	1.26E-350	1.36E-351	38912
5657908	2.04E-354	1.87E-353	2.04E-354	39120
5687987	3.06E-357	2.71E-356	3.06E-357	39328
5718066	4.55E-360	4.00E-359	4.55E-360	39536
5748145	6.82E-363	5.86E-362	6.82E-363	39744
5778224	1.02E-366	8.79E-365	1.02E-366	39952
5808303	1.52E-369	1.32E-368	1.52E-369	40160
5838382	2.25E-372	2.05E-371	2.25E-372	40368
5868461	3.38E-375	3.08E-374	3.38E-375	40576
5898540	5.06E-378	4.62E-377	5.06E-378	40784
5928619	7.50E-381	6.81E-380	7.50E-381	40992
5958698	1.11E-384	1.02E-383	1.11E-384	41200
5988777	1.66E-387	1.51E-386	1.66E-387	41408
6018856	2.49E-390	2.26E-389	2.49E-390	41616
6048935	3.71E-393	3.39E-392	3.71E-393	41824
6079014	5.52E-396	5.00E-395	5.52E-396	42032
6109093	8.28E-399	7.35E-398	8.28E-399	42240
6139172	1.24E-402	1.09E-401	1.24E-402	42448
6169251	1.86E-405	1.62E-404	1.86E-405	42656
6199330	2.79E-408	2.39E-407	2.79E-408	42864
6229409	4.18E-411	3.58E-410	4.18E-411	43072
6259488	6.27E-414	5.26E-413	6.27E-414	43280
6289567	9.41E-417	7.77E-416	9.41E-417	43488
6319646	1.41E-420	1.16E-419	1.41E-420	43696
6349725	2.12E-423	1.74E-422	2.12E-423	43904
6379804	3.18E-426	2.55E-425	3.18E-426	44112
6409883	4.77E-429	3.82E-428	4.77E-429	44320
6439962	7.15E-432	5.67E-431	7.15E-432	44528
6470041	1.07E-435	8.41E-434	1.07E-435	44736
6500120	1.61E-438	1.26E-437	1.61E-438	44944
6530199	2.41E-441	1.87E-440	2.41E-441	45152
6560278	3.59E-444	2.71E-443	3.59E-444	45360
6590357	5.38E-447	4.00E-446	5.38E-447	45568
6620436	8.06E-450	5.86E-449	8.06E-450	45776
6650515	1.21E-453	8.79E-452	1.21E-453	45984
6680594	1.81E-456	1.32E-455	1.81E-456	46192
6710673	2.71E-459	2.05E-458	2.71E-459	46400
6740752	4.06E-462	3.08E-461	4.06E-462	46608
6770831	6.09E-465	4.62E-46		

WATER TRAVEL TIME = 145 YEARS
 AXIAL DISPERSION COEFFICIENT = .0080 CM/2/MIN
 PORE NUMBER = 4.26E+06
 NUCLEI DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 177715 YEARS
 PEAK DISCHARGE RATE = 2.33E-08 CUPES PER YEAR AT 2085048 YEARS
 BAND WIDTH = 5455201 YEARS WITH TAIL END AT 7232915 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME-YR	DISC RATE-CI/YR	PULSE RATE	BAND RATE	DIM TIME
1747635	.000E+00	.000E+00	12081	1.613E-08
1777715	1.474E-39	1.474E-39	12288	1.629E-08
1807794	2.494E-36	2.494E-36	12496	1.629E-08
1837873	4.237E-33	4.237E-33	12704	1.631E-08
1867953	7.163E-30	7.163E-30	12912	1.629E-08
1898032	1.213E-26	1.213E-26	13120	1.649E-08
1928111	2.065E-23	2.065E-23	13328	1.677E-08
1958191	3.500E-20	3.500E-20	13536	1.629E-08
1988270	5.934E-17	5.934E-17	13744	1.722E-08
2018350	1.006E-13	1.006E-13	13952	1.629E-08
2048429	1.706E-10	1.706E-10	14160	1.629E-08
2078508	2.411E-07	2.411E-07	14368	1.629E-08
2108587	3.023E-04	3.023E-04	14576	1.629E-08
2138666	3.740E-01	3.740E-01	14784	1.629E-08
2168745	4.217E-02	4.217E-02	14992	1.629E-08
2198824	5.940E-01	5.940E-01	15200	1.629E-08
2228903	7.473E-10	7.473E-10	15408	1.629E-08
2258982	9.371E-10	9.371E-10	15616	1.629E-08
2289061	1.043E-09	1.043E-09	15824	1.629E-08
2319140	1.307E-09	1.307E-09	16032	1.629E-08
2349219	1.639E-09	1.639E-09	16240	1.629E-08
2379298	2.056E-09	2.056E-09	16448	1.629E-08
2409377	2.576E-09	2.576E-09	16656	1.629E-08
2439456	3.232E-09	3.232E-09	16864	1.629E-08
2469535	4.053E-09	4.053E-09	17072	1.629E-08
2499614	5.084E-09	5.084E-09	17280	1.629E-08
2529693	6.373E-09	6.373E-09	17488	1.629E-08
2559772	7.991E-09	7.991E-09	17696	1.629E-08
2589851	9.944E-09	9.944E-09	17904	1.629E-08
2619930	1.247E-08	1.247E-08	18112	1.629E-08
2649999	1.595E-08	1.595E-08	18320	1.629E-08
2680078	2.056E-08	2.056E-08	18528	1.629E-08
2710157	2.674E-08	2.674E-08	18736	1.629E-08
2740236	3.500E-08	3.500E-08	18944	1.629E-08
2770315	4.615E-08	4.615E-08	19152	1.629E-08
2800394	6.077E-08	6.077E-08	19360	1.629E-08
2830473	8.044E-08	8.044E-08	19568	1.629E-08
2860552	1.070E-07	1.070E-07	19776	1.629E-08
2890631	1.423E-07	1.423E-07	19984	1.629E-08
2920710	1.891E-07	1.891E-07	20192	1.629E-08
2950789	2.500E-07	2.500E-07	20400	1.629E-08
2980868	3.294E-07	3.294E-07	20608	1.629E-08
3010947	4.423E-07	4.423E-07	20816	1.629E-08
3041026	5.940E-07	5.940E-07	21024	1.629E-08
3071105	7.991E-07	7.991E-07	21232	1.629E-08
3101184	1.070E-06	1.070E-06	21440	1.629E-08
3131263	1.423E-06	1.423E-06	21648	1.629E-08
3161342	1.891E-06	1.891E-06	21856	1.629E-08
3191421	2.500E-06	2.500E-06	22064	1.629E-08
3221500	3.294E-06	3.294E-06	22272	1.629E-08
3251579	4.423E-06	4.423E-06	22480	1.629E-08
3281658	5.940E-06	5.940E-06	22688	1.629E-08
3311737	7.991E-06	7.991E-06	22896	1.629E-08
3341816	1.070E-05	1.070E-05	23104	1.629E-08
3371895	1.423E-05	1.423E-05	23312	1.629E-08
3401974	1.891E-05	1.891E-05	23520	1.629E-08
3432053	2.500E-05	2.500E-05	23728	1.629E-08
3462132	3.294E-05	3.294E-05	23936	1.629E-08
3492211	4.423E-05	4.423E-05	24144	1.629E-08
3522290	5.940E-05	5.940E-05	24352	1.629E-08
3552369	7.991E-05	7.991E-05	24560	1.629E-08
3582448	1.070E-04	1.070E-04	24768	1.629E-08
3612527	1.423E-04	1.423E-04	24976	1.629E-08
3642606	1.891E-04	1.891E-04	25184	1.629E-08
3672685	2.500E-04	2.500E-04	25392	1.629E-08
3702764	3.294E-04	3.294E-04	25600	1.629E-08
3732843	4.423E-04	4.423E-04	25808	1.629E-08
3762922	5.940E-04	5.940E-04	26016	1.629E-08
3792999	7.991E-04	7.991E-04	26224	1.629E-08
3823078	1.070E-03	1.070E-03	26432	1.629E-08
3853157	1.423E-03	1.423E-03	26640	1.629E-08
3883236	1.891E-03	1.891E-03	26848	1.629E-08
3913315	2.500E-03	2.500E-03	27056	1.629E-08
3943394	3.294E-03	3.294E-03	27264	1.629E-08
3973473	4.423E-03	4.423E-03	27472	1.629E-08
4003552	5.940E-03	5.940E-03	27680	1.629E-08
4033631	7.991E-03	7.991E-03	27888	1.629E-08
4063710	1.070E-02	1.070E-02	28096	1.629E-08
4093789	1.423E-02	1.423E-02	28304	1.629E-08
4123868	1.891E-02	1.891E-02	28512	1.629E-08
4153947	2.500E-02	2.500E-02	28720	1.629E-08
4184026	3.294E-02	3.294E-02	28928	1.629E-08
4214105	4.423E-02	4.423E-02	29136	1.629E-08
4244184	5.940E-02	5.940E-02	29344	1.629E-08
4274263	7.991E-02	7.991E-02	29552	1.629E-08
4304342	1.070E-01	1.070E-01	29760	1.629E-08
4334421	1.423E-01	1.423E-01	29968	1.629E-08
4364500	1.891E-01	1.891E-01	30176	1.629E-08
4394579	2.500E-01	2.500E-01	30384	1.629E-08
4424658	3.294E-01	3.294E-01	30592	1.629E-08
4454737	4.423E-01	4.423E-01	30800	1.629E-08
4484816	5.940E-01	5.940E-01	31008	1.629E-08
4514895	7.991E-01	7.991E-01	31216	1.629E-08
4544974	1.070E-00	1.070E-00	31424	1.629E-08
4575053	1.423E-00	1.423E-00	31632	1.629E-08
4605132	1.891E-00	1.891E-00	31840	1.629E-08
4635211	2.500E-00	2.500E-00	32048	1.629E-08
4665290	3.294E-00	3.294E-00	32256	1.629E-08
4695369	4.423E-00	4.423E-00	32464	1.629E-08
4725448	5.940E-00	5.940E-00	32672	1.629E-08
4755527	7.991E-00	7.991E-00	32880	1.629E-08
4785606	1.070E-01	1.070E-01	33088	1.629E-08
4815685	1.423E-01	1.423E-01	33296	1.629E-08
4845764	1.891E-01	1.891E-01	33504	1.629E-08
4875843	2.500E-01	2.500E-01	33712	1.629E-08
4905922	3.294E-01	3.294E-01	33920	1.629E-08
4936001	4.423E-01	4.423E-01	34128	1.629E-08
4966080	5.940E-01	5.940E-01	34336	1.629E-08
4996159	7.991E-01	7.991E-01	34544	1.629E-08
5026238	1.070E-00	1.070E-00	34752	1.629E-08
5056317	1.423E-00	1.423E-00	34960	1.629E-08
5086396	1.891E-00	1.891E-00	35168	1.629E-08
5116475	2.500E-00	2.500E-00	35376	1.629E-08
5146554	3.294E-00	3.294E-00	35584	1.629E-08
5176633	4.423E-00	4.423E-00	35792	1.629E-08
5206712	5.940E-00	5.940E-00	36000	1.629E-08
5236791	7.991E-00	7.991E-00	36208	1.629E-08
5266870	1.070E-01	1.070E-01	36416	1.629E-08
5296949	1.423E-01	1.423E-01	36624	1.629E-08
5327028	1.891E-01	1.891E-01	36832	1.629E-08
5357107	2.500E-01	2.500E-01	37040	1.629E-08
5387186	3.294E-01	3.294E-01	37248	1.629E-08
5417265	4.423E-01	4.423E-01	37456	1.629E-08
5447344	5.940E-01	5.940E-01	37664	1.629E-08
5477423	7.991E-01	7.991E-01	37872	1.629E-08
5507502	1.070E-00	1.070E-00	38080	1.629E-08
5537581	1.423E-00	1.423E-00	38288	1.629E-08
5567660	1.891E-00	1.891E-00	38496	1.629E-08
5597739	2.500E-00	2.500E-00	38704	1.629E-08
5627818	3.294E-00	3.294E-00	38912	1.629E-08
5657897	4.423E-00	4.423E-00	39120	1.629E-08
5687976	5.940E-00	5.940E-00	39328	1.629E-08
5718055	7.991E-00	7.991E-00	39536	1.629E-08
5748134	1.070E-01	1.070E-01	39744	1.629E-08
5778213	1.423E-01	1.423E-01	39952	1.629E-08
5808292	1.891E-01	1.891E-01	40160	1.629E-08
5838371	2.500E-01	2.500E-01	40368	1.629E-08
5868450	3.294E-01	3.294E-01	40576	1.629E-08
5898529	4.423E-01	4.423E-01	40784	1.629E-08
5928608	5.940E-01	5.940E-01	40992	1.629E-08
5958687	7.991E-01	7.991E-01	41200	1.629E-08
5988766	1.070E-00	1.070E-00	41408	1.629E-08
6018845	1.423E-00	1.423E-00	41616	1.629E-08
6048924	1.891E-00	1.891E-00	41824	1.629E-08
6079003	2.500E-00	2.500E-00	42032	1.629E-08
6109082	3.294E-00	3.294E-00	42240	1.629E-08
6139161	4.423E-00	4.423E-00	42448	1.629E-08
6169240	5.940E-00	5.940E-00	42656	1.629E-08
6199319	7.991E-00	7.991E-00	42864	1.629E-08
6229398	1.070E-01	1.070E-01	43072	1.629E-08
6259477	1.423E-01	1.423E-01	43280	1.629E-08
6289556	1.891E-01	1.891E-01	43488	1.629E-08
6319635	2.500E-01	2.500E-01	43696	1.629E-08
6349714	3.294E-01	3.294E-01	43904	1.629E-08
6379793	4.423E-01	4.423E-01	44112	1.629E-08
6409872	5.940E-01	5.940E-01	44320	1.629E-08
6439951	7.991E-01	7.991E-01	44528	1.629E-08
6470030	1.070E-00	1.070E-00	44736	1.629E-08
6500109	1.423E-00	1.423E-00	44944	1.629E-08
6530188	1.891E-00	1.891E-00	45152	1.629E-08
6560267	2.500E-00	2.500E-00	45360	1.629E-08
6590346	3.294E-00	3.294E-00	45568	1.629E-08
6620425	4.423E-00	4.423E-00	45776	1.629E-08
6650504	5.940E-00	5.940E-00	45984	1.629E-08
6680583	7.991E-00	7.991E-00	46192	1.629E-08
6710662	1.070E-01	1.070E-01	46400	1.629E-08
6740741	1.423E-01	1.423E-01	46608	1.629E-08
6770820	1.891E-01	1.891E-01	46816	1.629E-08
6800899	2.500E-01	2.500E-01	47024	1.629E-08
6830978	3.294E-01	3.294E-01	47232	1.629E-08
6861057	4.423E-01	4.423E-01	47440	1.629E-08
6891136	5.940E-01	5.940E-01	47648	1.629E-08
6921215	7.991E-01	7.991E-01	47856	1.629E-08
6951294	1.070E-00	1.070E-00	48064	1.629E-08
6981373	1.423E-00	1.423E-00	48272	1.629E-08
7011452	1.891E-00	1.89		

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: U236 VTA PU244 FROM CM24R

NUCLIDE CM24R PU244 U236 V

HALF LIFE, YR 3.50E+05 8.30E+07 2.34E+07

DECAY NUMBER 2.86E-04 1.21E-06 4.28E-06

DISTRIB COEF 3.33E+03 1.00E+04 1.43E+04

YR 2000 CURIES 5.01E-01 .00E+00 .00E+00

NUCL G-ATOMS 4.90E-01 .00E+00 .00E+00

NUCL VEL/M/YR 2.07E-05 6.91E-06 4.84E-06

DISCH TIME/YR 4.82E+05 1.45E+06 2.07E+06

DISC TIME 3.33E+03 1.00E+04 1.43E+04

LEACH RATE= .003000 FRACTION PER YEAR

LEACH DURATION= 333 YEARS

PATH LENGTH= 10.00 MILES

DIMENSIONLESS DISTANCE= 1.00

WATER VELOCITY= 1.00 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .00800 CM²/MIN

PECLET NUMBER= 4.26E+06

NUCLIDE DISCHARGE RATE FROM ANUHEM WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 482443 YEARS

PEAK DISCHARGE RATE= 4.44E-11 CURIES PER YEAR AT 1446627 YEARS

BAND WIDTH= 583379 YEARS WITH TAIL END AT 2065822 YEARS

DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME*YR DISC RATE*CI/YR PULSE RATE BAND RATE DIM TIME

482031	1.200E-14	1.438E-15	1.200E-14	3332
482237	1.200E-14	1.274E-15	1.200E-14	3333
482443	1.200E-14	3.462E-15	1.200E-14	3334
482670	8.100E-14	1.249E-14	8.100E-14	3337
483084	7.394E-14	1.732E-14	7.394E-14	3339
483294	6.953E-14	2.190E-14	6.953E-14	3340
483511	6.248E-14	2.657E-14	6.248E-14	3342
483725	5.542E-14	3.122E-14	5.542E-14	3343
484133	4.396E-14	4.055E-14	4.396E-14	3346
484365	3.602E-14	4.521E-14	3.602E-14	3348
484540	3.072E-14	4.947E-14	3.072E-14	3349
484744	2.455E-14	5.454E-14	2.455E-14	3351
484907	1.744E-14	5.921E-14	1.744E-14	3352
485221	1.220E-14	6.384E-14	1.220E-14	3354
485435	6.049E-15	6.850E-14	6.049E-15	3355
486717	2.629E-13	9.441E-14	2.629E-13	3364

534151	1.202E-12	1.174E-12	1.202E-12	3692
581586	2.397E-12	2.332E-12	2.397E-12	4020
629020	3.553E-12	3.575E-12	3.553E-12	4348
676454	4.963E-12	4.907E-12	4.963E-12	4676
723889	6.331E-12	6.335E-12	6.331E-12	5003
771323	7.952E-12	7.862E-12	7.952E-12	5331
818757	9.232E-12	9.495E-12	9.232E-12	5659
866192	1.136E-11	1.124E-11	1.136E-11	5987
913626	1.314E-11	1.310E-11	1.314E-11	6315
961060	1.517E-11	1.509E-11	1.517E-11	6643
1008495	1.714E-11	1.721E-11	1.714E-11	6971
1055929	1.937E-11	1.947E-11	1.937E-11	7299
1103363	2.184E-11	2.187E-11	2.184E-11	7627
1150798	2.425E-11	2.443E-11	2.425E-11	7955
1198232	2.721E-11	2.715E-11	2.721E-11	8283
1245666	3.010E-11	3.004E-11	3.010E-11	8610
1293101	3.324E-11	3.311E-11	3.324E-11	8934
1340535	3.661E-11	3.637E-11	3.661E-11	9266
1387970	3.992E-11	3.984E-11	3.992E-11	9594
1435404	4.346E-11	4.351E-11	4.346E-11	9922
1473113	4.666E-11	4.655E-11	4.666E-11	9934
147682	4.939E-11	4.936E-11	4.939E-11	9938
148252	4.346E-11	4.374E-11	4.346E-11	9942
1439961	4.382E-11	4.348E-11	4.382E-11	9954
1441670	4.373E-11	4.401E-11	4.373E-11	9965
1442240	4.400E-11	4.406E-11	4.400E-11	9969
1443944	4.391E-11	4.420E-11	4.391E-11	9981
1445657	4.432E-11	4.432E-11	4.432E-11	9993
1446227	4.436E-11	4.436E-11	4.436E-11	9997
1446797	4.437E-11	4.436E-11	4.437E-11	10001
1447390	4.437E-11	4.435E-11	4.437E-11	10005
1447983	4.433E-11	4.433E-11	4.433E-11	10009
1448577	4.430E-11	4.430E-11	4.430E-11	10013
1449170	4.426E-11	4.426E-11	4.426E-11	10017
1449764	4.423E-11	4.423E-11	4.423E-11	10021
1450357	4.419E-11	4.419E-11	4.419E-11	10025
1450950	4.415E-11	4.415E-11	4.415E-11	10030
1451544	4.411E-11	4.411E-11	4.411E-11	10034
1452137	4.408E-11	4.408E-11	4.408E-11	10038
1452731	4.404E-11	4.404E-11	4.404E-11	10042
1453324	4.400E-11	4.401E-11	4.400E-11	10046
1453917	4.397E-11	4.397E-11	4.397E-11	10050
1454511	4.393E-11	4.393E-11	4.393E-11	10054
1455104	4.390E-11	4.390E-11	4.390E-11	10058
1455698	4.386E-11	4.386E-11	4.386E-11	10062
1456291	4.382E-11	4.382E-11	4.382E-11	10066
1456884	4.378E-11	4.378E-11	4.378E-11	10071
1457478	4.375E-11	4.375E-11	4.375E-11	10075
1458071	4.371E-11	4.371E-11	4.371E-11	10079
1458664	4.367E-11	4.367E-11	4.367E-11	10083
1459159	4.363E-11	4.363E-11	4.363E-11	10087
1517641	3.996E-11	3.996E-11	3.996E-11	10491
1547129	3.806E-11	3.806E-11	3.806E-11	10694
1574617	3.614E-11	3.614E-11	3.614E-11	10898

PULSE 6-ATOMS 3.25E+03 .00E+00 .00E+00
 NUCL VEL./MI/YR 2.07E+05 6.91E+04 +.84E+06
 DISCH TIME/YR 4.42E+05 1.45E+04 2.07E+06
 DIM DISC TIME 3.37E+03 1.00E+02 1.43E+04
 LEACH RATE= .003700 FRACTION PER YEAR
 LEACH DURATION= 333 YEARS
 PATH LENGTH= 10.00 MILES
 DIMENSIONLESS DISTANCE= 1.00
 WATER VELOCITY= 1.00 FT/Day
 WATER TRAVEL TIME= 145 YEARS
 AXIAL DISPERSION COEFFICIENT= .0080 CM²/MIN
 PORE NUMBER= 4.26E+06
 INITIAL DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 PEAK DISCHARGE RATE= 1.39E-05 CURIES PER YEAR AT 61413 YEARS
 BAND WIDTH= 2051284 YEARS WITH TAIL END AT 2065856 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME/YR DISC RATE/CI/YR PULSE RATE BAND RATE DIM TIME

14493	.000E+00	1.321E-22	.000E+00	100
14503	.001E+00	1.030E-19	.000E+00	100
14513	.000E+00	3.127E-17	.000E+00	100
14520	.000E+00	4.181E-15	.000E+00	100
14529	.000E+00	2.585E-13	.000E+00	100
14539	.000E+00	7.695E-12	.000E+00	100
14545	.000E+00	1.147E-10	.000E+00	100
14555	8.67E-10	8.991E-10	8.67E-10	100
14563	8.67E-10	4.126E-09	8.67E-10	100
14572	8.67E-10	1.095E-08	8.67E-10	100
14581	1.95E-09	2.126E-08	1.95E-09	100
14589	3.03E-08	3.301E-08	3.03E-08	100
14598	4.10E-08	4.505E-08	4.10E-08	100
14606	5.14E-08	5.712E-08	5.14E-08	100
14615	6.35E-08	6.918E-08	6.35E-08	100
14653	9.93E-08	1.257E-07	9.93E-08	101
14696	1.25E-07	1.621E-07	1.25E-07	101
14714	1.93E-07	2.102E-07	1.93E-07	101
14735	2.20E-07	2.342E-07	2.20E-07	101
14797	3.26E-07	3.270E-07	3.26E-07	102
14817	3.51E-07	3.499E-07	3.51E-07	102
14837	3.79E-07	3.777E-07	3.79E-07	102
14857	4.11E-07	4.054E-07	4.11E-07	102
14878	4.29E-07	4.331E-07	4.29E-07	102
14898	4.37E-07	4.607E-07	4.37E-07	102
14918	4.36E-07	4.683E-07	4.36E-07	102
14938	5.07E-07	5.154E-07	5.07E-07	103
14958	5.76E-07	5.434E-07	5.76E-07	103
14978	6.90E-07	5.708E-07	6.90E-07	103
14998	7.90E-07	5.982E-07	7.90E-07	103
15019	8.32E-07	6.256E-07	8.32E-07	103
15039	1.33E-06	1.351E-06	1.33E-06	263

MIGRATION OF RADIOISOTOPIC CHAINS THROUGH AN ADSORBING MEDIUM
 FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
 POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDES: U235 VIA NEP37 FROM GM245

NUCLIDE	GM245	100 YR	0.23 Y
HALE LIFE, YR	8.5E+03	2.1E+00	1.5E+05
DECAY NUMBER	1.1E+02	6.0E+05	6.3E+04
DISPERSION	0.33E+03	1.3E+02	1.4E+04
YR 2000 CURIES	1.3E+05	.00E+00	.00E+00

61413	1.385E-05	1.403E-05	1.385E-05	424	485228	2.184E-06	2.213E-06	2.184E-06	3354
64610	1.276E-05	1.293E-05	1.276E-05	584	485403	2.184E-06	2.211E-06	2.184E-06	3355
107607	1.156E-05	1.171E-05	1.156E-05	745	485577	2.179E-06	2.209E-06	2.179E-06	3356
131004	1.044E-05	1.057E-05	1.044E-05	905	485751	2.179E-06	2.204E-06	2.179E-06	3357
156202	9.42E-06	9.54E-06	9.42E-06	1065	485925	2.178E-06	2.204E-06	2.178E-06	3358
177399	8.50E-06	8.61E-06	8.50E-06	1226	564064	1.542E-06	1.562E-06	1.542E-06	3899
220596	7.67E-06	7.77E-06	7.67E-06	1386	642243	1.092E-06	1.106E-06	1.092E-06	4439
223793	6.92E-06	7.01E-06	6.92E-06	1545	720402	7.733E-07	7.833E-07	7.733E-07	4979
246930	6.25E-06	6.33E-06	6.25E-06	1707	798561	5.476E-07	5.547E-07	5.476E-07	5520
270187	5.64E-06	5.71E-06	5.64E-06	1867	876120	3.878E-07	3.928E-07	3.878E-07	6060
293384	5.09E-06	5.16E-06	5.09E-06	2027	954879	2.748E-07	2.781E-07	2.748E-07	6600
316581	4.60E-06	4.65E-06	4.60E-06	2188	1033039	1.944E-07	1.970E-07	1.944E-07	7141
339778	4.15E-06	4.20E-06	4.15E-06	2348	1111198	1.377E-07	1.395E-07	1.377E-07	7681
362975	3.74E-06	3.79E-06	3.74E-06	2509	1189357	9.751E-08	9.877E-08	9.751E-08	8221
386173	3.38E-06	3.42E-06	3.38E-06	2669	1267516	6.905E-08	6.994E-08	6.905E-08	8761
409370	3.05E-06	3.09E-06	3.05E-06	2829	1345675	4.890E-08	4.953E-08	4.890E-08	9302
432567	2.75E-06	2.79E-06	2.75E-06	2990	1423834	3.462E-08	3.507E-08	3.462E-08	9842
455764	2.48E-06	2.52E-06	2.48E-06	3150	1501993	2.452E-08	2.484E-08	2.452E-08	10382
478961	2.24E-06	2.27E-06	2.24E-06	3310	1580152	1.736E-08	1.759E-08	1.736E-08	10923
479309	2.24E-06	2.27E-06	2.24E-06	3312	1658311	1.229E-08	1.245E-08	1.229E-08	11463
479483	2.24E-06	2.27E-06	2.24E-06	3313	1736470	8.703E-09	8.815E-09	8.703E-09	12003
479657	2.23E-06	2.26E-06	2.23E-06	3314	1814629	6.149E-09	6.228E-09	6.149E-09	12544
479831	2.23E-06	2.26E-06	2.23E-06	3315	1892789	4.293E-09	4.348E-09	4.293E-09	13084
480006	2.23E-06	2.26E-06	2.23E-06	3316	1970948	2.767E-09	2.801E-09	2.767E-09	13624
480180	2.23E-06	2.26E-06	2.23E-06	3318	2049107	7.45E-10	7.482E-10	7.45E-10	14165
480354	2.23E-06	2.26E-06	2.23E-06	3319	2049984	7.121E-10	7.147E-10	7.121E-10	14171
480528	2.23E-06	2.26E-06	2.23E-06	3320	2050870	6.787E-10	6.807E-10	6.787E-10	14177
480702	2.22E-06	2.25E-06	2.22E-06	3321	2051751	6.445E-10	6.464E-10	6.445E-10	14183
480875	2.22E-06	2.25E-06	2.22E-06	3322	2052633	6.107E-10	6.116E-10	6.107E-10	14189
481050	2.22E-06	2.25E-06	2.22E-06	3324	2053514	5.741E-10	5.764E-10	5.741E-10	14195
481224	2.22E-06	2.25E-06	2.22E-06	3325	2054396	5.411E-10	5.409E-10	5.411E-10	14201
481398	2.22E-06	2.25E-06	2.22E-06	3326	2055278	5.057E-10	5.049E-10	5.057E-10	14207
481572	2.22E-06	2.25E-06	2.22E-06	3327	2056159	4.694E-10	4.684E-10	4.694E-10	14213
481747	2.22E-06	2.25E-06	2.22E-06	3328	2057041	4.335E-10	4.315E-10	4.335E-10	14219
481921	2.21E-06	2.24E-06	2.21E-06	3330	2057922	3.963E-10	3.942E-10	3.963E-10	14225
482095	2.21E-06	2.24E-06	2.21E-06	3331	2058804	3.596E-10	3.564E-10	3.596E-10	14232
482269	2.21E-06	2.24E-06	2.21E-06	3332	2059685	3.219E-10	3.181E-10	3.219E-10	14238
482443	2.21E-06	2.24E-06	2.21E-06	3333	2060567	2.834E-10	2.793E-10	2.834E-10	14244
482617	2.21E-06	2.24E-06	2.21E-06	3334	2061444	2.452E-10	2.401E-10	2.452E-10	14250
482791	2.20E-06	2.23E-06	2.20E-06	3336	2062330	2.061E-10	2.004E-10	2.061E-10	14256
482965	2.20E-06	2.23E-06	2.20E-06	3337	2063212	1.664E-10	1.603E-10	1.664E-10	14262
483139	2.20E-06	2.23E-06	2.20E-06	3338	2064093	1.265E-10	1.204E-10	1.265E-10	14268
483313	2.20E-06	2.23E-06	2.20E-06	3339	2064975	8.54E-11	8.22E-11	8.54E-11	14274
483488	2.20E-06	2.23E-06	2.20E-06	3340	2065856	4.47E-11	4.22E-11	4.47E-11	14280
483662	2.20E-06	2.23E-06	2.20E-06	3342	2067617	0.00E+00	9.67E-12	0.00E+00	14293
483836	2.19E-06	2.22E-06	2.19E-06	3343	2068501	0.00E+00	2.94E-12	0.00E+00	14299
484010	2.19E-06	2.22E-06	2.19E-06	3344	2069382	0.00E+00	6.71E-13	0.00E+00	14305
484184	2.19E-06	2.22E-06	2.19E-06	3345	2070264	0.00E+00	1.11E-13	0.00E+00	14311
484358	2.19E-06	2.22E-06	2.19E-06	3346	2071144	0.00E+00	1.27E-14	0.00E+00	14317
484532	2.19E-06	2.22E-06	2.19E-06	3349	2072027	0.00E+00	1.050E-15	0.00E+00	14323
484706	2.18E-06	2.21E-06	2.18E-06	3350					
484880	2.18E-06	2.21E-06	2.18E-06	3351					
485054	2.18E-06	2.21E-06	2.18E-06	3352					

MITIGATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BOMB RELEASE OF ALL OF THE YP 2000 NUCLEAR

POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: TR-229 VIA U233 FROM NP237

NUCLIDE	NP237	U233 F	TH229	14898	1.092E-05	2.268E-05	1.092E-05	2102
HALF LIFE, YR	2.14E+06	1.58E+05	7.34E+03	14918	1.273E-05	2.404E-05	1.273E-05	102
DECAY NUMBER	4.69E-05	6.35E-04	1.37E-02	14938	1.323E-05	2.539E-05	1.323E-05	103
DISTRIB COEF	1.00E+02	1.43E+04	5.00E+04	14958	1.562E-05	2.674E-05	1.562E-05	103
YR 2000 CURIES	8.07E+04	.00E+00	.00E+00	14979	1.705E-05	2.809E-05	1.705E-05	103
PULSE G-ATOMS	4.99E+35	.00E+00	.00E+00	14999	1.849E-05	2.943E-05	1.849E-05	103
NUCL VEL-MI/YR	6.91E-04	4.84E-06	1.38E-06	15019	1.898E-05	3.077E-05	1.898E-05	103
DISCH TIME, YR	1.45E+04	2.07E+06	7.23E+06	15029	1.898E-05	3.077E-05	1.898E-05	103
DIM DISC TIME	1.00E+02	1.43E+04	5.00E+04	15049	1.898E-05	3.077E-05	1.898E-05	103
LEACH RATE=	.003000	FRACTION PER YEAR		15069	1.898E-05	3.077E-05	1.898E-05	103
LEACH DURATION=	333 YEARS			15089	1.898E-05	3.077E-05	1.898E-05	103
PATH LENGTH=	10.00 MILES			15109	1.898E-05	3.077E-05	1.898E-05	103
DIMENSIONLESS DISTANCE=	1.00			15129	1.898E-05	3.077E-05	1.898E-05	103
WATER VELOCITY=	1.00 FT/DAY			15149	1.898E-05	3.077E-05	1.898E-05	103
WATER TRAVEL TIME=	145 YEARS			15169	1.898E-05	3.077E-05	1.898E-05	103
AXIAL DISPERSION COEFFICIENT=	.0080 CM ² /MIN			15189	1.898E-05	3.077E-05	1.898E-05	103
PECLET NUMBER=	4.26E+06			15209	1.898E-05	3.077E-05	1.898E-05	103
NUCLIDE DISCHARGE RATE FROM ADJUFER WITH AXIAL DISPERSION				15229	1.898E-05	3.077E-05	1.898E-05	103
INITIAL BREAKTHROUGH AT	14635 YEARS			15249	1.898E-05	3.077E-05	1.898E-05	103
PEAK DISCHARGE RATE=	4.91E-04 CURIES PER YEAR AT 116723 YEARS			15269	1.898E-05	3.077E-05	1.898E-05	103
HAND WIDTH=	2599247 YEARS WITH TAIL END AT 2599247 YEARS			15289	1.898E-05	3.077E-05	1.898E-05	103
DISPERSION PEAK/NO-DISPERSION PEAK =	.00E+00			15309	1.898E-05	3.077E-05	1.898E-05	103
TIME, YR	DISC RATE, CI/YR	PULSE RATE	HAND RATE	DIM TIME				
14520	.000E+00	9.203E-14	.000E+00	100				
14529	.000E+00	8.757E-12	.000E+00	100				
14538	.000E+00	3.161E-10	.000E+00	100				
14546	.000E+00	5.214E-09	.000E+00	100				
14555	.000E+00	4.316E-08	.000E+00	100				
14563	.000E+00	2.024E-07	.000E+00	100				
14615	8.646E-05	3.421E-06	8.646E-08	100				
14635	8.646E-05	4.815E-06	8.646E-08	100				
14655	1.729E-07	6.206E-06	1.729E-07	101				
14675	1.285E-06	7.594E-06	1.285E-06	101				
14695	1.556E-06	8.979E-06	1.556E-06	101				
14715	1.902E-06	1.036E-05	1.902E-06	101				
14735	2.352E-06	1.174E-05	2.352E-06	101				
14755	3.821E-06	1.312E-05	3.821E-06	101				
14775	5.141E-06	1.444E-05	5.141E-06	101				
14795	6.461E-06	1.576E-05	6.461E-06	101				
14815	7.781E-06	1.708E-05	7.781E-06	101				
14835	9.101E-06	1.840E-05	9.101E-06	101				
14855	1.042E-05	1.972E-05	1.042E-05	101				
14875	1.174E-05	2.104E-05	1.174E-05	101				
14895	1.306E-05	2.236E-05	1.306E-05	101				
14915	1.438E-05	2.368E-05	1.438E-05	101				
14935	1.570E-05	2.500E-05	1.570E-05	101				
14955	1.702E-05	2.632E-05	1.702E-05	101				
14975	1.834E-05	2.764E-05	1.834E-05	101				
14995	1.966E-05	2.896E-05	1.966E-05	101				
15015	2.098E-05	3.028E-05	2.098E-05	101				
15035	2.230E-05	3.160E-05	2.230E-05	101				
15055	2.362E-05	3.292E-05	2.362E-05	101				
15075	2.494E-05	3.424E-05	2.494E-05	101				
15095	2.626E-05	3.556E-05	2.626E-05	101				
15115	2.758E-05	3.688E-05	2.758E-05	101				
15135	2.890E-05	3.820E-05	2.890E-05	101				
15155	3.022E-05	3.952E-05	3.022E-05	101				
15175	3.154E-05	4.084E-05	3.154E-05	101				
15195	3.286E-05	4.216E-05	3.286E-05	101				
15215	3.418E-05	4.348E-05	3.418E-05	101				
15235	3.550E-05	4.480E-05	3.550E-05	101				
15255	3.682E-05	4.612E-05	3.682E-05	101				
15275	3.814E-05	4.744E-05	3.814E-05	101				
15295	3.946E-05	4.876E-05	3.946E-05	101				
15315	4.078E-05	5.008E-05	4.078E-05	101				
15335	4.210E-05	5.140E-05	4.210E-05	101				
15355	4.342E-05	5.272E-05	4.342E-05	101				
15375	4.474E-05	5.404E-05	4.474E-05	101				
15395	4.606E-05	5.536E-05	4.606E-05	101				
15415	4.738E-05	5.668E-05	4.738E-05	101				
15435	4.870E-05	5.800E-05	4.870E-05	101				
15455	5.002E-05	5.932E-05	5.002E-05	101				
15475	5.134E-05	6.064E-05	5.134E-05	101				
15495	5.266E-05	6.196E-05	5.266E-05	101				
15515	5.398E-05	6.328E-05	5.398E-05	101				
15535	5.530E-05	6.460E-05	5.530E-05	101				
15555	5.662E-05	6.592E-05	5.662E-05	101				
15575	5.794E-05	6.724E-05	5.794E-05	101				
15595	5.926E-05	6.856E-05	5.926E-05	101				
15615	6.058E-05	6.988E-05	6.058E-05	101				
15635	6.190E-05	7.120E-05	6.190E-05	101				
15655	6.322E-05	7.252E-05	6.322E-05	101				
15675	6.454E-05	7.384E-05	6.454E-05	101				
15695	6.586E-05	7.516E-05	6.586E-05	101				
15715	6.718E-05	7.648E-05	6.718E-05	101				
15735	6.850E-05	7.780E-05	6.850E-05	101				
15755	6.982E-05	7.912E-05	6.982E-05	101				
15775	7.114E-05	8.044E-05	7.114E-05	101				
15795	7.246E-05	8.176E-05	7.246E-05	101				
15815	7.378E-05	8.308E-05	7.378E-05	101				
15835	7.510E-05	8.440E-05	7.510E-05	101				
15855	7.642E-05	8.572E-05	7.642E-05	101				
15875	7.774E-05	8.704E-05	7.774E-05	101				
15895	7.906E-05	8.836E-05	7.906E-05	101				
15915	8.038E-05	8.968E-05	8.038E-05	101				
15935	8.170E-05	9.100E-05	8.170E-05	101				
15955	8.302E-05	9.232E-05	8.302E-05	101				
15975	8.434E-05	9.364E-05	8.434E-05	101				
15995	8.566E-05	9.496E-05	8.566E-05	101				
16015	8.698E-05	9.628E-05	8.698E-05	101				
16035	8.830E-05	9.760E-05	8.830E-05	101				
16055	8.962E-05	9.892E-05	8.962E-05	101				
16075	9.094E-05	1.002E-04	9.094E-05	101				
16095	9.226E-05	1.015E-04	9.226E-05	101				
16115	9.358E-05	1.028E-04	9.358E-05	101				
16135	9.490E-05	1.041E-04	9.490E-05	101				
16155	9.622E-05	1.054E-04	9.622E-05	101				
16175	9.754E-05	1.067E-04	9.754E-05	101				
16195	9.886E-05	1.080E-04	9.886E-05	101				
16215	1.000E-04	1.093E-04	1.000E-04	101				
16235	1.013E-04	1.106E-04	1.013E-04	101				
16255	1.026E-04	1.119E-04	1.026E-04	101				
16275	1.039E-04	1.132E-04	1.039E-04	101				
16295	1.052E-04	1.145E-04	1.052E-04	101				
16315	1.065E-04	1.158E-04	1.065E-04	101				
16335	1.078E-04	1.171E-04	1.078E-04	101				
16355	1.091E-04	1.184E-04	1.091E-04	101				
16375	1.104E-04	1.197E-04	1.104E-04	101				
16395	1.117E-04	1.210E-04	1.117E-04	101				
16415	1.130E-04	1.223E-04	1.130E-04	101				
16435	1.143E-04	1.236E-04	1.143E-04	101				
16455	1.156E-04	1.249E-04	1.156E-04	101				
16475	1.169E-04	1.262E-04	1.169E-04	101				
16495	1.182E-04	1.275E-04	1.182E-04	101				
16515	1.195E-04	1.288E-04	1.195E-04	101				
16535	1.208E-04	1.301E-04	1.208E-04	101				
16555	1.221E-04	1.314E-04	1.221E-04	101				
16575	1.234E-04	1.327E-04	1.234E-04	101				
16595	1.247E-04	1.340E-04	1.247E-04	101				
16615	1.260E-04	1.353E-04	1.260E-04	101				
16635	1.273E-04	1.366E-04	1.273E-04	101				
16655	1.286E-04	1.379E-04	1.286E-04	101				
16675	1.299E-04	1.392E-04	1.299E-04	101				
16695	1.312E-04	1.405E-04	1.312E-04	101				
16715	1.325E-04	1.418E-04	1.325E-04	101				
16735	1.338E-04	1.431E-04	1.338E-04	101				
16755	1.351E-04	1.444E-04	1.351E-04	101				
16775	1.364E-04	1.457E-04	1.364E-04	101				
16795	1.377E-04	1.470E-04	1.377E-04	101				
16815	1.390E-04	1.483E-04	1.390E-04	101				
16835	1.403E-04	1.496E-04	1.403E-04	101				
16855	1.416E-04	1.509E-04	1.416E-04	101				
16875	1.429E-04	1.522E-04	1.429E-04	101				
168								

15019	3.355E-04	2.611E-04	3.355E-04	2103	2061449	4.648E-08	5.901E-08	4.648E-08	14250
86610	2.847E-04	3.671E-04	2.847E-04	598	2062330	4.630E-08	5.954E-08	4.630E-08	14256
158201	2.075E-04	2.676E-04	2.075E-04	1093	2063212	4.612E-08	5.859E-08	4.612E-08	14262
229792	1.513E-04	1.951E-04	1.513E-04	1588	2064093	4.593E-08	5.578E-08	4.593E-08	14268
301384	1.103E-04	1.422E-04	1.103E-04	2083	2064975	4.570E-08	4.506E-08	4.570E-08	14274
372975	8.039E-05	1.037E-04	8.039E-05	2578	2065856	4.407E-08	3.741E-08	4.407E-08	14280
444566	5.660E-05	7.557E-05	5.660E-05	3073	2067619	.000E+00	1.110E+00	.000E+00	14293
516157	4.272E-05	5.569E-05	4.272E-05	3557	2068501	.000E+00	3.950E-09	.000E+00	14299
587744	3.114E-05	4.016E-05	3.114E-05	4062	2069383	.000E+00	1.019E-09	.000E+00	14305
659339	2.270E-05	2.927E-05	2.270E-05	4557	2070264	.000E+00	1.874E-10	.000E+00	14311
730530	1.655E-05	2.134E-05	1.655E-05	5052	2071145	.000E+00	2.431E-11	.000E+00	14317
802522	1.206E-05	1.566E-05	1.206E-05	5547	2072027	.000E+00	2.205E-12	.000E+00	14323
874113	8.794E-06	1.134E-05	8.794E-06	6042	2072909	.000E+00	1.392E-13	.000E+00	14329
945704	6.410E-06	8.266E-06	6.410E-06	6537	2073791	.000E+00	6.093E-15	.000E+00	14335
1017295	4.673E-06	6.026E-06	4.673E-06	7032	2074672	.000E+00	1.647E-16	.000E+00	14341
1088886	3.406E-06	4.393E-06	3.406E-06	7527	2075554	.000E+00	3.864E-18	.000E+00	14347
1160477	2.483E-06	3.202E-06	2.483E-06	8022	2076435	.000E+00	5.464E-20	.000E+00	14353
1232168	1.810E-06	2.334E-06	1.810E-06	8516	2077317	.000E+00	3.657E-22	.000E+00	14360
1303660	1.320E-06	1.702E-06	1.320E-06	9011	2078199	.000E+00	.000E+00	.000E+00	14366
1375251	9.619E-07	1.240E-06	9.619E-07	9506					
1446842	7.012E-07	9.043E-07	7.012E-07	10001					
1476955	6.139E-07	7.917E-07	6.139E-07	10209					
1507068	5.375E-07	6.931E-07	5.375E-07	10417					
1537182	4.706E-07	6.066E-07	4.706E-07	10626					
1567295	4.120E-07	5.313E-07	4.120E-07	10834					
1597408	3.607E-07	4.651E-07	3.607E-07	11042					
1627521	3.158E-07	4.072E-07	3.158E-07	11250					
1657635	2.765E-07	3.565E-07	2.765E-07	11458					
1687746	2.420E-07	3.121E-07	2.420E-07	11667					
1717861	2.119E-07	2.732E-07	2.119E-07	11875					
1747974	1.855E-07	2.392E-07	1.855E-07	12083					
1778085	1.624E-07	2.094E-07	1.624E-07	12291					
1808201	1.422E-07	1.834E-07	1.422E-07	12499					
1838314	1.265E-07	1.605E-07	1.265E-07	12707					
1868427	1.090E-07	1.405E-07	1.090E-07	12916					
1896541	9.542E-08	1.230E-07	9.542E-08	13124					
1928654	8.354E-08	1.077E-07	8.354E-08	13332					
1958767	7.314E-08	9.431E-08	7.314E-08	13540					
1988880	6.403E-08	8.257E-08	6.403E-08	13748					
2018994	5.606E-08	7.229E-08	5.606E-08	13956					
2049107	4.904E-08	6.329E-08	4.904E-08	14165					
2049988	4.484E-08	6.304E-08	4.484E-08	14171					
2050870	4.051E-08	5.280E-08	4.051E-08	14177					
2051752	3.651E-08	4.832E-08	3.651E-08	14183					
2052433	3.251E-08	4.332E-08	3.251E-08	14189					
2053515	2.851E-08	3.832E-08	2.851E-08	14195					
2054396	2.476E-08	3.332E-08	2.476E-08	14201					
2055278	2.075E-08	2.832E-08	2.075E-08	14207					
2056156	1.675E-08	2.332E-08	1.675E-08	14213					
2057031	1.275E-08	1.832E-08	1.275E-08	14219					
2057922	8.75E-09	1.332E-08	8.75E-09	14225					
2058804	6.75E-09	1.032E-08	6.75E-09	14232					
2059685	4.75E-09	8.32E-09	4.75E-09	14238					
2060567	2.75E-09	5.32E-09	2.75E-09	14244					

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: U238 VIA PU242 FROM CM246

NUCLIDE CM246 PU242 U238 V
HALF LIFE, YR 4.76E+03 3.87E+05 4.47E+09
DECAY NUMBER 2.11E-02 2.59E-04 2.24E-04
DISTRIB COEF 3.33E+03 1.00E+04 1.43E+04
YR 2000 CURIES 2.68E+04 .00E+00 .00E+00
PULSE G-AIOMS 3.51E+02 .00E+00 .00E+00
NUCL VEL*MI/YR 2.07E-05 .00E+00 4.84E-06
DISCH TIME*YR 4.82E+05 1.45E+06 2.07E+06
DIM DISC TIME 3.33E+03 1.00E+04 1.43E+04
LEACH RATE= .003000 FRACTION PER YEAR
LEACH DURATION= 333 YEARS
PATH LENGTH= 10.00 MILES
DIMENSIONLESS DISTANCE= 1.00
WATER VELOCITY= 1.00 FT/DAY
WATER TRAVEL TIME= 145 YEARS
AXIAL DISPERSION COEFFICIENT= .0000 CM²/MIN
PELLET NUMBER= 4.20E+06
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
INITIAL BREAKTHROUGH AT 483773 YEARS
PEAK DISCHARGE RATE= 8.85E-08 CURIES PER YEAR AT 2018988 YEARS
BAND WIDTH= 157913 YEARS WITH TAIL END AT 2064906 YEARS
DISPERSION PIVOT/NO-DISPERSION PEAK = .00E+00

TIME*YR DISC RATE*CI/YR PULSE RATE BAND RATE DIM TIME

483440	•000E+00	1446797	9.371E-09	9.521E-09	9.371E-09	10001
483551	1.485E-39	1447438	9.514F-09	9.676E-09	9.514E-09	10005
483652	1.485E-39	1448078	9.540E-09	9.758E-09	9.540E-09	10010
483773	1.617E-39	1448719	9.565F-09	9.802E-09	9.565E-09	10014
483883	1.757E-39	1449360	9.591E-09	9.832E-09	9.591E-09	10019
483994	1.896E-39	1450001	9.616F-09	9.859E-09	9.616E-09	10023
484105	1.896E-39	1450642	9.642E-09	9.885E-09	9.642E-09	10027
484216	2.036E-39	1451283	9.670F-09	9.912E-09	9.670E-09	10032
484327	2.177E-39	1451923	9.694F-09	9.938E-09	9.694E-09	10036
484437	2.321E-39	1452564	9.720E-09	9.965E-09	9.720E-09	10041
484548	2.466E-39	1453205	9.746F-09	9.992E-09	9.746E-09	10045
484659	2.613E-39	1453846	9.774E-09	1.002E-08	9.774E-09	10050
532125	2.934E-37	1454487	9.800F-09	1.005E-08	9.800E-09	10054
579591	3.382E-35	1455128	9.855E-09	1.007E-08	9.825E-09	10058
627057	1.002E-33	1455769	9.877E-09	1.010E-08	9.851E-09	10063
674523	2.845E-32	1456409	9.877E-09	1.013E-08	9.877E-09	10067
771989	7.975E-31	1457050	9.904E-09	1.015E-08	9.904E-09	10072
769455	2.228E-29	1457691	9.931E-09	1.018E-08	9.931E-09	10076
815921	6.461E-28	1458332	9.955E-09	1.021E-08	9.955E-09	10081
864387	1.735E-26	1458973	9.979E-09	1.024E-08	9.979E-09	10085
911853	4.839E-25	1459614	1.000E-08	1.026E-08	1.000E-08	10089
959319	1.350E-23	1459054	1.003E-08	1.028E-08	1.003E-08	10093
1006755	3.766E-22	1518495	1.247E-08	1.312E-08	1.247E-08	10496
1291582	1.050E-20	1577377	1.409E-08	1.443E-08	1.409E-08	10700
1101714	2.930E-19	1577377	1.586E-08	1.670E-08	1.586E-08	10904
1149184	8.174E-18	1606817	1.744E-08	1.827E-08	1.736E-08	11107
1194650	2.369E-16	1636258	2.094E-08	1.582E-08	2.094E-08	11311
1244115	6.609E-15	1655699	2.368E-08	2.487E-08	2.368E-08	11514
1390048	4.944E-12	1695140	2.678E-08	2.812E-08	2.678E-08	11718
1386514	1.381E-10	1754021	3.079E-08	3.181E-08	3.079E-08	11921
1433980	4.002E-09	1783462	3.474E-08	3.597E-08	3.426E-08	12125
1436621	4.072E-09	1812903	4.361E-08	4.608E-08	3.674E-08	12328
1435262	4.214E-09	1822343	4.954E-08	5.202E-08	4.954E-08	12532
1435902	4.407E-09	1871784	5.601E-08	5.861E-08	5.601E-08	12735
1436543	4.610E-09	1901225	6.329E-08	6.545E-08	6.329E-08	12939
1437184	5.010E-09	1936666	7.136E-08	7.493E-08	7.136E-08	13142
1437825	5.043E-09	1940105	7.993E-08	8.393E-08	7.993E-08	13346
1438466	5.275E-09	1949547	9.191E-08	9.574E-08	8.845E-08	13549
1439107	5.513E-09	2018498	8.845E-08	9.287E-08	8.845E-08	13753
1439747	5.772E-09	2048429	6.114E-08	6.421E-08	6.114E-08	13956
1440388	6.036E-09	2049344	5.924E-08	6.225E-08	5.924E-08	14160
1441029	6.314E-09	2050260	5.732E-08	6.018E-08	5.732E-08	14166
1441670	6.604E-09	2051175	5.525E-08	5.801E-08	5.525E-08	14173
1442311	6.908E-09	2052090	5.304E-08	5.574E-08	5.304E-08	14179
1442952	7.225E-09	2053005	5.081E-08	5.335E-08	5.081E-08	14185
1443593	7.557E-09	2053921	4.842E-08	5.084E-08	4.842E-08	14191
1444233	7.904E-09	2054837	4.592E-08	4.822E-08	4.592E-08	14198
1444874	8.264E-09	2055752	4.331E-08	4.546E-08	4.331E-08	14204
1445515	8.542E-09	2056668	4.055E-08	4.258E-08	4.055E-08	14210
1446156	8.846E-09	2057583	3.767E-08	3.955E-08	3.767E-08	14217
	9.272E-09	2058494	3.445E-08	3.639E-08	3.445E-08	14223
		2059414	3.150E-08	3.307E-08	3.150E-08	14229
		2060329	2.819E-08	2.960E-08	2.819E-08	14236
						14242

2061245 2.473E-08 2.596E-08 2.473E-08 14248 72427 3.144E-16 3.309E-16 3.144E-16 500

2062160 2.110E-08 2.216E-08 2.110E-08 14255 72457 3.478E-16 3.478E-16 3.478E-16 500

2063076 1.731E-08 1.818E-08 1.731E-08 14261 72516 2.632E-16 2.632E-16 2.632E-16 501

2063991 1.335E-08 1.401E-08 1.335E-08 14267 72580 7.942E-16 7.942E-16 7.942E-16 501

2064906 9.198E-09 9.198E-09 9.198E-09 14274 72615 2.025E-15 2.025E-15 2.025E-15 501

2065093 .000E+00 .000E+00 .000E+00 14280 72649 3.795E-15 3.795E-15 3.795E-15 502

72718 3.526E-15 3.526E-15 3.526E-15 502

72787 5.444E-15 5.444E-15 5.444E-15 502

72822 7.600E-15 7.600E-15 7.600E-15 503

72856 8.128E-15 8.128E-15 8.128E-15 503

72890 1.033E-14 1.033E-14 1.033E-14 503

72925 1.110E-14 1.110E-14 1.110E-14 503

72959 1.275E-14 1.275E-14 1.275E-14 504

72994 1.389E-14 1.389E-14 1.389E-14 504

73028 1.457E-14 1.457E-14 1.457E-14 504

73063 1.578E-14 1.578E-14 1.578E-14 504

73097 1.620E-14 1.620E-14 1.620E-14 505

73132 1.807E-14 1.807E-14 1.807E-14 505

73165 1.813E-14 1.813E-14 1.813E-14 505

73201 2.083E-14 2.083E-14 2.083E-14 505

73235 2.151E-14 2.151E-14 2.151E-14 506

171995 2.867E-12 2.867E-12 2.867E-12 1188

278754 1.189E-11 1.189E-11 1.189E-11 1871

369514 4.321E-11 4.321E-11 4.321E-11 2554

468274 1.528E-10 1.528E-10 1.528E-10 3236

567033 5.395E-10 5.395E-10 5.395E-10 3919

665793 1.904E-09 1.904E-09 1.904E-09 4602

764553 6.721E-09 6.721E-09 6.721E-09 5285

863313 2.372E-08 2.372E-08 2.372E-08 5967

962072 8.394E-08 8.394E-08 8.394E-08 6650

1060432 2.954E-07 2.954E-07 2.954E-07 7333

1159592 1.042E-06 1.042E-06 1.042E-06 8015

1258351 3.679E-06 3.679E-06 3.679E-06 8698

1357111 1.299E-05 1.299E-05 1.299E-05 9381

1455671 4.562E-05 4.562E-05 4.562E-05 10064

1554630 1.617E-04 1.617E-04 1.617E-04 10746

1653390 5.706E-04 5.706E-04 5.706E-04 11429

1752150 2.014E-03 2.014E-03 2.014E-03 12112

1850909 7.107E-03 7.107E-03 7.107E-03 12794

1949669 2.508E-02 2.508E-02 2.508E-02 13477

2048429 8.851E-02 8.851E-02 8.851E-02 14160

2049344 8.955E-02 8.955E-02 8.955E-02 14166

2050260 9.061E-02 9.061E-02 9.061E-02 14173

2051175 9.167E-02 9.167E-02 9.167E-02 14179

2052091 9.275E-02 9.275E-02 9.275E-02 14185

2053006 9.384E-02 9.384E-02 9.384E-02 14191

2053921 9.494E-02 9.494E-02 9.494E-02 14198

2054837 9.604E-02 9.604E-02 9.604E-02 14204

2055752 9.719E-02 9.719E-02 9.719E-02 14210

2056668 9.833E-02 9.833E-02 9.833E-02 14217

2057583 9.949E-02 9.949E-02 9.949E-02 14223

2058494 1.006E-01 1.006E-01 1.006E-01 14229

2059414 1.014E-01 1.014E-01 1.014E-01 14236

2060340 1.030E-01 1.030E-01 1.030E-01 14242

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND BAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: RA226 VIA TH230 FROM U234

NUCLIDE U234 TH230 PA226

HALF LIFE, YR 2.44E+05 7.70E+04 1.60E+03

DECAY NUMBER 4.11E-04 1.30E-03 6.27E-02

DISTRIB COEF 1.43E+04 5.00E+04 5.00E+02

YR 2000 CURIES 2.27E+04 .00E+00 .00E+00

PULSE G-AUTONS 1.16E+05 .00E+00 .00E+00

NUCL VEL, MI/YR 4.84E+06 1.38E+06 1.38E+04

DISCH TIME, YR 2.07E+06 7.23E+06 7.23E+04

DIM DISC TIME 1.43E+04 5.00E+04 5.00E+02

LEACH RATE= .003000 FRACTION PER YEAR

LEACH DURATION= 333 YEARS

PATH LENGTH= 10.00 MILES

DIMENSIONLESS DISTANCE= 1.00

WATER VELOCITY= 1.00 FT/DAY

WATER TRAVEL TIME= 145 YEARS

AXIAL DISPERSION COEFFICIENT= .0080 CM12/MIN

PECLET NUMBER= 4.26E+06

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION

INITIAL BREAKTHROUGH AT 72248 YEARS

PEAK DISCHARGE RATE= 1.11E-01 CUMIFS PER YEAR AT 2065822 YEARS

BAND WIDTH= 7187724 YEARS WITH TAIL END AT 7259972 YEARS

DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME.YR DISC RATE.CI/YR PULSE RATE BAND RATE DIM TIME

72010 .000E+00 1.341E-33 .000E+00 497

72040 .000E+00 2.127E-31 .000E+00 497

72070 .000E+00 2.340E-29 .000E+00 498

72219 3.617E-19 3.617E-19 3.617E-19 499

72248 3.617E-19 4.113E-20 3.617E-19 499

72274 3.617E-19 3.407E-19 3.617E-19 499

72308 2.452E-14 2.581E-14 2.452E-14 499

72338 1.042E-17 1.139E-17 1.042E-17 499

72367 3.175E-17 3.343E-17 3.175E-17 500

72397 1.316E-16 1.385E-16 1.316E-16 500

LEACH DURATION= 333 YEARS									
PATH LENGTH= 10.00 MILES									
DIMENSIONLESS DISTANCE= 1.00									
WATER VELOCITY= 1.00 FT/DAY									
WATER TRAVEL TIME= 145 YEARS									
AXIAL DISPERSION COEFFICIENT= .0080 CM ² /MIN									
PECLET NUMBER= 4.26E+06									
NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION									
INITIAL BREAKTHROUGH AT 72457 YEARS									
PEAK DISCHARGE RATE= 4.94E-02 CURIES PER YEAR AT 2069484 YEARS									
BAND WIDTH= 7186940 YEARS WITH TAIL END AT 7261396 YEARS									
DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00									
TIME,YR	DISC RATE,CI/YR	PULSE RATE	HAND RATE	QIM TIME					
71951	.000E+00	.000E+00	.000E+00	497	369514	1.273E-13	1.277E-13	1.273E-13	2554
71981	.000E+00	4.962E-38	.000E+00	497	468274	6.021E-13	6.039E-13	6.021E-13	3236
72010	.000E+00	6.417E-36	.000E+00	497	567033	2.843E-12	2.851E-12	2.843E-12	3919
72040	.000E+00	9.112E-34	.000E+00	497	665793	1.342E-11	1.346E-11	1.342E-11	4602
72070	.000E+00	9.075E-32	.000E+00	498	764553	6.333E-11	6.351E-11	6.333E-11	5285
72100	.000E+00	6.154E-24	.000E+00	499	863313	2.966E-10	2.974E-10	2.966E-10	5967
72130	.000E+00	7.528E-23	.000E+00	499	962072	1.411E-09	1.415E-09	1.411E-09	6650
72160	.000E+00	6.664E-22	.000E+00	499	1060832	6.658E-09	6.677E-09	6.658E-09	7333
72190	.000E+00	4.321E-21	.000E+00	499	1159592	3.142E-08	3.152E-08	3.142E-08	8015
72220	.000E+00	5.674E-20	.000E+00	499	1258351	1.463E-07	1.467E-07	1.463E-07	8698
72250	.000E+00	1.847E-19	.000E+00	500	1357111	7.000E-07	7.020E-07	7.000E-07	9381
72280	.000E+00	2.098E-19	.000E+00	500	1455871	3.304E-06	3.313E-06	3.304E-06	10064
72310	.000E+00	3.705E-18	.000E+00	500	1554630	1.559E-05	1.564E-05	1.559E-05	10746
72340	.000E+00	4.602E-18	.000E+00	501	1653390	7.359E-05	7.381E-05	7.359E-05	11429
72370	.000E+00	5.450E-18	.000E+00	502	1752150	3.473E-04	3.483E-04	3.473E-04	12112
72400	.000E+00	6.296E-18	.000E+00	502	1850909	1.639E-03	1.644E-03	1.639E-03	12794
72430	.000E+00	7.147E-18	.000E+00	502	1949669	7.737E-03	7.760E-03	7.737E-03	13477
72460	.000E+00	8.002E-18	.000E+00	502	2048429	3.652E-02	3.662E-02	3.652E-02	14160
72490	.000E+00	8.862E-18	.000E+00	502	2049344	3.705E-02	3.715E-02	3.705E-02	14166
72520	.000E+00	9.717E-18	.000E+00	502	2050260	3.758E-02	3.768E-02	3.758E-02	14173
72550	.000E+00	1.057E-17	.000E+00	502	2051175	3.813E-02	3.824E-02	3.813E-02	14179
72580	.000E+00	1.142E-17	.000E+00	502	2052091	3.868E-02	3.879E-02	3.868E-02	14185
72610	.000E+00	1.227E-17	.000E+00	502	2053006	3.924E-02	3.935E-02	3.924E-02	14191
72640	.000E+00	1.312E-17	.000E+00	502	2053921	3.981E-02	3.992E-02	3.981E-02	14198
72670	.000E+00	1.397E-17	.000E+00	502	2054837	4.038E-02	4.050E-02	4.038E-02	14204
72700	.000E+00	1.482E-17	.000E+00	502	2055752	4.097E-02	4.109E-02	4.097E-02	14210
72730	.000E+00	1.567E-17	.000E+00	502	2056668	4.156E-02	4.169E-02	4.156E-02	14217
72760	.000E+00	1.652E-17	.000E+00	502	2057583	4.215E-02	4.229E-02	4.215E-02	14223
72790	.000E+00	1.737E-17	.000E+00	502	2058499	4.273E-02	4.290E-02	4.273E-02	14229
72820	.000E+00	1.822E-17	.000E+00	502	2059414	4.330E-02	4.352E-02	4.330E-02	14236
72850	.000E+00	1.907E-17	.000E+00	502	2060330	4.388E-02	4.415E-02	4.388E-02	14242
72880	.000E+00	2.000E-17	.000E+00	502	2061245	4.446E-02	4.479E-02	4.446E-02	14248
72910	.000E+00	2.093E-17	.000E+00	502	2062160	4.504E-02	4.544E-02	4.504E-02	14255
72940	.000E+00	2.186E-17	.000E+00	502	2063076	4.562E-02	4.610E-02	4.562E-02	14261
72970	.000E+00	2.279E-17	.000E+00	502	2063991	4.620E-02	4.678E-02	4.620E-02	14267
73000	.000E+00	2.372E-17	.000E+00	502	2064907	4.678E-02	4.734E-02	4.678E-02	14274
73030	.000E+00	2.465E-17	.000E+00	502	2065822	4.736E-02	4.794E-02	4.736E-02	14280
73060	.000E+00	2.558E-17	.000E+00	502	2066737	4.794E-02	4.854E-02	4.794E-02	14286
73090	.000E+00	2.651E-17	.000E+00	502	2067653	4.852E-02	4.914E-02	4.852E-02	14293
73120	.000E+00	2.744E-17	.000E+00	502	2068569	4.910E-02	4.974E-02	4.910E-02	14299
73150	.000E+00	2.837E-17	.000E+00	502	2069484	4.968E-02	5.034E-02	4.968E-02	14305
73180	.000E+00	2.930E-17	.000E+00	502	2070400	5.026E-02	5.094E-02	5.026E-02	14312
73210	.000E+00	3.023E-17	.000E+00	502	2071315	5.084E-02	5.154E-02	5.084E-02	14318
73240	.000E+00	3.116E-17	.000E+00	502	2072231	5.142E-02	5.214E-02	5.142E-02	14324
73270	.000E+00	3.209E-17	.000E+00	502	2073146	5.200E-02	5.274E-02	5.200E-02	14331
73300	.000E+00	3.302E-17	.000E+00	502	2074062	5.258E-02	5.334E-02	5.258E-02	14337
73330	.000E+00	3.395E-17	.000E+00	502	2074977	5.316E-02	5.394E-02	5.316E-02	14343
73360	.000E+00	3.488E-17	.000E+00	502	2075893	5.374E-02	5.454E-02	5.374E-02	14350
73390	.000E+00	3.581E-17	.000E+00	502	2076808	5.432E-02	5.514E-02	5.432E-02	14356
73420	.000E+00	3.674E-17	.000E+00	504	2077724	5.490E-02	5.574E-02	5.490E-02	14363
73450	.000E+00	3.767E-17	.000E+00	504	2078639	5.548E-02	5.634E-02	5.548E-02	14369
73480	.000E+00	3.860E-17	.000E+00	505	2079554	5.606E-02	5.694E-02	5.606E-02	14376
73510	.000E+00	3.953E-17	.000E+00	505	2080470	5.664E-02	5.754E-02	5.664E-02	14383
73540	.000E+00	4.046E-17	.000E+00	505	2081386	5.722E-02	5.814E-02	5.722E-02	14389
73570	.000E+00	4.139E-17	.000E+00	505	2082301	5.780E-02	5.874E-02	5.780E-02	14396
73600	.000E+00	4.232E-17	.000E+00	505	2083217	5.838E-02	5.934E-02	5.838E-02	14402
73630	.000E+00	4.325E-17	.000E+00	506	2084132	5.896E-02	5.994E-02	5.896E-02	14409
73660	.000E+00	4.418E-17	.000E+00	506	2085048	5.954E-02	6.054E-02	5.954E-02	14415
73690	.000E+00	4.511E-17	.000E+00	506	2085963	6.012E-02	6.114E-02	6.012E-02	14422
73720	.000E+00	4.604E-17	.000E+00	506	2086879	6.070E-02	6.174E-02	6.070E-02	14428
73750	.000E+00	4.697E-17	.000E+00	506	2087794	6.128E-02	6.234E-02	6.128E-02	14435
73780	.000E+00	4.790E-17	.000E+00	506	2088709	6.186E-02	6.294E-02	6.186E-02	14441
73810	.000E+00	4.883E-17	.000E+00	506	2089624	6.244E-02	6.354E-02	6.244E-02	14448
73840	.000E+00	4.976E-17	.000E+00	506	2090539	6.302E-02	6.414E-02	6.302E-02	14454
73870	.000E+00	5.069E-17	.000E+00	506	2091454	6.360E-02	6.474E-02	6.360E-02	14461
73900	.000E+00	5.162E-17	.000E+00	506	2092369	6.418E-02	6.534E-02	6.418E-02	14467
73930	.000E+00	5.255E-17	.000E+00	506	2093284	6.476E-02	6.596E-02	6.476E-02	14474
73960	.000E+00	5.348E-17	.000E+00	506	2094199	6.534E-02	6.658E-02	6.534E-02	14480
73990	.000E+00	5.441E-17	.000E+00	506	2095114	6.592E-02	6.720E-02	6.592E-02	14487
74020	.000E+00	5.534E-17	.000E+00	506	2096029	6.650E-02	6.784E-02	6.650E-02	14493
74050	.000E+00	5.627E-17	.000E+00	506	2096944	6.708E-02	6.848E-02	6.708E-02	14499
74080	.000E+00	5.720E-17	.000E+00	506	2097859	6.766E-02	6.912E-02	6.766E-02	14506
74110	.000E+00	5.813E-17	.000E+00	506	2098774	6.824E-02	6.970E-02	6.824E-02	14512
74140	.000E+00	5.906E-17	.000E+00	506	2099689	6.882E-02	7.028E-02	6.882E-02	14519
74170	.000E+00	6.000E-17	.000E+00	506	2100604	6.940E-02	7.086E-02	6.940E-02	14525
74200	.000E+00	6.093E-17	.000E+00	506	2101519	7.000E-02	7.144E-02	7.000E-02	14532
74230	.000E+00	6.186E-17	.000E+00	506	2102434	7.060E-02	7.204E-02	7.060E-02	14538
74260	.000E+00	6.279E-17	.000E+00	506	2103349	7.120E-02	7.264E-02	7.120E-02	14545
74290	.000E+00	6.372E-17	.000E+00	506	2104264	7.180E-02	7.318E-02	7.180E-02	14551
74320	.000E+00	6.465E-17	.000E+00	506	2105179	7.240E-02	7.372E-02	7.240E-02	14558
74350	.000E+00	6.558E-17	.000E+00	506	2106094	7.300E-02	7.426E-02	7.300E-02	14564
74380	.000E+00	6.651E-17	.000E+00	506	2107009	7.360E-02	7.480E-02	7.360E-02	14571
74410	.000E+00	6.744E-17	.000E+00	506	2107924	7.420E-02	7.534E-02	7.420E-02	14577
74440	.000E+00	6.837E-17	.000E+00	506	2108839	7.480E-02	7.588E-02	7.480E-02	14584
74470	.000E+00	6.930E-17	.000E+00	506	2109754	7.540E-02	7.642E-02	7.540E-02	14590
74500	.000E+00	7.023E-17	.000E+00	506	2110669	7.600E-02	7.696E-02	7.600E-02	14597
74530	.000E+00	7.116E-17	.000E+00	506	2111584	7.660E-02	7.756E-02	7.660E-02	14603
74560	.000E+00	7.209E-17	.000E+00	506	2112500	7.720E-02	7.816E-02	7.720E-02	14610
74590	.000E+00	7.302E-17	.000E+00	506	2113415	7.780E-02	7.876E-02	7.780E-02	14616
74620	.000E+00	7.395E-17	.000E+00	506	2114330	7.840E-02	7.936E-0		

1.80

72516	5.391E-19	2.193E-18	5.391E-19	2063074	1.532E-04	1.536E-04	1.532E-04	14261
72540	1.229E-18	2.911E-18	1.229E-18	2063991	1.550E-04	1.554E-04	1.550E-04	14267
72580	1.248E-18	3.754E-18	1.248E-18	2064907	1.568E-04	1.569E-04	1.568E-04	14274
72615	2.922E-18	4.600E-18	2.922E-18	2067653	1.590E-04	1.591E-04	1.590E-04	14293
72649	3.141E-18	5.443E-18	3.141E-18	2068569	1.570E-04	1.570E-04	1.573E-04	14299
72719	5.035E-18	7.143E-18	5.035E-18	2069484	1.550E-04	1.555E-04	1.560E-04	14305
72787	7.963E-18	8.840E-18	7.963E-18	2070400	1.542E-04	1.539E-04	1.542E-04	14312
72822	1.120E-17	9.688E-18	1.120E-17	2071315	1.525E-04	1.525E-04	1.525E-04	14318
72856	1.180E-17	1.054E-17	1.180E-17	2072231	1.508E-04	1.507E-04	1.508E-04	14324
72890	1.506E-17	1.139E-17	1.506E-17	2073146	1.493E-04	1.492E-04	1.495E-04	14331
72925	1.609E-17	1.224E-17	1.609E-17	2074062	1.482E-04	1.476E-04	1.482E-04	14337
72959	1.849E-17	1.308E-17	1.849E-17	2074977	1.461E-04	1.461E-04	1.464E-04	14343
72994	2.003E-17	1.393E-17	2.003E-17	2075893	1.451E-04	1.445E-04	1.451E-04	14350
73028	2.112E-17	1.478E-17	2.112E-17	2076808	1.431E-04	1.430E-04	1.430E-04	14356
73063	2.233E-17	1.564E-17	2.233E-17	2077724	1.417E-04	1.415E-04	1.417E-04	14362
73097	2.347E-17	1.649E-17	2.347E-17	2078639	1.404E-04	1.401E-04	1.404E-04	14369
73164	2.618E-17	1.819E-17	2.618E-17	2079555	1.386E-04	1.386E-04	1.366E-04	14375
73201	3.010E-17	1.904E-17	3.010E-17	2080470	1.373E-04	1.373E-04	1.373E-04	14381
73235	3.096E-17	1.989E-17	3.096E-17	2081386	1.360E-04	1.357E-04	1.360E-04	14388
73270	4.115E-15	4.115E-15	4.115E-15	2082301	1.343E-04	1.343E-04	1.343E-04	14394
73307	1.707E-14	1.712E-14	1.707E-14	2083217	1.330E-04	1.329E-04	1.330E-04	14400
73342	6.195E-14	6.202E-14	6.195E-14	2084132	1.317E-04	1.315E-04	1.317E-04	14407
73377	2.199E-13	2.199E-13	2.199E-13	2085048	1.304E-04	1.301E-04	1.304E-04	14413
73412	7.765E-13	7.765E-13	7.765E-13	2341017	6.927E-06	6.914E-06	6.927E-06	16182
73447	2.733E-12	2.741E-12	2.733E-12	2596986	3.678E-07	3.673E-07	3.678E-07	17952
73482	3.404E-11	3.414E-11	3.404E-11	2852955	1.954E-08	1.954E-08	1.954E-08	19721
73517	1.205E-10	1.205E-10	1.205E-10	3108925	5.515E-11	5.509E-11	5.515E-11	21491
73552	1.496E-09	1.501E-09	1.496E-09	3364895	2.921E-12	2.921E-12	2.929E-12	23260
73587	5.296E-09	5.296E-09	5.296E-09	3620864	1.555E-13	1.555E-13	1.555E-13	25030
73622	1.869E-08	1.869E-08	1.869E-08	3876834	8.270E-15	8.261E-15	8.270E-15	26799
73657	6.595E-06	6.595E-06	6.595E-06	4132803	4.397E-16	4.397E-16	4.397E-16	28564
73692	2.321E-07	2.321E-07	2.321E-07	4388773	2.335E-17	2.335E-17	2.335E-17	30334
73727	8.214E-07	8.214E-07	8.214E-07	4644742	1.240E-18	1.239E-18	1.240E-18	32106
73762	1.274E-04	1.274E-04	1.274E-04	4900711	6.594E-20	6.594E-20	6.594E-20	33877
73797	1.263E-04	1.263E-04	1.263E-04	5156681	3.500E-21	3.497E-21	3.500E-21	35647
73832	1.301E-04	1.301E-04	1.301E-04	5412650	1.863E-22	1.858E-22	1.863E-22	37416
73867	1.320E-04	1.320E-04	1.320E-04	5668620	9.880E-24	9.880E-24	9.880E-24	39186
73902	1.335E-04	1.335E-04	1.335E-04	5926559	5.246E-25	5.240E-25	5.246E-25	40955
73937	1.347E-04	1.347E-04	1.347E-04	6180559	2.777E-26	2.777E-26	2.777E-26	42725
73972	1.367E-04	1.367E-04	1.367E-04	6436524	1.443E-27	1.442E-27	1.443E-27	44494
73987	1.379E-04	1.379E-04	1.379E-04	6692497	6.723E-29	6.711E-29	6.723E-29	46264
74002	1.399E-04	1.399E-04	1.399E-04	6948467	7.364E-31	7.315E-31	7.364E-31	48033
74017	1.411E-04	1.411E-04	1.411E-04	7204436	6.902E-31	6.869E-31	6.902E-31	49803
74032	1.432E-04	1.432E-04	1.432E-04	7205860	6.433E-31	6.433E-31	6.433E-31	49813
74047	1.445E-04	1.445E-04	1.445E-04	7207284	6.016E-31	6.006E-31	6.016E-31	49822
74062	1.466E-04	1.466E-04	1.466E-04	7208704	5.503E-31	5.587E-31	5.503E-31	49832
74077	1.479E-04	1.479E-04	1.479E-04	7210132	5.242E-31	5.178E-31	5.242E-31	49842
74092	1.496E-04	1.496E-04	1.496E-04	7211556	4.824E-31	4.776E-31	4.824E-31	49852
74107	1.511E-04	1.511E-04	1.511E-04	7212980	4.442E-31	4.402E-31	4.442E-31	49862
74122	1.524E-04	1.524E-04	1.524E-04	7214404	4.014E-31	4.002E-31	4.014E-31	49872
74137	1.546E-04	1.546E-04	1.546E-04	7215828	3.664E-31	3.664E-31	3.664E-31	49881
74152	1.561E-04	1.561E-04	1.561E-04	7217252	3.240E-31	3.240E-31	3.240E-31	49891
74167	1.574E-04	1.574E-04	1.574E-04	7218676	2.941E-31	2.941E-31	2.941E-31	49901
74182	1.589E-04	1.589E-04	1.589E-04	7220100	2.693E-31	2.693E-31	2.693E-31	49911

NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION
 INITIAL BREAKTHROUGH AT 2061245 YEARS
 PEAK DISCHARGE RATE= 2.33E-05 Curies per year AT 2066738 YEARS
 BAND WIDTH= 5171671 YEARS WITH TAIL END AT 7232916 YEARS
 DISPERSION PEAK/NO-DISPERSION PEAK = .00E+00

TIME, YR	DISC RATE, CI/YR	PULSE RATE	BAND RATE	DISP TIME
2042344	.000E+00	.000E+00	.000E+00	14166
2050260	.000E+00	2.573E-35	.000E+00	14173
2051175	.000E+00	3.552E-32	.000E+00	14179
2052091	.000E+00	3.345E-29	.000E+00	14185
2064907	6.067E-14	3.310E-06	6.067E-14	14274
2065422	1.022E-09	8.398E-06	1.022E-09	14280
2066738	2.329E-05	1.562E-05	2.329E-05	14286
2067653	1.519E-05	2.243E-05	1.519E-05	14293
2068569	1.504E-05	2.663E-05	1.504E-05	14299
2069484	1.486E-05	2.825E-05	1.486E-05	14305
2070400	1.472E-05	2.859E-05	1.472E-05	14312
2071315	1.457E-05	2.829E-05	1.457E-05	14318
2072231	1.442E-05	2.801E-05	1.442E-05	14324
2073146	1.427E-05	2.772E-05	1.427E-05	14331
2074062	1.412E-05	2.743E-05	1.412E-05	14337
2074977	1.397E-05	2.714E-05	1.397E-05	14343
2075893	1.382E-05	2.686E-05	1.382E-05	14350
2076809	1.367E-05	2.658E-05	1.367E-05	14356
2077724	1.352E-05	2.630E-05	1.352E-05	14362
2078639	1.337E-05	2.603E-05	1.337E-05	14369
2079555	1.322E-05	2.576E-05	1.322E-05	14375
2080470	1.312E-05	2.549E-05	1.312E-05	14381
2081385	1.298E-05	2.522E-05	1.298E-05	14388
2082301	1.285E-05	2.496E-05	1.285E-05	14394
2083217	1.271E-05	2.470E-05	1.271E-05	14400
2084132	1.258E-05	2.444E-05	1.258E-05	14407
2085048	1.245E-05	2.418E-05	1.245E-05	14413
2341017	6.613E-07	1.285E-06	6.613E-07	16182
2546937	3.513E-06	6.826E-08	3.513E-06	17952
2852956	1.867E-04	3.627E-09	1.867E-04	19721
3108925	9.917E-11	1.927E-10	9.917E-11	21491
3364895	5.269E-12	1.024E-11	5.269E-12	23260
3620864	2.789E-13	5.339E-13	2.789E-13	25030
3876834	1.487E-14	2.889E-14	1.487E-14	26799
4132803	7.901E-16	1.535E-15	7.901E-16	28569
4388773	4.194E-17	6.156E-17	4.194E-17	30338
4644742	2.230E-18	4.333E-18	2.230E-18	32108
4900711	1.145E-19	2.302E-19	1.145E-19	33877
5156681	6.295E-21	1.223E-20	6.295E-21	35647
5412650	3.345E-22	6.494E-22	3.345E-22	37416
5668620	1.777E-23	3.452E-23	1.777E-23	39186
5924569	9.446E-25	1.834E-24	9.446E-25	40955
6180559	5.016E-26	9.745E-26	5.016E-26	42725
6436528	2.665E-27	5.177E-27	2.665E-27	44494

49921	2.632E-31	2.554E-31	2.632E-31	49921
49931	2.281E-31	2.215E-31	2.281E-31	49931
49941	1.929E-31	1.849E-31	1.929E-31	49941
49950	1.572E-31	1.578E-31	1.572E-31	49950
49960	1.218E-31	1.286E-31	1.218E-31	49960
50000	4.537E-33	4.065E-32	4.537E-33	50000
50009	2.972E-30	2.739E-32	2.972E-30	50009
50019	2.920E-30	1.757E-32	2.920E-30	50019
50029	2.877E-30	1.059E-32	2.877E-30	50029
50039	2.829E-30	6.106E-33	2.829E-30	50039
50049	2.781E-30	3.291E-33	2.781E-30	50049
50059	2.734E-30	1.666E-33	2.734E-30	50059
50068	2.695E-30	7.905E-34	2.695E-30	50068
50078	2.647E-30	3.531E-34	2.647E-30	50078
50088	2.600E-30	1.475E-34	2.600E-30	50088
50098	2.565E-30	5.680E-35	2.565E-30	50098
50108	2.521E-30	2.249E-35	2.521E-30	50108
50118	2.482E-30	8.865E-36	2.482E-30	50118
50128	2.439E-30	4.464E-36	2.439E-30	50128
50137	2.400E-30	2.962E-36	2.400E-30	50137
50147	2.361E-30	2.461E-36	2.361E-30	50147
50157	2.326E-30	2.336E-36	2.326E-30	50157
50167	2.283E-30	2.253E-36	2.283E-30	50167
50177	2.241E-30	2.211E-36	2.241E-30	50177
50187	.000E+00	2.149E-36	.000E+00	50187
50196	.000E+00	.000E+00	.000E+00	50196

MIGRATION OF RADIOISOTOPES THROUGH AN ADSORBING MEDIUM
 FOR IMPULSE AND BAND RELEASE OF ALL OF THE Y2000 NUCLEAR
 POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: TH230 VIA U234 FROM AM242M

NUCLIDE	3424M	U234 F	TH230
HALF LIFE, YR	1.52E+02	2.44E+15	7.70E+04
DECAY NUMBER	6.60E-01	4.11E-04	1.30E-03
DISTRIB COEF	1.00E+04	1.43E+04	5.00E+04
YR 2000 CURIES	2.45E+06	.00E+00	.00E+00
PULSE G-AIOMS	2.01E+01	.00E+00	.00E+00
NUCL VEL, MI/YR	6.91E-06	4.84E-06	1.38E-06
DISCH TIME, YR	1.45E+16	2.07E+06	7.23E+06
DIM DISC TIME	1.00E+04	1.43E+04	5.00E+04
LEACH RATE=	.003000	FRACTION PER YEAR	
LEACH DURATION=	335	YEARS	
PATH LENGTH=	10.00	FT/LS	
DIMENSIONLESS DISTANCE=	1.00		
WATER VELOCITY=	1.00	FT/DAY	
WATER TRAVEL TIME=	100	YEARS	
AXIAL DISPERSION COEFFICIENT=	.0080	CM ² /MIN	
PELLET NUMBER=	4.28E+06		

6692498	1.416E-28	2.751E-26	1.416E-28	46264	DISTRIB COEF	1.00E+04	1.43E+04	1.67E+04	
6948467	7.521E-30	1.461E-29	7.521E-30	48033	YR 2000 CURIES	9.69E+05	.00E+00	.00E+00	
7204435	3.96E-31	7.64E-31	3.96E-31	49803	PULSE G-ATOMS	6.72E+04	.00E+00	.00E+00	
7205860	3.931E-31	7.63E-31	3.931E-31	49813	NUCL VEL M/YR	6.91E+06	4.84E-06	4.15E-06	
7207284	3.86E-31	7.51E-31	3.86E-31	49822	DISCH TIME,YR	1.45E+06	2.07E+06	2.41E+06	
7208769	3.805E-31	7.393E-31	3.805E-31	49832	DIM DISC TIME	1.00E+04	1.43E+04	1.67E+04	
7210132	3.743E-31	7.273E-31	3.743E-31	49842	LEACH RATE=	.003000	FRACTION PER YEAR		
7211556	3.683E-31	7.155E-31	3.683E-31	49852	LEACH DURATION=	333 YEARS			
7212980	3.623E-31	7.039E-31	3.623E-31	49862	PATH LENGTH=	10.00 MILES			
7214404	3.564E-31	6.924E-31	3.564E-31	49872	DIMENSIONLESS DISTANCE=	1.00			
7215828	3.507E-31	6.804E-31	3.507E-31	49881	WATER VELOCITY=	1.00 FT/DAY			
7217252	3.450E-31	6.692E-31	3.450E-31	49891	WATER TRAVEL TIME=	145 YEARS			
7218676	3.394E-31	6.569E-31	3.394E-31	49901	AXIAL DISPERSION COEFFICIENT=	.0080 CM/2/MIN			
7220100	3.339E-31	6.432E-31	3.339E-31	49911	PECIET NUMBER=	4.26E+06			
7221524	3.285E-31	6.269E-31	3.285E-31	49921	NUCLIDE DISCHARGE RATE FROM AQUIFER WITH AXIAL DISPERSION				
7222948	3.232E-31	6.064E-31	3.232E-31	49931	INITIAL BREAKTHROUGH AT	1446/97 YEARS			
7224372	3.179E-31	5.796E-31	3.179E-31	49941	PEAK DISCHARGE RATE=	1.25E-03 CURIES PER YEAR AT 2065R56 YEARS			
7225746	3.127E-31	5.445E-31	3.127E-31	49950	HAND WIDTH=	964352 YEARS WITH TAIL END AT 2411149 YEARS			
7227220	3.074E-31	4.997E-31	3.074E-31	49960	DISPERSION PEAK/NO-DISPERSION PEAK =	.00E+00			
7228644	3.009E-31	4.450E-31	3.009E-31	49970					
7230068	2.884E-31	3.819E-31	2.884E-31	49980					
7231492	2.461E-31	3.135E-31	2.461E-31	49990					
7232915	5.401E-32	2.458E-31	5.401E-32	50000					
7234340	.000E+00	1.824E-31	.000E+00	50009					
7235764	.000E+00	1.277E-31	.000E+00	50019					
7237189	.000E+00	5.403E-32	.000E+00	50029					
7238612	.000E+00	5.184E-32	.000E+00	50039					
7240036	.000E+00	2.991E-32	.000E+00	50049					
7241460	.000E+00	1.609E-32	.000E+00	50059					
7242884	.000E+00	8.070E-33	.000E+00	50069					
7244308	.000E+00	3.764E-33	.000E+00	50079					
7245732	.000E+00	1.630E-33	.000E+00	50089					
7247155	.000E+00	6.553E-34	.000E+00	50098					
7248580	.000E+00	2.444E-34	.000E+00	50108					
7250004	.000E+00	8.445E-35	.000E+00	50119					
7251428	.000E+00	2.705E-35	.000E+00	50129					
7252852	.000E+00	8.018E-36	.000E+00	50137					
7254276	.000E+00	2.195E-36	.000E+00	50147					
7255700	.000E+00	5.576E-37	.000E+00	50157					
7257124	.000E+00	.000E+00	.000E+00	50167					
143R323	.000E+00	.000E+00	.000E+00	143R323	TIME,YR	DISC RATE,CI/YR	PULSE RATE	HAND RATE	DIM TIME
143R322	.000E+00	.000E+00	.000E+00	143R322					
143R320	.000E+00	.000E+00	.000E+00	143R320					
143R319	.000E+00	.000E+00	.000E+00	143R319					
1440317	.000E+00	.000E+00	.000E+00	1440317					
1440816	.000E+00	.000E+00	.000E+00	1440816					
1441314	.000E+00	.000E+00	.000E+00	1441314					
1441912	.000E+00	.000E+00	.000E+00	1441912					
1442311	.000E+00	.000E+00	.000E+00	1442311					
1442809	.000E+00	.000E+00	.000E+00	1442809					
1443308	.000E+00	.000E+00	.000E+00	1443308					
1443806	.000E+00	.000E+00	.000E+00	1443806					
1444305	.000E+00	.000E+00	.000E+00	1444305					
1444803	.000E+00	.000E+00	.000E+00	1444803					
1445301	.000E+00	.000E+00	.000E+00	1445301					
1445800	.000E+00	.000E+00	.000E+00	1445800					
1446298	.000E+00	.000E+00	.000E+00	1446298					
1446797	.000E+00	.000E+00	.000E+00	1446797					
1447295	.000E+00	.000E+00	.000E+00	1447295					
1447794	.000E+00	.000E+00	.000E+00	1447794					
1448292	.000E+00	.000E+00	.000E+00	1448292					
1448791	.000E+00	.000E+00	.000E+00	1448791					
1449289	.000E+00	.000E+00	.000E+00	1449289					
1449787	.000E+00	.000E+00	.000E+00	1449787					
1450286	.000E+00	.000E+00	.000E+00	1450286					
1450784	.000E+00	.000E+00	.000E+00	1450784					
1451283	.000E+00	.000E+00	.000E+00	1451283					
1451781	.000E+00	.000E+00	.000E+00	1451781					
1452280	.000E+00	.000E+00	.000E+00	1452280					
1452776	.000E+00	.000E+00	.000E+00	1452776					

MIGRATION OF RADIONUCLIDE CHAINS THROUGH AN ADSORBING MEDIUM
FOR IMPULSE AND HAND RELEASE OF ALL OF THE YR 2000 NUCLEAR
POWER ECONOMY WASTE FROM AN UNDERGROUND REPOSITORY

TIME OF LEACH INCIDENT: 100 YEARS

NUCLIDE: PA231 VIA U235 FROM PU239

NUCLIDE U235 R PA231

HALF LIFE, YR 2.44E+04 7.04E+06 3.25E+04

DECAY NUMBER 4.11E-03 1.42E-07 3.09E-03

1453276	1.121E-21	1.174E-21	1.121E-21	1.121E-21	10066	2073146	5.162E-04	5.192E-04	5.162E-04	14331
1453775	1.226E-21	1.261E-21	1.226E-21	1.226E-21	10069	2074061	4.497E-04	4.529E-04	4.497E-04	14337
1454273	1.335E-21	1.392E-21	1.335E-21	1.335E-21	10053	2074977	3.914E-04	3.950E-04	3.914E-04	14343
1454772	1.447E-21	1.507E-21	1.447E-21	1.447E-21	10056	2075492	3.412E-04	3.446E-04	3.412E-04	14350
1455270	1.563E-21	1.624E-21	1.563E-21	1.563E-21	10059	2076004	2.949E-04	3.005E-04	2.949E-04	14356
1455769	1.684E-21	1.746E-21	1.684E-21	1.684E-21	10063	2077723	2.582E-04	2.621E-04	2.582E-04	14362
1456267	1.804E-21	1.871E-21	1.804E-21	1.804E-21	10066	2078639	2.241E-04	2.287E-04	2.241E-04	14369
1456765	1.931E-21	2.008E-21	1.931E-21	1.931E-21	10070	2079554	1.945E-04	1.954E-04	1.945E-04	14375
1457263	2.058E-21	2.145E-21	2.058E-21	2.058E-21	10074	2080470	1.687E-04	1.740E-04	1.687E-04	14381
1457761	2.187E-21	2.284E-21	2.187E-21	2.187E-21	10079	2081385	1.454E-04	1.517E-04	1.454E-04	14388
1458259	2.316E-21	2.424E-21	2.316E-21	2.316E-21	10084	2082301	1.259E-04	1.324E-04	1.259E-04	14394
1458757	2.445E-21	2.563E-21	2.445E-21	2.445E-21	10089	2083216	1.082E-04	1.154E-04	1.082E-04	14400
1459255	2.574E-21	2.692E-21	2.574E-21	2.574E-21	10093	2084132	9.05E-05	1.007E-04	9.05E-05	14407
1459753	2.703E-21	2.821E-21	2.703E-21	2.703E-21	10098	2085047	8.745E-05	8.743E-05	8.745E-05	14413
1460251	2.832E-21	2.950E-21	2.832E-21	2.832E-21	11028	2085962	8.546E-06	8.540E-06	8.546E-06	14420
1460749	2.961E-21	3.079E-21	2.961E-21	2.961E-21	11033	2100640	8.334E-07	8.334E-07	8.334E-07	14429
1461247	3.090E-21	3.208E-21	3.090E-21	3.090E-21	11038	2116234	8.126E-08	8.532E-08	8.126E-08	14436
1461745	3.219E-21	3.337E-21	3.219E-21	3.219E-21	11043	2131827	7.922E-09	8.318E-09	7.922E-09	14444
1462243	3.348E-21	3.466E-21	3.348E-21	3.348E-21	11048	2147420	7.725E-10	8.111E-10	7.725E-10	14452
1462741	3.477E-21	3.595E-21	3.477E-21	3.477E-21	12217	2163013	7.532E-11	7.908E-11	7.532E-11	14460
1463239	3.606E-21	3.724E-21	3.606E-21	3.606E-21	12222	2178606	7.344E-12	7.711E-12	7.344E-12	14468
1463737	3.735E-21	3.853E-21	3.735E-21	3.735E-21	12527	2194199	7.141E-13	7.519E-13	7.141E-13	14475
1464235	3.864E-21	3.982E-21	3.864E-21	3.864E-21	12532	2209792	6.942E-14	7.318E-14	6.942E-14	14483
1464733	3.993E-21	4.111E-21	3.993E-21	3.993E-21	12936	2225385	6.745E-15	7.121E-15	6.745E-15	14491
1465231	4.122E-21	4.240E-21	4.122E-21	4.122E-21	13141	2240978	6.548E-16	6.924E-16	6.548E-16	14499
1465729	4.251E-21	4.369E-21	4.251E-21	4.251E-21	13346	2256571	6.351E-17	6.727E-17	6.351E-17	14507
1466227	4.380E-21	4.498E-21	4.380E-21	4.380E-21	13550	2272165	6.154E-18	6.530E-18	6.154E-18	14515
1466725	4.509E-21	4.627E-21	4.509E-21	4.509E-21	13755	2287758	5.957E-19	6.333E-19	5.957E-19	14523
1467223	4.638E-21	4.756E-21	4.638E-21	4.638E-21	13960	2303351	5.760E-20	6.136E-20	5.760E-20	14531
1467721	4.767E-21	4.885E-21	4.767E-21	4.767E-21	14171	2318944	5.563E-21	5.939E-21	5.563E-21	14539
1468219	4.896E-21	5.014E-21	4.896E-21	4.896E-21	14177	2334537	5.366E-22	5.742E-22	5.366E-22	14547
1468717	5.025E-21	5.143E-21	5.025E-21	5.025E-21	14183	2350130	5.169E-23	5.545E-23	5.169E-23	14555
1469215	5.154E-21	5.272E-21	5.154E-21	5.154E-21	14189	2365723	4.972E-24	5.348E-24	4.972E-24	14563
1469713	5.283E-21	5.401E-21	5.283E-21	5.283E-21	14195	2381316	4.775E-25	5.151E-25	4.775E-25	14571
1470211	5.412E-21	5.530E-21	5.412E-21	5.412E-21	14201	2396909	4.578E-26	4.954E-26	4.578E-26	14579
1470709	5.541E-21	5.659E-21	5.541E-21	5.541E-21	14207	2412502	4.381E-27	4.757E-27	4.381E-27	14587
1471207	5.670E-21	5.788E-21	5.670E-21	5.670E-21	14213	2428095	4.184E-28	4.560E-28	4.184E-28	14595
1471705	5.799E-21	5.917E-21	5.799E-21	5.799E-21	14219	2443688	3.987E-29	4.363E-29	3.987E-29	14603
1472203	5.928E-21	6.046E-21	5.928E-21	5.928E-21	14225	2459281	3.790E-30	4.166E-30	3.790E-30	14611
1472701	6.057E-21	6.175E-21	6.057E-21	6.057E-21	14232	2474874	3.593E-31	3.969E-31	3.593E-31	14619
1473199	6.186E-21	6.304E-21	6.186E-21	6.186E-21	14238	2490467	3.396E-32	3.772E-32	3.396E-32	14627
1473697	6.315E-21	6.433E-21	6.315E-21	6.315E-21	14244	2506060	3.199E-33	3.575E-33	3.199E-33	14635
1474195	6.444E-21	6.562E-21	6.444E-21	6.444E-21	14250	2521653	3.002E-34	3.378E-34	3.002E-34	14643
1474693	6.573E-21	6.691E-21	6.573E-21	6.573E-21	14256	2537246	2.805E-35	3.181E-35	2.805E-35	14651
1475191	6.702E-21	6.820E-21	6.702E-21	6.702E-21	14262	2552839	2.608E-36	2.984E-36	2.608E-36	14659
1475689	6.831E-21	6.949E-21	6.831E-21	6.831E-21	14268	2568432	2.411E-37	2.787E-37	2.411E-37	14667
1476187	6.960E-21	7.078E-21	6.960E-21	6.960E-21	14274	2584025	2.214E-38	2.590E-38	2.214E-38	14675
1476685	7.089E-21	7.207E-21	7.089E-21	7.089E-21	14280	2599618	2.017E-39	2.393E-39	2.017E-39	14683
1477183	7.218E-21	7.336E-21	7.218E-21	7.218E-21	14286	2615211	1.820E-40	2.196E-40	1.820E-40	14691
1477681	7.347E-21	7.465E-21	7.347E-21	7.347E-21	14293	2630804	1.623E-41	1.999E-41	1.623E-41	14699
1478179	7.476E-21	7.594E-21	7.476E-21	7.476E-21	14299	2646397	1.426E-42	1.802E-42	1.426E-42	14707
1478677	7.605E-21	7.723E-21	7.605E-21	7.605E-21	14305	2661990	1.229E-43	1.605E-43	1.229E-43	14715
1479175	7.734E-21	7.852E-21	7.734E-21	7.734E-21	14312	2677583	1.032E-44	1.408E-44	1.032E-44	14723
1479673	7.863E-21	7.981E-21	7.863E-21	7.863E-21	14318	2693176	8.35E-46	1.214E-46	8.35E-46	14731
1480171	7.992E-21	8.110E-21	7.992E-21	7.992E-21	14324	2708769	6.38E-47	1.016E-47	6.38E-47	14739
1480669	8.121E-21	8.239E-21	8.121E-21	8.121E-21	14331	2724362	4.41E-48	8.18E-48	4.41E-48	14747
1481167	8.250E-21	8.368E-21	8.250E-21	8.250E-21	14337	2739955	2.44E-49	6.21E-49	2.44E-49	14755
1481665	8.379E-21	8.497E-21	8.379E-21	8.379E-21	14344	2755548	4.47E-50	1.21E-50	4.47E-50	14763
1482163	8.508E-21	8.626E-21	8.508E-21	8.508E-21	14350	2771141	2.50E-51	6.24E-51	2.50E-51	14771
1482661	8.637E-21	8.755E-21	8.637E-21	8.637E-21	14357	2786734	5.53E-52	1.42E-52	5.53E-52	14779
1483159	8.766E-21	8.884E-21	8.766E-21	8.766E-21	14363	2802327	3.56E-53	9.27E-53	3.56E-53	14787
1483657	8.895E-21	9.013E-21	8.895E-21	8.895E-21	14370	2817920	1.59E-54	4.10E-54	1.59E-54	14795
1484155	9.024E-21	9.142E-21	9.024E-21	9.024E-21	14376	2833513	9.92E-56	2.52E-56	9.92E-56	14803
1484653	9.153E-21	9.271E-21	9.153E-21	9.153E-21	14383	2849106	5.95E-57	1.55E-57	5.95E-57	14811
1485151	9.282E-21	9.400E-21	9.282E-21	9.282E-21	14389	2864699	3.98E-58	1.02E-58	3.98E-58	14819
1485649	9.411E-21	9.529E-21	9.411E-21	9.411E-21	14396	2880292	2.01E-59	5.23E-59	2.01E-59	14827
1486147	9.540E-21	9.658E-21	9.540E-21	9.540E-21	14402	2895885	1.04E-60	2.74E-60	1.04E-60	14835
1486645	9.669E-21	9.787E-21	9.669E-21	9.669E-21	14409	2911478	6.43E-62	1.67E-62	6.43E-62	14843
1487143	9.798E-21	9.916E-21	9.798E-21	9.798E-21	14415	2927071	3.46E-63	9.00E-63	3.46E-63	14851
1487641	9.927E-21	1.0045E-20	9.927E-21	9.927E-21	14422	2942664	2.00E-64	5.12E-64	2.00E-64	14859
1488139	1.0156E-20	1.0274E-20	1.0156E-20	1.0156E-20	14428	2958257	1.03E-65	2.65E-65	1.03E-65	14867
1488637	1.0285E-20	1.0403E-20	1.0285E-20	1.0285E-20	14435	2973850	5.36E-66	1.38E-66	5.36E-66	14875
1489135	1.0414E-20	1.0532E-20	1.0414E-20	1.0414E-20	14441	2989443	2.89E-67	7.41E-67	2.89E-67	14883
1489633	1.0543E-20	1.0661E-20	1.0543E-20	1.0543E-20	14448	3005036	1.52E-68	3.93E-68	1.52E-68	14891
1490131	1.0672E-20	1.0790E-20	1.0672E-20	1.0672E-20	14454	3020629	8.15E-70	2.07E-70	8.15E-70	14899
1490629	1.0801E-20	1.0919E-20	1.0801E-20	1.0801E-20	14461	3036222	4.48E-71	1.14E-71	4.48E-71	14907
1491127	1.0930E-20	1.1048E-20	1.0930E-20	1.0930E-20	14467	3051815	2.41E-72	6.17E-72	2.41E-72	14915
1491625	1.1059E-20	1.1176E-20	1.1059E-20	1.1059E-20	14474	3067408	1.26E-73	3.24E-73	1.26E-73	14923
1492123	1.1188E-20	1.1304E-20	1.1188E-20	1.1188E-20	14480	3083001	6.80E-75	1.76E-75	6.80E-75	14931
1492621	1.1317E-20	1.1433E-20	1.1317E-20	1.1317E-20	14487	3098594	3.63E-76	9.33E-76	3.63E-76	14939
1493119	1.1446E-20	1.1562E-20	1.1446E-20	1.1446E-20	14493	3114187	1.96E-77	5.06E-77	1.96E-77	14947
1493617	1.1575E-20	1.1691E-20	1.1575E-20	1.1575E-20	14499	3129780	1.07E-78	2.77E-78	1.07E-78	14955
1494115	1.1704E-20	1.1819E-20	1.1704E-20	1.1704E-20	14506	3145373	5.80E-80	1.49E-80	5.80E-80	14963
1494613	1.1833E-20	1.1949E-20	1.1833E-20	1.1833E-20	14512	3160966	3.12E-81	8.00E-81	3.12E-81	14971
1495111	1.1962E-20	1.2077E-20</								

I.4 Geosphere Transport Output File

The geosphere transport output file which follows contains all nuclide inventories exiting the soil column at the peak discharge times for 26 important single nuclides. Table I.1 shows the nuclide inventory locations for the entries in output file.

TABLE I.1. Nuclide Inventory Locations for
Geosphere Transport Output File

^3H	^{10}Be	^{14}C	^{22}Na	^{24}Na	^{32}P	^{41}Ca
^{51}Cr	^{54}Mn	^{55}Fe	^{59}Fe	^{57}Co	^{58}Co	^{60}Co
^{59}Ni	^{63}Ni	^{65}Zn	^{79}Se	^{82}Br	^{85}Kr	^{87}Rb
^{89}Sr	^{90}Sr	$^{90}\text{D}_{\text{Sr}}$	^{91}Sr	^{90}Y	$^{91}\text{M}_{\text{Y}}$	^{91}Y
$^{93+\text{D}}\text{Zr}$	^{95}Zr	$^{95}\text{D}_{\text{Zr}}$	$^{93}\text{M}_{\text{Nb}}$	^{95}Nb	^{93}Mo	$^{99+\text{D}}\text{Mo}$
$^{99}\text{D}_{\text{Mo}}$	$^{99}\text{M}_{\text{Tc}}$	^{99}Tc	$^{103+\text{D}}\text{Ru}$	$^{106+\text{D}}\text{Ru}$	^{107}Pd	$^{110\text{M}+\text{D}}\text{Ag}$
$^{113}\text{M}_{\text{Cd}}$	$^{126+\text{D}}\text{Sn}$	^{125}Sb	^{126}Sb	$^{125}\text{M}_{\text{Te}}$	$^{127}\text{M}_{\text{Te}}$	^{127}Te
^{129}I	^{130}I	^{131}I	^{132}I	^{133}I	^{134}I	^{135}I
^{134}Cs	^{135}Cs	^{136}Cs	^{137}Cs	^{138}Cs	^{140}Ba	$^{140}\text{D}_{\text{Ba}}$
^{141}Ce	$^{144+\text{D}}\text{Ce}$	^{144}Pr	^{147}Pm	^{148}Pm	^{151}Sm	^{152}Eu
^{154}Eu	^{155}Eu	$^{166}\text{M}_{\text{Ho}}$	$^{210+\text{D}}\text{Pb}$	$^{210+\text{D}}\text{Bi}$	^{210}Po	$^{222+\text{D}}\text{Rn}$
$^{223+\text{D}}\text{Ra}$	$^{224+\text{D}}\text{Ra}$	$^{225+\text{D}}\text{Ra}$	$^{226+\text{D}}\text{Ra}$	$^{228+\text{D}}\text{Ra}$	^{225}Ac	$^{227+\text{D}}\text{Ac}$
$^{227+\text{D}}\text{Th}$	$^{228+\text{D}}\text{Th}$	^{229}Th	$^{230+\text{D}}\text{Th}$	$^{232+\text{D}}\text{Th}$	^{234}Th	$^{231+\text{D}}\text{Pa}$
^{233}Pa	^{232}U	^{233}U	^{234}U	$^{235}\text{D}_{\text{U}}$	^{236}U	^{237}U
$^{238+\text{D}}\text{U}$	$^{237+\text{D}}\text{Np}$	^{239}Np	^{238}Pu	^{239}Pu	^{240}Pu	^{241}Pu
^{242}Pu	^{244}Pu	^{241}Am	$^{242\text{M}+\text{D}}\text{Am}$	$^{243+\text{D}}\text{Am}$	^{242}Cm	^{243}Cm
^{244}Cm	$^{245+\text{D}}\text{Cm}$	^{246}Cm	$^{247+\text{D}}\text{Cm}$	^{248}Cm		

[illegible]

1.89

I.5 Accumulated Dose Summary

I.5 Accumulated Dose Summary

*** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***

TC99 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** 50 YR BUILDUP *** 12:21:01 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
TC-99	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-03	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-03	.0
I-129	.0E+00	.0E+00	.0E+00	.0E+00	1.3E+01	6.5E-04	.0E+00	.0E+00	.0E+00	.0E+00	1.3E+01	100.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	1.3E+01	2.5E-03	.0E+00	.0E+00	.0E+00	.0E+00	1.3E+01	100.0
PERCENT	.0	.0	.0	.0	100.0	.0	.0	.0	.0	.0		
BODY ***												
H-3	1.7E-05	8.5E-06	8.5E-06	8.0E-04	.0E+00	.0E+00	3.7E-04	2.3E-04	2.6E-04	4.2E-03	5.8E-03	.0
1235 <NUMERIC UNDERFLOW>												
TC-99	5.5E-01	9.5E-02	9.5E-02	1.5E+00	.0E+00	9.5E-04	1.5E+02	1.4E-02	5.9E+01	5.3E-01	2.1E+02	91.5
I-129	2.4E-01	4.0E-02	4.0E-02	6.5E-01	7.5E+00	3.5E-04	6.2E+00	2.6E-02	4.2E+00	6.9E-01	2.0E+01	8.5
TOTAL	7.9E-01	1.3E-01	1.3E-01	2.2E+00	7.5E+00	1.3E-03	1.6E+02	4.0E-02	6.3E+01	1.2E+00	2.3E+02	100.0
PERCENT	.3	.1	.1	1.0	3.2	.0	67.4	.0	27.4	.5		
GI-LLI ***												
1235 <NUMERIC UNDERFLOW>												
TC-99	7.0E+01	1.1E+01	1.1E+01	1.8E+02	.0E+00	9.5E-04	1.8E+04	1.8E+00	7.1E+03	6.4E+01	2.6E+04	100.0
I-129	1.1E-02	1.8E-03	1.8E-03	3.0E-02	7.5E+00	3.5E-04	2.9E-01	1.2E-03	2.0E-01	3.3E-02	8.1E+00	.0
TOTAL	7.0E+01	1.2E+01	1.2E+01	1.9E+02	7.5E+00	1.3E-03	1.8E+04	1.8E+00	7.2E+03	6.5E+01	2.6E+04	100.0
PERCENT	.3	.0	.0	.7	.0	.0	70.7	.0	27.9	.3		
THYROID ***												
I-129	2.8E+02	4.7E+01	4.7E+01	7.6E+02	7.5E+00	3.5E-04	7.3E+03	3.0E+01	4.9E+03	8.1E+02	1.4E+04	100.0
TOTAL	2.8E+02	4.7E+01	4.7E+01	7.6E+02	7.5E+00	1.3E-03	7.3E+03	3.0E+01	4.9E+03	8.1E+02	1.4E+04	100.0
PERCENT	1.9	.3	.3	5.3	.1	.0	51.5	.2	34.5	5.7		
BONE ***												
TC-99	1.4E+00	2.4E-01	2.4E-01	3.9E+00	.0E+00	9.5E-04	3.7E+02	3.6E-02	1.5E+02	1.3E+00	5.3E+02	97.8
I-129	9.9E-02	1.5E-02	1.5E-02	2.4E-01	7.5E+00	3.5E-04	2.4E+00	9.7E-03	1.6E+00	2.6E-01	1.2E+01	2.2
TOTAL	1.5E+00	2.5E-01	2.5E-01	4.1E+00	7.5E+00	1.3E-03	3.8E+02	4.6E-02	1.5E+02	1.6E+00	5.4E+02	100.0
PERCENT	.3	.0	.0	.8	1.4	.0	69.6	.0	27.6	.3		

LIVER * * *													
TC-99	2.1E+00	3.6E-01	3.6E-01	5.5E+00	.0E+00	9.5E-04	5.6E+02	5.4E-02	2.2E+02	2.0E+00	7.9E+02	98.6	
I-129	6.5E-02	1.0E-02	1.0E-02	1.7E-01	7.5E+00	3.5E-04	1.7E+00	6.9E-03	1.1E+00	1.9E-01	1.1E+01	1.4	
TOTAL	2.2E+00	3.7E-01	3.7E-01	5.7E+00	7.5E+00	1.3E-03	5.6E+02	6.1E-02	2.2E+02	2.2E+00	8.0E+02	100.0	
PERCENT	.3	.0	.0	.7	.9	.0	70.0	.0	27.7	.3			
LUNG * * *													
H-3	1.7E-05	8.5E-06	8.5E-06	7.5E-04	.0E+00	.0E+00	3.7E-04	2.3E-04	2.6E-04	4.1E-03	5.8E-03	.1	
TC-99	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	9.5E-04	.0E+00	.0E+00	.0E+00	.0E+00	9.5E-04	.0	
I-129	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+00	3.5E-04	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+00	99.9	
TOTAL	1.7E-05	8.5E-06	8.5E-06	7.5E-04	7.5E+00	1.3E-03	3.7E-04	2.3E-04	2.6E-04	4.1E-03	7.5E+00	100.0	
PERCENT	.0	.0	.0	.0	99.9	.0	.0	.0	.0	.1			
KIDNEY * * *													
H-3	1.7E-05	8.5E-06	8.5E-06	7.5E-04	.0E+00	.0E+00	3.7E-04	2.3E-04	2.6E-04	4.1E-03	5.8E-03	.0	
TC-99	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	9.5E-04	.0E+00	.0E+00	.0E+00	.0E+00	9.5E-04	.0	
I-129	1.8E-01	3.0E-02	3.0E-02	4.9E-01	7.5E+00	3.5E-04	4.8E+00	2.0E-02	3.2E+00	5.3E-01	1.7E+01	100.0	
TOTAL	1.9E-01	3.1E-02	3.1E-02	5.0E-01	7.5E+00	1.3E-03	4.8E+00	2.0E-02	3.2E+00	5.4E-01	1.7E+01	100.0	
PERCENT	1.1	.2	.2	2.9	44.6	.0	28.5	.1	19.2	3.2			

***** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE *****

C14 MAX. INDIVIDUAL ***** LST008 SOURCE FILE ***** 50 YR BUILDUP ***** 12:30:55 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
C-14	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-03	100.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-03	100.0
PERCENT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0		
BODY ***												
C-14	6.5E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.3E+04	100.0
1235 <NUMERIC UNDERFLOW>												
TOTAL	6.5E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.3E+04	100.0
PERCENT	1.0	1.0	1.0	.0	.0	.0	18.5	1.9	4.1	72.5		
GI-LLI ***												
C-14	3.8E+02	3.7E+02	3.7E+02	3.3E+00	.0E+00	.0E+00	7.0E+03	7.3E+02	1.5E+03	2.7E+04	3.8E+04	100.0
1235 <NUMERIC UNDERFLOW>												
TOTAL	3.8E+02	3.7E+02	3.7E+02	3.3E+00	.0E+00	.0E+00	7.0E+03	7.3E+02	1.5E+03	2.7E+04	3.8E+04	100.0
PERCENT	1.0	1.0	1.0	.0	.0	.0	18.5	1.9	4.1	72.5		
THYROID ***												
C-14	6.5E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.2E+04	100.0
TOTAL	6.5E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.2E+04	100.0
PERCENT	1.0	1.0	1.0	.0	.0	.0	18.5	1.9	4.1	72.5		
BONE ***												
C-14	3.1E+03	3.1E+03	3.1E+03	2.7E+01	.0E+00	.0E+00	5.7E+04	6.0E+03	1.3E+04	2.3E+05	3.1E+05	100.0
1235 <NUMERIC UNDERFLOW>												
TOTAL	3.1E+03	3.1E+03	3.1E+03	2.7E+01	.0E+00	.0E+00	5.7E+04	6.0E+03	1.3E+04	2.3E+05	3.1E+05	100.0
PERCENT	1.0	1.0	1.0	.0	.0	.0	18.5	1.9	4.1	72.5		
LIVER ***												
C-14	6.5E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.2E+04	100.0
1235 <NUMERIC UNDERFLOW>												

TOTAL PERCENT	6.5E+02	6.0E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.2E+04	100.0
	1.0	1.0	1.0	1.0	.0	.0	.0	18.5	1.9	4.1	72.5		
LUNG ***													
C-14	6.5E+02	6.0E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.2E+04	100.0
TOTAL PERCENT	6.5E+02	6.0E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.2E+04	100.0
	1.0	1.0	1.0	1.0	.0	.0	.0	18.5	1.9	4.1	72.5		
KIDNEY ***													
C-14	6.5E+02	6.0E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.2E+04	100.0
TOTAL PERCENT	6.5E+02	6.0E+02	6.0E+02	6.0E+02	5.5E+00	.0E+00	.0E+00	1.2E+04	1.2E+03	2.5E+03	4.5E+04	6.2E+04	100.0
	1.0	1.0	1.0	1.0	.0	.0	.0	18.5	1.9	4.1	72.5		

*** DOSES BY PATH, ORGAN, AND NUCLEIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***

M093 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** ** 50 YR BUILDUP *** 08:31:25 04/21/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
MO-93	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	4.4E-07	.0E+00	.0E+00	.0E+00	.0E+00	4.4E-07	100.0
TOTAL PERCENT	.0	.0	.0	.0	.0	100.0	.0	.0	.0	.0	4.4E-07	100.0
BODY ***												
MO-93	1.4E-03	7.0E-04	7.0E-04	5.5E-03	.0E+00	2.5E-07	2.9E-01	2.3E-04	4.0E-02	1.2E-02	3.5E-01	100.0
TOTAL PERCENT	1.4E-03	7.0E-04	7.0E-04	5.5E-03	.0E+00	2.5E-07	2.9E-01	2.3E-04	4.0E-02	1.2E-02	3.5E-01	100.0
GI-LLI ***												
MO-93	8.5E-03	4.2E-03	4.2E-03	3.4E-02	.0E+00	2.5E-07	1.8E+00	1.4E-03	2.4E-01	7.5E-02	2.1E+00	100.0
TOTAL PERCENT	8.5E-03	4.2E-03	4.2E-03	3.4E-02	.0E+00	2.5E-07	1.8E+00	1.4E-03	2.4E-01	7.5E-02	2.1E+00	100.0
THYROID ***												
MO-93	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-07	100.0
TOTAL PERCENT	.0	.0	.0	.0	.0	100.0	.0	.0	.0	.0	2.5E-07	100.0
BONE ***												
MO-93	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-07	100.0
TOTAL PERCENT	.0	.0	.0	.0	.0	100.0	.0	.0	.0	.0	2.5E-07	100.0
LIVER ***												
MO-93	5.0E-02	2.6E-02	2.6E-02	2.1E-01	.0E+00	2.5E-07	1.1E+01	8.4E-03	1.5E+00	4.6E-01	1.3E+01	100.0
TOTAL PERCENT	5.0E-02	2.6E-02	2.6E-02	2.1E-01	.0E+00	2.5E-07	1.1E+01	8.4E-03	1.5E+00	4.6E-01	1.3E+01	100.0

LUNG * * *													
MO-93	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-07	100.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-07	100.0
PERCENT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0		
KIDNEY * * *													
MO-93	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-07	100.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-07	100.0
PERCENT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0		

***** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE *****

SR90 MAX. INDIVIDUAL ***** LST008 SOURCE FILE ***** 50 YR BUILDUP ***** 12125120 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
CA-41	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-03	.0E+00	.0E+00	.0E+00	.0E+00	5.5E+00	1.8
PA-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	9.0E-01	.0E+00	.0E+00	.0E+00	.0E+00	6.9E-01	.2
NP-237+0	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-01	.0E+00	.0E+00	.0E+00	.0E+00	3.0E+02	98.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.9E-01	.0E+00	.0E+00	.0E+00	.0E+00	3.1E+02	100.0
PERCENT	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0		
BODY ***												
CA-41	6.1E+00	2.5E+01	2.5E+01	6.1E+00	4.6E+00	1.1E-03	9.8E+01	1.2E-03	4.1E+01	3.8E-01	2.1E+02	15.7
1235 <NUMERIC UNDERFLOW>												
SE-79	1.9E+00	9.5E-01	9.5E-01	4.5E-01	.0E+00	7.0E-06	2.2E+02	2.3E-01	1.5E+02	7.9E-01	3.8E+02	28.9
PA-233	2.6E-04	1.3E-03	1.3E-03	9.5E-04	5.0E-01	7.5E-02	1.2E-03	4.2E-08	1.6E-06	3.8E-05	5.8E-01	.0
NP-237+0	8.1E+00	1.6E+02	1.6E+02	3.2E+01	2.6E+02	8.0E-02	9.9E+01	2.1E-03	7.4E-02	3.1E+00	7.2E+02	55.3
TOTAL	1.6E+01	1.9E+02	1.9E+02	3.9E+01	2.7E+02	1.6E-01	4.2E+02	2.4E-01	1.9E+02	4.3E+00	1.3E+03	100.0
PERCENT	1.2	14.3	14.3	3.0	20.2	.0	31.9	.0	14.8	.3		
GI-LLI ***												
CA-41	2.3E-02	9.5E-02	9.5E-02	2.4E-02	4.6E+00	1.1E-03	3.8E-01	4.7E-06	1.6E-01	1.4E-03	5.4E+00	.3
1235 <NUMERIC UNDERFLOW>												
SE-79	2.3E+00	1.1E+00	1.1E+00	5.5E-01	.0E+00	7.0E-06	2.7E+02	2.8E-01	1.9E+02	9.5E-01	4.6E+02	22.8
PA-233	4.7E+00	2.3E+01	2.3E+01	1.7E+01	5.0E-01	7.5E-02	2.2E+01	7.5E-04	2.9E-02	6.9E-01	9.2E+01	4.5
NP-237+0	2.1E+01	4.2E+02	4.2E+02	8.5E+01	2.6E+02	8.0E-02	2.8E+02	5.4E-03	2.0E-01	8.2E+00	1.5E+03	72.5
TOTAL	2.8E+01	4.4E+02	4.4E+02	1.0E+02	2.7E+02	1.6E-01	5.5E+02	2.9E-01	1.9E+02	9.9E+00	2.0E+03	100.0
PERCENT	1.4	21.8	21.8	5.0	13.0	.0	27.2	.0	9.2	.5		
THYROID ***												
CA-41	.0E+00	.0E+00	.0E+00	.0E+00	4.6E+00	1.1E-03	.0E+00	.0E+00	.0E+00	.0E+00	4.6E+00	1.7
PA-233	.0E+00	.0E+00	.0E+00	.0E+00	5.0E-01	7.5E-02	.0E+00	.0E+00	.0E+00	.0E+00	5.7E-01	.2
NP-237+0	.0E+00	.0E+00	.0E+00	.0E+00	2.6E+02	8.0E-02	.0E+00	.0E+00	.0E+00	.0E+00	2.6E+02	98.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	2.7E+02	1.6E-01	.0E+00	.0E+00	.0E+00	.0E+00	2.7E+02	100.0
PERCENT	.0	.0	.0	.0	99.9	.1	.0	.0	.0	.0		
BONE ***												
CA-41	1.3E+01	5.4E+01	5.4E+01	1.3E+01	4.6E+00	1.1E-03	2.1E+02	2.6E-03	8.9E+01	8.1E-01	4.4E+02	3.7

1235 <NUMERIC UNDERFLOW>												
PA-233	1.5E-03	7.5E-03	7.5E-03	5.0E-01	7.5E-02	7.0E-03	2.4E-07	9.3E-06	2.2E-04	6.0E-01		.0
NP-237+0	1.9E-02	3.9E-03	3.9E-03	2.6E-02	8.0E-02	2.4E-03	4.9E-02	1.8E-00	7.5E-01	1.1E-04		96.3
TOTAL	2.1E-02	3.9E-03	3.9E-03	2.7E-02	1.6E-01	2.6E-03	5.2E-02	9.1E-01	7.6E-01	1.2E-04		100.0
PERCENT	1.7	33.0	33.0	2.2	.0	21.9	.0	.8	.6			
LIVER * * *												
CA-41	.0E+00	.0E+00	.0E+00	4.6E+00	1.1E-03	.0E+00	.0E+00	.0E+00	.0E+00	4.6E+00		.1
1235 <NUMERIC UNDERFLOW>												
SE-79	1.1E+01	5.5E+00	5.5E+00	.0E+00	7.0E-06	1.3E-03	1.4E-00	9.1E-02	4.7E+00	2.3E-03		64.4
PA-233	3.0E-04	1.5E-03	1.5E-03	5.0E-01	7.5E-02	1.4E-03	4.9E-08	1.9E-06	4.5E-05	5.8E-01		.0
NP-237+0	1.7E+01	3.4E+02	3.4E+02	2.6E+02	8.0E-02	2.1E-02	4.4E-03	1.6E-01	6.6E+00	1.2E-03		35.5
TOTAL	2.8E+01	3.5E+02	3.5E+02	2.7E+02	1.6E-01	1.5E+03	1.4E+00	9.1E-02	1.1E+01	3.5E-03		100.0
PERCENT	.8	9.9	9.9	7.5	.0	43.6	.0	25.9	.3			
LUNG * * *												
CA-41	.0E+00	.0E+00	.0E+00	4.6E+00	1.1E-03	.0E+00	.0E+00	.0E+00	.0E+00	4.6E+00		1.7
PA-233	.0E+00	.0E+00	.0E+00	5.0E-01	7.5E-02	.0E+00	.0E+00	.0E+00	.0E+00	5.7E-01		.2
NP-237+0	.0E+00	.0E+00	.0E+00	2.6E+02	8.0E-02	.0E+00	.0E+00	.0E+00	.0E+00	2.6E-02		98.0
TOTAL	.0E+00	.0E+00	.0E+00	2.7E+02	1.6E-01	.0E+00	.0E+00	.0E+00	.0E+00	2.7E-02		100.0
PERCENT	.0	.0	.0	99.9	.1	.0	.0	.0	.0			
KIDNEY * * *												
CA-41	.0E+00	.0E+00	.0E+00	4.6E+00	1.1E-03	.0E+00	.0E+00	.0E+00	.0E+00	4.6E+00		1.7
PA-233	.0E+00	.0E+00	.0E+00	5.0E-01	7.5E-02	.0E+00	.0E+00	.0E+00	.0E+00	5.7E-01		.2
U-233	5.5E-05	8.5E-04	8.5E-04	2.2E-03	6.5E-07	3.5E-03	7.3E-08	2.6E-04	1.1E-04	9.0E-03		.0
NP-237+0	.0E+00	.0E+00	.0E+00	2.6E+02	8.0E-02	.0E+00	.0E+00	.0E+00	.0E+00	2.6E-02		98.0
TOTAL	5.5E-05	8.5E-04	8.5E-04	2.7E+02	1.6E-01	3.5E-03	7.3E-08	2.6E-04	1.1E-04	2.7E-02		100.0
PERCENT	.0	.0	.0	99.9	.1	.0	.0	.0	.0			

*** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***
 N159 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** ** 50 YR BUILDUP *** 12:40:33 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
NI-59	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.1E+03	.0E+00	.0E+00	.0E+00	.0E+00	1.1E+03	11.2
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	4.6E-07	.0E+00	.0E+00	.0E+00	.0E+00	9.6E-07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	5.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	9.5E-04	9.2
PA-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	6.5E-06	.0E+00	.0E+00	.0E+00	.0E+00	7.4E-06	.1
U-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	3.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	5.0E-03	48.5
NP-237+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	3.2E-03	31.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.2E-03	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-02	100.0
PERCENT	.0	.0	.0	.0	.0	11.2	.0	.0	.0	.0	.0	
BODY ***												
NI-59	6.4E+00	3.2E+00	3.2E+00	2.6E+00	.0E+00	8.0E-04	2.4E+01	1.7E-02	5.6E+00	1.4E-01	4.5E+01	99.9
RA-225+D	3.2E+03	8.0E-03	8.0E-03	2.6E-03	3.4E-08	8.0E-09	2.3E-03	1.0E-09	5.7E-03	1.1E-05	3.0E-02	.1
TH-229	3.1E-04	2.6E-03	2.6E-03	4.3E-04	8.0E-04	2.4E-07	1.6E-03	3.0E-08	1.0E-06	4.6E-05	8.4E-03	.0
U-233	2.8E-05	4.1E-04	4.1E-04	5.4E-04	4.2E-03	1.3E-06	1.7E-03	3.5E-08	1.3E-04	5.3E-05	7.5E-03	.0
NP-237+D	8.6E+05	1.7E-03	1.7E-03	3.5E-04	2.8E-03	8.5E-07	1.1E-03	2.2E-08	8.0E-07	3.4E-05	7.8E-03	.0
TOTAL	6.4E+00	3.2E+00	3.2E+00	2.6E+00	7.8E-03	8.0E-04	2.4E+01	1.7E-02	5.6E+00	1.4E-01	4.5E+01	100.0
PERCENT	14.1	7.1	7.1	5.7	.0	.0	53.3	.0	12.5	.3	.0	
GI-LLI ***												
NI-59	2.8E+00	1.4E+00	1.4E+00	1.1E+00	.0E+00	8.0E-04	1.1E+01	7.4E-03	2.5E+00	6.1E-02	2.0E+01	99.6
RA-225+D	7.5E-04	1.8E-03	1.8E-03	6.0E-04	3.4E-08	8.0E-09	5.4E-04	2.4E-10	1.3E-03	2.5E-06	6.9E-03	.0
AC-225	4.7E-04	9.5E-03	9.5E-03	7.5E-03	4.4E-07	1.6E-07	5.3E-04	2.8E-08	9.1E-07	1.3E-05	2.1E-02	.1
TH-229	7.5E-04	6.5E-03	6.5E-03	1.0E-03	8.0E-04	2.4E-07	3.9E-03	7.3E-08	2.5E-06	1.1E-04	2.0E-02	.0
PA-233	5.0E-05	2.5E-04	2.5E-04	1.8E-04	5.5E-06	8.0E-07	2.3E-04	8.1E-09	3.1E-07	7.4E-06	9.8E-04	.0
U-233	3.2E-05	4.9E-04	4.9E-04	6.5E-04	4.2E-03	1.3E-06	2.0E-03	4.2E-08	1.5E-04	6.3E-05	8.1E-03	.0
NP-237+D	2.2E+04	4.5E-03	4.5E-03	9.0E-04	2.8E-03	8.5E-07	2.8E-03	5.8E-08	2.1E-06	8.8E-05	1.6E-02	.1
TOTAL	2.9E+00	1.4E+00	1.4E+00	1.2E+00	7.8E-03	8.0E-04	1.1E+01	7.4E-03	2.5E+00	6.2E-02	2.0E+01	100.0
PERCENT	14.2	7.1	7.1	5.7	.0	.0	53.2	.0	12.4	.3	.0	
THYROID ***												
NI-59	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-04	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-04	9.3
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.6E-07	.0E+00	.0E+00	.0E+00	.0E+00	6.1E-07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-07	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-04	9.3
PA-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-07	.0E+00	.0E+00	.0E+00	.0E+00	6.3E-06	.1
U-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	4.2E-03	48.8
NP-237+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	8.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.8E-03	32.5

*** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***
 RB87 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** 50 YR BUILDUP *** 12153112 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
RB-87	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.9E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.9E-07	.0
RA-225+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	3.1E-08	.0E+00	.0E+00	.0E+00	.0E+00	9.1E-08	.0
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	5.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-06	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	6.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.2E-03	18.5
PA-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	9.2E-07	.0
U-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.7E-06	.0E+00	.0E+00	.0E+00	.0E+00	4.7E-03	74.9
NP-237+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-07	.0E+00	.0E+00	.0E+00	.0E+00	4.1E-04	6.6
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	4.5E-06	.0E+00	.0E+00	.0E+00	.0E+00	6.2E-03	100.0
PERCENT	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	

BODY ***												
RB-87	1.2E-02	3.0E-03	3.0E-03	2.5E-04	.0E+00	1.4E-09	1.3E-02	1.3E-06	6.9E-03	4.6E-05	3.8E-02	41.6
RA-225+D	3.8E-03	9.5E-03	9.5E-03	3.1E-03	4.1E-08	9.5E-09	2.8E-03	1.2E-09	6.8E-03	1.3E-05	3.5E-02	38.9
AC-225	4.1E-07	8.5E-06	8.5E-06	6.5E-07	5.5E-07	2.0E-07	4.6E-07	2.5E-11	7.9E-10	1.1E-08	1.9E-05	.0
TH-229	3.7E-04	3.1E-03	3.1E-03	5.0E-04	9.0E-04	2.9E-07	1.9E-03	3.5E-08	1.2E-06	5.5E-05	9.8E-03	10.8
U-233	2.5E-05	3.7E-04	3.7E-04	5.0E-04	3.8E-03	1.1E-06	1.5E-03	3.2E-08	1.2E-04	4.9E-05	6.8E-03	7.5
NP-237+D	1.1E-05	2.2E-04	2.2E-04	4.5E-05	3.6E-04	1.1E-07	1.4E-04	2.8E-09	1.0E-07	4.3E-06	9.9E-04	1.1
TOTAL	1.6E-02	1.6E-02	1.6E-02	4.3E-03	5.1E-03	1.9E-06	1.9E-02	1.3E-06	1.4E-02	1.7E-04	9.1E-02	100.0
PERCENT	17.8	17.8	17.8	4.8	5.6	.0	20.8	.0	15.1	.2	.0	

GI-LLI ***												
RB-87	1.6E-03	4.0E-04	4.0E-04	3.3E-05	.0E+00	1.4E-09	1.7E-03	1.7E-07	9.2E-04	6.1E-06	5.1E-03	7.2
RA-225+D	8.5E-04	2.2E-03	2.2E-03	7.0E-04	4.1E-08	9.5E-09	6.5E-04	2.8E-10	1.6E-03	3.0E-06	8.2E-03	11.6
AC-225	5.5E-04	1.1E-02	1.1E-02	9.0E-04	5.5E-07	2.0E-07	6.4E-04	3.4E-08	1.1E-06	1.5E-05	2.5E-02	35.5
TH-229	9.0E-04	7.5E-03	7.5E-03	1.2E-03	9.0E-04	2.9E-07	4.6E-03	8.7E-08	3.0E-06	1.4E-04	2.3E-02	32.2
PA-233	6.5E-06	3.2E-05	3.2E-05	2.3E-05	7.0E-07	1.0E-07	3.0E-05	1.0E-09	3.9E-08	9.4E-07	1.3E-04	.2
U-233	2.9E-05	4.4E-04	4.4E-04	6.0E-04	3.8E-03	1.1E-06	1.8E-03	3.8E-08	1.4E-04	5.8E-05	7.4E-03	10.5
NP-237+D	2.9E-05	6.0E-04	6.0E-04	1.1E-04	3.6E-04	1.1E-07	3.6E-04	7.4E-09	2.7E-07	1.1E-05	2.1E-03	2.9
TOTAL	4.0E-03	2.3E-02	2.3E-02	3.6E-03	5.1E-03	1.9E-06	9.8E-03	3.4E-07	2.6E-03	2.3E-04	7.1E-02	100.0
PERCENT	5.6	32.1	32.1	5.1	7.2	.0	13.9	.0	3.7	.3	.0	

THYROID ***												
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	5.5E-07	2.0E-07	.0E+00	.0E+00	.0E+00	.0E+00	7.5E-07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	9.0E-04	2.9E-07	.0E+00	.0E+00	.0E+00	.0E+00	9.0E-04	17.6
PA-233	.0E+00	.0E+00	.0E+00	.0E+00	7.0E-07	1.0E-07	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-07	.0
U-233	.0E+00	.0E+00	.0E+00	.0E+00	3.8E-03	1.1E-06	.0E+00	.0E+00	.0E+00	.0E+00	3.9E-03	75.3

*** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***
 CS135 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** ** 50 YR BUILDUP *** 13:00:30 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
CS-135	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.0E+03	.0E+00	.0E+00	.0E+00	.0E+00	2.0E+03	30.6
RA-225+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	3.5E+08	.0E+00	.0E+00	.0E+00	.0E+00	1.0E+07	.0
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+07	.0E+00	.0E+00	.0E+00	.0E+00	1.3E+06	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.3E+03	.0E+00	.0E+00	.0E+00	.0E+00	1.3E+03	19.4
U-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	3.3E+03	.0E+00	.0E+00	.0E+00	.0E+00	3.4E+03	50.0
NP-237+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	9.0E+07	.0E+00	.0E+00	.0E+00	.0E+00	9.0E+07	.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.1E+03	.0E+00	.0E+00	.0E+00	.0E+00	6.7E+03	100.0
PERCENT	.0	.0	.0	.0	.0	30.6	.0	.0	.0	.0		
BODY ***												
CS-135	2.9E+02	7.3E+00	7.3E+00	5.6E+00	.0E+00	1.2E+05	1.9E+01	7.6E+02	1.9E+01	3.3E+00	3.5E+02	100.0
RA-225+D	4.3E+03	1.1E+02	1.1E+02	3.5E+03	4.7E+08	1.0E+08	3.2E+03	1.4E+09	7.7E+03	1.4E+05	4.0E+02	.0
TH-229	4.3E+04	3.6E+03	3.6E+03	5.7E+04	1.0E+03	3.3E+07	2.1E+03	4.0E+08	1.4E+06	6.2E+05	1.1E+02	.0
U-233	1.8E+05	2.7E+04	2.7E+04	3.6E+04	2.7E+03	8.5E+07	1.1E+03	2.3E+08	8.4E+05	3.5E+05	4.9E+03	.0
TOTAL	2.9E+02	7.3E+00	7.3E+00	5.6E+00	3.8E+03	1.4E+05	1.9E+01	7.6E+02	1.9E+01	3.3E+00	3.5E+02	100.0
PERCENT	82.4	2.1	2.1	1.6	.0	.0	5.4	.0	5.4	1.0		
GI-LLI ***												
CS-135	1.6E+01	4.2E+01	4.2E+01	3.4E+01	.0E+00	1.2E+05	1.1E+00	4.4E+03	1.1E+00	2.0E+01	2.0E+01	99.7
RA-225+D	1.0E+03	2.4E+03	2.4E+03	8.0E+04	4.7E+08	1.0E+08	7.3E+04	3.2E+10	1.8E+03	3.3E+06	9.2E+03	.0
AC-225	6.5E+04	1.3E+02	1.3E+02	1.0E+03	6.0E+07	2.2E+07	7.2E+04	3.8E+08	1.2E+06	1.7E+05	2.8E+02	.1
TH-229	1.0E+03	8.5E+03	8.5E+03	1.4E+03	1.0E+03	3.3E+07	5.2E+03	9.8E+08	3.4E+06	1.5E+04	2.6E+02	.1
U-233	2.1E+05	3.2E+04	3.2E+04	4.3E+04	2.7E+03	8.5E+07	1.3E+03	2.8E+08	9.9E+05	4.2E+05	5.3E+03	.0
TOTAL	1.7E+01	4.4E+01	4.4E+01	3.4E+01	3.8E+03	1.4E+05	1.1E+00	4.4E+03	1.1E+00	2.0E+01	2.0E+01	100.0
PERCENT	81.9	2.2	2.2	1.7	.0	.0	5.5	.0	5.5	1.0		
THYROID ***												
CS-135	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.2E+05	.0E+00	.0E+00	.0E+00	.0E+00	1.2E+05	.3
RA-225+D	.0E+00	.0E+00	.0E+00	.0E+00	4.7E+08	1.0E+08	.0E+00	.0E+00	.0E+00	.0E+00	5.7E+08	.0
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	6.0E+07	2.2E+07	.0E+00	.0E+00	.0E+00	.0E+00	8.2E+07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	2.7E+03	3.3E+07	.0E+00	.0E+00	.0E+00	.0E+00	1.1E+03	27.5
U-233	.0E+00	.0E+00	.0E+00	.0E+00	8.0E+07	8.5E+07	.0E+00	.0E+00	.0E+00	.0E+00	2.8E+03	72.1
NP-237+D	.0E+00	.0E+00	.0E+00	.0E+00	8.0E+07	2.4E+10	.0E+00	.0E+00	.0E+00	.0E+00	8.0E+07	.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	3.8E+03	1.4E+05	.0E+00	.0E+00	.0E+00	.0E+00	3.8E+03	100.0
PERCENT	.0	.0	.0	.0	99.6	.4	.0	.0	.0	.0		

BONE ***														
CS-135	7.7E+02	1.9E+01	1.9E+01	1.5E+01	.0E+00	1.2E+05	5.1E+01	2.1E-01	5.1E+01	9.1E+00	9.4E+02	99.9		
RA-225+D	2.1E-02	5.5E-02	1.7E-02	1.7E-02	4.7E-08	1.0E-08	1.0E-08	6.9E-09	3.8E-02	7.2E-05	2.0E-01	.0		
TH-229	1.4E-02	1.2E-01	1.2E-01	2.0E-02	1.0E-03	3.3E-07	1.4E-06	1.4E-06	4.8E-05	2.2E-03	3.5E-01	.0		
U-233	2.9E-04	4.4E-03	4.4E-03	6.0E-03	2.7E-03	8.5E-07	1.8E-02	3.8E-07	1.4E-03	5.7E-04	3.8E-02	.0		
TOTAL	7.7E+02	1.9E+01	1.9E+01	1.6E+01	3.8E-03	1.4E+05	5.1E+01	2.1E-01	5.1E+01	9.1E+00	9.4E+02	100.0		
PERCENT	82.4	2.0	2.0	1.7	.0	.0	5.4	.0	5.4	1.0				
LIVER ***														
CS-135	6.9E+02	1.8E+01	1.8E+01	1.4E+01	.0E+00	1.2E+05	4.7E+01	1.9E-01	4.7E+01	8.4E+00	8.4E+02	100.0		
TH-229	4.3E-04	3.6E-03	3.6E-03	5.7E-04	1.0E-03	3.3E-07	2.1E-03	4.0E-08	1.4E-06	6.3E-05	1.1E-02	.0		
TOTAL	6.9E+02	1.8E+01	1.8E+01	1.4E+01	3.8E-03	1.4E+05	4.7E+01	1.9E-01	4.7E+01	8.4E+00	8.4E+02	100.0		
PERCENT	81.9	2.1	2.1	1.7	.0	.0	5.6	.0	5.6	1.0				
LUNG ***														
CS-135	5.4E+02	1.4E+01	1.4E+01	1.1E+01	.0E+00	1.2E+05	3.5E+01	1.4E-01	3.5E+01	6.3E+00	6.5E+02	100.0		
TOTAL	5.4E+02	1.4E+01	1.4E+01	1.1E+01	3.8E-03	1.4E+05	3.5E+01	1.4E-01	3.5E+01	6.3E+00	6.5E+02	100.0		
PERCENT	82.3	2.1	2.1	1.6	.0	.0	5.4	.0	5.4	1.0				
KIDNEY ***														
CS-135	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.2E+05	.0E+00	.0E+00	.0E+00	.0E+00	1.2E+05	.1		
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	6.0E-07	2.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	8.2E-07	.0		
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-03	3.3E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-03	8.5		
U-233	7.0E-05	1.1E-03	1.1E-03	1.5E-03	2.7E-03	8.5E-07	4.4E-03	9.2E-08	3.3E-04	1.4E-04	1.1E-02	91.4		
NP-237+D	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-07	2.4E-10	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-07	.0		
TOTAL	7.0E-05	1.1E-03	1.1E-03	1.5E-03	3.8E-03	1.4E+05	4.4E-03	9.2E-08	3.3E-04	1.4E-04	1.2E-02	100.0		
PERCENT	.6	8.5	8.5	11.8	30.8	.1	35.9	.0	2.7	1.1				

*** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***

SN126 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** 50 YR BUILDUP *** 13:06:06 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
SN-126-D	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+02	5.5E+03	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+02	99.9
SB-126	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+01	3.0E-01	.0E+00	.0E+00	.0E+00	.0E+00	1.0E+00	.1
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+02	3.1E-01	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+02	100.0
PERCENT	.0	.0	.0	.0	100.0	.0	.0	.0	.0	.0		

BODY ***

PD-107	5.5E-04	8.5E-03	8.5E-03	2.2E-03	.0E+00	.0E+00	4.3E+00	4.0E-04	6.2E-01	1.5E-02	4.9E+00	.6
SN-126-D	8.0E+01	1.3E+01	1.3E+01	1.1E+00	7.0E+02	1.6E-03	3.3E+00	6.8E-06	1.2E+00	5.2E-02	8.1E+02	99.2
SB-126	4.3E-03	2.1E-02	2.1E-02	1.7E-01	7.0E-01	2.2E-01	1.4E-01	6.1E-05	3.4E-02	6.1E-04	1.3E+00	.2
RA-225-D	4.0E-03	1.0E-02	1.0E-02	3.2E-03	4.4E-08	1.0E-08	2.9E-03	1.3E-09	7.2E-03	1.3E-05	3.7E-02	.0
TH-229	3.9E-04	3.3E-03	3.3E-03	5.3E-04	1.0E-03	3.0E-07	2.0E-03	3.7E-08	1.3E-06	5.8E-05	1.1E-02	.0
TOTAL	8.0E+01	1.3E+01	1.3E+01	1.2E+00	7.0E+02	2.2E-01	7.7E+00	4.7E-04	1.9E+00	6.7E-02	8.2E+02	100.0
PERCENT	9.8	1.6	1.6	.2	85.7	.0	.9	.0	.2	.0		

GI-LLI ***

PD-107	5.5E-02	8.0E-01	8.0E-01	2.2E-01	.0E+00	.0E+00	4.1E+02	3.9E-02	6.0E+01	1.5E+00	4.8E+02	19.9
SN-126-D	8.0E+02	1.3E+02	1.3E+02	1.1E+01	7.0E+02	1.6E-03	3.3E+01	6.8E-05	1.2E+01	5.2E-01	1.8E+03	76.2
SB-126	1.0E+00	4.9E+00	4.9E+00	3.9E+01	7.0E-01	2.2E-01	3.3E+01	1.4E-02	7.7E+00	1.4E-01	9.2E+01	3.8
AC-225	6.0E-04	1.2E-02	1.2E-02	9.5E-04	5.5E-07	2.1E-07	6.7E-04	3.6E-08	1.1E-06	1.6E-05	2.6E-02	.0
TH-229	9.5E-04	8.0E-03	8.0E-03	1.3E-03	1.0E-03	3.0E-07	4.9E-03	9.2E-08	3.1E-06	1.4E-04	2.4E-02	.0
TOTAL	8.0E+02	1.4E+02	1.4E+02	5.1E+01	7.0E+02	2.2E-01	4.8E+02	5.3E-02	8.1E+01	2.1E+00	2.4E+03	100.0
PERCENT	33.4	5.9	5.9	2.1	29.2	.0	20.0	.0	3.4	.1		

THYROID ***

SN-126-D	1.6E+01	2.7E+00	2.7E+00	2.2E-01	7.0E+02	1.6E-03	6.7E+01	1.4E-06	2.5E-01	1.1E-02	7.2E+02	99.9
SB-126	7.5E-05	3.6E-04	3.6E-04	2.9E-03	7.0E-01	2.2E-01	2.4E-03	1.0E-06	5.7E-04	1.0E-05	9.3E-01	.1
TOTAL	1.6E+01	2.7E+00	2.7E+00	2.2E-01	7.0E+02	2.2E-01	6.7E+01	2.4E-06	2.5E-01	1.1E-02	7.2E+02	100.0
PERCENT	2.3	.4	.4	.0	96.8	.0	.1	.0	.0	.0		

BONE ***

SN-126-D	2.8E+03	4.6E+02	4.6E+02	3.7E+01	7.0E+02	1.6E-03	1.1E+02	2.4E-04	4.3E+01	1.8E+00	4.6E+03	99.9
SB-126	1.2E-02	6.0E-02	6.0E-02	4.9E-01	7.0E-01	2.2E-01	4.0E-01	1.7E-04	9.5E-02	1.7E-03	2.0E+00	.0
RA-225-D	2.0E-02	5.0E-02	5.0E-02	1.6E-02	4.4E-08	1.0E-08	1.5E-02	6.4E-09	3.6E-02	6.7E-05	1.9E-01	.0

TH-229	1.4E-02	1.2E-01	1.2E-01	1.9E-02	1.0E-03	3.0E-07	7.0E-02	1.3E-06	4.5E-05	2.1E-03	3.4E-01	.0
TOTAL	2.8E+03	4.6E+02	4.6E+02	3.8E+01	7.0E+02	2.2E-01	1.2E+02	4.1E-04	4.3E+01	1.8E+00	4.6E+03	100.0
PERCENT	60.3	10.1	10.1	.A	15.3	.0	2.5	.0	.9	.0		
LIVER ***												
PD-107	8.5E-03	1.3E-01	1.3E-01	3.5E-02	.0E+00	.0E+00	6.7E+01	6.3E-03	9.8E+00	2.4E-01	7.7E+01	9.0
SN-126.D	5.6E+01	9.2E+00	9.2E+00	7.7E-01	7.0E-02	1.6E-03	2.3E+00	4.7E-06	8.5E-01	3.6E-02	7.8E+02	90.9
SB-126	2.4E-04	1.2E-03	1.2E-03	1.0E-02	7.0E-01	2.2E-01	8.1E-03	3.4E-06	1.9E-03	3.5E-05	9.4E-01	.1
TH-229	3.9E-04	3.3E-03	3.3E-03	5.3E-04	1.0E-03	3.0E-07	2.0E-03	3.7E-08	1.3E-06	5.8E-05	1.1E-02	.0
TOTAL	5.7E+01	9.4E+00	9.4E+00	8.2E-01	7.0E+02	2.2E-01	6.9E+01	6.3E-03	1.1E+01	2.7E-01	8.6E+02	100.0
PERCENT	6.6	1.1	1.1	.1	81.8	.0	8.0	.0	1.2	.0		
LUNG ***												
SN-126.D	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+02	1.6E-03	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+02	99.9
SB-126	.0E+00	.0E+00	.0E+00	.0E+00	7.0E-01	2.2E-01	.0E+00	.0E+00	.0E+00	.0E+00	9.2E-01	.1
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+02	2.2E-01	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+02	100.0
PERCENT	.0	.0	.0	.0	100.0	.0	.0	.0	.0	.0		
KIDNEY ***												
SN-126.D	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+02	1.6E-03	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+02	99.9
SB-126	.0E+00	.0E+00	.0E+00	.0E+00	7.0E-01	2.2E-01	.0E+00	.0E+00	.0E+00	.0E+00	9.2E-01	.1
U-233	6.5E-05	1.0E-03	1.0E-03	1.4E-03	2.6E-03	8.0E-07	4.1E-03	8.6E-08	3.1E-04	1.3E-04	1.1E-02	.0
TOTAL	6.5E-05	1.0E-03	1.0E-03	1.4E-03	7.0E+02	2.2E-01	4.1E-03	8.6E-08	3.1E-04	1.3E-04	7.0E+02	100.0
PERCENT	.0	.0	.0	.0	100.0	.0	.0	.0	.0	.0		

***** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE *****												
H0166M MAX. INDIVIDUAL ***** LST008 SOURCE FILE ***** ***** 50 YR BUILDUP ***** 13:12:05 08/26/75												
ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING=	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN *****												
RA-225+D	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-08	1.4E-08	.0E+00	.0E+00	.0E+00	.0E+00	3.9E-08	.0
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	2.6E-07	2.4E-07	.0E+00	.0E+00	.0E+00	.0E+00	5.0E-07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	5.0E-04	2.8E-07	.0E+00	.0E+00	.0E+00	.0E+00	5.0E-04	27.6
U-233	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-03	7.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-03	72.4
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-03	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-03	100.0
PERCENT	.0	.0	.0	.0	99.9	.1	.0	.0	.0	.0		
BODY *****												
RA-225+D	1.7E-03	4.1E-03	4.1E-03	1.3E-03	1.8E-08	4.1E-09	1.2E-03	5.3E-10	2.9E-03	5.5E-06	1.5E-02	71.5
RA-226+D	2.6E-08	6.4E-08	6.4E-08	2.1E-08	1.8E-10	6.0E-14	4.6E-08	1.1E-14	7.2E-08	2.7E-10	2.9E-07	.0
AC-225	1.8E-07	3.6E-06	3.6E-06	2.9E-07	2.3E-07	8.5E-08	2.0E-07	1.1E-11	3.4E-10	4.8E-09	8.2E-06	.0
TH-229	1.7E-04	1.3E-03	1.3E-03	2.1E-04	4.0E-04	1.2E-07	8.1E-04	1.5E-08	5.2E-07	2.4E-05	4.2E-03	19.7
U-233	7.1E-06	1.0E-04	1.0E-04	1.4E-04	1.0E-03	3.2E-07	4.3E-04	8.9E-09	3.2E-05	1.4E-05	1.9E-03	8.8
TOTAL	1.8E-03	5.5E-03	5.5E-03	1.7E-03	1.5E-03	5.4E-07	2.5E-03	2.5E-08	3.0E-03	4.3E-05	2.1E-02	100.0
PERCENT	8.5	25.7	25.7	7.7	6.8	.0	11.5	.0	13.9	.2		
GI-LLI *****												
RA-225+D	3.8E-04	9.5E-04	9.5E-04	3.1E-04	1.8E-08	4.1E-09	2.8E-04	1.2E-10	6.9E-04	1.3E-06	3.6E-03	13.4
AC-225	2.5E-04	4.9E-03	4.9E-03	4.0E-04	2.3E-07	8.5E-08	2.8E-04	1.5E-08	4.7E-07	6.6E-06	1.1E-02	40.8
TH-229	4.0E-04	3.3E-03	3.3E-03	5.5E-04	4.0E-04	1.2E-07	2.0E-03	3.8E-08	1.3E-06	5.9E-05	1.0E-02	38.1
U-233	8.5E-06	1.2E-04	1.2E-04	1.7E-04	1.0E-03	3.2E-07	5.1E-04	1.1E-08	3.8E-05	1.6E-05	2.0E-03	7.7
TOTAL	1.0E-03	9.4E-03	9.4E-03	1.4E-03	1.5E-03	5.4E-07	3.1E-03	6.4E-08	7.3E-04	8.3E-05	2.7E-02	100.0
PERCENT	3.9	35.3	35.3	5.4	5.5	.0	11.6	.0	2.7	.3		
THYROID *****												
RA-225+D	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-08	4.1E-09	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-08	.0
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-07	8.5E-08	.0E+00	.0E+00	.0E+00	.0E+00	3.1E-07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	4.0E-04	1.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	4.1E-04	27.8
U-233	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-03	3.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-03	72.1
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	1.5E-03	5.4E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.5E-03	100.0
PERCENT	.0	.0	.0	.0	100.0	.0	.0	.0	.0	.0		
BONE *****												

RA-225+D	8.0E-03	2.1E-02	2.1E-02	6.5E-03	1.8E-08	4.1E-09	6.1E-03	2.6E-09	1.5E-02	2.8E-05	7.6E-02	33.0
AC-225	2.7E-06	5.5E-05	5.5E-05	4.3E-06	2.3E-07	8.5E-08	3.0E-06	1.6E-10	5.1E-09	7.1E-08	1.2E-04	.1
TH-229	5.8E-03	4.8E-02	4.8E-02	7.8E-03	4.0E-04	1.2E-07	2.9E-02	5.5E-07	1.9E-05	8.5E-04	1.4E-01	60.5
U-233	1.1E-04	1.7E-03	1.7E-03	2.3E-03	1.0E-03	3.2E-07	7.0E-03	1.5E-07	5.3E-04	2.2E-04	1.5E-02	6.4
TOTAL	1.4E-02	7.0E-02	7.0E-02	1.7E-02	1.5E-03	5.4E-07	4.2E-02	7.0E-07	1.5E-02	1.1E-03	2.3E-01	100.0
PERCENT	6.0	30.5	30.5	7.2	.6	.0	18.1	.0	6.6	.5		
LIVER ***												
PO-210	1.6E-09	3.1E-08	3.1E-08	1.3E-10	1.7E-17	5.0E-19	7.4E-10	1.1E-13	1.0E-10	3.1E-12	6.5E-08	.0
RA-225+D	9.5E-06	2.4E-05	2.4E-05	8.0E-06	1.8E-08	4.1E-09	7.2E-06	3.1E-12	1.7E-05	3.3E-08	9.0E-05	1.6
AC-225	3.7E-06	7.5E-05	7.5E-05	6.0E-06	2.3E-07	8.5E-08	4.2E-06	2.2E-10	7.1E-09	9.9E-08	1.6E-04	3.0
TH-229	1.7E-04	1.3E-03	1.3E-03	2.3E-04	4.0E-04	1.2E-07	8.1E-04	1.5E-08	5.3E-07	2.4E-05	4.2E-03	76.5
U-233	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-03	3.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-03	18.9
TOTAL	1.8E-04	1.4E-03	1.4E-03	2.4E-04	1.5E-03	5.4E-07	8.3E-04	1.6E-08	1.8E-05	2.4E-05	5.5E-03	100.0
PERCENT	3.2	25.3	25.3	4.3	26.2	.0	14.9	.0	.3	.4		
LUNG ***												
RA-225+D	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-08	4.1E-09	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-08	.0
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-07	8.5E-08	.0E+00	.0E+00	.0E+00	.0E+00	3.1E-07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	4.0E-04	1.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	4.1E-04	27.8
U-233	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-03	3.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-03	72.1
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	1.5E-03	5.4E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.5E-03	100.0
PERCENT	.0	.0	.0	.0	100.0	.0	.0	.0	.0	.0		
KIDNEY ***												
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-07	8.5E-08	.0E+00	.0E+00	.0E+00	.0E+00	3.1E-07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	4.0E-04	1.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	4.1E-04	8.5
U-233	2.8E-05	4.2E-04	4.2E-04	5.5E-04	1.0E-03	3.2E-07	1.7E-03	3.6E-08	1.3E-04	5.4E-05	4.3E-03	91.5
TOTAL	2.8E-05	4.2E-04	4.2E-04	5.5E-04	1.5E-03	5.4E-07	1.7E-03	3.6E-08	1.3E-04	5.4E-05	4.8E-03	100.0
PERCENT	.6	8.7	8.7	11.6	30.6	.0	36.0	.0	2.7	1.1		

***** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE *****

CM247 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** ** 50 YR BUILDUP *** 11:59:27 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
RA-225+D	.0E+00	.0E+00	.0E+00	.0E+00	1.5E-08	8.0E-09	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-08	.0
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	1.5E-07	1.4E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.9E-07	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	2.9E-04	1.8E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.9E-04	22.1
U-233	.0E+00	.0E+00	.0E+00	.0E+00	7.5E-04	4.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	7.5E-04	57.1
AM-243+D	.0E+00	.0E+00	.0E+00	.0E+00	2.8E-06	1.0E-09	.0E+00	.0E+00	.0E+00	.0E+00	2.8E-06	.2
CM-247+D	.0E+00	.0E+00	.0E+00	.0E+00	2.7E-04	9.0E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.7E-04	20.6
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-03	8.6E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-03	100.0
PERCENT	.0	.0	.0	.0	99.9	.1	.0	.0	.0	.0		

BODY ***

RA-225+D	9.5E-04	2.4E-03	2.4E-03	8.0E-04	1.0E-08	2.4E-09	7.1E-04	3.1E-10	1.7E-03	3.2E-06	9.0E-03	66.8
AC-225	1.3E-07	3.2E-07	3.2E-07	1.1E-07	9.5E-10	3.1E-13	2.4E-07	5.8E-14	3.7E-07	1.4E-09	1.5E-06	.0
TH-229	9.5E-05	7.9E-04	7.9E-04	1.3E-04	2.3E-04	7.5E-08	4.8E-04	6.3E-12	2.0E-10	2.8E-09	4.8E-06	.0
U-233	4.1E-06	6.0E-05	6.0E-05	8.1E-05	6.5E-04	1.9E-07	2.5E-04	9.0E-09	3.1E-07	1.4E-05	2.5E-03	18.9
AM-243+D	2.9E-09	4.1E-08	4.1E-08	3.2E-08	4.5E-10	8.0E-14	7.2E-08	5.3E-09	1.9E-05	8.0E-06	1.1E-03	8.4
CM-247+D	2.0E-07	4.0E-06	4.0E-06	3.2E-07	2.4E-06	7.0E-10	7.1E-07	1.7E-11	6.9E-10	2.5E-08	1.9E-07	.0
TOTAL	1.2E-05	2.3E-04	2.3E-04	1.8E-05	2.3E-04	6.0E-08	5.8E-05	1.2E-09	4.3E-08	1.8E-06	7.7E-04	5.8
PERCENT	7.9	25.9	25.9	7.7	8.3	.0	11.1	.0	13.0	.2		100.0

GI-LLI ***

RA-225+D	2.2E-04	5.5E-04	5.5E-04	1.8E-04	1.0E-08	2.4E-09	1.7E-04	7.2E-11	4.0E-04	7.5E-07	2.1E-03	11.9
AC-225	1.4E-04	2.9E-03	2.9E-03	2.3E-04	1.3E-07	5.0E-08	1.6E-04	8.7E-09	2.8E-07	3.9E-06	6.3E-03	36.5
TH-229	2.3E-04	1.9E-03	1.9E-03	3.2E-04	2.3E-04	7.5E-08	1.2E-03	2.2E-08	7.5E-07	3.5E-05	5.9E-03	33.9
U-233	4.9E-06	7.5E-05	7.5E-05	1.0E-04	6.5E-04	1.9E-07	3.0E-04	6.2E-09	2.3E-05	9.5E-06	1.2E-03	7.1
NP-239	4.8E-08	9.5E-07	9.5E-07	1.9E-07	3.3E-10	5.5E-10	3.3E-08	5.6E-12	9.5E-11	9.2E-11	2.2E-06	.0
PU-239	1.9E-08	2.7E-07	2.7E-07	2.2E-07	4.5E-10	8.0E-14	4.9E-07	1.2E-11	1.4E-10	1.7E-08	1.3E-06	.0
AM-243+D	6.5E-07	1.3E-05	1.3E-05	1.0E-06	2.4E-06	7.0E-10	2.3E-06	5.7E-11	2.3E-09	8.3E-08	3.3E-05	.2
CM-247+D	3.3E-05	6.5E-04	6.5E-04	5.5E-05	2.3E-04	6.0E-08	1.7E-04	3.4E-09	1.2E-07	5.2E-06	1.8E-03	10.3
TOTAL	6.4E-04	6.1E-03	6.1E-03	8.9E-04	1.1E-03	3.8E-07	2.0E-03	4.1E-08	4.3E-04	5.4E-05	1.7E-02	100.0
PERCENT	3.7	35.3	35.3	5.1	6.4	.0	11.4	.0	2.5	.3		

THYROID ***

RA-225+D	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-08	2.4E-09	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-08	.0
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-07	5.0E-08	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-07	.0

I.113

DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE * * * *												
7R93 MAX. INDIVIDUAL * * * LST008 SOURCE FILE * * * 50 YR BUILDUP * * * 12102137 08/26/75												
ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN * * *												
PB-210+D	.0E+00	.0E+00	.0E+00	.0E+00	2.7E-07	1.4E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.8E-07	.0
RN-222+D	.0E+00	.0E+00	.0E+00	.0E+00	7.0E-08	1.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.9E-07	.0
RA-226+D	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-04	1.2E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-04	6.9
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	4.0E-06	2.3E-09	.0E+00	.0E+00	.0E+00	.0E+00	4.1E-06	.1
TH-230+D	.0E+00	.0E+00	.0E+00	.0E+00	5.5E-07	2.7E-10	.0E+00	.0E+00	.0E+00	.0E+00	5.5E-07	.0
U-233	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-05	6.5E-09	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-05	.3
PU-242	.0E+00	.0E+00	.0E+00	.0E+00	3.2E-03	8.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	3.2E-03	92.6
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	3.5E-03	1.1E-06	.0E+00	.0E+00	.0E+00	.0E+00	3.5E-03	100.0
PERCENT	.0	.0	.0	.0	100.0	.0	.0	.0	.0	.0		
BODY * * *												
ZR-93+D	2.0E-05	2.0E-05	2.0E-05	2.5E-04	.0E+00	.0E+00	5.3E-04	8.0E-09	2.6E-07	1.9E-06	8.4E-04	.1
NB-93M	3.5E-01	5.7E-04	5.7E-04	4.7E-04	.0E+00	.0E+00	1.9E-03	6.1E-09	2.6E-04	4.7E-06	3.5E-01	46.2
PB-210+D	2.3E-04	1.2E-04	1.2E-04	9.3E-05	2.0E-07	1.1E-10	1.4E-03	1.7E-08	2.3E-05	5.3E-06	2.0E-03	.3
PO-210	2.0E-04	4.0E-03	4.0E-03	1.6E-05	1.9E-11	6.0E-13	9.5E-05	1.4E-08	1.3E-05	4.0E-07	8.2E-03	1.1
RA-225+D	1.4E-05	3.4E-05	3.4E-05	1.1E-05	1.5E-10	3.4E-11	1.0E-05	4.3E-12	2.4E-05	4.5E-08	1.3E-04	.0
RA-226+D	2.9E-02	7.2E-02	7.2E-02	2.4E-02	2.1E-04	7.0E-08	5.2E-02	1.3E-08	8.1E-02	3.1E-04	3.3E-01	43.9
TH-229	1.3E-06	1.1E-05	1.1E-05	1.8E-06	3.3E-06	1.0E-09	6.7E-06	1.3E-10	4.3E-09	2.0E-07	3.6E-05	.0
U-233	6.0E-08	8.7E-07	8.7E-07	1.1E-06	8.5E-06	2.6E-09	3.5E-06	7.3E-11	2.6E-07	1.1E-07	1.5E-05	.0
PU-242	9.3E-04	1.3E-02	1.3E-02	1.1E-02	2.2E-04	2.6E-08	2.4E-02	5.9E-07	7.1E-06	8.5E-04	6.3E-02	8.4
TOTAL	3.8E-01	9.0E-02	9.0E-02	3.5E-02	4.4E-04	1.7E-07	8.0E-02	6.5E-07	8.1E-02	1.2E-03	7.5E-01	100.0
PERCENT	49.9	12.0	12.0	4.7	.1	.0	10.6	.0	10.8	.2		
GI-LLI * * *												
ZR-93+D	4.5E-02	4.6E-02	4.6E-02	5.5E-01	.0E+00	.0E+00	1.2E+00	1.8E-05	6.0E-04	4.3E-03	1.9E+00	.3
NB-93M	6.5E+02	1.1E+00	1.1E+00	9.0E+01	.0E+00	.0E+00	3.0E+00	1.2E-05	4.9E-01	9.0E-03	6.6E+02	99.6
PU-242	6.5E-03	9.5E-02	9.5E-02	7.5E-02	2.2E-04	2.6E-08	1.7E-01	4.1E-06	4.9E-05	5.9E-03	4.4E-01	.1
TOTAL	6.5E+02	1.2E+00	1.2E+00	1.5E+00	4.4E-04	1.7E-07	4.4E+00	3.4E-05	4.9E-01	1.9E-02	6.6E+02	100.0
PERCENT	98.7	.2	.2	.2	.0	.0	.7	.0	.1	.0		
THYROID * * *												
PB-210+D	.0E+00	.0E+00	.0E+00	.0E+00	2.0E-07	1.1E-10	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-07	.0
RN-222+D	.0E+00	.0E+00	.0E+00	.0E+00	6.0E-08	7.0E-08	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-07	.0
RA-226+D	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-04	7.0E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-04	46.9
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	3.3E-06	1.0E-09	.0E+00	.0E+00	.0E+00	.0E+00	3.3E-06	.8
TH-230+D	.0E+00	.0E+00	.0E+00	.0E+00	4.8E-07	1.5E-10	.0E+00	.0E+00	.0E+00	.0E+00	4.8E-07	.1

*** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***

U238 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** ** 50 YR BUILDUP *** 12106121 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
PB-210+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	4.5E-05	.0E+00	.0E+00	.0E+00	.0E+00	9.5E-04	.1
BI-210+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	4.4E-05	.0E+00	.0E+00	.0E+00	.0E+00	4.4E-05	.0
RM-222+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	3.9E-04	.0E+00	.0E+00	.0E+00	.0E+00	6.2E-04	.0
RA-226+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	3.9E-04	.0E+00	.0E+00	.0E+00	.0E+00	8.0E-01	90.1
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	8.5E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.7E-05	.0
AC-227+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.7E-03	.2
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.7E-02	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-02	2.0
TH-230+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	3.2E-03	.0E+00	.0E+00	.0E+00	.0E+00	3.2E-03	.4
TH-234	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	5.0E-05	.0E+00	.0E+00	.0E+00	.0E+00	6.2E-05	.0
PA-231+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.2E-06	.0E+00	.0E+00	.0E+00	.0E+00	3.9E-03	.4
U-233	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	7.0E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.2E-03	.1
U-234	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.6E-06	.0E+00	.0E+00	.0E+00	.0E+00	9.5E-03	1.1
U-235+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.9E-02	3.2
U-236	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	6.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-02	2.4
U-238+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	5.0E-05	.0E+00	.0E+00	.0E+00	.0E+00	5.0E-05	.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-03	.0E+00	.0E+00	.0E+00	.0E+00	8.9E-01	100.0
PERCENT	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0		

BODY ***

PB-210+D	7.6E-01	3.7E-01	3.7E-01	2.9E-01	7.0E-04	3.8E-07	4.5E+00	5.7E-05	7.6E-02	1.7E-02	6.4E+00	.6
PO-210	6.5E-01	1.3E-01	1.3E-01	5.5E-02	6.5E-08	1.9E-09	3.1E-01	4.5E-05	4.2E-02	1.3E-03	2.7E-01	2.4
RA-223+D	4.9E-03	1.2E-02	1.2E-02	4.0E-03	1.9E-06	6.5E-07	3.0E-03	1.5E-09	7.9E-03	1.3E-05	4.5E-02	.0
RA-225+D	5.5E-02	1.5E-01	1.5E-01	4.7E-02	6.5E-07	1.4E-07	4.3E-02	1.8E-08	1.0E-01	1.9E-04	5.4E-01	.0
RA-226+D	9.7E-01	2.4E+02	2.4E+02	7.7E+01	7.0E-01	2.3E-04	1.7E-02	4.2E-05	2.7E-02	1.0E+00	1.1E+03	96.7
AC-227+D	3.8E-04	7.8E-03	7.8E-03	6.1E-04	1.4E-03	7.5E-07	1.6E-03	3.6E-08	1.4E-06	5.3E-05	2.0E-02	.0
TH-229	5.7E-03	4.7E-02	4.7E-02	7.7E-03	1.4E-02	4.4E-06	2.8E-02	5.4E-07	1.8E-05	8.4E-04	1.5E-01	.0
U-234	7.1E-03	1.0E-01	1.0E-01	1.4E-01	3.5E-04	9.5E-08	4.2E-01	8.8E-06	3.2E-02	1.3E-02	8.2E-01	.1
U-235+D	8.1E-05	1.2E-03	1.2E-03	1.6E-03	2.3E-02	1.8E-06	5.0E-03	1.0E-07	3.7E-04	1.6E-04	3.3E-02	.0
U-236	1.6E-02	2.4E-01	2.4E-01	3.3E-01	2.4E-05	6.0E-09	1.0E+00	2.1E-05	7.6E-02	3.2E-02	2.0E+00	.2
U-238+D	6.5E-04	9.2E-03	9.2E-03	1.2E-02	.0E+00	1.6E-06	3.9E-02	8.1E-07	2.9E-03	1.2E-03	7.4E-02	.0
TOTAL	9.9E+01	2.5E+02	2.5E+02	7.8E+01	7.5E-01	4.7E-04	1.8E+02	1.8E-04	2.7E+02	1.1E+00	1.1E+03	100.0
PERCENT	8.8	22.2	22.2	6.9	.1	.0	15.8	.0	23.8	.1		

GI-LLI ***

PB-210+D	8.0E-02	4.1E-02	4.1E-02	3.3E-02	7.0E-04	3.8E-07	4.9E-01	6.2E-06	8.3E-03	1.9E-03	7.0E-01	2.4
BI-210+D	9.5E-03	3.1E-03	3.1E-03	2.5E-02	.0E+00	3.4E-07	9.8E-03	8.3E-06	1.0E-03	2.1E-05	5.2E-02	.2
PO-210	4.8E-01	9.5E+00	9.5E+00	3.9E-02	6.5E-08	1.9E-09	2.3E-01	3.3E-05	3.1E-02	9.6E-04	2.0E+01	67.7
RA-222+D	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-04	2.2E-04	.0E+00	.0E+00	.0E+00	.0E+00	4.3E-04	.0
RA-223+D	3.0E-03	7.5E-03	7.5E-03	2.5E-03	1.9E-06	6.5E-07	1.9E-03	9.3E-10	5.0E-03	7.8E-06	2.7E-02	.1

RA-225+D	1.3E-02	3.3E-02	1.1E-02	6.5E-07	1.4E-07	9.9E-03	4.3E-09	2.4E-02	4.5E-05	1.3E-01	.4
RA-226+D	2.5E-01	6.5E-01	2.0E-01	7.0E-01	2.3E-04	4.5E-01	1.1E-07	7.1E-01	2.7E-03	3.6E+00	12.4
AC-225	8.5E-03	1.7E-01	1.4E-02	8.0E-06	3.0E-06	9.7E-03	5.2E-07	1.7E-05	2.3E-04	3.8E-01	1.3
AC-227+D	4.0E-04	8.0E-03	6.5E-04	1.4E-03	7.5E-07	1.7E-03	3.8E-08	1.4E-06	5.6E-05	2.0E-02	.1
TH-227+D	3.1E-03	2.6E-02	4.2E-03	1.0E-06	2.2E-07	4.4E-03	1.7E-07	6.2E-06	1.3E-04	6.4E-02	.2
TH-229	1.4E-02	1.1E-01	1.9E-02	1.4E-02	4.4E-06	7.0E-02	1.3E-06	4.5E-05	2.1E-03	3.5E-01	1.2
TH-230+D	1.1E-04	9.0E-04	1.5E-04	2.8E-04	9.0E-07	5.5E-04	1.0E-08	3.5E-07	1.6E-05	5.4E-03	.0
TH-234	2.3E-02	1.9E-01	3.1E-02	1.0E-05	1.6E-06	3.7E-02	1.3E-06	5.0E-05	1.1E-03	4.7E-01	1.6
PA-231+D	1.4E-03	7.0E-03	5.0E-03	3.2E-03	8.5E-07	1.6E-02	3.3E-07	1.2E-05	4.9E-04	4.0E-02	.1
U-233	7.5E-06	1.1E-04	1.5E-04	1.0E-03	3.0E-07	4.8E-04	9.9E-09	3.6E-05	1.5E-05	1.9E-03	.0
U-234	8.0E-03	1.2E-01	1.6E-01	3.5E-04	9.5E-08	5.0E-01	1.0E-05	3.8E-02	1.6E-02	9.7E-01	3.3
U-235+D	1.3E-04	1.9E-03	2.6E-03	2.3E-02	1.8E-06	8.0E-03	1.7E-07	6.0E-04	2.5E-04	3.8E-02	.1
U-236	1.9E-02	2.8E-01	3.8E-01	2.4E-05	6.0E-09	1.2E+00	2.4E-05	8.8E-02	3.7E-02	2.3E+00	7.8
U-238+D	2.3E-03	3.4E-02	4.6E-02	.0E+00	1.6E-06	1.4E-01	2.9E-06	1.1E-02	4.5E-03	2.7E-01	.9
TOTAL	9.2E+01	1.1E+01	9.9E+01	7.5E-01	4.7E-04	3.2E+00	9.0E-05	9.2E-01	6.7E-02	2.9E+01	100.0
PERCENT	3.1	38.3	3.4	2.6	.0	10.9	.0	3.1	.2		

THYROID * * *

PB-210+D	.0E+00	.0E+00	.0E+00	7.0E-04	3.8E-07	.0E+00	.0E+00	.0E+00	.0E+00	7.0E-04	.1
RN-222+D	.0E+00	.0E+00	.0E+00	2.1E-04	2.2E-04	.0E+00	.0E+00	.0E+00	.0E+00	4.3E-04	.1
RA-226+D	.0E+00	.0E+00	.0E+00	7.0E-01	2.3E-04	.0E+00	.0E+00	.0E+00	.0E+00	7.0E-01	93.7
AC-225	.0E+00	.0E+00	.0E+00	8.0E-06	3.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-05	.0
AC-227+D	.0E+00	.0E+00	.0E+00	1.4E-03	7.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.4E-03	.2
TH-229	.0E+00	.0E+00	.0E+00	1.4E-02	4.4E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.4E-02	1.9
TH-230+D	.0E+00	.0E+00	.0E+00	2.8E-03	9.0E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.8E-03	.4
TH-234	.0E+00	.0E+00	.0E+00	1.0E-05	1.6E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.2E-05	.0
PA-231+D	.0E+00	.0E+00	.0E+00	3.2E-03	8.5E-07	.0E+00	.0E+00	.0E+00	.0E+00	3.2E-03	.4
U-233	.0E+00	.0E+00	.0E+00	1.0E-03	3.0E-07	.0E+00	.0E+00	.0E+00	.0E+00	1.0E-03	.1
U-234	.0E+00	.0E+00	.0E+00	3.5E-04	9.5E-08	.0E+00	.0E+00	.0E+00	.0E+00	3.5E-04	.0
U-235+D	.0E+00	.0E+00	.0E+00	2.3E-02	1.8E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-02	3.1
U-236	.0E+00	.0E+00	.0E+00	2.4E-05	6.0E-09	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-05	.0
TOTAL	.0E+00	.0E+00	.0E+00	7.5E-01	4.7E-04	.0E+00	.0E+00	.0E+00	.0E+00	7.5E-01	100.0
PERCENT	.0	.0	.0	99.9	.1	.0	.0	.0	.0		

BONE * * *

PB-210+D	1.9E+01	9.2E+00	7.5E+00	7.0E-04	3.8E-07	1.1E+02	1.4E-03	1.9E+00	4.4E-01	1.6E+02	6.8
PO-210	2.7E+00	5.5E+01	2.2E+01	6.5E-08	1.9E-09	1.3E+00	1.9E-04	1.7E-01	5.4E-03	1.1E+02	4.9
RA-223+D	4.7E-02	1.2E-01	3.8E-02	1.9E-06	6.5E-07	2.9E-02	1.5E-08	7.7E-02	1.2E-04	4.3E-01	.0
RA-225+D	2.9E-01	7.0E-01	2.4E-01	6.5E-07	1.4E-07	2.1E-01	9.3E-08	5.2E-01	9.7E-04	2.7E+00	.1
RA-226+D	1.8E-02	4.4E-02	1.4E-02	7.0E-01	2.3E-04	3.2E+02	7.9E-05	5.0E+02	1.9E+00	2.0E+03	86.1
AC-227+D	6.2E-03	1.2E-01	1.0E-02	1.4E-03	7.5E-07	2.6E-02	5.9E-07	2.2E-05	8.6E-04	2.9E-01	.0
TH-229	2.0E-01	1.7E+00	2.8E-01	1.4E-02	4.4E-06	1.0E-02	1.9E-05	6.5E-04	3.0E-02	4.9E+00	.2
TH-230+D	2.0E-03	1.7E-02	2.7E-03	2.8E-03	9.0E-07	1.0E-02	1.9E-07	6.4E-06	2.9E-04	5.2E-02	.0
PA-231+D	4.8E-03	2.4E-02	1.8E-02	3.2E-03	8.5E-07	5.4E-02	1.1E-06	4.1E-05	1.7E-03	1.3E-01	.0
U-234	1.1E-01	1.6E+00	2.2E+00	3.5E-04	9.5E-08	6.8E+00	1.4E-04	5.1E-01	2.1E-01	1.3E+01	.6
U-235+D	1.3E-03	2.0E-02	2.7E-02	2.3E-02	1.8E-06	8.1E-02	1.7E-06	6.1E-03	2.5E-03	1.8E-01	.0
U-236	2.6E-01	3.9E+00	5.3E+00	2.4E-05	6.0E-09	1.6E+01	3.4E-04	1.2E+00	5.1E-01	3.1E+01	1.3
U-238+D	1.0E-02	1.6E-01	2.1E-01	.0E+00	1.6E-06	6.5E-01	1.3E-05	4.8E-02	2.0E-02	1.2E+00	.1

TOTAL PERCENT	2.0E+02	5.1E+02	5.1E+02	1.6E+02	7.5E+01	4.7E+04	4.6E+02	2.2E+03	5.1E+02	3.1E+00	2.4E+03	100.0
	8.6	21.8	21.8	6.6	.0	.0	19.5	.0	21.5	.1		

LIVER * * *

PB-210+D	5.9E+00	2.9E+00	2.9E+00	2.4E+00	7.0E+04	3.8E+07	3.5E+01	4.4E+04	5.8E+01	1.3E+01	5.0E+01	17.1
BI-210+D	6.5E+04	2.1E+04	2.1E+04	1.7E+03	.0E+00	3.8E+07	6.6E+04	5.6E+07	7.0E+05	1.4E+06	3.6E+03	.0
PO-210	5.5E+00	1.2E+02	1.2E+02	4.7E+01	6.5E+08	1.9E+09	2.7E+00	3.9E+04	3.7E+01	1.1E+02	2.4E+02	82.5
RA-225+D	3.4E+04	8.5E+04	8.5E+04	2.7E+04	6.5E+07	2.3E+04	2.5E+04	1.1E+10	6.1E+04	1.1E+06	3.2E+03	.0
RA-226+D	4.3E+03	1.1E+02	1.1E+02	3.5E+03	7.0E+01	2.3E+04	7.9E+03	1.9E+09	1.2E+02	4.6E+05	7.5E+01	.3
AC-225	1.3E+04	2.6E+03	2.6E+03	2.1E+04	8.0E+06	3.0E+06	1.5E+04	7.7E+09	2.5E+07	3.5E+06	5.7E+03	.0
AC-227+D	1.1E+03	2.2E+02	2.2E+02	1.7E+03	1.4E+03	7.5E+07	4.5E+03	1.0E+07	3.9E+06	1.5E+04	5.3E+02	.0
TH-229	5.7E+03	4.7E+02	4.7E+02	7.7E+03	1.4E+02	4.4E+06	2.9E+02	5.4E+07	1.8E+05	8.5E+04	1.5E+01	.1
TH-230+D	1.2E+04	9.6E+04	9.6E+04	1.5E+04	2.8E+03	9.0E+07	5.8E+04	1.1E+08	3.7E+07	1.7E+05	5.6E+03	.0
PA-231+D	1.8E+04	9.2E+04	9.2E+04	6.8E+04	3.2E+03	8.5E+07	2.1E+03	4.3E+08	1.5E+06	6.5E+05	8.0E+03	.0
U-235+D	.0E+00	.0E+00	.0E+00	.0E+00	2.3E+02	1.8E+06	.0E+00	.0E+00	.0E+00	.0E+00	2.3E+02	.0
TOTAL PERCENT	1.1E+01	1.2E+02	1.2E+02	2.8E+00	7.5E+01	4.7E+04	3.8E+01	8.3E+04	9.7E+01	1.5E+01	2.9E+02	100.0
	3.9	40.7	40.7	1.0	.3	.0	13.0	.0	.3	.1		

LUNG * * *

PB-210+D	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+04	3.8E+07	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+04	.1
RN-222+D	.0E+00	.0E+00	.0E+00	.0E+00	2.1E+04	2.2E+04	.0E+00	.0E+00	.0E+00	.0E+00	4.3E+04	.1
RA-226+D	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+01	2.3E+04	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+01	93.7
AC-225	.0E+00	.0E+00	.0E+00	.0E+00	8.0E+06	3.0E+06	.0E+00	.0E+00	.0E+00	.0E+00	1.1E+05	.0
AC-227+D	.0E+00	.0E+00	.0E+00	.0E+00	1.4E+03	7.5E+07	.0E+00	.0E+00	.0E+00	.0E+00	1.4E+03	.2
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	2.8E+03	4.4E+06	.0E+00	.0E+00	.0E+00	.0E+00	1.4E+02	1.9
TH-230+D	.0E+00	.0E+00	.0E+00	.0E+00	2.8E+03	9.0E+07	.0E+00	.0E+00	.0E+00	.0E+00	2.8E+03	.4
TH-234	.0E+00	.0E+00	.0E+00	.0E+00	1.0E+05	1.6E+06	.0E+00	.0E+00	.0E+00	.0E+00	1.2E+05	.0
PA-231+D	.0E+00	.0E+00	.0E+00	.0E+00	3.2E+03	8.5E+07	.0E+00	.0E+00	.0E+00	.0E+00	3.2E+03	.4
U-233	.0E+00	.0E+00	.0E+00	.0E+00	1.0E+03	3.0E+07	.0E+00	.0E+00	.0E+00	.0E+00	1.0E+03	.1
U-234	.0E+00	.0E+00	.0E+00	.0E+00	3.5E+04	9.5E+08	.0E+00	.0E+00	.0E+00	.0E+00	3.5E+04	.0
U-235+D	.0E+00	.0E+00	.0E+00	.0E+00	2.3E+02	1.8E+06	.0E+00	.0E+00	.0E+00	.0E+00	2.3E+02	3.1
U-236	.0E+00	.0E+00	.0E+00	.0E+00	2.4E+05	6.0E+09	.0E+00	.0E+00	.0E+00	.0E+00	2.4E+05	.0
TOTAL PERCENT	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+01	4.7E+04	.0E+00	.0E+00	.0E+00	.0E+00	7.5E+01	100.0
	.0	.0	.0	.0	99.9	.1	.0	.0	.0	.0		

KIDNEY * * *

PB-210+D	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+04	3.8E+07	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+04	.0
RN-222+D	.0E+00	.0E+00	.0E+00	.0E+00	2.1E+04	2.2E+04	.0E+00	.0E+00	.0E+00	.0E+00	4.3E+04	.0
RA-226+D	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+01	2.3E+04	.0E+00	.0E+00	.0E+00	.0E+00	7.0E+01	5.9
AC-227+D	.0E+00	.0E+00	.0E+00	.0E+00	1.4E+03	7.5E+07	.0E+00	.0E+00	.0E+00	.0E+00	1.4E+03	.0
TH-229	.0E+00	.0E+00	.0E+00	.0E+00	1.4E+02	4.4E+06	.0E+00	.0E+00	.0E+00	.0E+00	1.4E+02	.1
TH-230+D	.0E+00	.0E+00	.0E+00	.0E+00	2.8E+03	9.0E+07	.0E+00	.0E+00	.0E+00	.0E+00	2.8E+03	.0
PA-231+D	.0E+00	.0E+00	.0E+00	.0E+00	3.2E+03	8.5E+07	.0E+00	.0E+00	.0E+00	.0E+00	3.2E+03	.0
U-233	.0E+00	.0E+00	.0E+00	.0E+00	1.0E+03	3.0E+07	.0E+00	.0E+00	.0E+00	.0E+00	1.0E+03	.0
U-234	2.6E+05	3.9E+04	3.9E+04	5.0E+04	1.0E+03	3.0E+07	1.6E+03	3.3E+08	1.2E+04	5.0E+05	4.1E+03	.0
TOTAL PERCENT	2.7E+02	4.0E+01	4.0E+01	5.5E+01	3.5E+04	9.5E+08	1.6E+00	3.4E+05	1.2E+01	5.2E+02	3.2E+00	26.8

U-235+0	3.1E-04	4.7E-03	4.7E-03	6.5E-03	2.3E-02	1.8E-06	1.9E-02	4.0E-07	1.4E-03	6.1E-04	6.0E-02	.5
U-236	6.5E-02	9.5E-01	9.5E-01	1.3E+00	2.4E-05	6.0E-09	3.9E+00	8.1E-05	2.9E-01	1.2E-01	7.6E+00	64.1
U-238+0	2.4E-03	3.7E-02	3.7E-02	4.9E-02	.0E+00	1.6E-06	1.5E-01	3.1E-06	1.1E-02	4.7E-03	2.9E-01	2.5
TOTAL	9.4E-02	1.4E+00	1.4E+00	1.9E+00	7.5E-01	4.7E-04	5.7E+00	1.2E-04	4.3E-01	1.8E-01	1.2E+01	100.0
PERCENT	.8	11.7	11.7	16.1	6.3	.0	48.2	.0	3.6	1.5		

*** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***
 PA231 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** 50 YR BUILDUP *** 12:08148 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
PB-210+D	.0E+00	.0E+00	.0E+00	.0E+00	2.6E-05	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.8E-05	.1
BI-210+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-06	.0
RN-222+D	.0E+00	.0E+00	.0E+00	.0E+00	7.0E-06	1.1E-05	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-05	.1
RA-226+D	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-02	1.2E-05	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-02	98.6
TH-230+D	.0E+00	.0E+00	.0E+00	.0E+00	2.8E-04	1.4E-07	.0E+00	.0E+00	.0E+00	.0E+00	2.9E-04	1.2
TOTAL PERCENT	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-02	2.6E-05	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-02	100.0

BODY ***												
PB-210+D	2.3E-02	1.1E-02	1.1E-02	9.1E-03	2.0E-05	1.1E-08	1.3E-01	1.7E-06	2.3E-03	5.2E-04	1.9E-01	.6
PO-210	2.0E-02	3.9E-01	3.9E-01	1.6E-03	1.9E-09	5.5E-11	9.4E-03	1.3E-06	1.3E-03	3.9E-05	8.1E-01	2.4
RA-226+D	2.8E+00	7.1E+00	7.1E+00	2.3E+00	2.0E-02	7.0E-06	5.1E+00	1.3E-06	8.0E+00	3.0E-02	3.3E+01	97.0
TH-230+D	4.9E-06	4.2E-05	4.2E-05	6.6E-06	2.4E-04	8.0E-08	2.5E-05	4.7E-10	1.6E-08	7.3E-07	3.7E-04	.0
TOTAL PERCENT	2.9E+00	7.5E+00	7.5E+00	2.3E+00	2.1E-02	1.4E-05	5.3E+00	4.3E-06	8.0E+00	3.1E-02	3.4E+01	100.0

GI-LLI ***												
PB-210+D	2.4E-03	1.2E-03	1.2E-03	1.0E-03	2.0E-05	1.1E-08	1.5E-02	1.9E-07	2.5E-04	5.7E-05	2.1E-02	2.9
BI-210+D	2.8E-04	9.5E-05	9.5E-05	7.5E-04	.0E+00	1.0E-08	2.9E-04	2.5E-07	3.1E-05	6.3E-07	1.5E-03	.2
PO-210	1.4E-02	2.9E-01	2.9E-01	1.1E-03	1.9E-09	5.5E-11	6.9E-03	9.9E-07	9.2E-04	2.9E-05	6.0E-01	82.3
RN-222+D	.0E+00	.0E+00	.0E+00	.0E+00	6.0E-06	7.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-05	.0
RA-226+D	7.5E-03	1.9E-02	1.9E-02	6.0E-03	2.0E-02	7.0E-06	1.4E-02	3.9E-09	2.1E-02	8.0E-05	1.1E-01	14.6
TH-230+D	9.5E-06	8.0E-05	8.0E-05	1.3E-05	2.4E-04	8.0E-08	4.9E-05	9.2E-10	3.1E-08	1.4E-06	4.8E-04	.1
TOTAL PERCENT	2.5E-02	3.1E-01	3.1E-01	8.9E-03	2.1E-02	1.4E-05	3.6E-02	1.4E-06	2.2E-02	1.7E-04	7.3E-01	100.0

THYROID ***												
PB-210+D	.0E+00	.0E+00	.0E+00	.0E+00	2.0E-05	1.1E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-05	.1
RN-222+D	.0E+00	.0E+00	.0E+00	.0E+00	6.0E-06	7.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-05	.1
RA-226+D	.0E+00	.0E+00	.0E+00	.0E+00	2.0E-02	7.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-02	98.7
TH-230+D	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-04	8.0E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-04	1.2
TOTAL PERCENT	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-02	1.4E-05	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-02	100.0

BONE * * *													
PB-210-D	5.4E-01	2.8E-01	2.0E-05	1.1E-08	3.4E+00	4.2E-05	5.6E-02	1.3E-02	4.8E+00	6.9			
PO-210	8.0E-02	1.6E+00	1.9E-09	5.5E-11	3.9E-02	5.6E-06	5.2E-03	1.6E-04	3.3E+00	4.9			
RA-226-D	5.3E+00	1.3E+01	2.0E-02	7.0E-06	9.6E+00	2.4E-06	1.5E+01	5.7E-02	6.0E+01	88.2			
TH-230-D	1.8E-04	1.4E-03	2.4E-04	8.0E-08	8.8E-04	1.7E-08	5.7E-07	2.6E-05	4.5E-03	.0			
TOTAL	5.9E+00	1.5E+01	2.1E-02	1.4E-05	1.3E+01	5.0E-05	1.5E+01	7.0E-02	6.8E+01	100.0			
PERCENT	8.7	21.8	.0	.0	19.0	.0	22.0	.1					
LIVER * * *													
PB-210-D	1.7E-01	8.8E-02	2.0E-05	1.1E-08	1.0E+00	1.3E-05	1.7E-02	4.0E-03	1.5E+00	17.1			
81-210-D	1.9E-05	6.5E-06	.0E+00	1.0E-08	2.0E-05	1.7E-08	2.1E-06	4.3E-08	1.0E-04	.0			
PO-210	1.7E-01	3.5E+00	1.9E-09	5.5E-11	8.2E-02	1.2E-05	1.1E-02	3.4E-04	7.2E+00	82.6			
RA-226-D	1.3E-04	3.2E-04	2.0E-02	7.0E-06	2.4E-04	5.8E-11	3.7E-04	1.4E-06	2.2E-02	.3			
TH-230-D	1.0E-05	8.5E-05	2.4E-04	8.0E-08	5.1E-05	9.7E-10	3.3E-08	1.5E-06	4.9E-04	.0			
TOTAL	3.4E-01	3.5E+00	2.1E-02	1.4E-05	1.1E+00	2.5E-05	2.9E-02	4.4E-03	8.7E+00	100.0			
PERCENT	4.0	40.7	.2	.0	13.0	.0	.3	.1					
LUNG * * *													
PB-210-D	.0E+00	.0E+00	2.0E-05	1.1E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-05	.1			
RM-222-D	.0E+00	.0E+00	6.0E-06	7.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-05	.1			
RA-226-D	.0E+00	.0E+00	2.0E-02	7.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-02	98.7			
TH-230-D	.0E+00	.0E+00	2.4E-04	8.0E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-04	1.2			
TOTAL	.0E+00	.0E+00	2.1E-02	1.4E-05	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-02	100.0			
PERCENT	.0	.0	99.9	.1	.0	.0	.0	.0					
KIDNEY * * *													
PB-210-D	.0E+00	.0E+00	2.0E-05	1.1E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-05	.1			
RM-222-D	.0E+00	.0E+00	6.0E-06	7.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.3E-05	.1			
RA-226-D	.0E+00	.0E+00	2.0E-02	7.0E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-02	98.7			
TH-230-D	.0E+00	.0E+00	2.4E-04	8.0E-08	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-04	1.2			
TOTAL	.0E+00	.0E+00	2.1E-02	1.4E-05	.0E+00	.0E+00	.0E+00	.0E+00	2.1E-02	100.0			
PERCENT	.0	.0	99.9	.1	.0	.0	.0	.0					

*** DOSES BY PATH, ORGAN, AND NUCLIDE AFTER 50 YEARS UPTAKE AND 50 YEARS EXPOSURE ***

TH232 MAX. INDIVIDUAL *** LST008 SOURCE FILE *** ** 50 YR BUILDUP *** 12:11:22 08/26/75

ISOTOPE	FISH	CRUSTACEA	MOLLUSCS	DRINKING-	SHORELINE	SWIMMING	PRODUCE	EGGS	MILK	MEAT	TOTAL	PERCENT
SKIN ***												
RA-224+D	.0E+00	.0E+00	.0E+00	.0E+00	1.2E-06	1.8E-06	.0E+00	.0E+00	.0E+00	.0E+00	3.1E-06	1.2
TH-228+D	.0E+00	.0E+00	.0E+00	.0E+00	2.4E-04	1.8E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-04	97.8
TH-232+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-06	1.0
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-04	6.2E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-04	100.0
PERCENT	.0	.0	.0	.0	97.5	2.5	.0	.0	.0	.0		

BODY ***												
RA-224+D	5.5E-04	1.3E-03	1.3E-03	4.3E-04	1.1E-06	1.3E-06	1.2E-04	1.3E-10	4.5E-04	1.5E-07	4.3E-03	67.4
TH-228+D	3.1E-05	2.5E-04	2.5E-04	4.0E-05	2.2E-04	1.3E-06	8.8E-05	2.2E-09	8.8E-08	3.1E-06	8.8E-04	13.9
TH-232+D	4.9E-05	4.0E-04	4.0E-04	6.6E-05	.0E+00	1.8E-06	2.5E-04	4.7E-09	1.6E-07	7.3E-06	1.2E-03	18.6
TOTAL	6.3E-04	2.0E-03	2.0E-03	5.4E-04	2.2E-04	4.5E-06	4.5E-04	7.0E-09	4.5E-04	1.1E-05	6.3E-03	100.0
PERCENT	10.0	31.7	31.7	8.6	3.5	.1	7.1	.0	7.2	.2		

GI-LLI ***

RA-224+D	9.0E-04	2.2E-03	2.2E-03	7.0E-04	1.1E-06	1.3E-06	1.9E-04	2.2E-10	7.5E-04	2.6E-07	7.0E-03	18.9
TH-228+D	1.0E-03	9.0E-03	9.0E-03	1.4E-03	2.2E-04	1.3E-06	3.1E-03	7.8E-08	3.1E-06	1.1E-04	2.4E-02	65.2
TH-232+D	2.4E-04	2.0E-03	2.0E-03	3.3E-04	.0E+00	1.8E-06	1.2E-03	2.3E-08	7.8E-07	3.6E-05	5.8E-03	15.9
TOTAL	2.2E-03	1.3E-02	1.3E-02	2.5E-03	2.2E-04	4.5E-06	4.5E-03	1.0E-07	7.6E-04	1.5E-04	3.7E-02	100.0
PERCENT	6.0	36.0	36.0	6.8	.6	.0	12.3	.0	2.1	.4		

THYROID ***

RA-224+D	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-06	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-06	1.1
TH-228+D	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04	98.1
TH-232+D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-06	.8
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04	4.5E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-04	100.0
PERCENT	.0	.0	.0	.0	98.0	2.0	.0	.0	.0	.0		

BONE ***

RA-224+D	4.2E-03	1.0E-02	1.0E-02	3.4E-03	1.1E-06	1.3E-06	9.2E-04	1.1E-09	3.6E-03	1.2E-06	3.3E-02	34.8
TH-228+D	9.0E-04	7.5E-03	7.5E-03	1.2E-03	2.2E-04	1.3E-06	2.6E-03	6.5E-08	2.6E-06	9.2E-05	2.0E-02	20.9
TH-232+D	1.8E-03	1.4E-02	1.4E-02	2.4E-03	.0E+00	1.8E-06	9.0E-03	1.7E-07	5.8E-06	2.7E-04	4.2E-02	44.3
TOTAL	7.0E-03	3.2E-02	3.2E-02	7.1E-03	2.2E-04	4.5E-06	1.2E-02	2.4E-07	3.6E-03	3.6E-04	9.6E-02	

PERCENT	7.3	33.9	33.9	7.4	.2	.0	13.1	.0	3.8	.4	100.0
LIVER ***											
RA-224*D	1.0E-05	2.5E-05	2.5E-05	8.5E-06	1.1E-06	1.3E-06	2.2E-06	2.5E-12	8.7E-06	2.9E-09	8.3E-05
TH-228*D	1.5E-05	1.3E-04	1.3E-04	2.0E-05	2.2E-04	1.3E-06	4.4E-05	1.1E-09	4.4E-08	1.6E-06	5.5E-04
TH-232*D	1.0E-04	8.4E-04	8.4E-04	1.4E-04	.0E+00	1.8E-06	5.1E-04	9.7E-09	3.3E-07	1.5E-05	2.5E-03
TOTAL	1.3E-04	9.9E-04	9.9E-04	1.7E-04	2.2E-04	4.5E-06	5.6E-04	1.1E-08	9.1E-06	1.7E-05	3.1E-03
PERCENT	4.1	32.1	32.1	5.5	7.1	.1	18.0	.0	.3	.5	100.0
LUNG ***											
RA-224*D	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-06	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-06
TH-228*D	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04
TH-232*D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-06
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04	4.5E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-04
PERCENT	.0	.0	.0	.0	98.0	2.0	.0	.0	.0	.0	100.0
KIDNEY ***											
RA-224*D	.0E+00	.0E+00	.0E+00	.0E+00	1.1E-06	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.5E-06
TH-228*D	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04	1.3E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04
TH-232*D	.0E+00	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-06	.0E+00	.0E+00	.0E+00	.0E+00	1.8E-06
TOTAL	.0E+00	.0E+00	.0E+00	.0E+00	2.2E-04	4.5E-06	.0E+00	.0E+00	.0E+00	.0E+00	2.3E-04
PERCENT	.0	.0	.0	.0	98.0	2.0	.0	.0	.0	.0	100.0