

Nuclear and Chemical Waste Programs

EVALUATION OF HEALTH AND SAFETY IMPACTS OF  
DEFENSE HIGH-LEVEL WASTE IN GEOLOGIC REPOSITORIES

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## EVALUATION OF HEALTH AND SAFETY IMPACTS OF DISPOSAL OF DEFENSE HIGH-LEVEL WASTE IN GEOLOGIC REPOSITORIES

### 1. Introduction

Pursuant to the revised Statement of Work of October 5, 1983 for our contribution to DOE's evaluation of commercial repositories for the disposal of defense high-level waste, we have performed an evaluation of the health and safety aspects of the different disposal options for the defense wastes. This report describes the initial results of our evaluation.

The major emphasis of this report is to provide a comparison of the health and safety aspects of the various disposal options for defense high-level waste; i.e., to evaluate whether or not there are likely to be significant differences in health and safety impacts among the different options. This evaluation has been performed using a set of baseline assumptions and ground rules which have been provided by DOE; these assumptions are described in the Statement of Work of October 5.

A very important assumption with regard to evaluating the health and safety aspects of any disposal option for defense high-level waste is that all applicable standards and regulations must be met in all cases. Thus, any disposal option must conform with the requirements of the NRC's 10 CFR 20 and 10 CFR 60 and the EPA's 40 CFR 191 during both the operational and the post-closure phases. It is particularly important to note that the EPA standard sets a very low level of long-term incremental risk to the general public from radioactive waste disposal. Thus, it must be demonstrated with reasonable assurance that

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any option for defense waste disposal will be quite safe over a long time period in the future, or else that option will not be licensed. In essence, this means that the real question regarding long-term health and safety aspects is whether it is likely to be significantly easier or harder to demonstrate compliance of the various disposal options with applicable standards. Similar considerations also apply to occupational and off-site exposures during the short-term period of repository operations.

The above discussion emphasizes that the health and safety aspects of defense waste disposal are intimately related to regulatory factors. It is also clear that health and safety is related to cost factors; i.e., given that certain standards must be met for any disposal option, it may be significantly more costly to meet those standards with some options than with others.

This report is concerned with evaluating the health and safety aspects of defense waste disposal during both the operational and the post-closure phases of a repository. In each case, the evaluation includes three different aspects: (1) an identification and discussion of the various factors which are expected to influence the health and safety impacts of the different disposal options for defense high-level waste, (2) an identification of the general assumptions which were used in estimating potential health and safety effects and a selection of appropriate models for estimating the health and safety impacts of the various disposal options, and (3) an analysis of the health and safety impacts for each disposal option for defense high-level waste. This report describes our initial results in these areas.

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Based on the evaluations presented in this report, our initial conclusion is that the potential health and safety impacts are not likely to vary significantly among the different disposal options that might be chosen for defense high-level waste, primarily because of the need to meet standards in all cases. The differences in estimated health and safety aspects for different disposal options are in all cases much smaller than the uncertainties which will be associated with realistic estimates of these impacts.

## 2. Factors Influencing Health and Safety

This section discusses our initial efforts to identify the factors which are expected to influence both the long-term and the short-term health and safety impacts of the different disposal options for defense high-level waste.

### 2.1 Long-term effects

Differences in the properties of commercial and defense wastes which might influence differences in the long-term health and safety impacts of the various emplacement schemes for defense high-level waste include the following: (1) differences in the relative abundances of specific radionuclides in commercial and defense wastes; (2) the much greater concentration of radioactivity in commercial waste forms than in defense waste forms; and (3) differences in the leachability of the different waste forms.

The radionuclide inventories in commercial and defense wastes are compared in section 3 of this report. Defense high-level wastes usually

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contain less fission products and actinides per metric ton of uranium fuel than either commercial spent fuel or high-level waste, but this is not always the case for defense wastes and commercial high-level wastes.

The most important implication of the differences in concentrations of radioactivity in the different types of waste is that the defense waste package will generate considerably less heat than a commercial spent-fuel or high-level waste package. This difference in heat generation means that a defense-only repository will involve a shorter time for the so-called thermal period, slightly lower peak temperatures in the waste package, and lower temperatures in the waste package at the time leaching begins than will either a commercial repository or a repository containing both defense and commercial wastes in the same location. The differences in thermal behavior of the waste could have important implications for repository performance.

The lower activity concentration and apparent lower leaching susceptibility of defense waste glass relative to commercial spent fuel or commercial high-level waste glass should result in lower rates of radionuclide releases from defense waste forms. Both glass waste forms and spent fuel may be cracked by the time leaching begins, so it seems reasonable to assume that there will be no significant differences in the waste surface area available to leaching.

The following sections describe in more detail some of the implications of the above mentioned differences between defense and commercial wastes for certain aspects of a health and safety analysis of the different emplacement options for defense wastes.

#### 2.1.1 Implications for containment

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The lower heat generation potential of defense waste means that the thermal period will be considerably shorter for a repository which contains defense waste only than for a repository which contains either commercial waste only or defense and commercial waste. Since the containment requirement in 10 CFR 60 is intended to prevent any release of radioactivity from the waste package during the thermal period, it is likely that a shorter containment period would be required by the NRC for a defense-only repository than for a commercial or defense-plus-commercial repository. It is also likely that a shorter containment period would be required for a separate defense waste area (e.g., a separate mined cavity) in a facility which also includes commercial waste, provided the defense waste area would not be affected by the heat generated by the commercial wastes. To the extent that a shorter containment period would be required for the defense wastes, it will presumably be less costly to comply with the containment requirement because thinner or less corrosion-resistant canisters or overpacks might suffice.

Temperatures in a repository during the thermal period will also be lower for a defense-only repository than for a commercial repository, due to the lower heat generation rate of defense waste. Since corrosion rates and mechanical stresses both increase with increasing temperature, the canister and overpack lifetimes should be longer in a defense-only repository than in a commercial-only repository. A separate defense waste area in a combined facility would probably have the same low corrosion rates as a defense-only repository, but mechanical stresses on defense waste packages would probably be greater than in a defense-only repository due to the thermal effects of the commercial waste on the

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mechanical behavior of the host rock. In a combined facility with both commercial and defense wastes in the same area, the waste package density would probably be greater than in a commercial-only repository (this assumes that the thermal loading on the host rock will determine the waste density in a repository, so that the thermal loading will be the same in both cases). Thus, peak rock temperatures and thermally-induced mechanical stresses would be roughly the same as in a commercial-only repository. Peak temperatures of commercial waste packages would be unaffected by the presence of defense waste, but defense waste packages would reach higher temperatures and thus experience greater corrosion rates than in a defense-only disposal area.

#### 2.1.2 Implications for radionuclide release rate from the repository

Differences in the concentration of activity and in the leaching susceptibility of defense and commercial waste forms can directly affect the rate at which radionuclides are released from the repository to the host rock via groundwater flow. Radionuclide release rates as measured in leaching tests have generally been the highest for spent fuel, intermediate for commercial high-level waste glass, and the lowest for defense high-level waste glass. (The difference in concentration of activity is probably responsible for most of the difference in the observed leaching behavior between commercial and defense glasses.) If no other factors affected the release rate, then radioactivity from defense wastes would be released into groundwater at a lower rate than from commercial wastes. A commercial repository which contained some defense wastes would be expected to have a lower annual fractional release of radioactivity than would a repository which contained only

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commercial wastes, but a higher release rate than a defense-only repository. This is only an apparent effect, however, because the actual quantity of radioactivity released from the commercial waste would be no less than from the same amount of waste in a commercial-only repository, and there would be no more radioactivity released from the defense waste than in a defense-only repository. Therefore, the apparent difference in release rates would not make a difference in the health and safety impacts of disposing of either type of waste, but could mean that it would be easier to comply with the 10 CFR 60 limits on radionuclide release rates at a combined repository than at a commercial-only repository.

Several other factors can indirectly affect radionuclide release rates. One of these factors, the radionuclide inventory available for leaching, depends on the initial inventory and on the elapsed time before containment failure. Initial radionuclide inventories differ for defense and commercial wastes, and containment time will depend on several waste-related factors discussed above, as well as on canister/overpack characteristics. Because of the complexity of the interactions among these variables, the effect of waste properties on the inventory available for leaching cannot readily be evaluated in isolation.

Another factor which indirectly affects release rates of radioactivity is the heat generation potential. Leaching rates of glass waste forms increase with increasing temperature, so that radionuclide release rates from a repository will depend in part on the temperature of the waste form after containment failure. After several hundred years, which is a likely containment time, temperatures in the

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repository will have equilibrated and all waste packages will be at essentially the same temperature. Thus, defense wastes which are placed in the same area as commercial wastes will be hotter than defense wastes which are isolated from commercial wastes, and will leach somewhat more rapidly than would defense wastes in a defense-only repository or in a separate disposal cavity in a combined repository.

Radiation damage to the waste form will be greater for commercial wastes than for defense wastes because of the greater concentration of radioactivity in the former. Since radiation damage increases leaching susceptibility, this effect further contributes to the difference in leaching behavior between commercial and defense wastes. However, cross irradiations of waste forms are presumed to be negligible, so that radiation damage in defense wastes should not be affected by disposal in a commercial repository. Thus, this factor should not result in any differences in radioactivity releases among the disposal options.

Backfill and packing materials can help to control the rate of radionuclide release from the engineered barrier system by limiting the rate of groundwater flow and by chemically retarding the transport of some of the radionuclides. The effectiveness of these materials in limiting radionuclide releases can be diminished by exposure to heat and radiation. If we assume that the degree of functional impairment is related to the duration and intensity of exposure of the materials to heat and radiation, then the greatest reduction in the effectiveness of these materials would occur in a commercial-only repository. In a disposal area which contains both commercial and defense wastes, the effectiveness of packing materials surrounding the defense wastes should be lower than in a defense-only disposal area, but these materials

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should experience less damage than the packing around the commercial wastes because of the lower peak temperatures and radiation levels.

2.1.3 Other implications for radionuclide releases to the accessible environment

Radionuclide transport in groundwater is generally regarded as the most likely means by which wastes in a geologic repository may reach the accessible environment. This process involves, first, transport through the disturbed or near-field zone of the host rock immediately surrounding the repository and, second, transport through the undisturbed or far-field zone between the boundary of the disturbed zone and the boundary of the accessible environment.

The disturbed zone is that portion of the host rock where the physical or chemical properties are changed as a result of repository construction and waste emplacement such that the changes may have a significant effect on repository performance. Because of the importance of heat generation rates in perturbing the host rock, the extent of the disturbed zone in a given type of host rock should be greatest for a commercial-only repository, intermediate for a combined commercial and defense repository, and least for a defense-only repository.

The extent of the disturbed zone affects evaluations of repository performance in two ways. First, the NRC's 10 CFR 60 requires a minimum pre-waste-emplacment groundwater travel time from the outer boundary of the disturbed zone to the boundary of the accessible environment. Thus, the closer these two boundaries are to one another, the more difficult it will be to find sites that satisfy the requirement and to demonstrate with reasonable assurance that such sites are in compliance. Second,

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demonstrations of compliance with the radionuclide release limits in the EPA's 40 CFR 191 probably will require estimates of groundwater transport of radionuclides through both the disturbed and far-field zones. Since such estimates are expected to have greater uncertainties in the disturbed zone than in the far-field zone, demonstrating compliance with the standard may be significantly more difficult if an appreciable fraction of the distance from the repository to the accessible environment is in the disturbed zone.

Consideration of radionuclide transport in groundwater through the far-field zone should, by itself, have no effect on the choice of a disposal option. This is because the transport of a unit quantity of a particular radionuclide is independent of the source of the waste, i.e., of whether the radionuclide was originally in commercial or defense waste. We must remember, of course, that the quantities of different radionuclides which enter the far-field zone depend on the type of waste and the performance of the engineered barriers and disturbed zone. Again, it may be easier to demonstrate compliance of a disposal option with 40 CFR 191 if the far-field zone provides a relatively large fraction of the distance from a repository to the boundary of the accessible environment.

Consideration of radionuclide transport in groundwater through the far-field zone will probably be more important in choosing a host rock for defense-waste disposal than in choosing between a defense-only or a defense-plus-commercial repository at a given location in a given host rock. It cannot be overemphasized that any comparison of the waste isolation capabilities of different host rocks (i.e., bedded salt vs. basalt or tuff) requires extensive and detailed information on the

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geologic, hydrologic, and geochemical properties of specific sites. Although comparisons of the long-term performance of geologic repositories in different rock types have been presented by the EPA, these calculations are strictly generic in nature and may not be indicative even qualitatively of the isolation capabilities of those rock types at specific sites.

## 2.2 Short-term effects

The short-term health and safety effects which need to be considered include both radiological and non-radiological impacts on workers and off-site members of the general public.

Occupational radiation exposures are limited by the NRC's 10 CFR 20. These exposures are expected to depend on the number of waste packages handled per year. Radiation exposures from a given number of defense waste packages would presumably not depend significantly on the choice of disposal option. Off-site radiation exposures are limited by the EPA's 40 CFR 191. Such exposures can be estimated, for example, by using the information developed by the EPA in support of their standard. The off-site exposures will depend on the amount of radioactivity released during normal operations but are not expected to depend significantly on the particular disposal option. Accidental radiation exposures to workers and off-site individuals can be treated by considering the potential kinds of accidents that could occur and their associated releases of radioactivity. Such exposures also should not differ greatly among the various disposal options.

Non-radiological effects can be estimated by considering accidents and, if appropriate, their associated releases of non-radioactive

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materials. These effects also should not differ significantly among the various disposal options.

### 3. Analysis of long-term effects on health and safety

#### 3.1 Scope of the analysis

The task description called for comparison of the health effects of defense waste disposal in a hard rock (basalt or tuff) or salt repository, with a corrosion-resistant TiCode-12 overpack or with no overpack, and in a separate defense waste repository or in a repository developed primarily for commercial high-level waste and spent fuel. Two approaches for placing defense waste in a commercial repository were to be considered: (1) codisposal with commercial waste, with the defense waste counting toward the 70,000 MTU limit on the quantity of waste to be placed in the first commercial repository, and (2) emplacement in a separate disposal area at the same site. The effects of defense waste disposal were to be compared to those of up to 70,000 MTU of commercial waste in the same repository or at a similar site. In all cases, the analysis was to assume that all applicable laws (the Environmental Protection Agency's proposed 40 CFR 191, the Nuclear Regulatory Commission's criteria in 10 CFR 60, and the Nuclear Waste Policy Act of 1982) would be met.

In the proposed generally applicable environmental standard (40 CFR 191) to limit long-term health effects from disposal of high-level radioactive wastes, EPA has elected to place limits on cumulative radionuclide releases to the accessible environment. These release limits correspond to 10 health effects per 1,000 MTU in the exposed population over 10,000 years and, thus, the allowable releases

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correspond to a very low level of incremental risk. In the present analysis, we have chosen to adopt the same approach, and we evaluate the different disposal options in terms of their effect on releases of radionuclides to the accessible environment. We use the specific release limits in the EPA standard as a benchmark for estimating relative health effects of the different disposal options.

As a basis for this analysis, we have identified 12 different scenarios that can represent the different disposal approaches that were considered in our analysis:

- 1 -- Commercial high-level waste in salt geology
- 2 -- Commercial high-level waste in hard rock geology
- 3 -- PWR spent fuel in salt geology
- 4 -- PWR spent fuel in hard rock geology
- 5 -- BWR spent fuel in salt geology
- 6 -- BWR spent fuel in hard rock geology
- 7 -- Defense high-level waste in a separate repository in salt geology, packaged with minimal overpack
- 8 -- Defense high-level waste in a separate repository in hard rock geology, packaged with minimal overpack
- 9 -- Defense high-level waste codisposed in a commercial repository in salt geology, packaged with minimal overpack
- 10 -- Defense high-level waste codisposed in a commercial repository in salt geology, packaged with a corrosion-resistant TiCode-12 overpack
- 11 -- Defense high-level waste codisposed in a commercial repository in hard rock geology, packaged with minimal overpack
- 12 -- Defense high-level waste codisposed in a commercial

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repository in hard rock geology, packaged with a corrosion-resistant TiCode-12 overpack

The first six of these scenarios are intended to represent the behavior of the various waste types to be placed in commercial repositories in salt and hard rock, and these scenarios form the basis for comparing the effects of commercial and defense waste disposal. The remaining scenarios represent several different options for disposal of defense wastes. Calculated radionuclide releases from unit quantities (1000 MTU) of waste in each of these scenarios can be compared to the EPA standard. They can also be combined to represent the overall impact of a commercial repository, with and without codisposal of defense waste.

### 3.2 Assumptions used in analysis

The assumptions used in a quantitative analysis should be appropriate to the purpose of the study, and will be dictated in part by the requirements of available computational tools. The purpose of the present analysis is to compare the effect of different disposal configurations for defense high-level waste on radionuclide releases to the accessible environment. Although the results of a quantitative comparison of these different configurations must be compared with applicable standards (i.e., the proposed 40 CFR 191), these quantitative results are to be used only to estimate the potential effects of differences among the options, not to make realistic determinations of regulatory compliance. Very simple models of the waste isolation system are most appropriate for this type of comparative analysis, as it is important that the analysis illustrate the effect of changing a single critical variable. As discussed in section 2, the critical variables

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for this comparison are initial radionuclide inventory, waste package containment time, temperature-influenced rates of radionuclide release from the waste package, and host rock characteristics that influence flow rate and geochemical retardation.

The principal criteria for selection of a computer code for this comparison were (1) the code's availability for use on our computer systems within the time requirements of the study and (2) the ability to evaluate the effects of changes in the critical variables identified above. The ability to calculate radionuclide releases from low-probability disruptive events is not a high priority for this study. Though this type of analysis will be needed to demonstrate compliance with 40 CFR 191, consideration of releases from low-probability events would require introduction of numerous additional variables whose effects on the results might detract from the comparison study. Our analysis is, therefore, limited to releases via normal groundwater flow. Not only is this an important potential release mechanism with a very high probability of occurrence, but analysis of this mechanism provides a measure of the potential exposure to waste radionuclides from the more important nonroutine release mechanisms (e.g., pumping of groundwater from a contaminated aquifer). Thus, this one release mechanism provides a good indicator of overall waste isolation effectiveness.

Two computer codes generally met our primary selection criteria and were considered for use in this study. GARD2 (Rosinger and Tremaine 1980) was selected over REPRISK (Smith et al. 1982) because of the former's more realistic handling of radioactive decay chains. Important advantages of REPRISK are (1) its ability to calculate waste package release rates limited by solubility and by the slow flux of groundwater

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through the repository and (2) it was used by the EPA to formulate and test the proposed EPA high-level waste standard, and the results of the EPA analysis could be a good benchmark to use in comparing the effects of defense waste disposal with those of commercial waste disposal. However, REPRISK input data on radionuclide inventories must be manipulated extensively to overcome limitations in the code's handling of decay chain transport, and our time schedule did not permit the data manipulation needed to adapt this code to analyze defense waste disposal.

GARD2 evaluates one-dimensional groundwater transport through the geosphere of radionuclides released from a repository, and the code considers the effects of radioactive decay and daughter ingrowth for decay chains of up to three members. The simplifying assumptions required in implementing GARD2 are generally quite conservative. All waste packages are assumed to fail simultaneously and completely, whereas containment failure is actually expected to be a gradual process. GARD2 calculates release of waste from the engineered barrier system at a constant rate over a finite time interval, and treats all radionuclides as being released at this one rate. Most investigators expect, however, that releases from an actual repository will occur at rates that will vary over time and differ greatly for different radionuclides (National Research Council 1983). Geosphere transport is treated as occurring at a constant velocity (input by the user) along a single linear flow path of known length. The effects of dispersion are neglected. The model simulates all geochemical interactions with the host rock as ion exchange processes using a retardation factor (R) to calculate delays in radionuclide travel resulting from reversible

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sorption processes. This method is used to handle geochemical interactions in most groundwater transport models, but it may give erroneous results when applied to interactions that are not due to ion exchange, and it fails to give credit for geochemical interactions (e.g., some precipitation reactions) that may cause contaminants to be retained indefinitely in geologic media. Selection of conservative values for R should prevent any overestimate of the effectiveness of geochemical processes in retarding radionuclide transport, and will result in overestimates of the transport of most radionuclides.

GARD2 requires input describing the initial repository inventories, half-lives, geologic retardation factors, and decay chain characteristics for all radionuclides for which releases are to be calculated, or which contribute to ingrowth of radionuclides for which releases are to be calculated. Sixty-two radionuclides were considered in our analysis. Table 3.2-1 lists the initial radionuclide inventories assumed for one MTU-equivalent for four waste types: FWR spent fuel, BWR spent fuel, commercial high-level waste, and defense high-level waste. All wastes are assumed to be 10 years old. Inventories for spent fuel and commercial high-level waste were obtained from calculations using the ORIGEN2 computer code (Croff and Alexander 1980); the commercial high-level waste inventory was calculated by assuming it to be derived from reprocessing of BWR and FWR spent fuel in the proportion 1.0 MTU FWR to 0.52 MTU BWR (the proportion at which the two spent fuel types are assumed to be disposed in a commercial repository). The defense waste inventory was calculated from data presented by Baxter (1981), assuming that each canister of defense waste glass contains the waste from 0.5 MTU. Inventories for key radionuclides which were not listed

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in the literature sources are indicated by a question mark and were estimated by us.

Two sets of geologic retardation factors (R values) were used to represent the characteristics of salt and "hard rock" (see Table 3.2-2). Where possible, retardation factors were selected from the National Research Council's (1983) recommended generic values, which are represented as "suitably conservative for the purpose of predicting the performance of conceptual repositories." Values for radionuclides not covered in the National Research Council report are those used in the other modeling studies cited in Table 3.2-2, or were estimated by analogy to National Research Council values for isotopes of elements which form ions of similar charge and ionic radius. Where the National Research Council listed different values for tuff and basalt, the value given for "hard rock" is the lower of these two values. The retardation factor R is the ratio of groundwater pore velocity to the net transport velocity of the dissolved substance (National Research Council 1983); a substance which is not retarded by geochemical interactions in a given geologic setting is assigned a retardation factor of 1 for that geologic setting.

Groundwater velocity and the length of the groundwater flow path to the accessible environment are site-specific variables, and it is not reasonable to assign values that are typical of all salt sites or all hard rock sites. Groundwater flux in repository host formations is expected to be quite low, but because associated geologic units may support much larger flows, it is not appropriate to use a velocity typical of the host rock to represent the entire flow path to the accessible environment. The distance to the accessible environment

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depends on the geometry of the groundwater flow system in and around the site, and on the vertical and horizontal distances to the boundaries of the accessible environment. The NRC technical criteria for high-level waste disposal (10 CFR 60) require that the pre-placement groundwater travel time from the outer boundary of the zone of thermal disturbance to the accessible environment be at least 1000 years. For the purpose of the present comparison, we have arbitrarily assumed a travel time of exactly 1000 years for both salt and hard rock repository sites, based on a groundwater velocity of 1 m/yr and a flow path 1 km in length. These are conservative assumptions, in that actual repository sites are likely to have lower flow velocities and longer flow paths; however, they do meet the NRC's minimum criterion, and quantities of radionuclides released after such a short travel time may indicate potential releases via disruptive events more effectively than if a more realistic travel time were assumed.

Another datum required for GARD2 input is the time until the waste containers fail and radionuclides begin to be released into groundwater. 10 CFR 60 requires that containment be effective for at least 300 years or as long as 1000 years (specific requirements to be set on a case-specific basis) after closure of the repository. This containment criterion is expected to be met by providing waste canisters (or canisters supplemented by overpacks) with the mechanical integrity and corrosion resistance to survive at least 300 to 1000 years in a repository environment; site-specific factors such as dry conditions in the repository could assist in complying with this criterion. For the present analysis, we have assumed that the containment criterion is met solely by the waste package. TiCode-12 overpacks are assumed to be used

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on all commercial waste packages, as described by Westinghouse Electric Corp. (1983a and 1983b), as well as on defense waste packages in scenarios 10 and 12. Though these overpacks are expected by Westinghouse (1983a and 1983b) to withstand corrosion for much longer than 1000 years in most environments, in this analysis we disregard this added margin of safety and assume that they provide containment for just 1000 years. Defense wastes disposed of by the "no overpack" option are treated as if minimal steel overpacking is done to assure containment for 300 years. [An analysis reported by Westinghouse (1983a and 1983b) indicates that overpacks will be needed to prevent mechanical failure of the waste package.] Defense wastes placed apart from commercial wastes (either in separate repositories or in separate areas at the same repository site) are also assumed to be provided with minimal overpacks that provide 300-year containment. Though (as discussed in section 2) integrity of defense waste containers may be diminished by the higher temperatures and greater mechanical stresses expected in a commercial repository, it is reasonable to assume that these effects are compensated for by supplying sturdier containers, so that codisposal in a commercial waste repository does not affect containment life of defense waste packages.

The final variable required for GARD2 input is the time period over which the waste inventory is released (the inverse of this parameter is the waste release rate, expressed in  $\text{yr}^{-1}$ ). As noted above, waste release rates are a complex function of a variety of factors, and GARD2's treatment of this process is not realistic. However, as discussed in section 2, a key difference between commercial and defense wastes is the lower leaching rate of defense waste forms, and leaching

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rate is identified as a factor which will probably be affected by the choice of a disposal option for defense high-level wastes. In order to evaluate differences among the different disposal options, it is appropriate to treat the waste release rate as a function of the waste form leaching rate alone, while recognizing that other factors (e.g., the performance of backfill materials) also affect release rates and generally result in significantly lower release rates than are calculated from waste form leaching rates alone. Fractional release rates for spent fuel, commercial high-level waste, and defense high-level waste were calculated from waste form leaching rates and waste form dimensions reported by Westinghouse (1983a and 1983b), which are listed in Tables 3.2-3 through 3.2-5. Calculated release rates for the commercial wastes exceed the minimum fractional release rate of  $10^{-5}$   $\text{yr}^{-1}$  set by 10 CFR 60, so assumed release rates for these wastes were set equal to the 10 CFR 60 criterion (Tables 3.2-3 and 3.2-4).

The fractional release rate calculated for defense waste is acceptable under the 10 CFR 60 containment criterion (Table 3.2-5). For the comparison of different waste disposal options, it was assumed that leaching rates vary with the repository temperature at the time of containment failure (i.e., 300 or 1000 years after emplacement). These temperatures were estimated from published repository thermal analyses for salt and tuff (Westinghouse 1983a and 1983b), based on the waste characteristics listed in Tables 3.2-3 through 3.2-5 and waste emplacement geometries in DOE reference conceptual repository designs. Temperature estimates for the different defense waste disposal scenarios are listed in Table 3.2-6; temperatures for codisposal scenarios are based on the predicted rock temperatures for spent fuel or commercial

high-level waste disposal tunnels at 300 and 1000 years after emplacement. Because temperatures in defense waste repositories are essentially stable after 300 years, it seems reasonable to assume that 300 years of containment would suffice for this option. The waste release rate for a separate defense waste disposal area (50 to 60°C) was assumed to be  $10^{-6} \text{ yr}^{-1}$  (slightly lower than the calculated release rate for defense waste), and release rates for the other scenarios were calculated by assuming that increases in leaching susceptibility at higher temperatures are directly related to the increase in silica solubility at those temperatures (Table 3.2-5). It should be noted that these assumed release rates tend to overstate the differences among defense waste disposal options, as release rates are based on peak temperatures for the release period, whereas actual temperatures and release rates for the codisposal options would decline over time.

Table 3.2-6 summarizes the assumptions regarding containment life and waste release rate that were used in GARD2 to analyze the effects of the different defense waste disposal scenarios. As stated above, all commercial wastes were assumed to have waste release rates of  $10^{-5} \text{ yr}^{-1}$  and to be emplaced in packages with a 1000-yr containment life. For all cases, the travel time to the accessible environment is assumed to be 1000 years. Assumptions concerning waste inventory and geologic retardation factors are listed in Tables 3.2-1 and 3.2-2. Except for the waste inventory, all assumptions selected are deliberately intended to be conservative (in that they will usually result in overpredictions of radionuclide releases), while meeting NRC criteria and permitting comparisons among alternate disposal options.

### 3.3 Results of analysis

The computer code GARD2 was used to calculate radionuclide releases from 1000 MTU of waste for 100,000 years after waste emplacement for each of the twelve scenarios listed in section 3.1. Total releases for each of ten 10,000-yr intervals were determined by fitting a spline function to the GARD2 output data and integrating, using numerical analysis routines of Forsythe et al. (1977). Computer listings of the results of the analysis are in the Appendix.

In all twelve cases, calculated releases are below release limits established by the proposed 40 CFR 191 (Table 3.3-1) for the first 10,000-year period after waste emplacement, which is the time period to which the standard applies. Calculated releases begin to exceed the standard after 20,000 years and 50,000 years for salt and hard rock scenarios, respectively. Because non-site-specific conservative assumptions were used for this analysis, these results should not be used to indicate the effectiveness of any site design in meeting the EPA standard, but only for comparing the relative performance of the disposal scenarios analyzed.

In this analysis, health effects are assumed to be proportional to the release limits established by the proposed EPA performance standard (40 CFR 191). As an indication of the relative effects from each scenario, the sum of the ratios of calculated release of each radionuclide to the release limit for that radionuclide (Table 3.3-1) can be determined for each scenario for each period of interest. The total effects from a commercial repository can be represented by the weighted average of the calculated releases for each of the three



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commercial waste types, using weights of 0.33, 0.17, and 0.50 for PWR spent fuel, BWR spent fuel, and commercial high-level waste respectively, in accordance with their expected representation in the mix of commercial wastes.

In all cases, the predicted effects of all defense disposal options are less than the predicted effects from an equivalent quantity of commercial waste placed in a repository in the same geologic medium. The lowest release sums calculated are for defense waste in a separate disposal area. Except for the first 10,000-year period after closure, the differences in predicted releases for the different defense waste disposal options are almost directly proportional to the contrast in assumed waste release rates. Releases in the the first 10,000 years are dominated by C-14 (half-life of 5730 years), and as a direct result of the additional delay in first release of this isotope, C-14 releases for this period are substantially lower for codisposal scenarios involving TiCode overpacks than for codisposal scenarios in which minimal overpacks are used. For this performance compliance period, the calculated release sum for the most effective defense waste disposal scenario (separate disposal) is 13% of the sum for commercial waste disposal in both media. For the least effective defense waste disposal scenarios (codisposal, using minimal overpacking), the release sums for this period are 26% and 60% of the release sums for commercial waste in hard rock and salt, respectively. In all subsequent time intervals, the contrast between commercial waste and defense waste disposed separately is greater than an order of magnitude, and tends to increase over time as isotopes of uranium (more abundant in unprocessed spent fuel) and uranium daughters dominate the releases. Beyond the first 10,000 years,

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the most and least effective defense waste disposal scenarios tend to differ by factors of about 2 and 5 for hard rock and salt, respectively.

### 3.4 Conclusions

These results tend to support our suppositions that defense waste disposal would result in fewer long-term health effects than commercial waste disposal, and that separate disposal of defense waste would lead to fewer long-term effects from the defense waste than would codisposal with commercial waste. Codisposal of defense wastes, even without a corrosion-resistant TiCode overpack, is expected to result in fewer health effects than are expected from an equivalent quantity of commercial wastes in the same repository. However, differences among the three defense waste disposal configurations were never larger than a factor of 5, and are largely attributable to assumed differences in waste release rates due to different leaching temperatures. These differences are much less than uncertainties that would be associated with a realistic repository performance assessment, particularly if one is comparing the health and safety aspects of disposal at two different sites.

From the standpoint of compliance with the regulations that constrain allowable health and safety effects, advantages of the separate waste disposal option for defense waste would be that it ought to be much easier to demonstrate regulatory compliance for a defense waste repository than for a commercial waste repository, and that it should not be difficult to justify a requirement for a minimal containment period (300 years) for defense waste packages in a separate repository. (The same conclusions may apply to defense waste disposal

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in a separate portion of a commercial repository.) An advantage of codisposal would be a slight reduction in radionuclide releases per MIU (averaged for the entire repository) due to the inclusion of defense waste.

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Table 3.2-1. Initial radionuclide inventories assumed in analysis of long-term effects<sup>a</sup> (Ci/KTU)

Nuclide	Spent fuel		Commercial HLW	Defense HLW
	PWR	BWR		
C-14	1.5	1.6	1.0	2.3 (?)
Se-79	0.41	0.34	0.39	0.24
Sr-90	$5.8 \times 10^4$	$4.8 \times 10^4$	$5.4 \times 10^4$	$5.4 \times 10^4$
Y-90	$5.8 \times 10^4$	$4.8 \times 10^4$	$5.4 \times 10^4$	$5.4 \times 10^4$
Zr-93	1.8	1.5	1.7	3.2
Nb-94	1.3	0.32	0.96	2.3 (?)
Tc-99	13	11	12	4.4
Pd-107	0.11	$9.5 \times 10^{-2}$	0.10	$1.6 \times 10^{-2}$
Sn-126	0.78	0.63	0.73	$2.7 \times 10^{-2}$
Sb-126	0.11	$8.8 \times 10^{-2}$	0.10	$3.3 \times 10^{-3}$
I-129	$3.2 \times 10^{-2}$	$2.6 \times 10^{-2}$	$7.6 \times 10^{-5}$ (?)	$5.0 \times 10^{-5}$ (?)
Cs-135	0.35	0.36	0.35	0.12
Cs-137	$8.3 \times 10^4$	$6.7 \times 10^4$	$7.7 \times 10^4$	$5.0 \times 10^4$
Sm-151	$3.3 \times 10^2$	$3.0 \times 10^2$	$3.2 \times 10^2$	$4.2 \times 10^2$
Th-229	$7.0 \times 10^{-8}$	$8.6 \times 10^{-8}$	$6.1 \times 10^{-3}$	$5.6 \times 10^{-9}$ (?)
Th-230	$1.3 \times 10^{-4}$	$1.2 \times 10^{-4}$	$2.8 \times 10^{-5}$	$1.0 \times 10^{-4}$ (?)
Th-232	$2.5 \times 10^{-10}$ (?)	$2.5 \times 10^{-10}$ (?)	$5.4 \times 10^{-11}$ (?)	$1.2 \times 10^{-10}$ (?)
Pa-231	$1.6 \times 10^{-5}$	$1.6 \times 10^{-5}$	$2.0 \times 10^{-4}$ (?)	$2.3 \times 10^{-4}$ (?)
U-232	$5.5 \times 10^{-3}$ (?)	$6.5 \times 10^{-3}$ (?)	$2.5 \times 10^{-3}$ (?)	$9.1 \times 10^{-3}$
U-233	$2.8 \times 10^{-5}$	$3.3 \times 10^{-5}$	$1.3 \times 10^{-5}$	$1.1 \times 10^{-6}$
U-234	1.2	1.0	$8.2 \times 10^{-3}$	$9.95 \times 10^{-3}$
U-235	$1.7 \times 10^{-2}$	$1.6 \times 10^{-2}$	$8.3 \times 10^{-5}$ (?)	$9.4 \times 10^{-5}$
U-236	0.26	0.21	$1.2 \times 10^{-3}$	$2.0 \times 10^{-3}$

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Table 3.2-1 (continued)

Nuclide..	Spent fuel		Commercial HLW	Defense HLW
	PWR	BWR		
U-238	0.72	0.32	$2.0 \times 10^{-3}$	$5.5 \times 10^{-4}$
Np-237	0.32	0.25	0.29	$1.6 \times 10^{-2}$
Pu-238	$2.2 \times 10^3$	$1.7 \times 10^3$	97	$1.3 \times 10^3$
Pu-239	$3.1 \times 10^2$	$3.0 \times 10^2$	1.6	13
Pu-240	$5.3 \times 10^2$	$4.8 \times 10^2$	3.7	8.0
Pu-241	$7.8 \times 10^4$	$7.0 \times 10^4$	$3.7 \times 10^2$	$1.5 \times 10^3$
Pu-242	1.8	1.4	$8.3 \times 10^{-3}$	$1.1 \times 10^{-2}$
Am-241	$1.7 \times 10^3$	$1.5 \times 10^3$	$1.9 \times 10^2$	19
Am-242m	34 (?)	30	3.8	$2.6 \times 10^{-2}$
Am-243	17	13	16	$1.0 \times 10^{-2}$
Cm-242	3.0	3.4	3.1	$6.2 \times 10^{-2}$
Cm-243	0.78 (?)	0.88 (?)	11	$9.9 \times 10^{-3}$
Cm-244	$1.0 \times 10^3$	$7.0 \times 10^2$	$8.9 \times 10^2$	0.29
Cm-245	0.41 (?)	0.29 (?)	0.71 (?)	$1.2 \times 10^{-5}$
Cm-246	$8.2 \times 10^{-2}$ (?)	$5.7 \times 10^{-2}$ (?)	0.20 (?)	$9.4 \times 10^{-7}$
Cm-247	0	0	0	$1.2 \times 10^{-12}$
Cm-248	0	0	0	$1.2 \times 10^{-12}$

<sup>a</sup>Excludes radionuclides whose initial inventory is 0.

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Table 3.2-2. Geologic retardation factors (R) used in analysis of long-term effects

Radionuclide	R value for hard rock	R value for salt	Source
C-14	1	1	a,b,c,i
Se-79	50	200	e
Sr-90	200	10	e
Y-90	1,000	1,000	f
Nb-93m, Nb-94	5,000	1,000	f
Zr-93	5,000	1,000	e
Tc-99	5	5	e
Pd-107	1,000	100	g
Sn-126	1,000	100	e
Sb-126	100	50	e
I-129	1	1	a,b,c,d,e,h
Te-129m	100	50	i
Cs-135, Cs-137	500	10	e
Sm-151	3,000	1,000	j
Pb-210	50	50	e
Bi-210	50	50	h
Po-210	100	50	i
Rn-222	1	1	h
Ra isotopes	500	50	e
Ac-225, Ac-227	500	1,000	k
Th isotopes	5,000	1,000	e
Pa-231, Pa-233	500	100	m
U isotopes	50	20	e
Np-237, Np-239	100	50	e
Pu isotopes	200	200	e
Am isotopes	500	1,000	e
Cm isotopes	500	1,000	e

<sup>a</sup>From Smith et al., 1982.

<sup>b</sup>Based on Pepping et al., 1983a.

<sup>c</sup>Based on Siegel and Chu, 1983.

<sup>d</sup>Based Pepping et al., 1983b.

<sup>e</sup>From National Research Council, 1983.

<sup>f</sup>Values based on an assumption of geochemical similarity to zirconium.

<sup>g</sup>Values based on an assumption of geochemical similarity to tin.

<sup>h</sup>From Rosinger and Tremaine, 1980.

<sup>i</sup>Values based on an assumption of geochemical similarity to antimony.

<sup>j</sup>Value for hard rock is that used by Rosinger and Tremaine (1980). Value for salt is set equal to the highest value recommended for any nuclide in salt by National Research Council (1983).

<sup>k</sup>Values based on an assumption of geochemical similarity to americium and curium [suggested by Pepping et al. (1983a,b) and Siegel and Chu (1983)].

<sup>m</sup>Hard rock value based on an assumption of geochemical similarity to americium and curium [suggested by Pepping et al. (1983a) and Siegel and Chu (1983)]. Salt value based on Pepping et al. (1983b).

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**Table 3.2-3. Spent nuclear fuel characteristics assumed in analysis of long-term effects**

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<b>Waste form</b>	<b>Spent fuel assemblies</b>
<b>Canister size</b>	(PWR) 0.43 m dia. x 3.85 m long (BWR) 0.49 m dia. x 4.11 m long
<b>Nominal leach rate of spent fuel</b>	$10^{-5}$ g/cm <sup>2</sup> -day
<b>Waste package fractional release rate assumed under repository conditions</b>	$1.0 \times 10^{-5}$ yr <sup>-1</sup>
<b>Waste package radioactivity content</b>	(PWR) $2.4 \times 10^6$ Ci (BWR) $2.5 \times 10^6$ Ci
<b>Waste package nuclear fuel content</b>	(PWR) 2.77 MTU (BWR) 3.4 MTU
<b>Canister average heat output at emplacement</b>	(PWR) 3300 W (BWR) 3400 W

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Table 3.2-4. Commercial high-level waste characteristics assumed in analysis of long-term effects

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Waste form	Borosilicate glass
Canister size	0.324 m dia. x 3.0 m long
Canister active glass volume	0.19 m <sup>3</sup>
Waste package fractional release rate assumed under repository conditions	$10 \times 10^{-5} \text{ yr}^{-1}$
Nominal leach rate at 20-25°C	$2.0 \times 10^{-6} \text{ g/cm}^2\text{-day}$
Canister radioactivity content	$6.58 \times 10^5 \text{ Ci}$
Canister nuclear fuel content	2.28 MTU
Canister average heat output at emplacement	2200 W

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Table 3.2-5. Defense high-level waste characteristics assumed in analysis of long-term effects

Waste form	Borosilicate glass
Canister size	0.61 m dia. x 3.0 m long
Canister active glass volume	0.63 m <sup>3</sup>
Canister active glass surface area	5.0 x 10 <sup>5</sup> cm <sup>2</sup>
Nominal leach rate at 20-25°C	1.0 x 10 <sup>-7</sup> g/cm <sup>2</sup> -day
Calculated waste form fractional release rate	1.2 x 10 <sup>-6</sup> yr <sup>-1</sup>
waste form fractional release rate assumed for 50-60°C	1.0 x 10 <sup>-6</sup> yr <sup>-1</sup>
Waste form fractional release rate assumed for 75°C	1.15 x 10 <sup>-6</sup> yr <sup>-1</sup>
Waste form fractional release rate assumed for 100°C	2.0 x 10 <sup>-6</sup> yr <sup>-1</sup>
Waste form fractional release rate assumed for 130°C	5.0 x 10 <sup>-6</sup> yr <sup>-1</sup>
Canister radioactivity content	1.5 x 10 <sup>5</sup> Ci
Canister nuclear fuel content	0.5 MTU
Canister average heat output at emplacement	423 W

Sources: Baxter, 1981; Westinghouse, 1983a, 1983b (nominal leach rate). Temperature dependence of fractional release rates based on temperature dependence of SiO<sub>2</sub> solubility, as reported by National Research Council (1983).

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Table 3.2-6. Assumptions used in analyzing different defense waste disposal scenarios

	Life of container (yr)	Temperature after containment failure (°C)	Waste release rate (yr <sup>-1</sup> ) <sup>a</sup>
Separate disposal of defense waste			
Minimal overpack, <sup>b</sup> both rock types	300	50-60	1.0 x 10 <sup>-6</sup>
Codisposal of defense waste with CHLW and spent fuel			
Minimal overpack, salt geology	300	130	5.0 x 10 <sup>-6</sup>
TiCode-12 overpack, <sup>b</sup> salt geology	1000	100	2.0 x 10 <sup>-6</sup>
Minimal overpack, <sup>b</sup> hard rock geology	300	100	2.0 x 10 <sup>-6</sup>
TiCode-12 overpack, hard rock geology	1000	75	1.15 x 10 <sup>-6</sup>

<sup>a</sup>For GARD2 input, waste form release rates are inverted to represent the time required to release the entire waste inventory at a constant fractional release rate.

<sup>b</sup>The minimal overpack option is assumed to provide sufficient mechanical stability and corrosion resistance to meet the minimum containment period (300 yr) set by 10 CFR 60.

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Table 3.3-1. Release limits in the proposed EPA Standard (40 CFR 191)

Radionuclide	Release Limit
Americium-241 - - - - -	10
Americium-243 - - - - -	4
Carbon-14 - - - - -	200
Cesium-135 - - - - -	2000
Cesium-137 - - - - -	500
Neptunium-237 - - - - -	20
Plutonium-238 - - - - -	400
Plutonium-239 - - - - -	100
Plutonium-240 - - - - -	100
Plutonium-242 - - - - -	100
Radium-226 - - - - -	3
Strontium-90 - - - - -	80
Technetium-99 - - - - -	2000
Tin-126 - - - - -	80
Any other alpha-emitting radionuclide - - - - -	10
Any other radionuclide which does not emit alpha particles - - - - -	500

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## 4. SHORT-TERM HEALTH AND SAFETY EFFECTS

The short-term health and safety effects related to geologic disposal of high-level wastes will be related to construction and operation of the repositories. These effects result from nonradiological and radiological phases of construction and operation.

### 4.1 Construction

Health and safety impacts related to repository construction are those associated with construction of surface facilities and mining of the repository. The major health and safety impacts are those associated with accidents during construction and radiological and nonradiological effluents released during the construction period. Estimates of effects given in this study were determined by normalizing values given for model repositories in DOE/EIS-0046F (reference 1) to a per MTHM of waste capacity. These normalized values were then converted to appropriate values for the repository capacities disposal options considered in the present study.

#### 4.1.1 Nonradiological accidents

Table 4.1 summarizes the number of predicted injuries (temporarily disabling) and fatalities (or permanently disabling injuries) associated with surface facility construction and underground mining operations for repositories in salt and hard rock. These predictions are based on injury rates of 13.6 temporary disabling injuries per million hours of construction for surface facilities and 25 injuries per million man-hours for underground mining. Fatality rates are 0.17 per million man-hours for construction and 0.53 per million man-hours for underground mining.

**Table 4.1. Estimates of nonradiological disabling injuries and fatalities associated with repository construction<sup>a</sup>**

Repository type	Geologic media			
	Salt		Hard rock	
	Disabling injuries	Fatalities	Disabling injuries	Fatalities
<b>Defense waste repository</b>				
3,350 MTU	29	0.6	41	0.8
10,000 MTU	86	1.7	124	2.5
<b>Commercial repository</b>				
Commercial plus defense wastes				
73,350 MTU	632	13	909	19
80,000 MTU	690	14	992	20
<b>Defense waste replacement of commercial wastes</b>				
70,000 MTU	603	12	868	18

<sup>a</sup> Estimated from values given in reference 1 for construction of a spent fuel repository.

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These accidents are related both to size (capacity) of the repository and to geologic media. Injury and fatality estimates for mining in hard rock are about 40% higher than for mining in salt.

#### 4.1.2 Nonradiological effluents

Nonradiological effluents from repository construction include dust and pollutants generated from machinery operation during facility construction and mining operations. Burning of propane, diesel, and gasoline fuels results in air pollutant emissions, but concentrations in air are not expected to exceed applicable limits (40 CFR 50). Table 4.2 gives estimates of the total quantities of emissions during construction of the repositories in a salt formation. Emissions from construction of repositories in hard rock would be 10 to 20% greater.

In addition to pollutants from burning fuels, dust generated from surface operations and rock transport to storage will result in above-ground dust. In a non-arid environment, about 4.7 MT of dust per day would be produced from surface handling of mined material during construction of a 70,000 MTU capacity hard rock repository (U.S. DOE, 1980). For a repository in salt, about 4.2 MT/d would be produced. These estimates are based on the assumption that no control techniques are applied. Dust emissions could result in concentrations in air which are higher than the existing federal air quality standard ( $75 \mu\text{g}/\text{m}^3$ ) if control techniques are not used (U.S. DOE, 1980).

No significant health and safety impacts should result from nonradiological emissions if dust emissions are controlled.

Table 4.2. Effluents released to the atmosphere during construction of geologic repositories in salt<sup>a</sup>

Repository type	Pollutant (MT total release)				
	CO	Hydrcarbons	NO <sub>x</sub>	SO <sub>x</sub>	Particulates
<b>Defense waste repository</b>					
3,350 MTU	519	24	97	6	6
10,000 MTU	1,550	71	290	18	18
<b>Commercial and defense wastes<sup>a</sup></b>					
73,350 MTU	11,370	518	2,127	132	132
80,000 MTU	12,400	565	2,320	144	144
<b>Commercial replaced by defense wastes</b>					
70,000 MTU	12,040	494	2,030	126	126

<sup>a</sup>Values estimated from construction of a spent fuel repository given in reference 1.

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#### 4.1.3 Radiological effluents

During the construction (mining) of repositories, naturally occurring radon and its decay products will be released to the atmosphere. Both workers and the surrounding population will be exposed to these radioactive emissions. Radon and daughter emissions will be higher from hard rock mining than from salt mining by several orders of magnitude. Thus, the size of the repository is less important than the geologic medium. Table 4.3 gives estimates of 70-year whole-body dose commitments from radionuclides released during construction of repositories. No health effects would be expected in the surrounding population from radioactive releases during construction. Occupational exposures (maximum of 3406 man-rem) would not result in health effects based on the assumption that there are 200 health effects per million man-rem. Since no health effects are estimated for the repository capacities or geologic media considered here, no waste disposal option has a particular advantage over another.

#### 4.2 Operation of repositories

The operational phase of high-level waste repositories will include receiving, handling, and placement of waste packages into subterranean storage areas. Storage areas will be backfilled when they reach capacity.

##### 4.2.1 Nonradiological effluents

The major nonradiological effluents released from repository operations are the same pollutants discussed under construction impacts, although total quantities released are greater during the operation period than during construction. Table 4.4 gives total quantities of



Table 4.3. Summary of 70-year whole-body dose commitments from naturally occurring radionuclides released during construction of repositories<sup>a</sup>

Repository type	Salt		Hard rock	
	Workers	Population	Workers	Population
<b>Defense waste repository</b>				
3,350 MTU	1.2E-2	4.6E-2	1.4E+2	1.7E+0
10,000 MTU	3.5E-2	1.4E-3	4.2E+2	5.0E+0
<b>Commercial plus defense wastes</b>				
73,350 MTU	2.6E-1	1.0E-2	3.1E+3	3.6E+1
80,000 MTU	2.8E-1	1.1E-2	3.4E+3	4.0E+1
<b>Commercial replaced by defense wastes</b>				
70,000 MTU	2.5E-1	9.6E-3	3.0E+0	3.5E+1

<sup>a</sup> Estimates based on construction of spent fuel repositories given in U. S. DOE (1980).

<sup>b</sup> Surrounding population out to 80 km is 2 million persons.

Table 4.4. Effluents released to the atmosphere during operation of geologic repositories in salt<sup>a</sup>

Repository type	Pollutant (MT total release)				
	CO	Hydrcarbons	NO <sub>x</sub>	SO <sub>x</sub>	Particulates
<b>Defense waste repository</b>					
3,350 MTU	167	57	985	636	28
10,000 MTU	500	170	2,940	1,900	84
<b>Commercial and defense wastes</b>					
73,350 MTU	3,367	1,246	21,505	13,936	618
80,000 MTU	4,000	1,360	23,520	15,200	674
<b>Commercial replaced by defense wastes</b>					
70,000 MTU	3,500	1,190	20,580	13,300	590

<sup>a</sup>Values estimated from construction of a spent fuel repository given in reference 1.

pollutants released to the atmosphere in salt. Values for hard rock repositories would be about 45% lower (U.S. DOE, 1980). In all cases, air quality standards would be met and no health effects would be predicted.

In addition, about  $7.6 \times 10^3$  MJ of heat would be released to the atmosphere for each MIU stored independently of geologic media. Heat releases would be expected to cause no health effects.

#### 4.2.2 Radiological effects:

Routine radiological releases from geologic repositories during normal operation will consist principally of radon emanating from exposed rock faces and radon's decay products. These releases will also occur from backfilling operations but are negligible compared to radon releases during repository construction. Occasionally, external contamination may occur on canisters as a result of some minor accident. The population dose from decontamination activities would be much less than that from operation at a spent fuel packaging and storing facility, for which the 70-year whole-body population dose was determined to be about 1 man-rem (DOE/ET-0029). Doses to maximum, off-site individuals would be much less than 1 millirem per year.

Doses to the work force during repository operation will include contributions from receiving, handling, and placement of waste canisters into subterranean storage areas. Doses estimated to result from operations, based on expected time of operation and permissible exposure limits, are presented in Table 4.5 for disposal of wastes for the various disposal options. Estimates given in DOE/EIS-0046F were used and they are independent of geologic media. Also these are estimates for spent

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Table 4.5. Estimated occupational exposures and health effects for operation of repositories<sup>a</sup>

Repository type	Total man-rem <sup>b</sup>	Health effects <sup>a</sup>
Defense waste		
3,350 MTU	3.0E+2	0.06
10,000 MTU	9.0E+2	0.18
Commercial and defense wastes		
73,350 MTU	6.6E+3	1.3
80,000 MTU	7.2E+3	1.4
Commercial replaced by defense wastes		
70,000 MTU	6.3E+3	1.3

<sup>a</sup>Based on U.S. DOE (1980).

<sup>b</sup>For duration of operational phase.

<sup>c</sup>Health effects are 200 per million man-rem.

1-1000

fuel waste and represent the occupational exposures for the duration of repository operation. Between 1 and 2 health effects are estimated for repositories where 70,000 MTU or more capacity is used. Since the number of curies per MTU is higher for spent fuel than for defense or commercial waste, these estimates based on spent fuel are conservative.

#### 4.2.3 Radiological accidents

Several accidents which result in the release of radionuclides have been given in DOE/EIS-0046F. They were chosen on the basis of their probability and radiological consequences. In all cases, they are much more severe to workers than to surrounding populations. Of accidents which might occur during repository operation, the drop of a canister down the repository mine shaft is most serious. Estimated frequency of occurrence is  $1-5$ /yr. Less serious, and representative of minor accidents, would be the rupture of a contact-handled transuranic (CH-TU) waste drum. This type of accident has an estimated frequency of 0.15/yr. Accidents are summarized in Table 4.6.

No health effects would be predicted to off-site persons as a result of these accidents. However, estimated occupational exposures would be fatal in the case of canister drops. These doses are independent of geologic media and their estimated frequencies are such that they are considered to be rare.

#### 4.3 Summary of Short-Term Health and Safety Effects

There is no significant health and safety advantage associated with construction or operation of repositories in any geologic media. The size (MTU capacity) of the repository seems to be the dominant influence

Table 4.6. Radiation doses associated with representative accidents during repository operation

	Dose (rem)		
	Occupational <sup>a</sup>	Maximum individual <sup>b</sup>	Population <sup>c</sup>
Drop of waste canister into mine shaft			
Spent fuel canister	1.9E+3	3.5E-5	8.7E+0
Commercial waste canister	6.5E+3	1.4E-5	3.5E+0
Rupture of CH-TRU waste drum	--	1.0E-12	3.9E-18

<sup>a</sup> Worker near the point of impact of canister. Dose is first year whole-body dose.

<sup>b</sup> Maximum individual offsite is 1600 m from the release point. Dose is a 70-year whole-body dose commitment.

<sup>c</sup> Population dose is based on 2 million persons living within 80 km of the facility. Dose is 70-year whole-body dose commitment in man-rem.

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on health and safety issues. Given that any repository must meet Federal standards, there is little health and safety advantage to be gained by options considered here. Of course, handling defense wastes in a defense-only repository would have much less impact in terms of capacity. But if other wastes also have to be isolated, the effects of larger, combined waste repositories are not great enough to preclude their use.

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Computer Listing of Radionuclide Releases (Ci/1000 MtU) over 10,000-Year  
 Intervals for Scenario 1: Commercial High-Level Waste;  
 Salt Geologic Setting

NP237	FROM	5.10000E+04	TO	6.00000E+04	2.93499E+01	CURIES
NP237	FROM	6.00000E+04	TO	7.00000E+04	3.26297E+01	CURIES
NP237	FROM	7.00000E+04	TO	8.00000E+04	3.26610E+01	CURIES
NP237	FROM	8.00000E+04	TO	9.00000E+04	3.24997E+01	CURIES
NP237	FROM	9.00000E+04	TO	1.00000E+05	3.23782E+01	CURIES
U233	FROM	2.10000E+04	TO	3.00000E+04	1.53738E+00	CURIES
U233	FROM	3.00000E+04	TO	4.00000E+04	5.05466E+00	CURIES
U233	FROM	4.00000E+04	TO	5.00000E+04	6.57336E+00	CURIES
U233	FROM	5.00000E+04	TO	6.00000E+04	1.11259E+01	CURIES
U233	FROM	6.00000E+04	TO	7.00000E+04	1.22244E+01	CURIES
U233	FROM	7.00000E+04	TO	8.00000E+04	1.32492E+01	CURIES
U233	FROM	8.00000E+04	TO	9.00000E+04	1.42316E+01	CURIES
U233	FROM	9.00000E+04	TO	1.00000E+05	1.51654E+01	CURIES
U234	FROM	2.10000E+04	TO	3.00000E+04	3.81488E+00	CURIES
U234	FROM	3.00000E+04	TO	4.00000E+04	4.12251E+00	CURIES
U234	FROM	4.00000E+04	TO	5.00000E+04	4.00269E+00	CURIES
U234	FROM	5.00000E+04	TO	6.00000E+04	3.89310E+00	CURIES
U234	FROM	6.00000E+04	TO	7.00000E+04	3.78409E+00	CURIES
U234	FROM	7.00000E+04	TO	8.00000E+04	3.67868E+00	CURIES
U234	FROM	8.00000E+04	TO	9.00000E+04	3.57554E+00	CURIES
U234	FROM	9.00000E+04	TO	1.00000E+05	3.47551E+00	CURIES
U235	FROM	2.10000E+04	TO	3.00000E+04	6.76497E-03	CURIES
U235	FROM	3.00000E+04	TO	4.00000E+04	1.17699E-02	CURIES
U235	FROM	4.00000E+04	TO	5.00000E+04	1.30966E-02	CURIES
U235	FROM	5.00000E+04	TO	6.00000E+04	1.38670E-02	CURIES
U235	FROM	6.00000E+04	TO	7.00000E+04	1.42845E-02	CURIES
U235	FROM	7.00000E+04	TO	8.00000E+04	1.44824E-02	CURIES
U235	FROM	8.00000E+04	TO	9.00000E+04	1.45437E-02	CURIES
U235	FROM	9.00000E+04	TO	1.00000E+05	1.45283E-02	CURIES
U236	FROM	2.10000E+04	TO	3.00000E+04	2.12129E-01	CURIES
U236	FROM	3.00000E+04	TO	4.00000E+04	2.07882E-01	CURIES
U236	FROM	4.00000E+04	TO	5.00000E+04	3.09416E-01	CURIES
U236	FROM	5.00000E+04	TO	6.00000E+04	3.01495E-01	CURIES
U236	FROM	6.00000E+04	TO	7.00000E+04	2.96140E-01	CURIES
U236	FROM	7.00000E+04	TO	8.00000E+04	2.93407E-01	CURIES
U236	FROM	8.00000E+04	TO	9.00000E+04	2.92184E-01	CURIES
U236	FROM	9.00000E+04	TO	1.00000E+05	2.91627E-01	CURIES
U238	FROM	2.10000E+04	TO	3.00000E+04	1.80000E-01	CURIES
U238	FROM	3.00000E+04	TO	4.00000E+04	2.00001E-01	CURIES
U238	FROM	4.00000E+04	TO	5.00000E+04	2.00009E-01	CURIES
U238	FROM	5.00000E+04	TO	6.00000E+04	2.00010E-01	CURIES
U238	FROM	6.00000E+04	TO	7.00000E+04	2.00010E-01	CURIES
U238	FROM	7.00000E+04	TO	8.00000E+04	2.00014E-01	CURIES

U238	FROM8.00000E+04	TO9.00000E+04	2.00020E-01	CURIES
U238	FROM9.00000E+04	TO1.00000E+05	2.00020E-01	CURIES
PA231	FROM2.10000E+04	TO3.00000E+04	1.95326E-04	CURIES
PA231	FROM3.00000E+04	TO4.00000E+04	6.69531E-04	CURIES
PA231	FROM4.00000E+04	TO5.00000E+04	1.11113E-03	CURIES
PA231	FROM5.00000E+04	TO6.00000E+04	1.49446E-03	CURIES
PA231	FROM6.00000E+04	TO7.00000E+04	1.81410E-03	CURIES
PA231	FROM7.00000E+04	TO8.00000E+04	2.07199E-03	CURIES
PA231	FROM8.00000E+04	TO9.00000E+04	2.27501E-03	CURIES
PA231	FROM9.00000E+04	TO1.00000E+05	2.43116E-03	CURIES
PA233	FROM5.10000E+04	TO6.00000E+04	4.08155E+01	CURIES
PA233	FROM6.00000E+04	TO7.00000E+04	6.06239E+01	CURIES
PA233	FROM7.00000E+04	TO8.00000E+04	*****	CURIES
PA233	FROM8.00000E+04	TO9.00000E+04	1.42295E+01	CURIES
PA233	FROM9.00000E+04	TO1.00000E+05	1.85886E+01	CURIES
TH227	FROM2.10000E+04	TO3.00000E+04	9.31265E-03	CURIES
TH227	FROM3.00000E+04	TO4.00000E+04	1.80728E-02	CURIES
TH227	FROM4.00000E+04	TO5.00000E+04	1.91531E-02	CURIES
TH227	FROM5.00000E+04	TO6.00000E+04	1.87372E-02	CURIES
TH227	FROM6.00000E+04	TO7.00000E+04	1.83161E-02	CURIES
TH227	FROM7.00000E+04	TO8.00000E+04	1.80913E-02	CURIES
TH227	FROM8.00000E+04	TO9.00000E+04	1.80116E-02	CURIES
TH227	FROM9.00000E+04	TO1.00000E+05	1.80051E-02	CURIES
TH228	FROM2.10010E+04	TO3.00000E+04	1.02331E-08	CURIES
TH228	FROM3.00000E+04	TO4.00000E+04	3.58130E-08	CURIES
TH228	FROM4.00000E+04	TO5.00000E+04	6.16595E-08	CURIES
TH228	FROM5.00000E+04	TO6.00000E+04	8.75571E-08	CURIES
TH228	FROM6.00000E+04	TO7.00000E+04	1.13359E-07	CURIES
TH228	FROM7.00000E+04	TO8.00000E+04	1.39117E-07	CURIES
TH228	FROM8.00000E+04	TO9.00000E+04	1.64879E-07	CURIES
TH228	FROM9.00000E+04	TO1.00000E+05	1.90622E-07	CURIES
TH229	FROM2.10000E+04	TO3.00000E+04	1.93055E-01	CURIES
TH229	FROM3.00000E+04	TO4.00000E+04	6.80719E-01	CURIES
TH229	FROM4.00000E+04	TO5.00000E+04	1.19279E+00	CURIES
TH229	FROM5.00000E+04	TO6.00000E+04	1.58633E+00	CURIES
TH229	FROM6.00000E+04	TO7.00000E+04	1.77090E+00	CURIES
TH229	FROM7.00000E+04	TO8.00000E+04	1.93120E+00	CURIES
TH229	FROM8.00000E+04	TO9.00000E+04	2.07982E+00	CURIES
TH229	FROM9.00000E+04	TO1.00000E+05	2.21866E+00	CURIES
TH230	FROM2.10000E+04	TO3.00000E+04	3.22031E-03	CURIES
TH230	FROM3.00000E+04	TO4.00000E+04	1.05810E-02	CURIES
TH230	FROM4.00000E+04	TO5.00000E+04	1.71318E-02	CURIES
TH230	FROM5.00000E+04	TO6.00000E+04	2.29163E-02	CURIES
TH230	FROM6.00000E+04	TO7.00000E+04	2.79990E-02	CURIES
TH230	FROM7.00000E+04	TO8.00000E+04	3.24547E-02	CURIES
TH230	FROM8.00000E+04	TO9.00000E+04	3.63314E-02	CURIES
TH230	FROM9.00000E+04	TO1.00000E+05	3.96934E-02	CURIES
TH231	FROM2.10000E+04	TO3.00000E+04	3.91138E-04	CURIES
TH231	FROM3.00000E+04	TO4.00000E+04	3.38926E-04	CURIES
TH231	FROM4.00000E+04	TO5.00000E+04	2.04820E-04	CURIES
TH231	FROM5.00000E+04	TO6.00000E+04	3.21002E-04	CURIES
TH231	FROM6.00000E+04	TO7.00000E+04	3.32634E-04	CURIES

TH231	FROM	7.00000E+04	TC	8.00000E+04	3.38194E-04	CURIES
TH231	FROM	8.00000E+04	TC	9.00000E+04	2.39264E-04	CURIES
TH231	FROM	9.00000E+04	TC	1.00000E+05	3.39422E-04	CURIES
TH232	FROM	2.10010E+04	TC	3.00000E+04	5.86038E-10	CURIES
TH232	FROM	3.00000E+04	TC	4.00000E+04	3.83027E-09	CURIES
TH232	FROM	4.00000E+04	TC	5.00000E+04	6.87195E-09	CURIES
TH232	FROM	5.00000E+04	TC	6.00000E+04	9.88049E-09	CURIES
TH232	FROM	6.00000E+04	TC	7.00000E+04	1.28479E-08	CURIES
TH232	FROM	7.00000E+04	TC	8.00000E+04	1.57912E-08	CURIES
TH232	FROM	8.00000E+04	TC	9.00000E+04	1.87223E-08	CURIES
TH232	FROM	9.00000E+04	TC	1.00000E+05	2.16489E-08	CURIES
TH234	FROM	2.10000E+04	TC	3.00000E+04	8.22941E-03	CURIES
TH234	FROM	3.00000E+04	TC	4.00000E+04	5.80590E-03	CURIES
TH234	FROM	4.00000E+04	TC	5.00000E+04	1.76056E-03	CURIES
TH234	FROM	5.00000E+04	TC	6.00000E+04	4.00234E-03	CURIES
TH234	FROM	6.00000E+04	TC	7.00000E+04	4.00336E-03	CURIES
TH234	FROM	7.00000E+04	TC	8.00000E+04	4.00427E-03	CURIES
TH234	FROM	8.00000E+04	TC	9.00000E+04	4.00491E-03	CURIES
TH234	FROM	9.00000E+04	TC	1.00000E+05	4.00554E-03	CURIES
AC225	FROM	2.10000E+04	TC	3.00000E+04	1.93202E-01	CURIES
AC225	FROM	3.00000E+04	TC	4.00000E+04	6.80985E-01	CURIES
AC225	FROM	4.00000E+04	TC	5.00000E+04	1.19305E+00	CURIES
AC225	FROM	5.00000E+04	TC	6.00000E+04	1.58672E+00	CURIES
AC225	FROM	6.00000E+04	TC	7.00000E+04	1.77131E+00	CURIES
AC225	FROM	7.00000E+04	TC	8.00000E+04	1.93155E+00	CURIES
AC225	FROM	8.00000E+04	TC	9.00000E+04	2.07912E+00	CURIES
AC225	FROM	9.00000E+04	TC	1.00000E+05	2.21896E+00	CURIES
AC227	FROM	2.10000E+04	TC	3.00000E+04	4.73878E-05	CURIES
AC227	FROM	3.00000E+04	TC	4.00000E+04	2.10386E-04	CURIES
AC227	FROM	4.00000E+04	TC	5.00000E+04	4.11406E-04	CURIES
AC227	FROM	5.00000E+04	TC	6.00000E+04	6.10706E-04	CURIES
AC227	FROM	6.00000E+04	TC	7.00000E+04	7.89703E-04	CURIES
AC227	FROM	7.00000E+04	TC	8.00000E+04	9.37891E-04	CURIES
AC227	FROM	8.00000E+04	TC	9.00000E+04	1.05729E-03	CURIES
AC227	FROM	9.00000E+04	TC	1.00000E+05	1.14930E-03	CURIES
RA223	FROM	2.10000E+04	TC	3.00000E+04	4.73878E-05	CURIES
RA223	FROM	3.00000E+04	TC	4.00000E+04	2.10386E-04	CURIES
RA223	FROM	4.00000E+04	TC	5.00000E+04	4.11406E-04	CURIES
RA223	FROM	5.00000E+04	TC	6.00000E+04	6.10706E-04	CURIES
RA223	FROM	6.00000E+04	TC	7.00000E+04	7.89703E-04	CURIES
RA223	FROM	7.00000E+04	TC	8.00000E+04	9.37891E-04	CURIES
RA223	FROM	8.00000E+04	TC	9.00000E+04	1.05729E-03	CURIES
RA223	FROM	9.00000E+04	TC	1.00000E+05	1.14930E-03	CURIES
RA224	FROM	2.10010E+04	TC	3.00000E+04	1.02331E-08	CURIES
RA224	FROM	3.00000E+04	TC	4.00000E+04	3.58130E-08	CURIES
RA224	FROM	4.00000E+04	TC	5.00000E+04	6.16995E-08	CURIES
RA224	FROM	5.00000E+04	TC	6.00000E+04	8.75571E-08	CURIES
RA224	FROM	6.00000E+04	TC	7.00000E+04	1.13359E-07	CURIES
RA224	FROM	7.00000E+04	TC	8.00000E+04	1.39117E-07	CURIES
RA224	FROM	8.00000E+04	TC	9.00000E+04	1.64879E-07	CURIES
RA224	FROM	9.00000E+04	TC	1.00000E+05	1.90622E-07	CURIES
RA225	FROM	2.10000E+04	TC	3.00000E+04	1.93202E-01	CURIES

RA225	FROM	3.00000E+04	TO	4.00000E+04	6.80985E-01	CURIES
RA225	FROM	4.00000E+04	TO	5.00000E+04	1.19305E+00	CURIES
RA225	FROM	5.00000E+04	TO	6.00000E+04	1.58672E+00	CURIES
RA225	FROM	6.00000E+04	TO	7.00000E+04	1.77131E+00	CURIES
RA225	FROM	7.00000E+04	TO	8.00000E+04	1.93155E+00	CURIES
RA225	FROM	8.00000E+04	TO	9.00000E+04	2.07912E+00	CURIES
RA225	FROM	9.00000E+04	TO	1.00000E+05	2.21896E+00	CURIES
RA226	FROM	2.10000E+04	TO	3.00000E+04	1.28951E-02	CURIES
RA226	FROM	3.00000E+04	TO	4.00000E+04	5.01334E-02	CURIES
RA226	FROM	4.00000E+04	TO	5.00000E+04	8.44957E-02	CURIES
RA226	FROM	5.00000E+04	TO	6.00000E+04	1.14953E-01	CURIES
RA226	FROM	6.00000E+04	TO	7.00000E+04	1.41896E-01	CURIES
RA226	FROM	7.00000E+04	TO	8.00000E+04	1.65635E-01	CURIES
RA226	FROM	8.00000E+04	TO	9.00000E+04	1.86491E-01	CURIES
RA226	FROM	9.00000E+04	TO	1.00000E+05	2.04733E-01	CURIES
RA228	FROM	2.10000E+04	TO	3.00000E+04	1.02331E-06	CURIES
RA228	FROM	3.00000E+04	TO	4.00000E+04	3.58130E-08	CURIES
RA228	FROM	4.00000E+04	TO	5.00000E+04	6.16955E-08	CURIES
RA228	FROM	5.00000E+04	TO	6.00000E+04	8.75571E-08	CURIES
RA228	FROM	6.00000E+04	TO	7.00000E+04	1.13359E-07	CURIES
RA228	FROM	7.00000E+04	TO	8.00000E+04	1.39117E-07	CURIES
RA228	FROM	8.00000E+04	TO	9.00000E+04	1.64879E-07	CURIES
RA228	FROM	9.00000E+04	TO	1.00000E+05	1.90622E-07	CURIES
RA222	FROM	2.10000E+04	TO	3.00000E+04	1.28951E-02	CURIES
RA222	FROM	3.00000E+04	TO	4.00000E+04	5.01334E-02	CURIES
RA222	FROM	4.00000E+04	TO	5.00000E+04	8.44957E-02	CURIES
RA222	FROM	5.00000E+04	TO	6.00000E+04	1.14953E-01	CURIES
RA222	FROM	6.00000E+04	TO	7.00000E+04	1.41896E-01	CURIES
RA222	FROM	7.00000E+04	TO	8.00000E+04	1.65635E-01	CURIES
RA222	FROM	8.00000E+04	TO	9.00000E+04	1.86491E-01	CURIES
RA222	FROM	9.00000E+04	TO	1.00000E+05	2.04733E-01	CURIES
PO210	FROM	2.10000E+04	TO	3.00000E+04	1.28951E-02	CURIES
PO210	FROM	3.00000E+04	TO	4.00000E+04	5.01334E-02	CURIES
PO210	FROM	4.00000E+04	TO	5.00000E+04	8.44957E-02	CURIES
PO210	FROM	5.00000E+04	TO	6.00000E+04	1.14953E-01	CURIES
PO210	FROM	6.00000E+04	TO	7.00000E+04	1.41896E-01	CURIES
PO210	FROM	7.00000E+04	TO	8.00000E+04	1.65635E-01	CURIES
PO210	FROM	8.00000E+04	TO	9.00000E+04	1.86491E-01	CURIES
PO210	FROM	9.00000E+04	TO	1.00000E+05	2.04733E-01	CURIES
PI210	FROM	2.10000E+04	TO	3.00000E+04	1.28951E-02	CURIES
PI210	FROM	3.00000E+04	TO	4.00000E+04	5.01334E-02	CURIES
PI210	FROM	4.00000E+04	TO	5.00000E+04	8.44957E-02	CURIES
PI210	FROM	5.00000E+04	TO	6.00000E+04	1.14953E-01	CURIES
PI210	FROM	6.00000E+04	TO	7.00000E+04	1.41896E-01	CURIES
PI210	FROM	7.00000E+04	TO	8.00000E+04	1.65635E-01	CURIES
PI210	FROM	8.00000E+04	TO	9.00000E+04	1.86491E-01	CURIES
PI210	FROM	9.00000E+04	TO	1.00000E+05	2.04733E-01	CURIES
PB210	FROM	2.10000E+04	TO	3.00000E+04	1.28951E-02	CURIES
PB210	FROM	3.00000E+04	TO	4.00000E+04	5.01334E-02	CURIES
PB210	FROM	4.00000E+04	TO	5.00000E+04	8.44957E-02	CURIES
PB210	FROM	5.00000E+04	TO	6.00000E+04	1.14953E-01	CURIES
PB210	FROM	6.00000E+04	TO	7.00000E+04	1.41896E-01	CURIES

2B210	FROM	7.00000E+04	TO	9.00000E+04	1.65635E-01	CURIES
2B210	FROM	8.00000E+04	TO	9.00000E+04	1.86491E-01	CURIES
2B210	FROM	9.00000E+04	TO	1.00000E+05	2.04733E-01	CURIES
CS135	FROM	1.10000E+04	TO	2.00000E+04	3.13531E+01	CURIES
CS135	FROM	2.00000E+04	TO	3.00000E+04	3.47371E+01	CURIES
CS135	FROM	3.00000E+04	TO	4.00000E+04	3.46326E+01	CURIES
CS135	FROM	4.00000E+04	TO	5.00000E+04	3.45279E+01	CURIES
CS135	FROM	5.00000E+04	TO	6.00000E+04	3.44246E+01	CURIES
CS135	FROM	6.00000E+04	TO	7.00000E+04	3.43203E+01	CURIES
CS135	FROM	7.00000E+04	TO	8.00000E+04	3.42175E+01	CURIES
CS135	FROM	8.00000E+04	TO	9.00000E+04	3.41151E+01	CURIES
CS135	FROM	9.00000E+04	TO	1.00000E+05	3.40126E+01	CURIES
I129	FROM	2.00000E+03	TO	1.00000E+04	6.07845E-03	CURIES
I129	FROM	1.00000E+04	TO	2.00000E+04	7.59494E-03	CURIES
I129	FROM	2.00000E+04	TO	3.00000E+04	7.59176E-03	CURIES
I129	FROM	3.00000E+04	TO	4.00000E+04	7.58840E-03	CURIES
I129	FROM	4.00000E+04	TO	5.00000E+04	7.58512E-03	CURIES
I129	FROM	5.00000E+04	TO	6.00000E+04	7.58178E-03	CURIES
I129	FROM	6.00000E+04	TO	7.00000E+04	7.57843E-03	CURIES
I129	FROM	7.00000E+04	TO	8.00000E+04	7.57520E-03	CURIES
I129	FROM	8.00000E+04	TO	9.00000E+04	7.57190E-03	CURIES
I129	FROM	9.00000E+04	TO	1.00000E+05	7.56865E-03	CURIES
TC99	FROM	6.00000E+03	TO	1.00000E+04	4.67665E+02	CURIES
TC99	FROM	1.00000E+04	TO	2.00000E+04	1.14296E+03	CURIES
TC99	FROM	2.00000E+04	TO	3.00000E+04	1.10638E+03	CURIES
TC99	FROM	3.00000E+04	TO	4.00000E+04	1.07084E+03	CURIES
TC99	FROM	4.00000E+04	TO	5.00000E+04	1.03634E+03	CURIES
TC99	FROM	5.00000E+04	TO	6.00000E+04	1.00314E+03	CURIES
TC99	FROM	6.00000E+04	TO	7.00000E+04	9.70909E+02	CURIES
TC99	FROM	7.00000E+04	TO	8.00000E+04	9.40476E+02	CURIES
TC99	FROM	8.00000E+04	TO	9.00000E+04	9.10078E+02	CURIES
TC99	FROM	9.00000E+04	TO	1.00000E+05	8.80900E+02	CURIES
C14	FROM	2.00000E+03	TO	1.00000E+04	4.02426E+01	CURIES
C14	FROM	1.00000E+04	TO	2.00000E+04	1.73043E+01	CURIES
C14	FROM	2.00000E+04	TO	3.00000E+04	5.15611E+00	CURIES
C14	FROM	3.00000E+04	TO	4.00000E+04	1.53405E+00	CURIES
C14	FROM	4.00000E+04	TO	5.00000E+04	4.56186E-01	CURIES
C14	FROM	5.00000E+04	TO	6.00000E+04	1.36731E-01	CURIES
C14	FROM	6.00000E+04	TO	7.00000E+04	4.03407E-02	CURIES
C14	FROM	7.00000E+04	TO	8.00000E+04	1.19864E-02	CURIES
C14	FROM	8.00000E+04	TO	9.00000E+04	3.59992E-03	CURIES
C14	FROM	9.00000E+04	TO	1.00000E+05	1.10148E-03	CURIES

Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year  
 Intervals for Scenario 2: Commercial High-Level Waste;  
 Hard Rock Geologic Setting

U233	FROM5.10000E+04	TO6.00000E+04	1.51089E+00	CURIES
U233	FROM6.00000E+04	TO7.00000E+04	5.02198E+00	CURIES
U233	FROM7.00000E+04	TO8.00000E+04	8.57905E+00	CURIES
U233	FROM8.00000E+04	TO9.00000E+04	1.21756E+01	CURIES
U233	FROM9.00000E+04	TO1.00000E+05	1.58148E+01	CURIES
U234	FROM5.10000E+04	TO6.00000E+04	3.50034E+00	CURIES
U234	FROM6.00000E+04	TO7.00000E+04	3.78858E+00	CURIES
U234	FROM7.00000E+04	TO8.00000E+04	3.57090E+00	CURIES
U234	FROM8.00000E+04	TO9.00000E+04	3.57320E+00	CURIES
U234	FROM9.00000E+04	TO1.00000E+05	3.47332E+00	CURIES
U235	FROM5.10000E+04	TO6.00000E+04	8.86805E-03	CURIES
U235	FROM6.00000E+04	TO7.00000E+04	1.19973E-02	CURIES
U235	FROM7.00000E+04	TO8.00000E+04	1.33225E-02	CURIES
U235	FROM8.00000E+04	TO9.00000E+04	1.40348E-02	CURIES
U235	FROM9.00000E+04	TO1.00000E+05	1.43834E-02	CURIES
U236	FROM5.10000E+04	TO6.00000E+04	2.17450E-01	CURIES
U236	FROM6.00000E+04	TO7.00000E+04	3.10731E-01	CURIES
U236	FROM7.00000E+04	TO8.00000E+04	3.06373E-01	CURIES
U236	FROM8.00000E+04	TO9.00000E+04	2.99113E-01	CURIES
U236	FROM9.00000E+04	TO1.00000E+05	2.94578E-01	CURIES
U238	FROM5.10000E+04	TO6.00000E+04	1.80000E-01	CURIES
U238	FROM6.00000E+04	TO7.00000E+04	2.00000E-01	CURIES
U238	FROM7.00000E+04	TO8.00000E+04	2.00004E-01	CURIES
U238	FROM8.00000E+04	TO9.00000E+04	2.00010E-01	CURIES
U238	FROM9.00000E+04	TO1.00000E+05	2.00010E-01	CURIES
PA231	FROM5.10000E+04	TO6.00000E+04	7.25471E-04	CURIES
PA231	FROM6.00000E+04	TO7.00000E+04	2.38231E-03	CURIES
PA231	FROM7.00000E+04	TO8.00000E+04	3.77947E-03	CURIES
PA231	FROM8.00000E+04	TO9.00000E+04	4.85749E-03	CURIES
PA231	FROM9.00000E+04	TO1.00000E+05	5.64274E-03	CURIES
TH227	FROM5.10000E+04	TO6.00000E+04	9.73244E-03	CURIES
TH227	FROM6.00000E+04	TO7.00000E+04	1.90001E-02	CURIES
TH227	FROM7.00000E+04	TO8.00000E+04	2.03646E-02	CURIES
TH227	FROM8.00000E+04	TO9.00000E+04	2.03590E-02	CURIES
TH227	FROM9.00000E+04	TO1.00000E+05	2.02856E-02	CURIES
TH228	FROM5.10010E+04	TO6.00000E+04	2.65652E-09	CURIES
TH228	FROM6.00000E+04	TO7.00000E+04	9.39958E-09	CURIES
TH228	FROM7.00000E+04	TO8.00000E+04	1.62601E-08	CURIES
TH228	FROM8.00000E+04	TO9.00000E+04	2.30892E-08	CURIES
TH228	FROM9.00000E+04	TO1.00000E+05	2.99001E-08	CURIES
TH229	FROM5.10000E+04	TO6.00000E+04	1.87378E-01	CURIES
TH229	FROM6.00000E+04	TO7.00000E+04	6.57486E-01	CURIES

TH229	FROM7.00000E+04	T08.00000E+04	1.14926E+00	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	1.65127E+00	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	2.16022E+00	CURIES
TH230	FROM5.10000E+04	T06.00000E+04	1.46978E-03	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	4.83237E-03	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	7.82734E-03	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	1.04724E-02	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	1.28006E-02	CURIES
TH231	FROM5.10000E+04	T06.00000E+04	2.38937E-04	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	3.85416E-04	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	1.73497E-04	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	2.03481E-04	CURIES
TH232	FROM5.10010E+04	T06.00000E+04	4.92626E-10	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	1.91008E-09	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	3.41717E-09	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	4.89645E-09	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	6.35850E-09	CURIES
TH234	FROM5.10000E+04	T06.00000E+04	5.09255E-03	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	7.58632E-03	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	1.71171E-03	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	2.27383E-03	CURIES
AC225	FROM5.10000E+04	T06.00000E+04	1.87404E-01	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	6.57550E-01	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	1.14935E+00	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	1.65137E+00	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	2.16032E+00	CURIES
AC227	FROM5.10000E+04	T06.00000E+04	2.22127E-04	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	9.18666E-04	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	1.67109E-03	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	2.33214E-03	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	2.84967E-03	CURIES
RA223	FROM5.10000E+04	T06.00000E+04	2.22127E-04	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	9.18666E-04	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	1.67109E-03	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	2.33214E-03	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	2.84967E-03	CURIES
RA224	FROM5.10010E+04	T06.00000E+04	2.65662E-09	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	9.39958E-09	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	1.62601E-08	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	2.30892E-08	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	2.99001E-08	CURIES
RA225	FROM5.10000E+04	T06.00000E+04	1.87404E-01	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	6.57550E-01	CURIES
RA225	FROM7.00000E+04	T08.00000E+04	1.14935E+00	CURIES
RA225	FROM8.00000E+04	T09.00000E+04	1.65137E+00	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	2.16032E+00	CURIES



RA226	FROM5.10000E+04	TO6.00000E+04	3.21193E-03	CURIES
RA226	FROM6.00000E+04	TO7.00000E+04	1.28938E-02	CURIES
RA226	FROM7.00000E+04	TO8.00000E+04	2.21381E-02	CURIES
RA226	FROM8.00000E+04	TO9.00000E+04	3.02137E-02	CURIES
RA226	FROM9.00000E+04	TO1.00000E+05	3.73927E-02	CURIES
RA228	FROM5.10010E+04	TO6.00000E+04	2.65662E-09	CURIES
RA228	FROM6.00000E+04	TO7.00000E+04	9.39958E-09	CURIES
RA228	FROM7.00000E+04	TO8.00000E+04	1.62601E-08	CURIES
RA228	FROM8.00000E+04	TO9.00000E+04	2.30892E-08	CURIES
RA228	FROM9.00000E+04	TO1.00000E+05	2.99001E-08	CURIES
RN222	FROM5.10000E+04	TO6.00000E+04	3.21193E-03	CURIES
RN222	FROM6.00000E+04	TO7.00000E+04	1.28938E-02	CURIES
RN222	FROM7.00000E+04	TO8.00000E+04	2.21381E-02	CURIES
RN222	FROM8.00000E+04	TO9.00000E+04	3.02137E-02	CURIES
RN222	FROM9.00000E+04	TO1.00000E+05	3.73927E-02	CURIES
PO210	FROM5.10000E+04	TO6.00000E+04	3.21193E-03	CURIES
PO210	FROM6.00000E+04	TO7.00000E+04	1.28938E-02	CURIES
PO210	FROM7.00000E+04	TO8.00000E+04	2.21381E-02	CURIES
PO210	FROM8.00000E+04	TO9.00000E+04	3.02137E-02	CURIES
PO210	FROM9.00000E+04	TO1.00000E+05	3.73927E-02	CURIES
BI210	FROM5.10000E+04	TO6.00000E+04	3.21193E-03	CURIES
BI210	FROM6.00000E+04	TO7.00000E+04	1.28938E-02	CURIES
BI210	FROM7.00000E+04	TO8.00000E+04	2.21381E-02	CURIES
BI210	FROM8.00000E+04	TO9.00000E+04	3.02137E-02	CURIES
BI210	FROM9.00000E+04	TO1.00000E+05	3.73927E-02	CURIES
PB210	FROM5.10000E+04	TO6.00000E+04	3.21193E-03	CURIES
PB210	FROM6.00000E+04	TO7.00000E+04	1.28938E-02	CURIES
PB210	FROM7.00000E+04	TO8.00000E+04	2.21381E-02	CURIES
PB210	FROM8.00000E+04	TO9.00000E+04	3.02137E-02	CURIES
PB210	FROM9.00000E+04	TO1.00000E+05	3.73927E-02	CURIES
I129	FROM2.00000E+03	TO1.00000E+04	6.07845E-03	CURIES
I129	FROM1.00000E+04	TO2.00000E+04	7.59494E-03	CURIES
I129	FROM2.00000E+04	TO3.00000E+04	7.59173E-03	CURIES
I129	FROM3.00000E+04	TO4.00000E+04	7.58839E-03	CURIES
I129	FROM4.00000E+04	TO5.00000E+04	7.58514E-03	CURIES
I129	FROM5.00000E+04	TO6.00000E+04	7.58178E-03	CURIES
I129	FROM6.00000E+04	TO7.00000E+04	7.57843E-03	CURIES
I129	FROM7.00000E+04	TO8.00000E+04	7.57520E-03	CURIES
I129	FROM8.00000E+04	TO9.00000E+04	7.57190E-03	CURIES
I129	FROM9.00000E+04	TO1.00000E+05	7.56865E-03	CURIES
TC99	FROM6.00000E+03	TO1.00000E+04	4.67773E+02	CURIES
TC99	FROM1.00000E+04	TO2.00000E+04	1.14218E+03	CURIES
TC99	FROM2.00000E+04	TO3.00000E+04	1.10646E+03	CURIES
TC99	FROM3.00000E+04	TO4.00000E+04	1.07084E+03	CURIES
TC99	FROM4.00000E+04	TO5.00000E+04	1.03634E+03	CURIES
TC99	FROM5.00000E+04	TO6.00000E+04	1.00314E+03	CURIES
TC99	FROM6.00000E+04	TO7.00000E+04	9.70909E+02	CURIES
TC99	FROM7.00000E+04	TO8.00000E+04	9.40476E+02	CURIES
TC99	FROM8.00000E+04	TO9.00000E+04	9.10078E+02	CURIES
TC99	FROM9.00000E+04	TO1.00000E+05	8.80900E+02	CURIES

SE79	FROM5.10000E+04	T06.00000E+04	1.94298E+01	CURIES
SE79	FROM6.00000E+04	T07.00000E+04	1.75117E+01	CURIES
SE79	FROM7.00000E+04	T08.00000E+04	1.75341E+01	CURIES
SE79	FROM8.00000E+04	T09.00000E+04	1.57617E+01	CURIES
SE79	FROM9.00000E+04	T01.00000E+05	1.41676E+01	CURIES
C14	FROM2.00000E+03	T01.00000E+04	4.02459E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	1.71025E+01	CURIES
C14	FROM2.00000E+04	T03.00000E+04	5.17478E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	1.53779E+00	CURIES
C14	FROM4.00000E+04	T05.00000E+04	4.52429E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	1.36730E-01	CURIES
C14	FROM6.00000E+04	T07.00000E+04	4.03407E-02	CURIES
C14	FROM7.00000E+04	T08.00000E+04	1.19864E-02	CURIES
C14	FROM8.00000E+04	T09.00000E+04	3.59992E-03	CURIES
C14	FROM9.00000E+04	T01.00000E+05	1.10148E-03	CURIES

Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year  
 Intervals for Scenario 3: PWR Spent Fuel; Salt Geologic Setting

NP237	FROM5.10000E+04	T06.00000E+04	1.05274E+02	CURIES
NP237	FROM6.00000E+04	T07.00000E+04	1.16237E+02	CURIES
NP237	FROM7.00000E+04	T08.00000E+04	1.18374E+02	CURIES
NP237	FROM8.00000E+04	T09.00000E+04	1.13903E+02	CURIES
NP237	FROM9.00000E+04	T01.00000E+05	1.16390E+02	CURIES
U233	FROM2.10000E+04	T03.00000E+04	5.50719E+00	CURIES
U233	FROM3.00000E+04	T04.00000E+04	1.31814E+01	CURIES
U233	FROM4.00000E+04	T05.00000E+04	3.02415E+01	CURIES
U233	FROM5.00000E+04	T06.00000E+04	4.00045E+01	CURIES
U233	FROM6.00000E+04	T07.00000E+04	4.39393E+01	CURIES
U233	FROM7.00000E+04	T08.00000E+04	4.76532E+01	CURIES
U233	FROM8.00000E+04	T09.00000E+04	5.11834E+01	CURIES
U233	FROM9.00000E+04	T01.00000E+05	5.45469E+01	CURIES
U234	FROM2.10000E+04	T03.00000E+04	1.71437E+02	CURIES
U234	FROM3.00000E+04	T04.00000E+04	1.84313E+02	CURIES
U234	FROM4.00000E+04	T05.00000E+04	1.77764E+02	CURIES
U234	FROM5.00000E+04	T06.00000E+04	1.73215E+02	CURIES
U234	FROM6.00000E+04	T07.00000E+04	1.68807E+02	CURIES
U234	FROM7.00000E+04	T08.00000E+04	1.64059E+02	CURIES
U234	FROM8.00000E+04	T09.00000E+04	1.59531E+02	CURIES
U234	FROM9.00000E+04	T01.00000E+05	1.55106E+02	CURIES
U235	FROM2.10000E+04	T03.00000E+04	1.77336E+00	CURIES
U235	FROM3.00000E+04	T04.00000E+04	2.36679E+00	CURIES
U235	FROM4.00000E+04	T05.00000E+04	2.62160E+00	CURIES
U235	FROM5.00000E+04	T06.00000E+04	2.76975E+00	CURIES
U235	FROM6.00000E+04	T07.00000E+04	2.84934E+00	CURIES
U235	FROM7.00000E+04	T08.00000E+04	2.88865E+00	CURIES
U235	FROM8.00000E+04	T09.00000E+04	2.89996E+00	CURIES
U235	FROM9.00000E+04	T01.00000E+05	2.89692E+00	CURIES
U236	FROM2.10000E+04	T03.00000E+04	3.23936E+01	CURIES
U236	FROM3.00000E+04	T04.00000E+04	4.22187E+01	CURIES
U236	FROM4.00000E+04	T05.00000E+04	4.23467E+01	CURIES
U236	FROM5.00000E+04	T06.00000E+04	4.16553E+01	CURIES
U236	FROM6.00000E+04	T07.00000E+04	4.11870E+01	CURIES
U236	FROM7.00000E+04	T08.00000E+04	4.09503E+01	CURIES
U236	FROM8.00000E+04	T09.00000E+04	4.02393E+01	CURIES
U236	FROM9.00000E+04	T01.00000E+05	4.07364E+01	CURIES
U238	FROM2.10000E+04	T03.00000E+04	6.48000E+01	CURIES
U238	FROM3.00000E+04	T04.00000E+04	7.20001E+01	CURIES
U238	FROM4.00000E+04	T05.00000E+04	7.20009E+01	CURIES
U238	FROM5.00000E+04	T06.00000E+04	7.20011E+01	CURIES
U238	FROM6.00000E+04	T07.00000E+04	7.20013E+01	CURIES
U238	FROM7.00000E+04	T08.00000E+04	7.20020E+01	CURIES

U238	FROM8.00000E+04	T09.00000E+04	7.20021E+01	CURIES
U238	FROM9.00000E+04	T01.00000E+05	7.20029E+01	CURIES
PA231	FROM2.10000E+04	T03.00000E+04	3.76713E-02	CURIES
PA231	FROM3.00000E+04	T04.00000E+04	1.29942E-01	CURIES
PA231	FROM4.00000E+04	T05.00000E+04	2.16337E-01	CURIES
PA231	FROM5.00000E+04	T06.00000E+04	2.91802E-01	CURIES
PA231	FROM6.00000E+04	T07.00000E+04	3.54844E-01	CURIES
PA231	FROM7.00000E+04	T08.00000E+04	4.05786E-01	CURIES
PA231	FROM8.00000E+04	T09.00000E+04	4.46068E-01	CURIES
PA231	FROM9.00000E+04	T01.00000E+05	4.77134E-01	CURIES
PA233	FROM3.10000E+04	T06.00000E+04	1.24233E+02	CURIES
PA233	FROM6.00000E+04	T07.00000E+04	1.65696E+02	CURIES
PA233	FROM7.00000E+04	T08.00000E+04	1.31452E+01	CURIES
PA233	FROM8.00000E+04	T09.00000E+04	8.03731E+01	CURIES
PA233	FROM9.00000E+04	T01.00000E+05	8.81908E+01	CURIES
TH227	FROM2.10000E+04	T03.00000E+04	2.70464E-02	CURIES
TH227	FROM3.00000E+04	T04.00000E+04	7.39241E-02	CURIES
TH227	FROM4.00000E+04	T05.00000E+04	1.12999E-01	CURIES
TH227	FROM5.00000E+04	T06.00000E+04	1.49313E-01	CURIES
TH227	FROM6.00000E+04	T07.00000E+04	1.82058E-01	CURIES
TH227	FROM7.00000E+04	T08.00000E+04	2.09956E-01	CURIES
TH227	FROM8.00000E+04	T09.00000E+04	2.32702E-01	CURIES
TH227	FROM9.00000E+04	T01.00000E+05	2.50419E-01	CURIES
TH228	FROM2.10010E+04	T03.00000E+04	2.14129E-06	CURIES
TH228	FROM3.00000E+04	T04.00000E+04	7.46276E-06	CURIES
TH228	FROM4.00000E+04	T05.00000E+04	1.28356E-05	CURIES
TH228	FROM5.00000E+04	T06.00000E+04	1.82070E-05	CURIES
TH228	FROM6.00000E+04	T07.00000E+04	2.35678E-05	CURIES
TH228	FROM7.00000E+04	T08.00000E+04	2.89376E-05	CURIES
TH228	FROM8.00000E+04	T09.00000E+04	3.42868E-05	CURIES
TH228	FROM9.00000E+04	T01.00000E+05	3.96387E-05	CURIES
TH229	FROM2.10000E+04	T03.00000E+04	4.02189E+00	CURIES
TH229	FROM3.00000E+04	T04.00000E+04	1.33583E+01	CURIES
TH229	FROM4.00000E+04	T05.00000E+04	2.27065E+01	CURIES
TH229	FROM5.00000E+04	T06.00000E+04	2.94820E+01	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	3.24096E+01	CURIES
TH229	FROM7.00000E+04	T08.00000E+04	3.51569E+01	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	3.77713E+01	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	4.02602E+01	CURIES
TH230	FROM2.10000E+04	T03.00000E+04	1.88199E-01	CURIES
TH230	FROM3.00000E+04	T04.00000E+04	6.20637E-01	CURIES
TH230	FROM4.00000E+04	T05.00000E+04	1.00847E+00	CURIES
TH230	FROM5.00000E+04	T06.00000E+04	1.35267E+00	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	1.65870E+00	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	1.93008E+00	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	2.16916E+00	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	2.37961E+00	CURIES
TH231	FROM2.10000E+04	T03.00000E+04	7.36240E-02	CURIES
TH231	FROM3.00000E+04	T04.00000E+04	6.29547E-02	CURIES
TH231	FROM4.00000E+04	T05.00000E+04	3.30523E-02	CURIES
TH231	FROM5.00000E+04	T06.00000E+04	5.54043E-02	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	5.70135E-02	CURIES

TH231	FROM7.00000E+04	T08.00000E+04	5.77661E-02	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	5.80024E-02	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	5.79418E-02	CURIES
TH232	FROM2.10010E+04	T03.00000E+04	1.37276E-07	CURIES
TH232	FROM3.00000E+04	T04.00000E+04	5.35195E-07	CURIES
TH232	FROM4.00000E+04	T05.00000E+04	9.61396E-07	CURIES
TH232	FROM5.00000E+04	T06.00000E+04	1.38203E-06	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	1.79720E-06	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	2.20933E-06	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	2.61972E-06	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	3.02906E-06	CURIES
TH234	FROM2.10000E+04	T03.00000E+04	2.96261E+00	CURIES
TH234	FROM3.00000E+04	T04.00000E+04	2.08982E+00	CURIES
TH234	FROM4.00000E+04	T05.00000E+04	6.33123E-01	CURIES
TH234	FROM5.00000E+04	T06.00000E+04	1.43791E+00	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	1.44000E+00	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	1.44004E+00	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	1.44010E+00	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	1.44010E+00	CURIES
AC225	FROM2.10000E+04	T03.00000E+04	4.02210E+00	CURIES
AC225	FROM3.00000E+04	T04.00000E+04	1.33534E+01	CURIES
AC225	FROM4.00000E+04	T05.00000E+04	2.27073E+01	CURIES
AC225	FROM5.00000E+04	T06.00000E+04	2.94796E+01	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	3.24002E+01	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	3.51621E+01	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	3.77729E+01	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	4.02607E+01	CURIES
AC227	FROM2.10000E+04	T03.00000E+04	7.36074E-03	CURIES
AC227	FROM3.00000E+04	T04.00000E+04	3.59489E-02	CURIES
AC227	FROM4.00000E+04	T05.00000E+04	7.31329E-02	CURIES
AC227	FROM5.00000E+04	T06.00000E+04	1.10773E-01	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	1.44794E-01	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	1.73519E-01	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	1.96668E-01	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	2.14599E-01	CURIES
RA223	FROM2.10000E+04	T03.00000E+04	7.36074E-03	CURIES
RA223	FROM3.00000E+04	T04.00000E+04	3.59489E-02	CURIES
RA223	FROM4.00000E+04	T05.00000E+04	7.31329E-02	CURIES
RA223	FROM5.00000E+04	T06.00000E+04	1.10773E-01	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	1.44794E-01	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	1.73519E-01	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	1.96668E-01	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	2.14599E-01	CURIES
RA224	FROM2.10010E+04	T03.00000E+04	2.14129E-06	CURIES
RA224	FROM3.00000E+04	T04.00000E+04	7.46276E-06	CURIES
RA224	FROM4.00000E+04	T05.00000E+04	1.29356E-05	CURIES
RA224	FROM5.00000E+04	T06.00000E+04	1.82070E-05	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	2.35678E-05	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	2.89376E-05	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	3.42868E-05	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	3.96387E-05	CURIES
RA225	FROM2.10000E+04	T03.00000E+04	4.02210E+00	CURIES

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RA225	FROM3.00000E+04	T04.00000E+04	1.33584E+01	CURIES
RA225	FROM4.00000E+04	T05.00000E+04	2.27073E+01	CURIES
RA225	FROM5.00000E+04	T06.00000E+04	2.94796E+01	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	3.24062E+01	CURIES
RA225	FROM7.00000E+04	T08.00000E+04	3.51621E+01	CURIES
RA225	FROM8.00000E+04	T09.00000E+04	3.77729E+01	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	4.02607E+01	CURIES
RA226	FROM2.10000E+04	T03.00000E+04	2.03131E+00	CURIES
RA226	FROM3.00000E+04	T04.00000E+04	8.16774E+00	CURIES
RA226	FROM4.00000E+04	T05.00000E+04	1.38944E+01	CURIES
RA226	FROM5.00000E+04	T06.00000E+04	1.90088E+01	CURIES
RA226	FROM6.00000E+04	T07.00000E+04	2.35692E+01	CURIES
RA226	FROM7.00000E+04	T08.00000E+04	2.76358E+01	CURIES
RA226	FROM8.00000E+04	T09.00000E+04	3.12366E+01	CURIES
RA226	FROM9.00000E+04	T01.00000E+05	3.44275E+01	CURIES
RA228	FROM2.10010E+04	T03.00000E+04	2.14129E-06	CURIES
RA228	FROM3.00000E+04	T04.00000E+04	7.46276E-06	CURIES
RA228	FROM4.00000E+04	T05.00000E+04	1.28556E-05	CURIES
RA228	FROM5.00000E+04	T06.00000E+04	1.82070E-05	CURIES
RA228	FROM6.00000E+04	T07.00000E+04	2.35678E-05	CURIES
RA228	FROM7.00000E+04	T08.00000E+04	2.89376E-05	CURIES
RA228	FROM8.00000E+04	T09.00000E+04	3.42868E-05	CURIES
RA228	FROM9.00000E+04	T01.00000E+05	3.96387E-05	CURIES
RN222	FROM2.10000E+04	T03.00000E+04	2.03131E+00	CURIES
RN222	FROM3.00000E+04	T04.00000E+04	8.16774E+00	CURIES
RN222	FROM4.00000E+04	T05.00000E+04	1.38944E+01	CURIES
RN222	FROM5.00000E+04	T06.00000E+04	1.90088E+01	CURIES
RN222	FROM6.00000E+04	T07.00000E+04	2.35692E+01	CURIES
RN222	FROM7.00000E+04	T08.00000E+04	2.76358E+01	CURIES
RN222	FROM8.00000E+04	T09.00000E+04	3.12366E+01	CURIES
RN222	FROM9.00000E+04	T01.00000E+05	3.44275E+01	CURIES
PO210	FROM2.10000E+04	T03.00000E+04	2.03131E+00	CURIES
PO210	FROM3.00000E+04	T04.00000E+04	8.16774E+00	CURIES
PO210	FROM4.00000E+04	T05.00000E+04	1.38944E+01	CURIES
PO210	FROM5.00000E+04	T06.00000E+04	1.90088E+01	CURIES
PO210	FROM6.00000E+04	T07.00000E+04	2.35692E+01	CURIES
PO210	FROM7.00000E+04	T08.00000E+04	2.76358E+01	CURIES
PO210	FROM8.00000E+04	T09.00000E+04	3.12366E+01	CURIES
PO210	FROM9.00000E+04	T01.00000E+05	3.44275E+01	CURIES
BI210	FROM2.10000E+04	T03.00000E+04	2.03131E+00	CURIES
BI210	FROM3.00000E+04	T04.00000E+04	8.16774E+00	CURIES
BI210	FROM4.00000E+04	T05.00000E+04	1.38944E+01	CURIES
BI210	FROM5.00000E+04	T06.00000E+04	1.90088E+01	CURIES
BI210	FROM6.00000E+04	T07.00000E+04	2.35692E+01	CURIES
BI210	FROM7.00000E+04	T08.00000E+04	2.76358E+01	CURIES
BI210	FROM8.00000E+04	T09.00000E+04	3.12366E+01	CURIES
BI210	FROM9.00000E+04	T01.00000E+05	3.44275E+01	CURIES
PB210	FROM2.10000E+04	T03.00000E+04	2.03131E+00	CURIES
PB210	FROM3.00000E+04	T04.00000E+04	8.16774E+00	CURIES
PB210	FROM4.00000E+04	T05.00000E+04	1.38944E+01	CURIES
PB210	FROM5.00000E+04	T06.00000E+04	1.90088E+01	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	2.35692E+01	CURIES

PB210	FROM7.00000E+04	T08.00000E+04	2.76358E+01	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	3.12366E+01	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	3.44275E+01	CURIES
CS135	FROM1.10000E+04	T02.00000E+04	3.13531E+01	CURIES
CS135	FROM2.00000E+04	T03.00000E+04	3.47371E+01	CURIES
CS135	FROM3.00000E+04	T04.00000E+04	3.46326E+01	CURIES
CS133	FROM4.00000E+04	T05.00000E+04	3.45279E+01	CURIES
CS135	FROM5.00000E+04	T06.00000E+04	3.44246E+01	CURIES
CS135	FROM6.00000E+04	T07.00000E+04	3.43203E+01	CURIES
CS135	FROM7.00000E+04	T08.00000E+04	3.42179E+01	CURIES
CS135	FROM8.00000E+04	T09.00000E+04	3.41151E+01	CURIES
CS135	FROM9.00000E+04	T01.00000E+05	3.40126E+01	CURIES
I129	FROM2.00000E+03	T01.00000E+04	2.55934E+00	CURIES
I129	FROM1.00000E+04	T02.00000E+04	3.19791E+00	CURIES
I129	FROM2.00000E+04	T03.00000E+04	3.19648E+00	CURIES
I129	FROM3.00000E+04	T04.00000E+04	3.19514E+00	CURIES
I129	FROM4.00000E+04	T05.00000E+04	3.19378E+00	CURIES
I129	FROM5.00000E+04	T06.00000E+04	3.19232E+00	CURIES
I129	FROM6.00000E+04	T07.00000E+04	3.19092E+00	CURIES
I129	FROM7.00000E+04	T08.00000E+04	3.18955E+00	CURIES
I129	FROM8.00000E+04	T09.00000E+04	3.18815E+00	CURIES
I129	FROM9.00000E+04	T01.00000E+05	3.18676E+00	CURIES
TC99	FROM6.00000E+03	T01.00000E+04	3.06489E+02	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	1.23815E+03	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	1.19252E+03	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	1.16022E+03	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	1.12322E+03	CURIES
TC99	FROM5.00000E+04	T06.00000E+04	1.08634E+03	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	1.05193E+03	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	1.01872E+03	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	9.85914E+02	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	9.54327E+02	CURIES
C14	FROM2.00000E+03	T01.00000E+04	6.03657E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	2.59564E+01	CURIES
C14	FROM2.00000E+04	T03.00000E+04	7.73522E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	2.30157E+00	CURIES
C14	FROM4.00000E+04	T05.00000E+04	6.83766E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	2.05059E-01	CURIES
C14	FROM6.00000E+04	T07.00000E+04	6.04498E-02	CURIES
C14	FROM7.00000E+04	T08.00000E+04	1.80329E-02	CURIES
C14	FROM8.00000E+04	T09.00000E+04	5.40301E-03	CURIES
C14	FROM9.00000E+04	T01.00000E+05	1.64926E-03	CURIES

Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year Intervals for Scenario 4: PWR Spent Fuel; Hard Rock Geologic Setting

U233	FROM5.10000E+04	T06.00000E+04	5.41644E+00	CURIES
U233	FROM6.00000E+04	T07.00000E+04	1.80691E+01	CURIES
U233	FROM7.00000E+04	T08.00000E+04	3.08669E+01	CURIES
U233	FROM8.00000E+04	T09.00000E+04	4.38038E+01	CURIES
U233	FROM9.00000E+04	T01.00000E+05	5.68941E+01	CURIES
U234	FROM5.10000E+04	T06.00000E+04	1.56517E+02	CURIES
U234	FROM6.00000E+04	T07.00000E+04	1.70010E+02	CURIES
U234	FROM7.00000E+04	T08.00000E+04	1.61628E+02	CURIES
U234	FROM8.00000E+04	T09.00000E+04	1.58711E+02	CURIES
U234	FROM9.00000E+04	T01.00000E+05	1.54479E+02	CURIES
U235	FROM5.10000E+04	T06.00000E+04	1.79885E+00	CURIES
U235	FROM6.00000E+04	T07.00000E+04	2.41079E+00	CURIES
U235	FROM7.00000E+04	T08.00000E+04	2.66505E+00	CURIES
U235	FROM8.00000E+04	T09.00000E+04	2.80221E+00	CURIES
U235	FROM9.00000E+04	T01.00000E+05	2.86928E+00	CURIES
U236	FROM5.10000E+04	T06.00000E+04	3.28401E+01	CURIES
U236	FROM6.00000E+04	T07.00000E+04	4.24518E+01	CURIES
U236	FROM7.00000E+04	T08.00000E+04	4.20666E+01	CURIES
U236	FROM8.00000E+04	T09.00000E+04	4.14373E+01	CURIES
U236	FROM9.00000E+04	T01.00000E+05	4.10413E+01	CURIES
U238	FROM5.10000E+04	T06.00000E+04	6.47996E+01	CURIES
U238	FROM6.00000E+04	T07.00000E+04	7.19995E+01	CURIES
U238	FROM7.00000E+04	T08.00000E+04	7.20007E+01	CURIES
U238	FROM8.00000E+04	T09.00000E+04	7.20011E+01	CURIES
U238	FROM9.00000E+04	T01.00000E+05	7.20019E+01	CURIES
PA231	FROM5.10000E+04	T06.00000E+04	1.45350E-01	CURIES
PA231	FROM6.00000E+04	T07.00000E+04	4.77329E-01	CURIES
PA231	FROM7.00000E+04	T08.00000E+04	7.53635E-01	CURIES
PA231	FROM8.00000E+04	T09.00000E+04	9.67201E-01	CURIES
PA231	FROM9.00000E+04	T01.00000E+05	1.12379E+00	CURIES
TH227	FROM5.10000E+04	T06.00000E+04	5.23633E-02	CURIES
TH227	FROM6.00000E+04	T07.00000E+04	1.95534E-01	CURIES
TH227	FROM7.00000E+04	T08.00000E+04	3.41683E-01	CURIES
TH227	FROM8.00000E+04	T09.00000E+04	4.69099E-01	CURIES
TH227	FROM9.00000E+04	T01.00000E+05	5.68957E-01	CURIES
TH228	FROM5.10010E+04	T06.00000E+04	5.37481E-07	CURIES
TH228	FROM6.00000E+04	T07.00000E+04	1.28967E-06	CURIES
TH228	FROM7.00000E+04	T08.00000E+04	3.26068E-06	CURIES
TH228	FROM8.00000E+04	T09.00000E+04	4.62690E-06	CURIES
TH228	FROM9.00000E+04	T01.00000E+05	5.99024E-06	CURIES
TH229	FROM5.10000E+04	T06.00000E+04	3.95514E+00	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	1.32528E+01	CURIES



TH229	FROM7.00000E+04	T08.00000E+04	2.26686E+01	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	3.21903E+01	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	4.18257E+01	CURIES
TH230	FROM5.10000E+04	T06.00000E+04	8.76852E-02	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	2.89152E-01	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	4.70037E-01	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	6.31213E-01	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	7.74512E-01	CURIES
TH231	FROM5.10000E+04	T06.00000E+04	4.64701E-02	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	7.24270E-02	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	2.55075E-02	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	3.10331E-02	CURIES
TH232	FROM5.10010E+04	T06.00000E+04	6.86174E-08	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	2.66872E-07	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	4.77939E-07	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	6.85044E-07	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	8.89682E-07	CURIES
TH234	FROM5.10000E+04	T06.00000E+04	1.33332E+00	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	2.73085E+00	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	6.15197E-01	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	8.17283E-01	CURIES
AC225	FROM5.10000E+04	T06.00000E+04	3.95523E+00	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	1.32529E+01	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	2.26685E+01	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	3.21902E+01	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	4.18257E+01	CURIES
AC227	FROM5.10000E+04	T06.00000E+04	4.22586E-02	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	1.76324E-01	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	3.21817E-01	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	4.49937E-01	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	5.50427E-01	CURIES
RA223	FROM5.10000E+04	T06.00000E+04	4.32586E-02	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	1.76324E-01	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	3.21817E-01	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	4.49937E-01	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	5.50427E-01	CURIES
RA224	FROM5.10010E+04	T06.00000E+04	5.37481E-07	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	1.38967E-06	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	3.26068E-06	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	4.62680E-06	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	5.99024E-06	CURIES
RA225	FROM5.10000E+04	T06.00000E+04	3.95523E+00	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	1.32529E+01	CURIES
RA225	FROM7.00000E+04	T08.00000E+04	2.26685E+01	CURIES
RA225	FROM8.00000E+04	T09.00000E+04	3.21902E+01	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	4.18257E+01	CURIES
RA226	FROM5.10000E+04	T06.00000E+04	4.24934E-01	CURIES
RA226	FROM6.00000E+04	T07.00000E+04	1.35294E+00	CURIES
RA226	FROM7.00000E+04	T08.00000E+04	3.25325E+00	CURIES
RA226	FROM8.00000E+04	T09.00000E+04	4.48160E+00	CURIES

RA226	FROM9.00000E+04	T01.00000E+05	5.58531E+00	CURIES
RA228	FROM5.10010E+04	T06.00000E+04	5.37481E-07	CURIES
RA228	FROM6.00000E+04	T07.00000E+04	1.88967E-06	CURIES
RA228	FROM7.00000E+04	T08.00000E+04	3.26068E-06	CURIES
RA228	FROM8.00000E+04	T09.00000E+04	4.62680E-06	CURIES
RA228	FROM9.00000E+04	T01.00000E+05	5.99024E-06	CURIES
RN222	FROM5.10000E+04	T06.00000E+04	4.24934E-01	CURIES
RN222	FROM6.00000E+04	T07.00000E+04	1.95294E+00	CURIES
RN222	FROM7.00000E+04	T08.00000E+04	3.25325E+00	CURIES
RN222	FROM8.00000E+04	T09.00000E+04	4.48160E+00	CURIES
RN222	FROM9.00000E+04	T01.00000E+05	5.58531E+00	CURIES
PO210	FROM5.10000E+04	T06.00000E+04	4.24934E-01	CURIES
PO210	FROM6.00000E+04	T07.00000E+04	1.95294E+00	CURIES
PO210	FROM7.00000E+04	T08.00000E+04	3.25325E+00	CURIES
PO210	FROM8.00000E+04	T09.00000E+04	4.48160E+00	CURIES
PO210	FROM9.00000E+04	T01.00000E+05	5.58531E+00	CURIES
BI210	FROM5.10000E+04	T06.00000E+04	4.24934E-01	CURIES
BI210	FROM6.00000E+04	T07.00000E+04	1.95294E+00	CURIES
BI210	FROM7.00000E+04	T08.00000E+04	3.25325E+00	CURIES
BI210	FROM8.00000E+04	T09.00000E+04	4.48160E+00	CURIES
BI210	FROM9.00000E+04	T01.00000E+05	5.58531E+00	CURIES
PB210	FROM5.10000E+04	T06.00000E+04	4.24934E-01	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	1.95294E+00	CURIES
PB210	FROM7.00000E+04	T08.00000E+04	3.25325E+00	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	4.48160E+00	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	5.58531E+00	CURIES
I129	FROM2.00000E+03	T01.00000E+04	2.55935E+00	CURIES
I129	FROM1.00000E+04	T02.00000E+04	3.19780E+00	CURIES
I129	FROM2.00000E+04	T03.00000E+04	3.19555E+00	CURIES
I129	FROM3.00000E+04	T04.00000E+04	3.19515E+00	CURIES
I129	FROM4.00000E+04	T05.00000E+04	3.19376E+00	CURIES
I129	FROM5.00000E+04	T06.00000E+04	3.19232E+00	CURIES
I129	FROM6.00000E+04	T07.00000E+04	3.19092E+00	CURIES
I129	FROM7.00000E+04	T08.00000E+04	3.18955E+00	CURIES
I129	FROM8.00000E+04	T09.00000E+04	3.18815E+00	CURIES
I129	FROM9.00000E+04	T01.00000E+05	3.18676E+00	CURIES
TC99	FROM6.00000E+03	T01.00000E+04	5.06504E+02	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	1.23904E+03	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	1.19829E+03	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	1.16018E+03	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	1.12327E+03	CURIES
TC99	FROM5.00000E+04	T06.00000E+04	1.08684E+03	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	1.05193E+03	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	1.01872E+03	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	9.85914E+02	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	9.54327E+02	CURIES
SE79	FROM5.10000E+04	T06.00000E+04	2.04260E+01	CURIES
SE79	FROM6.00000E+04	T07.00000E+04	2.05111E+01	CURIES
SE79	FROM7.00000E+04	T08.00000E+04	1.94336E+01	CURIES
SE79	FROM8.00000E+04	T09.00000E+04	1.65707E+01	CURIES
SE79	FROM9.00000E+04	T01.00000E+05	1.48945E+01	CURIES

C14	FROM2.00000E+03	T01.00000E+04	6.03705E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	2.56535E+01	CURIES
C14	FROM2.00000E+04	T03.00000E+04	7.76215E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	2.30674E+00	CURIES
C14	FROM4.00000E+04	T05.00000E+04	6.78669E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	2.05058E-01	CURIES
C14	FROM6.00000E+04	T07.00000E+04	6.04498E-02	CURIES
C14	FROM7.00000E+04	T08.00000E+04	1.80329E-02	CURIES
C14	FROM8.00000E+04	T09.00000E+04	5.40301E-03	CURIES
C14	FROM9.00000E+04	T01.00000E+05	1.64926E-03	CURIES

Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year  
Intervals for Scenario 5: BWR Spent Fuel; Salt Geologic Setting

NP237	FROM5.10000E+04	T06.00000E+04	9.07320E+01	CURIES
NP237	FROM6.00000E+04	T07.00000E+04	1.00205E+02	CURIES
NP237	FROM7.00000E+04	T08.00000E+04	1.02037E+02	CURIES
NP237	FROM8.00000E+04	T09.00000E+04	1.00759E+02	CURIES
NP237	FROM9.00000E+04	T01.00000E+05	1.00321E+02	CURIES
U233	FROM2.10000E+04	T03.00000E+04	4.74540E+00	CURIES
U233	FROM3.00000E+04	T04.00000E+04	1.56757E+01	CURIES
U233	FROM4.00000E+04	T05.00000E+04	2.65945E+01	CURIES
U233	FROM5.00000E+04	T06.00000E+04	3.44810E+01	CURIES
U233	FROM6.00000E+04	T07.00000E+04	3.78711E+01	CURIES
U233	FROM7.00000E+04	T08.00000E+04	4.10720E+01	CURIES
U233	FROM8.00000E+04	T09.00000E+04	4.41152E+01	CURIES
U233	FROM9.00000E+04	T01.00000E+05	4.70141E+01	CURIES
U234	FROM2.10000E+04	T03.00000E+04	1.37791E+02	CURIES
U234	FROM3.00000E+04	T04.00000E+04	1.48529E+02	CURIES
U234	FROM4.00000E+04	T05.00000E+04	1.43744E+02	CURIES
U234	FROM5.00000E+04	T06.00000E+04	1.40110E+02	CURIES
U234	FROM6.00000E+04	T07.00000E+04	1.36219E+02	CURIES
U234	FROM7.00000E+04	T08.00000E+04	1.32351E+02	CURIES
U234	FROM8.00000E+04	T09.00000E+04	1.28691E+02	CURIES
U234	FROM9.00000E+04	T01.00000E+05	1.25106E+02	CURIES
U235	FROM2.10000E+04	T03.00000E+04	1.68079E+00	CURIES
U235	FROM3.00000E+04	T04.00000E+04	2.24559E+00	CURIES
U235	FROM4.00000E+04	T05.00000E+04	2.49255E+00	CURIES
U235	FROM5.00000E+04	T06.00000E+04	2.63586E+00	CURIES
U235	FROM6.00000E+04	T07.00000E+04	2.71368E+00	CURIES
U235	FROM7.00000E+04	T08.00000E+04	2.74960E+00	CURIES
U235	FROM8.00000E+04	T09.00000E+04	2.76121E+00	CURIES
U235	FROM9.00000E+04	T01.00000E+05	2.75829E+00	CURIES
U236	FROM2.10000E+04	T03.00000E+04	2.70377E+01	CURIES
U236	FROM3.00000E+04	T04.00000E+04	3.56752E+01	CURIES
U236	FROM4.00000E+04	T05.00000E+04	3.57920E+01	CURIES
U236	FROM5.00000E+04	T06.00000E+04	3.51654E+01	CURIES
U236	FROM6.00000E+04	T07.00000E+04	3.47432E+01	CURIES
U236	FROM7.00000E+04	T08.00000E+04	3.45301E+01	CURIES
U236	FROM8.00000E+04	T09.00000E+04	3.44295E+01	CURIES
U236	FROM9.00000E+04	T01.00000E+05	3.43824E+01	CURIES
U238	FROM2.10000E+04	T03.00000E+04	2.88000E+01	CURIES
U238	FROM3.00000E+04	T04.00000E+04	3.20001E+01	CURIES
U238	FROM4.00000E+04	T05.00000E+04	3.20009E+01	CURIES
U238	FROM5.00000E+04	T06.00000E+04	3.20011E+01	CURIES
U238	FROM6.00000E+04	T07.00000E+04	3.20018E+01	CURIES

U238	FROM7.00000E+04	T08.00000E+04	3.20020E+01	CURIES
U238	FROM8.00000E+04	T09.00000E+04	3.20021E+01	CURIES
U238	FROM9.00000E+04	T01.00000E+05	3.20029E+01	CURIES
PA231	FROM2.10000E+04	T03.00000E+04	3.55591E-02	CURIES
PA231	FROM3.00000E+04	T04.00000E+04	1.22988E-01	CURIES
PA231	FROM4.00000E+04	T05.00000E+04	2.05162E-01	CURIES
PA231	FROM5.00000E+04	T06.00000E+04	2.77048E-01	CURIES
PA231	FROM6.00000E+04	T07.00000E+04	3.37201E-01	CURIES
PA231	FROM7.00000E+04	T08.00000E+04	3.85853E-01	CURIES
PA231	FROM8.00000E+04	T09.00000E+04	4.24323E-01	CURIES
PA231	FROM9.00000E+04	T01.00000E+05	4.53991E-01	CURIES
PA233	FROM5.10000E+04	T06.00000E+04	1.06262E+02	CURIES
PA233	FROM6.00000E+04	T07.00000E+04	1.40926E+02	CURIES
PA233	FROM7.00000E+04	T08.00000E+04	1.47407E+01	CURIES
PA233	FROM8.00000E+04	T09.00000E+04	7.03308E+01	CURIES
PA233	FROM9.00000E+04	T01.00000E+05	7.67855E+01	CURIES
TH227	FROM2.10000E+04	T03.00000E+04	1.45583E-02	CURIES
TH227	FROM3.00000E+04	T04.00000E+04	4.90435E-02	CURIES
TH227	FROM4.00000E+04	T05.00000E+04	8.56302E-02	CURIES
TH227	FROM5.00000E+04	T06.00000E+04	1.21409E-01	CURIES
TH227	FROM6.00000E+04	T07.00000E+04	1.53751E-01	CURIES
TH227	FROM7.00000E+04	T08.00000E+04	1.81167E-01	CURIES
TH227	FROM8.00000E+04	T09.00000E+04	2.07367E-01	CURIES
TH227	FROM9.00000E+04	T01.00000E+05	2.20599E-01	CURIES
TH228	FROM2.10010E+04	T03.00000E+04	1.73238E-06	CURIES
TH228	FROM3.00000E+04	T04.00000E+04	6.04494E-06	CURIES
TH228	FROM4.00000E+04	T05.00000E+04	1.04017E-05	CURIES
TH228	FROM5.00000E+04	T06.00000E+04	1.47594E-05	CURIES
TH228	FROM6.00000E+04	T07.00000E+04	1.91070E-05	CURIES
TH228	FROM7.00000E+04	T08.00000E+04	2.34425E-05	CURIES
TH228	FROM8.00000E+04	T09.00000E+04	2.77853E-05	CURIES
TH228	FROM9.00000E+04	T01.00000E+05	3.21234E-05	CURIES
TH229	FROM2.10000E+04	T03.00000E+04	3.58543E+00	CURIES
TH229	FROM3.00000E+04	T04.00000E+04	1.19002E+01	CURIES
TH229	FROM4.00000E+04	T05.00000E+04	2.02227E+01	CURIES
TH229	FROM5.00000E+04	T06.00000E+04	2.62533E+01	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	2.88595E+01	CURIES
TH229	FROM7.00000E+04	T08.00000E+04	3.13110E+01	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	3.36368E+01	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	3.58522E+01	CURIES
TH230	FROM2.10000E+04	T03.00000E+04	1.33421E-01	CURIES
TH230	FROM3.00000E+04	T04.00000E+04	4.39210E-01	CURIES
TH230	FROM4.00000E+04	T05.00000E+04	7.12509E-01	CURIES
TH230	FROM5.00000E+04	T06.00000E+04	9.54667E-01	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	1.16879E+00	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	1.35762E+00	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	1.52319E+00	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	1.66776E+00	CURIES
TH231	FROM2.10000E+04	T03.00000E+04	7.13260E-02	CURIES
TH231	FROM3.00000E+04	T04.00000E+01	5.96139E-02	CURIES
TH231	FROM4.00000E+04	T05.00000E+04	3.15909E-02	CURIES
TH231	FROM5.00000E+04	T06.00000E+04	5.27176E-02	CURIES

TH231	FROM6.00000E+04	T07.00000E+04	5.42768E-02	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	5.49959E-02	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	5.52287E-02	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	5.51714E-02	CURIES
TH232	FROM2.10010E+04	T03.00000E+04	1.13935E-07	CURIES
TH232	FROM3.00000E+04	T04.00000E+04	4.48653E-07	CURIES
TH232	FROM4.00000E+04	T05.00000E+04	8.08834E-07	CURIES
TH232	FROM5.00000E+04	T06.00000E+04	1.16465E-06	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	1.51517E-06	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	1.86219E-06	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	2.20824E-06	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	2.55344E-06	CURIES
TH234	FROM2.10000E+04	T03.00000E+04	1.31666E+00	CURIES
TH234	FROM3.00000E+04	T04.00000E+04	9.28799E-01	CURIES
TH234	FROM4.00000E+04	T05.00000E+04	2.81433E-01	CURIES
TH234	FROM5.00000E+04	T06.00000E+04	6.39990E-01	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	6.40033E-01	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	6.40038E-01	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	6.40048E-01	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	6.40048E-01	CURIES
AC225	FROM2.10000E+04	T03.00000E+04	3.58573E+00	CURIES
AC225	FROM3.00000E+04	T04.00000E+04	1.19011E+01	CURIES
AC225	FROM4.00000E+04	T05.00000E+04	2.02239E+01	CURIES
AC225	FROM5.00000E+04	T06.00000E+04	2.62573E+01	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	2.88605E+01	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	3.13124E+01	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	3.36377E+01	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	3.58521E+01	CURIES
AC227	FROM2.10000E+04	T03.00000E+04	7.03415E-03	CURIES
AC227	FROM3.00000E+04	T04.00000E+04	3.45135E-02	CURIES
AC227	FROM4.00000E+04	T05.00000E+04	7.03557E-02	CURIES
AC227	FROM5.00000E+04	T06.00000E+04	1.06673E-01	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	1.39505E-01	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	1.67239E-01	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	1.89589E-01	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	2.06906E-01	CURIES
RA223	FROM2.10000E+04	T03.00000E+04	7.03415E-03	CURIES
RA223	FROM3.00000E+04	T04.00000E+04	3.45135E-02	CURIES
RA223	FROM4.00000E+04	T05.00000E+04	7.03557E-02	CURIES
RA223	FROM5.00000E+04	T06.00000E+04	1.06673E-01	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	1.39505E-01	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	1.67239E-01	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	1.89589E-01	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	2.06906E-01	CURIES
RA224	FROM2.10010E+04	T03.00000E+04	1.73238E-06	CURIES
RA224	FROM3.00000E+04	T04.00000E+04	6.04494E-06	CURIES
RA224	FROM4.00000E+04	T05.00000E+04	1.04017E-05	CURIES
RA224	FROM5.00000E+04	T06.00000E+04	1.47594E-05	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	1.91070E-05	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	2.34425E-05	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	2.77853E-05	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	3.21234E-05	CURIES
RA225	FROM2.10000E+04	T03.00000E+04	3.58573E+00	CURIES

RA225	FROM3.00000E+04	T04.00000E+04	1.19011E+01	CURIES
RA225	FROM4.00000E+04	T05.00000E+04	2.02239E+01	CURIES
RA225	FROM5.00000E+04	T06.00000E+04	2.62573E+01	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	2.88605E+01	CURIES
RA225	FROM7.00000E+04	T08.00000E+04	3.13124E+01	CURIES
RA225	FROM8.00000E+04	T09.00000E+04	3.36377E+01	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	3.58321E+01	CURIES
RA226	FROM2.10000E+04	T03.00000E+04	1.38907E+00	CURIES
RA226	FROM3.00000E+04	T04.00000E+04	5.57727E+00	CURIES
RA226	FROM4.00000E+04	T05.00000E+04	9.47026E+00	CURIES
RA226	FROM5.00000E+04	T06.00000E+04	1.29253E+01	CURIES
RA226	FROM6.00000E+04	T07.00000E+04	1.59936E+01	CURIES
RA226	FROM7.00000E+04	T08.00000E+04	1.87056E+01	CURIES
RA226	FROM8.00000E+04	T09.00000E+04	2.10993E+01	CURIES
RA226	FROM9.00000E+04	T01.00000E+05	2.32019E+01	CURIES
RA228	FROM2.10010E+04	T03.00000E+04	1.73238E-06	CURIES
RA228	FROM3.00000E+04	T04.00000E+04	6.04494E-06	CURIES
RA228	FROM4.00000E+04	T05.00000E+04	1.04017E-05	CURIES
RA228	FROM5.00000E+04	T06.00000E+04	1.47594E-05	CURIES
RA228	FROM6.00000E+04	T07.00000E+04	1.91070E-05	CURIES
RA228	FROM7.00000E+04	T08.00000E+04	2.34425E-05	CURIES
RA228	FROM8.00000E+04	T09.00000E+04	2.77853E-05	CURIES
RA228	FROM9.00000E+04	T01.00000E+05	3.21234E-05	CURIES
RN222	FROM2.10000E+04	T03.00000E+04	1.38907E+00	CURIES
RN222	FROM3.00000E+04	T04.00000E+04	5.57727E+00	CURIES
RN222	FROM4.00000E+04	T05.00000E+04	9.47026E+00	CURIES
RN222	FROM5.00000E+04	T06.00000E+04	1.29253E+01	CURIES
RN222	FROM6.00000E+04	T07.00000E+04	1.59936E+01	CURIES
RN222	FROM7.00000E+04	T08.00000E+04	1.87056E+01	CURIES
RN222	FROM8.00000E+04	T09.00000E+04	2.10993E+01	CURIES
RN222	FROM9.00000E+04	T01.00000E+05	2.32019E+01	CURIES
PO210	FROM2.10000E+04	T03.00000E+04	1.38907E+00	CURIES
PO210	FROM3.00000E+04	T04.00000E+04	5.57727E+00	CURIES
PO210	FROM4.00000E+04	T05.00000E+04	9.47026E+00	CURIES
PO210	FROM5.00000E+04	T06.00000E+04	1.29253E+01	CURIES
PO210	FROM6.00000E+04	T07.00000E+04	1.59936E+01	CURIES
PO210	FROM7.00000E+04	T08.00000E+04	1.87056E+01	CURIES
PO210	FROM8.00000E+04	T09.00000E+04	2.10993E+01	CURIES
PO210	FROM9.00000E+04	T01.00000E+05	2.32019E+01	CURIES
BI210	FROM2.10000E+04	T03.00000E+04	1.38907E+00	CURIES
BI210	FROM3.00000E+04	T04.00000E+04	5.57727E+00	CURIES
BI210	FROM4.00000E+04	T05.00000E+04	9.47026E+00	CURIES
BI210	FROM5.00000E+04	T06.00000E+04	1.29253E+01	CURIES
BI210	FROM6.00000E+04	T07.00000E+04	1.59936E+01	CURIES
BI210	FROM7.00000E+04	T08.00000E+04	1.87056E+01	CURIES
BI210	FROM8.00000E+04	T09.00000E+04	2.10993E+01	CURIES
BI210	FROM9.00000E+04	T01.00000E+05	2.32019E+01	CURIES
PB210	FROM2.10000E+04	T03.00000E+04	1.38907E+00	CURIES
PB210	FROM3.00000E+04	T04.00000E+04	5.57727E+00	CURIES
PB210	FROM4.00000E+04	T05.00000E+04	9.47026E+00	CURIES
PB210	FROM5.00000E+04	T06.00000E+04	1.29253E+01	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	1.59936E+01	CURIES

PB210	FROM7.00000E+04	T08.00000E+04	1.87056E+01	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	2.10793E+01	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	2.32019E+01	CURIES
CS135	FROM1.10000E+04	T02.00000E+04	3.22492E+01	CURIES
CS135	FROM2.00000E+04	T03.00000E+04	3.57304E+01	CURIES
CS135	FROM3.00000E+04	T04.00000E+04	3.56218E+01	CURIES
CS135	FROM4.00000E+04	T05.00000E+04	3.55143E+01	CURIES
CS135	FROM5.00000E+04	T06.00000E+04	3.54036E+01	CURIES
CS135	FROM6.00000E+04	T07.00000E+04	3.53022E+01	CURIES
CS135	FROM7.00000E+04	T08.00000E+04	3.51951E+01	CURIES
CS135	FROM8.00000E+04	T09.00000E+04	3.50897E+01	CURIES
CS135	FROM9.00000E+04	T01.00000E+05	3.49838E+01	CURIES
I129	FROM2.00000E+03	T01.00000E+04	2.07947E+00	CURIES
I129	FROM1.00000E+04	T02.00000E+04	2.59827E+00	CURIES
I129	FROM2.00000E+04	T03.00000E+04	2.59719E+00	CURIES
I129	FROM3.00000E+04	T04.00000E+04	2.57612E+00	CURIES
I129	FROM4.00000E+04	T05.00000E+04	2.59504E+00	CURIES
I129	FROM5.00000E+04	T06.00000E+04	2.59382E+00	CURIES
I129	FROM6.00000E+04	T07.00000E+04	2.59271E+00	CURIES
I129	FROM7.00000E+04	T08.00000E+04	2.59150E+00	CURIES
I129	FROM8.00000E+04	T09.00000E+04	2.59035E+00	CURIES
I129	FROM9.00000E+04	T01.00000E+05	2.58920E+00	CURIES
TC99	FROM6.00000E+03	T01.00000E+04	4.28611E+02	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	1.04780E+03	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	1.01413E+03	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	9.81656E+02	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	9.50175E+02	CURIES
TC99	FROM5.00000E+04	T06.00000E+04	9.19809E+02	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	8.90373E+02	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	8.61769E+02	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	8.34220E+02	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	8.07513E+02	CURIES
C14	FROM2.00000E+03	T01.00000E+04	6.43904E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	2.76347E+01	CURIES
C14	FROM2.00000E+04	T03.00000E+04	8.25199E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	2.45523E+00	CURIES
C14	FROM4.00000E+04	T05.00000E+04	7.28934E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	2.18714E-01	CURIES
C14	FROM6.00000E+04	T07.00000E+04	6.44550E-02	CURIES
C14	FROM7.00000E+04	T08.00000E+04	1.92578E-02	CURIES
C14	FROM8.00000E+04	T09.00000E+04	5.76453E-03	CURIES
C14	FROM9.00000E+04	T01.00000E+05	1.75607E-03	CURIES



Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year Intervals for Scenario 6: BWR Spent Fuel; Hard Rock Geologic Setting

U233	FROM5.10000E+04	T06.00000E+04	4.66830E+00	CURIES
U233	FROM6.00000E+04	T07.00000E+04	1.55742E+01	CURIES
U233	FROM7.00000E+04	T08.00000E+04	2.66047E+01	CURIES
U233	FROM8.00000E+04	T09.00000E+04	3.77549E+01	CURIES
U233	FROM9.00000E+04	T01.00000E+05	4.90368E+01	CURIES
U234	FROM5.10000E+04	T06.00000E+04	1.26129E+02	CURIES
U234	FROM6.00000E+04	T07.00000E+04	1.36741E+02	CURIES
U234	FROM7.00000E+04	T08.00000E+04	1.31292E+02	CURIES
U234	FROM8.00000E+04	T09.00000E+04	1.28328E+02	CURIES
U234	FROM9.00000E+04	T01.00000E+05	1.24826E+02	CURIES
U235	FROM5.10000E+04	T06.00000E+04	1.70012E+00	CURIES
U235	FROM6.00000E+04	T07.00000E+04	2.28777E+00	CURIES
U235	FROM7.00000E+04	T08.00000E+04	2.53393E+00	CURIES
U235	FROM8.00000E+04	T09.00000E+04	2.66668E+00	CURIES
U235	FROM9.00000E+04	T01.00000E+05	2.73156E+00	CURIES
U236	FROM5.10000E+04	T06.00000E+04	2.74451E+01	CURIES
U236	FROM6.00000E+04	T07.00000E+04	3.58897E+01	CURIES
U236	FROM7.00000E+04	T08.00000E+04	3.55367E+01	CURIES
U236	FROM8.00000E+04	T09.00000E+04	3.49708E+01	CURIES
U236	FROM9.00000E+04	T01.00000E+05	3.46127E+01	CURIES
U238	FROM5.10000E+04	T06.00000E+04	2.88000E+01	CURIES
U238	FROM6.00000E+04	T07.00000E+04	3.20000E+01	CURIES
U238	FROM7.00000E+04	T08.00000E+04	3.20003E+01	CURIES
U238	FROM8.00000E+04	T09.00000E+04	3.20011E+01	CURIES
U238	FROM9.00000E+04	T01.00000E+05	3.20019E+01	CURIES
PA231	FROM5.10000E+04	T06.00000E+04	1.37244E-01	CURIES
PA231	FROM6.00000E+04	T07.00000E+04	4.51937E-01	CURIES
PA231	FROM7.00000E+04	T08.00000E+04	7.15013E-01	CURIES
PA231	FROM8.00000E+04	T09.00000E+04	9.18808E-01	CURIES
PA231	FROM9.00000E+04	T01.00000E+05	1.06341E+00	CURIES
TH227	FROM5.10000E+04	T06.00000E+04	4.79425E-02	CURIES
TH227	FROM6.00000E+04	T07.00000E+04	1.83320E-01	CURIES
TH227	FROM7.00000E+04	T08.00000E+04	3.23763E-01	CURIES
TH227	FROM8.00000E+04	T09.00000E+04	4.46639E-01	CURIES
TH227	FROM9.00000E+04	T01.00000E+05	5.43030E-01	CURIES
TH228	FROM5.10010E+04	T06.00000E+04	4.35697E-07	CURIES
TH228	FROM6.00000E+04	T07.00000E+04	1.53460E-06	CURIES
TH228	FROM7.00000E+04	T08.00000E+04	2.64993E-06	CURIES
TH228	FROM8.00000E+04	T09.00000E+04	3.76092E-06	CURIES
TH228	FROM9.00000E+04	T01.00000E+05	4.86953E-06	CURIES
TH229	FROM5.10000E+04	T06.00000E+04	3.52589E+00	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	1.18103E+01	CURIES

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TH229	FROM7.00000E+04	T08.00000E+04	2.01977E+01	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	2.86809E+01	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	3.72654E+01	CURIES
TH230	FROM5.10000E+04	T06.00000E+04	6.15921E-02	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	2.02832E-01	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	3.29207E-01	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	4.41362E-01	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	5.40636E-01	CURIES
TH231	FROM5.10000E+04	T06.00000E+04	4.38212E-02	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	6.83780E-02	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	2.42993E-02	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	2.95203E-02	CURIES
TH232	FROM5.10010E+04	T06.00000E+04	5.69976E-08	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	2.23908E-07	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	4.02367E-07	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	5.77239E-07	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	7.49871E-07	CURIES
TH234	FROM5.10000E+04	T06.00000E+04	8.14796E-01	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	1.21370E+00	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	2.73429E-01	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	3.63246E-01	CURIES
AC225	FROM5.10000E+04	T06.00000E+04	3.52587E+00	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	1.18103E+01	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	2.01988E+01	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	2.86216E+01	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	3.72650E+01	CURIES
RA223	FROM5.10000E+04	T06.00000E+04	4.02154E-02	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	1.68638E-01	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	3.08568E-01	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	4.31995E-01	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	5.28872E-01	CURIES
RA224	FROM5.10010E+04	T06.00000E+04	4.35697E-07	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	1.53460E-06	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	2.64993E-06	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	3.76092E-06	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	4.86953E-06	CURIES
RA225	FROM5.10000E+04	T06.00000E+04	3.52587E+00	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	1.18103E+01	CURIES
RA225	FROM7.00000E+04	T08.00000E+04	2.01988E+01	CURIES
RA225	FROM8.00000E+04	T09.00000E+04	2.86216E+01	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	3.72650E+01	CURIES
RA226	FROM5.10010E+04	T06.00000E+04	4.35697E-07	CURIES
RA226	FROM6.00000E+04	T07.00000E+04	1.53460E-06	CURIES
RA226	FROM7.00000E+04	T08.00000E+04	2.64993E-06	CURIES
RA226	FROM8.00000E+04	T09.00000E+04	3.76092E-06	CURIES
RA226	FROM9.00000E+04	T01.00000E+05	4.86953E-06	CURIES
RN222	FROM5.10000E+04	T06.00000E+04	2.88704E-01	CURIES
RN222	FROM6.00000E+04	T07.00000E+04	1.25433E+00	CURIES
RN222	FROM7.00000E+04	T08.00000E+04	2.19709E+00	CURIES
RN222	FROM8.00000E+04	T09.00000E+04	3.02005E+00	CURIES
RN222	FROM9.00000E+04	T01.00000E+05	3.75553E+00	CURIES

PO210	FROM5.10000E+04	T06.00000E+04	2.88704E-01	CURIES
PO210	FROM6.00000E+04	T07.00000E+04	1.25433E+00	CURIES
PO210	FROM7.00000E+04	T08.00000E+04	2.19709E+00	CURIES
PO210	FROM8.00000E+04	T09.00000E+04	3.02005E+00	CURIES
PO210	FROM9.00000E+04	T01.00000E+05	3.75553E+00	CURIES
BI210	FROM5.10000E+04	T06.00000E+04	2.88704E-01	CURIES
BI210	FROM6.00000E+04	T07.00000E+04	1.25433E+00	CURIES
BI210	FROM7.00000E+04	T08.00000E+04	2.19709E+00	CURIES
BI210	FROM8.00000E+04	T09.00000E+04	3.02005E+00	CURIES
BI210	FROM9.00000E+04	T01.00000E+05	3.75553E+00	CURIES
PB210	FROM5.10000E+04	T06.00000E+04	2.88704E-01	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	1.25433E+00	CURIES
PB210	FROM7.00000E+04	T08.00000E+04	2.19709E+00	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	3.02005E+00	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	3.75553E+00	CURIES
I129	FROM2.00000E+03	T01.00000E+04	2.07946E+00	CURIES
I129	FROM1.00000E+04	T02.00000E+04	2.59842E+00	CURIES
I129	FROM2.00000E+04	T03.00000E+04	2.59715E+00	CURIES
I129	FROM3.00000E+04	T04.00000E+04	2.59610E+00	CURIES
I129	FROM4.00000E+04	T05.00000E+04	2.59505E+00	CURIES
I129	FROM5.00000E+04	T06.00000E+04	2.59382E+00	CURIES
I129	FROM6.00000E+04	T07.00000E+04	2.59271E+00	CURIES
I129	FROM7.00000E+04	T08.00000E+04	2.59150E+00	CURIES
I129	FROM8.00000E+04	T09.00000E+04	2.59035E+00	CURIES
I129	FROM9.00000E+04	T01.00000E+05	2.58920E+00	CURIES
TC99	FROM6.00000E+03	T01.00000E+04	4.28651E+02	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	1.04778E+03	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	1.01405E+03	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	9.81624E+02	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	9.50213E+02	CURIES
TC99	FROM5.00000E+04	T06.00000E+04	9.19809E+02	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	8.90373E+02	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	8.61769E+02	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	8.34220E+02	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	8.07513E+02	CURIES
SE79	FROM5.10000E+04	T06.00000E+04	1.69393E+01	CURIES
SE79	FROM6.00000E+04	T07.00000E+04	1.70102E+01	CURIES
SE79	FROM7.00000E+04	T08.00000E+04	1.52856E+01	CURIES
SE79	FROM8.00000E+04	T09.00000E+04	1.37409E+01	CURIES
SE79	FROM9.00000E+04	T01.00000E+05	1.23506E+01	CURIES
C14	FROM2.00000E+03	T01.00000E+04	6.43945E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	2.73731E+01	CURIES
C14	FROM2.00000E+04	T03.00000E+04	8.27830E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	2.46024E+00	CURIES
C14	FROM4.00000E+04	T05.00000E+04	7.24142E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	2.18713E-01	CURIES
C14	FROM6.00000E+04	T07.00000E+04	6.44550E-02	CURIES
C14	FROM7.00000E+04	T08.00000E+04	1.92578E-02	CURIES
C14	FROM8.00000E+04	T09.00000E+04	5.76453E-03	CURIES
C14	FROM9.00000E+04	T01.00000E+05	1.75807E-03	CURIES

Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year Intervals for Scenario 7: Defense High-Level Waste in a Separate Repository in Salt Geologic Setting

NP237	FROM5.03000E+04	T06.00000E+04	2.82106E-01	CURIES
NP237	FROM6.00000E+04	T07.00000E+04	2.90258E-01	CURIES
NP237	FROM7.00000E+04	T08.00000E+04	2.99739E-01	CURIES
NP237	FROM8.00000E+04	T09.00000E+04	2.93290E-01	CURIES
NP237	FROM9.00000E+04	T01.00000E+05	2.92039E-01	CURIES
U233	FROM2.03000E+04	T03.00000E+04	1.53205E-02	CURIES
U233	FROM3.00000E+04	T04.00000E+04	4.72410E-02	CURIES
U233	FROM4.00000E+04	T05.00000E+04	7.90658E-02	CURIES
U233	FROM5.00000E+04	T06.00000E+04	1.00639E-01	CURIES
U233	FROM6.00000E+04	T07.00000E+04	1.10406E-01	CURIES
U233	FROM7.00000E+04	T08.00000E+04	1.19728E-01	CURIES
U233	FROM8.00000E+04	T09.00000E+04	1.28594E-01	CURIES
U233	FROM9.00000E+04	T01.00000E+05	1.37036E-01	CURIES
U234	FROM2.03000E+04	T03.00000E+04	4.31476E+00	CURIES
U234	FROM3.00000E+04	T04.00000E+04	4.32443E+00	CURIES
U234	FROM4.00000E+04	T05.00000E+04	4.20260E+00	CURIES
U234	FROM5.00000E+04	T06.00000E+04	4.08580E+00	CURIES
U234	FROM6.00000E+04	T07.00000E+04	3.97135E+00	CURIES
U234	FROM7.00000E+04	T08.00000E+04	3.85938E+00	CURIES
U234	FROM8.00000E+04	T09.00000E+04	3.75163E+00	CURIES
U234	FROM9.00000E+04	T01.00000E+05	3.64657E+00	CURIES
U235	FROM2.03000E+04	T03.00000E+04	2.04057E-03	CURIES
U235	FROM3.00000E+04	T04.00000E+04	3.79270E-03	CURIES
U235	FROM4.00000E+04	T05.00000E+04	4.85033E-03	CURIES
U235	FROM5.00000E+04	T06.00000E+04	5.46072E-03	CURIES
U235	FROM6.00000E+04	T07.00000E+04	5.78971E-03	CURIES
U235	FROM7.00000E+04	T08.00000E+04	5.94041E-03	CURIES
U235	FROM8.00000E+04	T09.00000E+04	5.98520E-03	CURIES
U235	FROM9.00000E+04	T01.00000E+05	5.96918E-03	CURIES
U236	FROM2.03000E+04	T03.00000E+04	3.40120E-02	CURIES
U236	FROM3.00000E+04	T04.00000E+04	4.47064E-02	CURIES
U236	FROM4.00000E+04	T05.00000E+04	4.46777E-02	CURIES
U236	FROM5.00000E+04	T06.00000E+04	4.35732E-02	CURIES
U236	FROM6.00000E+04	T07.00000E+04	4.28551E-02	CURIES
U236	FROM7.00000E+04	T08.00000E+04	4.24962E-02	CURIES
U236	FROM8.00000E+04	T09.00000E+04	4.23336E-02	CURIES
U236	FROM9.00000E+04	T01.00000E+05	4.22591E-02	CURIES
U238	FROM2.03000E+04	T03.00000E+04	5.33514E-03	CURIES
U238	FROM3.00000E+04	T04.00000E+04	5.50053E-03	CURIES
U238	FROM4.00000E+04	T05.00000E+04	5.50085E-03	CURIES
U238	FROM5.00000E+04	T06.00000E+04	5.50113E-03	CURIES
U238	FROM6.00000E+04	T07.00000E+04	5.50145E-03	CURIES

U238	FROM7.00000E+04	T08.00000E+04	5.50174E-03	CURIES
U238	FROM8.00000E+04	T09.00000E+04	5.50203E-03	CURIES
U238	FROM9.00000E+04	T01.00000E+05	5.50235E-03	CURIES
PA231	FROM2.03000E+04	T03.00000E+04	4.04569E-05	CURIES
PA231	FROM3.00000E+04	T04.00000E+04	1.72183E-04	CURIES
PA231	FROM4.00000E+04	T05.00000E+04	3.36158E-04	CURIES
PA231	FROM5.00000E+04	T06.00000E+04	4.99455E-04	CURIES
PA231	FROM6.00000E+04	T07.00000E+04	6.45821E-04	CURIES
PA231	FROM7.00000E+04	T08.00000E+04	7.68848E-04	CURIES
PA231	FROM8.00000E+04	T09.00000E+04	8.67582E-04	CURIES
PA231	FROM9.00000E+04	T01.00000E+05	9.43852E-04	CURIES
PA233	FROM5.03000E+04	T06.00000E+04	3.72580E-01	CURIES
PA233	FROM6.00000E+04	T07.00000E+04	3.77845E-01	CURIES
PA233	FROM7.00000E+04	T08.00000E+04	*****	CURIES
PA233	FROM8.00000E+04	T09.00000E+04	1.94789E-01	CURIES
PA233	FROM9.00000E+04	T01.00000E+05	2.05143E-01	CURIES
TH227	FROM2.03000E+04	T03.00000E+04	2.17287E-05	CURIES
TH227	FROM3.00000E+04	T04.00000E+04	1.19186E-04	CURIES
TH227	FROM4.00000E+04	T05.00000E+04	2.56493E-04	CURIES
TH227	FROM5.00000E+04	T06.00000E+04	3.99301E-04	CURIES
TH227	FROM6.00000E+04	T07.00000E+04	5.29884E-04	CURIES
TH227	FROM7.00000E+04	T08.00000E+04	6.40667E-04	CURIES
TH227	FROM8.00000E+04	T09.00000E+04	7.30169E-04	CURIES
TH227	FROM9.00000E+04	T01.00000E+05	7.99307E-04	CURIES
TH228	FROM2.03010E+04	T03.00000E+04	1.93805E-09	CURIES
TH228	FROM3.00000E+04	T04.00000E+04	6.16226E-09	CURIES
TH228	FROM4.00000E+04	T05.00000E+04	1.04220E-08	CURIES
TH228	FROM5.00000E+04	T06.00000E+04	1.46708E-08	CURIES
TH228	FROM6.00000E+04	T07.00000E+04	1.89097E-08	CURIES
TH228	FROM7.00000E+04	T08.00000E+04	2.31379E-08	CURIES
TH228	FROM8.00000E+04	T09.00000E+04	2.73692E-08	CURIES
TH228	FROM9.00000E+04	T01.00000E+05	3.15953E-08	CURIES
TH229	FROM2.03000E+04	T03.00000E+04	7.17145E-03	CURIES
TH229	FROM3.00000E+04	T04.00000E+04	2.23485E-02	CURIES
TH229	FROM4.00000E+04	T05.00000E+04	3.75679E-02	CURIES
TH229	FROM5.00000E+04	T06.00000E+04	4.79822E-02	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	5.27581E-02	CURIES
TH229	FROM7.00000E+04	T08.00000E+04	5.72646E-02	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	6.15349E-02	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	6.55962E-02	CURIES
TH230	FROM2.03000E+04	T03.00000E+04	3.75370E-03	CURIES
TH230	FROM3.00000E+04	T04.00000E+04	1.11340E-02	CURIES
TH230	FROM4.00000E+04	T05.00000E+04	1.76574E-02	CURIES
TH230	FROM5.00000E+04	T06.00000E+04	2.33988E-02	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	2.84377E-02	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	3.28378E-02	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	3.66534E-02	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	3.99674E-02	CURIES
TH231	FROM2.03000E+04	T03.00000E+04	6.97167E-05	CURIES
TH231	FROM3.00000E+04	T04.00000E+04	7.63124E-05	CURIES
TH231	FROM4.00000E+04	T05.00000E+04	8.82616E-05	CURIES

TH231	FROM5.00000E+04	T06.00000E+04	1.09177E-04	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	1.15740E-04	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	1.18862E-04	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	1.19704E-04	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	1.19383E-04	CURIES
TH232	FROM2.03010E+04	T03.00000E+04	1.48038E-10	CURIES
TH232	FROM3.00000E+04	T04.00000E+04	5.62771E-10	CURIES
TH232	FROM4.00000E+04	T05.00000E+04	1.01301E-09	CURIES
TH232	FROM5.00000E+04	T06.00000E+04	1.45633E-09	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	1.88957E-09	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	2.31733E-09	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	2.74280E-09	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	3.15712E-09	CURIES
TH234	FROM2.03000E+04	T03.00000E+04	2.69193E-04	CURIES
TH234	FROM3.00000E+04	T04.00000E+04	1.11987E-04	CURIES
TH234	FROM4.00000E+04	T05.00000E+04	6.09706E-05	CURIES
TH234	FROM5.00000E+04	T06.00000E+04	1.10021E-04	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	1.10028E-04	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	1.10035E-04	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	1.10041E-04	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	1.10049E-04	CURIES
AC223	FROM2.03000E+04	T03.00000E+04	7.17403E-03	CURIES
AC225	FROM3.00000E+04	T04.00000E+04	2.23449E-02	CURIES
AC225	FROM4.00000E+04	T05.00000E+04	3.75608E-02	CURIES
AC225	FROM5.00000E+04	T06.00000E+04	4.79811E-02	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	5.27571E-02	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	5.72721E-02	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	6.15379E-02	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	6.55990E-02	CURIES
AC227	FROM2.03000E+04	T03.00000E+04	2.11052E-05	CURIES
AC227	FROM3.00000E+04	T04.00000E+04	1.18046E-04	CURIES
AC227	FROM4.00000E+04	T05.00000E+04	2.55308E-04	CURIES
AC227	FROM5.00000E+04	T06.00000E+04	3.98141E-04	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	5.29761E-04	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	6.39631E-04	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	7.29108E-04	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	7.98245E-04	CURIES
RA223	FROM2.03000E+04	T03.00000E+04	2.11052E-05	CURIES
RA223	FROM3.00000E+04	T04.00000E+04	1.18046E-04	CURIES
RA223	FROM4.00000E+04	T05.00000E+04	2.55308E-04	CURIES
RA223	FROM5.00000E+04	T06.00000E+04	3.98141E-04	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	5.29761E-04	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	6.39631E-04	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	7.29108E-04	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	7.98245E-04	CURIES
RA224	FROM2.03010E+04	T03.00000E+04	1.93305E-09	CURIES
RA224	FROM3.00000E+04	T04.00000E+04	6.16226E-09	CURIES
RA224	FROM4.00000E+04	T05.00000E+04	1.04220E-08	CURIES
RA224	FROM5.00000E+04	T06.00000E+04	1.46708E-08	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	1.89097E-08	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	2.31379E-08	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	2.73692E-08	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	3.15955E-08	CURIES

RA225	FROM2.03000E+04	T03.00000E+04	7.17403E-03	CURIES
RA225	FROM3.00000E+04	T04.00000E+04	2.23449E-02	CURIES
RA225	FROM4.00000E+04	T05.00000E+04	3.75608E-02	CURIES
RA225	FROM5.00000E+04	T06.00000E+04	4.79811E-02	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	5.27571E-02	CURIES
RA225	FROM7.00000E+04	T08.00000E+04	5.72721E-02	CURIES
RA225	FROM8.00000E+04	T09.00000E+04	6.15379E-02	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	6.55990E-02	CURIES
RA226	FROM2.03000E+04	T03.00000E+04	4.92556E-03	CURIES
RA226	FROM3.00000E+04	T04.00000E+04	1.53735E-02	CURIES
RA226	FROM4.00000E+04	T05.00000E+04	2.46915E-02	CURIES
RA226	FROM5.00000E+04	T06.00000E+04	3.29013E-02	CURIES
RA226	FROM6.00000E+04	T07.00000E+04	4.01120E-02	CURIES
RA226	FROM7.00000E+04	T08.00000E+04	4.64262E-02	CURIES
RA226	FROM8.00000E+04	T09.00000E+04	5.19063E-02	CURIES
RA226	FROM9.00000E+04	T01.00000E+05	5.66512E-02	CURIES
RA228	FROM2.03010E+04	T03.00000E+04	1.93805E-09	CURIES
RA228	FROM3.00000E+04	T04.00000E+04	6.16226E-09	CURIES
RA228	FROM4.00000E+04	T05.00000E+04	1.04220E-08	CURIES
RA228	FROM5.00000E+04	T06.00000E+04	1.46708E-08	CURIES
RA228	FROM6.00000E+04	T07.00000E+04	1.89097E-08	CURIES
RA228	FROM7.00000E+04	T08.00000E+04	2.31379E-08	CURIES
RA228	FROM8.00000E+04	T09.00000E+04	2.73692E-08	CURIES
RA228	FROM9.00000E+04	T01.00000E+05	3.15955E-08	CURIES
RN222	FROM2.03000E+04	T03.00000E+04	4.92556E-03	CURIES
RN222	FROM3.00000E+04	T04.00000E+04	1.53735E-02	CURIES
RN222	FROM4.00000E+04	T05.00000E+04	2.46915E-02	CURIES
RN222	FROM5.00000E+04	T06.00000E+04	3.29013E-02	CURIES
RN222	FROM6.00000E+04	T07.00000E+04	4.01120E-02	CURIES
RN222	FROM7.00000E+04	T08.00000E+04	4.64262E-02	CURIES
RN222	FROM8.00000E+04	T09.00000E+04	5.19063E-02	CURIES
RN222	FROM9.00000E+04	T01.00000E+05	5.66512E-02	CURIES
PO210	FROM2.03000E+04	T03.00000E+04	4.92556E-03	CURIES
PO210	FROM3.00000E+04	T04.00000E+04	1.53735E-02	CURIES
PO210	FROM4.00000E+04	T05.00000E+04	2.46915E-02	CURIES
PO210	FROM5.00000E+04	T06.00000E+04	3.29013E-02	CURIES
PO210	FROM6.00000E+04	T07.00000E+04	4.01120E-02	CURIES
PO210	FROM7.00000E+04	T08.00000E+04	4.64262E-02	CURIES
PO210	FROM8.00000E+04	T09.00000E+04	5.19063E-02	CURIES
PO210	FROM9.00000E+04	T01.00000E+05	5.66512E-02	CURIES
BI210	FROM2.03000E+04	T03.00000E+04	4.92556E-03	CURIES
BI210	FROM3.00000E+04	T04.00000E+04	1.53735E-02	CURIES
BI210	FROM4.00000E+04	T05.00000E+04	2.46915E-02	CURIES
BI210	FROM5.00000E+04	T06.00000E+04	3.29013E-02	CURIES
BI210	FROM6.00000E+04	T07.00000E+04	4.01120E-02	CURIES
BI210	FROM7.00000E+04	T08.00000E+04	4.64262E-02	CURIES
BI210	FROM8.00000E+04	T09.00000E+04	5.19063E-02	CURIES
BI210	FROM9.00000E+04	T01.00000E+05	5.66512E-02	CURIES

PB210	FROM2.03000E+04	T03.00000E+04	4.92556E-03	CURIES
PB210	FROM3.00000E+04	T04.00000E+04	1.53735E-02	CURIES
PB210	FROM4.00000E+04	T05.00000E+04	2.46915E-02	CURIES
PB210	FROM5.00000E+04	T06.00000E+04	3.29013E-02	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	4.01120E-02	CURIES
PB210	FROM7.00000E+04	T08.00000E+04	4.64262E-02	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	5.19063E-02	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	5.66512E-02	CURIES
CS135	FROM1.03000E+04	T02.00000E+04	1.15868E+00	CURIES
CS135	FROM2.00000E+04	T03.00000E+04	1.19095E+00	CURIES
CS135	FROM3.00000E+04	T04.00000E+04	1.18752E+00	CURIES
CS135	FROM4.00000E+04	T05.00000E+04	1.18400E+00	CURIES
CS135	FROM5.00000E+04	T06.00000E+04	1.18033E+00	CURIES
CS135	FROM6.00000E+04	T07.00000E+04	1.17675E+00	CURIES
CS135	FROM7.00000E+04	T08.00000E+04	1.17307E+00	CURIES
CS135	FROM8.00000E+04	T09.00000E+04	1.16944E+00	CURIES
CS135	FROM9.00000E+04	T01.00000E+05	1.16615E+00	CURIES
I129	FROM1.30000E+03	T01.00000E+04	4.34894E-04	CURIES
I129	FROM1.00000E+04	T02.00000E+04	4.99671E-04	CURIES
I129	FROM2.00000E+04	T03.00000E+04	4.99449E-04	CURIES
I129	FROM3.00000E+04	T04.00000E+04	4.99246E-04	CURIES
I129	FROM4.00000E+04	T05.00000E+04	4.99035E-04	CURIES
I129	FROM5.00000E+04	T06.00000E+04	4.98810E-04	CURIES
I129	FROM6.00000E+04	T07.00000E+04	4.98592E-04	CURIES
I129	FROM7.00000E+04	T08.00000E+04	4.98360E-04	CURIES
I129	FROM8.00000E+04	T09.00000E+04	4.98147E-04	CURIES
I129	FROM9.00000E+04	T01.00000E+05	4.97935E-04	CURIES
TC99	FROM5.30000E+03	T01.00000E+04	2.01726E+01	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	4.19093E+01	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	4.05629E+01	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	3.92523E+01	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	3.80045E+01	CURIES
TC99	FROM5.00000E+04	T06.00000E+04	3.67878E+01	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	3.56100E+01	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	3.44763E+01	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	3.33686E+01	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	3.23003E+01	CURIES
C14	FROM1.30000E+03	T01.00000E+04	1.05741E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	3.97967E+00	CURIES
C14	FROM2.00000E+04	T03.00000E+04	1.18517E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	3.52917E-01	CURIES
C14	FROM4.00000E+04	T05.00000E+04	1.05052E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	3.14114E-02	CURIES
C14	FROM6.00000E+04	T07.00000E+04	9.27652E-03	CURIES
C14	FROM7.00000E+04	T08.00000E+04	2.76019E-03	CURIES
C14	FROM8.00000E+04	T09.00000E+04	8.32955E-04	CURIES
C14	FROM9.00000E+04	T01.00000E+05	2.52121E-04	CURIES



Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year  
Intervals for Scenario 8: Defense High-Level Waste in a Separate  
Repository in Hard Rock Geologic Setting

U233	FROM5.03000E+04	TO6.00000E+04	1.51538E-02	CURIES
U233	FROM6.00000E+04	TO7.00000E+04	4.70433E-02	CURIES
U233	FROM7.00000E+04	TO8.00000E+04	7.92202E-02	CURIES
U233	FROM8.00000E+04	TO9.00000E+04	1.11751E-01	CURIES
U233	FROM9.00000E+04	TO1.00000E+05	1.44667E-01	CURIES
U234	FROM5.03000E+04	TO6.00000E+04	3.94630E+00	CURIES
U234	FROM6.00000E+04	TO7.00000E+04	3.95746E+00	CURIES
U234	FROM7.00000E+04	TO8.00000E+04	3.87506E+00	CURIES
U234	FROM8.00000E+04	TO9.00000E+04	3.75182E+00	CURIES
U234	FROM9.00000E+04	TO1.00000E+05	3.64591E+00	CURIES
U234	FROM5.03000E+04	TO6.00000E+04	3.94630E+00	CURIES
U234	FROM6.00000E+04	TO7.00000E+04	3.95746E+00	CURIES
U234	FROM7.00000E+04	TO8.00000E+04	3.87506E+00	CURIES
U234	FROM8.00000E+04	TO9.00000E+04	3.75182E+00	CURIES
U234	FROM9.00000E+04	TO1.00000E+05	3.64591E+00	CURIES
U235	FROM5.03000E+04	TO6.00000E+04	2.13715E-03	CURIES
U235	FROM6.00000E+04	TO7.00000E+04	3.93855E-03	CURIES
U235	FROM7.00000E+04	TO8.00000E+04	5.03448E-03	CURIES
U235	FROM8.00000E+04	TO9.00000E+04	5.59429E-03	CURIES
U235	FROM9.00000E+04	TO1.00000E+05	5.86548E-03	CURIES
U236	FROM5.03000E+04	TO6.00000E+04	3.48261E-02	CURIES
U236	FROM6.00000E+04	TO7.00000E+04	4.50094E-02	CURIES
U236	FROM7.00000E+04	TO8.00000E+04	4.42379E-02	CURIES
U236	FROM8.00000E+04	TO9.00000E+04	4.32498E-02	CURIES
U236	FROM9.00000E+04	TO1.00000E+05	4.26455E-02	CURIES
U238	FROM5.03000E+04	TO6.00000E+04	5.33514E-03	CURIES
U238	FROM6.00000E+04	TO7.00000E+04	5.50053E-03	CURIES
U238	FROM7.00000E+04	TO8.00000E+04	5.50090E-03	CURIES
U238	FROM8.00000E+04	TO9.00000E+04	5.50123E-03	CURIES
U238	FROM9.00000E+04	TO1.00000E+05	5.50155E-03	CURIES
PA231	FROM5.03000E+04	TO6.00000E+04	1.61025E-04	CURIES
PA231	FROM6.00000E+04	TO7.00000E+04	6.60243E-04	CURIES
PA231	FROM7.00000E+04	TO8.00000E+04	1.22350E-03	CURIES
PA231	FROM8.00000E+04	TO9.00000E+04	1.72729E-03	CURIES
PA231	FROM9.00000E+04	TO1.00000E+05	2.12435E-03	CURIES
TH227	FROM5.03000E+04	TO6.00000E+04	9.60658E-05	CURIES
TH227	FROM6.00000E+04	TO7.00000E+04	4.88833E-04	CURIES
TH227	FROM7.00000E+04	TO8.00000E+04	9.81912E-04	CURIES
TH227	FROM8.00000E+04	TO9.00000E+04	1.43973E-03	CURIES
TH227	FROM9.00000E+04	TO1.00000E+05	1.80666E-03	CURIES

TH228	FROM5.03010E+04	T06.00000E+04	4.93545E-10	CURIES
TH228	FROM6.00000E+04	T07.00000E+04	1.59302E-09	CURIES
TH228	FROM7.00000E+04	T08.00000E+04	2.70863E-09	CURIES
TH228	FROM8.00000E+04	T09.00000E+04	3.81705E-09	CURIES
TH228	FROM9.00000E+04	T01.00000E+05	4.92150E-09	CURIES
TH229	FROM5.03000E+04	T06.00000E+04	7.07981E-03	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	2.21403E-02	CURIES
TH229	FROM7.00000E+04	T08.00000E+04	3.73780E-02	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	5.28034E-02	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	6.84163E-02	CURIES
TH230	FROM5.03000E+04	T06.00000E+04	1.70706E-03	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	5.06302E-03	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	8.03060E-03	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	1.06474E-02	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	1.29447E-02	CURIES
TH231	FROM5.03000E+04	T06.00000E+04	4.23567E-05	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	6.08440E-05	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	2.66055E-05	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	5.57194E-05	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	5.97123E-05	CURIES
TH232	FROM5.03010E+04	T06.00000E+04	7.45418E-11	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	2.82221E-10	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	5.05595E-10	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	7.22451E-10	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	9.35511E-10	CURIES
TH234	FROM5.03000E+04	T06.00000E+04	1.71331E-04	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	1.72826E-04	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	5.3720E-05	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	6.09306E-05	CURIES
AC225	FROM5.03000E+04	T06.00000E+04	7.07995E-03	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	2.21403E-02	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	3.73784E-02	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	5.28044E-02	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	6.84174E-02	CURIES
AC227	FROM5.03000E+04	T06.00000E+04	9.54225E-05	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	4.27689E-04	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	9.80762E-04	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	1.43863E-03	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	1.80556E-03	CURIES
RA223	FROM5.03000E+04	T06.00000E+04	9.54225E-05	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	4.87689E-04	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	9.80762E-04	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	1.43863E-03	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	1.80556E-03	CURIES
RA224	FROM5.03010E+04	T06.00000E+04	4.93545E-10	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	1.59302E-09	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	2.70863E-09	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	3.81705E-09	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	4.92150E-09	CURIES

RA225	FROM5.03000E+04	T06.00000E+04	7.07995E-03	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	2.21403E-02	CURIES
PA225	FROM7.00000E+04	T08.00000E+04	3.73784E-02	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	5.28044E-02	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	6.84174E-02	CURIES
RA226	FROM5.03000E+04	T06.00000E+04	1.91736E-03	CURIES
RA226	FROM6.00000E+04	T07.00000E+04	5.92054E-03	CURIES
RA226	FROM7.00000E+04	T08.00000E+04	9.50782E-03	CURIES
RA226	FROM8.00000E+04	T09.00000E+04	1.26599E-02	CURIES
RA226	FROM9.00000E+04	T01.00000E+05	1.54319E-02	CURIES
RA228	FROM5.03010E+04	T06.00000E+04	4.93545E-10	CURIES
RA228	FROM6.00000E+04	T07.00000E+04	1.59302E-09	CURIES
RA228	FROM7.00000E+04	T08.00000E+04	2.70863E-09	CURIES
RA228	FROM8.00000E+04	T09.00000E+04	3.81705E-09	CURIES
RA228	FROM9.00000E+04	T01.00000E+05	4.92150E-09	CURIES
RN222	FROM5.03000E+04	T06.00000E+04	1.91736E-03	CURIES
RN222	FROM6.00000E+04	T07.00000E+04	5.92054E-03	CURIES
RN222	FROM7.00000E+04	T08.00000E+04	9.50782E-03	CURIES
RN222	FROM8.00000E+04	T09.00000E+04	1.26599E-02	CURIES
RN222	FROM9.00000E+04	T01.00000E+05	1.54319E-02	CURIES
PO210	FROM5.03000E+04	T06.00000E+04	1.91736E-03	CURIES
PO210	FROM6.00000E+04	T07.00000E+04	5.92054E-03	CURIES
PO210	FROM7.00000E+04	T08.00000E+04	9.50782E-03	CURIES
PO210	FROM8.00000E+04	T09.00000E+04	1.26599E-02	CURIES
PO210	FROM9.00000E+04	T01.00000E+05	1.54319E-02	CURIES
BI210	FROM5.03000E+04	T06.00000E+04	1.91736E-03	CURIES
BI210	FROM6.00000E+04	T07.00000E+04	5.92054E-03	CURIES
BI210	FROM7.00000E+04	T08.00000E+04	9.50782E-03	CURIES
BI210	FROM8.00000E+04	T09.00000E+04	1.26599E-02	CURIES
BI210	FROM9.00000E+04	T01.00000E+05	1.54319E-02	CURIES
PB210	FROM5.03000E+04	T06.00000E+04	1.91736E-03	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	5.92054E-03	CURIES
PB210	FROM7.00000E+04	T08.00000E+04	9.50782E-03	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	1.26599E-02	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	1.54319E-02	CURIES
I129	FROM1.30000E+03	T01.00000E+04	4.34893E-04	CURIES
I129	FROM1.00000E+04	T02.00000E+04	4.99691E-04	CURIES
I129	FROM2.00000E+04	T03.00000E+04	4.99449E-04	CURIES
I129	FROM3.00000E+04	T04.00000E+04	4.99246E-04	CURIES
I129	FROM4.00000E+04	T05.00000E+04	4.99034E-04	CURIES
I129	FROM5.00000E+04	T06.00000E+04	4.98810E-04	CURIES
I129	FROM6.00000E+04	T07.00000E+04	4.98592E-04	CURIES
I129	FROM7.00000E+04	T08.00000E+04	4.98360E-04	CURIES
I129	FROM8.00000E+04	T09.00000E+04	4.98147E-04	CURIES
I129	FROM9.00000E+04	T01.00000E+05	4.97935E-04	CURIES
TC99	FROM5.30000E+03	T01.00000E+04	2.01733E+01	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	4.18943E+01	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	4.05674E+01	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	3.92524E+01	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	3.80037E+01	CURIES

TC99	FROM5.00000E+04	T06.00000E+04	3.67878E+01	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	3.56100E+01	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	3.44763E+01	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	3.33686E+01	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	3.23003E+01	CURIES
SE79	FROM5.03000E+04	T06.00000E+04	1.29312E+00	CURIES
SE79	FROM6.00000E+04	T07.00000E+04	1.20015E+00	CURIES
SE79	FROM7.00000E+04	T08.00000E+04	1.07953E+00	CURIES
SE79	FROM8.00000E+04	T09.00000E+04	9.69982E-01	CURIES
SE79	FROM9.00000E+04	T01.00000E+05	8.71852E-01	CURIES
C14	FROM1.30000E+03	T01.00000E+04	1.05742E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	3.93738E+00	CURIES
C14	FROM2.00000E+04	T03.00000E+04	1.19093E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	3.53014E-01	CURIES
C14	FROM4.00000E+04	T05.00000E+04	1.04436E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	3.14114E-02	CURIES
C14	FROM6.00000E+04	T07.00000E+04	9.27652E-03	CURIES
C14	FROM7.00000E+04	T08.00000E+04	2.76019E-03	CURIES
C14	FROM8.00000E+04	T09.00000E+04	8.32955E-04	CURIES
C14	FROM9.00000E+04	T01.00000E+05	2.52121E-04	CURIES

Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year  
 Intervals for Scenario 9: Defense High-Level Waste Codisposed  
 in a Commercial Repository in Salt Geologic Setting,  
 Packaged with Minimal Overpack

NP237	FROM5.03000E+04	T06.00000E+04	1.41022E+00	CURIES
NP237	FROM6.00000E+04	T07.00000E+04	1.45097E+00	CURIES
NP237	FROM7.00000E+04	T08.00000E+04	1.47902E+00	CURIES
NP237	FROM8.00000E+04	T09.00000E+04	1.46648E+00	CURIES
NP237	FROM9.00000E+04	T01.00000E+05	1.46025E+00	CURIES
U233	FROM2.03000E+04	T03.00000E+04	7.66026E-02	CURIES
U233	FROM3.00000E+04	T04.00000E+04	2.36203E-01	CURIES
U233	FROM4.00000E+04	T05.00000E+04	3.95334E-01	CURIES
U233	FROM5.00000E+04	T06.00000E+04	5.03198E-01	CURIES
U233	FROM6.00000E+04	T07.00000E+04	5.52037E-01	CURIES
U233	FROM7.00000E+04	T08.00000E+04	5.98662E-01	CURIES
U233	FROM8.00000E+04	T09.00000E+04	6.42944E-01	CURIES
U233	FROM9.00000E+04	T01.00000E+05	6.85159E-01	CURIES
U234	FROM2.03000E+04	T03.00000E+04	2.15732E+01	CURIES
U234	FROM3.00000E+04	T04.00000E+04	2.16217E+01	CURIES
U234	FROM4.00000E+04	T05.00000E+04	2.10128E+01	CURIES
U234	FROM5.00000E+04	T06.00000E+04	2.04270E+01	CURIES
U234	FROM6.00000E+04	T07.00000E+04	1.98549E+01	CURIES
U234	FROM7.00000E+04	T08.00000E+04	1.92998E+01	CURIES
U234	FROM8.00000E+04	T09.00000E+04	1.87588E+01	CURIES
U234	FROM9.00000E+04	T01.00000E+05	1.82330E+01	CURIES
U235	FROM2.03000E+04	T03.00000E+04	1.02028E-02	CURIES
U235	FROM3.00000E+04	T04.00000E+04	1.89944E-02	CURIES
U235	FROM4.00000E+04	T05.00000E+04	2.42533E-02	CURIES
U235	FROM5.00000E+04	T06.00000E+04	2.73030E-02	CURIES
U235	FROM6.00000E+04	T07.00000E+04	2.89425E-02	CURIES
U235	FROM7.00000E+04	T08.00000E+04	2.97031E-02	CURIES
U235	FROM8.00000E+04	T09.00000E+04	2.99255E-02	CURIES
U235	FROM9.00000E+04	T01.00000E+05	2.98453E-02	CURIES
U236	FROM2.03000E+04	T03.00000E+04	1.70076E-01	CURIES
U236	FROM3.00000E+04	T04.00000E+04	2.23531E-01	CURIES
U236	FROM4.00000E+04	T05.00000E+04	2.23393E-01	CURIES
U236	FROM5.00000E+04	T06.00000E+04	2.17896E-01	CURIES
U236	FROM6.00000E+04	T07.00000E+04	2.14308E-01	CURIES
U236	FROM7.00000E+04	T08.00000E+04	2.12446E-01	CURIES
U236	FROM8.00000E+04	T09.00000E+04	2.11666E-01	CURIES
U236	FROM9.00000E+04	T01.00000E+05	2.11295E-01	CURIES
U238	FROM2.03000E+04	T03.00000E+04	2.66761E-02	CURIES
U238	FROM3.00000E+04	T04.00000E+04	2.75021E-02	CURIES
U238	FROM4.00000E+04	T05.00000E+04	2.75037E-02	CURIES
U238	FROM5.00000E+04	T06.00000E+04	2.75062E-02	CURIES
U238	FROM6.00000E+04	T07.00000E+04	2.75079E-02	CURIES
U238	FROM7.00000E+04	T08.00000E+04	2.75087E-02	CURIES

U238	FROM8.00000E+04	T09.00000E+04	2.75102E-02	CURIES
U238	FROM9.00000E+04	T01.00000E+05	2.75118E-02	CURIES
PA231	FROM2.03000E+04	T03.00000E+04	2.02234E-04	CURIES
PA231	FROM3.00000E+04	T04.00000E+04	8.61144E-04	CURIES
PA231	FROM4.00000E+04	T05.00000E+04	1.68117E-03	CURIES
PA231	FROM5.00000E+04	T06.00000E+04	2.49742E-03	CURIES
PA231	FROM6.00000E+04	T07.00000E+04	3.22925E-03	CURIES
PA231	FROM7.00000E+04	T08.00000E+04	3.84420E-03	CURIES
PA231	FROM8.00000E+04	T09.00000E+04	4.33794E-03	CURIES
PA231	FROM9.00000E+04	T01.00000E+05	4.71928E-03	CURIES
PA233	FROM5.03000E+04	T06.00000E+04	1.86238E+00	CURIES
PA233	FROM6.00000E+04	T07.00000E+04	1.88921E+00	CURIES
PA233	FROM7.00000E+04	T08.00000E+04	*****	CURIES
PA233	FROM8.00000E+04	T09.00000E+04	9.73929E-01	CURIES
PA233	FROM9.00000E+04	T01.00000E+05	1.02569E+00	CURIES
TH227	FROM2.03000E+04	T03.00000E+04	1.08636E-04	CURIES
TH227	FROM3.00000E+04	T04.00000E+04	5.95977E-04	CURIES
TH227	FROM4.00000E+04	T05.00000E+04	1.28253E-03	CURIES
TH227	FROM5.00000E+04	T06.00000E+04	1.97661E-03	CURIES
TH227	FROM6.00000E+04	T07.00000E+04	2.64950E-03	CURIES
TH227	FROM7.00000E+04	T08.00000E+04	3.20323E-03	CURIES
TH227	FROM8.00000E+04	T09.00000E+04	3.65085E-03	CURIES
TH227	FROM9.00000E+04	T01.00000E+05	3.99656E-03	CURIES
TH228	FROM2.03010E+04	T03.00000E+04	9.69156E-09	CURIES
TH228	FROM3.00000E+04	T04.00000E+04	3.08043E-08	CURIES
TH228	FROM4.00000E+04	T05.00000E+04	5.20994E-08	CURIES
TH228	FROM5.00000E+04	T06.00000E+04	7.33444E-08	CURIES
TH228	FROM6.00000E+04	T07.00000E+04	9.45391E-08	CURIES
TH228	FROM7.00000E+04	T08.00000E+04	1.15697E-07	CURIES
TH228	FROM8.00000E+04	T09.00000E+04	1.36841E-07	CURIES
TH228	FROM9.00000E+04	T01.00000E+05	1.57975E-07	CURIES
TH229	FROM2.03000E+04	T03.00000E+04	3.58614E-02	CURIES
TH229	FROM3.00000E+04	T04.00000E+04	1.11719E-01	CURIES
TH229	FROM4.00000E+04	T05.00000E+04	1.87803E-01	CURIES
TH229	FROM5.00000E+04	T06.00000E+04	2.39832E-01	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	2.63760E-01	CURIES
TH229	FROM7.00000E+04	T08.00000E+04	2.86353E-01	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	3.07671E-01	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	3.27931E-01	CURIES
TH230	FROM2.03000E+04	T03.00000E+04	1.27794E-02	CURIES
TH230	FROM3.00000E+04	T04.00000E+04	5.56154E-02	CURIES
TH230	FROM4.00000E+04	T05.00000E+04	8.82027E-02	CURIES
TH230	FROM5.00000E+04	T06.00000E+04	1.16967E-01	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	1.42165E-01	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	1.64217E-01	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	1.83316E-01	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	1.99839E-01	CURIES

TH231	FROM2.03000E+04	T03.00000E+04	3.48566E-04	CURIES
TH231	FROM3.00000E+04	T04.00000E+04	3.81639E-04	CURIES
TH231	FROM4.00000E+04	T05.00000E+04	4.41434E-04	CURIES
TH231	FROM5.00000E+04	T06.00000E+04	5.46117E-04	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	5.78909E-04	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	5.94037E-04	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	5.98543E-04	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	5.96949E-04	CURIES
TH232	FROM2.03010E+04	T03.00000E+04	7.40219E-10	CURIES
TH232	FROM3.00000E+04	T04.00000E+04	2.81371E-09	CURIES
TH232	FROM4.00000E+04	T05.00000E+04	5.06794E-09	CURIES
TH232	FROM5.00000E+04	T06.00000E+04	7.28096E-09	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	9.44700E-09	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	1.15874E-08	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	1.37141E-08	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	1.58357E-08	CURIES
TH234	FROM2.03000E+04	T03.00000E+04	1.34594E-03	CURIES
TH234	FROM3.00000E+04	T04.00000E+04	5.59933E-04	CURIES
TH234	FROM4.00000E+04	T05.00000E+04	3.04853E-04	CURIES
TH234	FROM5.00000E+04	T06.00000E+04	5.50113E-04	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	5.50145E-04	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	5.50174E-04	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	5.50203E-04	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	5.50235E-04	CURIES
AC225	FROM2.03000E+04	T03.00000E+04	3.58685E-02	CURIES
AC225	FROM3.00000E+04	T04.00000E+04	1.11739E-01	CURIES
AC225	FROM4.00000E+04	T05.00000E+04	1.87824E-01	CURIES
AC225	FROM5.00000E+04	T06.00000E+04	2.39911E-01	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	2.63795E-01	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	2.86357E-01	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	3.07690E-01	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	3.27992E-01	CURIES
AC227	FROM2.03000E+04	T03.00000E+04	1.05415E-04	CURIES
AC227	FROM3.00000E+04	T04.00000E+04	5.90813E-04	CURIES
AC227	FROM4.00000E+04	T05.00000E+04	1.27738E-03	CURIES
AC227	FROM5.00000E+04	T06.00000E+04	1.99101E-03	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	2.64407E-03	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	3.19775E-03	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	3.64555E-03	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	3.99126E-03	CURIES
RA223	FROM2.03000E+04	T03.00000E+04	1.05415E-04	CURIES
RA223	FROM3.00000E+04	T04.00000E+04	5.90812E-04	CURIES
RA223	FROM4.00000E+04	T05.00000E+04	1.27738E-03	CURIES
RA223	FROM5.00000E+04	T06.00000E+04	1.99101E-03	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	2.64407E-03	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	3.19775E-03	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	3.64555E-03	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	3.99126E-03	CURIES
RA224	FROM2.03010E+04	T03.00000E+04	9.69156E-09	CURIES
RA224	FROM3.00000E+04	T04.00000E+04	3.08043E-08	CURIES
RA224	FROM4.00000E+04	T05.00000E+04	5.20994E-08	CURIES
RA224	FROM5.00000E+04	T06.00000E+04	7.33444E-08	CURIES

RA224	FROM6.00000E+04	TO7.00000E+04	9.45391E-08	CURIES
RA224	FROM7.00000E+04	TO8.00000E+04	1.15697E-07	CURIES
RA224	FROM8.00000E+04	TO9.00000E+04	1.36841E-07	CURIES
RA224	FROM9.00000E+04	TO1.00000E+05	1.57975E-07	CURIES
RA225	FROM2.03000E+04	TO3.00000E+04	3.58685E-02	CURIES
RA225	FROM3.00000E+04	TO4.00000E+04	1.11739E-01	CURIES
RA225	FROM4.00000E+04	TO5.00000E+04	1.87824E-01	CURIES
RA225	FROM5.00000E+04	TO6.00000E+04	2.39911E-01	CURIES
RA225	FROM6.00000E+04	TO7.00000E+04	2.63795E-01	CURIES
RA225	FROM7.00000E+04	TO8.00000E+04	2.86357E-01	CURIES
RA225	FROM8.00000E+04	TO9.00000E+04	3.07690E-01	CURIES
RA225	FROM9.00000E+04	TO1.00000E+05	3.27992E-01	CURIES
RA226	FROM2.03000E+04	TO3.00000E+04	2.46172E-02	CURIES
RA226	FROM3.00000E+04	TO4.00000E+04	7.69183E-02	CURIES
RA226	FROM4.00000E+04	TO5.00000E+04	1.23536E-01	CURIES
RA226	FROM5.00000E+04	TO6.00000E+04	1.64568E-01	CURIES
RA226	FROM6.00000E+04	TO7.00000E+04	2.00623E-01	CURIES
RA226	FROM7.00000E+04	TO8.00000E+04	2.32060E-01	CURIES
RA226	FROM8.00000E+04	TO9.00000E+04	2.59531E-01	CURIES
RA226	FROM9.00000E+04	TO1.00000E+05	2.83259E-01	CURIES
RA228	FROM2.03010E+04	TO3.00000E+04	9.69156E-09	CURIES
RA228	FROM3.00000E+04	TO4.00000E+04	3.08043E-08	CURIES
RA228	FROM4.00000E+04	TO5.00000E+04	5.20994E-08	CURIES
RA228	FROM5.00000E+04	TO6.00000E+04	7.33444E-08	CURIES
RA228	FROM6.00000E+04	TO7.00000E+04	9.45391E-08	CURIES
RA228	FROM7.00000E+04	TO8.00000E+04	1.15697E-07	CURIES
RA228	FROM8.00000E+04	TO9.00000E+04	1.36841E-07	CURIES
RA228	FROM9.00000E+04	TO1.00000E+05	1.57975E-07	CURIES
RN222	FROM2.03000E+04	TO3.00000E+04	2.46172E-02	CURIES
RN222	FROM3.00000E+04	TO4.00000E+04	7.69183E-02	CURIES
RN222	FROM4.00000E+04	TO5.00000E+04	1.23536E-01	CURIES
RN222	FROM5.00000E+04	TO6.00000E+04	1.64568E-01	CURIES
RN222	FROM6.00000E+04	TO7.00000E+04	2.00623E-01	CURIES
RN222	FROM7.00000E+04	TO8.00000E+04	2.32060E-01	CURIES
RN222	FROM8.00000E+04	TO9.00000E+04	2.59531E-01	CURIES
RN222	FROM9.00000E+04	TO1.00000E+05	2.83259E-01	CURIES
PO210	FROM2.03000E+04	TO3.00000E+04	2.46172E-02	CURIES
PO210	FROM3.00000E+04	TO4.00000E+04	7.69183E-02	CURIES
PO210	FROM4.00000E+04	TO5.00000E+04	1.23536E-01	CURIES
PO210	FROM5.00000E+04	TO6.00000E+04	1.64568E-01	CURIES
PO210	FROM6.00000E+04	TO7.00000E+04	2.00623E-01	CURIES
PO210	FROM7.00000E+04	TO8.00000E+04	2.32060E-01	CURIES
PO210	FROM8.00000E+04	TO9.00000E+04	2.59531E-01	CURIES
PO210	FROM9.00000E+04	TO1.00000E+05	2.83259E-01	CURIES
BI210	FROM2.03000E+04	TO3.00000E+04	2.46172E-02	CURIES
BI210	FROM3.00000E+04	TO4.00000E+04	7.69183E-02	CURIES
BI210	FROM4.00000E+04	TO5.00000E+04	1.23536E-01	CURIES
BI210	FROM5.00000E+04	TO6.00000E+04	1.64568E-01	CURIES
BI210	FROM6.00000E+04	TO7.00000E+04	2.00623E-01	CURIES
BI210	FROM7.00000E+04	TO8.00000E+04	2.32060E-01	CURIES
BI210	FROM8.00000E+04	TO9.00000E+04	2.59531E-01	CURIES
BI210	FROM9.00000E+04	TO1.00000E+05	2.83259E-01	CURIES



PB210	FROM2.03000E+04	T03.00000E+04	2.46172E-02	CURIES
PB210	FROM3.00000E+04	T04.00000E+04	7.69183E-02	CURIES
PB210	FROM4.00000E+04	T05.00000E+04	1.23536E-01	CURIES
PB210	FROM5.00000E+04	T06.00000E+04	1.64568E-01	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	2.00623E-01	CURIES
PB210	FROM7.00000E+04	T08.00000E+04	2.32060E-01	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	2.59531E-01	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	2.83259E-01	CURIES
CS135	FROM1.03000E+04	T02.00000E+04	5.79349E+00	CURIES
CS135	FROM2.00000E+04	T03.00000E+04	5.95487E+00	CURIES
CS135	FROM3.00000E+04	T04.00000E+04	5.93725E+00	CURIES
CS135	FROM4.00000E+04	T05.00000E+04	5.91948E+00	CURIES
CS135	FROM5.00000E+04	T06.00000E+04	5.90142E+00	CURIES
CS135	FROM6.00000E+04	T07.00000E+04	5.88366E+00	CURIES
CS135	FROM7.00000E+04	T08.00000E+04	5.86582E+00	CURIES
CS135	FROM8.00000E+04	T09.00000E+04	5.84829E+00	CURIES
CS135	FROM9.00000E+04	T01.00000E+05	5.83065E+00	CURIES
I129	FROM1.30000E+03	T01.00000E+04	2.17445E-03	CURIES
I129	FROM1.00000E+04	T02.00000E+04	2.49839E-03	CURIES
I129	FROM2.00000E+04	T03.00000E+04	2.49724E-03	CURIES
I129	FROM3.00000E+04	T04.00000E+04	2.49627E-03	CURIES
I129	FROM4.00000E+04	T05.00000E+04	2.49524E-03	CURIES
I129	FROM5.00000E+04	T06.00000E+04	2.49405E-03	CURIES
I129	FROM6.00000E+04	T07.00000E+04	2.49292E-03	CURIES
I129	FROM7.00000E+04	T08.00000E+04	2.49182E-03	CURIES
I129	FROM8.00000E+04	T09.00000E+04	2.49076E-03	CURIES
I129	FROM9.00000E+04	T01.00000E+05	2.48963E-03	CURIES
TC99	FROM5.30000E+03	T01.00000E+04	1.00855E+02	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	2.09523E+02	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	2.02853E+02	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	1.96332E+02	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	1.90042E+02	CURIES
TC99	FROM5.00000E+04	T06.00000E+04	1.83954E+02	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	1.78060E+02	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	1.72363E+02	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	1.66848E+02	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	1.61502E+02	CURIES
C14	FROM1.30000E+03	T01.00000E+04	5.28739E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	1.98984E+01	CURIES
C14	FROM2.00000E+04	T03.00000E+04	5.92670E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	1.76464E+00	CURIES
C14	FROM4.00000E+04	T05.00000E+04	5.25115E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	1.57087E-01	CURIES
C14	FROM6.00000E+04	T07.00000E+04	4.64147E-02	CURIES
C14	FROM7.00000E+04	T08.00000E+04	1.37636E-02	CURIES
C14	FROM8.00000E+04	T09.00000E+04	4.16437E-03	CURIES
C14	FROM9.00000E+04	T01.00000E+05	1.26225E-03	CURIES

Computer Listing of Radionuclide Releases (Ci/yr) for Scenario 10: Defense High-Level Waste in a Commercial Repository in Salt Domes  
 Packaged with TICOM-12 Overpack

NP237	FROM5.10000E+04	T06.00000E+04	5.36277E-01	CURIES
NP237	FROM6.00000E+04	T07.00000E+04	5.35100E-01	CURIES
NP237	FROM7.00000E+04	T08.00000E+04	5.22129E-01	CURIES
NP237	FROM8.00000E+04	T09.00000E+04	5.26696E-01	CURIES
NP237	FROM9.00000E+04	T01.00000E+05	5.44374E-01	CURIES
U233	FROM2.10000E+04	T03.00000E+04	2.73820E-02	CURIES
U233	FROM3.00000E+04	T04.00000E+04	9.15932E-02	CURIES
U233	FROM4.00000E+04	T05.00000E+04	1.55191E-01	CURIES
U233	FROM5.00000E+04	T06.00000E+04	2.01142E-01	CURIES
U233	FROM6.00000E+04	T07.00000E+04	2.20930E-01	CURIES
U233	FROM7.00000E+04	T08.00000E+04	2.39334E-01	CURIES
U233	FROM8.00000E+04	T09.00000E+04	2.57178E-01	CURIES
U233	FROM9.00000E+04	T01.00000E+05	2.74072E-01	CURIES
U234	FROM2.10000E+04	T03.00000E+04	7.92575E+00	CURIES
U234	FROM3.00000E+04	T04.00000E+04	8.64500E+00	CURIES
U234	FROM4.00000E+04	T05.00000E+04	8.40700E+00	CURIES
U234	FROM5.00000E+04	T06.00000E+04	8.17122E+00	CURIES
U234	FROM6.00000E+04	T07.00000E+04	7.94257E+00	CURIES
U234	FROM7.00000E+04	T08.00000E+04	7.71903E+00	CURIES
U234	FROM8.00000E+04	T09.00000E+04	7.50332E+00	CURIES
U234	FROM9.00000E+04	T01.00000E+05	7.29320E+00	CURIES
U235	FROM2.10000E+04	T03.00000E+04	3.78013E-03	CURIES
U235	FROM3.00000E+04	T04.00000E+04	7.47235E-03	CURIES
U235	FROM4.00000E+04	T05.00000E+04	9.60830E-03	CURIES
U235	FROM5.00000E+04	T06.00000E+04	1.18523E-02	CURIES
U235	FROM6.00000E+04	T07.00000E+04	1.15240E-02	CURIES
U235	FROM7.00000E+04	T08.00000E+04	1.18514E-02	CURIES
U235	FROM8.00000E+04	T09.00000E+04	1.19455E-02	CURIES
U235	FROM9.00000E+04	T01.00000E+05	1.19201E-02	CURIES
U236	FROM2.10000E+04	T03.00000E+04	5.30354E-02	CURIES
U236	FROM3.00000E+04	T04.00000E+04	3.87511E-02	CURIES
U236	FROM4.00000E+04	T05.00000E+04	3.91469E-02	CURIES
U236	FROM5.00000E+04	T06.00000E+04	3.70707E-02	CURIES
U236	FROM6.00000E+04	T07.00000E+04	3.57022E-02	CURIES
U236	FROM7.00000E+04	T08.00000E+04	3.49743E-02	CURIES
U236	FROM8.00000E+04	T09.00000E+04	3.46539E-02	CURIES
U236	FROM9.00000E+04	T01.00000E+05	3.45143E-02	CURIES
U238	FROM2.10000E+04	T03.00000E+04	2.10000E-03	CURIES
U238	FROM3.00000E+04	T04.00000E+04	1.10000E-03	CURIES
U238	FROM4.00000E+04	T05.00000E+04	1.10000E-03	CURIES
U238	FROM5.00000E+04	T06.00000E+04	1.10000E-03	CURIES
U238	FROM6.00000E+04	T07.00000E+04	1.10000E-03	CURIES

U238	FROM6.00000E+04	TO7.00000E+04	1.10029E-02	CURIES
U238	FROM7.00000E+04	TO8.00000E+04	1.10035E-02	CURIES
U238	FROM8.00000E+04	TO9.00000E+04	1.10041E-02	CURIES
U238	FROM9.00000E+04	TO1.00000E+05	1.10047E-02	CURIES
PA231	FROM2.10000E+04	TO3.00000E+04	7.08899E-05	CURIES
PA231	FROM3.00000E+04	TO4.00000E+04	3.29566E-04	CURIES
PA231	FROM4.00000E+04	TO5.00000E+04	6.56039E-04	CURIES
PA231	FROM5.00000E+04	TO6.00000E+04	9.82724E-04	CURIES
PA231	FROM6.00000E+04	TO7.00000E+04	1.27679E-03	CURIES
PA231	FROM7.00000E+04	TO8.00000E+04	1.52433E-03	CURIES
PA231	FROM8.00000E+04	TO9.00000E+04	1.72356E-03	CURIES
PA231	FROM9.00000E+04	TO1.00000E+05	1.87776E-03	CURIES
PA233	FROM5.10000E+04	TO6.00000E+04	6.64043E-01	CURIES
PA233	FROM6.00000E+04	TO7.00000E+04	9.16214E-01	CURIES
PA233	FROM7.00000E+04	TO8.00000E+04	XXXXXXXXXX	CURIES
PA233	FROM8.00000E+04	TO9.00000E+04	3.66389E-01	CURIES
PA233	FROM9.00000E+04	TO1.00000E+05	4.17383E-01	CURIES
TH227	FROM2.10000E+04	TO3.00000E+04	3.35267E-05	CURIES
TH227	FROM3.00000E+04	TO4.00000E+04	2.27351E-04	CURIES
TH227	FROM4.00000E+04	TO5.00000E+04	5.00016E-04	CURIES
TH227	FROM5.00000E+04	TO6.00000E+04	7.85063E-04	CURIES
TH227	FROM6.00000E+04	TO7.00000E+04	1.04681E-03	CURIES
TH227	FROM7.00000E+04	TO8.00000E+04	1.26958E-03	CURIES
TH227	FROM8.00000E+04	TO9.00000E+04	1.44991E-03	CURIES
TH227	FROM9.00000E+04	TO1.00000E+05	1.59738E-03	CURIES
TH227	FROM2.10000E+04	TO3.00000E+04	1.33932E-04	CURIES
TH228	FROM3.00000E+04	TO4.00000E+04	1.17055E-08	CURIES
TH228	FROM4.00000E+04	TO5.00000E+04	2.02830E-08	CURIES
TH228	FROM5.00000E+04	TO6.00000E+04	2.87443E-08	CURIES
TH228	FROM6.00000E+04	TO7.00000E+04	3.72202E-08	CURIES
TH228	FROM7.00000E+04	TO8.00000E+04	4.56975E-08	CURIES
TH228	FROM8.00000E+04	TO9.00000E+04	5.41446E-08	CURIES
TH228	FROM9.00000E+04	TO1.00000E+05	6.25977E-08	CURIES
TH229	FROM2.10000E+04	TO3.00000E+04	1.30514E-02	CURIES
TH229	FROM3.00000E+04	TO4.00000E+04	4.33085E-02	CURIES
TH229	FROM4.00000E+04	TO5.00000E+04	7.37064E-02	CURIES
TH229	FROM5.00000E+04	TO6.00000E+04	9.53436E-02	CURIES
TH229	FROM6.00000E+04	TO7.00000E+04	1.05505E-01	CURIES
TH229	FROM7.00000E+04	TO8.00000E+04	1.14536E-01	CURIES
TH229	FROM8.00000E+04	TO9.00000E+04	1.23071E-01	CURIES
TH229	FROM9.00000E+04	TO1.00000E+05	1.31192E-01	CURIES
TH230	FROM2.10000E+04	TO3.00000E+04	2.46839E-07	CURIES
TH230	FROM3.00000E+04	TO4.00000E+04	1.12441E-07	CURIES
TH230	FROM4.00000E+04	TO5.00000E+04	3.43797E-07	CURIES
TH230	FROM5.00000E+04	TO6.00000E+04	4.59452E-07	CURIES
TH230	FROM6.00000E+04	TO7.00000E+04	5.60982E-07	CURIES
TH230	FROM7.00000E+04	TO8.00000E+04	6.49742E-07	CURIES
TH230	FROM8.00000E+04	TO9.00000E+04	7.25817E-07	CURIES
TH230	FROM9.00000E+04	TO1.00000E+05	7.93462E-07	CURIES
TH231	FROM2.10000E+04	TO3.00000E+04	1.24909E-04	CURIES
TH231	FROM3.00000E+04	TO4.00000E+04	1.38729E-04	CURIES

TH231	FROM4.00000E+04	T03.00000E+04	1.68351E-04	CURIES
TH231	FROM5.00000E+04	T04.00000E+04	2.17114E-04	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	2.30595E-04	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	2.36948E-04	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	2.38911E-04	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	2.38404E-04	CURIES
TH232	FROM1.10010E+04	T03.00000E+04	2.57271E-10	CURIES
TH232	FROM1.00000E+04	T04.00000E+04	1.07197E-09	CURIES
TH232	FROM1.00000E+04	T05.00000E+04	1.97008E-09	CURIES
TH232	FROM5.00000E+04	T06.00000E+04	2.85393E-09	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	3.72011E-09	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	4.57509E-09	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	5.42522E-09	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	6.27485E-09	CURIES
TH234	FROM2.10000E+04	T03.00000E+04	4.52630E-04	CURIES
TH234	FROM3.00000E+04	T04.00000E+04	3.19292E-04	CURIES
TH234	FROM4.00000E+04	T05.00000E+04	9.67532E-05	CURIES
TH234	FROM5.00000E+04	T06.00000E+04	2.20036E-04	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	2.20061E-04	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	2.20065E-04	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	2.20081E-04	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	2.20092E-04	CURIES
TH235	FROM2.10000E+04	T03.00000E+04	1.30534E-02	CURIES
TH235	FROM3.00000E+04	T04.00000E+04	4.33137E-02	CURIES
TH235	FROM4.00000E+04	T05.00000E+04	7.37120E-02	CURIES
TH235	FROM5.00000E+04	T06.00000E+04	9.58545E-02	CURIES
TH235	FROM6.00000E+04	T07.00000E+04	1.05514E-01	CURIES
TH235	FROM7.00000E+04	T08.00000E+04	1.14527E-01	CURIES
TH235	FROM8.00000E+04	T09.00000E+04	1.23073E-01	CURIES
TH235	FROM9.00000E+04	T01.00000E+05	1.31201E-01	CURIES
TH237	FROM1.10000E+04	T03.00000E+04	7.73626E-05	CURIES
TH237	FROM3.00000E+04	T04.00000E+04	2.35320E-04	CURIES
TH237	FROM4.00000E+04	T05.00000E+04	4.97582E-04	CURIES
TH237	FROM5.00000E+04	T06.00000E+04	7.82791E-04	CURIES
TH237	FROM6.00000E+04	T07.00000E+04	1.04459E-03	CURIES
TH237	FROM7.00000E+04	T08.00000E+04	1.26733E-03	CURIES
TH237	FROM8.00000E+04	T09.00000E+04	1.44772E-03	CURIES
TH237	FROM9.00000E+04	T01.00000E+05	1.58747E-03	CURIES
TH237	FROM2.10000E+04	T03.00000E+04	3.73683E-05	CURIES
TH233	FROM3.00000E+04	T04.00000E+04	2.32620E-04	CURIES
TH233	FROM4.00000E+04	T05.00000E+04	4.97682E-04	CURIES
TH233	FROM5.00000E+04	T06.00000E+04	7.82791E-04	CURIES
TH233	FROM6.00000E+04	T07.00000E+04	1.04459E-03	CURIES
TH233	FROM7.00000E+04	T08.00000E+04	1.26733E-03	CURIES
TH233	FROM8.00000E+04	T09.00000E+04	1.44772E-03	CURIES
TH233	FROM9.00000E+04	T01.00000E+05	1.58747E-03	CURIES
TH236	FROM1.10010E+04	T03.00000E+04	3.33902E-09	CURIES
TH236	FROM1.00000E+04	T04.00000E+04	1.17353E-09	CURIES
TH236	FROM1.00000E+04	T05.00000E+04	2.02530E-09	CURIES
TH236	FROM5.00000E+04	T06.00000E+04	2.97443E-09	CURIES
TH236	FROM6.00000E+04	T07.00000E+04	3.72203E-09	CURIES

14204	FROM7.00000E+04	TO3.00000E+04	4.53875E-08	CURIES
14205	FROM11.00000E+04	TO3.00000E+04	5.41446E-08	CURIES
14206	FROM19.00000E+04	TO1.00000E+05	6.25977E-08	CURIES
14207	FROM2.10000E+04	TO3.00000E+04	1.30534E-02	CURIES
14208	FROM3.00000E+04	TO4.00000E+04	4.03137E-02	CURIES
14209	FROM4.00000E+04	TO5.00000E+04	7.37120E-02	CURIES
14210	FROM5.00000E+04	TO6.00000E+04	9.58545E-02	CURIES
14211	FROM6.00000E+04	TO7.00000E+04	1.05514E-01	CURIES
14212	FROM7.00000E+04	TO8.00000E+04	1.14527E-01	CURIES
14213	FROM8.00000E+04	TO9.00000E+04	1.23025E-01	CURIES
14214	FROM9.00000E+04	TO1.00000E+05	1.31201E-01	CURIES
14215	FROM1.10000E+05	TO2.00000E+05	8.44106E-03	CURIES
14216	FROM1.30000E+05	TO4.00000E+05	2.92992E-02	CURIES
14217	FROM1.50000E+05	TO5.00000E+05	4.80660E-02	CURIES
14218	FROM1.70000E+05	TO6.00000E+05	6.46018E-02	CURIES
14219	FROM1.90000E+05	TO7.00000E+05	7.91232E-02	CURIES
14220	FROM2.10000E+05	TO8.00000E+05	9.13341E-02	CURIES
14221	FROM2.30000E+05	TO9.00000E+05	1.02395E-01	CURIES
14222	FROM2.50000E+05	TO1.00000E+06	1.12471E-01	CURIES
14223	FROM2.70000E+05	TO1.00000E+06	3.33903E-07	CURIES
14224	FROM2.90000E+05	TO4.00000E+06	1.17355E-03	CURIES
14225	FROM3.10000E+05	TO5.00000E+06	2.02530E-03	CURIES
14226	FROM3.30000E+05	TO6.00000E+06	2.37443E-03	CURIES
14227	FROM3.50000E+05	TO7.00000E+06	3.72202E-03	CURIES
14228	FROM3.70000E+05	TO8.00000E+06	4.53875E-03	CURIES
14229	FROM3.90000E+05	TO9.00000E+06	5.41446E-03	CURIES
14230	FROM4.10000E+05	TO1.00000E+07	6.25977E-03	CURIES
14231	FROM4.30000E+05	TO3.00000E+07	8.44106E-03	CURIES
14232	FROM4.50000E+05	TO4.00000E+07	2.92992E-02	CURIES
14233	FROM4.70000E+05	TO5.00000E+07	4.80660E-02	CURIES
14234	FROM4.90000E+05	TO6.00000E+07	6.46018E-02	CURIES
14235	FROM5.10000E+05	TO7.00000E+07	7.91232E-02	CURIES
14236	FROM5.30000E+05	TO8.00000E+07	9.13341E-02	CURIES
14237	FROM5.50000E+05	TO9.00000E+07	1.02395E-01	CURIES
14238	FROM5.70000E+05	TO1.00000E+08	1.12471E-01	CURIES
14239	FROM5.90000E+05	TO1.00000E+08	8.44106E-03	CURIES
14240	FROM6.10000E+05	TO4.00000E+08	2.92992E-02	CURIES
14241	FROM6.30000E+05	TO5.00000E+08	4.80660E-02	CURIES
14242	FROM6.50000E+05	TO6.00000E+08	6.46018E-02	CURIES
14243	FROM6.70000E+05	TO7.00000E+08	7.91232E-02	CURIES
14244	FROM6.90000E+05	TO8.00000E+08	9.13341E-02	CURIES
14245	FROM7.10000E+05	TO9.00000E+08	1.02395E-01	CURIES
14246	FROM7.30000E+05	TO1.00000E+09	1.12471E-01	CURIES
14247	FROM7.50000E+05	TO1.00000E+09	8.44106E-03	CURIES
14248	FROM7.70000E+05	TO4.00000E+09	2.92992E-02	CURIES
14249	FROM7.90000E+05	TO5.00000E+09	4.80660E-02	CURIES
14250	FROM8.10000E+05	TO6.00000E+09	6.46018E-02	CURIES
14251	FROM8.30000E+05	TO7.00000E+09	7.91232E-02	CURIES
14252	FROM8.50000E+05	TO8.00000E+09	9.13341E-02	CURIES
14253	FROM8.70000E+05	TO9.00000E+09	1.02395E-01	CURIES
14254	FROM8.90000E+05	TO1.00000E+10	1.12471E-01	CURIES

PC210	FROM2.10000E+04	T03.00000E+04	3.14103E-03	CURIES
P8210	FROM3.00000E+04	T04.00000E+04	2.12992E-02	CURIES
PE210	FROM4.00000E+04	T05.00000E+04	4.80660E-02	CURIES
PE210	FROM5.00000E+04	T06.00000E+04	6.46019E-02	CURIES
PE210	FROM6.00000E+04	T07.00000E+04	7.91292E-02	CURIES
PE210	FROM7.00000E+04	T08.00000E+04	9.18341E-02	CURIES
PE210	FROM8.00000E+04	T09.00000E+04	1.02895E-01	CURIES
PE210	FROM9.00000E+04	T01.00000E+05	1.12471E-01	CURIES
CS135	FROM1.10000E+04	T02.00000E+04	2.14999E+00	CURIES
CS135	FROM2.00000E+04	T03.00000E+04	2.39186E+00	CURIES
CS135	FROM3.00000E+04	T04.00000E+04	2.37483E+00	CURIES
CS135	FROM4.00000E+04	T05.00000E+04	2.36782E+00	CURIES
CS135	FROM5.00000E+04	T06.00000E+04	2.36064E+00	CURIES
CS135	FROM6.00000E+04	T07.00000E+04	2.35360E+00	CURIES
CS135	FROM7.00000E+04	T08.00000E+04	2.34634E+00	CURIES
CS135	FROM8.00000E+04	T09.00000E+04	2.33931E+00	CURIES
CS135	FROM9.00000E+04	T01.00000E+05	2.33222E+00	CURIES
1129	FROM2.00000E+03	T01.00000E+04	7.99791E-04	CURIES
1129	FROM1.00000E+04	T02.00000E+04	9.99355E-04	CURIES
1129	FROM2.00000E+04	T03.00000E+04	9.99092E-04	CURIES
1129	FROM3.00000E+04	T04.00000E+04	9.98476E-04	CURIES
1129	FROM4.00000E+04	T05.00000E+04	9.98049E-04	CURIES
1129	FROM5.00000E+04	T06.00000E+04	9.97604E-04	CURIES
1129	FROM6.00000E+04	T07.00000E+04	9.97174E-04	CURIES
1129	FROM7.00000E+04	T08.00000E+04	9.96739E-04	CURIES
1129	FROM8.00000E+04	T09.00000E+04	9.96303E-04	CURIES
1129	FROM9.00000E+04	T01.00000E+05	9.95864E-04	CURIES
1299	FROM6.00000E+03	T01.00000E+04	3.42955E+01	CURIES
1299	FROM1.00000E+04	T02.00000E+04	3.38123E+01	CURIES
1299	FROM2.00000E+04	T03.00000E+04	3.11292E+01	CURIES
1299	FROM3.00000E+04	T04.00000E+04	7.85300E+01	CURIES
1299	FROM4.00000E+04	T05.00000E+04	7.60132E+01	CURIES
1299	FROM5.00000E+04	T06.00000E+04	7.35786E+01	CURIES
1299	FROM6.00000E+04	T07.00000E+04	7.12202E+01	CURIES
1299	FROM7.00000E+04	T08.00000E+04	6.89500E+01	CURIES
1299	FROM8.00000E+04	T09.00000E+04	6.67377E+01	CURIES
1299	FROM9.00000E+04	T01.00000E+05	6.46063E+01	CURIES
014	FROM2.00000E+03	T01.00000E+04	1.05101E+01	CURIES
014	FROM1.00000E+04	T02.00000E+04	7.95934E+00	CURIES
014	FROM2.00000E+04	T03.00000E+04	2.37146E+00	CURIES
014	FROM3.00000E+04	T04.00000E+04	7.05554E-01	CURIES
014	FROM4.00000E+04	T05.00000E+04	2.10001E-01	CURIES
014	FROM5.00000E+04	T06.00000E+04	3.22852E-02	CURIES
014	FROM6.00000E+04	T07.00000E+04	1.85306E-02	CURIES
014	FROM7.00000E+04	T08.00000E+04	7.55211E-03	CURIES
014	FROM8.00000E+04	T09.00000E+04	3.55692E-03	CURIES
014	FROM9.00000E+04	T01.00000E+05	3.05622E-03	CURIES

TH229	FROM5.03000E+04	T06.00000E+04	1.41594E-02	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	4.42798E-02	CURIES
TH229	FROM7.00000E+04	T08.00000E+04	7.47550E-02	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	1.05607E-01	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	1.36832E-01	CURIES
TH230	FROM5.03000E+04	T06.00000E+04	3.41396E-03	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	1.01256E-02	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	1.60617E-02	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	2.12942E-02	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	2.58881E-02	CURIES
TH231	FROM5.03000E+04	T06.00000E+04	8.47161E-05	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	1.21691E-04	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	5.32043E-05	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	1.11444E-04	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	1.19431E-04	CURIES
TH232	FROM5.03010E+04	T06.00000E+04	1.49088E-10	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	5.64452E-10	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	1.01118E-09	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	1.44497E-09	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	1.87108E-09	CURIES
TH234	FROM5.03000E+04	T06.00000E+04	3.42680E-04	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	3.45669E-04	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	1.07449E-04	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	1.21860E-04	CURIES
AC225	FROM5.03000E+04	T06.00000E+04	1.41604E-02	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	4.42810E-02	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	7.47553E-02	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	1.05607E-01	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	1.36832E-01	CURIES
AC227	FROM5.03000E+04	T06.00000E+04	1.90845E-04	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	9.75362E-04	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	1.96147E-03	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	2.87728E-03	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	3.61123E-03	CURIES
RA223	FROM5.03000E+04	T06.00000E+04	1.90845E-04	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	9.75362E-04	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	1.96147E-03	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	2.87728E-03	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	3.61123E-03	CURIES
RA224	FROM5.03010E+04	T06.00000E+04	5.37080E-10	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	3.18604E-09	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	5.41713E-09	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	7.63406E-09	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	9.24314E-09	CURIES
RA225	FROM5.03000E+04	T06.00000E+04	1.41604E-02	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	4.42810E-02	CURIES
RA225	FROM7.00000E+04	T08.00000E+04	7.47553E-02	CURIES
RA225	FROM8.00000E+04	T09.00000E+04	1.05607E-01	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	1.36832E-01	CURIES
RA226	FROM5.03000E+04	T06.00000E+04	3.83469E-03	CURIES
RA226	FROM6.00000E+04	T07.00000E+04	1.18409E-02	CURIES

RA226	FROM7.00000E+04	T08.00000E+04	1.90158E-02	CURIES
RA226	FROM8.00000E+04	T09.00000E+04	2.53196E-02	CURIES
RA226	FROM9.00000E+04	T01.00000E+05	3.08638E-02	CURIES
RA228	FROM5.03010E+04	T06.00000E+04	9.87080E-10	CURIES
RA228	FROM6.00000E+04	T07.00000E+04	3.18604E-09	CURIES
RA228	FROM7.00000E+04	T08.00000E+04	5.41713E-09	CURIES
RA228	FROM8.00000E+04	T09.00000E+04	7.63406E-09	CURIES
RA228	FROM9.00000E+04	T01.00000E+05	9.84314E-09	CURIES
RN222	FROM5.03000E+04	T06.00000E+04	3.83469E-03	CURIES
RN222	FROM6.00000E+04	T07.00000E+04	1.18409E-02	CURIES
RN222	FROM7.00000E+04	T08.00000E+04	1.90153E-02	CURIES
RN222	FROM8.00000E+04	T09.00000E+04	2.53196E-02	CURIES
RN222	FROM9.00000E+04	T01.00000E+05	3.08638E-02	CURIES
PO210	FROM5.03000E+04	T06.00000E+04	3.83469E-03	CURIES
PO210	FROM6.00000E+04	T07.00000E+04	1.18409E-02	CURIES
PO210	FROM7.00000E+04	T08.00000E+04	1.90153E-02	CURIES
PO210	FROM8.00000E+04	T09.00000E+04	2.53196E-02	CURIES
PO210	FROM9.00000E+04	T01.00000E+05	3.08638E-02	CURIES
BI210	FROM5.03000E+04	T06.00000E+04	3.83469E-03	CURIES
BI210	FROM6.00000E+04	T07.00000E+04	1.18409E-02	CURIES
BI210	FROM7.00000E+04	T08.00000E+04	1.90158E-02	CURIES
BI210	FROM8.00000E+04	T09.00000E+04	2.53196E-02	CURIES
BI210	FROM9.00000E+04	T01.00000E+05	3.08638E-02	CURIES
PB210	FROM5.03000E+04	T06.00000E+04	3.83469E-03	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	1.18409E-02	CURIES
PB210	FROM7.00000E+04	T08.00000E+04	1.90153E-02	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	2.53196E-02	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	3.08638E-02	CURIES
I129	FROM1.30000E+03	T01.00000E+04	8.69785E-04	CURIES
I129	FROM1.00000E+04	T02.00000E+04	9.99351E-04	CURIES
I129	FROM2.00000E+04	T03.00000E+04	9.98911E-04	CURIES
I129	FROM3.00000E+04	T04.00000E+04	9.98478E-04	CURIES
I129	FROM4.00000E+04	T05.00000E+04	9.98047E-04	CURIES
I129	FROM5.00000E+04	T06.00000E+04	9.97599E-04	CURIES
I129	FROM6.00000E+04	T07.00000E+04	9.97167E-04	CURIES
I129	FROM7.00000E+04	T08.00000E+04	9.96746E-04	CURIES
I129	FROM8.00000E+04	T09.00000E+04	9.96302E-04	CURIES
I129	FROM9.00000E+04	T01.00000E+05	9.95863E-04	CURIES
TC99	FROM5.30000E+03	T01.00000E+04	4.03425E+01	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	8.38171E+01	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	8.11267E+01	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	7.85292E+01	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	7.60145E+01	CURIES
TC99	FROM5.00000E+04	T06.00000E+04	7.35765E+01	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	7.12212E+01	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	6.89516E+01	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	6.67322E+01	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	6.46012E+01	CURIES
SE79	FROM5.03000E+04	T06.00000E+04	2.58699E+00	CURIES
SE79	FROM6.00000E+04	T07.00000E+04	2.40117E+00	CURIES
SE79	FROM7.00000E+04	T08.00000E+04	2.15324E+00	CURIES
SE79	FROM8.00000E+04	T09.00000E+04	1.93998E+00	CURIES
SE79	FROM9.00000E+04	T01.00000E+05	1.74376E+00	CURIES



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C14	FROM1.30000E+03	TD1.00000E+04	2.11506E+01	CURIES
C14	FROM1.00000E+04	TD2.00000E+04	7.85826E+00	CURIES
C14	FROM2.00000E+04	TD3.00000E+04	2.38527E+00	CURIES
C14	FROM3.00000E+04	TD4.00000E+04	7.06140E-01	CURIES
C14	FROM4.00000E+04	TD5.00000E+04	2.08593E-01	CURIES
C14	FROM5.00000E+04	TD6.00000E+04	6.28474E-02	CURIES
C14	FROM6.00000E+04	TD7.00000E+04	1.85772E-02	CURIES
C14	FROM7.00000E+04	TD8.00000E+04	5.49367E-03	CURIES
C14	FROM8.00000E+04	TD9.00000E+04	1.66563E-03	CURIES
C14	FROM9.00000E+04	TD1.00000E+05	5.05412E-04	CURIES

Computer Listing of Radionuclide Releases (Ci/1000 MTu) over 10,000-Year Intervals for Scenario 12: Defense High-Level Waste Codisposed in a Commercial Repository in Hard Rock Geologic Setting, Packaged with TiCode-12 Overpack

U233	FROM5.10000E+04	T06.00000E+04	1.57539E-02	CURIES
U233	FROM6.00000E+04	T07.00000E+04	5.22801E-02	CURIES
U233	FROM7.00000E+04	T08.00000E+04	8.92003E-02	CURIES
U233	FROM8.00000E+04	T09.00000E+04	1.26520E-01	CURIES
U233	FROM9.00000E+04	T01.00000E+05	1.64288E-01	CURIES
U234	FROM5.10000E+04	T06.00000E+04	4.22004E+00	CURIES
U234	FROM6.00000E+04	T07.00000E+04	4.56398E+00	CURIES
U234	FROM7.00000E+04	T08.00000E+04	4.43671E+00	CURIES
U234	FROM8.00000E+04	T09.00000E+04	4.31225E+00	CURIES
U234	FROM9.00000E+04	T01.00000E+05	4.19144E+00	CURIES
U235	FROM5.10000E+04	T06.00000E+04	2.26846E-03	CURIES
U235	FROM6.00000E+04	T07.00000E+04	4.50675E-03	CURIES
U235	FROM7.00000E+04	T08.00000E+04	5.73297E-03	CURIES
U235	FROM8.00000E+04	T09.00000E+04	6.39409E-03	CURIES
U235	FROM9.00000E+04	T01.00000E+05	6.71722E-03	CURIES
U236	FROM5.10000E+04	T06.00000E+04	3.70212E-02	CURIES
U236	FROM6.00000E+04	T07.00000E+04	5.14346E-02	CURIES
U236	FROM7.00000E+04	T08.00000E+04	5.07641E-02	CURIES
U236	FROM8.00000E+04	T09.00000E+04	4.96899E-02	CURIES
U236	FROM9.00000E+04	T01.00000E+05	4.90132E-02	CURIES
U238	FROM5.10000E+04	T06.00000E+04	5.68979E-03	CURIES
U238	FROM6.00000E+04	T07.00000E+04	6.32236E-03	CURIES
U238	FROM7.00000E+04	T08.00000E+04	6.32283E-03	CURIES
U238	FROM8.00000E+04	T09.00000E+04	6.32323E-03	CURIES
U238	FROM9.00000E+04	T01.00000E+05	6.32365E-03	CURIES
PA231	FROM5.10000E+04	T06.00000E+04	1.62075E-04	CURIES
PA231	FROM6.00000E+04	T07.00000E+04	7.26766E-04	CURIES
PA231	FROM7.00000E+04	T08.00000E+04	1.37439E-03	CURIES
PA231	FROM8.00000E+04	T09.00000E+04	1.95672E-03	CURIES
PA231	FROM9.00000E+04	T01.00000E+05	2.41796E-03	CURIES
TH227	FROM5.10000E+04	T06.00000E+04	9.72326E-05	CURIES
TH227	FROM6.00000E+04	T07.00000E+04	5.36754E-04	CURIES
TH227	FROM7.00000E+04	T08.00000E+04	1.10123E-03	CURIES
TH227	FROM8.00000E+04	T09.00000E+04	1.62920E-03	CURIES
TH227	FROM9.00000E+04	T01.00000E+05	2.05484E-03	CURIES
TH228	FROM5.10010E+04	T06.00000E+04	4.88926E-10	CURIES
TH228	FROM6.00000E+04	T07.00000E+04	1.74340E-09	CURIES
TH228	FROM7.00000E+04	T08.00000E+04	3.02489E-09	CURIES
TH228	FROM8.00000E+04	T09.00000E+04	4.29876E-09	CURIES
TH228	FROM9.00000E+04	T01.00000E+05	5.56824E-09	CURIES
TH229	FROM5.10000E+04	T06.00000E+04	7.35744E-03	CURIES
TH229	FROM6.00000E+04	T07.00000E+04	2.45987E-02	CURIES
TH229	FROM7.00000E+04	T08.00000E+04	4.20845E-02	CURIES
TH229	FROM8.00000E+04	T09.00000E+04	5.97793E-02	CURIES
TH229	FROM9.00000E+04	T01.00000E+05	7.76908E-02	CURIES

TH230	FROM5.10000E+04	T06.00000E+04	1.69013E-03	CURIES
TH230	FROM6.00000E+04	T07.00000E+04	5.55301E-03	CURIES
TH230	FROM7.00000E+04	T08.00000E+04	8.98876E-03	CURIES
TH230	FROM8.00000E+04	T09.00000E+04	1.20168E-02	CURIES
TH230	FROM9.00000E+04	T01.00000E+05	1.46737E-02	CURIES
TH231	FROM5.10000E+04	T06.00000E+04	4.28581E-05	CURIES
TH231	FROM6.00000E+04	T07.00000E+04	7.92921E-05	CURIES
TH231	FROM7.00000E+04	T08.00000E+04	2.68802E-05	CURIES
TH231	FROM8.00000E+04	T09.00000E+04	6.21621E-05	CURIES
TH231	FROM9.00000E+04	T01.00000E+05	6.88326E-05	CURIES
TH232	FROM5.10010E+04	T06.00000E+04	7.43696E-11	CURIES
TH232	FROM6.00000E+04	T07.00000E+04	3.08585E-10	CURIES
TH232	FROM7.00000E+04	T08.00000E+04	5.64546E-10	CURIES
TH232	FROM8.00000E+04	T09.00000E+04	8.13596E-10	CURIES
TH232	FROM9.00000E+04	T01.00000E+05	1.05839E-09	CURIES
TH234	FROM5.10000E+04	T06.00000E+04	1.60973E-04	CURIES
TH234	FROM6.00000E+04	T07.00000E+04	2.39784E-04	CURIES
TH234	FROM7.00000E+04	T08.00000E+04	*****	CURIES
TH234	FROM8.00000E+04	T09.00000E+04	5.40292E-05	CURIES
TH234	FROM9.00000E+04	T01.00000E+05	7.17766E-05	CURIES
AC225	FROM5.10000E+04	T06.00000E+04	7.35777E-03	CURIES
AC225	FROM6.00000E+04	T07.00000E+04	2.45997E-02	CURIES
AC225	FROM7.00000E+04	T08.00000E+04	4.20855E-02	CURIES
AC225	FROM8.00000E+04	T09.00000E+04	5.97803E-02	CURIES
AC225	FROM9.00000E+04	T01.00000E+05	7.76918E-02	CURIES
AC227	FROM5.10000E+04	T06.00000E+04	9.65484E-05	CURIES
AC227	FROM6.00000E+04	T07.00000E+04	5.35453E-04	CURIES
AC227	FROM7.00000E+04	T08.00000E+04	1.09991E-03	CURIES
AC227	FROM8.00000E+04	T09.00000E+04	1.62788E-03	CURIES
AC227	FROM9.00000E+04	T01.00000E+05	2.05332E-03	CURIES
RA223	FROM5.10000E+04	T06.00000E+04	9.65484E-05	CURIES
RA223	FROM6.00000E+04	T07.00000E+04	5.35453E-04	CURIES
RA223	FROM7.00000E+04	T08.00000E+04	1.09991E-03	CURIES
RA223	FROM8.00000E+04	T09.00000E+04	1.62788E-03	CURIES
RA223	FROM9.00000E+04	T01.00000E+05	2.05352E-03	CURIES
RA224	FROM5.10010E+04	T06.00000E+04	4.88926E-10	CURIES
RA224	FROM6.00000E+04	T07.00000E+04	1.74340E-09	CURIES
RA224	FROM7.00000E+04	T08.00000E+04	3.02489E-09	CURIES
RA224	FROM8.00000E+04	T09.00000E+04	4.29876E-09	CURIES
RA224	FROM9.00000E+04	T01.00000E+05	5.56824E-09	CURIES
RA225	FROM5.10000E+04	T06.00000E+04	7.35777E-03	CURIES
RA225	FROM6.00000E+04	T07.00000E+04	2.45997E-02	CURIES
RA225	FROM7.00000E+04	T08.00000E+04	4.20855E-02	CURIES
RA225	FROM8.00000E+04	T09.00000E+04	5.97803E-02	CURIES
RA225	FROM9.00000E+04	T01.00000E+05	7.76918E-02	CURIES
RA226	FROM5.10000E+04	T06.00000E+04	1.89158E-03	CURIES
RA226	FROM6.00000E+04	T07.00000E+04	6.48349E-03	CURIES
RA226	FROM7.00000E+04	T08.00000E+04	1.06364E-02	CURIES
RA226	FROM8.00000E+04	T09.00000E+04	1.42847E-02	CURIES
RA226	FROM9.00000E+04	T01.00000E+05	1.74441E-02	CURIES

RA228	FROM5.10010E+04	T06.00000E+04	4.88926E-10	CURIES
RA228	FROM6.00000E+04	T07.00000E+04	1.74340E-09	CURIES
RA228	FROM7.00000E+04	T08.00000E+04	3.02489E-09	CURIES
RA228	FROM8.00000E+04	T09.00000E+04	4.29876E-09	CURIES
RA228	FROM9.00000E+04	T01.00000E+05	5.56824E-09	CURIES
RN222	FROM5.10000E+04	T06.00000E+04	1.89158E-03	CURIES
RN222	FROM6.00000E+04	T07.00000E+04	6.48349E-03	CURIES
RN222	FROM7.00000E+04	T08.00000E+04	1.06364E-02	CURIES
RN222	FROM8.00000E+04	T09.00000E+04	1.42847E-02	CURIES
RN222	FROM9.00000E+04	T01.00000E+05	1.74941E-02	CURIES
PO210	FROM5.10000E+04	T06.00000E+04	1.89158E-03	CURIES
PO210	FROM6.00000E+04	T07.00000E+04	6.48349E-03	CURIES
PO210	FROM7.00000E+04	T08.00000E+04	1.06364E-02	CURIES
PO210	FROM8.00000E+04	T09.00000E+04	1.42847E-02	CURIES
PO210	FROM9.00000E+04	T01.00000E+05	1.74941E-02	CURIES
BI210	FROM5.10000E+04	T06.00000E+04	1.89158E-03	CURIES
BI210	FROM6.00000E+04	T07.00000E+04	6.48349E-03	CURIES
BI210	FROM7.00000E+04	T08.00000E+04	1.06364E-02	CURIES
BI210	FROM8.00000E+04	T09.00000E+04	1.42847E-02	CURIES
BI210	FROM9.00000E+04	T01.00000E+05	1.74941E-02	CURIES
PB210	FROM5.10000E+04	T06.00000E+04	1.89158E-03	CURIES
PB210	FROM6.00000E+04	T07.00000E+04	6.48349E-03	CURIES
PB210	FROM7.00000E+04	T08.00000E+04	1.06364E-02	CURIES
PB210	FROM8.00000E+04	T09.00000E+04	1.42847E-02	CURIES
PB210	FROM9.00000E+04	T01.00000E+05	1.74941E-02	CURIES
I129	FROM2.00000E+03	T01.00000E+04	4.59650E-04	CURIES
I129	FROM1.00000E+04	T02.00000E+04	5.74340E-04	CURIES
I129	FROM2.00000E+04	T03.00000E+04	5.74086E-04	CURIES
I129	FROM3.00000E+04	T04.00000E+04	5.73839E-04	CURIES
I129	FROM4.00000E+04	T05.00000E+04	5.73586E-04	CURIES
I129	FROM5.00000E+04	T06.00000E+04	5.73343E-04	CURIES
I129	FROM6.00000E+04	T07.00000E+04	5.73105E-04	CURIES
I129	FROM7.00000E+04	T08.00000E+04	5.72826E-04	CURIES
I129	FROM8.00000E+04	T09.00000E+04	5.72590E-04	CURIES
I129	FROM9.00000E+04	T01.00000E+05	5.72339E-04	CURIES
TC99	FROM6.00000E+03	T01.00000E+04	1.97092E+01	CURIES
TC99	FROM1.00000E+04	T02.00000E+04	4.81737E+01	CURIES
TC99	FROM2.00000E+04	T03.00000E+04	4.66247E+01	CURIES
TC99	FROM3.00000E+04	T04.00000E+04	4.51321E+01	CURIES
TC99	FROM4.00000E+04	T05.00000E+04	4.36864E+01	CURIES
TC99	FROM5.00000E+04	T06.00000E+04	4.22835E+01	CURIES
TC99	FROM6.00000E+04	T07.00000E+04	4.09267E+01	CURIES
TC99	FROM7.00000E+04	T08.00000E+04	3.96300E+01	CURIES
TC99	FROM8.00000E+04	T09.00000E+04	3.83352E+01	CURIES
TC99	FROM9.00000E+04	T01.00000E+05	3.71266E+01	CURIES
SE79	FROM5.10000E+04	T06.00000E+04	1.37440E+00	CURIES
SE79	FROM6.00000E+04	T07.00000E+04	1.38018E+00	CURIES
SE79	FROM7.00000E+04	T08.00000E+04	1.24023E+00	CURIES
SE79	FROM8.00000E+04	T09.00000E+04	1.11494E+00	CURIES
SE79	FROM9.00000E+04	T01.00000E+05	1.00217E+00	CURIES

**DRAFT**

**APPENDIX A**

**COMPUTER LISTINGS OF LONG-TERM RADIONUCLIDE RELEASES**

**DRAFT**

C14	FROM2.00000E+03	T01.00000E+04	1.06399E+01	CURIES
C14	FROM1.00000E+04	T02.00000E+04	4.52383E+00	CURIES
C14	FROM2.00000E+04	T03.00000E+04	1.36766E+00	CURIES
C14	FROM3.00000E+04	T04.00000E+04	4.06484E-01	CURIES
C14	FROM4.00000E+04	T05.00000E+04	1.19677E-01	CURIES
C14	FROM5.00000E+04	T06.00000E+04	3.61437E-02	CURIES
C14	FROM6.00000E+04	T07.00000E+04	1.06592E-02	CURIES
C14	FROM7.00000E+04	T08.00000E+04	3.17354E-03	CURIES
C14	FROM8.00000E+04	T09.00000E+04	9.51983E-04	CURIES
C14	FROM9.00000E+04	T01.00000E+05	2.90933E-04	CURIES