RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

4/3/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No.52-021

RAI NO.:	**NO.589-4536 REVISION 2**
SRP SECTION:	**03.11 – Environmental Qualification of Mechanical and Electrical Equipment**
APPLICATION SECTION:	**3.11**
DATE OF RAI ISSUE:	**6/8/2010**

QUESTION NO. 03.11-36:

Question RAI 512-3893 03.11-29, requested additional information, beyond that provided in the response to RAI 358-2642 Question 03.11-1, about the methodology and assumptions used to calculate the Total Integrated Dose (TID) to equipment. In their response, the applicant provided a more detailed narrative description of the method used to establish the source term. The applicant also provided a general formula for calculating beta dose rates in water and air. However the response did not include the MicroShield input parameter data files and insufficient information was available to the NRC staff to allow confirmation of the TID values provided in MUAP-08015 Revision 1, Table 5-5 “Total Integrated Dose for Zone”. In addition, the applicant did not justify the use of analytical methods that are not consistent with the guidance provided in Regulatory Guide 1.183 “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors”. Examples of inconsistency include the omission of information regarding about how the contribution from the decay chains of the principle radio nuclides are considered, how gamma and beta TID was calculated for points located on the surface of the water at the centerline of the large pool of sump water and the effects of activity plated out on containment surfaces on TID. Also, in their response, the applicant referenced NISTIR 5632 “Tables Of X-Ray Mass Attenuation Coefficients and Mass Energy Absorption Coefficients for 1 keV To 20 MeV for Elements Z = 1 To 92 and 48Additional Substances of Dosimetric Interest” (NISTIR-5632) and Federal Guidance Report 12 “External Exposure To Radio nuclides In Air, Water, And Soil” (FGR-12), that are not described in MUAP-08015 Revision 1, FSAR Revision 2 Tier 2 Sections3.11 or FSAR Revision 2 Tier 2 Chapter 15 “Transient and Accident Analyses”.

The applicant is requested to:

- ·Describe any computer codes, including revisions, besides MicroShield, that were used to calculate dose rates and the resultant Total Integrated Dose (TID) to equipment,
- ·Provide a sample calculation performed by the applicant to calculated dose rates and the resultant TID resulting from liquids, plated out material and airborne activity, including the input parameter and output data files of MicroShield and any other computer codes used for the analysis.
- ·Describe the basis for any assumed parameters, such as the Geometry Correction Factor, or the type of surface selected to represent a plate outsource.

·Describe the methods for averaging dose rate to obtain TID for the stated intervals, and for interpolating the Source Strength at Time after Release provided in Table 1, and the Operational Durations specified in MUAP-08015(R1) Table 5-5.
·Revise and update either MUAP-08015 Revision 1 or FSAR Revision 2Tier 2 Section 3.11 to include a complete description of the methods and assumptions, and referenced documents, used to calculate equipment TID.

Reference: MHI's Response to US-APWR DCD RAI No. 512-3893; MHI Ref: UAP-HF-10018; Dated January 28, 2010; ML100330613.

ANSWER:

MUAP-08015 Revision 1, Table 5-5 “Total Integrated Dose for Zone” provides a summary of the cumulative normal and accident doses used to determine the total integrated dose (TID) for each Environmental Zone of the US-APWR. In accordance with the previously provided response to RAI 358-2462 Revision 1 Question 03.11-2 Item 5, the cumulative accident dose listed in Table 5-5 for each Environmental Zone, excluding the containment, annulus, and main steam piping area outside containment (i.e., Zones 2-5, 7-9, and 11-14), is calculated using the upper limit dose rate of any location within the respective Environmental Zone shown in Figures 12.3-3 through 12.3-6 of US-APWR DCD Section 12.3.

The calculation method for the cumulative accident dose of the containment, annulus, and main steam piping area (Zones 1, 6, and 10) was previously provided in MHI’s responses to RAI 358-2642 Revision 1 Question 03.11-2 Item 5 (ML091970103), RAI 358-2642 Revision 1 Question 03.11-1 Item 1, and RAI 512-3893 Question 03.11-29 (ML100330613). The resulting cumulative accident dose was then used in MUAP-08015 Revision 1. However, the resultant cumulative doses are too conservative for actual equipment procurement. Therefore, MHI has opted to perform a more realistic dose estimation to reduce the cumulative dose in containment. This revised response explains the changes incorporated into the updated accident dose calculation as follows.

1. Change of assumption for cumulative dose calculation inside containment

MHI reduces the cumulative doses inside containment provided in technical report MUAP-08015 Revision 1 by reducing the level of conservatism included in the calculation assumptions. The level of conservatism used in the updated calculation is closer to that typically used in the U.S. nuclear industry, making procurement of equipment easier.

The results of the revised calculation will be reflected in Table 5-5 of MUAP-08015 Revison 2. The markups of the affected portions of MUAP-08015 are attached to this response. The doses in the zones outside containment are also revised to reflect the dose reduction inside containment. It is assumed that the doses in the penetration area are same as that inside containment.

The assumed conditions associated with the doses included in MUAP-08015 Revision 1 are highly conservative as described in the previous responses to RAIs 358 and 512. In order to reduce the cumulative doses inside containment, only the assumptions summarized in Table 1 are changed. The dose calculation method is not changed from that of MUAP-08015 Revision 1.

The first item of Table 1 shows the release fraction of core inventory into containment. In MUAP-08015 Revision 1, the total inventory using the release fraction listed in Table 2 of RG 1.183 is conservatively assumed to be instantaneously discharged into containment after the

accident occurs. This assumption is changed to a fraction that considers the timing of fission product release following the start of an accident.

The second item of Table 1 concerns the removal of fission products in the vapor phase in containment due to containment spray. This containment spray removal effect is not considered in MUAP-08015 Revision 1. In the revised calculation, the amount of airborne radioactivity in the vapor phase is reduced by considering this effect. It is assumed that containment spray operates for 30 days and that during this period, 30 percent of the recirculation water is suspended through recirculation. Halfway water to RWSP is 30 percent of recirculation water volume. Halfway water means floating water in vapor phase and flowing water on floor and wall during recirculation. Thus, 30 percent of removed radioactivity by containment spray system is assumed to be contributed to the airborne source strength.

These changes are implemented with using the DCD Chapter 15 dose analysis code RADTRAD. The revised calculation conditions are same as those used in DCD Chapter 15, except for (1) the evaluation time after accident occurrence, (2) no consideration of radioactivity leakage, and (3) no consideration of plate-out. Additional details regarding these calculation condition differences are described in Section 2 of this response. The calculation flow for evaluating the accident dose rate inside containment is shown in Figure 1. In addition, the electronic data (including MicroShield input data, MicroShield output data and Microsoft EXCEL spreadsheets) that is used for the TID calculation is provided in order to facilitate the confirmation of the calculated TID by the NRC staff.

The revised calculation conditions comply with the methods stated in RG 1.183 Appendix I. Compliance to this regulatory guide appendix is further explained in Section 3 of this RAI response.

2. Difference from dose evaluation in US-APWR DCD Section 15.6.5.5

US-APWR DCD Section 15.6.5 contains a radiological consequences analysis similar to this source strength analysis for inside containment.

Basically, the same parameters are used in both analyses. However, non-conservative source strength parameters (related to hold-up and leakage) used in dose analysis in DCD Section 15.6.5.5 were made more conservative for the purpose of the updated MUAP-08015 source strength analysis. Therefore, the updated MUAP-08015 source strength evaluation is considered to be reasonable and proper.

The differences between the LOCA radiological consequences in DCD Section 15.6.5.5 and this source strength evaluation in containment are listed in Table 2.

3. Compliance to RG 1.183

Compliance of this revised calculation with RG 1.183, Appendix I is demonstrated in the compliance matrix given in Table 3.

4. Impact on the response to RAI358 by dose reduction inside containment

In the response to RAI 358-2642, MHI has shown that the radiological condition in the main steam/feedwater piping area after a main steam line break (MSLB) is bounded by the radiological condition in containment after a loss of coolant accident (LOCA). The containment source strength for LOCA in the response to RAI 358-2642 did not include the mitigation effect associated with the operation of the containment spray system (CSS). The following discusses whether the containment source strength including the mitigation effect due to CSS after LOCA causes a more severe radiological condition than the main steam/feedwater piping area source strength after MSLB.

The volumetric ratio of the main steam/feedwater piping area and containment is 1/30. Therefore, if the radioactivity released to the main steam/feedwater piping area after a MSLB is a factor of 30 larger than the radioactivity contributing to the source strength after LOCA, then the radioactive concentration in the main steam/feedwater piping area after a MSLB can be higher than the radioactive concentration in containment after a LOCA. In this case, the integrated dose in the main steam/feedwater piping area after a MSLB could be larger than in containment after LOCA.

However, since the radioactive concentration in the main steam/feedwater piping area after a MSLB is less than the radioactive concentration in containment after a LOCA, the integrated dose in the main steam/feedwater piping area after a MSLB is bounded by the integrated dose in containment after a LOCA.

The mitigation due to CSS operation is not expected for noble gases, organic iodine, and elemental iodine because CSS does not include an iodine removal additive. Therefore, removal by CSS is expected for particulate only. Radioactivity removed by the CSS circulates in containment as recirculation water. Thus, radioactivity incorporated by water, which is injected to containment by CSS and emergency core cooling system and is recirculated to the RWSP, is taken into account as source.

The amount of water returned to the RWSP via this pathway is 30% of the recirculation water volume. Thus, 30% of radioactivity removed by CSS is assumed to contribute to the containment source strength.

The release fraction to the containment for each nuclide group during a LOCA and the fraction contributing to the source strength are shown in Table 4. Note that radiological decay is not considered in this study for simplicity.

Tables 15A-3 and 15A-10 in DCD Rev. 3 show the reactor coolant source term and core inventory, respectively. The ratio of the reactor coolant source term and core inventory for each nuclide group is shown in Table 5.

As shown in the response RAI 358-2642, radioactivity released to the main steam/feedwater piping area during a MSLB is shown in Table 6.

The ratio of core inventory and radioactivity released to the main steam/feedwater piping area during a MSLB is derived from Tables 5 and 6. These values and 1/30 of the radioactivity contributing to source strength during a LOCA are shown in Table 7.

Since almost of all particulate is incorporated in recirculation water, the contribution to the containment gas phase source strength would be negligible if the CSS is stopped after 1 month. Since there is no such mitigation measure in the main steam/feedwater piping area, contribution to source strength from particulate during a MSLB would continue.

However, as shown in Table 7, the difference between the LOCA and MSLB radioactive concentration is large. Therefore, even if the difference in the period contributing to source strength is considered, 1/30 of the radioactive concentration from a LOCA is large enough to match that of a MSLB.

Therefore, the radiological condition in containment after a LOCA bounds the radiological conditions in the main steam/feedwater piping area after a MSLB. Thus, it is not necessary to change the description provided in the response to RAI 358-2642.

The information provided in this response will be included in the DCD through the revision of technical report MUAP-08015 to Revision 2. The revised parts of the technical report associated with this RAI response are described in the markup attached to this response. There are no other changes to the DCD other than changing the revision number of the technical report MUAP-08015 from Revision 1 to Revision 2.

Impact on DCD

The revision number of technical report MUAP-08015 referenced in US-APWR DCD Chapters 1 and 3 will be changed from Revision 1 to Revision 2 after the report is revised.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on S-COLA

There is no impact on the S-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Report

The dose calculation results tabulated in the MUAP-08015 Revision 1 are to be revised as shown in the attached markups to reflect the changes to the dose calculation described in this RAI response.

Table 1 Comparison of Revised Calculation Assumptions

Section of Calculation	Category of Assumption	Previous Assumption (Conservative) [1)]	Revised Assumption [2)]	Effect on Radiation Level in Containment
Radioactivity	Core inventory fraction released into containment	The total inventory is instantaneously discharged into containment after accident occurred (Total rate in Table 2 of RG 1.183 is considered)	Timing of release of fission products into containment is considered (Each phase rate in Table 2 of RG 1.183 is considered)	Decrease in integrated dose at the beginning of accident
	Removal of fission products in the gaseous phase by containment spray	Not considered	Considered (for 30 days after accident)	Decrease of dose rate from airborne fission products due to precipitation into liquid phase
Dose	No change			-

Notes:
1. The previous assumption means the assumption in MUAP-08015 Revision 1.
2. This assumption will be reflected in MUAP-08015 Revision 2.

Table 2 Difference of Conditions between DCD Ch.15 Radiological Consequences Analysis and the MUAP-08015 Source Strength Analysis

	Radiological Consequences Analysis in DCD Section 15.6.5.5	Mitigated source strength analysis due to containment spray	
		With removal due to containment spray[1)]	Without removal due to containment spray[1)]
Removal coefficient by containment spray (1/hr)	0.0-3.23hr : 7.32 3.23-720hr : 0.732	0.0-3.23hr : 7.32 3.23-720hr : 0.732 720-8760hr : 0.0[2)]	0.0
Sprayed region volume (ft^3)	1,680,000	1,680,000	0.0
Unsprayed region volume (ft^3)	1,120,000	1,120,000	2,800,000
Mixing rate between sprayed region and unsprayed region (times/hr)	2	2	0.0
Removal due to natural deposition	Considered	Not considered[3)]	Not considered[3)]
Containment leak rate (%/d)	0-1day : 0.15 1-30day : 0.075	0.0[4)]	0.0[4)]
Containment purge flow rate (cfm)	20,700	0.0[4)]	0.0[4)]
Evaluation period (hr)	720	8760[5)]	8760[5)]

Notes:

1. In order to evaluate radioactivity removed by containment spray, two cases were evaluated. One was the case taking into account removal by containment spray, and another one was the case without removal by containment spray. The difference between these cases is the radioactivity removed by containment spray.
2. Containment spray system was assumed to be stopped 30 days after accident initiation.
3. Deposited radioactivity was assumed to be included in the source strength inside containment.
4. In terms of source strength, radioactivity hold-up inside containment is a more conservative condition. Therefore, release/leakage from containment is not taken into account.
5. To evaluate source strength for 1 year post-accident, the evaluation period was changed.

Table 3 Compliance with RG 1.183

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
BASIC ASSUMPTIONS		
1. Gamma and beta doses and dose rates should be determined for three types of radioactive source distributions: (1) activity suspended in the containment atmosphere (2) activity plated out on containment surfaces, and (3) activity mixed in the containment sump water. A given piece of equipment may receive a dose contribution from any or all of these sources. The amount of dose contributed by each of these sources is determined by the location of the equipment, the time dependent and location-dependent distribution of the source, and the effects of shielding. For EQ components located outside of the containment, additional radiation sources may include piping and components in systems that circulate containment sump water outside of containment. Activity deposited in ventilation and process filter media may be a source of post-accident dose.	Conformance with the Requirement. Gamma and beta doses and dose rates are determined for radioactive source distributions of activity suspended in the containment atmosphere, activity plated out on containment surfaces, and activity mixed in the containment sump water. In the calculation, the radioactive source distribution of activity plated out on containment surfaces is assumed to be suspended in the containment atmosphere. Since the dose is calculated at the midpoint of the containment, this assumption is conservative.	MUAP-08015R2 Appendix E 3. Cumulative Accident Dose Inside the Containment

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
2. The integrated dose should be determined from estimated dose rates using appropriate integration factors determined for each of the major source terms (e.g., containment sump, containment atmosphere, ECCS, normal operation). The period of exposure should be consistent with the survivability period for the EQ equipment being evaluated. The survivability period is the maximum duration, post-accident, that the particular EQ component is expected to operate and perform its intended safety function. The period of exposure for normal operation dose is generally the duration of the plant license, i.e., 40 years.	Conformance with the Requirement. The integrated dose is determined from estimated dose rates by appropriate integration as shown in the attached markup for MUAP-08015R2 Appendix E. For any zones not inside the containment, the annulus area, or the main steam piping area, the cumulative accident doses are appropriately estimated using the upper limit dose rate for each zone based on the Post Accident Radiation Zone MAP shown in Figures 12.3-3 through 12.3-6 in the US-APWR DCD Section 12.3. The upper limit dose rate for each post accident time and for each zone is shown in the attached markup for Table E-1 in MUAP-08015R2 Appendix E. For any zones inside the containment, the annulus area, or the main steam piping area, the cumulative accident doses are appropriately estimated by using the time dependent source term during the accident. The normal operation dose is estimated for a 60 year exposure period based on dose limit for each Radiation Zone for Normal Operation/Shutdown shown in Figure12.3-1 in the US-APWR DCD Section 12.3. The period of exposure is consistent with the required survivability period for the EQ equipment being evaluated as shown in the attached markup for MUAP-08015R2 Appendix E.	MUAP-08015R2 Appendix E 2. Cumulative Accident Dose inside Zones Excluding the Containment 3. Cumulative Accident Dose Inside the Containment DCD Section 12.3 Figure 12.3-1 Figure 12.3-3 through Figure 12.3-6

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
FISSION PRODUCT CONCENTRATIONS		
3. The radiation environment resulting from normal operations should be based on the conservative source term estimates reported in the facility's Safety Analysis Report or should be consistent with the primary coolant specific activity limits contained in the facility's technical specifications. The use of equilibrium primary coolant concentrations based on 1% fuel cladding failures would be one acceptable method. In estimating the integrated dose from prior normal operations, appropriate historical dose rate data may be used where available.	Conformance with the Requirement. The radiation environment resulting from normal operations is estimated conservatively using the dose limit for each Zone (the highest dose rate of the upper limits of the areas within the same zone). The dose rate for each zone is based on Normal Operation/Shutdown shown in Figure 12.3-1 in the US-APWR DCD Section 12.3. The equilibrium primary coolant concentrations are based on a 1% fuel cladding failure rate. As mentioned the above, the integrated dose is based on the conservative source term estimates.	MUAP-08015R2 Table 5-4 Figure 12.3-1
4. The radioactivity released from the core during a design basis loss-of-coolant accident (LOCA) should be based on the assumptions provided in Regulatory Position 3 and Appendix A of this regulatory guide. Although the design basis LOCA is generally limiting for radiological environmental qualification (EQ) purposes, there may be components for which another design basis accident may be limiting. In these cases, the assumptions provided in Appendices B through H of this regulatory guide, as applicable, should be used. Applicable features and mechanisms may be	Conformance with the Requirement. The radioactivity released from the core during a design basis loss-of-coolant accident (LOCA) should be based on the assumptions provided in Regulatory Position 3 and Appendix A of this regulatory guide as shown in Table 2 (Different from the dose evaluation in US-APWR DCD Section 15.6.5.5). A design basis LOCA emits the most amount of radioactivity from core into the CV and its accident duration is the longest amongst the design basis accidents. This is considered to be the basis for radiological environmental qualification. The amount of radioactivity in the primary coolant is generally very small when compared with the core inventory. Therefore, accidents accompanied by fuel failure are considered for potential impact on	

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
assumed in EQ calculations provided that any prerequisites and limitations identified regarding their use are met. [Discussion pertaining to BWR Mark III containments and PWR ice-condenser containments is omitted here]	radiological environmental qualification. Accidents accompanied by fuel failure include LOCA, Rod Ejection, RCP Rotor Seizure, and Fuel Handling. Since the amount of radioactivity emitted from core into the CV after a Rod Ejection Accident is smaller than a LOCA, the LOCA is limiting. The RCP Rotor Seizure Accident assumes that some amount of radioactivity in the fuel gap emitted into the primary coolant is leaked to the secondary system. However, it is considered that the amount of leakage into the secondary system is very small, and there is a shielding effect by piping. The accident duration is also for a short time. Therefore, the influence on EQ is small. A Fuel Handling Accident assumes that the amount of radioactivity is emitted from the fuel gap by damage of a spent fuel assembly (24hr decay) within the SFP. Noble gases and a part of the iodine float to the Fuel Handling Area since particulate matter and a part of iodine are maintained in the SFP underwater. Furthermore, the volume of the Fuel Handling Area is large. Therefore it is considered that the dose rate in the Fuel Handling Area is small and the influence on EQ is small.	
DOSE MODEL FOR CONTAINMENT ATMOSPHERE		
5. The beta and gamma dose rates and integrated doses from the airborne activity within the containment atmosphere and from the plateout of aerosols on containment surfaces generally should be calculated for the midpoint in the containment, and this dose rate should be used for all exposed components. Radiation shielding afforded by internal structures may be neglected for modeling simplicity. It is expected that the shielding	Conformance with the Requirement. The beta and gamma integrated doses are calculated at the midpoint in containment, and this dose rate should be used for all exposed components. Radiation shielding afforded by internal structures is neglected for modeling simplicity.	MUAP-08015R2 Appendix E 3. Cumulative Accident Dose Inside the Containment

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
afforded by these structures would reduce the dose rates by factors of two or more depending on the specific location and geometry. More detailed calculations may be warranted for selected components if acceptable dose rates cannot be achieved using the simpler modeling assumptions.		
6. Because of the short range of the betas in air, the airborne beta dose rates should be calculated using an infinite medium model. Other models, such as finite cloud and semi-infinite cloud, may be applicable to selected components with sufficient justification. The applicability of the semi-infinite model would depend on the location of the component, available shielding, and receptor geometry. For example, beta dose rates for equipment located on the containment walls or on large internal structures might be adequately assessed using the semi-infinite model. Use of a finite cloud model will be considered on a case-by-case method.	Conformance with the Requirement. The airborne beta doses are calculated using an infinite medium model.	MUAP-08015R2 Appendix E 3. Cumulative Accident Dose Inside the Containment

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
7. All gamma dose rates should be multiplied by a correction factor of 1.3 to account for the omission of the contribution from the decay chains of the radio nuclides. This correction is particularly important for non-gamma-emitting radio nuclides having gamma emitting progeny for example, Cs-137 decay to Ba-137m. This correction may be omitted if the calculational method explicitly accounts for the emissions from buildup and decay of the radioactive progeny.	Conformance with the Requirement. All gamma dose rates are multiplied by a correction factor of 1.3 to account for the omission of the contribution from the decay chains of the radio nuclides.	
DOSE MODEL FOR CONTAINMENT SUMP WATER SOURCES		
8. With the exception of noble gases, all the activity released from the fuel should be assumed to be transported to the containment sump as it is released. This activity should be assumed to mix instantaneously and uniformly with other liquids that drain to the sump. This transport can also be modeled mechanistically as the time-dependent washout of airborne aerosols by the action of containment sprays. Radio nuclides that do not become airborne on release from the reactor coolant system, e.g., they are entrained in non-flashed reactor coolant should be assumed to be instantaneously transported to the sump and be uniformly distributed in the sump water.	Conformance with the Requirement. With the exception of noble gases, all the activity released from the fuel is assumed to be transported to the containment sump in order to calculate the dose from RWSP.	MUAP-08015R2 Appendix E 3.Cumulative Accident Dose Inside the Containment

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
9. The gamma and beta dose rates and the integrated doses should be calculated for a point located on the surface of the water at the centerline of the large pool of sump water. The effects of buildup should be considered. More detailed modeling with shielding analysis codes may be performed.	Conformance with the Requirement. The gamma and beta dose rates and the integrated doses are calculated for a point located on the surface of the water at the centerline of the large pool of sump water.	MUAP-08015R2 Appendix E 3.Cumulative Accident Dose inside the Containment
DOSE MODEL FOR EQUIPMENT LOCATED OUTSIDE CONTAINMENT		
10. EQ equipment located outside of containment may be exposed to: (1) radiation from sources within the containment building (2) radiation from activity contained in piping and components in systems that re-circulate containment sump water outside of containment (e.g., ECCS, RHR, sampling systems) (3) radiation from activity contained in piping and components in systems that process containment atmosphere (e.g., hydrogen recombiners, purge systems) (4) radiation from activity deposited in ventilation and process filter media (5) radiation from airborne activity in plant areas outside of the containment (i.e., leakage from recirculation systems).	Conformance with the Requirement. (1) Radiation from sources within the containment building is considered. (2) Radiation from radiation from activity contained in piping and components in systems that re-circulate containment sump water outside of containment is considered. (3) Radiation from activity contained in piping and components in systems that process containment atmosphere is included in the dose limit of Radiation Zones for normal operation/Shutdown shown in Figure 12.3-1 in the US-APWR DCD Section 12.3. (4) Radiation from activity deposited in ventilation and process filter media is included in the dose limit of Radiation Zones for normal operation/Shutdown shown in Figure 12.3-1 in the US-APWR DCD Section 12.3. (5) In main steam piping area and penetration area (annulus), radiation from airborne leaked from the containment is considered.	MUAP-08015R2 Appendix E 2. Cumulative Accident Dose inside Zones Excluding the Containment DCD Section 12.3 Figure 12.3-1

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
The amount of dose contributed by each of these sources is determined by the location of the equipment, the time-dependent and location-dependent distribution of the source, and the effects of shielding.		
11. Because of the large amount of EQ equipment and the complexity of system and component layout in plant buildings, it is generally not reasonable to model each EQ component. A reasonable approach is to determine the limiting dose rate from all sources in a particular plant area (e.g., cubicle, floor, building) to a real or hypothetical receptor and to base the integrated doses for all components in that area on this postulated dose rate. Individual detailed modeling of selected equipment may be performed.	Conformance with the Requirement. As shown in Table 5-4 and Table 5-5 of MUAP-0815R2, all areas inside the plant are part of some zone and all components are based on the integrated dose for each zone. This approach is reasonable.	MUAP-08015R2 Table5-4, Table 5-5
12. The integrated doses from components and piping in systems recirculating sump water should assume a source term based on the time-dependent containment sump source term described above. Similarly, the doses from components that contain air from the containment atmosphere should assume a source term based on the time-dependent containment atmosphere source term described above.	Conformance with the Requirement. The integrated doses from components and piping in systems recirculating sump water assume a source term based on the time-dependent containment sump source term described above. Similarly, the doses from components that contain air from the containment atmosphere assume a source term based on the time-dependent containment atmosphere source term described above.	MUAP-08015R2 Appendix E 3.Cumulative Accident Dose Inside the Containment

Reg Guide 1.183, Appendix I Requirements	US-APWR Position	DCD / TeR / RAI Location Where Addressed
13. Analyses of integrated doses caused by radiation from the buildup of activity on ventilation and process filter media in systems containing containment sump water or atmosphere or both should assume that the ventilation or process flow is at its nominal design value and that the filter media is 100% efficient for iodine and particulates. The duration of flow through the filter media should be consistent with the plant design and operating procedures. Radioactive decay in the filter media should be considered. Shielding by structures and components between the filter and the EQ equipment may be considered.	Conformance with the Requirement. Dose rate from filters used in normal operation is included in the dose limit of Radiation Zones for normal operation/Shutdown shown in Figure 12.3-1 in the US-APWR DCD Section 12.3. The annulus exhaust filer used in accident is located in zone IX in Post Accident Radiation Zone MAP shown in Figures 12.3-3 through 12.3-6 in the US-APWR DCD Section 12.3. Dose rate from the annulus exhaust filer is included in upper limit dose rate for this zone IX.	DCD Section 12.3 Figure 12.3-1 Figure 12.3-3 through Figure 12.3-6

Table 4 Radioactivity Contributing to LOCA Containment Gas Phase Source Strength

	Release fraction to containment	Fraction contributing to source strength
Noble gas	100%	100%
Iodine	40% (38%:particulate, 1.94%:elemental, 0.06%:organic)	13.4% (11.4%:particulate, 1.94%:elemental, 0.06%:organic)
Alkali metal	30%	9%
Te group	5%	1.5%
Ba, Sr	2%	0.6%
Noble metal	0.25%	0.075%
Ce Group	0.05%	0.015%
Lanthanide	0.02%	0.006%

Table 5 Ratio of Reactor Coolant Source Term to Core Inventory

	Ratio of reactor coolant source term and core inventory	Bases
Noble gas	1%	Kr-85
Iodine	0.001%	I-131
Others	0.001%	Rb-86

Table 6 Radioactivity Released by a MSLB

	Contribution of radioactivity in reactor coolant	Contribution of radioactivity in secondary coolant	Contribution of iodine spike
Noble gas	0.5% of reactor coolant	—	—
Iodine	16% of reactor coolant		0.0003% of core inventory
Others	16% of reactor coolant		—

Table 7 Comparison of LOCA and MSLB Source Strength

	1/30 of radioactivity contributing to source strength (ratio to core inventory)	radioactivity released to main steam/feedwater piping area in MSLB (ratio to core inventory)
Noble gas	3.33%	0.005%
Iodine	0.45%	0.00046%
Others	0.3% (This value is based on alkali)	0.00016% (This value is based on alkali)

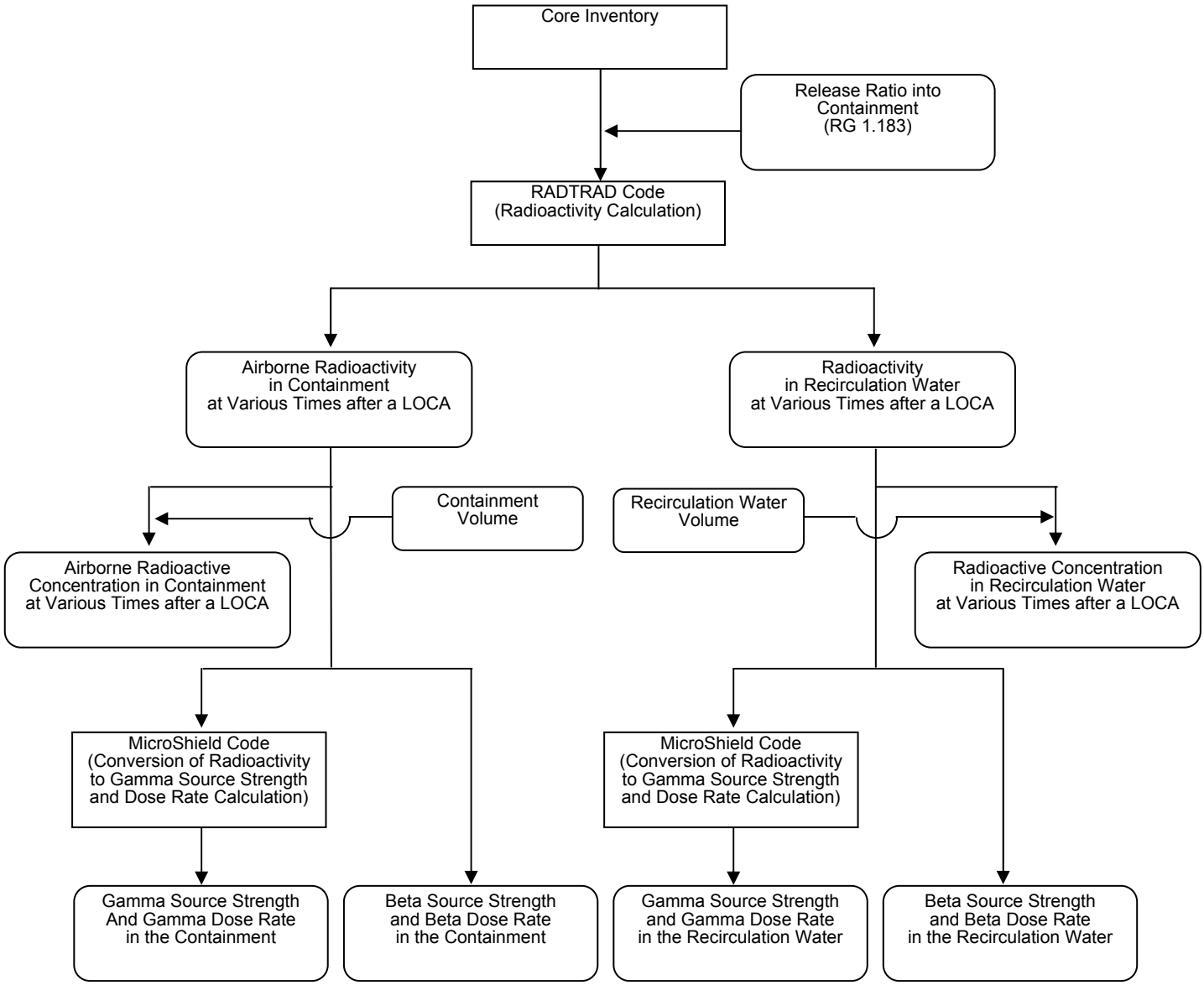

Figure 1 Calculation Flow for Estimating the Accident Dose Rate Inside Containment

See Attachment B of this Technical Report.

5.4 Containment Test Environment

RG 1.18 specifies requires that containment integrated leak rate testing acceptance criteria is 1.15 times design pressure. The design pressure of the US-APWR containment is 68 psig. Consequently, the maximum pressure specified for the containment test is 68 x 1.15 = 78.2 psig. Environmental parameters, such as containment temperature and humidity associated with this test are enveloped by the parameters specified for normal or abnormal plant conditions.

5.5 Design Basis Accident Conditions

Equipment qualification requirements are specified where the design basis accident~~s for which the equipment performs an important to safety or safety-related function and the accident~~ potentially changes the local environment due to increased temperature, pressure, humidity, radiation, or seismic effects. The environmental conditions for each applicable design basis accident are summarized in Table 5-3. DCD_ 03.11-41

5.5.1 High-Energy Line Break Accidents Inside Containment

5.5.1.1 Radiation Environment – Loss-of-coolant Accident

The EQ radiation environment parameters of Total Integrated Dose and maximum dose rates are determined for all compartments containing ~~safety-related or important to safety~~ equipment requiring environmental qualification. Gamma and Beta sources are addressed where applicable. Analyses of radiation environments are performed in calculations. This is primarily a post accident evaluated radiation dose for inside the Containment. Radiation dose from containment is a maximum from the LOCA analysis results and impacts each piece of equipment differently. These impacts are determined by the individual piece of equipment's function, location, and safety class. This information is the result of engineering analysis for each piece of equipment requiring environmental qualification~~that is safety-related or important to safety~~. Radiation sources can include both airborne activity in the containment and radioactivity containing equipment inside or outside of the containment. If necessary, particular equipment components may be subjected to more detailed evaluations based on their actual locations with respect to radiation sources. DCD_ 03.11-41 DCD_ 03.11-41

Radiation doses associated with postulated accidents are determined by ~~following~~ methods, models and assumptions described in Appendix E. ~~Source term calculation methods are described in Chapter 12.~~ DCD_ 03.11-36

~~The gamma dose due to airborne radioactive materials in containment can be calculated using the point-kernel shielding code MicroShield. The gamma dose at the center of the source is calculated by using gamma radiation source strength in containment and by modeling containment as cylinder with the containment free volume.~~

~~The gamma dose due to dissolved radioactive materials in recirculation water can be calculated using the point-kernel shielding code MicroShield. The gamma dose at the center of the source is calculated by using gamma radiation source strength in recirculation water and by modeling recirculation water as cylinder with the volume of recirculation water.~~
~~It is possible to assume containment and recirculation water are an infinite space for beta radiation, so that for beta dose calculation the submersion model is adopted. This model is~~ DCD_ 03.11-36

DCD_
03.11-36

~~commonly used in cases of uniform distribution of radioactive concentration. That is, the following equation is used together with the airborne radioactive concentration in containment and the radioactive concentration in recirculation water to calculate beta dose.~~

$$H_\beta = \frac{K \cdot E_\beta}{\rho} \cdot \chi$$

~~where:~~

~~Hβ: beta dose (Gy/s)~~
~~K: 1.6 × 10-10 ((Gy/s)(dis/MeV)(g/Bq)~~
~~Eβ: effective energy of beta radiation (MeV/dis)~~
~~ρ: density of air or water (g/cm3)~~
~~χ: airborne radioactive concentration in containment or that in recirculation water (Bq/cm3) ”~~

~~The methodology described in RG 1.183 Appendix I, with respect to EQ related doses and as shown in FSAR Tier 2 Chapters 12 or 15, uses the following methods, models and assumptions for calculating doses to equipment, including the dose to equipment immersed in sump fluids and the Beta dose from airborne activity in containment as follows:~~

~~The method used to calculate the doses to equipment (inside and outside containment, immersed in sump fluids) after LOCA.~~

~~(1) Airborne radioactive concentration in containment / radioactive concentration in recirculation water after LOCA~~

~~(a) Radioactivity released into containment~~

~~As mentioned in DCD Chapter 15, for core inventory calculation, it is assumed that core has 2 regions and irradiation time for a cycle is 28 months, and average specific power is 32.1 MW/MTU, which correspond to burnup of about 55 GWD/MTU in 2 cycles. The core thermal power is 102 % of the design thermal power. Table 15A-10 lists the fission product inventories. The fractions of fission products released into containment are listed in Table 15A-13, which are based on RG1.183. The radioactivity released into containment is calculated based on the above-mentioned core inventory and release fraction.~~

~~(b) Airborne radioactive concentration in containment~~

~~The airborne radioactive concentration in containment is calculated based on the radioactivity released into containment and the following assumptions:~~

~~・All the radioactive material released into containment is airborne.~~
~~・Decreases due to deposit and attachment are not taken into consideration.~~
~~・The removal effect by spray is ignored.~~
~~・It does not dissolve in recirculation water.~~

~~Assuming that radioactive materials are uniformly airborne in containment, the airborne radioactivity is divided by the containment free volume to calculate the airborne radioactive concentration in containment.~~

~~(c) Radioactive concentration in recirculation water~~

DCD_
03.11-36

~~The radioactive concentration in the recirculation water is calculated based on the radioactivity released into containment and the following assumptions:~~

~~・All the radioactive material released into containment except for noble gas is dissolved in recirculation water.~~
~~・Decreases due to deposit and attachment are not taken into consideration.~~
~~・There is no airborne material in containment.~~

~~Assuming that radioactive materials are uniformly dissolved in recirculation water, the radioactivity is divided by the volume of recirculation water to calculate the radioactive concentration in the recirculation water.~~

~~(2) Gamma radiation source strength in containment and recirculation water after LOCA~~
~~The gamma radiation source strengths can be calculated using the point-kernel shielding code MicroShield, and also using the airborne radioactive concentration in containment and the radioactive concentration in recirculation water.~~

~~(3) Beta radiation source strength in containment and recirculation water after LOCA~~
~~The beta radiation source strengths can be calculated by multiplying the airborne radioactive concentration in containment and the radioactivity in recirculation water by the effective energy of beta radiation.~~

~~(4) Gamma dose in containment and recirculation water after LOCA~~
~~(a) Gamma dose in containment~~
~~The gamma dose due to airborne radioactive materials in containment can be calculated using the point-kernel shielding code MicroShield. The gamma dose at the center of the source is calculated by using gamma radiation source strength in containment and by modeling containment as cylinder with the containment free volume.~~

~~(b) Gamma dose in recirculation water~~
~~The gamma dose due to dissolved radioactive materials in recirculation water can be calculated using MicroShield code. The gamma dose at the center of the source is calculated by using gamma radiation source strength in recirculation water and by modeling recirculation water as cylinder with the volume of recirculation water.~~

~~(5) Beta dose in containment and recirculation water after LOCA~~
~~It is possible to assume containment and recirculation water are an infinite space for beta radiation, so that for beta dose calculation the submersion model is adopted. This model is commonly used in cases of uniform distribution of radioactive concentration. That is, the following equation is used together with the airborne radioactive concentration in containment and the radioactive concentration in recirculation water to calculate beta dose.~~

~~$$H_\beta = \frac{K \cdot E_\beta}{\rho} \cdot \chi$$~~

~~where:~~

~~H_β : beta dose (Gy/s)~~
~~K: 1.6 × 10-10 ((Gy/s)(dis/MeV)(g/Bq)~~

~~E β : effective energy of beta radiation (MeV/dis)~~
~~ρ : density of air or water (g/cm3)~~
~~χ : airborne radioactive concentration in containment or that in recirculation water (Bq/cm3)~~

DCD_ 03.11-36

~~(6) Gamma dose outside containment after LOCA~~
~~The upper limit doses on the radiation zone maps for plant areas including those areas requiring post-accident access, as shown in Chapter 12, are used for the gamma dose outside containment. The doses on the radiation zone maps are determined by adding the upper limit dose on the radiation zone maps under normal conditions to the gamma dose from airborne radioactive materials in containment after LOCA, which are calculated by modeling outer shield and containment as cylinder with the containment free volume. Then the outer shield is ignored in dose calculation of the penetration areas and the other shields having sufficient shielding effect are considered.~~

The Nuclear source term for the LOCA accident analysis follows ANSI/ANS and NRC guidelines. Specifically, the guidance of 10 CFR 50.34 and NRC RG 1.183 are incorporated into the dose analysis. Beta radiation is also considered for component inside Containment (Zone 1).

The dose rate results (for each elevation inside the Containment and areas of the Reactor Building containing ~~safety-related or important to safety~~ equipment requiring environmental qualification) are summarized in Dose Maps provided in DCD Chapter 12 at several times after the postulated accident (i.e., 1 hr, 1 day, 1 week, and 1 month). These show the gamma radiation levels in the areas from contained circulating post-accident fluids, and are intended to show that areas requiring post-accident accessibility are indeed accessible by operating personnel. Although they are not intended for EQ purposes, the radiological basis accident scenario used to develop these maps forms the basis to develop the time-integrated EQ gamma doses for up to 1 year of post-accident exposure, with sufficient time increments to allow consideration of particular equipment operational duration requirements, some of which are less than 1 year.

DCD_ 03.11-41

The values for radiation after the LOCA accident are specified in Table 5-5 as a function of in-plant location and time after accident. In Zone 6 (Penetration Area and Safeguard Component Area (Radiological Area)), it is conservatively assumed that the radiation doses are equal to the values of in Zone 1.

5.5.1.2 Radiation Environment – Steam Line Break Accident

Steam line break accident sources are based on the release of reactor coolant system radioactive, content with the design basis fuel defect level of 1.0 percent assumed during operation. Assuming that an “transient-initiated” iodine activity spike occurs, this increases the reactor coolant radioactivity during the Steam line break accident 500 times the normal radioactivity in the reactor coolant.

The activity inventory is instantaneously released into the containment (Zone 1) or the main steam piping area (Zone 10). It is conservatively assumed that the radiation doses in Zone 1 and Zone 10 resulting from a steam line break are equal to the values in Zone 1 for a loss-of-coolant accident.

Table 5-5 Total Integrated Dose for Zone (Sheet 1 of 7)

Zone	Operational Duration	Normal Operation Cumulative Dose (rad)				Accident Cumulative Dose (rad)			Total (rad)	Radiation Condition	
										Harsh or Mild	
		γ	n	β	Total	γ	β	Total		Electrical	Mechanical
1-1	5 min	6.9E+11	6.9E+11	-	1.4E+12	1.6E+3 (2.0E+3)^2~~4.7E+05~~	4.8E+3~~2.4E+06~~	6.4E+3 (6.8E+3)^2~~2.9E+06~~	1.4E+12 (1.4E+12)^2 ~~1.4E+12~~	Harsh	Harsh
	2 wks [1]					4.0E+7 (5.8E+7)^2~~8.5E+07~~	2.5E+8~~4.9E+08~~	2.9E+8 (3.1E+8)^2~~5.8E+08~~	1.4E+12 (1.4E+12)^2 ~~1.4E+12~~	Harsh	Harsh
	4 mos					5.3E+7 (1.1E+8)^2~~2.5E+08~~	3.5E+8~~9.2E+08~~	4.0E+8 (4.6E+8)^2~~1.2E+09~~	1.4E+12 (1.4E+12)^2 ~~1.4E+12~~	Harsh	Harsh
	1 yr					5.3E+7~~5.1E+08~~ (1.7E+8)^2~~(8.1E+08)^2~~	4.1E+8~~1.5E+09~~ ~~(1.6E+09)^2~~	4.6E+8~~2.0E+09~~ (5.8E+8)^2~~(2.4E+09)^2~~	1.4E+12~~1.4E+12~~ (1.4E+12)^2 ~~(1.4E+12)^2~~	Harsh	Harsh
1-2	5 min	1.7E+09	7.9E+10	-	8.1E+10	1.6E+3~~4.7E+05~~	4.8E+3~~2.4E+06~~	6.4E+3~~2.9E+06~~	8.1E+10~~8.1E+10~~	Harsh	Harsh
	2 wks [1]					4.0E+7~~8.5E+07~~	2.5E+8~~4.9E+08~~	2.9E+8~~5.8E+08~~	8.1E+10~~8.2E+10~~	Harsh	Harsh
	4 mos					5.3E+7~~2.5E+08~~	3.5E+8~~9.2E+08~~	4.0E+8~~1.2E+09~~	8.1E+10~~8.2E+10~~	Harsh	Harsh
	1 yr					5.3E+7~~5.1E+08~~	4.1E+8~~1.5E+09~~	4.6E+8~~2.0E+09~~	8.1E+10~~8.3E+10~~	Harsh	Harsh
1-3	5 min	9.0E+08	-	-	9.0E+08	1.6E+3~~4.7E+05~~	4.8E+3~~2.4E+06~~	6.4E+3~~2.9E+06~~	9.0E+8~~9.0E+08~~	Harsh	Harsh
	2 wks [1]					4.0E+7~~8.5E+07~~	2.5E+8~~4.9E+08~~	2.9E+8~~5.8E+08~~	1.2E+9~~1.5E+09~~	Harsh	Harsh
	4 mos					5.3E+7~~2.5E+08~~	3.5E+8~~9.2E+08~~	4.0E+8~~1.2E+09~~	1.3E+9~~2.1E+09~~	Harsh	Harsh
	1 yr					5.3E+7~~5.1E+08~~	4.1E+8~~1.5E+09~~	4.6E+8~~2.0E+09~~	1.4E+9~~2.9E+09~~	Harsh	Harsh

DCD_03.11-36

Table 5-5 Total Integrated Dose for Zone (Sheet 2 of 7)

Zone	Operational Duration	Normal Operation Cumulative Dose (rad)				Accident Cumulative Dose (rad)			Total (rad)	Radiation Condition	
										Harsh or Mild	
		γ	n	β	Total	γ	β	γ		Electrical	Mechanical
1-4	5 min	2.7E+08	-	-	2.7E+08	1.6E+34.7E+05	4.8E+32.4E+06	6.4E+32.9E+06	2.7E+82.7E+08	Harsh	Harsh
	2 wks [1]					4.0E+78.5E+07	2.5E+84.9E+08	2.9E+85.8E+08	5.6E+88.4E+08	Harsh	Harsh
	4 mos					5.3E+72.5E+08	3.5E+89.2E+08	4.0E+81.2E+09	6.7E+81.5E+09	Harsh	Harsh
	1 yr					5.3E+75.1E+08	4.1E+81.5E+09	4.6E+82.0E+09	7.3E+82.3E+09	Harsh	Harsh
1-5	5 min	5.3E+07	-	-	5.3E+07	1.6E+3 $(2.0E+3)^2$ 4.7E+05	4.8E+32.4E+06	6.4E+3 $(6.8E+3)^2$ 2.9E+06	5.3E+7 $(5.3E+7)^2$ 5.6E+07	Harsh	Harsh
	2 wks [1]					4.0E+7 $(5.8E+7)^2$ 8.5E+07	2.5E+84.9E+08	2.9E+8 $(3.1E+8)^2$ 5.8E+08	3.5E+8 $(3.6E+8)^2$ 6.3E+08	Harsh	Harsh
	4 mos					5.3E+7 $(1.1E+8)^2$ 2.5E+08	3.5E+89.2E+08	4.0E+8 $(4.6E+8)^2$ 1.2E+09	4.6E+8 $(5.2E+8)^2$ 1.3E+09	Harsh	Harsh
	1 yr					5.3E+7 $(1.7E+8)^2$ 5.1E+08	4.1E+81.5E+09	4.6E+8 $(5.8E+8)^2$ 2.0E+09	5.2E+8 $(6.4E+8)^2$ 2.1E+09	Harsh	Harsh
1-6	5 min	5.3E+05	-	4.3E+04	5.7E+05	1.6E+34.7E+05	4.8E+32.4E+06	6.4E+32.9E+06	5.4E+53.5E+06	Harsh	Harsh
	2 wks [1]					4.0E+78.5E+07	2.5E+84.9E+08	2.9E+85.8E+08	2.9E+85.8E+08	Harsh	Harsh
	4 mos					5.3E+72.5E+08	3.5E+89.2E+08	4.0E+81.2E+09	4.1E+81.2E+09	Harsh	Harsh
	1 yr					5.3E+75.1E+08 (8.1E+08)[2]	4.1E+81.5E+09 (1.6E+09)[2]	4.6E+82.0E+09 (2.4E+09)[2]	4.7E+81.4E+12 (1.4E+12)[2]	Harsh	Harsh

DCD_03.11-36

Table 5-5 Total Integrated Dose for Zone (Sheet 4 of 7)

Zone	Operational Duration	Normal Operation Cumulative Dose (rad)				Accident Cumulative Dose (rad)			Total (rad)	Radiation Condition	
										Harsh or Mild	
		γ	n	β	Total	γ	β	Total		Electrical	Mechanical
5	5 min	1.4E+02	-	-	1.4E+02	1.9E-04	-	1.9E-04	1.4E+02	Mild	Mild
	2 wks [1]					3.8E-01	-	3.8E-01	1.4E+02	Mild	Mild
	4 mos					3.3E+00	-	3.3E+00	1.4E+02	Mild	Mild
	1 yr					9.7E+00	-	9.7E+00	1.5E+02	Mild	Mild
6	5 min	5.3E+07	-	-	5.3E+07	1.6E+34~~.7E+05~~	4.8E+32~~.4E+06~~	6.4E+32~~.9E+06~~	5.3E+75~~.6E+07~~	Harsh	Harsh
	2 wks [1]					4.0E+78~~.5E+07~~	2.5E+84~~.9E+08~~	2.9E+85~~.8E+08~~	3.5E+86~~.3E+08~~	Harsh	Harsh
	4 mos					5.3E+72~~.5E+08~~	3.5E+89~~.2E+08~~	4.0E+81~~.2E+09~~	4.6E+81~~.3E+09~~	Harsh	Harsh
	1 yr					5.3E+75~~.1E+08~~	4.1E+81~~.5E+09~~	4.6E+82~~.0E+09~~	5.2E+82~~.1E+09~~	Harsh	Harsh
7	5 min	5.3E+07	-	-	5.3E+07	9.2E+01	-	9.2E+01	5.3E+07	Harsh	Harsh
	2 wks [1]					1.9E+05	-	1.9E+05	5.3E+07	Harsh	Harsh
	4 mos					1.7E+06	-	1.7E+06	5.5E+07	Harsh	Harsh
	1 yr					4.9E+06	-	4.9E+06	5.8E+07	Harsh	Harsh

DCD_03.11-36

Table 5-5 Total Integrated Dose for Zone (Sheet 5 of 7)

Zone	Operational Duration	Normal Operation Cumulative Dose (rad)				Accident Cumulative Dose (rad)			Total (rad)	Radiation Condition	
										Harsh or Mild	
		γ	n	β	Total	γ	β	Total		Electrical	Mechanical
8	5 min	1.4E+02	-	-	1.4E+02	1.9E+01	-	1.9E+01	1.5E+02	Mild	Mild
	2 wks [1]					3.8E+04	-	3.8E+04	3.8E+04	Harsh	Harsh
	4 mos					3.3E+05	-	3.3E+05	3.3E+05	Harsh	Harsh
	1 yr					9.7E+05	-	9.7E+05	9.7E+05	Harsh	Harsh
9	5 min	1.4E+02	-	-	1.4E+02	1.9E-04	-	1.9E-04	1.4E+02	Mild	Mild
	2 wks [1]					3.8E-01	-	3.8E-01	1.4E+02	Mild	Mild
	4 mos					3.3E+00	-	3.3E+00	1.4E+02	Mild	Mild
	1 yr					9.7E+00	-	9.7E+00	1.5E+02	Mild	Mild
10	5 min	1.4E+02	-	-	1.4E+02	1.6E+34.7E+05	4.8E+32.4E+06	6.4E+32.9E+06	6.5E+32.9E+06	Harsh	Harsh
	2 wks [1]					4.0E+78.5E+07	2.5E+84.9E+08	2.9E+85.8E+08	2.9E+85.8E+08	Harsh	Harsh
	4 mos					5.3E+72.5E+08	3.5E+89.2E+08	4.0E+81.2E+09	4.1E+81.2E+09	Harsh	Harsh
	1 yr					5.3E+75.1E+08	4.1E+81.5E+09	4.6E+82.0E+09	4.7E+82.0E+09	Harsh	Harsh

DCD_03.11-36

DCD_
03.11-36

Attachment E

Calculation Method for Radiation Dose after LOCA

E.1 Introduction

Table 5-5 “Total Integrated Dose for Zone” provides a summary of the cumulative normal and accident doses used to determine the total integrated dose (TID) for each environmental zone of the US-APWR. The cumulative accident doses listed in Table 5-5 for each environmental zone excluding the containment, annulus area, and main steam piping area outside containment (i.e., Zones 2-5, 7-9, and 11-14) are calculated using the upper limit dose rate of any location within the respective environmental zone shown in Figures 12.3-3 through 12.3-6 of US-APWR DCD Section 12.3. The cumulative accident doses of the containment, annulus area, and main steam piping area (Zones 1, 6, and 10) are calculated using the RADTRAD code (Reference 1) and the MicroShield code (Reference 2).

E.2 Cumulative Accident Dose inside Zones Excluding the Containment

For any zones not inside the containment, the annulus area, and the main steam piping area, the cumulative accident doses are calculated based on the dose rate for each zone (the highest dose rate of the upper limits of the areas within the same zone) shown in Figures 12.3-3 through 12.3-6 in the US-APWR DCD Section 12.3. The dose rates in Figures 12.3-3 through 12.3-6 in the US-APWR DCD Section 12.3 are set based on the dose rates (those for gamma rays) from radioactivity in the containment after LOCA. These are sorted out in Table E-1. The specific ways of the cumulative doses calculation are described below.

(1) 5 minutes later
For the cumulative dose following a time lapse of 5 minutes, the amount accumulated in 5 minutes was calculated on the assumption that the dose rate obtained by doubling the dose rate one hour after an accident is regarded as the dose rate measured immediately after the accident and this dose rate continues for one hour. An estimated margin of 10% is included. For example, in Zone 3 (Class 1E I&C Room), the upper limit dose rate after a lapse of 1 hour is 1 (rem/h) (refer to Table E-1) and the dose rate measured immediately after the accident is 2 (rem/h). Consequently, the following equation is derived:
[2 (rem/h) × 5 (min) / 60 (min)] × 1.1 ≈ 1.9E-01 (rem)
Here, when we assume 1 rem ≈ 1 rad, the cumulative dose becomes 1.9E-01 (rad).
This approach is applied to all zones.

(2) 2 weeks later
At first, the cumulative dose for the first day was calculated on the assumption that the dose rate is obtained by doubling the dose rate one hour after an accident, which is regarded as the dose rate measured immediately after the accident, and the dose rate measured one hour after the accident continues for the following 23 hours. The accumulation was calculated on the assumption that the dose rate measured one day after the accident continues for six days following the second day and the dose rate measured one week after the accident continues for one week following the eighth day.

DCD_
03.11-36

In this case, an estimated margin of 10% is included. In the case of Zone 3 (Class 1E I&C Room), the following equations are provided or derived:
1st day: 2 (rem/h) ×1 (h) + 1 (mrem/h) × 23 (h) = 25.0 (rem)
2nd day to 7th day: 15 (mrem/h) ×24 (h) ×6 (d) = 2.2 (rem)
8th day to 14th day: 15 (mrem/h) ×24 (h) ×7 (d) = 2.5 (rem)
Consequently, we derive that (25.0+2.2+2.5) (rem) × 1.1 ≈ 3.3E+01 (rem). Similarly, with 1 rem ≈ 1 rad assumed, we can derive 3.3E+01 (rad). This is the same for other zones.

(3) 4 months later (122 days later)
First, the value found in (2) is used for the two-week cumulative dose. The accumulation was calculated on the assumption that the dose rate measured one week after the accident continues from the 15th day to the first month and the dose rate measured one month after the accident continues for four months following the 31st day following the accident. In this case, a margin of 10% is included in the same manner as in the above cases. In the case of Zone 3 (Class 1E I&C Room), for example, we derive the following equations:
Through the 14th day: 29.7 (rem)
5th day to 30th day: 15 (mrem/h) × 24 (h) ×16 (d) = 5.8 (rem)
31st day to 122nd day:1 (mrem/h) × 24 (h) × 92 (d) = 2.2 (rem)
Accordingly, we derive that (29.7+5.8+2.2) (rem) × 1.1 ≈ 4.2E+01 (rem). Similarly, with 1 rem ≈ 1 rad assumed, we can derive 4.2E+01 (rad). This is the same for other zones.

(4) 1 year later (365 days later)
First, the value found in (3) is used for the four-month cumulative dose. The accumulation was calculated on the assumption that the dose rate measured one week after the accident continues from the 123rd day to the first one year and the dose rate measured one month after the accident continues for four months following the 30th day following the accident. In this case, a margin of 10% is also estimated in it in the same manner as in the case of 5 minutes later. In the case of Zone 3 (Class 1E I&C Room), for example, the following equations are derived:
Through the 122nd day: 37.7 (rem)
123rd day to 365th day: 1 (mrem/h) ×24 (h) ×243 (d) = 5.8 (rem)
Thus, (37.7+5.8) (rem) × 1.1 ≈ 4.8E+01 (rem) is derived. Similarly, with 1 rem ≈ 1 rad assumed, 4.8E+01 (rad) is derived. This is the same with other zones.

E.3 Cumulative Accident Dose inside the Containment

The following is the method we used to calculate the doses to equipment (inside and outside containment, immersed in sump fluids) after LOCA. Calculation flow of accident dose rate inside the containment shows Figure E-1.

(1) Airborne radioactive concentration in containment / radioactive concentration in recirculation water after LOCA

a) Radioactivity released into containment
As mentioned in 15A.1.1.3, for core inventory calculation, it is assumed that core has 2 regions and irradiation time for a cycle is 28 months, and average specific power is 32.1 MW/MTU, which correspond to burnup of about 55 GWD/MTU in 2 cycles. The core thermal power is 102 % of the design thermal power. Table 15A-10 lists the fission product inventories. The fractions of fission products released into containment are

listed in Table 15A-13, which are based on Regulatory Guide 1.183. The radioactivity released into containment is calculated based on the above-mentioned core inventory and release fraction.

DCD_
03.11-36

b) Airborne radioactive concentration in containment
The airborne radioactive concentration in containment is calculated based on the radioactivity released into containment and the following assumptions:

- Decreases due to deposit and attachment are not taken into consideration.
- The removal effect by spray is considered.
- It does not dissolve in recirculation water.

It is assumed that the period of using containment spray is for 30 days and 30 percent of the amount radioactivity which is transferred to recirculation water is floating by recirculation in the duration. Halfway water to RWSP is 30 percent of recirculation water volume. Halfway water means floating water in vapor phase and flowing water on floor and wall during recirculation. Thus, 30 percent of removed radioactivity by containment spray system is assumed to be contributed to the airborne source strength.

The airborne radioactive concentration is calculated by using the RADTRAD code that is used in DCD Chapter 15. The calculation conditions are same as that of DCD Chapter 15 Section 15.6.5.5 except for evaluation time after accident, no consideration of radioactivity leakage and no consideration of plate-out. Table E-2 summarizes the airborne radioactivity at typical times after a LOCA in the containment vessel.

c) Radioactive concentration in recirculation water
The radioactive concentration in the recirculation water is calculated based on the radioactivity released into containment and the following assumptions:

- All the radioactive material released into containment except for noble gas is dissolved in recirculation water.
- Decreases due to deposit and attachment are not taken into consideration.

Similar to the airborne calculation discussed above, the radioactive decay calculation has been made for various times after a LOCA by using the RADTRAD code. Table E-3 summarizes the recirculation water radioactivity at typical times after a LOCA in the containment vessel.

(2) Gamma ray source strength in containment and recirculation water after LOCA
The gamma ray source strengths can be calculated using the point-kernel shielding code MicroShield, and also using the airborne radioactive concentration in containment and the radioactive concentration in recirculation water.

(3) Beta ray source strength in containment and recirculation water after LOCA
The beta ray source strengths can be calculated by multiplying the airborne radioactive concentration in containment and the radioactivity in recirculation water by the effective energy of beta ray.

(4) Gamma dose in containment and recirculation water after LOCA

DCD_
03.11-36

The gamma dose due to airborne radioactive materials in containment can be calculated using the point-kernel shielding code MicroShield. The gamma dose at the center of the source is calculated by using gamma ray source strength in containment and by modeling containment as cylinder with the containment free volume.

The gamma dose due to dissolved radioactive materials in recirculation water can be calculated using MicroShield code. The gamma dose at the surface of the source is calculated by using gamma ray source strength in recirculation water and by modeling recirculation water as cylinder with the volume of recirculation water.

In order to calculate gamma dose rates irradiated to the components due to airborne radioactive materials in the CV after a LOCA, the CV is represented by a cylinder with a free volume of 2.74E+6 ft^3 and an inner diameter of 1790 inches as shown in Figure E-2. The dose rate at the center of the cylinder is calculated by assuming a uniform distribution of the containment airborne radioactivity in the cylinder and using the point kernel method. The dose rate at the center is the maximum in the dose rate irradiated to the components located in the CV. The gamma source strengths of airborne radioactive materials in the CV are as shown in Table E-4.

However, MicroShield does not allow evaluation points to be set in the radioactive source. Therefore, a half-height cylinder is assumed, and the surface dose rate of the half-height cylinder is calculated. The air density is assumed for the density in the CV. The use of the same radioactivity for the half-height cylinder, which makes the radioactivity concentration twice that in the full-height cylinder, allows this dose rate to be equivalent to the dose rate at the center of the full-height cylinder.

In the calculation of gamma dose rates irradiated to the components from the recirculation water after a LOCA, as in the calculation for the airborne radioactive materials in the CV, the recirculation water is represented by a cylinder with the effective recirculation water volume of 5.80E+4 ft^3. The inner diameter (1790 inches) of the CV is used for the diameter of the cylinder. The dose rate at the surface of the cylinder is calculated by assuming a uniform distribution of the radioactivity of the recirculation water in the cylinder and using MicroShield. The gamma source strengths of the recirculation water are as shown in Table E-5.

Table E-6 shows the main MicroShield input parameters. As described in Table E-6, the MicroShield calculation assumes an input source term of 1.0E+0 (Photon/sec) for every energy group. The “actual” dose rates are calculated through a process of multiplying the MicroShield output dose rates for each group by the “actual” source term for each group as previously provided in Table E-4 and Table E-5. The cumulative gamma accident dose at various times after a LOCA is then calculated by multiplying the “actual” dose rate in water and air at various times after a LOCA by the appropriate time interval. Table E-7 summarizes the cumulative gamma accident dose at various times after a LOCA.

In order to determine the doses associated with the specific post-LOCA time intervals tabulated in Table 5-5, one must utilize the appropriate doses tabulated in Table E-7 and add a margin of 10%.

(5) Beta dose in containment and recirculation water after LOCA

DCD_
03.11-36

It is possible to assume containment and recirculation water are an infinite space for beta ray, so that for beta dose calculation the submersion model is adopted. This model is commonly used in cases of uniform distribution of radioactive concentration. That is, the following equation is used.

$$H_\beta = \frac{K \cdot E_\beta}{\rho} \cdot \chi$$

where:

H_β: beta dose (Gy/s)
K: 1.6×10^{-10} ((Gy/s)(dis/MeV)(g/Bq)
E_β: effective energy of beta ray (MeV/dis)
ρ : density (g/cm^3)
χ : radioactive concentration (Bq/cm^3)

The effective energy of beta radiation is used to calculate beta dose rates irradiated to the components in the CV. The effective energy of beta radiation used is from Appendix A "Nuclear Decay Data" in Federal Guidance Report No.12 (Reference 3). The beta source strengths obtained from the effective energy are as shown in Table E-4. Table E-8 summarizes the cumulative beta accident dose at various times after a LOCA.

E.4 References

1. S.L Humphreys, RADTRAD: A Simplified Model for Radionuclide Transport and Removal and Dose Estimation, U .S. Nuclear Regulatory Commission, NUREG/CR-6604, April 1998.
2. MicroShield User's Manual Version 7. Grove Software, Inc. 2006
3. External Exposure to Radionuclides in Air, Water, and Soil, EPA Federal Guidance Report No. 12, EPA 402-R-93-081, September 1993.

DCD_
03.11-36

Table E-1 Upper Limit Dose Rate for Each Zone in DCD Figure 12.3-3 thru 12.3-6

Location			Upper limit dose rate			
			1 hour	1 day	1 week	1 month
Zone 1 Containment			—	—	—	—
Zone 2 Main Control Room and Remote Shutdown Console Room			1 rem/h	15 mrem/h	15 mrem/h	1 mrem/h
Zone 3 Class 1E I&C Room			1 rem/h	15 mrem/h	15 mrem/h	1 mrem/h
Zone 4 Class 1E Electrical Room, UPS Room, Battery Charger Room, and Reactor Trip Breaker Room			1 rem/h	15 mrem/h	15 mrem/h	1 mrem/h
Zone 5 Class 1E Battery Room			1 mrem/h	1 mrem/h	1 mrem/h	1 mrem/h
Zone 6 Penetration Area and Safeguard Component Area (Radiological Area)			—	—	—	—
Zone 7 Safety Related Component Area (Radiological Area)			500 Rad/h	500 Rad/h	500 Rad/h	500 Rad/h
Zone 8 Safety Related Component Area (Non-Radiological Area)			100 rem/h	100 rem/h	100 rem/h	100 rem/h
Zone 9 Essential Chiller Unit and Pump Room			1 mrem/h	1 mrem/h	1 mrem/h	1 mrem/h
Zone 10 Main Steam/Feedwater Piping Area			—	—	—	—
Zone 11 Gas Turbine Area			1 mrem/h	1 mrem/h	1 mrem/h	1 mrem/h
Zone 12 Fuel Handling Area			1 rem/h	15 mrem/h	15 mrem/h	15 mrem/h
Zone 13 Reactor Building and Auxiliary Building General Mechanical Area (Radiological Area)	13-1 [1)]	Auxiliary Building	5.45E+04 rem/h	5.45E+04 rem/h	5.45E+04 rem/h	5.45E+04 rem/h
	13-2	Reactor Building Sample Hx Room	500 Rad/h	500 Rad/h	500 Rad/h	500 Rad/h
	13-3	Reactor Building Passage	1 rem/h	15 mrem/h	15 mrem/h	15 mrem/h
Zone 14 Turbine Building General Mechanical Area			1 mrem/h	1 mrem/h	1 mrem/h	1 mrem/h

Note
1. The maximum area of 13-1 is Zone X and there is no upper limit dose rate. The dose rate inside spent resin storage tank room in which dose rate is the highest is used.

DCD_
03.11-36

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 1 of 11)

Nuclide	Time after LOCA (hr)										
	0.01	0.02	0.03	0.04	0.05	0.06	0.0667	0.08	0.0834	0.1	0.15
Co-60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85	2.9E+02	2.0E+03	3.8E+03	5.5E+03	7.2E+03	9.0E+03	1.0E+04	1.2E+04	1.3E+04	1.6E+04	2.5E+04
Kr-85m	0.0E+00	0.0E+00	1.0E+05	1.5E+05	2.0E+05	2.5E+05	2.8E+05	3.4E+05	3.6E+05	4.4E+05	6.7E+05
Kr-87	0.0E+00	0.0E+00	1.2E+05	3.0E+05	3.9E+05	4.8E+05	5.4E+05	6.6E+05	6.9E+05	8.3E+05	1.3E+06
Kr-88	0.0E+00	9.4E+04	2.9E+05	4.2E+05	5.6E+05	6.9E+05	7.8E+05	9.5E+05	1.0E+06	1.2E+06	1.8E+06
Rb-86	0.0E+00	0.0E+00	7.4E+02	1.1E+03	1.4E+03	1.8E+03	2.0E+03	2.4E+03	2.6E+03	3.0E+03	4.2E+03
Sr-89	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-97	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Nb-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Mo-99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tc-99m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rh-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sb-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sb-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-129m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-131m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-131	2.4E+04	1.7E+05	3.1E+05	4.6E+05	6.0E+05	7.4E+05	8.4E+05	1.0E+06	1.1E+06	1.3E+06	1.8E+06
I-132	0.0E+00	2.4E+05	4.5E+05	6.5E+05	8.6E+05	1.1E+06	1.2E+06	1.5E+06	1.5E+06	1.8E+06	2.5E+06
I-133	0.0E+00	3.5E+05	6.5E+05	9.5E+05	1.2E+06	1.5E+06	1.7E+06	2.1E+06	2.2E+06	2.6E+06	3.7E+06
I-134	0.0E+00	0.0E+00	7.1E+05	1.0E+06	1.3E+06	1.6E+06	1.9E+06	2.3E+06	2.4E+06	2.7E+06	3.7E+06
I-135	0.0E+00	3.3E+05	6.0E+05	8.8E+05	1.2E+06	1.4E+06	1.6E+06	2.0E+06	2.1E+06	2.4E+06	3.4E+06
Xe-133	5.0E+04	3.5E+05	6.5E+05	9.5E+05	1.2E+06	1.5E+06	1.7E+06	2.1E+06	2.2E+06	2.7E+06	4.2E+06
Xe-135	0.0E+00	1.1E+05	2.0E+05	2.9E+05	3.8E+05	4.8E+05	5.4E+05	6.6E+05	6.9E+05	8.5E+05	1.3E+06
Cs-134	5.7E+03	4.0E+04	7.3E+04	1.1E+05	1.4E+05	1.8E+05	2.0E+05	2.4E+05	2.5E+05	3.0E+05	4.2E+05
Cs-136	0.0E+00	1.1E+04	2.0E+04	2.9E+04	3.8E+04	4.8E+04	5.4E+04	6.6E+04	6.9E+04	8.1E+04	1.1E+05
Cs-137	3.2E+03	2.2E+04	4.2E+04	6.1E+04	8.0E+04	1.0E+05	1.1E+05	1.4E+05	1.4E+05	1.7E+05	2.4E+05
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-144	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pr-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Nd-147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Np-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-238	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-240	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Am-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-242	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-244	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Note

1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 2 of 11)

DCD_
03.11-36

Nuclide	Time after LOCA (hr)										
	0.2	0.3	0.4	0.5	0.5083	0.6	0.7	0.8	0.9	1	1.1
Co-60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.8E+01	1.3E+02	1.8E+02	2.3E+02	2.7E+02	3.1E+02
Kr-85	3.3E+04	5.1E+04	6.8E+04	8.5E+04	8.7E+04	2.0E+05	3.3E+05	4.6E+05	5.8E+05	7.1E+05	8.4E+05
Kr-85m	9.0E+05	1.3E+06	1.8E+06	2.2E+06	2.2E+06	5.2E+06	8.2E+06	1.1E+07	1.4E+07	1.7E+07	2.0E+07
Kr-87	1.6E+06	2.4E+06	3.0E+06	3.6E+06	3.6E+06	8.1E+06	1.2E+07	1.6E+07	2.0E+07	2.3E+07	2.5E+07
Kr-88	2.5E+06	3.7E+06	4.8E+06	5.9E+06	6.0E+06	1.4E+07	2.2E+07	2.9E+07	3.7E+07	4.3E+07	5.0E+07
Rb-86	5.3E+03	7.4E+03	9.3E+03	1.1E+04	1.1E+04	1.5E+04	1.9E+04	2.2E+04	2.6E+04	2.9E+04	3.1E+04
Sr-89	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E+05	4.0E+05	5.6E+05	7.0E+05	8.4E+05	9.6E+05
Sr-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+04	3.3E+04	4.6E+04	5.8E+04	6.9E+04	8.0E+04
Sr-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E+05	5.0E+05	6.9E+05	8.7E+05	1.0E+06	1.2E+06
Sr-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E+05	4.6E+05	6.3E+05	7.7E+05	9.0E+05	1.0E+06
Y-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+02	5.5E+02	7.2E+02	8.9E+02	1.1E+03
Y-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E+03	4.9E+03	7.0E+03	8.8E+03	1.0E+04	1.2E+04
Y-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+04	2.4E+04	3.6E+04	5.0E+04	6.4E+04
Y-93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+03	5.8E+03	8.1E+03	1.0E+04	1.2E+04	1.4E+04
Zr-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E+03	6.3E+03	8.9E+03	1.1E+04	1.3E+04	1.5E+04
Zr-97	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2E+03	6.1E+03	8.6E+03	1.1E+04	1.3E+04	1.5E+04
Nb-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E+03	6.3E+03	8.9E+03	1.1E+04	1.3E+04	1.5E+04
Mo-99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+04	8.0E+04	1.1E+05	1.4E+05	1.7E+05	1.9E+05
Tc-99m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.7E+04	7.0E+04	9.9E+04	1.2E+05	1.5E+05	1.7E+05
Ru-103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E+04	6.4E+04	9.0E+04	1.1E+05	1.3E+05	1.5E+05
Ru-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+04	3.7E+04	5.2E+04	6.4E+04	7.6E+04	8.5E+04
Ru-106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+04	2.2E+04	3.1E+04	3.9E+04	4.7E+04	5.4E+04
Rh-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E+04	3.9E+04	5.5E+04	6.9E+04	8.2E+04	9.4E+04
Sb-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E+04	8.8E+04	1.2E+05	1.6E+05	1.9E+05	2.1E+05
Sb-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+05	2.4E+05	3.3E+05	4.1E+05	4.8E+05	5.5E+05
Te-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.6E+04	8.7E+04	1.2E+05	1.5E+05	1.8E+05	2.1E+05
Te-127m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.1E+03	1.2E+04	1.6E+04	2.0E+04	2.4E+04	2.8E+04
Te-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+05	2.5E+05	3.5E+05	4.3E+05	5.1E+05	5.8E+05
Te-129m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E+04	4.0E+04	5.6E+04	7.0E+04	8.4E+04	9.6E+04
Te-131m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.3E+04	1.2E+05	1.7E+05	2.1E+05	2.5E+05	2.9E+05
Te-132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.4E+05	1.2E+06	1.7E+06	2.1E+06	2.5E+06	2.9E+06
I-131	2.3E+06	3.2E+06	4.0E+06	4.8E+06	4.9E+06	7.5E+06	1.0E+07	1.2E+07	1.4E+07	1.6E+07	1.8E+07
I-132	3.2E+06	4.4E+06	5.5E+06	6.5E+06	6.6E+06	1.0E+07	1.4E+07	1.6E+07	1.9E+07	2.1E+07	2.4E+07
I-133	4.7E+06	6.6E+06	8.3E+06	9.9E+06	1.0E+07	1.5E+07	2.0E+07	2.5E+07	2.9E+07	3.3E+07	3.6E+07
I-134	4.5E+06	5.9E+06	6.8E+06	7.5E+06	7.6E+06	1.1E+07	1.3E+07	1.5E+07	1.6E+07	1.7E+07	1.8E+07
I-135	4.4E+06	6.0E+06	7.5E+06	8.9E+06	9.0E+06	1.4E+07	1.8E+07	2.2E+07	2.5E+07	2.8E+07	3.1E+07
Xe-133	5.7E+06	8.7E+06	1.2E+07	1.5E+07	1.5E+07	3.5E+07	5.7E+07	7.9E+07	1.0E+08	1.2E+08	1.4E+08
Xe-135	1.8E+06	2.7E+06	3.7E+06	4.7E+06	4.8E+06	1.1E+07	1.8E+07	2.6E+07	3.3E+07	4.0E+07	4.7E+07
Cs-134	5.3E+05	7.4E+05	9.3E+05	1.1E+06	1.1E+06	1.5E+06	1.9E+06	2.2E+06	2.6E+06	2.9E+06	3.1E+06
Cs-136	1.4E+05	2.0E+05	2.5E+05	3.0E+05	3.0E+05	4.1E+05	5.2E+05	6.1E+05	7.0E+05	7.8E+05	8.5E+05
Cs-137	3.0E+05	4.2E+05	5.3E+05	6.3E+05	6.4E+05	8.7E+05	1.1E+06	1.3E+06	1.5E+06	1.6E+06	1.8E+06
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E+05	4.6E+05	6.2E+05	7.4E+05	8.4E+05	9.2E+05
Ba-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E+05	6.3E+05	8.8E+05	1.1E+06	1.3E+06	1.5E+06
La-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E+03	7.3E+03	1.1E+04	1.5E+04	1.8E+04	2.2E+04
La-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+03	7.3E+03	9.1E+03	1.1E+04	1.2E+04
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E+03	3.0E+03	6.3E+03	8.7E+03
Ce-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.8E+03	1.5E+04	2.1E+04	2.6E+04	3.1E+04	3.6E+04
Ce-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.6E+03	1.4E+04	2.0E+04	2.5E+04	3.0E+04	3.4E+04
Ce-144	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.9E+03	1.1E+04	1.6E+04	2.0E+04	2.4E+04	2.7E+04
Pr-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+03	5.6E+03	7.9E+03	9.9E+03	1.2E+04	1.4E+04
Nd-147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+03	2.3E+03	3.3E+03	4.2E+03	5.0E+03	5.7E+03
Np-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.4E+04	1.6E+05	2.2E+05	2.8E+05	3.3E+05	3.8E+05
Pu-238	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E+01	4.4E+01	6.2E+01	7.8E+01	9.3E+01	1.1E+02
Pu-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E+00	3.3E+00	4.7E+00	5.9E+00	7.0E+00	8.1E+00
Pu-240	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E+00	5.2E+00	7.4E+00	9.3E+00	1.1E+01	1.3E+01
Pu-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.1E+02	1.2E+03	1.6E+03	2.1E+03	2.4E+03	2.8E+03
Am-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E-01	6.2E-01	8.8E-01	1.1E+00	1.3E+00	1.5E+00
Cm-242	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.2E+01	1.5E+02	2.2E+02	2.7E+02	3.3E+02	3.8E+02
Cm-244	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.9E+00	1.9E+01	2.6E+01	3.3E+01	4.0E+01	4.6E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 3 of 11)

Nuclide	Time after LOCA (hr)										
	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8083	1.9	2	2.1
Co-60	3.5E+02	3.9E+02	4.2E+02	4.5E+02	4.9E+02	5.2E+02	5.5E+02	5.5E+02	5.1E+02	4.8E+02	4.5E+02
Kr-85	9.6E+05	1.1E+06	1.2E+06	1.3E+06	1.5E+06	1.6E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Kr-85m	2.2E+07	2.5E+07	2.7E+07	3.0E+07	3.2E+07	3.4E+07	3.6E+07	3.7E+07	3.6E+07	3.5E+07	3.5E+07
Kr-87	2.8E+07	3.0E+07	3.1E+07	3.3E+07	3.4E+07	3.5E+07	3.6E+07	3.6E+07	3.4E+07	3.2E+07	3.1E+07
Kr-88	5.6E+07	6.2E+07	6.7E+07	7.3E+07	7.8E+07	8.2E+07	8.7E+07	8.7E+07	8.5E+07	8.3E+07	8.1E+07
Rb-86	3.4E+04	3.7E+04	3.9E+04	4.2E+04	4.4E+04	4.6E+04	4.8E+04	4.9E+04	4.5E+04	4.3E+04	4.1E+04
Sr-89	1.1E+06	1.2E+06	1.3E+06	1.4E+06	1.5E+06	1.6E+06	1.7E+06	1.7E+06	1.6E+06	1.5E+06	1.4E+06
Sr-90	8.9E+04	9.9E+04	1.1E+05	1.2E+05	1.2E+05	1.3E+05	1.4E+05	1.4E+05	1.3E+05	1.2E+05	1.2E+05
Sr-91	1.3E+06	1.4E+06	1.5E+06	1.7E+06	1.8E+06	1.9E+06	1.9E+06	2.0E+06	1.8E+06	1.7E+06	1.6E+06
Sr-92	1.1E+06	1.2E+06	1.3E+06	1.3E+06	1.4E+06	1.4E+06	1.5E+06	1.5E+06	1.3E+06	1.2E+06	1.1E+06
Y-90	1.2E+03	1.4E+03	1.6E+03	1.7E+03	1.9E+03	2.1E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
Y-91	1.4E+04	1.5E+04	1.6E+04	1.8E+04	1.9E+04	2.0E+04	2.1E+04	2.1E+04	2.0E+04	1.9E+04	1.8E+04
Y-92	8.0E+04	9.6E+04	1.1E+05	1.3E+05	1.5E+05	1.6E+05	1.8E+05	1.8E+05	1.9E+05	2.1E+05	2.2E+05
Y-93	1.5E+04	1.7E+04	1.8E+04	1.9E+04	2.1E+04	2.2E+04	2.3E+04	2.3E+04	2.1E+04	2.0E+04	1.8E+04
Zr-95	1.7E+04	1.9E+04	2.1E+04	2.2E+04	2.4E+04	2.5E+04	2.7E+04	2.7E+04	2.5E+04	2.3E+04	2.2E+04
Zr-97	1.6E+04	1.8E+04	1.9E+04	2.1E+04	2.2E+04	2.4E+04	2.5E+04	2.5E+04	2.3E+04	2.1E+04	2.0E+04
Nb-95	1.7E+04	1.9E+04	2.1E+04	2.2E+04	2.4E+04	2.5E+04	2.7E+04	2.7E+04	2.5E+04	2.3E+04	2.2E+04
Mo-99	2.2E+05	2.4E+05	2.6E+05	2.8E+05	3.0E+05	3.2E+05	3.3E+05	3.4E+05	3.1E+05	2.9E+05	2.8E+05
Tc-99m	1.9E+05	2.1E+05	2.3E+05	2.5E+05	2.7E+05	2.8E+05	3.0E+05	3.0E+05	2.8E+05	2.6E+05	2.5E+05
Ru-103	1.7E+05	1.9E+05	2.1E+05	2.2E+05	2.4E+05	2.6E+05	2.7E+05	2.7E+05	2.5E+05	2.4E+05	2.2E+05
Ru-105	9.4E+04	1.0E+05	1.1E+05	1.2E+05	1.2E+05	1.3E+05	1.3E+05	1.3E+05	1.2E+05	1.1E+05	1.1E+05
Ru-106	6.1E+04	6.7E+04	7.3E+04	7.9E+04	8.4E+04	8.9E+04	9.5E+04	9.5E+04	8.8E+04	8.2E+04	7.8E+04
Rh-105	1.1E+05	1.2E+05	1.3E+05	1.4E+05	1.5E+05	1.6E+05	1.6E+05	1.7E+05	1.5E+05	1.4E+05	1.4E+05
Sb-127	2.4E+05	2.6E+05	2.9E+05	3.1E+05	3.3E+05	3.5E+05	3.7E+05	3.7E+05	3.4E+05	3.2E+05	3.1E+05
Sb-129	6.0E+05	6.5E+05	7.0E+05	7.4E+05	7.8E+05	8.2E+05	8.5E+05	8.6E+05	7.8E+05	7.2E+05	6.7E+05
Te-127	2.4E+05	2.6E+05	2.9E+05	3.1E+05	3.3E+05	3.5E+05	3.7E+05	3.7E+05	3.4E+05	3.2E+05	3.1E+05
Te-127m	3.1E+04	3.5E+04	3.8E+04	4.1E+04	4.4E+04	4.6E+04	4.9E+04	4.9E+04	4.6E+04	4.3E+04	4.1E+04
Te-129	6.5E+05	7.1E+05	7.6E+05	8.1E+05	8.6E+05	9.0E+05	9.5E+05	9.5E+05	8.7E+05	8.1E+05	7.6E+05
Te-129m	1.1E+05	1.2E+05	1.3E+05	1.4E+05	1.5E+05	1.6E+05	1.7E+05	1.7E+05	1.6E+05	1.5E+05	1.4E+05
Te-131m	3.2E+05	3.6E+05	3.9E+05	4.2E+05	4.4E+05	4.7E+05	5.0E+05	5.0E+05	4.6E+05	4.3E+05	4.1E+05
Te-132	3.3E+06	3.6E+06	3.9E+06	4.2E+06	4.5E+06	4.8E+06	5.1E+06	5.1E+06	4.7E+06	4.4E+06	4.2E+06
I-131	2.0E+07	2.1E+07	2.3E+07	2.5E+07	2.6E+07	2.8E+07	2.9E+07	2.9E+07	2.7E+07	2.6E+07	2.5E+07
I-132	2.6E+07	2.8E+07	2.9E+07	3.1E+07	3.3E+07	3.4E+07	3.6E+07	3.6E+07	3.3E+07	3.0E+07	2.8E+07
I-133	4.0E+07	4.3E+07	4.6E+07	4.9E+07	5.2E+07	5.5E+07	5.7E+07	5.8E+07	5.4E+07	5.1E+07	4.9E+07
I-134	1.8E+07	1.8E+07	1.8E+07	1.8E+07	1.7E+07	1.7E+07	1.6E+07	1.6E+07	1.4E+07	1.2E+07	1.1E+07
I-135	3.4E+07	3.7E+07	3.9E+07	4.1E+07	4.3E+07	4.5E+07	4.7E+07	4.7E+07	4.4E+07	4.1E+07	3.9E+07
Xe-133	1.7E+08	1.9E+08	2.1E+08	2.3E+08	2.5E+08	2.7E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08
Xe-135	5.5E+07	6.2E+07	6.9E+07	7.6E+07	8.4E+07	9.1E+07	9.8E+07	9.9E+07	9.8E+07	9.8E+07	9.7E+07
Cs-134	3.4E+06	3.7E+06	3.9E+06	4.1E+06	4.4E+06	4.6E+06	4.8E+06	4.8E+06	4.5E+06	4.3E+06	4.1E+06
Cs-136	9.2E+05	9.9E+05	1.1E+06	1.1E+06	1.2E+06	1.3E+06	1.3E+06	1.3E+06	1.2E+06	1.2E+06	1.1E+06
Cs-137	1.9E+06	2.1E+06	2.2E+06	2.4E+06	2.5E+06	2.6E+06	2.7E+06	2.8E+06	2.6E+06	2.4E+06	2.3E+06
Ba-139	9.8E+05	1.0E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.0E+06	8.9E+05	8.0E+05
Ba-140	1.7E+06	1.9E+06	2.1E+06	2.2E+06	2.4E+06	2.5E+06	2.7E+06	2.7E+06	2.5E+06	2.3E+06	2.2E+06
La-140	2.6E+04	3.0E+04	3.4E+04	3.9E+04	4.3E+04	4.7E+04	5.2E+04	5.2E+04	5.3E+04	5.4E+04	5.5E+04
La-141	1.3E+04	1.4E+04	1.5E+04	1.6E+04	1.7E+04	1.8E+04	1.9E+04	1.9E+04	1.7E+04	1.6E+04	1.5E+04
La-142	9.4E+03	9.9E+03	1.0E+04	1.1E+04	1.1E+04	1.1E+04	1.1E+04	1.1E+04	9.9E+03	8.9E+03	8.1E+03
Ce-141	4.0E+04	4.5E+04	4.9E+04	5.2E+04	5.6E+04	6.0E+04	6.3E+04	6.3E+04	5.9E+04	5.5E+04	5.2E+04
Ce-143	3.8E+04	4.2E+04	4.6E+04	5.0E+04	5.3E+04	5.6E+04	5.9E+04	6.0E+04	5.5E+04	5.1E+04	4.9E+04
Ce-144	3.1E+04	3.4E+04	3.7E+04	4.0E+04	4.2E+04	4.5E+04	4.8E+04	4.8E+04	4.4E+04	4.2E+04	3.9E+04
Pr-143	1.5E+04	1.7E+04	1.8E+04	2.0E+04	2.1E+04	2.3E+04	2.4E+04	2.4E+04	2.2E+04	2.1E+04	2.0E+04
Nd-147	6.4E+03	7.0E+03	7.7E+03	8.3E+03	8.8E+03	9.4E+03	9.9E+03	1.0E+04	9.2E+03	8.7E+03	8.2E+03
Np-239	4.3E+05	4.7E+05	5.1E+05	5.5E+05	5.9E+05	6.3E+05	6.7E+05	6.7E+05	6.2E+05	5.8E+05	5.5E+05
Pu-238	1.2E+02	1.3E+02	1.4E+02	1.6E+02	1.7E+02	1.8E+02	1.9E+02	1.9E+02	1.7E+02	1.6E+02	1.6E+02
Pu-239	9.1E+00	1.0E+01	1.1E+01	1.2E+01	1.3E+01	1.3E+01	1.4E+01	1.4E+01	1.3E+01	1.2E+01	1.2E+01
Pu-240	1.4E+01	1.6E+01	1.7E+01	1.8E+01	2.0E+01	2.1E+01	2.2E+01	2.2E+01	2.1E+01	1.9E+01	1.8E+01
Pu-241	3.2E+03	3.5E+03	3.8E+03	4.1E+03	4.4E+03	4.7E+03	4.9E+03	4.9E+03	4.6E+03	4.3E+03	4.1E+03
Am-241	1.7E+00	1.9E+00	2.0E+00	2.2E+00	2.4E+00	2.5E+00	2.7E+00	2.7E+00	2.5E+00	2.3E+00	2.2E+00
Cm-242	4.2E+02	4.7E+02	5.1E+02	5.5E+02	5.8E+02	6.2E+02	6.6E+02	6.6E+02	6.1E+02	5.7E+02	5.4E+02
Cm-244	5.1E+01	5.7E+01	6.2E+01	6.6E+01	7.1E+01	7.6E+01	8.0E+01	8.0E+01	7.4E+01	7.0E+01	6.6E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 4 of 11)

DCD_
03.11-36

Nuclide	Time after LOCA (hr)										
	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3	3.2	3.23
Co-60	4.3E+02	4.2E+02	4.0E+02	3.9E+02	3.8E+02	3.7E+02	3.7E+02	3.6E+02	3.5E+02	3.5E+02	3.5E+02
Kr-85	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Kr-85m	3.4E+07	3.4E+07	3.3E+07	3.3E+07	3.2E+07	3.2E+07	3.1E+07	3.1E+07	3.0E+07	2.9E+07	2.9E+07
Kr-87	2.9E+07	2.7E+07	2.6E+07	2.5E+07	2.3E+07	2.2E+07	2.1E+07	2.0E+07	1.9E+07	1.7E+07	1.6E+07
Kr-88	7.9E+07	7.7E+07	7.5E+07	7.4E+07	7.2E+07	7.0E+07	6.8E+07	6.7E+07	6.5E+07	6.2E+07	6.2E+07
Rb-86	3.9E+04	3.8E+04	3.7E+04	3.6E+04	3.5E+04	3.4E+04	3.4E+04	3.3E+04	3.3E+04	3.2E+04	3.2E+04
Sr-89	1.3E+06	1.3E+06	1.2E+06	1.2E+06	1.2E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06
Sr-90	1.1E+05	1.1E+05	1.0E+05	1.0E+05	9.7E+04	9.5E+04	9.3E+04	9.2E+04	9.1E+04	8.9E+04	8.8E+04
Sr-91	1.5E+06	1.4E+06	1.4E+06	1.3E+06	1.3E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.1E+06	1.1E+06
Sr-92	1.0E+06	9.8E+05	9.3E+05	8.8E+05	8.4E+05	8.0E+05	7.6E+05	7.3E+05	7.0E+05	6.5E+05	6.5E+05
Y-90	2.3E+03	2.4E+03	2.4E+03	2.4E+03	2.5E+03	2.5E+03	2.6E+03	2.6E+03	2.7E+03	2.8E+03	2.9E+03
Y-91	1.7E+04	1.6E+04	1.6E+04	1.5E+04	1.5E+04	1.5E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04
Y-92	2.3E+05	2.3E+05	2.4E+05	2.5E+05	2.5E+05	2.6E+05	2.7E+05	2.7E+05	2.8E+05	2.9E+05	2.9E+05
Y-93	1.8E+04	1.7E+04	1.6E+04	1.6E+04	1.5E+04	1.5E+04	1.4E+04	1.4E+04	1.4E+04	1.3E+04	1.3E+04
Zr-95	2.1E+04	2.0E+04	2.0E+04	1.9E+04	1.9E+04	1.8E+04	1.8E+04	1.8E+04	1.7E+04	1.7E+04	1.7E+04
Zr-97	1.9E+04	1.9E+04	1.8E+04	1.7E+04	1.7E+04	1.6E+04	1.6E+04	1.6E+04	1.5E+04	1.5E+04	1.5E+04
Nb-95	2.1E+04	2.0E+04	2.0E+04	1.9E+04	1.9E+04	1.8E+04	1.8E+04	1.8E+04	1.7E+04	1.7E+04	1.7E+04
Mo-99	2.6E+05	2.5E+05	2.5E+05	2.4E+05	2.3E+05	2.3E+05	2.2E+05	2.2E+05	2.1E+05	2.1E+05	2.1E+05
Tc-99m	2.4E+05	2.3E+05	2.2E+05	2.1E+05	2.1E+05	2.0E+05	2.0E+05	2.0E+05	1.9E+05	1.9E+05	1.9E+05
Ru-103	2.1E+05	2.1E+05	2.0E+05	1.9E+05	1.9E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.7E+05	1.7E+05
Ru-105	1.0E+05	9.4E+04	9.0E+04	8.6E+04	8.3E+04	8.0E+04	7.7E+04	7.4E+04	7.2E+04	6.8E+04	6.8E+04
Ru-106	7.5E+04	7.2E+04	7.0E+04	6.8E+04	6.6E+04	6.5E+04	6.3E+04	6.2E+04	6.1E+04	6.0E+04	6.0E+04
Rh-105	1.3E+05	1.3E+05	1.2E+05	1.2E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.0E+05	1.0E+05
Sb-127	2.9E+05	2.8E+05	2.7E+05	2.6E+05	2.6E+05	2.5E+05	2.5E+05	2.4E+05	2.4E+05	2.3E+05	2.3E+05
Sb-129	6.3E+05	6.0E+05	5.7E+05	5.5E+05	5.2E+05	5.1E+05	4.9E+05	4.7E+05	4.6E+05	4.3E+05	4.3E+05
Te-127	2.9E+05	2.8E+05	2.7E+05	2.6E+05	2.6E+05	2.5E+05	2.5E+05	2.4E+05	2.4E+05	2.3E+05	2.3E+05
Te-127m	3.9E+04	3.7E+04	3.6E+04	3.5E+04	3.4E+04	3.3E+04	3.3E+04	3.2E+04	3.2E+04	3.1E+04	3.1E+04
Te-129	7.1E+05	6.8E+05	6.5E+05	6.2E+05	6.0E+05	5.8E+05	5.6E+05	5.5E+05	5.3E+05	5.1E+05	5.1E+05
Te-129m	1.3E+05	1.3E+05	1.2E+05	1.2E+05	1.2E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05
Te-131m	3.9E+05	3.7E+05	3.6E+05	3.5E+05	3.4E+05	3.3E+05	3.3E+05	3.2E+05	3.1E+05	3.1E+05	3.0E+05
Te-132	4.0E+06	3.8E+06	3.7E+06	3.6E+06	3.5E+06	3.4E+06	3.4E+06	3.3E+06	3.3E+06	3.2E+06	3.2E+06
I-131	2.4E+07	2.3E+07	2.3E+07	2.2E+07	2.2E+07	2.1E+07	2.1E+07	2.1E+07	2.0E+07	2.0E+07	2.0E+07
I-132	2.6E+07	2.5E+07	2.4E+07	2.2E+07	2.1E+07	2.0E+07	2.0E+07	1.9E+07	1.8E+07	1.7E+07	1.7E+07
I-133	4.7E+07	4.5E+07	4.4E+07	4.3E+07	4.2E+07	4.1E+07	4.0E+07	3.9E+07	3.9E+07	3.8E+07	3.8E+07
I-134	9.8E+06	8.8E+06	7.9E+06	7.2E+06	6.5E+06	5.9E+06	5.4E+06	4.9E+06	4.5E+06	3.7E+06	3.7E+06
I-135	3.7E+07	3.6E+07	3.4E+07	3.3E+07	3.2E+07	3.1E+07	3.1E+07	3.0E+07	2.9E+07	2.8E+07	2.8E+07
Xe-133	3.0E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08	3.0E+08
Xe-135	9.6E+07	9.6E+07	9.5E+07	9.4E+07	9.4E+07	9.3E+07	9.2E+07	9.2E+07	9.1E+07	9.0E+07	9.0E+07
Cs-134	3.9E+06	3.8E+06	3.7E+06	3.6E+06	3.5E+06	3.4E+06	3.4E+06	3.3E+06	3.3E+06	3.2E+06	3.2E+06
Cs-136	1.1E+06	1.0E+06	9.9E+05	9.7E+05	9.5E+05	9.3E+05	9.1E+05	9.0E+05	8.9E+05	8.7E+05	8.7E+05
Cs-137	2.2E+06	2.1E+06	2.1E+06	2.0E+06	2.0E+06	2.0E+06	1.9E+06	1.9E+06	1.9E+06	1.8E+06	1.8E+06
Ba-139	7.3E+05	6.7E+05	6.2E+05	5.7E+05	5.3E+05	4.9E+05	4.6E+05	4.3E+05	4.0E+05	3.6E+05	3.5E+05
Ba-140	2.1E+06	2.0E+06	2.0E+06	1.9E+06	1.9E+06	1.8E+06	1.8E+06	1.8E+06	1.7E+06	1.7E+06	1.7E+06
La-140	5.7E+04	5.8E+04	6.0E+04	6.1E+04	6.3E+04	6.5E+04	6.7E+04	6.9E+04	7.1E+04	7.5E+04	7.5E+04
La-141	1.4E+04	1.3E+04	1.2E+04	1.2E+04	1.1E+04	1.1E+04	1.0E+04	1.0E+04	9.8E+03	9.2E+03	9.1E+03
La-142	7.4E+03	6.8E+03	6.3E+03	5.8E+03	5.4E+03	5.1E+03	4.8E+03	4.5E+03	4.2E+03	3.8E+03	3.7E+03
Ce-141	5.0E+04	4.8E+04	4.6E+04	4.5E+04	4.4E+04	4.3E+04	4.2E+04	4.2E+04	4.1E+04	4.0E+04	4.0E+04
Ce-143	4.7E+04	4.5E+04	4.3E+04	4.2E+04	4.1E+04	4.0E+04	3.9E+04	3.8E+04	3.8E+04	3.7E+04	3.6E+04
Ce-144	3.8E+04	3.6E+04	3.5E+04	3.4E+04	3.3E+04	3.3E+04	3.2E+04	3.1E+04	3.1E+04	3.0E+04	3.0E+04
Pr-143	1.9E+04	1.8E+04	1.8E+04	1.7E+04	1.7E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.5E+04	1.5E+04
Nd-147	7.9E+03	7.6E+03	7.3E+03	7.1E+03	6.9E+03	6.8E+03	6.6E+03	6.5E+03	6.4E+03	6.3E+03	6.3E+03
Np-239	5.2E+05	5.0E+05	4.9E+05	4.7E+05	4.6E+05	4.5E+05	4.4E+05	4.3E+05	4.3E+05	4.2E+05	4.1E+05
Pu-238	1.5E+02	1.4E+02	1.4E+02	1.3E+02	1.3E+02	1.3E+02	1.3E+02	1.2E+02	1.2E+02	1.2E+02	1.2E+02
Pu-239	1.1E+01	1.1E+01	1.0E+01	1.0E+01	9.9E+00	9.7E+00	9.5E+00	9.3E+00	9.2E+00	9.0E+00	9.0E+00
Pu-240	1.8E+01	1.7E+01	1.6E+01	1.6E+01	1.6E+01	1.5E+01	1.5E+01	1.5E+01	1.4E+01	1.4E+01	1.4E+01
Pu-241	3.9E+03	3.7E+03	3.6E+03	3.5E+03	3.4E+03	3.4E+03	3.3E+03	3.2E+03	3.2E+03	3.1E+03	3.1E+03
Am-241	2.1E+00	2.0E+00	2.0E+00	1.9E+00	1.9E+00	1.8E+00	1.8E+00	1.8E+00	1.7E+00	1.7E+00	1.7E+00
Cm-242	5.2E+02	5.0E+02	4.8E+02	4.7E+02	4.6E+02	4.5E+02	4.4E+02	4.3E+02	4.3E+02	4.2E+02	4.2E+02
Cm-244	6.3E+01	6.1E+01	5.9E+01	5.7E+01	5.6E+01	5.5E+01	5.4E+01	5.3E+01	5.2E+01	5.1E+01	5.1E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 5 of 11)

DCD_
03.11-36

Nuclide	Time after LOCA (hr)										
	3.4	3.6	3.8	4	4.2	4.4	4.6	4.8	5	5.5	6
Co-60	3.5E+02	3.4E+02	3.4E+02	3.4E+02	3.4E+02	3.4E+02	3.4E+02	3.4E+02	3.4E+02	3.3E+02	3.3E+02
Kr-85	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Kr-85m	2.9E+07	2.8E+07	2.7E+07	2.6E+07	2.5E+07	2.4E+07	2.4E+07	2.3E+07	2.2E+07	2.1E+07	1.9E+07
Kr-87	1.5E+07	1.3E+07	1.2E+07	1.1E+07	9.7E+06	8.7E+06	7.8E+06	7.0E+06	6.3E+06	4.8E+06	3.6E+06
Kr-88	5.9E+07	5.6E+07	5.4E+07	5.1E+07	4.9E+07	4.6E+07	4.4E+07	4.2E+07	4.0E+07	3.5E+07	3.1E+07
Rb-86	3.2E+04	3.2E+04	3.2E+04	3.2E+04	3.2E+04	3.1E+04	3.1E+04	3.1E+04	3.1E+04	3.1E+04	3.1E+04
Sr-89	1.1E+06	1.1E+06	1.1E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06
Sr-90	8.8E+04	8.8E+04	8.7E+04	8.7E+04	8.7E+04	8.7E+04	8.6E+04	8.6E+04	8.6E+04	8.5E+04	8.5E+04
Sr-91	1.1E+06	1.1E+06	1.1E+06	1.0E+06	1.0E+06	1.0E+06	9.8E+05	9.7E+05	9.5E+05	9.1E+05	8.7E+05
Sr-92	6.2E+05	5.8E+05	5.5E+05	5.2E+05	5.0E+05	4.7E+05	4.4E+05	4.2E+05	4.0E+05	3.5E+05	3.1E+05
Y-90	3.0E+03	3.2E+03	3.4E+03	3.5E+03	3.7E+03	3.9E+03	4.0E+03	4.2E+03	4.4E+03	4.8E+03	5.2E+03
Y-91	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04
Y-92	3.0E+05	3.1E+05	3.2E+05	3.3E+05	3.3E+05	3.4E+05	3.4E+05	3.4E+05	3.4E+05	3.5E+05	3.4E+05
Y-93	1.3E+04	1.3E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.1E+04	1.1E+04	1.1E+04	1.0E+04
Zr-95	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.6E+04	1.6E+04	1.6E+04
Zr-97	1.5E+04	1.5E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.3E+04	1.3E+04	1.3E+04
Nb-95	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.7E+04	1.6E+04	1.6E+04
Mo-99	2.1E+05	2.1E+05	2.1E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05
Tc-99m	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05
Ru-103	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.6E+05
Ru-105	6.6E+04	6.4E+04	6.2E+04	6.0E+04	5.7E+04	5.6E+04	5.4E+04	5.2E+04	5.0E+04	4.6E+04	4.2E+04
Ru-106	6.0E+04	6.0E+04	5.9E+04	5.9E+04	5.9E+04	5.9E+04	5.9E+04	5.8E+04	5.8E+04	5.8E+04	5.8E+04
Rh-105	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	9.9E+04	9.8E+04	9.7E+04
Sb-127	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.2E+05	2.2E+05	2.2E+05	2.2E+05
Sb-129	4.2E+05	4.0E+05	3.9E+05	3.8E+05	3.6E+05	3.5E+05	3.4E+05	3.3E+05	3.2E+05	2.9E+05	2.7E+05
Te-127	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.3E+05	2.2E+05	2.2E+05
Te-127m	3.1E+04	3.1E+04	3.1E+04	3.1E+04	3.1E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04
Te-129	4.9E+05	4.8E+05	4.7E+05	4.5E+05	4.4E+05	4.3E+05	4.2E+05	4.1E+05	3.9E+05	3.7E+05	3.4E+05
Te-129m	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05
Te-131m	3.0E+05	3.0E+05	3.0E+05	3.0E+05	2.9E+05	2.9E+05	2.9E+05	2.9E+05	2.8E+05	2.8E+05	2.7E+05
Te-132	3.2E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06
I-131	2.0E+07	2.0E+07	2.0E+07	2.0E+07	2.0E+07	2.0E+07	2.0E+07	1.9E+07	1.9E+07	1.9E+07	1.9E+07
I-132	1.6E+07	1.5E+07	1.5E+07	1.4E+07	1.3E+07	1.3E+07	1.2E+07	1.1E+07	1.1E+07	9.8E+06	8.8E+06
I-133	3.8E+07	3.7E+07	3.7E+07	3.6E+07	3.6E+07	3.6E+07	3.6E+07	3.5E+07	3.5E+07	3.4E+07	3.3E+07
I-134	3.2E+06	2.7E+06	2.3E+06	2.0E+06	1.7E+06	1.4E+06	1.2E+06	1.0E+06	8.8E+05	5.9E+05	4.0E+05
I-135	2.7E+07	2.7E+07	2.6E+07	2.6E+07	2.5E+07	2.4E+07	2.4E+07	2.3E+07	2.3E+07	2.2E+07	2.0E+07
Xe-133	3.0E+08	3.0E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08
Xe-135	8.9E+07	8.7E+07	8.6E+07	8.5E+07	8.4E+07	8.2E+07	8.1E+07	8.0E+07	7.9E+07	7.6E+07	7.3E+07
Cs-134	3.2E+06	3.2E+06	3.2E+06	3.2E+06	3.2E+06	3.2E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06
Cs-136	8.7E+05	8.6E+05	8.6E+05	8.6E+05	8.5E+05	8.5E+05	8.5E+05	8.5E+05	8.4E+05	8.4E+05	8.4E+05
Cs-137	1.8E+06	1.8E+06	1.8E+06	1.8E+06	1.8E+06	1.8E+06	1.8E+06	1.8E+06	1.8E+06	1.8E+06	1.8E+06
Ba-139	3.2E+05	2.9E+05	2.6E+05	2.3E+05	2.1E+05	1.9E+05	1.7E+05	1.5E+05	1.4E+05	1.1E+05	8.3E+04
Ba-140	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06
La-140	8.0E+04	8.5E+04	9.0E+04	9.5E+04	1.0E+05	1.1E+05	1.1E+05	1.2E+05	1.2E+05	1.3E+05	1.4E+05
La-141	8.8E+03	8.5E+03	8.2E+03	7.9E+03	7.6E+03	7.3E+03	7.0E+03	6.8E+03	6.5E+03	5.9E+03	5.4E+03
La-142	3.4E+03	3.1E+03	2.9E+03	2.6E+03	2.4E+03	2.2E+03	2.0E+03	1.8E+03	1.6E+03	1.3E+03	1.0E+03
Ce-141	4.0E+04	4.0E+04	4.0E+04	3.9E+04	3.9E+04	3.9E+04	3.9E+04	3.9E+04	3.9E+04	3.9E+04	3.8E+04
Ce-143	3.6E+04	3.6E+04	3.6E+04	3.5E+04	3.5E+04	3.5E+04	3.5E+04	3.4E+04	3.4E+04	3.4E+04	3.3E+04
Ce-144	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04
Pr-143	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04
Nd-147	6.3E+03	6.2E+03	6.2E+03	6.2E+03	6.2E+03	6.1E+03	6.1E+03	6.1E+03	6.1E+03	6.0E+03	6.0E+03
Np-239	4.1E+05	4.1E+05	4.1E+05	4.0E+05	4.0E+05	4.0E+05	4.0E+05	4.0E+05	3.9E+05	3.9E+05	3.9E+05
Pu-238	1.2E+02	1.2E+02	1.2E+02	1.2E+02	1.2E+02	1.2E+02	1.2E+02	1.2E+02	1.2E+02	1.1E+02	1.1E+02
Pu-239	9.0E+00	8.9E+00	8.9E+00	8.9E+00	8.8E+00	8.8E+00	8.8E+00	8.8E+00	8.7E+00	8.7E+00	8.6E+00
Pu-240	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01
Pu-241	3.1E+03	3.1E+03	3.1E+03	3.1E+03	3.1E+03	3.1E+03	3.0E+03	3.0E+03	3.0E+03	3.0E+03	3.0E+03
Am-241	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00
Cm-242	4.2E+02	4.1E+02	4.1E+02	4.1E+02	4.1E+02	4.1E+02	4.1E+02	4.1E+02	4.1E+02	4.0E+02	4.0E+02
Cm-244	5.1E+01	5.0E+01	5.0E+01	5.0E+01	5.0E+01	5.0E+01	5.0E+01	4.9E+01	4.9E+01	4.9E+01	4.9E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 6 of 11)

DCD_
03.11-36

Nuclide	Time after LOCA (hr)										
	6.5	7	7.5	8	8.8	9	9.5	10	11	12	13
Co-60	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02
Kr-85	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Kr-85m	1.8E+07	1.6E+07	1.5E+07	1.4E+07	1.2E+07	1.2E+07	1.1E+07	1.0E+07	8.8E+06	7.5E+06	6.5E+06
Kr-87	2.8E+06	2.1E+06	1.6E+06	1.2E+06	7.9E+05	7.1E+05	5.4E+05	4.1E+05	2.4E+05	1.4E+05	8.0E+04
Kr-88	2.8E+07	2.5E+07	2.2E+07	1.9E+07	1.6E+07	1.5E+07	1.3E+07	1.2E+07	9.2E+06	7.2E+06	5.7E+06
Rb-86	3.1E+04	3.1E+04	3.1E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04
Sr-89	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06
Sr-90	8.5E+04	8.4E+04	8.4E+04	8.4E+04	8.4E+04	8.4E+04	8.4E+04	8.4E+04	8.3E+04	8.3E+04	8.3E+04
Sr-91	8.4E+05	8.1E+05	7.8E+05	7.5E+05	7.0E+05	6.9E+05	6.7E+05	6.4E+05	6.0E+05	5.5E+05	5.1E+05
Sr-92	2.7E+05	2.4E+05	2.1E+05	1.8E+05	1.5E+05	1.4E+05	1.2E+05	1.1E+05	8.4E+04	6.5E+04	5.0E+04
Y-90	5.6E+03	6.0E+03	6.4E+03	6.8E+03	7.5E+03	7.6E+03	8.0E+03	8.4E+03	9.2E+03	1.0E+04	1.1E+04
Y-91	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04
Y-92	3.4E+05	3.3E+05	3.2E+05	3.0E+05	2.8E+05	2.8E+05	2.6E+05	2.5E+05	2.2E+05	2.0E+05	1.7E+05
Y-93	1.0E+04	9.7E+03	9.3E+03	9.0E+03	8.5E+03	8.4E+03	8.1E+03	7.8E+03	7.3E+03	6.8E+03	6.3E+03
Zr-95	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04
Zr-97	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.1E+04	1.1E+04	1.1E+04	1.1E+04	1.0E+04	9.8E+03	9.4E+03
Nb-95	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04
Mo-99	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05
Tc-99m	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05
Ru-103	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05
Ru-105	3.9E+04	3.6E+04	3.3E+04	3.1E+04	2.7E+04	2.6E+04	2.4E+04	2.2E+04	1.9E+04	1.6E+04	1.4E+04
Ru-106	5.7E+04	5.7E+04	5.7E+04	5.7E+04	5.7E+04	5.7E+04	5.7E+04	5.7E+04	5.7E+04	5.7E+04	5.6E+04
Rh-105	9.6E+04	9.5E+04	9.5E+04	9.4E+04	9.3E+04	9.2E+04	9.2E+04	9.1E+04	8.9E+04	8.8E+04	8.6E+04
Sb-127	2.2E+05	2.2E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05	2.0E+05
Sb-129	2.4E+05	2.2E+05	2.1E+05	1.9E+05	1.7E+05	1.6E+05	1.5E+05	1.4E+05	1.2E+05	9.9E+04	8.5E+04
Te-127	2.2E+05	2.2E+05	2.2E+05	2.2E+05	2.2E+05	2.2E+05	2.2E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05
Te-127m	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04
Te-129	3.2E+05	3.0E+05	2.8E+05	2.7E+05	2.4E+05	2.4E+05	2.2E+05	2.1E+05	1.9E+05	1.7E+05	1.5E+05
Te-129m	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05
Te-131m	2.7E+05	2.7E+05	2.6E+05	2.6E+05	2.5E+05	2.5E+05	2.5E+05	2.5E+05	2.4E+05	2.3E+05	2.3E+05
Te-132	3.0E+06	2.9E+06	2.9E+06	2.9E+06	2.9E+06	2.9E+06	2.8E+06	2.8E+06	2.8E+06	2.8E+06	2.7E+06
I-131	1.9E+07	1.9E+07	1.9E+07	1.9E+07	1.9E+07	1.9E+07	1.9E+07	1.9E+07	1.9E+07	1.8E+07	1.8E+07
I-132	8.0E+06	7.3E+06	6.7E+06	6.1E+06	5.4E+06	5.3E+06	4.9E+06	4.6E+06	4.2E+06	3.8E+06	3.5E+06
I-133	3.3E+07	3.2E+07	3.2E+07	3.1E+07	3.0E+07	3.0E+07	2.9E+07	2.9E+07	2.8E+07	2.7E+07	2.6E+07
I-134	2.7E+05	1.8E+05	1.2E+05	8.1E+04	4.3E+04	3.7E+04	2.5E+04	1.7E+04	7.5E+03	3.4E+03	1.5E+03
I-135	1.9E+07	1.8E+07	1.7E+07	1.6E+07	1.5E+07	1.5E+07	1.4E+07	1.3E+07	1.2E+07	1.1E+07	9.6E+06
Xe-133	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.9E+08	2.8E+08	2.8E+08	2.8E+08
Xe-135	7.1E+07	6.8E+07	6.6E+07	6.3E+07	6.0E+07	5.9E+07	5.7E+07	5.5E+07	5.1E+07	4.7E+07	4.4E+07
Cs-134	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06	3.1E+06
Cs-136	8.3E+05	8.3E+05	8.3E+05	8.2E+05	8.2E+05	8.2E+05	8.2E+05	8.2E+05	8.1E+05	8.1E+05	8.1E+05
Cs-137	1.8E+06	1.8E+06	1.8E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Ba-139	6.5E+04	5.0E+04	3.9E+04	3.0E+04	2.0E+04	1.8E+04	1.4E+04	1.1E+04	6.6E+03	4.0E+03	2.4E+03
Ba-140	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06	1.6E+06
La-140	1.6E+05	1.7E+05	1.8E+05	1.9E+05	2.1E+05	2.1E+05	2.3E+05	2.4E+05	2.6E+05	2.8E+05	3.0E+05
La-141	4.9E+03	4.5E+03	4.1E+03	3.8E+03	3.2E+03	3.1E+03	2.9E+03	2.6E+03	2.2E+03	1.8E+03	1.5E+03
La-142	8.2E+02	6.5E+02	5.2E+02	4.1E+02	2.9E+02	2.6E+02	2.1E+02	1.7E+02	1.1E+02	6.8E+01	4.3E+01
Ce-141	3.8E+04	3.8E+04	3.8E+04	3.8E+04	3.8E+04	3.8E+04	3.8E+04	3.8E+04	3.8E+04	3.7E+04	3.7E+04
Ce-143	3.3E+04	3.2E+04	3.2E+04	3.1E+04	3.1E+04	3.1E+04	3.0E+04	3.0E+04	2.9E+04	2.9E+04	2.8E+04
Ce-144	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.8E+04
Pr-143	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04
Nd-147	6.0E+03	5.9E+03	5.9E+03	5.9E+03	5.9E+03	5.9E+03	5.8E+03	5.8E+03	5.8E+03	5.8E+03	5.8E+03
Np-239	3.8E+05	3.8E+05	3.7E+05	3.7E+05	3.7E+05	3.7E+05	3.6E+05	3.6E+05	3.6E+05	3.5E+05	3.5E+05
Pu-238	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02
Pu-239	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00
Pu-240	1.4E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01
Pu-241	3.0E+03	3.0E+03	3.0E+03	3.0E+03	3.0E+03	3.0E+03	3.0E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03
Am-241	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00
Cm-242	4.0E+02	4.0E+02	4.0E+02	4.0E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02
Cm-244	4.9E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 7 of 11)

DCD_
03.11-36

Nuclide	Time after LOCA (hr)										
	14	15	16	17	18	19	20	21	22	23	24
Co-60	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02
Kr-85	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Kr-85m	5.5E+06	4.7E+06	4.1E+06	3.5E+06	3.0E+06	2.6E+06	2.2E+06	1.9E+06	1.6E+06	1.4E+06	1.2E+06
Kr-87	4.7E+04	2.7E+04	1.6E+04	9.1E+03	5.3E+03	3.0E+03	1.8E+03	1.0E+03	5.9E+02	3.4E+02	2.0E+02
Kr-88	4.4E+06	3.5E+06	2.7E+06	2.1E+06	1.7E+06	1.3E+06	1.0E+06	8.0E+05	6.3E+05	4.9E+05	3.9E+05
Rb-86	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	3.0E+04	2.9E+04
Sr-89	1.0E+06	1.0E+06	1.0E+06	9.9E+05	9.9E+05	9.9E+05	9.9E+05	9.9E+05	9.9E+05	9.9E+05	9.9E+05
Sr-90	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04
Sr-91	4.8E+05	4.4E+05	4.1E+05	3.8E+05	3.6E+05	3.3E+05	3.1E+05	2.9E+05	2.7E+05	2.5E+05	2.3E+05
Sr-92	3.9E+04	3.0E+04	2.3E+04	1.8E+04	1.4E+04	1.1E+04	8.3E+03	6.5E+03	5.0E+03	3.9E+03	3.0E+03
Y-90	1.2E+04	1.2E+04	1.3E+04	1.4E+04	1.5E+04	1.5E+04	1.6E+04	1.7E+04	1.8E+04	1.8E+04	1.9E+04
Y-91	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04
Y-92	1.5E+05	1.3E+05	1.1E+05	9.4E+04	8.0E+04	6.8E+04	5.8E+04	4.9E+04	4.1E+04	3.4E+04	2.9E+04
Y-93	5.9E+03	5.5E+03	5.1E+03	4.8E+03	4.5E+03	4.2E+03	3.9E+03	3.6E+03	3.4E+03	3.2E+03	3.0E+03
Zr-95	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04
Zr-97	9.0E+03	8.6E+03	8.3E+03	7.9E+03	7.6E+03	7.3E+03	7.0E+03	6.7E+03	6.5E+03	6.2E+03	6.0E+03
Nb-95	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04
Mo-99	1.8E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.7E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05
Tc-99m	1.7E+05	1.7E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.5E+05	1.5E+05
Ru-103	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05
Ru-105	1.2E+04	1.0E+04	8.7E+03	7.5E+03	6.4E+03	5.5E+03	4.7E+03	4.0E+03	3.4E+03	2.9E+03	2.5E+03
Ru-106	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04
Rh-105	8.5E+04	8.3E+04	8.2E+04	8.1E+04	7.9E+04	7.8E+04	7.6E+04	7.5E+04	7.3E+04	7.2E+04	7.1E+04
Sb-127	2.0E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05
Sb-129	7.2E+04	6.1E+04	5.2E+04	4.5E+04	3.8E+04	3.2E+04	2.8E+04	2.3E+04	2.0E+04	1.7E+04	1.4E+04
Te-127	2.1E+05	2.1E+05	2.1E+05	2.1E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05
Te-127m	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04
Te-129	1.4E+05	1.3E+05	1.2E+05	1.1E+05	1.1E+05	9.9E+04	9.4E+04	9.0E+04	8.6E+04	8.3E+04	8.0E+04
Te-129m	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	9.9E+04	9.9E+04	9.9E+04	9.9E+04	9.9E+04	9.9E+04
Te-131m	2.2E+05	2.2E+05	2.1E+05	2.1E+05	2.0E+05	2.0E+05	1.9E+05	1.9E+05	1.9E+05	1.8E+05	1.8E+05
Te-132	2.7E+06	2.7E+06	2.7E+06	2.6E+06	2.6E+06	2.6E+06	2.6E+06	2.6E+06	2.5E+06	2.5E+06	2.5E+06
I-131	1.8E+07	1.8E+07	1.8E+07	1.8E+07	1.8E+07	1.8E+07	1.8E+07	1.8E+07	1.8E+07	1.8E+07	1.8E+07
I-132	3.3E+06	3.2E+06	3.0E+06	2.9E+06	2.9E+06	2.8E+06	2.7E+06	2.7E+06	2.7E+06	2.6E+06	2.6E+06
I-133	2.5E+07	2.4E+07	2.4E+07	2.3E+07	2.2E+07	2.1E+07	2.1E+07	2.0E+07	1.9E+07	1.9E+07	1.8E+07
I-134	7.0E+02	3.2E+02	1.4E+02	6.5E+01	3.0E+01	1.3E+01	6.1E+00	2.8E+00	1.3E+00	5.7E-01	2.6E-01
I-135	8.6E+06	7.8E+06	7.0E+06	6.3E+06	5.7E+06	5.1E+06	4.6E+06	4.1E+06	3.7E+06	3.4E+06	3.0E+06
Xe-133	2.8E+08	2.8E+08	2.8E+08	2.7E+08	2.7E+08	2.7E+08	2.7E+08	2.7E+08	2.7E+08	2.7E+08	2.6E+08
Xe-135	4.1E+07	3.8E+07	3.5E+07	3.3E+07	3.0E+07	2.8E+07	2.6E+07	2.4E+07	2.2E+07	2.1E+07	1.9E+07
Cs-134	3.1E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06
Cs-136	8.1E+05	8.0E+05	8.0E+05	8.0E+05	8.0E+05	8.0E+05	7.9E+05	7.9E+05	7.9E+05	7.9E+05	7.9E+05
Cs-137	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Ba-139	1.5E+03	8.8E+02	5.4E+02	3.2E+02	2.0E+02	1.2E+02	7.2E+01	4.3E+01	2.6E+01	1.6E+01	9.6E+00
Ba-140	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06
La-140	3.2E+05	3.4E+05	3.7E+05	3.9E+05	4.0E+05	4.2E+05	4.4E+05	4.6E+05	4.8E+05	5.0E+05	5.1E+05
La-141	1.3E+03	1.1E+03	9.1E+02	7.6E+02	6.4E+02	5.3E+02	4.5E+02	3.8E+02	3.1E+02	2.6E+02	2.2E+02
La-142	2.8E+01	1.8E+01	1.1E+01	7.2E+00	4.6E+00	2.9E+00	1.9E+00	1.2E+00	7.6E-01	4.8E-01	3.1E-01
Ce-141	3.7E+04	3.7E+04	3.7E+04	3.7E+04	3.7E+04	3.7E+04	3.7E+04	3.7E+04	3.7E+04	3.7E+04	3.7E+04
Ce-143	2.7E+04	2.7E+04	2.6E+04	2.6E+04	2.5E+04	2.5E+04	2.4E+04	2.4E+04	2.3E+04	2.3E+04	2.2E+04
Ce-144	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04
Pr-143	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04
Nd-147	5.8E+03	5.7E+03	5.7E+03	5.7E+03	5.7E+03	5.7E+03	5.7E+03	5.6E+03	5.6E+03	5.6E+03	5.6E+03
Np-239	3.4E+05	3.4E+05	3.3E+05	3.3E+05	3.3E+05	3.2E+05	3.2E+05	3.1E+05	3.1E+05	3.1E+05	3.0E+05
Pu-238	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02
Pu-239	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00
Pu-240	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01
Pu-241	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03
Am-241	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00
Cm-242	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02
Cm-244	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 8 of 11)

Nuclide	Time after LOCA (hr)										
	26	28	30	35	40	48	50	60	70	80	96
Co-60	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02
Kr-85	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Kr-85m	8.6E+05	6.3E+05	4.7E+05	2.1E+05	9.9E+04	2.9E+04	2.1E+04	4.5E+03	9.6E+02	2.0E+02	1.7E+01
Kr-87	6.7E+01	2.3E+01	7.6E+00	5.0E-01	3.3E-02	4.2E-04	1.4E-04	6.0E-07	2.6E-09	0.0E+00	0.0E+00
Kr-88	2.4E+05	1.5E+05	8.9E+04	2.6E+04	7.8E+03	1.1E+03	6.8E+02	5.9E+01	5.1E+00	4.5E-01	9.0E-03
Rb-86	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.8E+04	2.8E+04	2.8E+04	2.7E+04	2.7E+04	2.6E+04
Sr-89	9.9E+05	9.9E+05	9.9E+05	9.8E+05	9.8E+05	9.8E+05	9.8E+05	9.7E+05	9.6E+05	9.6E+05	9.5E+05
Sr-90	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04
Sr-91	2.0E+05	1.7E+05	1.5E+05	1.0E+05	7.2E+04	4.0E+04	3.5E+04	1.7E+04	8.0E+03	3.9E+03	1.2E+03
Sr-92	1.8E+03	1.1E+03	6.5E+02	1.8E+02	5.0E+01	6.5E+00	3.9E+00	3.0E-01	2.3E-02	1.8E-03	3.0E-05
Y-90	2.0E+04	2.2E+04	2.3E+04	2.6E+04	2.9E+04	3.4E+04	3.5E+04	4.0E+04	4.4E+04	4.8E+04	5.4E+04
Y-91	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.5E+04	1.5E+04	1.5E+04
Y-92	2.0E+04	1.4E+04	9.9E+03	3.9E+03	1.5E+03	3.3E+02	2.3E+02	3.3E+01	4.7E+00	6.7E-01	2.9E-02
Y-93	2.6E+03	2.3E+03	2.0E+03	1.4E+03	9.9E+02	5.7E+02	5.0E+02	2.5E+02	1.3E+02	6.4E+01	2.1E+01
Zr-95	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.5E+04	1.5E+04	1.5E+04
Zr-97	5.5E+03	5.1E+03	4.7E+03	3.8E+03	3.1E+03	2.2E+03	2.1E+03	1.4E+03	9.0E+02	6.0E+02	3.1E+02
Nb-95	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04
Mo-99	1.5E+05	1.5E+05	1.5E+05	1.4E+05	1.3E+05	1.2E+05	1.2E+05	1.1E+05	9.8E+04	8.8E+04	7.4E+04
Tc-99m	1.5E+05	1.5E+05	1.4E+05	1.4E+05	1.3E+05	1.2E+05	1.2E+05	1.1E+05	9.5E+04	8.6E+04	7.2E+04
Ru-103	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.6E+05	1.5E+05	1.5E+05	1.5E+05	1.5E+05
Ru-105	1.8E+03	1.3E+03	9.8E+02	4.5E+02	2.1E+02	5.9E+01	4.3E+01	9.1E+00	1.9E+00	4.0E-01	3.3E-02
Ru-106	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04
Rh-105	6.8E+04	6.6E+04	6.3E+04	5.7E+04	5.2E+04	4.4E+04	4.3E+04	3.5E+04	2.9E+04	2.4E+04	1.7E+04
Sb-127	1.8E+05	1.8E+05	1.8E+05	1.7E+05	1.7E+05	1.6E+05	1.5E+05	1.4E+05	1.3E+05	1.2E+05	1.1E+05
Sb-129	1.1E+04	7.6E+03	5.5E+03	2.5E+03	1.1E+03	3.1E+02	2.2E+02	4.5E+01	9.0E+00	1.8E+00	1.4E-01
Te-127	2.0E+05	1.9E+05	1.9E+05	1.9E+05	1.8E+05	1.7E+05	1.7E+05	1.6E+05	1.5E+05	1.4E+05	1.3E+05
Te-127m	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04
Te-129	7.7E+04	7.4E+04	7.2E+04	6.8E+04	6.7E+04	6.5E+04	6.5E+04	6.4E+04	6.4E+04	6.3E+04	6.2E+04
Te-129m	9.9E+04	9.9E+04	9.9E+04	9.8E+04	9.8E+04	9.7E+04	9.7E+04	9.6E+04	9.5E+04	9.4E+04	9.3E+04
Te-131m	1.7E+05	1.6E+05	1.5E+05	1.4E+05	1.2E+05	1.0E+05	9.7E+04	7.7E+04	6.1E+04	4.9E+04	3.4E+04
Te-132	2.4E+06	2.4E+06	2.4E+06	2.3E+06	2.2E+06	2.0E+06	2.0E+06	1.8E+06	1.7E+06	1.5E+06	1.3E+06
I-131	1.8E+07	1.7E+07	1.7E+07	1.7E+07	1.7E+07	1.6E+07	1.6E+07	1.6E+07	1.5E+07	1.4E+07	1.4E+07
I-132	2.5E+06	2.5E+06	2.5E+06	2.4E+06	2.3E+06	2.1E+06	2.1E+06	1.9E+06	1.7E+06	1.6E+06	1.4E+06
I-133	1.7E+07	1.6E+07	1.5E+07	1.3E+07	1.1E+07	8.1E+06	7.6E+06	5.4E+06	3.9E+06	2.8E+06	1.6E+06
I-134	5.3E-02	1.1E-02	2.2E-03	4.3E-05	8.2E-07	1.4E-09	2.7E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-135	2.5E+06	2.0E+06	1.6E+06	9.6E+05	5.7E+05	2.4E+05	2.0E+05	6.9E+04	2.4E+04	8.5E+03	1.6E+03
Xe-133	2.6E+08	2.6E+08	2.6E+08	2.5E+08	2.4E+08	2.3E+08	2.3E+08	2.2E+08	2.1E+08	1.9E+08	1.8E+08
Xe-135	1.7E+07	1.4E+07	1.2E+07	8.5E+06	5.8E+06	3.2E+06	2.7E+06	1.3E+06	6.0E+05	2.8E+05	8.3E+04
Cs-134	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06
Cs-136	7.8E+05	7.8E+05	7.8E+05	7.7E+05	7.6E+05	7.5E+05	7.4E+05	7.3E+05	7.1E+05	7.0E+05	6.7E+05
Cs-137	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Ba-139	3.5E+00	1.3E+00	4.7E-01	3.8E-02	3.1E-03	5.5E-05	2.0E-05	1.3E-07	8.6E-10	0.0E+00	0.0E+00
Ba-140	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.4E+06	1.4E+06	1.4E+06	1.4E+06	1.3E+06	1.3E+06
La-140	5.5E+05	5.8E+05	6.1E+05	6.8E+05	7.5E+05	8.4E+05	8.6E+05	9.4E+05	1.0E+06	1.1E+06	1.1E+06
La-141	1.6E+02	1.1E+02	7.7E+01	3.2E+01	1.3E+01	3.2E+00	2.3E+00	3.9E-01	6.6E-02	1.1E-02	6.7E-04
La-142	1.3E-01	5.1E-02	2.1E-02	2.2E-03	2.3E-04	6.4E-06	2.6E-06	2.9E-08	3.2E-10	0.0E+00	0.0E+00
Ce-141	3.7E+04	3.7E+04	3.7E+04	3.7E+04	3.6E+04	3.6E+04	3.6E+04	3.6E+04	3.6E+04	3.5E+04	3.5E+04
Ce-143	2.1E+04	2.0E+04	2.0E+04	1.8E+04	1.6E+04	1.3E+04	1.3E+04	1.0E+04	8.5E+03	6.9E+03	4.9E+03
Ce-144	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04
Pr-143	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.4E+04
Nd-147	5.6E+03	5.5E+03	5.5E+03	5.4E+03	5.4E+03	5.3E+03	5.2E+03	5.1E+03	5.0E+03	4.8E+03	4.6E+03
Np-239	3.0E+05	2.9E+05	2.8E+05	2.6E+05	2.5E+05	2.3E+05	2.2E+05	1.9E+05	1.7E+05	1.5E+05	1.3E+05
Pu-238	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02
Pu-239	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00	8.5E+00
Pu-240	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01
Pu-241	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03
Am-241	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00	1.6E+00
Cm-242	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02	3.9E+02
Cm-244	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 9 of 11)

DCD_
03.11-36

Nuclide	Time after LOCA (hr)										
	100	120	150	160	170	180	200	240	264	288	300
Co-60	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.3E+02	3.2E+02	3.2E+02	3.2E+02	3.2E+02
Kr-85	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Kr-85m	9.2E+00	4.2E-01	4.0E-03	8.6E-04	1.8E-04	3.9E-05	1.8E-06	3.6E-09	8.8E-11	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	3.4E-03	2.6E-05	1.7E-08	1.5E-09	1.3E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	2.6E+04	2.5E+04	2.4E+04	2.4E+04	2.4E+04	2.3E+04	2.2E+04	2.1E+04	2.0E+04	2.0E+04	1.9E+04
Sr-89	9.5E+05	9.4E+05	9.2E+05	9.2E+05	9.1E+05	9.1E+05	9.0E+05	8.8E+05	8.6E+05	8.5E+05	8.5E+05
Sr-90	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04
Sr-91	9.0E+02	2.1E+02	2.3E+01	1.1E+01	5.4E+00	2.6E+00	6.1E-01	3.3E-02	5.7E-03	9.9E-04	4.1E-04
Sr-92	1.1E-05	6.5E-08	3.0E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-90	5.5E+04	6.0E+04	6.7E+04	6.8E+04	7.0E+04	7.1E+04	7.4E+04	7.7E+04	7.8E+04	8.0E+04	8.0E+04
Y-91	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04
Y-92	1.3E-02	2.7E-04	7.5E-07	1.1E-07	1.5E-08	2.1E-09	4.2E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-93	1.6E+01	4.1E+00	5.2E-01	2.6E-01	1.3E-01	6.6E-02	1.7E-02	1.1E-03	2.1E-04	4.0E-05	1.8E-05
Zr-95	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04
Zr-97	2.6E+02	1.2E+02	3.4E+01	2.3E+01	1.5E+01	9.9E+00	4.4E+00	8.5E-01	3.2E-01	1.2E-01	7.2E-02
Nb-95	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.6E+04
Mo-99	7.1E+04	5.8E+04	4.2E+04	3.8E+04	3.4E+04	3.1E+04	2.5E+04	1.6E+04	1.3E+04	9.9E+03	8.7E+03
Tc-99m	6.9E+04	5.6E+04	4.1E+04	3.7E+04	3.3E+04	3.0E+04	2.4E+04	1.6E+04	1.2E+04	9.6E+03	8.5E+03
Ru-103	1.5E+05	1.5E+05	1.4E+05	1.4E+05	1.4E+05	1.4E+05	1.4E+05	1.4E+05	1.3E+05	1.3E+05	1.3E+05
Ru-105	1.8E-02	7.8E-04	7.2E-06	1.5E-06	3.2E-07	6.6E-08	2.9E-09	5.7E-12	0.0E+00	0.0E+00	0.0E+00
Ru-106	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.6E+04	5.5E+04	5.5E+04	5.5E+04	5.5E+04
Rh-105	1.6E+04	1.1E+04	6.0E+03	4.9E+03	4.1E+03	3.3E+03	2.3E+03	1.0E+03	6.4E+02	4.0E+02	3.2E+02
Sb-127	1.1E+05	9.1E+04	7.3E+04	6.8E+04	6.3E+04	5.8E+04	5.0E+04	3.7E+04	3.1E+04	2.6E+04	2.4E+04
Sb-129	7.3E-02	3.0E-03	2.4E-05	4.8E-06	9.7E-07	2.0E-07	7.9E-09	1.3E-11	0.0E+00	0.0E+00	0.0E+00
Te-127	1.3E+05	1.1E+05	9.5E+04	9.1E+04	8.6E+04	8.2E+04	7.4E+04	6.2E+04	5.6E+04	5.2E+04	5.0E+04
Te-127m	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.9E+04	2.8E+04	2.8E+04	2.8E+04
Te-129	6.2E+04	6.1E+04	6.0E+04	5.9E+04	5.9E+04	5.8E+04	5.7E+04	5.5E+04	5.4E+04	5.3E+04	5.2E+04
Te-129m	9.3E+04	9.1E+04	8.9E+04	8.8E+04	8.7E+04	8.7E+04	8.5E+04	8.2E+04	8.1E+04	7.9E+04	7.8E+04
Te-131m	3.1E+04	1.9E+04	9.7E+03	7.7E+03	6.1E+03	4.8E+03	3.0E+03	1.2E+03	6.9E+02	4.0E+02	3.0E+02
Te-132	1.3E+06	1.1E+06	8.1E+05	7.4E+05	6.8E+05	6.2E+05	5.2E+05	3.7E+05	3.0E+05	2.4E+05	2.2E+05
I-131	1.3E+07	1.3E+07	1.1E+07	1.1E+07	1.0E+07	1.0E+07	9.4E+06	8.2E+06	7.5E+06	6.9E+06	6.6E+06
I-132	1.3E+06	1.1E+06	8.5E+05	7.8E+05	7.1E+05	6.5E+05	5.5E+05	3.8E+05	3.1E+05	2.5E+05	2.2E+05
I-133	1.4E+06	7.4E+05	2.7E+05	1.9E+05	1.4E+05	1.0E+05	5.1E+04	1.4E+04	6.1E+03	2.7E+03	1.8E+03
I-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-135	1.0E+03	1.3E+02	5.5E+00	1.9E+00	6.8E-01	2.4E-01	2.9E-02	4.4E-04	3.6E-05	2.9E-06	8.2E-07
Xe-133	1.7E+08	1.6E+08	1.3E+08	1.3E+08	1.2E+08	1.1E+08	1.0E+08	8.1E+07	7.1E+07	6.2E+07	5.8E+07
Xe-135	6.1E+04	1.3E+04	1.4E+03	6.4E+02	3.0E+02	1.4E+02	3.0E+01	1.4E+00	2.3E-01	3.7E-02	1.5E-02
Cs-134	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06
Cs-136	6.7E+05	6.4E+05	6.0E+05	5.8E+05	5.7E+05	5.6E+05	5.3E+05	4.9E+05	4.6E+05	4.4E+05	4.3E+05
Cs-137	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-140	1.3E+06	1.2E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.0E+06	9.3E+05	8.8E+05	8.3E+05	8.1E+05
La-140	1.1E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.1E+06	1.1E+06	1.0E+06	9.9E+05	9.4E+05	9.2E+05
La-141	3.3E-04	9.8E-06	4.9E-08	8.5E-09	1.4E-09	2.5E-10	7.3E-12	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-141	3.5E+04	3.4E+04	3.3E+04	3.3E+04	3.3E+04	3.2E+04	3.2E+04	3.1E+04	3.0E+04	2.9E+04	2.9E+04
Ce-143	4.5E+03	3.0E+03	1.6E+03	1.3E+03	1.0E+03	8.4E+02	5.5E+02	2.4E+02	1.4E+02	8.7E+01	6.7E+01
Ce-144	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.8E+04
Pr-143	1.4E+04	1.4E+04	1.3E+04	1.3E+04	1.3E+04	1.2E+04	1.2E+04	1.1E+04	1.0E+04	9.9E+03	9.7E+03
Nd-147	4.6E+03	4.3E+03	4.0E+03	3.9E+03	3.8E+03	3.7E+03	3.5E+03	3.2E+03	3.0E+03	2.8E+03	2.7E+03
Np-239	1.2E+05	9.3E+04	6.4E+04	5.7E+04	5.0E+04	4.5E+04	3.5E+04	2.1E+04	1.6E+04	1.2E+04	1.0E+04
Pu-238	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02
Pu-239	8.5E+00	8.5E+00	8.5E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00
Pu-240	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01
Pu-241	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03
Am-241	1.6E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00
Cm-242	3.9E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.7E+02	3.7E+02	3.7E+02
Cm-244	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 10 of 11)

DCD_
03.11-36

Nuclide	Time after LOCA (hr)										
	312	336	360	400	480	500	600	700	720	960	1200
Co-60	3.2E+02	3.2E+02	3.2E+02	3.2E+02	3.2E+02	3.2E+02	3.2E+02	3.2E+02	0.0E+00	0.0E+00	0.0E+00
Kr-85	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	1.9E+04	1.8E+04	1.8E+04	1.6E+04	1.5E+04	1.4E+04	1.2E+04	1.0E+04	0.0E+00	0.0E+00	0.0E+00
Sr-89	8.4E+05	8.3E+05	8.2E+05	8.0E+05	7.6E+05	7.5E+05	7.1E+05	6.7E+05	0.0E+00	0.0E+00	0.0E+00
Sr-90	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	0.0E+00	0.0E+00	0.0E+00
Sr-91	1.7E-04	3.0E-05	5.2E-06	2.8E-07	8.2E-10	1.9E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-90	8.0E+04	8.1E+04	8.1E+04	8.2E+04	8.3E+04	8.3E+04	8.3E+04	8.3E+04	0.0E+00	0.0E+00	0.0E+00
Y-91	1.4E+04	1.4E+04	1.3E+04	1.3E+04	1.3E+04	1.3E+04	1.2E+04	1.1E+04	0.0E+00	0.0E+00	0.0E+00
Y-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-93	7.7E-06	1.5E-06	2.9E-07	1.8E-08	7.6E-11	1.9E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-95	1.4E+04	1.4E+04	1.4E+04	1.3E+04	1.3E+04	1.3E+04	1.2E+04	1.2E+04	0.0E+00	0.0E+00	0.0E+00
Zr-97	4.4E-02	1.7E-02	6.2E-03	1.2E-03	4.5E-05	2.0E-05	3.3E-07	5.4E-09	0.0E+00	0.0E+00	0.0E+00
Nb-95	1.6E+04	1.6E+04	1.6E+04	1.6E+04	1.5E+04	1.5E+04	1.5E+04	1.5E+04	0.0E+00	0.0E+00	0.0E+00
Mo-99	7.7E+03	6.0E+03	4.6E+03	3.1E+03	1.3E+03	1.1E+03	3.7E+02	1.3E+02	0.0E+00	0.0E+00	0.0E+00
Tc-99m	7.5E+03	5.8E+03	4.5E+03	3.0E+03	1.3E+03	1.0E+03	3.6E+02	1.3E+02	0.0E+00	0.0E+00	0.0E+00
Ru-103	1.3E+05	1.3E+05	1.2E+05	1.2E+05	1.1E+05	1.1E+05	1.0E+05	9.7E+04	0.0E+00	0.0E+00	0.0E+00
Ru-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-106	5.5E+04	5.5E+04	5.5E+04	5.5E+04	5.4E+04	5.4E+04	5.4E+04	5.3E+04	0.0E+00	0.0E+00	0.0E+00
Rh-105	2.5E+02	1.6E+02	9.8E+01	4.5E+01	9.3E+00	6.3E+00	8.9E-01	1.2E-01	0.0E+00	0.0E+00	0.0E+00
Sb-127	2.2E+04	1.8E+04	1.5E+04	1.1E+04	6.1E+03	5.3E+03	2.5E+03	1.2E+03	0.0E+00	0.0E+00	0.0E+00
Sb-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127	4.8E+04	4.4E+04	4.1E+04	3.7E+04	3.2E+04	3.1E+04	2.8E+04	2.6E+04	0.0E+00	0.0E+00	0.0E+00
Te-127m	2.8E+04	2.8E+04	2.8E+04	2.8E+04	2.7E+04	2.7E+04	2.6E+04	2.6E+04	0.0E+00	0.0E+00	0.0E+00
Te-129	5.2E+04	5.1E+04	5.0E+04	4.8E+04	4.5E+04	4.4E+04	4.0E+04	3.7E+04	0.0E+00	0.0E+00	0.0E+00
Te-129m	7.7E+04	7.6E+04	7.4E+04	7.2E+04	6.7E+04	6.6E+04	6.0E+04	5.5E+04	0.0E+00	0.0E+00	0.0E+00
Te-131m	2.3E+02	1.3E+02	7.5E+01	3.0E+01	4.7E+00	3.0E+00	2.9E-01	2.9E-02	0.0E+00	0.0E+00	0.0E+00
Te-132	1.9E+05	1.6E+05	1.3E+05	8.9E+04	4.4E+04	3.7E+04	1.5E+04	6.2E+03	0.0E+00	0.0E+00	0.0E+00
I-131	6.3E+06	5.8E+06	5.3E+06	4.6E+06	3.4E+06	3.2E+06	2.2E+06	1.6E+06	2.2E+05	9.1E+04	3.9E+04
I-132	2.0E+05	1.6E+05	1.3E+05	9.3E+04	4.6E+04	3.8E+04	1.6E+04	6.5E+03	0.0E+00	0.0E+00	0.0E+00
I-133	1.2E+03	5.5E+02	2.5E+02	6.5E+01	4.5E+00	2.3E+00	8.3E-02	3.0E-03	2.3E-04	7.7E-08	2.6E-11
I-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-135	2.3E-07	1.9E-08	1.5E-09	2.0E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-133	5.4E+07	4.7E+07	4.2E+07	3.3E+07	2.1E+07	1.9E+07	1.1E+07	6.4E+06	5.7E+06	1.5E+06	4.1E+05
Xe-135	5.9E-03	9.5E-04	1.5E-04	7.2E-06	1.6E-08	3.5E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	3.0E+06	0.0E+00	0.0E+00	0.0E+00
Cs-136	4.2E+05	4.0E+05	3.8E+05	3.4E+05	2.9E+05	2.8E+05	2.2E+05	1.8E+05	0.0E+00	0.0E+00	0.0E+00
Cs-137	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	0.0E+00	0.0E+00	0.0E+00
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-140	7.9E+05	7.4E+05	7.1E+05	6.4E+05	5.4E+05	5.1E+05	4.1E+05	3.3E+05	0.0E+00	0.0E+00	0.0E+00
La-140	9.0E+05	8.5E+05	8.1E+05	7.4E+05	6.2E+05	5.9E+05	4.7E+05	3.8E+05	0.0E+00	0.0E+00	0.0E+00
La-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-141	2.9E+04	2.8E+04	2.7E+04	2.7E+04	2.5E+04	2.4E+04	2.2E+04	2.0E+04	0.0E+00	0.0E+00	0.0E+00
Ce-143	5.2E+01	3.2E+01	1.9E+01	8.3E+00	1.5E+00	1.0E+00	1.2E-01	1.5E-02	0.0E+00	0.0E+00	0.0E+00
Ce-144	2.8E+04	2.8E+04	2.7E+04	2.7E+04	2.7E+04	2.7E+04	2.7E+04	2.7E+04	0.0E+00	0.0E+00	0.0E+00
Pr-143	9.4E+03	8.9E+03	8.5E+03	7.8E+03	6.6E+03	6.3E+03	5.1E+03	4.1E+03	0.0E+00	0.0E+00	0.0E+00
Nd-147	2.6E+03	2.5E+03	2.3E+03	2.1E+03	1.7E+03	1.6E+03	1.2E+03	9.5E+02	0.0E+00	0.0E+00	0.0E+00
Np-239	8.8E+03	6.6E+03	4.9E+03	3.0E+03	1.1E+03	8.8E+02	2.6E+02	7.6E+01	0.0E+00	0.0E+00	0.0E+00
Pu-238	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	1.1E+02	0.0E+00	0.0E+00	0.0E+00
Pu-239	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00	8.6E+00	0.0E+00	0.0E+00	0.0E+00
Pu-240	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	1.3E+01	0.0E+00	0.0E+00	0.0E+00
Pu-241	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	2.9E+03	0.0E+00	0.0E+00	0.0E+00
Am-241	1.8E+00	1.8E+00	1.8E+00	1.8E+00	1.8E+00	1.9E+00	1.9E+00	2.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-242	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.6E+02	3.6E+02	3.5E+02	3.5E+02	0.0E+00	0.0E+00	0.0E+00
Cm-244	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	4.8E+01	0.0E+00	0.0E+00	0.0E+00

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

Table E-2 Radioactivity at Typical Times after LOCA (for airborne) (Sheet 11 of 11)

DCD_
03.11-36

Nuclide	Time after LOCA (hr)										
	1440	2160	2880	3600	4320	5040	5760	6480	7200	7920	8760
Co-60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.6E+06	1.6E+06	1.6E+06
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-89	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-97	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Nb-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Mo-99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tc-99m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rh-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sb-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sb-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-129m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-131m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-131	1.6E+04	1.2E+03	9.2E+01	7.0E+00	5.2E-01	3.9E-02	3.0E-03	2.2E-04	1.7E-05	1.3E-06	6.2E-08
I-132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-133	1.1E+05	2.1E+03	3.9E+01	7.4E-01	1.4E-02	2.7E-04	5.1E-06	9.6E-08	1.8E-09	3.5E-11	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-136	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-144	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pr-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Nd-147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Np-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-238	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-240	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Am-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-242	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-244	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA(for recirculation water) (Sheet 1 of 11)

Nuclide	Time after LOCA (hr)										
	0.01	0.02	0.03	0.04	0.05	0.06	0.0667	0.08	0.0834	0.1	0.15
Co-60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	0.0E+00	0.0E+00	7.4E+02	1.1E+03	1.4E+03	1.8E+03	2.0E+03	2.4E+03	2.6E+03	3.1E+03	4.8E+03
Sr-89	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-97	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Nb-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Mo-99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tc-99m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rh-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sb-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sb-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-129m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-131m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-131	2.4E+04	1.7E+05	3.1E+05	4.6E+05	6.0E+05	7.4E+05	8.4E+05	1.0E+06	1.1E+06	1.3E+06	2.0E+06
I-132	0.0E+00	2.4E+05	4.5E+05	6.5E+05	8.6E+05	1.1E+06	1.2E+06	1.5E+06	1.5E+06	1.9E+06	2.9E+06
I-133	0.0E+00	3.5E+05	6.5E+05	9.5E+05	1.2E+06	1.5E+06	1.7E+06	2.1E+06	2.2E+06	2.7E+06	4.2E+06
I-134	0.0E+00	3.8E+05	7.1E+05	1.0E+06	1.3E+06	1.6E+06	1.9E+06	2.3E+06	2.4E+06	2.8E+06	4.2E+06
I-135	0.0E+00	3.3E+05	6.0E+05	8.8E+05	1.2E+06	1.4E+06	1.6E+06	2.0E+06	2.1E+06	2.5E+06	3.9E+06
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	5.7E+03	4.0E+04	7.3E+04	1.1E+05	1.4E+05	1.8E+05	2.0E+05	2.4E+05	2.5E+05	3.1E+05	4.8E+05
Cs-136	0.0E+00	1.1E+04	2.0E+04	2.9E+04	3.8E+04	4.8E+04	5.4E+04	6.6E+04	6.9E+04	8.5E+04	1.3E+05
Cs-137	3.2E+03	2.2E+04	4.2E+04	6.1E+04	8.0E+04	1.0E+05	1.1E+05	1.4E+05	1.4E+05	1.8E+05	2.7E+05
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-144	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pr-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Nd-147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Np-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-238	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-240	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Am-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-242	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cm-244	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 2 of 11)

Nuclide	Time after LOCA (hr)										
	0.2	0.3	0.4	0.5	0.5083	0.6	0.7	0.8	0.9	1	1.1
Co-60	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E+01	1.6E+02	2.4E+02	3.3E+02	4.1E+02	4.9E+02
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	6.5E+03	9.9E+03	1.3E+04	1.7E+04	1.7E+04	2.3E+04	3.0E+04	3.6E+04	4.3E+04	4.9E+04	5.6E+04
Sr-89	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E+05	4.9E+05	7.5E+05	1.0E+06	1.3E+06	1.5E+06
Sr-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+04	4.1E+04	6.2E+04	8.4E+04	1.0E+05	1.3E+05
Sr-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+05	6.2E+05	9.4E+05	1.2E+06	1.6E+06	1.9E+06
Sr-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E+05	5.7E+05	8.5E+05	1.1E+06	1.4E+06	1.6E+06
Y-90	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E+02	7.5E+02	1.1E+03	1.4E+03	1.7E+03
Y-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+03	6.2E+03	9.4E+03	1.3E+04	1.6E+04	1.9E+04
Y-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+04	3.4E+04	5.6E+04	8.3E+04	1.1E+05
Y-93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+03	7.2E+03	1.1E+04	1.5E+04	1.8E+04	2.2E+04
Zr-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.8E+03	7.9E+03	1.2E+04	1.6E+04	2.0E+04	2.4E+04
Zr-97	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.7E+03	7.6E+03	1.2E+04	1.5E+04	1.9E+04	2.3E+04
Nb-95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.8E+03	7.9E+03	1.2E+04	1.6E+04	2.0E+04	2.4E+04
Mo-99	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E+04	9.9E+04	1.5E+05	2.0E+05	2.5E+05	3.1E+05
Tc-99m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E+04	8.8E+04	1.3E+05	1.8E+05	2.2E+05	2.7E+05
Ru-103	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.8E+04	7.9E+04	1.2E+05	1.6E+05	2.0E+05	2.4E+05
Ru-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E+04	4.7E+04	7.0E+04	9.3E+04	1.1E+05	1.4E+05
Ru-106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E+04	2.8E+04	4.2E+04	5.7E+04	7.1E+04	8.6E+04
Rh-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E+04	4.8E+04	7.4E+04	9.9E+04	1.2E+05	1.5E+05
Sb-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.3E+04	1.1E+05	1.7E+05	2.2E+05	2.8E+05	3.4E+05
Sb-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+05	3.0E+05	4.5E+05	5.9E+05	7.3E+05	8.7E+05
Te-127	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.2E+04	1.1E+05	1.7E+05	2.2E+05	2.8E+05	3.4E+05
Te-127m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.9E+03	1.4E+04	2.2E+04	2.9E+04	3.7E+04	4.4E+04
Te-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+05	3.1E+05	4.7E+05	6.2E+05	7.7E+05	9.2E+05
Te-129m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E+04	4.9E+04	7.5E+04	1.0E+05	1.3E+05	1.5E+05
Te-131m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.2E+04	1.5E+05	2.3E+05	3.0E+05	3.8E+05	4.6E+05
Te-132	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.2E+05	1.5E+06	2.3E+06	3.1E+06	3.8E+06	4.6E+06
I-131	2.8E+06	4.2E+06	5.6E+06	7.1E+06	7.2E+06	1.1E+07	1.5E+07	1.8E+07	2.2E+07	2.6E+07	3.0E+07
I-132	3.9E+06	5.8E+06	7.7E+06	9.5E+06	9.6E+06	1.4E+07	2.0E+07	2.4E+07	2.9E+07	3.4E+07	3.9E+07
I-133	5.7E+06	8.7E+06	1.2E+07	1.5E+07	1.5E+07	2.2E+07	3.0E+07	3.8E+07	4.5E+07	5.3E+07	6.1E+07
I-134	5.5E+06	7.7E+06	9.6E+06	1.1E+07	1.1E+07	1.6E+07	2.0E+07	2.3E+07	2.6E+07	2.8E+07	2.9E+07
I-135	5.3E+06	7.9E+06	1.1E+07	1.3E+07	1.3E+07	2.0E+07	2.6E+07	3.3E+07	4.0E+07	4.6E+07	5.2E+07
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	6.5E+05	9.9E+05	1.3E+06	1.7E+06	1.7E+06	2.3E+06	2.9E+06	3.6E+06	4.2E+06	4.9E+06	5.5E+06
Cs-136	1.8E+05	2.7E+05	3.6E+05	4.5E+05	4.6E+05	6.2E+05	8.0E+05	9.8E+05	1.2E+06	1.3E+06	1.5E+06
Cs-137	3.7E+05	5.6E+05	7.6E+05	9.5E+05	9.6E+05	1.3E+06	1.7E+06	2.0E+06	2.4E+06	2.8E+06	3.2E+06
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E+05	5.8E+05	8.4E+05	1.1E+06	1.3E+06	1.5E+06
Ba-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.7E+05	7.8E+05	1.2E+06	1.6E+06	2.0E+06	2.4E+06
La-140	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.1E+03	9.3E+03	1.5E+04	2.2E+04	2.9E+04	3.7E+04
La-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.6E+03	9.9E+03	1.3E+04	1.6E+04	1.9E+04
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.8E+03	1.0E+04	1.2E+04	1.4E+04
Ce-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.9E+03	1.9E+04	2.8E+04	3.8E+04	4.8E+04	5.7E+04
Ce-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.5E+03	1.8E+04	2.7E+04	3.6E+04	4.5E+04	5.5E+04
Ce-144	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.7E+03	1.4E+04	2.1E+04	2.9E+04	3.6E+04	4.3E+04
Pr-143	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E+03	7.0E+03	1.1E+04	1.4E+04	1.8E+04	2.2E+04
Nd-147	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E+03	2.9E+03	4.5E+03	6.0E+03	7.5E+03	9.0E+03
Np-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E+04	2.0E+05	3.0E+05	4.0E+05	5.1E+05	6.1E+05
Pu-238	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E+01	5.5E+01	8.4E+01	1.1E+02	1.4E+02	1.7E+02
Pu-239	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+00	4.2E+00	6.3E+00	8.5E+00	1.1E+01	1.3E+01
Pu-240	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.1E+00	6.5E+00	9.9E+00	1.3E+01	1.7E+01	2.0E+01
Pu-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.9E+02	1.4E+03	2.2E+03	2.9E+03	3.7E+03	4.5E+03
Am-241	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.7E-01	7.8E-01	1.2E+00	1.6E+00	2.0E+00	2.4E+00
Cm-242	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.2E+01	1.9E+02	2.9E+02	3.9E+02	5.0E+02	6.0E+02
Cm-244	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+01	2.3E+01	3.6E+01	4.8E+01	6.0E+01	7.2E+01

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 3 of 11)

Nuclide	Time after LOCA (hr)										
	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8083	1.9	2	2.1
Co-60	5.8E+02	6.6E+02	7.5E+02	8.3E+02	9.1E+02	1.0E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	6.2E+04	6.9E+04	7.5E+04	8.2E+04	8.8E+04	9.5E+04	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05
Sr-89	1.8E+06	2.0E+06	2.3E+06	2.6E+06	2.8E+06	3.1E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06
Sr-90	1.5E+05	1.7E+05	1.9E+05	2.1E+05	2.3E+05	2.5E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Sr-91	2.2E+06	2.4E+06	2.7E+06	3.0E+06	3.3E+06	3.6E+06	3.9E+06	3.9E+06	3.8E+06	3.8E+06	3.8E+06
Sr-92	1.8E+06	2.0E+06	2.2E+06	2.4E+06	2.6E+06	2.7E+06	2.9E+06	2.9E+06	2.9E+06	2.8E+06	2.7E+06
Y-90	2.1E+03	2.5E+03	2.9E+03	3.4E+03	3.8E+03	4.3E+03	4.8E+03	4.9E+03	5.1E+03	5.4E+03	5.7E+03
Y-91	2.2E+04	2.6E+04	2.9E+04	3.2E+04	3.5E+04	3.9E+04	4.2E+04	4.2E+04	4.2E+04	4.2E+04	4.3E+04
Y-92	1.5E+05	1.9E+05	2.3E+05	2.7E+05	3.2E+05	3.7E+05	4.2E+05	4.2E+05	4.7E+05	5.1E+05	5.5E+05
Y-93	2.5E+04	2.9E+04	3.2E+04	3.5E+04	3.9E+04	4.2E+04	4.5E+04	4.5E+04	4.5E+04	4.5E+04	4.4E+04
Zr-95	2.8E+04	3.2E+04	3.7E+04	4.1E+04	4.5E+04	4.9E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04
Zr-97	2.7E+04	3.1E+04	3.4E+04	3.8E+04	4.2E+04	4.5E+04	4.9E+04	4.9E+04	4.9E+04	4.9E+04	4.9E+04
Nb-95	2.8E+04	3.3E+04	3.7E+04	4.1E+04	4.5E+04	4.9E+04	5.3E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04
Mo-99	3.6E+05	4.1E+05	4.6E+05	5.1E+05	5.6E+05	6.1E+05	6.6E+05	6.7E+05	6.7E+05	6.6E+05	6.6E+05
Tc-99m	3.2E+05	3.6E+05	4.1E+05	4.5E+05	5.0E+05	5.4E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05
Ru-103	2.9E+05	3.3E+05	3.7E+05	4.1E+05	4.5E+05	4.9E+05	5.3E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05
Ru-105	1.6E+05	1.8E+05	1.9E+05	2.1E+05	2.3E+05	2.5E+05	2.7E+05	2.7E+05	2.6E+05	2.6E+05	2.5E+05
Ru-106	1.0E+05	1.1E+05	1.3E+05	1.4E+05	1.6E+05	1.7E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05
Rh-105	1.7E+05	2.0E+05	2.3E+05	2.5E+05	2.8E+05	3.0E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05
Sb-127	3.9E+05	4.5E+05	5.1E+05	5.6E+05	6.2E+05	6.8E+05	7.3E+05	7.4E+05	7.4E+05	7.4E+05	7.4E+05
Sb-129	1.0E+06	1.1E+06	1.2E+06	1.4E+06	1.5E+06	1.6E+06	1.7E+06	1.7E+06	1.7E+06	1.6E+06	1.6E+06
Te-127	3.9E+05	4.5E+05	5.1E+05	5.6E+05	6.2E+05	6.8E+05	7.3E+05	7.4E+05	7.4E+05	7.4E+05	7.4E+05
Te-127m	5.2E+04	5.9E+04	6.7E+04	7.4E+04	8.2E+04	8.9E+04	9.7E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04
Te-129	1.1E+06	1.2E+06	1.3E+06	1.5E+06	1.6E+06	1.7E+06	1.9E+06	1.9E+06	1.9E+06	1.8E+06	1.8E+06
Te-129m	1.8E+05	2.0E+05	2.3E+05	2.6E+05	2.8E+05	3.1E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05
Te-131m	5.3E+05	6.1E+05	6.8E+05	7.6E+05	8.3E+05	9.1E+05	9.8E+05	9.9E+05	9.9E+05	9.8E+05	9.8E+05
Te-132	5.4E+06	6.2E+06	6.9E+06	7.7E+06	8.5E+06	9.2E+06	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
I-131	3.4E+07	3.8E+07	4.2E+07	4.5E+07	4.9E+07	5.3E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07
I-132	4.3E+07	4.7E+07	5.2E+07	5.6E+07	6.0E+07	6.4E+07	6.8E+07	6.8E+07	6.6E+07	6.5E+07	6.3E+07
I-133	6.8E+07	7.6E+07	8.3E+07	9.1E+07	9.8E+07	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08
I-134	3.1E+07	3.2E+07	3.2E+07	3.2E+07	3.2E+07	3.2E+07	3.2E+07	3.2E+07	3.0E+07	2.8E+07	2.5E+07
I-135	5.8E+07	6.4E+07	7.0E+07	7.6E+07	8.1E+07	8.7E+07	9.2E+07	9.3E+07	9.2E+07	9.1E+07	9.0E+07
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	6.2E+06	6.9E+06	7.5E+06	8.2E+06	8.8E+06	9.5E+06	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
Cs-136	1.7E+06	1.9E+06	2.0E+06	2.2E+06	2.4E+06	2.6E+06	2.7E+06	2.8E+06	2.8E+06	2.8E+06	2.8E+06
Cs-137	3.5E+06	3.9E+06	4.3E+06	4.6E+06	5.0E+06	5.4E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06
Ba-139	1.6E+06	1.8E+06	1.9E+06	2.0E+06	2.1E+06	2.2E+06	2.2E+06	2.2E+06	2.1E+06	2.0E+06	1.9E+06
Ba-140	2.8E+06	3.2E+06	3.6E+06	4.0E+06	4.5E+06	4.9E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06
La-140	4.5E+04	5.5E+04	6.5E+04	7.5E+04	8.7E+04	9.9E+04	1.1E+05	1.1E+05	1.2E+05	1.3E+05	1.4E+05
La-141	2.2E+04	2.5E+04	2.7E+04	3.0E+04	3.2E+04	3.4E+04	3.7E+04	3.7E+04	3.6E+04	3.6E+04	3.5E+04
La-142	1.5E+04	1.7E+04	1.8E+04	1.9E+04	2.0E+04	2.1E+04	2.2E+04	2.2E+04	2.1E+04	2.0E+04	1.9E+04
Ce-141	6.7E+04	7.7E+04	8.6E+04	9.6E+04	1.1E+05	1.2E+05	1.2E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05
Ce-143	6.4E+04	7.3E+04	8.2E+04	9.1E+04	1.0E+05	1.1E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05
Ce-144	5.1E+04	5.8E+04	6.5E+04	7.2E+04	8.0E+04	8.7E+04	9.4E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04
Pr-143	2.5E+04	2.9E+04	3.3E+04	3.6E+04	4.0E+04	4.4E+04	4.7E+04	4.7E+04	4.7E+04	4.7E+04	4.8E+04
Nd-147	1.1E+04	1.2E+04	1.4E+04	1.5E+04	1.7E+04	1.8E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04
Np-239	7.1E+05	8.1E+05	9.1E+05	1.0E+06	1.1E+06	1.2E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06
Pu-238	2.0E+02	2.3E+02	2.6E+02	2.8E+02	3.1E+02	3.4E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02
Pu-239	1.5E+01	1.7E+01	1.9E+01	2.2E+01	2.4E+01	2.6E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01
Pu-240	2.4E+01	2.7E+01	3.0E+01	3.4E+01	3.7E+01	4.1E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	5.2E+03	6.0E+03	6.7E+03	7.5E+03	8.2E+03	9.0E+03	9.7E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03
Am-241	2.8E+00	3.2E+00	3.6E+00	4.0E+00	4.4E+00	4.9E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00
Cm-242	7.0E+02	8.0E+02	9.0E+02	1.0E+03	1.1E+03	1.2E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03
Cm-244	8.5E+01	9.7E+01	1.1E+02	1.2E+02	1.3E+02	1.5E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 4 of 11)

Nuclide	Time after LOCA (hr)										
	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3	3.2	3.23
Co-60	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05
Sr-89	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06
Sr-90	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Sr-91	3.8E+06	3.7E+06	3.7E+06	3.7E+06	3.7E+06	3.6E+06	3.6E+06	3.6E+06	3.6E+06	3.5E+06	3.5E+06
Sr-92	2.6E+06	2.6E+06	2.5E+06	2.4E+06	2.4E+06	2.3E+06	2.3E+06	2.2E+06	2.2E+06	2.0E+06	2.0E+06
Y-90	6.0E+03	6.3E+03	6.6E+03	6.9E+03	7.2E+03	7.5E+03	7.8E+03	8.1E+03	8.3E+03	8.9E+03	9.0E+03
Y-91	4.3E+04	4.3E+04	4.3E+04	4.3E+04	4.3E+04	4.3E+04	4.3E+04	4.3E+04	4.3E+04	4.3E+04	4.3E+04
Y-92	6.0E+05	6.3E+05	6.7E+05	7.1E+05	7.4E+05	7.7E+05	8.0E+05	8.3E+05	8.5E+05	9.0E+05	9.1E+05
Y-93	4.4E+04	4.4E+04	4.4E+04	4.3E+04	4.3E+04	4.3E+04	4.2E+04	4.2E+04	4.2E+04	4.1E+04	4.1E+04
Zr-95	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04
Zr-97	4.9E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.7E+04	4.7E+04	4.7E+04	4.7E+04	4.7E+04
Nb-95	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04
Mo-99	6.6E+05	6.6E+05	6.6E+05	6.6E+05	6.6E+05	6.6E+05	6.6E+05	6.6E+05	6.6E+05	6.6E+05	6.6E+05
Tc-99m	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05
Ru-103	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05
Ru-105	2.5E+05	2.5E+05	2.4E+05	2.4E+05	2.4E+05	2.3E+05	2.3E+05	2.2E+05	2.2E+05	2.1E+05	2.1E+05
Ru-106	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05
Rh-105	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05
Sb-127	7.4E+05	7.4E+05	7.4E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05
Sb-129	1.6E+06	1.6E+06	1.5E+06	1.5E+06	1.5E+06	1.5E+06	1.4E+06	1.4E+06	1.4E+06	1.4E+06	1.4E+06
Te-127	7.4E+05	7.4E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05
Te-127m	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04
Te-129	1.8E+06	1.8E+06	1.8E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.7E+06	1.6E+06	1.6E+06	1.6E+06
Te-129m	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05
Te-131m	9.8E+05	9.8E+05	9.7E+05	9.7E+05	9.7E+05	9.7E+05	9.7E+05	9.6E+05	9.6E+05	9.6E+05	9.6E+05
Te-132	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
I-131	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07
I-132	6.2E+07	6.0E+07	5.9E+07	5.7E+07	5.6E+07	5.4E+07	5.3E+07	5.2E+07	5.1E+07	4.8E+07	4.8E+07
I-133	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.1E+08
I-134	2.4E+07	2.2E+07	2.0E+07	1.9E+07	1.7E+07	1.6E+07	1.5E+07	1.4E+07	1.2E+07	1.1E+07	1.0E+07
I-135	8.9E+07	8.8E+07	8.7E+07	8.6E+07	8.5E+07	8.4E+07	8.4E+07	8.3E+07	8.2E+07	8.0E+07	8.0E+07
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
Cs-136	2.8E+06	2.8E+06	2.8E+06	2.8E+06	2.8E+06	2.8E+06	2.8E+06	2.8E+06	2.8E+06	2.7E+06	2.7E+06
Cs-137	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06
Ba-139	1.8E+06	1.8E+06	1.7E+06	1.6E+06	1.5E+06	1.4E+06	1.4E+06	1.3E+06	1.2E+06	1.1E+06	1.1E+06
Ba-140	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06
La-140	1.5E+05	1.6E+05	1.6E+05	1.7E+05	1.8E+05	1.9E+05	2.0E+05	2.1E+05	2.2E+05	2.3E+05	2.4E+05
La-141	3.4E+04	3.4E+04	3.3E+04	3.3E+04	3.2E+04	3.2E+04	3.1E+04	3.0E+04	3.0E+04	2.9E+04	2.9E+04
La-142	1.9E+04	1.8E+04	1.7E+04	1.6E+04	1.6E+04	1.5E+04	1.4E+04	1.4E+04	1.3E+04	1.2E+04	1.2E+04
Ce-141	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05
Ce-143	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.1E+05	1.1E+05
Ce-144	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04
Pr-143	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04
Nd-147	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04
Np-239	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06
Pu-238	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02
Pu-239	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01
Pu-240	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03
Am-241	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00
Cm-242	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03
Cm-244	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 5 of 11)

Nuclide	Time after LOCA (hr)										
	3.4	3.6	3.8	4	4.2	4.4	4.6	4.8	5	5.5	6
Co-60	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05
Sr-89	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06
Sr-90	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Sr-91	3.5E+06	3.4E+06	3.4E+06	3.3E+06	3.3E+06	3.2E+06	3.2E+06	3.1E+06	3.1E+06	3.0E+06	2.9E+06
Sr-92	1.9E+06	1.8E+06	1.8E+06	1.7E+06	1.6E+06	1.5E+06	1.4E+06	1.4E+06	1.3E+06	1.1E+06	1.0E+06
Y-90	9.5E+03	1.0E+04	1.1E+04	1.1E+04	1.2E+04	1.2E+04	1.3E+04	1.4E+04	1.4E+04	1.6E+04	1.7E+04
Y-91	4.3E+04	4.4E+04	4.4E+04	4.4E+04	4.4E+04	4.4E+04	4.4E+04	4.4E+04	4.5E+04	4.5E+04	4.5E+04
Y-92	9.4E+05	9.8E+05	1.0E+06	1.0E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06
Y-93	4.1E+04	4.0E+04	4.0E+04	3.9E+04	3.8E+04	3.8E+04	3.7E+04	3.7E+04	3.6E+04	3.5E+04	3.4E+04
Zr-95	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04
Zr-97	4.6E+04	4.6E+04	4.6E+04	4.5E+04	4.5E+04	4.4E+04	4.4E+04	4.4E+04	4.3E+04	4.2E+04	4.2E+04
Nb-95	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04
Mo-99	6.6E+05	6.5E+05	6.5E+05	6.5E+05	6.5E+05	6.5E+05	6.5E+05	6.5E+05	6.4E+05	6.4E+05	6.4E+05
Tc-99m	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05	5.9E+05
Ru-103	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05
Ru-105	2.1E+05	2.0E+05	2.0E+05	1.9E+05	1.8E+05	1.8E+05	1.7E+05	1.7E+05	1.6E+05	1.5E+05	1.4E+05
Ru-106	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05
Rh-105	3.3E+05	3.2E+05	3.2E+05	3.2E+05	3.2E+05	3.2E+05	3.2E+05	3.2E+05	3.2E+05	3.2E+05	3.2E+05
Sb-127	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.2E+05	7.2E+05	7.2E+05	7.2E+05	7.2E+05	7.2E+05
Sb-129	1.3E+06	1.3E+06	1.2E+06	1.2E+06	1.2E+06	1.1E+06	1.1E+06	1.1E+06	1.0E+06	9.4E+05	8.7E+05
Te-127	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.3E+05	7.2E+05
Te-127m	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04
Te-129	1.6E+06	1.5E+06	1.5E+06	1.4E+06	1.4E+06	1.4E+06	1.3E+06	1.3E+06	1.3E+06	1.2E+06	1.1E+06
Te-129m	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05
Te-131m	9.5E+05	9.5E+05	9.4E+05	9.4E+05	9.3E+05	9.3E+05	9.3E+05	9.2E+05	9.2E+05	9.1E+05	9.0E+05
Te-132	9.9E+06	9.9E+06	9.9E+06	9.9E+06	9.9E+06	9.8E+06	9.8E+06	9.8E+06	9.8E+06	9.8E+06	9.7E+06
I-131	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.7E+07	5.6E+07	5.6E+07
I-132	4.6E+07	4.4E+07	4.2E+07	4.0E+07	3.8E+07	3.7E+07	3.5E+07	3.4E+07	3.2E+07	2.9E+07	2.6E+07
I-133	1.1E+08	1.1E+08	1.1E+08	1.1E+08	1.0E+08	1.0E+08	1.0E+08	1.0E+08	1.0E+08	1.0E+08	9.8E+07
I-134	9.1E+06	7.8E+06	6.6E+06	5.7E+06	4.8E+06	4.1E+06	3.5E+06	3.0E+06	2.6E+06	1.7E+06	1.2E+06
I-135	7.8E+07	7.7E+07	7.5E+07	7.4E+07	7.2E+07	7.1E+07	6.9E+07	6.8E+07	6.6E+07	6.3E+07	6.0E+07
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
Cs-136	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06
Cs-137	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06
Ba-139	1.0E+06	9.1E+05	8.2E+05	7.4E+05	6.7E+05	6.1E+05	5.5E+05	5.0E+05	4.5E+05	3.5E+05	2.7E+05
Ba-140	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.3E+06	5.2E+06
La-140	2.5E+05	2.7E+05	2.9E+05	3.0E+05	3.2E+05	3.4E+05	3.5E+05	3.7E+05	3.9E+05	4.3E+05	4.7E+05
La-141	2.8E+04	2.7E+04	2.6E+04	2.5E+04	2.4E+04	2.3E+04	2.3E+04	2.2E+04	2.1E+04	1.9E+04	1.8E+04
La-142	1.1E+04	9.9E+03	9.0E+03	8.3E+03	7.6E+03	6.9E+03	6.3E+03	5.8E+03	5.3E+03	4.2E+03	3.4E+03
Ce-141	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05
Ce-143	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05
Ce-144	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04
Pr-143	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04
Nd-147	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04	2.0E+04
Np-239	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06	1.3E+06
Pu-238	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02
Pu-239	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01
Pu-240	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03
Am-241	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00
Cm-242	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03
Cm-244	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 6 of 11)

Nuclide	Time after LOCA (hr)										
	6.5	7	7.5	8	8.8	9	9.5	10	11	12	13
Co-60	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05
Sr-89	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06
Sr-90	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Sr-91	2.8E+06	2.7E+06	2.6E+06	2.5E+06	2.3E+06	2.3E+06	2.2E+06	2.1E+06	2.0E+06	1.8E+06	1.7E+06
Sr-92	8.8E+05	7.7E+05	6.8E+05	6.0E+05	4.9E+05	4.6E+05	4.1E+05	3.6E+05	2.8E+05	2.2E+05	1.7E+05
Y-90	1.8E+04	2.0E+04	2.1E+04	2.3E+04	2.5E+04	2.5E+04	2.7E+04	2.8E+04	3.1E+04	3.3E+04	3.6E+04
Y-91	4.5E+04	4.6E+04	4.6E+04	4.6E+04	4.7E+04	4.7E+04	4.7E+04	4.7E+04	4.7E+04	4.8E+04	4.8E+04
Y-92	1.1E+06	1.1E+06	1.0E+06	1.0E+06	9.4E+05	9.2E+05	8.7E+05	8.3E+05	7.4E+05	6.5E+05	5.7E+05
Y-93	3.3E+04	3.2E+04	3.1E+04	3.0E+04	2.8E+04	2.8E+04	2.7E+04	2.6E+04	2.4E+04	2.3E+04	2.1E+04
Zr-95	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04
Zr-97	4.1E+04	4.0E+04	3.9E+04	3.8E+04	3.7E+04	3.7E+04	3.6E+04	3.5E+04	3.4E+04	3.3E+04	3.1E+04
Nb-95	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04
Mo-99	6.3E+05	6.3E+05	6.3E+05	6.2E+05	6.2E+05	6.2E+05	6.1E+05	6.1E+05	6.0E+05	6.0E+05	5.9E+05
Tc-99m	5.8E+05	5.8E+05	5.8E+05	5.8E+05	5.8E+05	5.8E+05	5.7E+05	5.7E+05	5.7E+05	5.6E+05	5.6E+05
Ru-103	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.4E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05
Ru-105	1.3E+05	1.2E+05	1.1E+05	1.0E+05	8.9E+04	8.7E+04	8.0E+04	7.4E+04	6.3E+04	5.4E+04	4.6E+04
Ru-106	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05
Rh-105	3.2E+05	3.1E+05	3.1E+05	3.1E+05	3.1E+05	3.1E+05	3.0E+05	3.0E+05	3.0E+05	2.9E+05	2.9E+05
Sb-127	7.1E+05	7.1E+05	7.1E+05	7.1E+05	7.0E+05	7.0E+05	7.0E+05	6.9E+05	6.9E+05	6.8E+05	6.8E+05
Sb-129	8.0E+05	7.4E+05	6.8E+05	6.3E+05	5.5E+05	5.4E+05	4.9E+05	4.6E+05	3.9E+05	3.3E+05	2.8E+05
Te-127	7.2E+05	7.2E+05	7.2E+05	7.2E+05	7.2E+05	7.1E+05	7.1E+05	7.1E+05	7.1E+05	7.0E+05	7.0E+05
Te-127m	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04
Te-129	1.1E+06	9.9E+05	9.3E+05	8.8E+05	8.0E+05	7.8E+05	7.4E+05	7.0E+05	6.3E+05	5.7E+05	5.1E+05
Te-129m	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05
Te-131m	8.9E+05	8.8E+05	8.7E+05	8.6E+05	8.4E+05	8.4E+05	8.3E+05	8.2E+05	8.0E+05	7.8E+05	7.6E+05
Te-132	9.7E+06	9.6E+06	9.6E+06	9.5E+06	9.5E+06	9.5E+06	9.4E+06	9.4E+06	9.3E+06	9.2E+06	9.1E+06
I-131	5.6E+07	5.6E+07	5.6E+07	5.6E+07	5.6E+07	5.6E+07	5.6E+07	5.6E+07	5.5E+07	5.5E+07	5.5E+07
I-132	2.4E+07	2.2E+07	2.0E+07	1.9E+07	1.7E+07	1.6E+07	1.5E+07	1.5E+07	1.3E+07	1.2E+07	1.1E+07
I-133	9.7E+07	9.5E+07	9.4E+07	9.2E+07	9.0E+07	8.9E+07	8.8E+07	8.6E+07	8.3E+07	8.1E+07	7.8E+07
I-134	7.8E+05	5.3E+05	3.6E+05	2.4E+05	1.3E+05	1.1E+05	7.3E+04	4.9E+04	2.2E+04	1.0E+04	4.6E+03
I-135	5.7E+07	5.4E+07	5.1E+07	4.8E+07	4.5E+07	4.4E+07	4.1E+07	3.9E+07	3.5E+07	3.2E+07	2.9E+07
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
Cs-136	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06
Cs-137	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06
Ba-139	2.1E+05	1.6E+05	1.3E+05	1.0E+05	6.7E+04	6.0E+04	4.7E+04	3.6E+04	2.2E+04	1.3E+04	8.1E+03
Ba-140	5.2E+06	5.2E+06	5.2E+06	5.2E+06	5.2E+06	5.2E+06	5.2E+06	5.2E+06	5.2E+06	5.2E+06	5.2E+06
La-140	5.1E+05	5.5E+05	5.9E+05	6.3E+05	7.0E+05	7.1E+05	7.5E+05	7.9E+05	8.6E+05	9.4E+05	1.0E+06
La-141	1.6E+04	1.5E+04	1.4E+04	1.2E+04	1.1E+04	1.0E+04	9.5E+03	8.7E+03	7.3E+03	6.1E+03	5.1E+03
La-142	2.7E+03	2.1E+03	1.7E+03	1.4E+03	9.6E+02	8.7E+02	7.0E+02	5.6E+02	3.6E+02	2.3E+02	1.4E+02
Ce-141	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.3E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05
Ce-143	1.1E+05	1.1E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	1.0E+05	9.9E+04	9.7E+04	9.5E+04	9.3E+04
Ce-144	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04
Pr-143	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.9E+04	4.9E+04	4.9E+04	4.9E+04
Nd-147	2.0E+04	2.0E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04
Np-239	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06	1.2E+06
Pu-238	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02
Pu-239	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01
Pu-240	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03
Am-241	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00
Cm-242	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03
Cm-244	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 7 of 11)

Nuclide	Time after LOCA (hr)										
	14	15	16	17	18	19	20	21	22	23	24
Co-60	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	1.0E+05	1.0E+05	1.0E+05	9.9E+04	9.9E+04	9.9E+04	9.9E+04	9.9E+04	9.9E+04	9.8E+04	9.8E+04
Sr-89	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06
Sr-90	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Sr-91	1.6E+06	1.5E+06	1.4E+06	1.3E+06	1.2E+06	1.1E+06	1.0E+06	9.6E+05	8.9E+05	8.3E+05	7.7E+05
Sr-92	1.3E+05	1.0E+05	7.7E+04	6.0E+04	4.6E+04	3.6E+04	2.8E+04	2.2E+04	1.7E+04	1.3E+04	1.0E+04
Y-90	3.9E+04	4.1E+04	4.4E+04	4.6E+04	4.9E+04	5.1E+04	5.4E+04	5.6E+04	5.8E+04	6.1E+04	6.3E+04
Y-91	4.9E+04	4.9E+04	4.9E+04	4.9E+04	5.0E+04	5.0E+04	5.0E+04	5.0E+04	5.0E+04	5.0E+04	5.1E+04
Y-92	4.9E+05	4.3E+05	3.7E+05	3.1E+05	2.7E+05	2.3E+05	1.9E+05	1.6E+05	1.4E+05	1.1E+05	9.6E+04
Y-93	2.0E+04	1.8E+04	1.7E+04	1.6E+04	1.5E+04	1.4E+04	1.3E+04	1.2E+04	1.1E+04	1.1E+04	9.9E+03
Zr-95	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04
Zr-97	3.0E+04	2.9E+04	2.8E+04	2.6E+04	2.5E+04	2.4E+04	2.3E+04	2.2E+04	2.2E+04	2.1E+04	2.0E+04
Nb-95	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.4E+04
Mo-99	5.9E+05	5.8E+05	5.7E+05	5.7E+05	5.6E+05	5.6E+05	5.5E+05	5.4E+05	5.4E+05	5.3E+05	5.3E+05
Tc-99m	5.6E+05	5.5E+05	5.5E+05	5.4E+05	5.4E+05	5.3E+05	5.3E+05	5.2E+05	5.2E+05	5.1E+05	5.1E+05
Ru-103	5.3E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05	5.3E+05
Ru-105	4.0E+04	3.4E+04	2.9E+04	2.5E+04	2.1E+04	1.8E+04	1.6E+04	1.3E+04	1.1E+04	9.8E+03	8.3E+03
Ru-106	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05
Rh-105	2.8E+05	2.8E+05	2.7E+05	2.7E+05	2.6E+05	2.6E+05	2.5E+05	2.5E+05	2.4E+05	2.4E+05	2.4E+05
Sb-127	6.7E+05	6.7E+05	6.6E+05	6.6E+05	6.5E+05	6.5E+05	6.4E+05	6.4E+05	6.3E+05	6.3E+05	6.3E+05
Sb-129	2.4E+05	2.0E+05	1.7E+05	1.5E+05	1.3E+05	1.1E+05	9.2E+04	7.8E+04	6.7E+04	5.7E+04	4.8E+04
Te-127	7.0E+05	6.9E+05	6.9E+05	6.9E+05	6.8E+05	6.8E+05	6.8E+05	6.7E+05	6.7E+05	6.6E+05	6.6E+05
Te-127m	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04
Te-129	4.7E+05	4.3E+05	4.0E+05	3.7E+05	3.5E+05	3.3E+05	3.1E+05	3.0E+05	2.9E+05	2.8E+05	2.7E+05
Te-129m	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05
Te-131m	7.5E+05	7.3E+05	7.1E+05	7.0E+05	6.8E+05	6.6E+05	6.5E+05	6.3E+05	6.2E+05	6.1E+05	5.9E+05
Te-132	9.0E+06	9.0E+06	8.9E+06	8.8E+06	8.7E+06	8.7E+06	8.6E+06	8.5E+06	8.4E+06	8.4E+06	8.3E+06
I-131	5.5E+07	5.5E+07	5.4E+07	5.4E+07	5.4E+07	5.4E+07	5.4E+07	5.3E+07	5.3E+07	5.3E+07	5.3E+07
I-132	1.1E+07	1.0E+07	1.0E+07	9.7E+06	9.4E+06	9.3E+06	9.1E+06	8.9E+06	8.8E+06	8.7E+06	8.6E+06
I-133	7.5E+07	7.3E+07	7.0E+07	6.8E+07	6.6E+07	6.4E+07	6.2E+07	6.0E+07	5.8E+07	5.6E+07	5.4E+07
I-134	2.1E+03	9.5E+02	4.3E+02	1.9E+02	8.8E+01	4.0E+01	1.8E+01	8.2E+00	3.7E+00	1.7E+00	7.7E+01
I-135	2.6E+07	2.3E+07	2.1E+07	1.9E+07	1.7E+07	1.5E+07	1.4E+07	1.2E+07	1.1E+07	1.0E+07	9.0E+06
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
Cs-136	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.7E+06	2.6E+06	2.6E+06	2.6E+06	2.6E+06	2.6E+06
Cs-137	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06
Ba-139	4.9E+03	2.9E+03	1.8E+03	1.1E+03	6.5E+02	3.9E+02	2.4E+02	1.4E+02	8.7E+01	5.3E+01	3.2E+01
Ba-140	5.2E+06	5.1E+06	5.1E+06	5.1E+06	5.1E+06	5.1E+06	5.1E+06	5.1E+06	5.1E+06	5.0E+06	5.0E+06
La-140	1.1E+06	1.1E+06	1.2E+06	1.3E+06	1.3E+06	1.4E+06	1.5E+06	1.5E+06	1.6E+06	1.7E+06	1.7E+06
La-141	4.3E+03	3.6E+03	3.0E+03	2.5E+03	2.1E+03	1.8E+03	1.5E+03	1.3E+03	1.0E+03	8.8E+02	7.4E+02
La-142	9.2E+01	5.9E+01	3.8E+01	2.4E+01	1.5E+01	9.7E+00	6.2E+00	4.0E+00	2.5E+00	1.6E+00	1.0E+00
Ce-141	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05
Ce-143	9.1E+04	8.9E+04	8.8E+04	8.6E+04	8.4E+04	8.2E+04	8.1E+04	7.9E+04	7.7E+04	7.6E+04	7.4E+04
Ce-144	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04
Pr-143	4.9E+04	4.9E+04	4.9E+04	4.9E+04	4.9E+04	4.9E+04	4.9E+04	4.9E+04	5.0E+04	5.0E+04	5.0E+04
Nd-147	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04	1.9E+04
Np-239	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.1E+06	1.0E+06	1.0E+06	1.0E+06	1.0E+06
Pu-238	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02
Pu-239	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01
Pu-240	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03
Am-241	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00	5.3E+00
Cm-242	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03
Cm-244	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 8 of 11)

Nuclide	Time after LOCA (hr)										
	26	28	30	35	40	48	50	60	70	80	96
Co-60	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	9.8E+04	9.8E+04	9.7E+04	9.7E+04	9.6E+04	9.5E+04	9.4E+04	9.3E+04	9.2E+04	9.0E+04	8.8E+04
Sr-89	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.3E+06	3.2E+06	3.2E+06	3.2E+06	3.2E+06
Sr-90	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Sr-91	6.6E+05	5.7E+05	5.0E+05	3.4E+05	2.4E+05	1.3E+05	1.2E+05	5.6E+04	2.7E+04	1.3E+04	4.0E+03
Sr-92	6.0E+03	3.6E+03	2.2E+03	6.0E+02	1.7E+02	2.2E+01	1.3E+01	1.0E+00	7.8E-02	6.0E-03	1.0E-04
Y-90	6.8E+04	7.2E+04	7.7E+04	8.7E+04	9.7E+04	1.1E+05	1.2E+05	1.3E+05	1.5E+05	1.6E+05	1.8E+05
Y-91	5.1E+04	5.1E+04	5.1E+04	5.2E+04	5.2E+04	5.2E+04	5.2E+04	5.2E+04	5.2E+04	5.1E+04	5.1E+04
Y-92	6.8E+04	4.7E+04	3.3E+04	1.3E+04	5.1E+03	1.1E+03	7.5E+02	1.1E+02	1.6E+01	2.2E+00	9.7E-02
Y-93	8.6E+03	7.5E+03	6.6E+03	4.6E+03	3.3E+03	1.9E+03	1.7E+03	8.4E+02	4.2E+02	2.1E+02	7.1E+01
Zr-95	5.3E+04	5.3E+04	5.3E+04	5.2E+04	5.2E+04	5.2E+04	5.2E+04	5.2E+04	5.2E+04	5.1E+04	5.1E+04
Zr-97	1.8E+04	1.7E+04	1.6E+04	1.3E+04	1.0E+04	7.4E+03	6.8E+03	4.5E+03	3.0E+03	2.0E+03	1.0E+03
Nb-95	5.4E+04	5.4E+04	5.4E+04	5.4E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04
Mo-99	5.2E+05	5.1E+05	5.0E+05	4.7E+05	4.5E+05	4.1E+05	4.0E+05	3.6E+05	3.3E+05	2.9E+05	2.5E+05
Tc-99m	5.0E+05	4.9E+05	4.8E+05	4.6E+05	4.3E+05	4.0E+05	3.9E+05	3.5E+05	3.2E+05	2.9E+05	2.4E+05
Ru-103	5.3E+05	5.3E+05	5.3E+05	5.2E+05	5.2E+05	5.2E+05	5.2E+05	5.2E+05	5.1E+05	5.1E+05	5.0E+05
Ru-105	6.1E+03	4.5E+03	3.3E+03	1.5E+03	6.9E+02	2.0E+02	1.4E+02	3.0E+01	6.3E+00	1.3E+00	1.1E-01
Ru-106	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05
Rh-105	2.3E+05	2.2E+05	2.1E+05	1.9E+05	1.7E+05	1.5E+05	1.4E+05	1.2E+05	9.6E+04	7.9E+04	5.8E+04
Sb-127	6.2E+05	6.1E+05	6.0E+05	5.8E+05	5.5E+05	5.2E+05	5.1E+05	4.8E+05	4.4E+05	4.1E+05	3.6E+05
Sb-129	3.5E+04	2.5E+04	1.8E+04	8.3E+03	3.7E+03	1.0E+03	7.4E+02	1.5E+02	3.0E+01	6.0E+00	4.6E-01
Te-127	6.5E+05	6.5E+05	6.4E+05	6.2E+05	6.0E+05	5.7E+05	5.7E+05	5.3E+05	5.0E+05	4.7E+05	4.3E+05
Te-127m	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04	9.8E+04
Te-129	2.6E+05	2.5E+05	2.4E+05	2.3E+05	2.2E+05	2.2E+05	2.2E+05	2.1E+05	2.1E+05	2.1E+05	2.1E+05
Te-129m	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.3E+05	3.2E+05	3.2E+05	3.2E+05	3.2E+05	3.1E+05	3.1E+05
Te-131m	5.6E+05	5.4E+05	5.1E+05	4.6E+05	4.1E+05	3.4E+05	3.2E+05	2.6E+05	2.0E+05	1.6E+05	1.1E+05
Te-132	8.1E+06	8.0E+06	7.8E+06	7.5E+06	7.2E+06	6.7E+06	6.6E+06	6.0E+06	5.5E+06	5.0E+06	4.4E+06
I-131	5.2E+07	5.2E+07	5.2E+07	5.1E+07	5.0E+07	4.8E+07	4.8E+07	4.6E+07	4.5E+07	4.3E+07	4.1E+07
I-132	8.5E+06	8.3E+06	8.2E+06	7.9E+06	7.5E+06	7.0E+06	6.9E+06	6.3E+06	5.8E+06	5.3E+06	4.6E+06
I-133	5.1E+07	4.7E+07	4.4E+07	3.7E+07	3.2E+07	2.4E+07	2.3E+07	1.6E+07	1.2E+07	8.4E+06	4.9E+06
I-134	1.6E-01	3.3E-02	6.7E-03	1.3E-04	2.5E-06	4.4E-09	9.1E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-135	7.3E+06	5.9E+06	4.8E+06	2.9E+06	1.7E+06	7.3E+05	5.9E+05	2.1E+05	7.3E+04	2.5E+04	4.8E+03
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
Cs-136	2.6E+06	2.6E+06	2.6E+06	2.6E+06	2.5E+06	2.5E+06	2.5E+06	2.4E+06	2.4E+06	2.3E+06	2.2E+06
Cs-137	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06
Ba-139	1.2E+01	4.3E+00	1.6E+00	1.3E-01	1.0E-02	1.8E-04	6.7E-05	4.4E-07	2.9E-09	0.0E+00	0.0E+00
Ba-140	5.0E+06	5.0E+06	5.0E+06	4.9E+06	4.9E+06	4.8E+06	4.7E+06	4.6E+06	4.5E+06	4.4E+06	4.3E+06
La-140	1.8E+06	1.9E+06	2.0E+06	2.3E+06	2.5E+06	2.8E+06	2.9E+06	3.1E+06	3.4E+06	3.6E+06	3.7E+06
La-141	5.2E+02	3.6E+02	2.6E+02	1.1E+02	4.4E+01	1.1E+01	7.5E+00	1.3E+00	2.2E-01	3.8E-02	2.2E-03
La-142	4.2E-01	1.7E-01	6.9E-02	7.3E-03	7.7E-04	2.1E-05	8.6E-06	9.6E-08	1.1E-09	0.0E+00	0.0E+00
Ce-141	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05	1.2E+05
Ce-143	7.1E+04	6.8E+04	6.5E+04	5.9E+04	5.3E+04	4.5E+04	4.3E+04	3.5E+04	2.8E+04	2.3E+04	1.6E+04
Ce-144	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.5E+04	9.4E+04	9.4E+04	9.4E+04	9.4E+04	9.4E+04	9.4E+04
Pr-143	5.0E+04	5.0E+04	5.0E+04	5.0E+04	5.0E+04	5.0E+04	5.0E+04	5.0E+04	4.9E+04	4.9E+04	4.8E+04
Nd-147	1.9E+04	1.8E+04	1.8E+04	1.8E+04	1.8E+04	1.8E+04	1.7E+04	1.7E+04	1.7E+04	1.6E+04	1.5E+04
Np-239	9.8E+05	9.6E+05	9.4E+05	8.8E+05	8.3E+05	7.5E+05	7.3E+05	6.5E+05	5.7E+05	5.1E+05	4.2E+05
Pu-238	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02
Pu-239	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01	2.8E+01
Pu-240	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03
Am-241	5.3E+00	5.3E+00	5.3E+00	5.4E+00	5.4E+00	5.4E+00	5.4E+00	5.4E+00	5.4E+00	5.4E+00	5.5E+00
Cm-242	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03
Cm-244	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 9 of 11)

Nuclide	Time after LOCA (hr)										
	100	120	150	160	170	180	200	240	264	288	300
Co-60	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	8.7E+04	8.5E+04	8.1E+04	8.0E+04	7.8E+04	7.7E+04	7.5E+04	7.0E+04	6.8E+04	6.5E+04	6.4E+04
Sr-89	3.2E+06	3.1E+06	3.1E+06	3.1E+06	3.0E+06	3.0E+06	3.0E+06	2.9E+06	2.9E+06	2.8E+06	2.8E+06
Sr-90	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Sr-91	3.0E+03	7.0E+02	7.8E+01	3.8E+01	1.8E+01	8.7E+00	2.0E+00	1.1E-01	1.9E-02	3.3E-03	1.4E-03
Sr-92	3.6E-05	2.2E-07	1.0E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-90	1.8E+05	2.0E+05	2.2E+05	2.3E+05	2.3E+05	2.4E+05	2.5E+05	2.6E+05	2.6E+05	2.7E+05	2.7E+05
Y-91	5.1E+04	5.0E+04	5.0E+04	4.9E+04	4.9E+04	4.9E+04	4.8E+04	4.7E+04	4.7E+04	4.6E+04	4.6E+04
Y-92	4.4E-02	8.9E-04	2.5E-06	3.5E-07	5.0E-08	7.0E-09	1.4E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-93	5.4E+01	1.4E+01	1.7E+00	8.7E-01	4.4E-01	2.2E-01	5.6E-02	3.6E-03	7.0E-04	1.3E-04	5.9E-05
Zr-95	5.1E+04	5.0E+04	5.0E+04	5.0E+04	4.9E+04	4.9E+04	4.9E+04	4.8E+04	4.7E+04	4.7E+04	4.7E+04
Zr-97	8.8E+02	3.9E+02	1.1E+02	7.5E+01	5.0E+01	3.3E+01	1.5E+01	2.8E+00	1.1E+00	3.9E-01	2.4E-01
Nb-95	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04
Mo-99	2.4E+05	1.9E+05	1.4E+05	1.3E+05	1.1E+05	1.0E+05	8.3E+04	5.5E+04	4.2E+04	3.3E+04	2.9E+04
Tc-99m	2.3E+05	1.9E+05	1.4E+05	1.2E+05	1.1E+05	1.0E+05	8.1E+04	5.3E+04	4.1E+04	3.2E+04	2.8E+04
Ru-103	5.0E+05	4.9E+05	4.8E+05	4.8E+05	4.8E+05	4.7E+05	4.6E+05	4.5E+05	4.4E+05	4.4E+05	4.3E+05
Ru-105	5.9E-02	2.6E-03	2.4E-05	5.0E-06	1.1E-06	2.2E-07	9.7E-09	1.9E-11	0.0E+00	0.0E+00	0.0E+00
Ru-106	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.9E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05
Rh-105	5.3E+04	3.6E+04	2.0E+04	1.6E+04	1.4E+04	1.1E+04	7.5E+03	3.4E+03	2.1E+03	1.3E+03	1.1E+03
Sb-127	3.5E+05	3.0E+05	2.4E+05	2.3E+05	2.1E+05	1.9E+05	1.7E+05	1.2E+05	1.0E+05	8.6E+04	7.9E+04
Sb-129	2.4E-01	9.9E-03	8.0E-05	1.6E-05	3.2E-06	6.5E-07	2.6E-08	4.3E-11	0.0E+00	0.0E+00	0.0E+00
Te-127	4.2E+05	3.7E+05	3.2E+05	3.0E+05	2.9E+05	2.7E+05	2.5E+05	2.1E+05	1.9E+05	1.7E+05	1.7E+05
Te-127m	9.8E+04	9.7E+04	9.7E+04	9.7E+04	9.7E+04	9.6E+04	9.6E+04	9.5E+04	9.5E+04	9.4E+04	9.4E+04
Te-129	2.1E+05	2.0E+05	2.0E+05	2.0E+05	2.0E+05	1.9E+05	1.9E+05	1.8E+05	1.8E+05	1.8E+05	1.7E+05
Te-129m	3.1E+05	3.0E+05	3.0E+05	2.9E+05	2.9E+05	2.9E+05	2.8E+05	2.7E+05	2.7E+05	2.6E+05	2.6E+05
Te-131m	1.0E+05	6.4E+04	3.2E+04	2.6E+04	2.0E+04	1.6E+04	1.0E+04	4.0E+03	2.3E+03	1.3E+03	1.0E+03
Te-132	4.2E+06	3.5E+06	2.7E+06	2.5E+06	2.3E+06	2.1E+06	1.7E+06	1.2E+06	9.9E+05	8.0E+05	7.2E+05
I-131	4.0E+07	3.7E+07	3.4E+07	3.2E+07	3.1E+07	3.0E+07	2.8E+07	2.4E+07	2.2E+07	2.0E+07	2.0E+07
I-132	4.4E+06	3.7E+06	2.8E+06	2.6E+06	2.4E+06	2.2E+06	1.8E+06	1.3E+06	1.0E+06	8.3E+05	7.5E+05
I-133	4.3E+06	2.2E+06	8.1E+05	5.8E+05	4.2E+05	3.0E+05	1.5E+05	4.0E+04	1.8E+04	8.2E+03	5.5E+03
I-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-135	3.1E+03	3.8E+02	1.7E+01	5.8E+00	2.0E+00	7.1E-01	8.7E-02	1.3E-03	1.1E-04	8.6E-06	2.4E-06
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07
Cs-136	2.2E+06	2.1E+06	2.0E+06	1.9E+06	1.9E+06	1.9E+06	1.8E+06	1.6E+06	1.5E+06	1.5E+06	1.4E+06
Cs-137	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-140	4.2E+06	4.1E+06	3.8E+06	3.7E+06	3.6E+06	3.5E+06	3.4E+06	3.1E+06	2.9E+06	2.8E+06	2.7E+06
La-140	3.8E+06	3.9E+06	3.9E+06	3.9E+06	3.8E+06	3.8E+06	3.7E+06	3.5E+06	3.3E+06	3.1E+06	3.1E+06
La-141	1.1E-03	3.3E-05	1.6E-07	2.8E-08	4.8E-09	8.3E-10	2.4E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-141	1.2E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.1E+05	1.0E+05	1.0E+05	9.8E+04	9.7E+04
Ce-143	1.5E+04	9.9E+03	5.2E+03	4.3E+03	3.4E+03	2.8E+03	1.8E+03	7.9E+02	4.8E+02	2.9E+02	2.2E+02
Ce-144	9.4E+04	9.4E+04	9.3E+04	9.3E+04	9.3E+04	9.3E+04	9.3E+04	9.3E+04	9.2E+04	9.2E+04	9.2E+04
Pr-143	4.8E+04	4.6E+04	4.4E+04	4.3E+04	4.2E+04	4.1E+04	4.0E+04	3.7E+04	3.5E+04	3.3E+04	3.2E+04
Nd-147	1.5E+04	1.4E+04	1.3E+04	1.3E+04	1.3E+04	1.2E+04	1.2E+04	1.1E+04	9.9E+03	9.3E+03	9.0E+03
Np-239	4.0E+05	3.1E+05	2.1E+05	1.9E+05	1.7E+05	1.5E+05	1.2E+05	7.1E+04	5.3E+04	4.0E+04	3.4E+04
Pu-238	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02
Pu-239	2.8E+01	2.8E+01	2.8E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Pu-240	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03
Am-241	5.5E+00	5.5E+00	5.6E+00	5.6E+00	5.6E+00	5.6E+00	5.6E+00	5.7E+00	5.8E+00	5.8E+00	5.8E+00
Cm-242	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.3E+03	1.2E+03	1.2E+03	1.2E+03
Cm-244	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 10 of 11)

Nuclide	Time after LOCA (hr)										
	312	336	360	400	480	500	600	700	720	960	1200
Co-60	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03	1.1E+03
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	6.3E+04	6.1E+04	5.8E+04	5.5E+04	4.9E+04	4.7E+04	4.0E+04	3.5E+04	3.3E+04	2.3E+04	1.6E+04
Sr-89	2.8E+06	2.8E+06	2.7E+06	2.7E+06	2.5E+06	2.5E+06	2.4E+06	2.2E+06	2.2E+06	1.9E+06	1.7E+06
Sr-90	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Sr-91	5.7E-04	1.0E-04	1.7E-05	9.3E-07	2.7E-09	6.3E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-90	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05	2.8E+05
Y-91	4.6E+04	4.5E+04	4.5E+04	4.4E+04	4.2E+04	4.2E+04	4.0E+04	3.8E+04	3.7E+04	3.3E+04	3.0E+04
Y-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-93	2.6E-05	5.0E-06	9.6E-07	6.1E-08	2.5E-10	6.4E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-95	4.6E+04	4.6E+04	4.5E+04	4.4E+04	4.3E+04	4.3E+04	4.1E+04	3.9E+04	3.8E+04	3.5E+04	3.1E+04
Zr-97	1.5E-01	5.5E-02	2.1E-02	4.0E-03	1.5E-04	6.6E-05	1.1E-06	1.8E-08	8.0E-09	0.0E+00	0.0E+00
Nb-95	5.3E+04	5.2E+04	5.2E+04	5.2E+04	5.1E+04	5.1E+04	5.0E+04	5.0E+04	4.9E+04	4.7E+04	4.4E+04
Mo-99	2.6E+04	2.0E+04	1.5E+04	1.0E+04	4.4E+03	3.6E+03	1.2E+03	4.4E+02	3.5E+02	2.8E+01	2.3E+00
Tc-99m	2.5E+04	1.9E+04	1.5E+04	9.9E+03	4.3E+03	3.5E+03	1.2E+03	4.2E+02	3.4E+02	2.8E+01	2.2E+00
Ru-103	4.3E+05	4.2E+05	4.1E+05	4.0E+05	3.8E+05	3.7E+05	3.5E+05	3.2E+05	3.2E+05	2.7E+05	2.2E+05
Ru-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-106	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.8E+05	1.7E+05	1.7E+05
Rh-105	8.4E+02	5.2E+02	3.3E+02	1.5E+02	3.1E+01	2.1E+01	3.0E+00	4.2E-01	2.8E-01	2.5E-03	2.3E-05
Sb-127	7.2E+04	6.0E+04	5.0E+04	3.7E+04	2.0E+04	1.8E+04	8.3E+03	3.9E+03	3.4E+03	5.6E+02	9.2E+01
Sb-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127	1.6E+05	1.5E+05	1.4E+05	1.2E+05	1.1E+05	1.0E+05	9.4E+04	8.8E+04	8.7E+04	7.9E+04	7.4E+04
Te-127m	9.4E+04	9.3E+04	9.3E+04	9.2E+04	9.0E+04	9.0E+04	8.7E+04	8.5E+04	8.5E+04	7.9E+04	7.5E+04
Te-129	1.7E+05	1.7E+05	1.7E+05	1.6E+05	1.5E+05	1.5E+05	1.3E+05	1.2E+05	1.2E+05	9.9E+04	8.1E+04
Te-129m	2.6E+05	2.5E+05	2.5E+05	2.4E+05	2.2E+05	2.2E+05	2.0E+05	1.8E+05	1.8E+05	1.5E+05	1.2E+05
Te-131m	7.6E+02	4.4E+02	2.5E+02	1.0E+02	1.6E+01	9.9E+00	9.8E-01	9.7E-02	6.1E-02	2.4E-04	9.4E-07
Te-132	6.4E+05	5.2E+05	4.2E+05	3.0E+05	1.5E+05	1.2E+05	5.0E+04	2.1E+04	1.7E+04	2.1E+03	2.5E+02
I-131	1.9E+07	1.7E+07	1.6E+07	1.4E+07	1.0E+07	9.6E+06	6.7E+06	4.7E+06	4.3E+06	1.8E+06	7.7E+05
I-132	6.7E+05	5.4E+05	4.4E+05	3.1E+05	1.5E+05	1.3E+05	5.2E+04	2.2E+04	1.8E+04	2.2E+03	2.6E+02
I-133	3.7E+03	1.6E+03	7.4E+02	2.0E+02	1.4E+01	7.0E+00	2.5E-01	8.9E-03	4.6E-03	1.5E-06	5.2E-10
I-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-135	6.9E-07	5.6E-08	4.5E-09	6.8E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	1.0E+07	9.9E+06	9.9E+06	9.9E+06	9.8E+06	9.7E+06
Cs-136	1.4E+06	1.3E+06	1.3E+06	1.1E+06	9.6E+05	9.2E+05	7.4E+05	5.9E+05	5.7E+05	3.3E+05	2.0E+05
Cs-137	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06	5.8E+06
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-140	2.6E+06	2.5E+06	2.4E+06	2.1E+06	1.8E+06	1.7E+06	1.4E+06	1.1E+06	1.0E+06	6.0E+05	3.5E+05
La-140	3.0E+06	2.8E+06	2.7E+06	2.5E+06	2.1E+06	2.0E+06	1.6E+06	1.3E+06	1.2E+06	7.0E+05	4.0E+05
La-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-141	9.6E+04	9.4E+04	9.2E+04	8.8E+04	8.2E+04	8.1E+04	7.4E+04	6.8E+04	6.6E+04	5.4E+04	4.3E+04
Ce-143	1.7E+02	1.1E+02	6.4E+01	2.8E+01	5.1E+00	3.4E+00	4.1E-01	5.0E-02	3.3E-02	2.1E-04	1.4E-06
Ce-144	9.2E+04	9.2E+04	9.2E+04	9.1E+04	9.0E+04	9.0E+04	8.9E+04	8.8E+04	8.8E+04	8.6E+04	8.4E+04
Pr-143	3.1E+04	3.0E+04	2.8E+04	2.6E+04	2.2E+04	2.1E+04	1.7E+04	1.4E+04	1.3E+04	7.9E+03	4.7E+03
Nd-147	8.7E+03	8.2E+03	7.7E+03	6.9E+03	5.6E+03	5.3E+03	4.1E+03	3.2E+03	3.0E+03	1.6E+03	8.5E+02
Np-239	2.9E+04	2.2E+04	1.6E+04	1.0E+04	3.8E+03	2.9E+03	8.6E+02	2.5E+02	2.0E+02	1.0E+01	5.5E-01
Pu-238	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02	3.7E+02
Pu-239	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Pu-240	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.8E+03	9.7E+03	9.7E+03	9.7E+03	9.7E+03
Am-241	5.8E+00	5.9E+00	5.9E+00	6.0E+00	6.1E+00	6.2E+00	6.4E+00	6.5E+00	6.6E+00	7.0E+00	7.4E+00
Cm-242	1.2E+03	1.2E+03	1.2E+03	1.2E+03	1.2E+03	1.2E+03	1.2E+03	1.2E+03	1.2E+03	1.1E+03	1.1E+03
Cm-244	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-3 Radioactivity at Typical Times after LOCA (for recirculation water) (Sheet 11 of 11)

Nuclide	Time after LOCA (hr)										
	1440	2160	2880	3600	4320	5040	5760	6480	7200	7920	8760
Co-60	1.1E+03	1.1E+03	1.0E+03	1.0E+03	1.0E+03	1.0E+03	1.0E+03	9.9E+02	9.8E+02	9.7E+02	9.5E+02
Kr-85	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-85m	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-87	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Kr-88	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Rb-86	1.1E+04	3.6E+03	1.2E+03	3.9E+02	1.3E+02	4.2E+01	1.4E+01	4.5E+00	1.5E+00	4.8E-01	1.3E-01
Sr-89	1.5E+06	9.7E+05	6.4E+05	4.3E+05	2.8E+05	1.9E+05	1.2E+05	8.2E+04	5.5E+04	3.6E+04	2.2E+04
Sr-90	2.8E+05	2.8E+05	2.8E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05
Sr-91	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sr-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-90	2.8E+05	2.8E+05	2.8E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05	2.7E+05
Y-91	2.6E+04	1.8E+04	1.3E+04	9.0E+03	6.3E+03	4.4E+03	3.1E+03	2.2E+03	1.5E+03	1.1E+03	7.1E+02
Y-92	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Y-93	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zr-95	2.8E+04	2.0E+04	1.5E+04	1.0E+04	7.6E+03	5.5E+03	4.0E+03	2.9E+03	2.1E+03	1.5E+03	1.0E+03
Zr-97	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Nb-95	4.2E+04	3.3E+04	2.6E+04	2.0E+04	1.5E+04	1.1E+04	8.1E+03	6.0E+03	4.4E+03	3.2E+03	2.2E+03
Mo-99	1.8E-01	9.5E-05	5.0E-08	2.6E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tc-99m	1.8E-01	9.3E-05	4.8E-08	2.5E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-103	1.9E+05	1.1E+05	6.5E+04	3.8E+04	2.2E+04	1.3E+04	7.8E+03	4.6E+03	2.7E+03	1.6E+03	8.6E+02
Ru-105	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ru-106	1.7E+05	1.6E+05	1.5E+05	1.4E+05	1.3E+05	1.3E+05	1.2E+05	1.1E+05	1.1E+05	1.0E+05	9.5E+04
Rh-105	2.1E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sb-127	1.5E+01	6.9E-02	3.1E-04	1.4E-06	6.3E-09	2.8E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sb-129	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-127	6.9E+04	5.7E+04	4.7E+04	3.9E+04	3.2E+04	2.7E+04	2.2E+04	1.8E+04	1.5E+04	1.2E+04	9.9E+03
Te-127m	7.0E+04	5.8E+04	4.8E+04	3.9E+04	3.3E+04	2.7E+04	2.2E+04	1.8E+04	1.5E+04	1.3E+04	1.0E+04
Te-129	6.6E+04	3.5E+04	1.9E+04	1.0E+04	5.5E+03	3.0E+03	1.6E+03	8.6E+02	4.6E+02	2.5E+02	1.2E+02
Te-129m	9.8E+04	5.3E+04	2.8E+04	1.5E+04	8.2E+03	4.4E+03	2.4E+03	1.3E+03	6.9E+02	3.7E+02	1.8E+02
Te-131m	3.7E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Te-132	2.9E+01	5.0E-02	8.4E-05	1.4E-07	2.4E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-131	3.3E+05	2.5E+04	1.9E+03	1.4E+02	1.1E+01	7.9E-01	6.0E-02	4.5E-03	3.4E-04	2.5E-05	1.2E-06
I-132	3.1E+01	5.2E-02	8.8E-05	1.5E-07	2.5E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
I-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-133	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Xe-135	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cs-134	9.6E+06	9.4E+06	9.1E+06	8.9E+06	8.6E+06	8.4E+06	8.2E+06	7.9E+06	7.7E+06	7.5E+06	7.3E+06
Cs-136	1.2E+05	2.4E+04	4.8E+03	9.9E+02	2.0E+02	4.1E+01	8.5E+00	1.7E+00	3.5E-01	7.2E-02	1.1E-02
Cs-137	5.8E+06	5.8E+06	5.7E+06	5.7E+06	5.7E+06	5.7E+06	5.7E+06	5.7E+06	5.7E+06	5.7E+06	5.7E+06
Ba-139	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ba-140	2.0E+05	4.0E+04	7.8E+03	1.5E+03	3.0E+02	5.8E+01	1.1E+01	2.2E+00	4.3E-01	8.5E-02	1.3E-02
La-140	2.3E+05	4.6E+04	9.0E+03	1.8E+03	3.4E+02	6.7E+01	1.3E+01	2.6E+00	5.0E-01	9.8E-02	1.5E-02
La-141	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
La-142	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-141	3.5E+04	1.8E+04	9.8E+03	5.1E+03	2.7E+03	1.4E+03	7.5E+02	4.0E+02	2.1E+02	1.1E+02	5.2E+01
Ce-143	9.0E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Ce-144	8.2E+04	7.6E+04	7.1E+04	6.6E+04	6.1E+04	5.7E+04	5.3E+04	4.9E+04	4.6E+04	4.2E+04	3.9E+04
Pr-143	2.8E+03	6.1E+02	1.3E+02	2.9E+01	6.2E+00	1.3E+00	2.9E-01	6.2E-02	1.3E-02	2.9E-03	4.8E-04
Nd-147	4.5E+02	6.8E+01	1.0E+01	1.5E+00	2.3E-01	3.5E-02	5.2E-03	7.9E-04	1.2E-04	1.8E-05	2.0E-06
Np-239	2.9E-02	4.2E-06	6.2E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pu-238	3.7E+02	3.7E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02	3.8E+02
Pu-239	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Pu-240	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01	4.4E+01
Pu-241	9.7E+03	9.7E+03	9.6E+03	9.6E+03	9.6E+03	9.5E+03	9.5E+03	9.4E+03	9.4E+03	9.4E+03	9.3E+03
Am-241	7.9E+00	9.1E+00	1.0E+01	1.2E+01	1.3E+01	1.4E+01	1.5E+01	1.7E+01	1.8E+01	1.9E+01	2.1E+01
Cm-242	1.0E+03	8.9E+02	7.9E+02	6.9E+02	6.1E+02	5.4E+02	4.7E+02	4.1E+02	3.7E+02	3.2E+02	2.8E+02
Cm-244	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.6E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02

Note
1. The gamma ray source strengths are converted from the above amount of radioactivity using MicroShield

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 1 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	0.01	0.02	0.03	0.04	0.05	0.06	0.0667	0.08	0.0834	0.1	0.15
0.015	1.0E+14	1.1E+15	2.6E+15	3.8E+15	5.1E+15	6.3E+15	7.1E+15	8.7E+15	9.1E+15	1.1E+16	1.7E+16
0.02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.03	9.0E+14	6.9E+15	1.3E+16	2.0E+16	2.6E+16	3.2E+16	3.6E+16	4.4E+16	4.6E+16	5.6E+16	8.6E+16
0.04	3.3E+13	2.5E+14	4.7E+14	6.8E+14	8.9E+14	1.1E+15	1.3E+15	1.5E+15	1.6E+15	2.0E+15	3.0E+15
0.05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.06	0.0E+00	5.0E+13	9.2E+13	1.4E+14	1.8E+14	2.2E+14	2.5E+14	3.1E+14	3.2E+14	3.7E+14	5.3E+14
0.08	7.2E+14	5.0E+15	9.4E+15	1.4E+16	1.8E+16	2.2E+16	2.5E+16	3.1E+16	3.2E+16	4.0E+16	6.1E+16
0.1	0.0E+00	9.5E+12	2.6E+13	3.8E+13	5.0E+13	6.2E+13	7.0E+13	8.5E+13	8.9E+13	1.1E+14	1.6E+14
0.15	1.1E+12	2.2E+14	4.7E+15	6.9E+15	9.0E+15	1.1E+16	1.3E+16	1.5E+16	1.6E+16	1.9E+16	2.9E+16
0.2	2.4E+12	4.8E+15	1.1E+16	1.6E+16	2.1E+16	2.6E+16	2.9E+16	3.6E+16	3.8E+16	4.6E+16	7.0E+16
0.3	5.8E+13	1.5E+15	3.4E+15	5.0E+15	6.6E+15	8.1E+15	9.2E+15	1.1E+16	1.2E+16	1.4E+16	2.0E+16
0.4	7.2E+14	6.1E+15	1.7E+16	2.7E+16	3.5E+16	4.4E+16	4.9E+16	6.0E+16	6.3E+16	7.4E+16	1.1E+17
0.5	6.3E+12	1.5E+16	3.0E+16	4.4E+16	5.8E+16	7.2E+16	8.2E+16	1.0E+17	1.0E+17	1.2E+17	1.7E+17
0.6	3.2E+14	1.4E+16	3.5E+16	5.1E+16	6.7E+16	8.3E+16	9.4E+16	1.1E+17	1.2E+17	1.4E+17	2.0E+17
0.8	2.1E+14	1.3E+16	7.1E+16	1.0E+17	1.4E+17	1.7E+17	1.9E+17	2.3E+17	2.4E+17	2.8E+17	3.8E+17
1.0	5.9E+12	8.2E+15	2.6E+16	3.8E+16	4.9E+16	6.1E+16	6.9E+16	8.4E+16	8.8E+16	1.0E+17	1.4E+17
1.5	6.4E+12	9.0E+15	2.1E+16	3.1E+16	4.1E+16	5.0E+16	5.7E+16	7.0E+16	7.3E+16	8.5E+16	1.2E+17
2.0	0.0E+00	3.8E+15	1.2E+16	1.7E+16	2.3E+16	2.8E+16	3.2E+16	3.9E+16	4.0E+16	4.8E+16	7.1E+16
3.0	0.0E+00	3.2E+13	7.9E+14	1.8E+15	2.3E+15	2.9E+15	3.2E+15	3.9E+15	4.1E+15	5.0E+15	7.4E+15
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	0.0E+00	1.7E+16	7.4E+17	3.0E+18	6.5E+18	1.1E+19	1.5E+19	2.3E+19	2.6E+19	3.9E+19	8.7E+19

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 2 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	0.2	0.3	0.4	0.5	0.5083	0.6	0.7	0.8	0.9	1	1.1
0.015	2.3E+16	3.4E+16	4.5E+16	5.5E+16	5.6E+16	1.3E+17	2.1E+17	2.9E+17	3.7E+17	4.5E+17	5.2E+17
0.02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+15	1.9E+15	2.7E+15	3.4E+15	4.0E+15	4.6E+15
0.03	1.2E+17	1.7E+17	2.3E+17	2.9E+17	2.9E+17	6.9E+17	1.1E+18	1.5E+18	1.9E+18	2.4E+18	2.8E+18
0.04	4.1E+15	6.2E+15	8.2E+15	1.0E+16	1.0E+16	2.5E+16	4.0E+16	5.5E+16	7.0E+16	8.5E+16	1.0E+17
0.05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E+15	6.4E+15	9.0E+15	1.1E+16	1.4E+16	1.6E+16
0.06	6.7E+14	9.3E+14	1.2E+15	1.4E+15	1.4E+15	2.0E+15	2.6E+15	3.1E+15	3.5E+15	4.0E+15	4.4E+15
0.08	8.2E+16	1.2E+17	1.7E+17	2.1E+17	2.1E+17	5.0E+17	8.0E+17	1.1E+18	1.4E+18	1.7E+18	2.0E+18
0.1	2.2E+14	3.2E+14	4.1E+14	5.0E+14	5.1E+14	4.5E+15	8.1E+15	1.1E+16	1.4E+16	1.7E+16	1.9E+16
0.15	3.8E+16	5.5E+16	7.0E+16	8.5E+16	8.6E+16	1.9E+17	3.0E+17	4.0E+17	4.9E+17	5.9E+17	6.7E+17
0.2	9.3E+16	1.4E+17	1.9E+17	2.3E+17	2.3E+17	5.6E+17	9.0E+17	1.2E+18	1.6E+18	1.9E+18	2.2E+18
0.3	2.5E+16	3.6E+16	4.5E+16	5.4E+16	5.4E+16	9.4E+16	1.3E+17	1.7E+17	2.0E+17	2.3E+17	2.6E+17
0.4	1.4E+17	1.9E+17	2.4E+17	2.8E+17	2.8E+17	4.8E+17	6.7E+17	8.4E+17	9.9E+17	1.1E+18	1.3E+18
0.5	2.2E+17	3.0E+17	3.8E+17	4.4E+17	4.5E+17	7.0E+17	9.2E+17	1.1E+18	1.3E+18	1.5E+18	1.6E+18
0.6	2.5E+17	3.4E+17	4.1E+17	4.8E+17	4.9E+17	7.4E+17	9.8E+17	1.2E+18	1.3E+18	1.5E+18	1.7E+18
0.8	4.8E+17	6.4E+17	7.6E+17	8.7E+17	8.8E+17	1.3E+18	1.7E+18	2.0E+18	2.3E+18	2.5E+18	2.7E+18
1.0	1.8E+17	2.4E+17	3.0E+17	3.4E+17	3.5E+17	5.4E+17	7.1E+17	8.5E+17	9.8E+17	1.1E+18	1.2E+18
1.5	1.5E+17	2.1E+17	2.6E+17	3.1E+17	3.1E+17	5.2E+17	7.1E+17	8.8E+17	1.0E+18	1.2E+18	1.3E+18
2.0	9.2E+16	1.3E+17	1.7E+17	2.0E+17	2.1E+17	4.2E+17	6.3E+17	8.4E+17	1.0E+18	1.2E+18	1.4E+18
3.0	9.8E+15	1.4E+16	1.8E+16	2.1E+16	2.2E+16	4.8E+16	7.3E+16	9.6E+16	1.2E+17	1.3E+17	1.5E+17
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E+12	3.1E+12	6.5E+12	9.0E+12
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	1.6E+20	3.3E+20	5.8E+20	8.9E+20	9.2E+20	1.3E+21	1.9E+21	2.9E+21	4.2E+21	5.7E+21	7.5E+21

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 3 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8083	1.9	2	2.1
0.015	5.9E+17	6.6E+17	7.3E+17	8.0E+17	8.7E+17	9.3E+17	1.0E+18	1.0E+18	9.9E+17	9.8E+17	9.7E+17
0.02	5.2E+15	5.7E+15	6.2E+15	6.7E+15	7.1E+15	7.6E+15	8.0E+15	8.1E+15	7.4E+15	7.0E+15	6.6E+15
0.03	3.2E+18	3.6E+18	4.0E+18	4.4E+18	4.8E+18	5.2E+18	5.6E+18	5.6E+18	5.6E+18	5.6E+18	5.6E+18
0.04	1.1E+17	1.3E+17	1.4E+17	1.6E+17	1.7E+17	1.9E+17	2.0E+17	2.1E+17	2.0E+17	2.0E+17	2.0E+17
0.05	1.7E+16	1.9E+16	2.1E+16	2.2E+16	2.4E+16	2.6E+16	2.7E+16	2.7E+16	2.5E+16	2.3E+16	2.2E+16
0.06	4.8E+15	5.2E+15	5.5E+15	5.9E+15	6.2E+15	6.5E+15	6.8E+15	6.9E+15	6.4E+15	6.0E+15	5.7E+15
0.08	2.3E+18	2.6E+18	2.9E+18	3.2E+18	3.5E+18	3.9E+18	4.2E+18	4.2E+18	4.2E+18	4.2E+18	4.2E+18
0.1	2.2E+16	2.4E+16	2.6E+16	2.8E+16	3.0E+16	3.2E+16	3.4E+16	3.4E+16	3.1E+16	3.0E+16	2.8E+16
0.15	7.6E+17	8.4E+17	9.2E+17	1.0E+18	1.1E+18	1.1E+18	1.2E+18	1.2E+18	1.2E+18	1.2E+18	1.1E+18
0.2	2.5E+18	2.8E+18	3.2E+18	3.5E+18	3.8E+18	4.1E+18	4.4E+18	4.4E+18	4.3E+18	4.3E+18	4.2E+18
0.3	2.9E+17	3.2E+17	3.4E+17	3.7E+17	3.9E+17	4.1E+17	4.4E+17	4.4E+17	4.2E+17	4.0E+17	3.9E+17
0.4	1.4E+18	1.5E+18	1.6E+18	1.7E+18	1.7E+18	1.8E+18	1.9E+18	1.9E+18	1.8E+18	1.7E+18	1.6E+18
0.5	1.8E+18	1.9E+18	2.0E+18	2.1E+18	2.3E+18	2.4E+18	2.5E+18	2.5E+18	2.3E+18	2.2E+18	2.1E+18
0.6	1.8E+18	1.9E+18	2.0E+18	2.1E+18	2.2E+18	2.3E+18	2.4E+18	2.4E+18	2.2E+18	2.0E+18	1.9E+18
0.8	2.9E+18	3.0E+18	3.1E+18	3.3E+18	3.3E+18	3.4E+18	3.5E+18	3.5E+18	3.2E+18	3.0E+18	2.7E+18
1.0	1.3E+18	1.4E+18	1.4E+18	1.5E+18	1.6E+18	1.6E+18	1.7E+18	1.7E+18	1.5E+18	1.4E+18	1.4E+18
1.5	1.4E+18	1.5E+18	1.6E+18	1.7E+18	1.8E+18	1.9E+18	2.0E+18	2.0E+18	1.9E+18	1.8E+18	1.7E+18
2.0	1.5E+18	1.7E+18	1.8E+18	1.9E+18	2.1E+18	2.2E+18	2.3E+18	2.3E+18	2.2E+18	2.2E+18	2.1E+18
3.0	1.6E+17	1.8E+17	1.9E+17	2.0E+17	2.0E+17	2.1E+17	2.2E+17	2.2E+17	2.1E+17	2.0E+17	1.9E+17
4.0	9.7E+12	1.0E+13	1.1E+13	1.1E+13	1.1E+13	1.1E+13	1.2E+13	1.2E+13	1.0E+13	9.2E+12	8.3E+12
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	9.5E+21	1.2E+22	1.4E+22	1.7E+22	1.9E+22	2.2E+22	2.5E+22	2.6E+22	2.9E+22	3.2E+22	3.5E+22

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 4 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3	3.2	3.23
0.015	9.6E+17	9.5E+17	9.4E+17	9.3E+17	9.2E+17	9.2E+17	9.1E+17	9.0E+17	8.9E+17	8.8E+17	8.8E+17
0.02	6.3E+15	6.1E+15	5.9E+15	5.7E+15	5.5E+15	5.4E+15	5.3E+15	5.2E+15	5.1E+15	5.0E+15	5.0E+15
0.03	5.6E+18	5.5E+18	5.5E+18	5.5E+18	5.5E+18	5.5E+18	5.5E+18	5.5E+18	5.5E+18	5.5E+18	5.5E+18
0.04	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17
0.05	2.1E+16	2.0E+16	2.0E+16	1.9E+16	1.9E+16	1.8E+16	1.8E+16	1.8E+16	1.7E+16	1.7E+16	1.7E+16
0.06	5.5E+15	5.3E+15	5.2E+15	5.0E+15	4.9E+15	4.8E+15	4.7E+15	4.7E+15	4.6E+15	4.5E+15	4.5E+15
0.08	4.2E+18	4.2E+18	4.2E+18	4.2E+18	4.2E+18	4.2E+18	4.2E+18	4.1E+18	4.1E+18	4.1E+18	4.1E+18
0.1	2.7E+16	2.6E+16	2.5E+16	2.5E+16	2.4E+16	2.3E+16	2.3E+16	2.3E+16	2.2E+16	2.1E+16	2.1E+16
0.15	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.0E+18	1.0E+18	1.0E+18	9.9E+17	9.7E+17	9.4E+17	9.4E+17
0.2	4.2E+18	4.1E+18	4.1E+18	4.0E+18	4.0E+18	3.9E+18	3.9E+18	3.9E+18	3.8E+18	3.7E+18	3.7E+18
0.3	3.8E+17	3.7E+17	3.6E+17	3.5E+17	3.4E+17	3.3E+17	3.3E+17	3.2E+17	3.2E+17	3.1E+17	3.0E+17
0.4	1.5E+18	1.5E+18	1.4E+18	1.4E+18	1.3E+18	1.3E+18	1.2E+18	1.2E+18	1.2E+18	1.1E+18	1.1E+18
0.5	2.0E+18	1.9E+18	1.8E+18	1.8E+18	1.7E+18	1.7E+18	1.7E+18	1.6E+18	1.6E+18	1.5E+18	1.5E+18
0.6	1.8E+18	1.7E+18	1.6E+18	1.6E+18	1.5E+18	1.4E+18	1.4E+18	1.3E+18	1.3E+18	1.2E+18	1.2E+18
0.8	2.6E+18	2.4E+18	2.3E+18	2.2E+18	2.1E+18	2.0E+18	1.9E+18	1.8E+18	1.7E+18	1.6E+18	1.6E+18
1.0	1.3E+18	1.2E+18	1.2E+18	1.1E+18	1.1E+18	1.0E+18	1.0E+18	9.7E+17	9.4E+17	8.9E+17	8.9E+17
1.5	1.6E+18	1.5E+18	1.5E+18	1.4E+18	1.4E+18	1.4E+18	1.3E+18	1.3E+18	1.2E+18	1.2E+18	1.2E+18
2.0	2.0E+18	2.0E+18	1.9E+18	1.9E+18	1.8E+18	1.8E+18	1.7E+18	1.7E+18	1.7E+18	1.6E+18	1.6E+18
3.0	1.8E+17	1.7E+17	1.6E+17	1.5E+17	1.4E+17	1.4E+17	1.3E+17	1.2E+17	1.2E+17	1.1E+17	1.1E+17
4.0	7.6E+12	7.0E+12	6.5E+12	6.0E+12	5.6E+12	5.2E+12	4.9E+12	4.6E+12	4.4E+12	3.9E+12	3.8E+12
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	3.8E+22	4.0E+22	4.3E+22	4.6E+22	4.8E+22	5.1E+22	5.3E+22	5.6E+22	5.8E+22	6.3E+22	6.3E+22

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 5 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	3.4	3.6	3.8	4	4.2	4.4	4.6	4.8	5	5.5	6
0.015	8.7E+17	8.6E+17	8.4E+17	8.3E+17	8.2E+17	8.1E+17	8.0E+17	7.9E+17	7.8E+17	7.6E+17	7.4E+17
0.02	5.0E+15	4.9E+15	4.9E+15	4.9E+15	4.9E+15	4.8E+15	4.8E+15	4.8E+15	4.8E+15	4.7E+15	4.7E+15
0.03	5.5E+18	5.4E+18	5.4E+18	5.4E+18	5.4E+18	5.4E+18	5.4E+18	5.4E+18	5.4E+18	5.3E+18	5.3E+18
0.04	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17	2.0E+17
0.05	1.7E+16	1.7E+16	1.7E+16	1.7E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16
0.06	4.5E+15	4.5E+15	4.5E+15	4.4E+15	4.4E+15	4.4E+15	4.4E+15	4.4E+15	4.4E+15	4.3E+15	4.3E+15
0.08	4.1E+18	4.1E+18	4.1E+18	4.1E+18	4.1E+18	4.1E+18	4.1E+18	4.1E+18	4.1E+18	4.1E+18	4.1E+18
0.1	2.1E+16	2.1E+16	2.1E+16	2.0E+16	2.0E+16	2.0E+16	1.9E+16	1.9E+16	1.9E+16	1.8E+16	1.8E+16
0.15	9.1E+17	8.8E+17	8.5E+17	8.3E+17	8.0E+17	7.8E+17	7.5E+17	7.3E+17	7.1E+17	6.5E+17	6.0E+17
0.2	3.7E+18	3.6E+18	3.5E+18	3.5E+18	3.4E+18	3.3E+18	3.3E+18	3.2E+18	3.2E+18	3.0E+18	2.9E+18
0.3	3.0E+17	2.9E+17	2.8E+17	2.8E+17	2.7E+17	2.7E+17	2.6E+17	2.5E+17	2.5E+17	2.4E+17	2.2E+17
0.4	1.1E+18	1.0E+18	9.9E+17	9.6E+17	9.3E+17	9.0E+17	8.8E+17	8.5E+17	8.4E+17	7.9E+17	7.6E+17
0.5	1.5E+18	1.5E+18	1.5E+18	1.4E+18	1.4E+18	1.4E+18	1.4E+18	1.4E+18	1.3E+18	1.3E+18	1.3E+18
0.6	1.2E+18	1.1E+18	1.1E+18	1.0E+18	9.9E+17	9.5E+17	9.2E+17	8.9E+17	8.6E+17	7.9E+17	7.4E+17
0.8	1.5E+18	1.4E+18	1.4E+18	1.3E+18	1.2E+18	1.2E+18	1.1E+18	1.1E+18	1.0E+18	9.4E+17	8.6E+17
1.0	8.6E+17	8.3E+17	7.9E+17	7.7E+17	7.4E+17	7.1E+17	6.9E+17	6.7E+17	6.5E+17	6.0E+17	5.6E+17
1.5	1.1E+18	1.1E+18	1.1E+18	1.0E+18	9.9E+17	9.5E+17	9.2E+17	8.9E+17	8.6E+17	7.9E+17	7.3E+17
2.0	1.5E+18	1.4E+18	1.4E+18	1.3E+18	1.2E+18	1.2E+18	1.1E+18	1.1E+18	1.0E+18	9.1E+17	8.1E+17
3.0	9.7E+16	8.8E+16	8.0E+16	7.3E+16	6.6E+16	6.0E+16	5.5E+16	5.0E+16	4.5E+16	3.6E+16	2.9E+16
4.0	3.5E+12	3.2E+12	2.9E+12	2.7E+12	2.4E+12	2.2E+12	2.0E+12	1.8E+12	1.7E+12	1.3E+12	1.1E+12
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	6.7E+22	7.1E+22	7.6E+22	8.0E+22	8.4E+22	8.7E+22	9.1E+22	9.5E+22	9.8E+22	1.1E+23	1.2E+23

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 6 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	6.5	7	7.5	8	8.8	9	9.5	10	11	12	13
0.015	7.3E+17	7.1E+17	7.0E+17	6.9E+17	6.7E+17	6.6E+17	6.5E+17	6.4E+17	6.3E+17	6.2E+17	6.0E+17
0.02	4.6E+15	4.6E+15	4.5E+15	4.5E+15	4.4E+15	4.4E+15	4.4E+15	4.4E+15	4.3E+15	4.3E+15	4.2E+15
0.03	5.3E+18	5.3E+18	5.2E+18	5.2E+18	5.2E+18	5.2E+18	5.2E+18	5.1E+18	5.1E+18	5.1E+18	5.0E+18
0.04	2.0E+17	2.0E+17	2.0E+17	1.9E+17	1.9E+17	1.9E+17	1.9E+17	1.9E+17	1.9E+17	1.9E+17	1.9E+17
0.05	1.6E+16	1.6E+16	1.6E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16
0.06	4.3E+15	4.3E+15	4.3E+15	4.2E+15	4.2E+15	4.2E+15	4.2E+15	4.2E+15	4.2E+15	4.2E+15	4.1E+15
0.08	4.1E+18	4.1E+18	4.0E+18	4.0E+18	4.0E+18	4.0E+18	4.0E+18	4.0E+18	4.0E+18	3.9E+18	3.9E+18
0.1	1.8E+16	1.7E+16	1.7E+16	1.7E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.5E+16	1.5E+16	1.5E+16
0.15	5.6E+17	5.2E+17	4.8E+17	4.5E+17	3.9E+17	3.8E+17	3.6E+17	3.3E+17	2.9E+17	2.5E+17	2.1E+17
0.2	2.8E+18	2.6E+18	2.5E+18	2.4E+18	2.3E+18	2.2E+18	2.1E+18	2.1E+18	1.9E+18	1.8E+18	1.6E+18
0.3	2.1E+17	2.0E+17	1.9E+17	1.9E+17	1.7E+17	1.7E+17	1.6E+17	1.6E+17	1.5E+17	1.4E+17	1.3E+17
0.4	7.3E+17	7.1E+17	6.9E+17	6.8E+17	6.6E+17	6.5E+17	6.4E+17	6.4E+17	6.2E+17	6.1E+17	6.1E+17
0.5	1.2E+18	1.2E+18	1.2E+18	1.2E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.0E+18	9.8E+17	9.4E+17
0.6	6.9E+17	6.5E+17	6.2E+17	5.9E+17	5.4E+17	5.4E+17	5.2E+17	5.0E+17	4.7E+17	4.5E+17	4.3E+17
0.8	7.9E+17	7.4E+17	6.9E+17	6.5E+17	5.9E+17	5.8E+17	5.5E+17	5.3E+17	4.9E+17	4.6E+17	4.3E+17
1.0	5.2E+17	4.9E+17	4.6E+17	4.3E+17	3.9E+17	3.9E+17	3.7E+17	3.5E+17	3.1E+17	2.9E+17	2.6E+17
1.5	6.7E+17	6.3E+17	5.8E+17	5.4E+17	4.9E+17	4.7E+17	4.4E+17	4.2E+17	3.7E+17	3.3E+17	2.9E+17
2.0	7.2E+17	6.4E+17	5.7E+17	5.1E+17	4.3E+17	4.1E+17	3.7E+17	3.3E+17	2.6E+17	2.1E+17	1.7E+17
3.0	2.3E+16	1.9E+16	1.5E+16	1.3E+16	9.3E+15	8.6E+15	7.2E+15	6.1E+15	4.5E+15	3.3E+15	2.6E+15
4.0	8.4E+11	6.7E+11	5.4E+11	4.3E+11	3.0E+11	2.7E+11	2.2E+11	1.7E+11	1.1E+11	7.0E+10	4.5E+10
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	1.2E+23	1.3E+23	1.4E+23	1.4E+23	1.6E+23	1.6E+23	1.6E+23	1.7E+23	1.8E+23	1.9E+23	2.1E+23

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 7 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	14	15	16	17	18	19	20	21	22	23	24
0.015	6.0E+17	5.9E+17	5.8E+17	5.7E+17	5.7E+17	5.6E+17	5.6E+17	5.5E+17	5.5E+17	5.4E+17	5.4E+17
0.02	4.2E+15	4.1E+15	4.1E+15	4.0E+15	4.0E+15	3.9E+15	3.9E+15	3.8E+15	3.8E+15	3.7E+15	3.7E+15
0.03	5.0E+18	5.0E+18	4.9E+18	4.9E+18	4.9E+18	4.8E+18	4.8E+18	4.8E+18	4.8E+18	4.7E+18	4.7E+18
0.04	1.9E+17	1.9E+17	1.8E+17	1.8E+17	1.8E+17	1.8E+17	1.8E+17	1.8E+17	1.8E+17	1.8E+17	1.8E+17
0.05	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.3E+16	1.3E+16	1.3E+16
0.06	4.1E+15	4.1E+15	4.1E+15	4.1E+15	4.1E+15	4.1E+15	4.0E+15	4.0E+15	4.0E+15	4.0E+15	4.0E+15
0.08	3.9E+18	3.9E+18	3.9E+18	3.8E+18	3.8E+18	3.8E+18	3.8E+18	3.8E+18	3.7E+18	3.7E+18	3.7E+18
0.1	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.2E+16
0.15	1.9E+17	1.6E+17	1.4E+17	1.2E+17	1.1E+17	9.7E+16	8.6E+16	7.7E+16	6.9E+16	6.2E+16	5.6E+16
0.2	1.5E+18	1.4E+18	1.3E+18	1.2E+18	1.1E+18	1.0E+18	9.8E+17	9.1E+17	8.5E+17	7.9E+17	7.4E+17
0.3	1.2E+17	1.2E+17	1.1E+17	1.1E+17	1.0E+17	1.0E+17	9.8E+16	9.5E+16	9.3E+16	9.1E+16	8.9E+16
0.4	6.0E+17	5.9E+17	5.9E+17	5.8E+17	5.8E+17	5.7E+17	5.7E+17	5.6E+17	5.6E+17	5.6E+17	5.5E+17
0.5	9.1E+17	8.8E+17	8.5E+17	8.2E+17	8.0E+17	7.7E+17	7.5E+17	7.2E+17	7.0E+17	6.8E+17	6.6E+17
0.6	4.1E+17	4.0E+17	3.9E+17	3.8E+17	3.7E+17	3.7E+17	3.6E+17	3.6E+17	3.5E+17	3.5E+17	3.4E+17
0.8	4.1E+17	3.9E+17	3.8E+17	3.7E+17	3.6E+17	3.5E+17	3.4E+17	3.4E+17	3.3E+17	3.2E+17	3.2E+17
1.0	2.4E+17	2.2E+17	2.1E+17	1.9E+17	1.8E+17	1.7E+17	1.6E+17	1.5E+17	1.4E+17	1.3E+17	1.3E+17
1.5	2.6E+17	2.4E+17	2.2E+17	2.0E+17	1.8E+17	1.7E+17	1.6E+17	1.4E+17	1.3E+17	1.3E+17	1.2E+17
2.0	1.4E+17	1.2E+17	9.5E+16	7.9E+16	6.6E+16	5.5E+16	4.7E+16	4.0E+16	3.4E+16	2.9E+16	2.5E+16
3.0	2.1E+15	1.7E+15	1.4E+15	1.3E+15	1.1E+15	1.0E+15	9.6E+14	9.1E+14	8.8E+14	8.6E+14	8.5E+14
4.0	2.9E+10	1.8E+10	1.2E+10	7.4E+09	4.7E+09	3.0E+09	1.9E+09	1.2E+09	7.8E+08	5.0E+08	3.2E+08
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	2.2E+23	2.3E+23	2.4E+23	2.5E+23	2.5E+23	2.6E+23	2.7E+23	2.8E+23	2.9E+23	3.0E+23	3.1E+23

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 8 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	26	28	30	35	40	48	50	60	70	80	96
0.015	5.3E+17	5.2E+17	5.2E+17	5.0E+17	4.9E+17	4.6E+17	4.6E+17	4.3E+17	4.1E+17	3.9E+17	3.6E+17
0.02	3.6E+15	3.5E+15	3.4E+15	3.2E+15	3.1E+15	2.8E+15	2.7E+15	2.4E+15	2.2E+15	1.9E+15	1.6E+15
0.03	4.6E+18	4.6E+18	4.5E+18	4.4E+18	4.3E+18	4.1E+18	4.0E+18	3.8E+18	3.6E+18	3.4E+18	3.1E+18
0.04	1.7E+17	1.7E+17	1.7E+17	1.6E+17	1.6E+17	1.5E+17	1.5E+17	1.4E+17	1.4E+17	1.3E+17	1.2E+17
0.05	1.3E+16	1.3E+16	1.3E+16	1.2E+16	1.1E+16	1.1E+16	1.1E+16	9.6E+15	8.8E+15	8.1E+15	7.0E+15
0.06	4.0E+15	4.0E+15	3.9E+15	3.9E+15	3.8E+15	3.7E+15	3.7E+15	3.6E+15	3.5E+15	3.4E+15	3.3E+15
0.08	3.7E+18	3.6E+18	3.6E+18	3.5E+18	3.4E+18	3.2E+18	3.2E+18	3.0E+18	2.9E+18	2.7E+18	2.5E+18
0.1	1.2E+16	1.2E+16	1.2E+16	1.1E+16	1.0E+16	9.4E+15	9.2E+15	8.2E+15	7.4E+15	6.6E+15	5.6E+15
0.15	4.7E+16	4.0E+16	3.4E+16	2.6E+16	2.2E+16	1.9E+16	1.9E+16	1.7E+16	1.6E+16	1.5E+16	1.4E+16
0.2	6.5E+17	5.7E+17	5.0E+17	3.7E+17	2.7E+17	1.8E+17	1.6E+17	1.1E+17	8.1E+16	6.6E+16	5.2E+16
0.3	8.6E+16	8.4E+16	8.2E+16	7.8E+16	7.6E+16	7.3E+16	7.2E+16	7.0E+16	6.8E+16	6.6E+16	6.3E+16
0.4	5.5E+17	5.4E+17	5.4E+17	5.3E+17	5.1E+17	5.0E+17	4.9E+17	4.8E+17	4.6E+17	4.4E+17	4.2E+17
0.5	6.2E+17	5.8E+17	5.5E+17	4.7E+17	4.1E+17	3.2E+17	3.1E+17	2.3E+17	1.8E+17	1.5E+17	1.1E+17
0.6	3.4E+17	3.3E+17	3.3E+17	3.2E+17	3.1E+17	2.9E+17	2.9E+17	2.8E+17	2.7E+17	2.6E+17	2.4E+17
0.8	3.1E+17	3.1E+17	3.0E+17	2.9E+17	2.7E+17	2.6E+17	2.6E+17	2.4E+17	2.3E+17	2.2E+17	2.1E+17
1.0	1.2E+17	1.1E+17	1.0E+17	8.7E+16	7.7E+16	6.8E+16	6.6E+16	6.0E+16	5.5E+16	5.2E+16	4.8E+16
1.5	1.1E+17	9.5E+16	8.7E+16	7.3E+16	6.5E+16	5.8E+16	5.7E+16	5.4E+16	5.4E+16	5.3E+16	5.3E+16
2.0	1.9E+16	1.5E+16	1.3E+16	8.2E+15	6.0E+15	4.3E+15	4.0E+15	3.3E+15	2.8E+15	2.6E+15	2.3E+15
3.0	8.5E+14	8.7E+14	8.9E+14	9.7E+14	1.0E+15	1.2E+15	1.2E+15	1.3E+15	1.4E+15	1.5E+15	1.5E+15
4.0	1.3E+08	5.3E+07	2.1E+07	2.3E+06	2.4E+05	6.5E+03	2.7E+03	3.0E+01	3.3E-01	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	3.2E+23	3.4E+23	3.5E+23	3.9E+23	4.2E+23	4.7E+23	4.8E+23	5.4E+23	5.9E+23	6.4E+23	7.1E+23

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 9 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	100	120	150	160	170	180	200	240	264	288	300
0.015	3.5E+17	3.1E+17	2.7E+17	2.5E+17	2.4E+17	2.3E+17	2.0E+17	1.6E+17	1.4E+17	1.3E+17	1.2E+17
0.02	1.5E+15	1.2E+15	8.6E+14	7.7E+14	6.9E+14	6.1E+14	4.9E+14	3.2E+14	2.5E+14	2.0E+14	1.8E+14
0.03	3.1E+18	2.7E+18	2.3E+18	2.2E+18	2.1E+18	2.0E+18	1.8E+18	1.4E+18	1.2E+18	1.1E+18	1.0E+18
0.04	1.2E+17	1.0E+17	8.8E+16	8.3E+16	7.9E+16	7.4E+16	6.7E+16	5.4E+16	4.7E+16	4.2E+16	3.9E+16
0.05	6.8E+15	5.7E+15	4.3E+15	4.0E+15	3.6E+15	3.3E+15	2.8E+15	2.0E+15	1.6E+15	1.3E+15	1.2E+15
0.06	3.2E+15	3.1E+15	2.9E+15	2.8E+15	2.7E+15	2.7E+15	2.6E+15	2.3E+15	2.2E+15	2.1E+15	2.0E+15
0.08	2.4E+18	2.2E+18	1.9E+18	1.8E+18	1.7E+18	1.6E+18	1.4E+18	1.1E+18	9.9E+17	8.7E+17	8.1E+17
0.1	5.3E+15	4.3E+15	3.1E+15	2.8E+15	2.6E+15	2.3E+15	1.9E+15	1.3E+15	1.0E+15	8.5E+14	7.6E+14
0.15	1.4E+16	1.3E+16	1.1E+16	1.1E+16	1.0E+16	9.8E+15	9.1E+15	7.8E+15	7.2E+15	6.7E+15	6.4E+15
0.2	5.0E+16	4.1E+16	3.2E+16	2.9E+16	2.7E+16	2.5E+16	2.1E+16	1.6E+16	1.3E+16	1.1E+16	1.0E+16
0.3	6.2E+16	5.8E+16	5.3E+16	5.2E+16	5.0E+16	4.9E+16	4.6E+16	4.1E+16	3.8E+16	3.6E+16	3.4E+16
0.4	4.1E+17	3.8E+17	3.4E+17	3.3E+17	3.2E+17	3.1E+17	2.9E+17	2.5E+17	2.3E+17	2.1E+17	2.0E+17
0.5	9.9E+16	7.4E+16	5.6E+16	5.2E+16	4.9E+16	4.7E+16	4.3E+16	3.8E+16	3.6E+16	3.3E+16	3.3E+16
0.6	2.4E+17	2.3E+17	2.1E+17	2.0E+17	2.0E+17	2.0E+17	1.9E+17	1.8E+17	1.7E+17	1.7E+17	1.7E+17
0.8	2.1E+17	2.0E+17	1.8E+17	1.8E+17	1.8E+17	1.7E+17	1.7E+17	1.6E+17	1.5E+17	1.5E+17	1.5E+17
1.0	4.7E+16	4.3E+16	3.9E+16	3.7E+16	3.6E+16	3.5E+16	3.3E+16	2.9E+16	2.7E+16	2.6E+16	2.5E+16
1.5	5.3E+16	5.2E+16	5.0E+16	4.9E+16	4.8E+16	4.8E+16	4.6E+16	4.2E+16	4.0E+16	3.8E+16	3.7E+16
2.0	2.2E+15	1.9E+15	1.5E+15	1.4E+15	1.3E+15	1.2E+15	1.1E+15	8.5E+14	7.3E+14	6.4E+14	6.0E+14
3.0	1.5E+15	1.6E+15	1.6E+15	1.6E+15	1.6E+15	1.5E+15	1.5E+15	1.4E+15	1.3E+15	1.3E+15	1.2E+15
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	7.3E+23	8.1E+23	9.2E+23	9.5E+23	9.8E+23	1.0E+24	1.1E+24	1.2E+24	1.2E+24	1.3E+24	1.3E+24

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 10 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	312	336	360	400	480	500	600	700	720	960	1200
0.015	1.1E+17	9.8E+16	8.6E+16	6.9E+16	4.6E+16	4.1E+16	2.5E+16	1.5E+16	1.1E+16	2.9E+15	7.9E+14
0.02	1.6E+14	1.3E+14	1.1E+14	8.2E+13	5.4E+13	5.0E+13	3.9E+13	3.4E+13	0.0E+00	0.0E+00	0.0E+00
0.03	9.6E+17	8.4E+17	7.4E+17	5.9E+17	3.8E+17	3.4E+17	2.0E+17	1.2E+17	9.9E+16	2.6E+16	7.1E+15
0.04	3.7E+16	3.2E+16	2.8E+16	2.3E+16	1.5E+16	1.3E+16	8.1E+15	4.9E+15	3.7E+15	9.9E+14	2.6E+14
0.05	1.0E+15	8.5E+14	6.9E+14	4.9E+14	2.5E+14	2.1E+14	9.5E+13	4.7E+13	0.0E+00	0.0E+00	0.0E+00
0.06	2.0E+15	1.9E+15	1.8E+15	1.6E+15	1.4E+15	1.3E+15	1.0E+15	8.4E+14	0.0E+00	0.0E+00	0.0E+00
0.08	7.6E+17	6.7E+17	5.9E+17	4.7E+17	3.0E+17	2.7E+17	1.6E+17	9.1E+16	8.0E+16	2.1E+16	5.7E+15
0.1	6.9E+14	5.7E+14	4.7E+14	3.5E+14	2.2E+14	2.0E+14	1.2E+14	8.9E+13	0.0E+00	0.0E+00	0.0E+00
0.15	6.2E+15	5.7E+15	5.4E+15	4.8E+15	3.9E+15	3.7E+15	2.9E+15	2.3E+15	1.3E+14	3.5E+13	9.4E+12
0.2	9.4E+15	8.0E+15	6.8E+15	5.4E+15	3.4E+15	3.1E+15	2.0E+15	1.4E+15	2.2E+13	9.1E+12	3.8E+12
0.3	3.3E+16	3.1E+16	2.9E+16	2.6E+16	2.1E+16	1.9E+16	1.5E+16	1.1E+16	5.3E+14	2.2E+14	9.3E+13
0.4	1.9E+17	1.8E+17	1.6E+17	1.4E+17	1.1E+17	9.8E+16	6.9E+16	4.8E+16	6.5E+15	2.8E+15	1.2E+15
0.5	3.2E+16	3.0E+16	2.8E+16	2.6E+16	2.2E+16	2.1E+16	1.8E+16	1.5E+16	3.0E+14	2.9E+14	2.8E+14
0.6	1.6E+17	1.6E+17	1.6E+17	1.5E+17	1.5E+17	1.5E+17	1.4E+17	1.4E+17	6.0E+14	2.5E+14	1.1E+14
0.8	1.4E+17	1.4E+17	1.4E+17	1.3E+17	1.3E+17	1.3E+17	1.2E+17	1.2E+17	1.4E+14	6.1E+13	2.6E+13
1.0	2.4E+16	2.3E+16	2.1E+16	2.0E+16	1.7E+16	1.6E+16	1.3E+16	1.1E+16	2.1E+05	7.0E+01	2.4E-02
1.5	3.6E+16	3.4E+16	3.3E+16	3.0E+16	2.6E+16	2.5E+16	2.0E+16	1.7E+16	2.1E+05	7.1E+01	2.4E-02
2.0	5.6E+14	4.9E+14	4.4E+14	3.6E+14	2.6E+14	2.4E+14	1.7E+14	1.3E+14	0.0E+00	0.0E+00	0.0E+00
3.0	1.2E+15	1.1E+15	1.1E+15	1.0E+15	8.3E+14	8.0E+14	6.3E+14	5.1E+14	0.0E+00	0.0E+00	0.0E+00
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	1.3E+24	1.3E+24	1.4E+24	1.4E+24	1.5E+24	1.5E+24	1.6E+24	1.7E+24	1.7E+24	1.8E+24	1.8E+24

DCD_
03.11-36

Table E-4 Integrated gamma ray and beta source strengths in the CV after a LOCA (Sheet 11 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	1440	2160	2880	3600	4320	5040	5760	6480	7200	7920	8760
0.015	2.1E+14	5.4E+12	1.3E+12	1.2E+12	1.2E+12	1.2E+12	1.2E+12	1.1E+12	1.1E+12	1.1E+12	1.1E+12
0.02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.03	1.9E+15	3.8E+13	8.4E+11	2.5E+10	1.2E+09	7.6E+07	5.5E+06	4.1E+05	3.1E+04	2.3E+03	1.1E+02
0.04	7.1E+13	1.3E+12	2.5E+10	4.8E+08	9.2E+06	1.7E+05	3.3E+03	6.3E+01	1.2E+00	2.3E-02	0.0E+00
0.05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.08	1.5E+15	3.0E+13	6.3E+11	1.7E+10	7.0E+08	4.2E+07	2.9E+06	2.2E+05	1.6E+04	1.2E+03	6.0E+01
0.1	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.15	2.5E+12	4.7E+10	9.0E+08	1.7E+07	3.2E+05	6.1E+03	1.2E+02	2.2E+00	4.2E-02	8.0E-04	0.0E+00
0.2	1.6E+12	1.2E+11	9.1E+09	6.9E+08	5.2E+07	3.9E+06	2.9E+05	2.2E+04	1.7E+03	1.2E+02	6.1E+00
0.3	3.9E+13	2.9E+12	2.2E+11	1.7E+10	1.3E+09	9.4E+07	7.1E+06	5.4E+05	4.0E+04	3.0E+03	1.5E+02
0.4	4.9E+14	3.7E+13	2.8E+12	2.1E+11	1.6E+10	1.2E+09	8.9E+07	6.7E+06	5.1E+05	3.8E+04	1.9E+03
0.5	2.8E+14	2.7E+14	2.7E+14	2.7E+14	2.7E+14	2.7E+14	2.6E+14	2.6E+14	2.6E+14	2.6E+14	2.6E+14
0.6	4.5E+13	3.4E+12	2.6E+11	1.9E+10	1.5E+09	1.1E+08	8.2E+06	6.2E+05	4.7E+04	3.5E+03	1.7E+02
0.8	1.1E+13	8.2E+11	6.2E+10	4.6E+09	3.5E+08	2.6E+07	2.0E+06	1.5E+05	1.1E+04	8.5E+02	4.1E+01
1.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1.5	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
3.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Beta	1.8E+24	1.8E+24	1.9E+24	1.9E+24	2.0E+24	2.0E+24	2.0E+24	2.1E+24	2.1E+24	2.2E+24	2.2E+24

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 1 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	0.01	0.02	0.03	0.04	0.05	0.06	0.0667	0.08	0.0834	0.1	0.15
0.015	4.8E+12	1.0E+14	1.9E+14	2.7E+14	3.5E+14	4.4E+14	4.9E+14	6.0E+14	6.3E+14	7.7E+14	1.2E+15
0.02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.03	4.5E+13	9.3E+14	1.7E+15	2.5E+15	3.3E+15	4.1E+15	4.6E+15	5.6E+15	5.9E+15	7.1E+15	1.1E+16
0.04	3.4E+11	1.6E+13	3.0E+13	4.4E+13	5.8E+13	7.2E+13	8.2E+13	1.0E+14	1.1E+14	1.3E+14	2.0E+14
0.05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.06	0.0E+00	5.0E+13	9.2E+13	1.4E+14	1.8E+14	2.2E+14	2.5E+14	3.1E+14	3.2E+14	3.9E+14	6.0E+14
0.08	2.3E+13	1.9E+14	3.5E+14	5.1E+14	6.7E+14	8.3E+14	9.4E+14	1.2E+15	1.2E+15	1.5E+15	2.3E+15
0.1	0.0E+00	2.6E+12	4.8E+12	7.0E+12	9.3E+12	1.1E+13	1.3E+13	1.6E+13	1.7E+13	2.0E+13	3.1E+13
0.15	0.0E+00	7.7E+14	1.4E+15	2.1E+15	2.7E+15	3.3E+15	3.7E+15	4.5E+15	4.7E+15	5.7E+15	8.5E+15
0.2	2.4E+12	7.6E+14	1.4E+15	2.1E+15	2.7E+15	3.3E+15	3.7E+15	4.6E+15	4.8E+15	5.8E+15	8.7E+15
0.3	5.8E+13	1.5E+15	2.8E+15	4.2E+15	5.5E+15	6.8E+15	7.6E+15	9.4E+15	9.8E+15	1.2E+16	1.8E+16
0.4	7.2E+14	7.8E+15	1.4E+16	2.1E+16	2.8E+16	3.4E+16	3.8E+16	4.7E+16	4.9E+16	6.0E+16	9.2E+16
0.5	6.3E+12	1.6E+16	3.0E+16	4.4E+16	5.8E+16	7.2E+16	8.1E+16	1.0E+17	1.0E+17	1.3E+17	2.0E+17
0.6	3.2E+14	1.9E+16	3.5E+16	5.1E+16	6.6E+16	8.2E+16	9.3E+16	1.1E+17	1.2E+17	1.4E+17	2.2E+17
0.8	2.1E+14	3.7E+16	6.9E+16	1.0E+17	1.3E+17	1.6E+17	1.8E+17	2.2E+17	2.3E+17	2.8E+17	4.2E+17
1.0	5.9E+12	1.4E+16	2.5E+16	3.7E+16	4.8E+16	5.9E+16	6.7E+16	8.1E+16	8.5E+16	1.0E+17	1.6E+17
1.5	6.4E+12	1.0E+16	1.9E+16	2.8E+16	3.7E+16	4.5E+16	5.1E+16	6.2E+16	6.5E+16	7.9E+16	1.2E+17
2.0	0.0E+00	2.7E+15	5.0E+15	7.3E+15	9.6E+15	1.2E+16	1.3E+16	1.6E+16	1.7E+16	2.1E+16	3.1E+16
3.0	0.0E+00	3.4E+13	6.2E+13	9.0E+13	1.2E+14	1.4E+14	1.6E+14	2.0E+14	2.1E+14	2.5E+14	3.7E+14
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 2 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	0.2	0.3	0.4	0.5	0.5083	0.6	0.7	0.8	0.9	1	1.1
0.015	1.6E+15	2.3E+15	3.1E+15	3.8E+15	3.8E+15	1.1E+16	1.9E+16	2.7E+16	3.4E+16	4.2E+16	4.9E+16
0.02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+15	2.4E+15	3.6E+15	4.9E+15	6.1E+15	7.3E+15
0.03	1.4E+16	2.1E+16	2.8E+16	3.5E+16	3.5E+16	7.4E+16	1.2E+17	1.6E+17	2.0E+17	2.4E+17	2.8E+17
0.04	2.7E+14	4.1E+14	5.5E+14	6.9E+14	7.0E+14	1.4E+15	2.2E+15	3.0E+15	3.7E+15	4.5E+15	5.2E+15
0.05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.8E+15	8.0E+15	1.2E+16	1.6E+16	2.0E+16	2.5E+16
0.06	8.2E+14	1.2E+15	1.7E+15	2.1E+15	2.1E+15	3.0E+15	3.9E+15	4.9E+15	5.8E+15	6.7E+15	7.7E+15
0.08	3.1E+15	4.7E+15	6.3E+15	7.9E+15	8.0E+15	1.2E+16	1.6E+16	2.1E+16	2.5E+16	2.9E+16	3.3E+16
0.1	4.2E+13	6.4E+13	8.6E+13	1.1E+14	1.1E+14	4.0E+15	8.2E+15	1.2E+16	1.7E+16	2.1E+16	2.5E+16
0.15	1.1E+16	1.6E+16	2.0E+16	2.3E+16	2.4E+16	3.8E+16	5.2E+16	6.5E+16	7.6E+16	8.6E+16	9.5E+16
0.2	1.2E+16	1.7E+16	2.2E+16	2.6E+16	2.6E+16	6.3E+16	1.0E+17	1.4E+17	1.8E+17	2.1E+17	2.5E+17
0.3	2.5E+16	3.7E+16	5.0E+16	6.2E+16	6.3E+16	9.4E+16	1.3E+17	1.6E+17	1.9E+17	2.3E+17	2.6E+17
0.4	1.2E+17	1.8E+17	2.4E+17	3.0E+17	3.1E+17	4.5E+17	6.1E+17	7.6E+17	9.1E+17	1.1E+18	1.2E+18
0.5	2.6E+17	3.9E+17	5.2E+17	6.5E+17	6.6E+17	9.8E+17	1.3E+18	1.7E+18	2.0E+18	2.3E+18	2.7E+18
0.6	2.9E+17	4.3E+17	5.7E+17	6.9E+17	7.0E+17	1.0E+18	1.4E+18	1.7E+18	2.0E+18	2.3E+18	2.6E+18
0.8	5.5E+17	8.0E+17	1.0E+18	1.2E+18	1.2E+18	1.8E+18	2.3E+18	2.8E+18	3.2E+18	3.6E+18	3.9E+18
1.0	2.1E+17	3.1E+17	4.0E+17	4.8E+17	4.9E+17	7.1E+17	9.5E+17	1.2E+18	1.4E+18	1.6E+18	1.8E+18
1.5	1.6E+17	2.4E+17	3.2E+17	3.9E+17	4.0E+17	5.9E+17	8.0E+17	1.0E+18	1.2E+18	1.4E+18	1.6E+18
2.0	4.2E+16	6.1E+16	8.0E+16	9.7E+16	9.8E+16	1.4E+17	1.9E+17	2.3E+17	2.7E+17	3.1E+17	3.5E+17
3.0	4.8E+14	6.9E+14	8.6E+14	1.0E+15	1.0E+15	1.4E+15	1.8E+15	2.3E+15	2.6E+15	2.9E+15	3.1E+15
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.1E+12	1.0E+13	1.2E+13	1.4E+13
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 3 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8083	1.9	2	2.1
0.015	5.7E+16	6.4E+16	7.2E+16	7.9E+16	8.6E+16	9.3E+16	1.0E+17	1.0E+17	1.0E+17	1.0E+17	1.0E+17
0.02	8.5E+15	9.8E+15	1.1E+16	1.2E+16	1.3E+16	1.5E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16
0.03	3.2E+17	3.5E+17	3.9E+17	4.3E+17	4.7E+17	5.0E+17	5.4E+17	5.4E+17	5.4E+17	5.4E+17	5.3E+17
0.04	5.9E+15	6.7E+15	7.4E+15	8.1E+15	8.8E+15	9.5E+15	1.0E+16	1.0E+16	1.0E+16	1.0E+16	1.0E+16
0.05	2.9E+16	3.3E+16	3.7E+16	4.1E+16	4.5E+16	4.9E+16	5.3E+16	5.4E+16	5.4E+16	5.4E+16	5.4E+16
0.06	8.6E+15	9.6E+15	1.0E+16	1.1E+16	1.2E+16	1.3E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16
0.08	3.8E+16	4.2E+16	4.6E+16	5.0E+16	5.5E+16	5.9E+16	6.3E+16	6.4E+16	6.4E+16	6.4E+16	6.4E+16
0.1	2.9E+16	3.3E+16	3.7E+16	4.1E+16	4.6E+16	5.0E+16	5.4E+16	5.4E+16	5.4E+16	5.4E+16	5.4E+16
0.15	1.0E+17	1.1E+17	1.2E+17	1.2E+17	1.3E+17	1.3E+17	1.4E+17	1.4E+17	1.3E+17	1.3E+17	1.2E+17
0.2	2.8E+17	3.2E+17	3.5E+17	3.8E+17	4.2E+17	4.5E+17	4.8E+17	4.8E+17	4.8E+17	4.8E+17	4.7E+17
0.3	2.9E+17	3.2E+17	3.5E+17	3.8E+17	4.1E+17	4.4E+17	4.7E+17	4.7E+17	4.7E+17	4.7E+17	4.6E+17
0.4	1.3E+18	1.5E+18	1.6E+18	1.7E+18	1.9E+18	2.0E+18	2.1E+18	2.2E+18	2.1E+18	2.1E+18	2.1E+18
0.5	3.0E+18	3.3E+18	3.6E+18	3.9E+18	4.2E+18	4.5E+18	4.8E+18	4.8E+18	4.8E+18	4.7E+18	4.7E+18
0.6	2.9E+18	3.1E+18	3.4E+18	3.6E+18	3.9E+18	4.1E+18	4.3E+18	4.4E+18	4.3E+18	4.2E+18	4.0E+18
0.8	4.2E+18	4.5E+18	4.8E+18	5.0E+18	5.3E+18	5.5E+18	5.7E+18	5.7E+18	5.5E+18	5.3E+18	5.1E+18
1.0	1.9E+18	2.1E+18	2.3E+18	2.4E+18	2.6E+18	2.7E+18	2.8E+18	2.8E+18	2.8E+18	2.7E+18	2.7E+18
1.5	1.7E+18	1.9E+18	2.1E+18	2.2E+18	2.4E+18	2.5E+18	2.7E+18	2.7E+18	2.6E+18	2.6E+18	2.5E+18
2.0	3.8E+17	4.2E+17	4.5E+17	4.8E+17	5.1E+17	5.4E+17	5.6E+17	5.7E+17	5.5E+17	5.4E+17	5.3E+17
3.0	3.3E+15	3.5E+15	3.6E+15	3.7E+15	3.8E+15	3.9E+15	4.0E+15	4.0E+15	3.8E+15	3.6E+15	3.4E+15
4.0	1.6E+13	1.7E+13	1.9E+13	2.0E+13	2.1E+13	2.2E+13	2.3E+13	2.3E+13	2.2E+13	2.1E+13	2.0E+13
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 4 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3	3.2	3.23
0.015	1.0E+17	9.9E+16	9.9E+16	9.9E+16	9.8E+16	9.8E+16	9.8E+16	9.7E+16	9.7E+16	9.7E+16	9.7E+16
0.02	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16
0.03	5.3E+17	5.3E+17	5.3E+17	5.2E+17	5.2E+17	5.2E+17	5.2E+17	5.1E+17	5.1E+17	5.1E+17	5.1E+17
0.04	1.0E+16	1.0E+16	1.0E+16	1.0E+16	1.0E+16	9.9E+15	9.9E+15	9.9E+15	9.8E+15	9.8E+15	9.8E+15
0.05	5.4E+16	5.4E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16
0.06	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16
0.08	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16
0.1	5.4E+16	5.4E+16	5.4E+16	5.4E+16	5.4E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16
0.15	1.2E+17	1.1E+17	1.1E+17	1.1E+17	1.0E+17	1.0E+17	9.7E+16	9.5E+16	9.2E+16	8.7E+16	8.7E+16
0.2	4.7E+17	4.7E+17	4.6E+17	4.6E+17	4.6E+17	4.5E+17	4.5E+17	4.5E+17	4.5E+17	4.4E+17	4.4E+17
0.3	4.6E+17	4.6E+17	4.5E+17	4.5E+17	4.4E+17	4.4E+17	4.4E+17	4.4E+17	4.3E+17	4.3E+17	4.3E+17
0.4	2.1E+18	2.1E+18	2.1E+18	2.1E+18	2.1E+18	2.0E+18	2.0E+18	2.0E+18	2.0E+18	2.0E+18	2.0E+18
0.5	4.7E+18	4.6E+18	4.6E+18	4.5E+18	4.5E+18	4.5E+18	4.4E+18	4.4E+18	4.4E+18	4.3E+18	4.3E+18
0.6	3.9E+18	3.9E+18	3.8E+18	3.7E+18	3.6E+18	3.5E+18	3.4E+18	3.4E+18	3.3E+18	3.1E+18	3.1E+18
0.8	4.9E+18	4.7E+18	4.5E+18	4.4E+18	4.2E+18	4.1E+18	4.0E+18	3.9E+18	3.7E+18	3.5E+18	3.5E+18
1.0	2.6E+18	2.5E+18	2.5E+18	2.4E+18	2.4E+18	2.3E+18	2.3E+18	2.2E+18	2.2E+18	2.1E+18	2.1E+18
1.5	2.5E+18	2.5E+18	2.4E+18	2.4E+18	2.4E+18	2.3E+18	2.3E+18	2.3E+18	2.2E+18	2.2E+18	2.1E+18
2.0	5.2E+17	5.1E+17	5.0E+17	4.9E+17	4.8E+17	4.7E+17	4.6E+17	4.5E+17	4.5E+17	4.3E+17	4.3E+17
3.0	3.2E+15	3.1E+15	2.9E+15	2.8E+15	2.7E+15	2.5E+15	2.4E+15	2.3E+15	2.2E+15	2.1E+15	2.0E+15
4.0	1.9E+13	1.8E+13	1.7E+13	1.7E+13	1.6E+13	1.5E+13	1.5E+13	1.4E+13	1.3E+13	1.2E+13	1.2E+13
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 5 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	3.4	3.6	3.8	4	4.2	4.4	4.6	4.8	5	5.5	6
0.015	9.6E+16	9.6E+16	9.5E+16	9.5E+16	9.4E+16	9.4E+16	9.4E+16	9.3E+16	9.3E+16	9.2E+16	9.2E+16
0.02	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.6E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16
0.03	5.0E+17	5.0E+17	5.0E+17	4.9E+17	4.9E+17	4.9E+17	4.9E+17	4.8E+17	4.8E+17	4.8E+17	4.7E+17
0.04	9.7E+15	9.7E+15	9.7E+15	9.6E+15	9.6E+15	9.6E+15	9.5E+15	9.5E+15	9.5E+15	9.4E+15	9.4E+15
0.05	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.2E+16	5.2E+16	5.2E+16	5.2E+16	5.2E+16
0.06	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16
0.08	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16	6.3E+16
0.1	5.3E+16	5.3E+16	5.3E+16	5.3E+16	5.2E+16	5.2E+16	5.2E+16	5.2E+16	5.2E+16	5.2E+16	5.1E+16
0.15	8.3E+16	8.0E+16	7.7E+16	7.4E+16	7.2E+16	7.0E+16	6.8E+16	6.7E+16	6.5E+16	6.2E+16	6.0E+16
0.2	4.4E+17	4.4E+17	4.3E+17	4.3E+17	4.3E+17	4.2E+17	4.2E+17	4.2E+17	4.2E+17	4.1E+17	4.1E+17
0.3	4.2E+17	4.2E+17	4.1E+17	4.1E+17	4.0E+17	4.0E+17	3.9E+17	3.9E+17	3.8E+17	3.8E+17	3.7E+17
0.4	2.0E+18	2.0E+18	2.0E+18	2.0E+18	1.9E+18	1.9E+18	1.9E+18	1.9E+18	1.9E+18	1.9E+18	1.9E+18
0.5	4.3E+18	4.2E+18	4.2E+18	4.1E+18	4.1E+18	4.0E+18	4.0E+18	3.9E+18	3.9E+18	3.8E+18	3.7E+18
0.6	3.0E+18	2.9E+18	2.8E+18	2.7E+18	2.6E+18	2.5E+18	2.4E+18	2.3E+18	2.3E+18	2.1E+18	2.0E+18
0.8	3.3E+18	3.2E+18	3.0E+18	2.9E+18	2.8E+18	2.6E+18	2.5E+18	2.5E+18	2.4E+18	2.2E+18	2.0E+18
1.0	2.1E+18	2.0E+18	1.9E+18	1.9E+18	1.8E+18	1.8E+18	1.7E+18	1.7E+18	1.6E+18	1.5E+18	1.4E+18
1.5	2.1E+18	2.0E+18	2.0E+18	1.9E+18	1.9E+18	1.8E+18	1.8E+18	1.8E+18	1.7E+18	1.6E+18	1.5E+18
2.0	4.2E+17	4.0E+17	3.9E+17	3.8E+17	3.7E+17	3.6E+17	3.5E+17	3.4E+17	3.3E+17	3.1E+17	2.9E+17
3.0	1.9E+15	1.8E+15	1.7E+15	1.6E+15	1.5E+15	1.5E+15	1.4E+15	1.4E+15	1.3E+15	1.2E+15	1.2E+15
4.0	1.1E+13	1.0E+13	9.3E+12	8.5E+12	7.8E+12	7.1E+12	6.5E+12	5.9E+12	5.4E+12	4.3E+12	3.5E+12
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 6 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	6.5	7	7.5	8	8.8	9	9.5	10	11	12	13
0.015	9.1E+16	9.0E+16	9.0E+16	8.9E+16	8.8E+16	8.8E+16	8.8E+16	8.7E+16	8.6E+16	8.5E+16	8.5E+16
0.02	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.5E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16
0.03	4.7E+17	4.6E+17	4.6E+17	4.6E+17	4.5E+17	4.5E+17	4.5E+17	4.4E+17	4.4E+17	4.3E+17	4.3E+17
0.04	9.3E+15	9.3E+15	9.2E+15	9.2E+15	9.1E+15	9.1E+15	9.1E+15	9.1E+15	9.0E+15	9.0E+15	8.9E+15
0.05	5.2E+16	5.1E+16	5.1E+16	5.1E+16	5.1E+16	5.0E+16	5.0E+16	5.0E+16	5.0E+16	4.9E+16	4.9E+16
0.06	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16
0.08	6.2E+16	6.2E+16	6.2E+16	6.2E+16	6.2E+16	6.2E+16	6.2E+16	6.2E+16	6.1E+16	6.1E+16	6.1E+16
0.1	5.1E+16	5.1E+16	5.0E+16	5.0E+16	5.0E+16	4.9E+16	4.9E+16	4.9E+16	4.8E+16	4.8E+16	4.7E+16
0.15	5.9E+16	5.7E+16	5.6E+16	5.6E+16	5.5E+16	5.4E+16	5.4E+16	5.3E+16	5.3E+16	5.2E+16	5.2E+16
0.2	4.0E+17	4.0E+17	3.9E+17	3.9E+17	3.8E+17	3.8E+17	3.8E+17	3.7E+17	3.7E+17	3.6E+17	3.6E+17
0.3	3.6E+17	3.5E+17	3.5E+17	3.4E+17	3.3E+17	3.3E+17	3.2E+17	3.2E+17	3.1E+17	3.0E+17	3.0E+17
0.4	1.9E+18	1.9E+18	1.8E+18	1.8E+18	1.8E+18	1.8E+18	1.8E+18	1.8E+18	1.8E+18	1.8E+18	1.8E+18
0.5	3.6E+18	3.6E+18	3.5E+18	3.4E+18	3.3E+18	3.3E+18	3.2E+18	3.2E+18	3.0E+18	2.9E+18	2.8E+18
0.6	1.9E+18	1.8E+18	1.7E+18	1.6E+18	1.5E+18	1.5E+18	1.4E+18	1.4E+18	1.3E+18	1.3E+18	1.2E+18
0.8	1.9E+18	1.8E+18	1.7E+18	1.7E+18	1.6E+18	1.5E+18	1.5E+18	1.4E+18	1.4E+18	1.3E+18	1.3E+18
1.0	1.4E+18	1.3E+18	1.2E+18	1.2E+18	1.1E+18	1.1E+18	1.0E+18	9.8E+17	9.0E+17	8.3E+17	7.7E+17
1.5	1.4E+18	1.4E+18	1.3E+18	1.2E+18	1.1E+18	1.1E+18	1.1E+18	1.0E+18	9.3E+17	8.5E+17	7.8E+17
2.0	2.7E+17	2.6E+17	2.4E+17	2.3E+17	2.1E+17	2.1E+17	2.0E+17	1.9E+17	1.7E+17	1.5E+17	1.4E+17
3.0	1.2E+15	1.2E+15	1.2E+15	1.2E+15	1.2E+15	1.3E+15	1.3E+15	1.3E+15	1.4E+15	1.5E+15	1.6E+15
4.0	2.8E+12	2.2E+12	1.8E+12	1.4E+12	9.8E+11	9.0E+11	7.2E+11	5.7E+11	3.7E+11	2.3E+11	1.5E+11
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 7 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	14	15	16	17	18	19	20	21	22	23	24
0.015	8.4E+16	8.3E+16	8.3E+16	8.2E+16	8.1E+16	8.1E+16	8.0E+16	7.9E+16	7.9E+16	7.8E+16	7.8E+16
0.02	1.4E+16	1.4E+16	1.4E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.2E+16	1.2E+16
0.03	4.3E+17	4.2E+17	4.2E+17	4.1E+17	4.1E+17	4.1E+17	4.0E+17	4.0E+17	4.0E+17	3.9E+17	3.9E+17
0.04	8.9E+15	8.8E+15	8.8E+15	8.7E+15	8.7E+15	8.6E+15	8.6E+15	8.6E+15	8.5E+15	8.5E+15	8.4E+15
0.05	4.8E+16	4.8E+16	4.7E+16	4.7E+16	4.7E+16	4.6E+16	4.6E+16	4.5E+16	4.5E+16	4.5E+16	4.4E+16
0.06	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.4E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16
0.08	6.1E+16	6.0E+16	6.0E+16	6.0E+16	6.0E+16	6.0E+16	5.9E+16	5.9E+16	5.9E+16	5.9E+16	5.8E+16
0.1	4.7E+16	4.6E+16	4.5E+16	4.5E+16	4.4E+16	4.4E+16	4.3E+16	4.3E+16	4.2E+16	4.2E+16	4.1E+16
0.15	5.1E+16	5.1E+16	5.1E+16	5.0E+16	5.0E+16	5.0E+16	4.9E+16	4.9E+16	4.9E+16	4.8E+16	4.8E+16
0.2	3.5E+17	3.5E+17	3.4E+17	3.4E+17	3.3E+17	3.3E+17	3.2E+17	3.2E+17	3.2E+17	3.1E+17	3.1E+17
0.3	2.9E+17	2.9E+17	2.8E+17	2.8E+17	2.7E+17	2.7E+17	2.7E+17	2.6E+17	2.6E+17	2.6E+17	2.6E+17
0.4	1.7E+18	1.7E+18	1.7E+18	1.7E+18	1.7E+18	1.7E+18	1.7E+18	1.7E+18	1.7E+18	1.7E+18	1.6E+18
0.5	2.7E+18	2.6E+18	2.6E+18	2.5E+18	2.4E+18	2.3E+18	2.2E+18	2.2E+18	2.1E+18	2.0E+18	2.0E+18
0.6	1.2E+18	1.2E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18
0.8	1.2E+18	1.2E+18	1.2E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.1E+18	1.0E+18	1.0E+18
1.0	7.1E+17	6.7E+17	6.2E+17	5.8E+17	5.5E+17	5.2E+17	4.9E+17	4.7E+17	4.4E+17	4.2E+17	4.0E+17
1.5	7.1E+17	6.6E+17	6.1E+17	5.6E+17	5.2E+17	4.9E+17	4.6E+17	4.3E+17	4.0E+17	3.8E+17	3.6E+17
2.0	1.2E+17	1.1E+17	1.0E+17	9.3E+16	8.5E+16	7.8E+16	7.1E+16	6.5E+16	6.0E+16	5.5E+16	5.1E+16
3.0	1.6E+15	1.7E+15	1.8E+15	1.9E+15	2.0E+15	2.1E+15	2.1E+15	2.2E+15	2.3E+15	2.4E+15	2.5E+15
4.0	9.5E+10	6.1E+10	3.9E+10	2.5E+10	1.6E+10	1.0E+10	6.4E+09	4.1E+09	2.6E+09	1.7E+09	1.1E+09
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 8 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	26	28	30	35	40	48	50	60	70	80	96
0.015	7.7E+16	7.6E+16	7.5E+16	7.2E+16	7.0E+16	6.7E+16	6.6E+16	6.3E+16	5.9E+16	5.6E+16	5.2E+16
0.02	1.2E+16	1.2E+16	1.1E+16	1.1E+16	1.0E+16	9.3E+15	9.1E+15	8.1E+15	7.2E+15	6.4E+15	5.3E+15
0.03	3.8E+17	3.8E+17	3.7E+17	3.6E+17	3.5E+17	3.3E+17	3.2E+17	3.0E+17	2.8E+17	2.6E+17	2.4E+17
0.04	8.3E+15	8.3E+15	8.2E+15	8.0E+15	7.8E+15	7.6E+15	7.5E+15	7.3E+15	7.0E+15	6.8E+15	6.5E+15
0.05	4.3E+16	4.3E+16	4.2E+16	4.0E+16	3.8E+16	3.6E+16	3.5E+16	3.2E+16	2.9E+16	2.7E+16	2.3E+16
0.06	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.3E+16	1.2E+16	1.2E+16	1.2E+16	1.2E+16	1.1E+16	1.1E+16
0.08	5.8E+16	5.8E+16	5.7E+16	5.6E+16	5.5E+16	5.3E+16	5.3E+16	5.1E+16	4.9E+16	4.8E+16	4.5E+16
0.1	4.0E+16	3.9E+16	3.9E+16	3.6E+16	3.4E+16	3.1E+16	3.1E+16	2.7E+16	2.5E+16	2.2E+16	1.9E+16
0.15	4.8E+16	4.7E+16	4.6E+16	4.5E+16	4.4E+16	4.2E+16	4.2E+16	3.9E+16	3.8E+16	3.6E+16	3.3E+16
0.2	3.0E+17	3.0E+17	2.9E+17	2.8E+17	2.6E+17	2.5E+17	2.4E+17	2.2E+17	2.0E+17	1.9E+17	1.6E+17
0.3	2.5E+17	2.5E+17	2.5E+17	2.4E+17	2.3E+17	2.3E+17	2.3E+17	2.2E+17	2.1E+17	2.1E+17	2.0E+17
0.4	1.6E+18	1.6E+18	1.6E+18	1.6E+18	1.5E+18	1.5E+18	1.5E+18	1.4E+18	1.4E+18	1.3E+18	1.2E+18
0.5	1.9E+18	1.7E+18	1.6E+18	1.4E+18	1.2E+18	9.8E+17	9.3E+17	7.2E+17	5.6E+17	4.5E+17	3.3E+17
0.6	1.0E+18	1.0E+18	1.0E+18	1.0E+18	9.8E+17	9.4E+17	9.4E+17	9.0E+17	8.7E+17	8.4E+17	7.9E+17
0.8	1.0E+18	9.9E+17	9.7E+17	9.3E+17	9.0E+17	8.5E+17	8.4E+17	8.0E+17	7.6E+17	7.3E+17	7.0E+17
1.0	3.7E+17	3.4E+17	3.2E+17	2.8E+17	2.5E+17	2.2E+17	2.2E+17	2.0E+17	1.8E+17	1.7E+17	1.6E+17
1.5	3.2E+17	2.9E+17	2.7E+17	2.3E+17	2.1E+17	1.9E+17	1.9E+17	1.8E+17	1.8E+17	1.8E+17	1.8E+17
2.0	4.4E+16	3.8E+16	3.3E+16	2.4E+16	1.9E+16	1.4E+16	1.3E+16	1.1E+16	9.5E+15	8.6E+15	7.5E+15
3.0	2.6E+15	2.7E+15	2.9E+15	3.2E+15	3.5E+15	3.9E+15	4.0E+15	4.3E+15	4.6E+15	4.9E+15	5.1E+15
4.0	4.3E+08	1.8E+08	7.1E+07	7.5E+06	8.0E+05	2.2E+04	8.9E+03	9.9E+01	1.1E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 9 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	100	120	150	160	170	180	200	240	264	288	300
0.015	5.1E+16	4.6E+16	4.1E+16	3.9E+16	3.8E+16	3.6E+16	3.4E+16	2.9E+16	2.7E+16	2.5E+16	2.4E+16
0.02	5.1E+15	4.0E+15	2.9E+15	2.6E+15	2.3E+15	2.0E+15	1.6E+15	1.1E+15	8.5E+14	6.7E+14	6.0E+14
0.03	2.3E+17	2.1E+17	1.8E+17	1.7E+17	1.6E+17	1.5E+17	1.4E+17	1.1E+17	1.0E+17	9.2E+16	8.7E+16
0.04	6.5E+15	6.2E+15	5.8E+15	5.7E+15	5.6E+15	5.5E+15	5.3E+15	4.9E+15	4.7E+15	4.5E+15	4.4E+15
0.05	2.3E+16	1.9E+16	1.4E+16	1.3E+16	1.2E+16	1.1E+16	9.3E+15	6.6E+15	5.3E+15	4.3E+15	3.9E+15
0.06	1.1E+16	1.0E+16	9.6E+15	9.3E+15	9.1E+15	8.9E+15	8.5E+15	7.8E+15	7.3E+15	7.0E+15	6.8E+15
0.08	4.4E+16	4.1E+16	3.7E+16	3.6E+16	3.5E+16	3.4E+16	3.2E+16	2.8E+16	2.5E+16	2.3E+16	2.2E+16
0.1	1.8E+16	1.4E+16	1.0E+16	9.5E+15	8.6E+15	7.7E+15	6.4E+15	4.3E+15	3.5E+15	2.8E+15	2.5E+15
0.15	3.3E+16	3.0E+16	2.7E+16	2.6E+16	2.5E+16	2.4E+16	2.3E+16	2.0E+16	1.9E+16	1.8E+16	1.7E+16
0.2	1.6E+17	1.3E+17	1.0E+17	9.7E+16	8.9E+16	8.3E+16	7.1E+16	5.2E+16	4.4E+16	3.7E+16	3.4E+16
0.3	1.9E+17	1.8E+17	1.7E+17	1.6E+17	1.6E+17	1.5E+17	1.5E+17	1.3E+17	1.2E+17	1.1E+17	1.1E+17
0.4	1.2E+18	1.1E+18	1.0E+18	9.9E+17	9.6E+17	9.2E+17	8.6E+17	7.4E+17	6.8E+17	6.3E+17	6.0E+17
0.5	3.1E+17	2.4E+17	1.8E+17	1.7E+17	1.6E+17	1.5E+17	1.4E+17	1.2E+17	1.2E+17	1.1E+17	1.1E+17
0.6	7.8E+17	7.4E+17	6.9E+17	6.7E+17	6.6E+17	6.4E+17	6.2E+17	5.8E+17	5.7E+17	5.5E+17	5.4E+17
0.8	6.9E+17	6.5E+17	6.1E+17	5.9E+17	5.8E+17	5.7E+17	5.5E+17	5.2E+17	5.0E+17	4.9E+17	4.8E+17
1.0	1.6E+17	1.4E+17	1.3E+17	1.2E+17	1.2E+17	1.2E+17	1.1E+17	9.7E+16	9.1E+16	8.5E+16	8.3E+16
1.5	1.8E+17	1.7E+17	1.7E+17	1.6E+17	1.6E+17	1.6E+17	1.5E+17	1.4E+17	1.3E+17	1.3E+17	1.2E+17
2.0	7.3E+15	6.3E+15	5.1E+15	4.8E+15	4.5E+15	4.2E+15	3.6E+15	2.8E+15	2.4E+15	2.1E+15	2.0E+15
3.0	5.2E+15	5.3E+15	5.3E+15	5.2E+15	5.2E+15	5.1E+15	5.0E+15	4.7E+15	4.5E+15	4.2E+15	4.1E+15
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 10 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	312	336	360	400	480	500	600	700	720	960	1200
0.015	2.3E+16	2.2E+16	2.0E+16	1.8E+16	1.5E+16	1.4E+16	1.1E+16	8.9E+15	8.5E+15	5.2E+15	3.3E+15
0.02	5.4E+14	4.4E+14	3.6E+14	2.7E+14	1.8E+14	1.7E+14	1.3E+14	1.1E+14	1.1E+14	9.0E+13	7.5E+13
0.03	8.3E+16	7.6E+16	6.9E+16	6.0E+16	4.6E+16	4.4E+16	3.3E+16	2.6E+16	2.4E+16	1.5E+16	1.0E+16
0.04	4.4E+15	4.2E+15	4.0E+15	3.8E+15	3.4E+15	3.3E+15	2.9E+15	2.5E+15	2.5E+15	1.9E+15	1.6E+15
0.05	3.5E+15	2.8E+15	2.3E+15	1.6E+15	8.3E+14	7.0E+14	3.2E+14	1.6E+14	1.4E+14	5.0E+13	3.5E+13
0.06	6.6E+15	6.2E+15	5.9E+15	5.4E+15	4.5E+15	4.3E+15	3.5E+15	2.8E+15	2.7E+15	1.6E+15	9.4E+14
0.08	2.2E+16	2.0E+16	1.8E+16	1.6E+16	1.2E+16	1.2E+16	8.3E+15	6.0E+15	5.6E+15	2.6E+15	1.3E+15
0.1	2.3E+15	1.9E+15	1.6E+15	1.2E+15	7.2E+14	6.5E+14	4.2E+14	3.0E+14	2.8E+14	1.5E+14	9.5E+13
0.15	1.6E+16	1.6E+16	1.5E+16	1.3E+16	1.1E+16	1.1E+16	8.8E+15	7.2E+15	7.0E+15	4.5E+15	3.0E+15
0.2	3.1E+16	2.6E+16	2.3E+16	1.8E+16	1.1E+16	1.0E+16	6.6E+15	4.6E+15	4.3E+15	2.2E+15	1.3E+15
0.3	1.1E+17	9.8E+16	9.2E+16	8.2E+16	6.5E+16	6.2E+16	4.7E+16	3.6E+16	3.4E+16	1.8E+16	1.0E+16
0.4	5.8E+17	5.3E+17	4.8E+17	4.2E+17	3.2E+17	2.9E+17	2.1E+17	1.4E+17	1.3E+17	5.7E+16	2.4E+16
0.5	1.0E+17	9.9E+16	9.3E+16	8.6E+16	7.3E+16	7.0E+16	5.8E+16	4.8E+16	4.7E+16	3.2E+16	2.3E+16
0.6	5.4E+17	5.3E+17	5.2E+17	5.0E+17	4.9E+17	4.8E+17	4.7E+17	4.6E+17	4.6E+17	4.5E+17	4.4E+17
0.8	4.8E+17	4.7E+17	4.6E+17	4.5E+17	4.2E+17	4.2E+17	4.0E+17	3.9E+17	3.9E+17	3.7E+17	3.5E+17
1.0	8.0E+16	7.6E+16	7.2E+16	6.5E+16	5.5E+16	5.3E+16	4.4E+16	3.7E+16	3.6E+16	2.5E+16	1.9E+16
1.5	1.2E+17	1.1E+17	1.1E+17	1.0E+17	8.5E+16	8.2E+16	6.7E+16	5.6E+16	5.4E+16	3.6E+16	2.5E+16
2.0	1.9E+15	1.6E+15	1.5E+15	1.2E+15	8.7E+14	8.0E+14	5.7E+14	4.3E+14	4.1E+14	2.3E+14	1.3E+14
3.0	4.0E+15	3.8E+15	3.6E+15	3.3E+15	2.8E+15	2.7E+15	2.1E+15	1.7E+15	1.6E+15	9.4E+14	5.4E+14
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

Table E-5 Integrated gamma ray and beta source strengths in the recirculation water after a LOCA (Sheet 11 of 11)

Gamma Ray Energy (MeV)	Source Strength at Time after Release (MeV)										
	1440	2160	2880	3600	4320	5040	5760	6480	7200	7920	8760
0.015	2.2E+15	9.5E+14	6.3E+14	5.1E+14	4.6E+14	4.2E+14	3.9E+14	3.7E+14	3.5E+14	3.3E+14	3.1E+14
0.02	6.4E+13	3.8E+13	2.4E+13	1.5E+13	9.4E+12	6.2E+12	4.3E+12	3.2E+12	2.5E+12	2.0E+12	1.7E+12
0.03	7.4E+15	4.4E+15	3.5E+15	3.0E+15	2.8E+15	2.6E+15	2.4E+15	2.3E+15	2.2E+15	2.1E+15	2.0E+15
0.04	1.4E+15	1.0E+15	9.0E+14	8.3E+14	7.8E+14	7.4E+14	7.1E+14	6.8E+14	6.5E+14	6.2E+14	6.0E+14
0.05	2.9E+13	1.8E+13	1.2E+13	8.0E+12	5.7E+12	4.3E+12	3.4E+12	2.8E+12	2.4E+12	2.1E+12	1.8E+12
0.06	5.6E+14	1.2E+14	3.4E+13	1.4E+13	9.0E+12	7.0E+12	5.9E+12	5.0E+12	4.3E+12	3.7E+12	3.1E+12
0.08	6.5E+14	1.4E+14	6.7E+13	5.2E+13	4.6E+13	4.3E+13	4.0E+13	3.7E+13	3.4E+13	3.2E+13	2.9E+13
0.1	6.1E+13	2.3E+13	1.4E+13	1.1E+13	9.3E+12	8.4E+12	7.7E+12	7.1E+12	6.6E+12	6.1E+12	5.6E+12
0.15	2.0E+15	8.5E+14	5.0E+14	3.6E+14	2.9E+14	2.5E+14	2.2E+14	2.0E+14	1.9E+14	1.7E+14	1.6E+14
0.2	7.7E+14	2.1E+14	1.0E+14	7.7E+13	7.0E+13	6.7E+13	6.4E+13	6.2E+13	6.1E+13	5.9E+13	5.7E+13
0.3	5.6E+15	1.1E+15	2.6E+14	9.3E+13	5.8E+13	4.9E+13	4.5E+13	4.3E+13	4.2E+13	4.0E+13	3.9E+13
0.4	1.1E+16	9.0E+14	1.1E+14	3.0E+13	1.7E+13	1.3E+13	1.0E+13	8.1E+12	6.6E+12	5.4E+12	4.2E+12
0.5	1.7E+16	9.8E+15	7.3E+15	6.1E+15	5.4E+15	5.0E+15	4.7E+15	4.4E+15	4.3E+15	4.1E+15	4.0E+15
0.6	4.3E+17	4.2E+17	4.1E+17	4.0E+17	3.9E+17	3.8E+17	3.7E+17	3.6E+17	3.5E+17	3.4E+17	3.3E+17
0.8	3.5E+17	3.3E+17	3.2E+17	3.1E+17	3.0E+17	2.9E+17	2.8E+17	2.8E+17	2.7E+17	2.6E+17	2.5E+17
1.0	1.5E+16	1.1E+16	9.7E+15	9.3E+15	9.0E+15	8.7E+15	8.5E+15	8.3E+15	8.0E+15	7.8E+15	7.6E+15
1.5	1.9E+16	1.2E+16	1.1E+16	1.0E+16	9.7E+15	9.5E+15	9.2E+15	9.0E+15	8.7E+15	8.5E+15	8.2E+15
2.0	7.5E+13	1.5E+13	2.9E+12	5.6E+11	1.1E+11	2.2E+10	4.6E+09	1.2E+09	5.6E+08	4.2E+08	3.9E+08
3.0	3.2E+14	6.2E+13	1.2E+13	2.4E+12	4.6E+11	9.0E+10	1.8E+10	3.4E+09	6.7E+08	1.3E+08	2.1E+07
4.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

DCD_
03.11-36

**Table E-6 Main MicroShield Input Parameters
(for airborne) (Sheet 1 of 2)**

Geometry		Cylinder Volume – End
Source Dimensions	Height	78 ft 6.1 in
	Radius	74 ft 7.0 in
Dose Points	X	0.0 in
	Y	78 ft 6.1 in
	Z	0.0 in
Source Density		Air (0.00122 g/cc)
Source Activity		1.0E+0 (Photon/sec) [1)]

Note
1. For all 25 energy groups, the actual dose rates are calculated by multiplying the respective MicroSheild group dose rate output by the respective group-related actual source term using Microsoft EXCEL.

**Table E-6 Main MicroShield Input Parameters
(for recirculation water) (Sheet 2 of 2)**

Geometry		Cylinder Volume – End
Source Dimensions	Height	3 ft 3.8 in
	Radius	74 ft 7.0 in
Dose Points	X	0.0 in
	Y	3 ft 3.8 in
	Z	0.0 in
Source Density		Water (1 g/cc)
Source Activity		1.0E+0 (Photon/sec) [1)]

Note
1. For all 25 energy groups, the actual dose rates are calculated by multiplying the respective MicroSheild group dose rate output by the respective group-related actual source term using Microsoft EXCEL.

DCD_
03.11-36

Table E-7 Accident Cumulative Dose (for gamma ray) at Various Times after LOCA (Sheet 1 of 3)

Time after LOCA (hr)	Airborne (rad)	Recirculation water (rad)
0.01	6.6E-01	1.4E-01
0.02	1.3E+00	2.9E-01
0.03	4.3E+01	1.8E+01
0.04	1.7E+02	5.2E+01
0.05	3.6E+02	1.0E+02
0.06	6.1E+02	1.6E+02
0.0667	8.2E+02	2.2E+02
0.08	1.3E+03	3.3E+02
0.0834	1.4E+03	3.7E+02
0.1	2.2E+03	5.6E+02
0.15	4.8E+03	1.2E+03
0.2	8.4E+03	2.3E+03
0.3	1.8E+04	5.0E+03
0.4	3.0E+04	9.1E+03
0.5	4.6E+04	1.4E+04
0.5083	4.8E+04	1.5E+04
0.6	6.5E+04	2.1E+04
0.7	9.6E+04	3.0E+04
0.8	1.4E+05	4.3E+04
0.9	1.9E+05	5.9E+04
1	2.6E+05	7.7E+04
1.1	3.3E+05	9.8E+04
1.2	4.1E+05	1.2E+05
1.3	5.0E+05	1.5E+05
1.4	5.9E+05	1.8E+05
1.5	6.9E+05	2.1E+05
1.6	8.0E+05	2.4E+05
1.7	9.1E+05	2.7E+05
1.8	1.0E+06	3.1E+05
1.8083	1.0E+06	3.1E+05
1.9	1.2E+06	3.5E+05
2	1.3E+06	3.8E+05
2.1	1.4E+06	4.2E+05
2.2	1.5E+06	4.6E+05
2.3	1.6E+06	4.9E+05
2.4	1.7E+06	5.3E+05
2.5	1.8E+06	5.6E+05
2.6	1.9E+06	5.9E+05
2.7	2.0E+06	6.3E+05
2.8	2.0E+06	6.6E+05
2.9	2.1E+06	6.9E+05
3	2.2E+06	7.2E+05
3.2	2.4E+06	7.8E+05
3.23	2.4E+06	7.9E+05
3.4	2.5E+06	8.4E+05
3.6	2.7E+06	8.9E+05
3.8	2.8E+06	9.5E+05
4	3.0E+06	1.0E+06
4.2	3.1E+06	1.1E+06
4.4	3.2E+06	1.1E+06
4.6	3.3E+06	1.2E+06
4.8	3.5E+06	1.2E+06

DCD_
03.11-36

Table E-7 Accident Cumulative Dose (for gamma ray) at Various Times after LOCA (Sheet 2 of 3)

Time after LOCA (hr)	Airborne (rad)	Recirculation water (rad)
5	3.6E+06	1.2E+06
5.5	3.9E+06	1.4E+06
6	4.1E+06	1.5E+06
6.5	4.4E+06	1.6E+06
7	4.6E+06	1.7E+06
7.5	4.8E+06	1.8E+06
8	5.1E+06	1.9E+06
8.8	5.4E+06	2.0E+06
9	5.5E+06	2.0E+06
9.5	5.6E+06	2.1E+06
10	5.8E+06	2.2E+06
11	6.1E+06	2.3E+06
12	6.5E+06	2.5E+06
13	6.8E+06	2.6E+06
14	7.0E+06	2.7E+06
15	7.3E+06	2.9E+06
16	7.6E+06	3.0E+06
17	7.8E+06	3.1E+06
18	8.0E+06	3.2E+06
19	8.3E+06	3.3E+06
20	8.5E+06	3.4E+06
21	8.7E+06	3.5E+06
22	8.9E+06	3.6E+06
23	9.1E+06	3.7E+06
24	9.3E+06	3.8E+06
26	9.7E+06	4.0E+06
28	1.0E+07	4.1E+06
30	1.0E+07	4.3E+06
35	1.1E+07	4.7E+06
40	1.2E+07	5.1E+06
48	1.3E+07	5.6E+06
50	1.4E+07	5.7E+06
60	1.5E+07	6.3E+06
70	1.6E+07	6.9E+06
80	1.7E+07	7.4E+06
96	1.9E+07	8.2E+06
100	2.0E+07	8.4E+06
120	2.2E+07	9.3E+06
150	2.5E+07	1.1E+07
160	2.5E+07	1.1E+07
170	2.6E+07	1.1E+07
180	2.7E+07	1.2E+07
200	2.8E+07	1.2E+07
240	3.1E+07	1.4E+07
264	3.2E+07	1.5E+07
288	3.4E+07	1.5E+07
300	3.4E+07	1.6E+07
312	3.5E+07	1.6E+07
336	3.6E+07	1.7E+07
360	3.7E+07	1.7E+07
400	3.9E+07	1.8E+07
480	4.1E+07	2.0E+07

DCD_
03.11-36

Table E-7 Accident Cumulative Dose (for gamma ray) at Various Times after LOCA (Sheet 3 of 3)

Time after LOCA (hr)	Airborne (rad)	Recirculation water (rad)
500	4.2E+07	2.1E+07
600	4.5E+07	2.3E+07
700	4.7E+07	2.4E+07
720	4.7E+07	2.5E+07
960	4.8E+07	2.9E+07
1200	4.8E+07	3.2E+07
1440	4.8E+07	3.5E+07
2160	4.8E+07	4.4E+07
2880	4.8E+07	5.2E+07
3600	4.8E+07	6.0E+07
4320	4.8E+07	6.8E+07
5040	4.8E+07	7.5E+07
5760	4.8E+07	8.2E+07
6480	4.8E+07	8.9E+07
7200	4.8E+07	9.6E+07
7920	4.8E+07	1.0E+08
8760	4.8E+07	1.1E+08

DCD_
03.11-36

Table E-8 Accident Cumulative Dose (for beta ray) at Various Times after LOCA (Sheet 1 of 3)

Time after LOCA (hr)	Airborne (rad)
0.01	0.0E+00
0.02	2.9E+00
0.03	1.3E+02
0.04	5.0E+02
0.05	1.1E+03
0.06	1.9E+03
0.0667	2.5E+03
0.08	3.9E+03
0.0834	4.4E+03
0.1	6.6E+03
0.15	1.5E+04
0.2	2.6E+04
0.3	5.6E+04
0.4	9.8E+04
0.5	1.5E+05
0.5083	1.5E+05
0.6	2.1E+05
0.7	3.3E+05
0.8	5.0E+05
0.9	7.1E+05
1	9.7E+05
1.1	1.3E+06
1.2	1.6E+06
1.3	2.0E+06
1.4	2.4E+06
1.5	2.8E+06
1.6	3.3E+06
1.7	3.8E+06
1.8	4.3E+06
1.8083	4.3E+06
1.9	4.8E+06
2	5.4E+06
2.1	5.9E+06
2.2	6.4E+06
2.3	6.8E+06
2.4	7.3E+06
2.5	7.7E+06
2.6	8.2E+06
2.7	8.6E+06
2.8	9.0E+06
2.9	9.4E+06
3	9.8E+06
3.2	1.1E+07
3.23	1.1E+07
3.4	1.1E+07
3.6	1.2E+07
3.8	1.3E+07
4	1.3E+07
4.2	1.4E+07
4.4	1.5E+07
4.6	1.5E+07
4.8	1.6E+07

DCD_
03.11-36

Table E-8 Accident Cumulative Dose (for beta ray) at Various Times after LOCA (Sheet 2 of 3)

Time after LOCA (hr)	Airborne (rad)
5	1.7E+07
5.5	1.8E+07
6	1.9E+07
6.5	2.1E+07
7	2.2E+07
7.5	2.3E+07
8	2.4E+07
8.8	2.6E+07
9	2.7E+07
9.5	2.8E+07
10	2.9E+07
11	3.1E+07
12	3.3E+07
13	3.5E+07
14	3.6E+07
15	3.8E+07
16	4.0E+07
17	4.1E+07
18	4.3E+07
19	4.5E+07
20	4.6E+07
21	4.7E+07
22	4.9E+07
23	5.0E+07
24	5.2E+07
26	5.4E+07
28	5.7E+07
30	5.9E+07
35	6.5E+07
40	7.1E+07
48	7.9E+07
50	8.1E+07
60	9.1E+07
70	1.0E+08
80	1.1E+08
96	1.2E+08
100	1.2E+08
120	1.4E+08
150	1.6E+08
160	1.6E+08
170	1.7E+08
180	1.7E+08
200	1.8E+08
240	2.0E+08
264	2.1E+08
288	2.1E+08
300	2.2E+08
312	2.2E+08
336	2.3E+08
360	2.3E+08
400	2.4E+08
480	2.5E+08

DCD_
03.11-36

Table E-8 Accident Cumulative Dose (for beta ray) at Various Times after LOCA (Sheet 3 of 3)

Time after LOCA (hr)	Airborne (rad)
500	2.6E+08
600	2.7E+08
700	2.8E+08
720	2.8E+08
960	3.0E+08
1200	3.0E+08
1440	3.0E+08
2160	3.1E+08
2880	3.2E+08
3600	3.2E+08
4320	3.3E+08
5040	3.4E+08
5760	3.5E+08
6480	3.5E+08
7200	3.6E+08
7920	3.7E+08
8760	3.7E+08

Note
1. Beta dose from recirculation water is negligible compared with beta dose from airborne.

DCD_
03.11-36

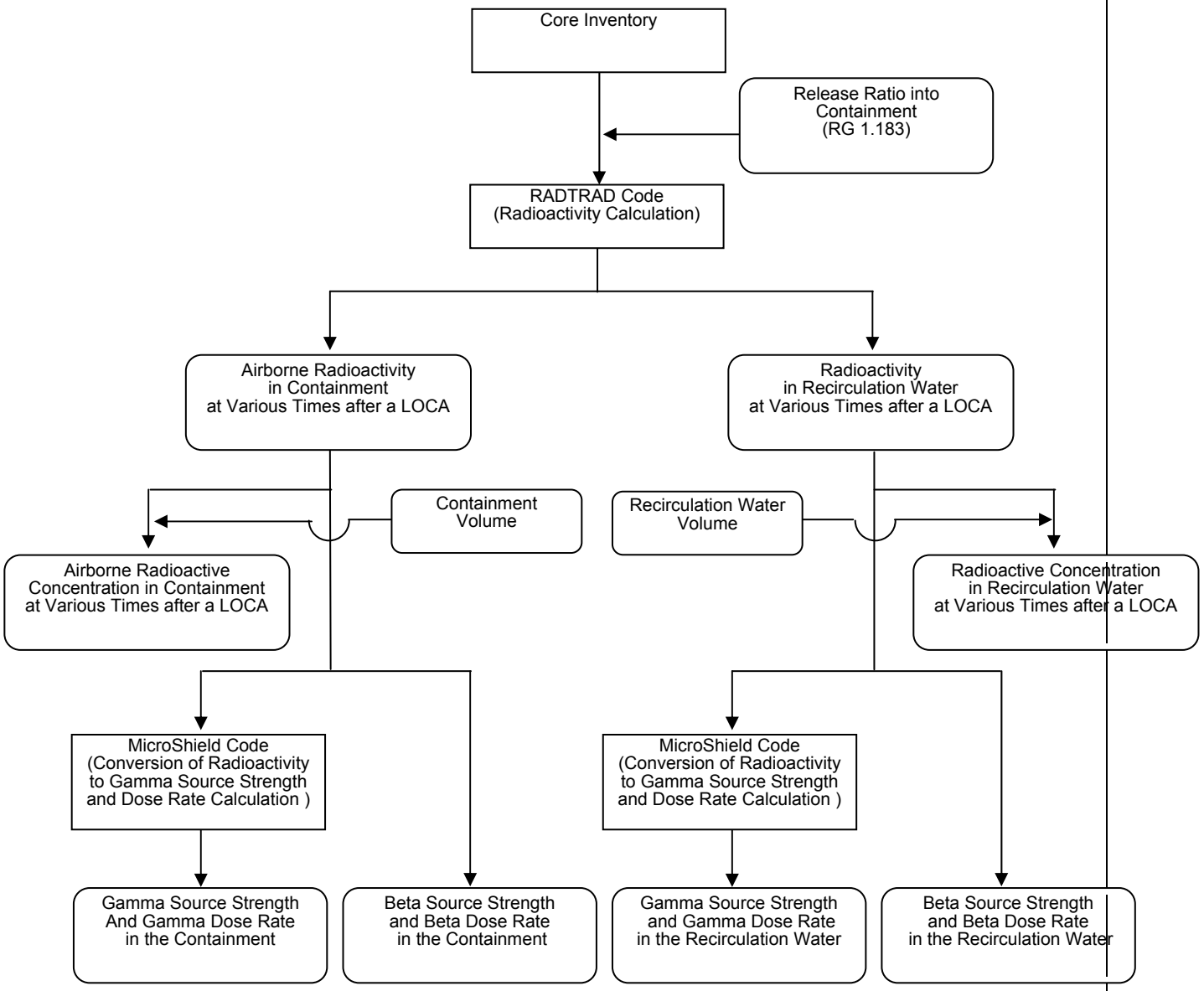

Figure E-1 Calculation Flow of Accident Dose Rate inside the Containment

DCD_
03.11-36

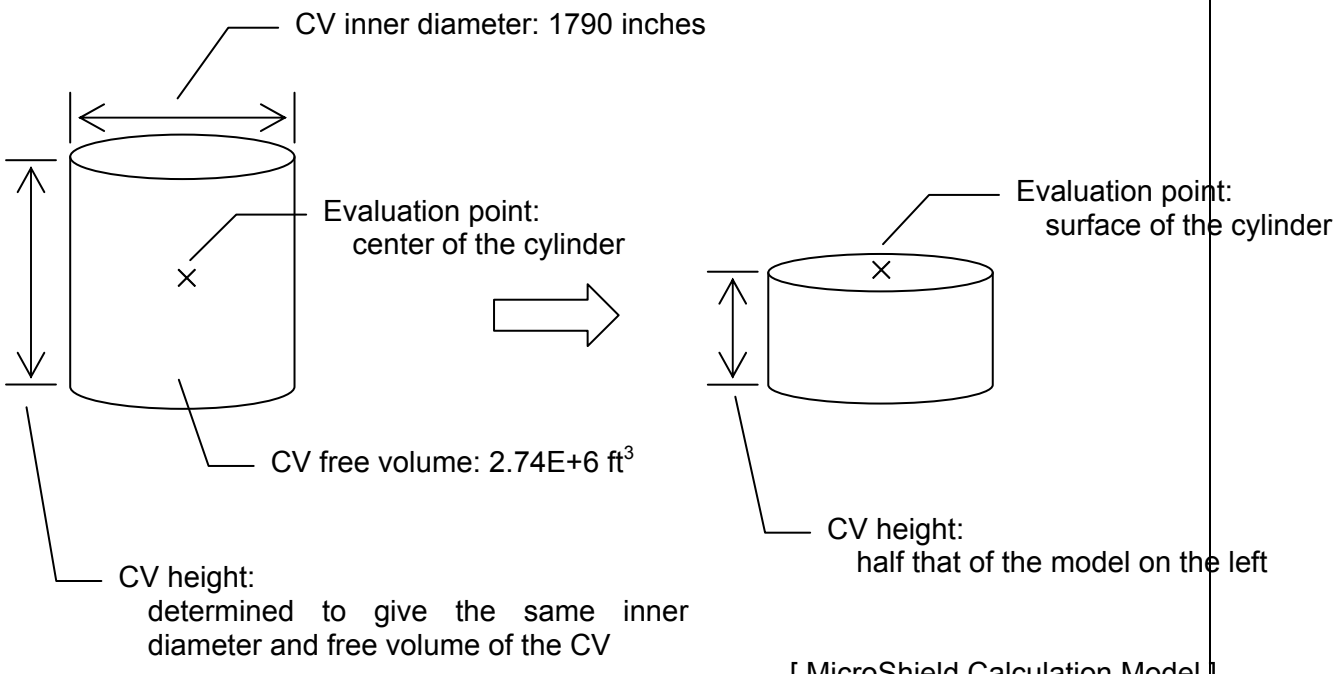

Figure E-2 Model for the Calculation of Gamma Dose rates in the CV after a LOCA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

4/3/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 589-4536 REVISION 2**
SRP SECTION:	**03.11 – Environmental Qualification of Mechanical and Electrical Equipment**
APPLICATION SECTION:	**3.11**
DATE OF RAI ISSUE:	**6/8/2010**

QUESTION NO. 03.11-38:

US-APWR DCD Tier 2 Revision 2 Table 3D-1 "Equipment Post-Accident Operability Times" notes that some equipment required to be operable for 2 weeks is located outside containment, is accessible, and can be repaired, replaced, or recalibrated. This table also notes that some equipment is located inside containment, is inaccessible and is required for post-accident monitoring is required to be operable for 4 months. Table 3D-2 "US-APWR Environmental Qualification Equipment List" was revised in response to DCD RAI 358-2462 Question 03.11-2. This question asked for information regarding the location of equipment requiring qualification and additional details regarding the radiation dose to which the equipment must be qualified. RAI 262-1972 Question 12.03-12.04-16 asked the applicant to identify any entries required into vital areas for the event duration and to provide the associated mission doses in DCD Tier 2 Section 12.4.

However, based on the information provided by the applicant, the NRC staff is unable to: (1) determine the event duration, and the basis for the selection of that duration, (2) determine if any equipment listed in Table 3D-2 is expected to need replacement, recalibration or repair for the duration of the event. Also, in light of the high dose rates experienced inside the containment building following the accident at Three Mile Island Unit 2, and the resultant effort required to reenter the containment building, the NRC staff would like the applicant to provide additional information describing why accessing equipment inside containment for calibration, repair or replacement, within the 4 months service time noted in Table 3D-1, meets the requirements of 10 CFR 20.1101(b) for maintaining Operational Radiation Exposure ALARA.

The applicant is requested to revise the US-APWR DCD Appendix 3D, Section 12.4 and other sections as necessary, to include information regarding the event duration and methods, basis and assumptions used to determine that interval, especially as it relates to areas which will have radiologically harsh environments. The applicant is also requested to clearly describe in Table 3D-1, those pieces of equipment located in the radiologically controlled vital areas of the plant that will require replacement, calibration, or repair for the duration of the event, and to provide Mission Doses for the identified pieces of equipment in DCD Chapter 12.4.

References:

MHI's Response to US-APWR DCD RAI No. 262-1972; MHI Ref: UAP-HF-09226; Dated May 7, 2009; ML091320442.

MHI's Response to US-APWR DCD RAI No. 358-2642; MHI Ref: UAP-HF-09371; Dated July 10, 2009; ML091970103.

ANSWER:

As described in US-APWR DCD Tier 2 Revision 2 Table 3D-1 "Equipment Post-Accident Operability Times", some equipment required to be operable for 2 weeks is located outside the containment vessel, and is accessible, and therefore can be repaired, recalibrated, or replaced, as needed to maintain long-term post-accident functionality.
The 2 weeks service time is established based on the assumptions stated below.

- Environmental conditions (temperature, pressure, and humidity) become mild within 2 weeks time after the accident so that maintenance and repair are considered to be possible. Therefore, 2 weeks is an appropriate required service time for the equipment located outside the containment vessel.
- The target equipment is the equipment that requires functional maintenance to ensure operability for a long period of time after the accident.

As answered in Question 03.11-5 of RAI 358-2642 Revision 1 (UAP-HF-09371), repairing, replacement, and recalibration are not required for the PAM equipment located inside the CV or inaccessible area with operability of 4 months, with access inside the CV required after 4 months (post accident). So, the description in DCD Table 3D-1 which states "This number is based on an acceptable amount of time to be repaired, replaced, or recalibrated, or for an equivalent indication to be obtained." will be deleted.

Equipment which requires repairing, replacement and recalibration after the post-accident operability time are identified in “Comment” column of Table 3D-2 as identification number (1). All other equipments in Table 3D-2 are not required after the post-accident operability time. Therefore, this equipment does not require repairing, replacement, or recalibration after the post-accident operability time described in Table 3D-2.

Table-1 describes the selected equipment whose service time duration is 2 weeks and that requires potential recalibration, repair or replacement under harsh radiation conditions. The estimation method for the mission dose associated with these activities is the same as described in DCD Section 12.3.1.2.2. Figure-12.3-11(Attachments 3) shows the installed location and the access route for each piece of equipment described in Table-1. Tables 12.3-9 and 12.3-10(Attachments 2) summarizes the projected dose rates and total mission dose for the equipment shown in Table-1 at 1 week after the accident. Although the required service time for this equipment is two weeks, the mission dose estimation conservatively assumes the dose rate corresponding to a time one week after an accident. In addition, due to the ALARA principle-based occupational exposure reduction measure (i.e. working time reduction for recalibration, repair or replacement by making sufficient working plans in advance, and providing temporary shielding as necessary), the mission dose described in Table12.3-10 are reduced further.

Impact on DCD

DCD Tables 3D-1 and 3D-2 will be revised as described in Attachment 1.

DCD Tables 12.3-9 and 12.3-10 and Figure 12.3-11 will be revised as described in Attachments 2 and 3.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

Table 1 Equipment With 2 Week Operational Duration Requiring Potential Recalibration, Repair and Replacement Under Harsh Post-Accident Radiation Conditions

Item Num	Equipment Tag	Description	Location		Purpose	Operational Duration	Environmental Conditions	Radiation Condition	Influence of Submergence for Total Integrated Dose	Qualification Process	Seismic Category	Comments
			Building	Zone	RT, ESF, PAM, Pressure Boundary (PB), Other[1]		Harsh or Mild	Harsh or Mild	Yes/No	E=Electrical M=Mechanical	I, II, Non	
Instruments (Transmitters)												
31	SIS-FT-062	A - Safety Injection Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
32	SIS-FT-063	B - Safety Injection Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
33	SIS-FT-064	C - Safety Injection Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
34	SIS-FT-065	D - Safety Injection Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
59	RHS-FT-011	A - Containment Spray / Residual Heat Removal Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
60	RHS-FT-014	A - Containment Spray / Residual Heat Removal Pump Minimum Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
61	RHS-FT-021	B – Containment Spray / Residual Heat Removal Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
62	RHS-FT-024	B – Containment Spray / Residual Heat Removal Pump Minimum Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
63	RHS-FT-031	C – Containment Spray / Residual Heat Removal Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
64	RHS-FT-034	C – Containment Spray / Residual Heat Removal Pump Minimum Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
65	RHS-FT-041	D – Containment Spray / Residual Heat Removal Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)
66	RHS-FT-044	D – Containment Spray / Residual Heat Removal Pump Minimum Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	Harsh	No (1)	E	I	(1)

Notes:

1. Identification number for “Influence of Submergence for Total Integrated Dose”
   (1) Components with no possibility of submergence.
   (2) These components can be submerged in case of HELB, however these components are not required to assure the safety function (including components with alternatives).
   (3) Non-safety related components.

2. Identification number for “Comments”
   (1) If required, this equipment can be repaired, replaced, or recalibrated after 2 weeks post-accident.
3. Identification number for “Purpose”
   (1) All active values in Table 3D-2 have the function and operating duration of “PB-1yr” in addition to any other requirements.

Table 3D-1 Equipment Post-Accident Operability Times

Equipment	Required Post-Accident Operability	
Equipment necessary to perform trip functions	5 minutes	(Envelopes trip time requirements)
Equipment located outside containment potentially requiring long-term functional maintenance after the post-accident operability time (parts of the equipment are accessible, and can be repaired, replaced, or recalibrated, as needed)	2 weeks	(Equipment requiring maintenance after the post accident operability time are identified by Note (1) in the "Comments" column of Table 3D-2.)
Equipment located inside containment that is inaccessible and is required for post-accident monitoring	4 months	
Equipment located inside containment, is inaccessible, or cannot be repaired, replaced, recalibrated or equivalent indication cannot be obtained	1 year	
Equipment located in a mild environment following an accident	Various	(Specific to function, maximum of 1 year)

DCD_03.11-38 S01

Brief Description of Section Headings

See Table 3D-2 that follows:

Item Number

Numerical sequence item numbering of the US-APWR Environmental Qualified Equipment.

Equipment Tag

Electrical equipment numbering system that uniquely identifies the item/device/component per acronyms/ abbreviations with sequential serial numbering system.

Description 1

Item/device/component brief description justifying the abbreviation/acronyms of the equipment tag references.

Location

Building

Table 3D-2 US-APWR Environmental Qualification Equipment List (Sheet 2 of 68)

Item Num	EquipmentTag	Description	Location		Purpose	Operational Duration	Environmental Conditions	Radiation Condition	Influence of Submergence for Total Integrated Dose	Qualification Process	Seismic Category	Comments
			Building	Zone	RT, ESF, PAM, Pressure Boundary (PB), Other(1)		Harsh or Mild	Harsh or Mild	Yes/No	E=Electrical M=Mechanical	I, II, Non	
16	RCS-FT-055	Loop D - Reactor Coolant Flow	PCCV	1-5	RT	5min*	Harsh	Harsh	No (1)	E	I	*Not Required Post Accident
17	RCS-LT-061	Pressurizer Water Level	PCCV	1-5	RT, PAM, Other	5min, 4mos, 36hr	Harsh	Harsh	No (1)	E	I	
18	RCS-LT-062	Pressurizer Water Level	PCCV	1-5	RT, PAM	5min, 4mos	Harsh	Harsh	No (1)	E	I	
19	RCS-LT-063	Pressurizer Water Level	PCCV	1-5	RT, PAM	5min, 4mos	Harsh	Harsh	No (1)	E	I	
20	RCS-LT-064	Pressurizer Water Level	PCCV	1-5	RT, PAM, Other	5min, 4mos, 36hr	Harsh	Harsh	No (1)	E	I	
21	RCS-PT-020	Loop A - Reactor Coolant Pressure	PCCV	1-5	PAM, Other	4mos, 36hr	Harsh	Harsh	No (1)	E	I	
22	RCS-PT-030	Loop B - Reactor Coolant Pressure	PCCV	1-5	PAM, Other	4mos, 36hr	Harsh	Harsh	No (1)	E	I	
23	RCS-PT-040	Loop C - Reactor Coolant Pressure	PCCV	1-5	PAM, Other	4mos, 36hr	Harsh	Harsh	No (1)	E	I	
24	RCS-PT-050	Loop D - Reactor Coolant Pressure	PCCV	1-5	PAM, Other	4mos, 36hr	Harsh	Harsh	No (1)	E	I	
25	RCS-PT-061	Pressurizer Pressure	PCCV	1-6	RT, ESF Other	5min, ~~4mos~~30min, 36hr*	Harsh	Harsh	No (1)	E	I	*Not Required Post Accident
26	RCS-PT-062	Pressurizer Pressure	PCCV	1-6	RT, ESF Other	5min, ~~4mos~~30min, 36hr*	Harsh	Harsh	No (1)	E	I	*Not Required Post Accident
27	RCS-PT-063	Pressurizer Pressure	PCCV	1-6	RT, ESF Other	5min, ~~4mos~~30min, 36hr*	Harsh	Harsh	No (1)	E	I	*Not Required Post Accident
28	RCS-PT-064	Pressurizer Pressure	PCCV	1-6	RT, ESF Other	5min, ~~4mos~~30min, 36hr*	Harsh	Harsh	No (1)	E	I	*Not Required Post Accident
29	CVS-FT-128	Primary Makeup Water Supply Flow	R/B	13-3	Other	2wks*	Mild	~~Harsh~~Mild	No (1)	E	I	~~(1)~~*Not Required Post Accident
30	CVS-FT-129	Primary Makeup Water Supply Flow	R/B	13-3	Other	2wks*	Mild	~~Harsh~~Mild	No (1)	E	I	~~(1)~~*Not Required Post Accident
31	SIS-FT-062	A - Safety Injection Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	~~Harsh~~Mild	No (1)	E	I	(1)
32	SIS-FT-063	B - Safety Injection Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	~~Harsh~~Mild	No (1)	E	I	(1)
33	SIS-FT-064	C - Safety Injection Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	~~Harsh~~Mild	No (1)	E	I	(1)
34	SIS-FT-065	D - Safety Injection Pump Discharge Flow	R/B	13-3	PAM, Other	2wks, 36hr	Mild	~~Harsh~~Mild	No (1)	E	I	(1)
35	SIS-FT-072	A - Safety Injection Pump Minimum Flow	PCCV	1-5	PAM, Other	4mos, 36hr	Harsh	Harsh	No (1)	E	I	

DCD_03.11-41

DCD_03.11-34_S01

DCD_03.11-38 S01

Table 12.3-9 Projected Dose Rates for the Access Areas 1 week after an Accident

POST ACCIDENT Access Areas	Dose Rate 1 week after an Accident
CS/RHR, SI Pump Discharge Flow Access Area	≦ 15 mrem/h
CS/RHR Pump Minimum Flow Access Area	≦ 15 mrem/h
~~PRimary Makeup Water Supply Flow Access Area~~	~~≦ 15 mrem/h~~

DCD_03.11-38 S01

Table 12.3-10 Mission Dose for the Access Areas access route 1 week after an Accident ~~(Sheet 1 of 2)~~

DCD_03.11-38 S01

Access Area	Task description	Time when access required [h]	Max dose rate [rem/h]	Mission dose [rem]	Access route zone map No.
CS/RHR, SI Pump Discharge Flow Access Area	Access to A-CS/RHR,SI Pump Discharge Flow Access Area from AC/B (round trip)	3.0E-02	2.5E-03	7.4E-05	Figure 12.3-11 Sheet 1,2,3
		6.1	1.5E-02	9.~~2~~1E-02	
		Total		9.~~2~~1E-02	
	Access to B-CS/RHR,SI Pump Discharge Flow Access Area from AC/B (round trip)	3.0E-02	2.5E-03	7.4E-05	Figure 12.3-11 Sheet 1,2,3
		6.~~2~~1	1.5E-02	9.2E-02	
		Total		9.2E-02	
	Access to C-CS/RHR,SI Pump Discharge Flow Access Area from AC/B (round trip)	5.~~6~~5E-02	2.5E-03	1.4E-04	Figure 12.3-11 Sheet 1,2,3
		6.~~1~~0	1.5E-02	9.1E-02	
		Total		9.1E-02	
	Access to D-CS/RHR,SI Pump Discharge Flow Access Area from AC/B (round trip)	3.0E-02	2.5E-03	7.4E-05	Figure 12.3-11 Sheet 1,2,3
		6.1	1.5E-02	9.1E-02	
		Total		9.1E-02	
CS/RHR Pump Minimum Flow Access Area	Access to A-CS/RHR, Pump Minimum Flow Access Area from AC/B (round trip)	3.0E-02	2.5E-03	7.4E-05	Figure 12.3-11 Sheet 3
		6.~~1~~0	1.5E-02	9.1E-02	
		Total		9.1E-02	
	Access to B-CS/RHR, Pump Minimum Flow Access Area from AC/B (round trip)	3.0E-02	2.5E-03	7.4E-05	Figure 12.3-11 Sheet 3
		6.1	1.5E-02	9.1E-02	
		Total		9.~~2~~1E-02	
	Access to C-CS/RHR, Pump Minimum Flow Access Area from AC/B (round trip)	3.0E-02	2.5E-03	7.4E-05	Figure 12.3-11 Sheet 3
		6.~~1~~0	1.5E-02	9.1E-02	
		Total		9.1E-02	
	Access to D-CS/RHR, Pump Minimum Flow Access Area from AC/B (round trip)	3.0E-02	2.5E-03	7.4E-05	Figure 12.3-11 Sheet 3
		6.~~1~~0	1.5E-02	9.~~1~~0E-02	
		Total		9.~~1~~0E-02	

MIC-03-12-0 0005

MIC-03-12-0 0005

MIC-03-12-0 0005

MIC-03-12-0 0005

(Note) Walk speed is usually about 13000 ft/h (4 km/h) and stairs are about 6500 ft/h (2 km/h). Replacement, calibration or repair time is conservatively assumed to require 6 hours.

DCD_03.11-38 S01

Table 12.3-10 Mission Dose for the Access Areas access route 1 week after an Accident (Sheet 2 of 2)

Access Area	Task description	Time when access required [h]	Max dose rate [rem/h]	Mission dose [rem]	Access route zone map No.
Primary Makeup Water Supply Flow Access Area	PMW Supply Flow Access Area from AC/B (round trip)	3.0E-02	2.5E-03	7.4E-05	Figure 12.3-11 Sheet 3.4.5
		6.10	1.5E-02	9.1E-02	
		Total		9.1E-02	

(Note) Walk speed is usually about 13000 ft/h (4 km/h) and stairs are about 6500 ft/h (2 km/h). Replacement, calibration or repair time is conservatively assumed to require 6 hours.

MIC-03-12-00005

MIC-03-12-0
0005
DCD_03.11-
38 S01

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-11 Post Accident Radiation Zone MAP: 1week After Accident (Sheet 3 of 10)
Power Block at Elevation 3'-7"

MIC-03-12-0
0005
DCD_03.11-
38 S01

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-11 Post Accident Radiation Zone MAP: 1week After Accident (Sheet 4 of 10)
Power Block at Elevation 13'-6"

MIC-03-12-0
0005
DCD_03.11-
38 S01

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-11 Post Accident Radiation Zone MAP: 1week After Accident (Sheet 5 of 10)
Power Block at Elevation 25'-3"