

OCT 30 1996
Sta. 37

ENGINEERING DATA TRANSMITTAL

Page 1 of 1
1. EDT 619416

| | | | | | |
|---|--|---|--|---|--|
| 2. To: (Receiving Organization) TWRS SAR Engineering | | 3. From: (Originating Organization) Consequence Analysis | | 4. Related EDT No.: N/A | |
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16. KEY

| Approval Designator (F) | Reason for Transmittal (G) | Disposition (H) & (I) |
|--|---|--|
| E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7) | 1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required) | 1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged |

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(See Approval Designator for required signatures)

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|------------|-----------|----------------------------|--------------------|----------|----------|------------|-----------|-------------------------|--------------------|----------|----------|
| | | Design Authority | | | | 1 | 1 | Peer Review D. A. Himes | <i>[Signature]</i> | 10/17/96 | |
| | | Design Agent | | | | | | | | | |
| 1 | 1 | Cog. Eng. J. C. Van Keuren | <i>[Signature]</i> | 10/17/96 | | | | | | | |
| 1 | 1 | Cog. Mgr. D. S. Leach | <i>[Signature]</i> | 10/17/96 | | | | | | | |
| | | QA | | | | | | | | | |
| | | Safety | | | | | | | | | |
| | | Env. | | | | | | | | | |

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| 18. J. C. Van Keuren <i>[Signature]</i> Signature of EDT Originator Date 10/17/96 | | 19. _____ Authorized Representative Date for Receiving Organization | | 20. D. S. Leach <i>[Signature]</i> Design Authority/ Cognizant Manager Date 10/17/96 | | 21. DOE APPROVAL (if required) Ctrl. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments | |
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Comparison of Radiological Dose Pathways for Tank Farm Accidents

J. C. Van Keuren

Westinghouse Hanford Co., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

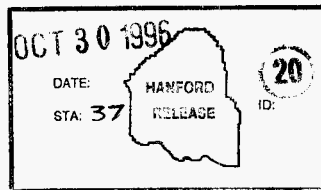
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Abstract: This calculation note documents an evaluation of the doses from submersion and ground shine due to a release of tank farm radioactive materials, and a comparison of these doses to the doses from inhalation of the materials. The submersion and ground shine doses are insignificant compared to the inhalation doses. The doses from resuspension are also shown to be negligible for the tank farm analysis conditions.

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1. INTRODUCTION

The doses reported in the Tank Waste Remediation System (TWRS) Final Safety Analysis (FSAR) and the TWRS Basis of Interim Operation (BIO) are calculated from the inhalation and ingestion of the released material. Submersion doses, resuspension, and ground shine effects are not included. Detailed calculations which demonstrate that these doses are much less than the inhalation doses are given in this report. The relative contribution of submersion, resuspension, and ground shine are discussed in the following three sections.

2. SUBMERSSION

The accident scenarios in the TWRS FSAR and BIO involve radioactive material from a Hanford waste tank being released to air and carried by the wind in a plume to a receptor. The principal dose to the receptor is calculated due to the radioactive materials being inhaled and retained in the body. However, in addition to the inhalation, the receptor will also receive an external dose from being submersed in the plume of radioactive material as it passes. The inhalation and submersion doses are compared in this section.

The submersion and inhalation doses for each tank farm composite was calculated at the onsite individual using the GENII code (PNL-1988). An onsite X/Q of 3.41×10^{-2} was taken from SARR-016 (WHC 1996a). Doses were calculated for each of six types of tank farm mixes, i.e., single shell tanks (SST) solids and liquids, double shell tank (DST) solids and liquids and aging waste facility (AWF) solids and liquids. The isotope mix for each composite was taken from WHC-SD-WM-SARR-016 (WHC 1996a) and are identical with those used in the TWRS FSAR and BIO. Submersion doses were calculated using an infinite cloud model. The GENII outputs are given in Attachment 1. The inhalation and submersion dose and the ratios are shown in Table 1.

Table 1 Comparison of Inhalation and Submersion Doses for Tank Farm Mixes at 100 m Onsite Receptor

| Mixture of Isotopes | Inhalation Dose (Sv) | Submersion Dose (Sv) | Submersion Dose Divided by Inhalation Dose |
|---------------------|----------------------|----------------------|--|
| SST Solids | 2.3 E+00 | 1.5 E-04 | 6.5 E-05 |
| SST Liquids | 1.2 E-01 | 2.9 E-05 | 2.4 E-04 |
| DST Solids | 5.9 E+00 | 6.5 E-05 | 1.1 E-05 |
| DST Liquids | 6.7 E-02 | 6.3 E-05 | 9.4 E-04 |
| AWF Solids | 1.9 E+01 | 1.8 E-04 | 9.5 E-06 |
| AWF Liquids | 1.5 E-02 | 9.4 E-05 | 6.3 E-03 |

The submersion dose is always a small fraction of the inhalation dose. Reactor accidents, which can result in a release of large quantities of radioactive krypton and xenon gases, can produce significant submersion doses. Inert gases give negligible inhalation doses but some of the inert gas isotopes have energetic gamma rays, which can produce significant submersion doses. These isotopes have short half-lives, and are not now present in the tank waste since the waste is a minimum of several year old. All the inert gases except for ^{85}Kr have decayed. ^{85}Kr emits only a weak beta, and does not contribute to submersion doses. The submersion doses for the tank farm mixes are dominated by the ^{137}Cs but the transuranic isotopes and ^{90}Sr produce inhalation doses which are much larger than the submersion doses.

Not including the submersion dose therefore does not affect the conclusions of the safety analysis.

3. RESUSPENSION.

The resuspension dose is the dose from material which falls out of the plume and is subsequently resuspended into the air due to wind or other activity. If resuspension is modeled, some fraction of the material is assumed to fall to the ground, and the fraction of that material which is resuspended is calculated. Accident scenarios used for the TWRS FSAR do not assume that material from the plume is deposited on the ground prior to reaching the receptor. Concentrations in the plume decrease as the plume moves from the release point due to diffusion, but 100% of the material released is assumed to remain in the air and to reach both the onsite and offsite receptors.

Since any deposition/resuspension model would calculate less than 100 % of the material reaches the receptor, the model used for the FSAR is conservative. A dose from resuspension can be calculated if deposition is assumed (although the fraction of material resuspended is usually small), but calculating an additional dose from resuspension does not make sense if no reduction in the dose for deposition is assumed.

An accident scenario that results in a pool formation and subsequent dry out can lead to doses from suspension of particles in the air. The releases from spills that result in pools do consider suspension of particles. This is a different accident scenario than a resuspension of deposited particles from a plume.

The spray leak events calculated doses are based on a respirable fraction of materials that are released by the spray. The larger particles could deposit on the ground near the spray source, and result in a pool. Particles could be released following the pool dry-out, as modeled for the spill events. Significant releases would occur only for the unmitigated spray leak event. The analysis of the unmitigated spray leak event indicates that mitigation is required. Further refinement of the spray models to look at suspension from a pool would not change that conclusion.

Not including the plume deposition and resuspension dose therefore does not affect the conclusions of the safety analysis.

4. GROUND SHINE

Ground shine dose is the dose due to external exposure from material that deposit on the ground. The ground shine is compared to a inhalation for a specific scenario and the results extrapolated to a more general case.

A release of 0.001 L/s of SST solids for 1 hour is assumed. SST solids is assumed because this composite has the largest concentrations of ¹³⁷Cs which tends to dominate shine calculations. The dose is calculated at the 100 m receptor.

The surface concentration of material on the ground from a passing plume is given by (PNL 1988):

$$C_i = X v_d t \quad (1)$$

where C_i = surface area concentration on radioactive isotope i on the ground (Bq/m²)

X = concentration of material in the air (Bq/m³)

v_d = deposition velocity (m/s)

t = time of passage of plume over ground (s)

X is the X/Q ' times the release rate which is 0.001 L/s x 0.0341 s/m³ x G_i , where G_i is the activity concentration for the i th isotope in the mix in Bq/L. The deposition velocity is a measure of the rate of material being deposited on the ground from the plume. The deposition velocity will depend on the particle size distribution but a velocity of 0.01 m/s is generally considered bounding for respirable particles. The time, t is assumed to be the time of release (1 hour).

The surface concentration on the ground for each isotope is therefore:

$$\begin{aligned} C_i (\text{Bq/m}^2) &= 0.001 \text{ L/s} \times 0.0341 \text{ s/m}^3 \times G_i \text{ Bq/L} \times 0.01 \text{ m/s} \times 3600 \text{ s} \\ &= 1.23 \times 10^{-3} G_i \end{aligned}$$

The G_i 's are taken from SARR-016 (WHC, 1996a). The G_i 's and the ground concentrations are shown in Table 2.

Table 2 Surface Contamination Levels at 100 m for a 0.01 s/L Release of SST solids

| Isotope | G_i , Concentration in Composite (Bq/L) | C_i , Surface Contamination Level (Bq/m ²) |
|---------|---|--|
| Co-60 | 4.2 E+08 | 5.17 E+05 |
| Cs-137* | 1.0 E+11 | 1.23 E+08 |
| Eu-154 | 5.8 E+09 | 7.13 E+06 |
| Eu-155 | 5.0 E+06 | 6.15 E+03 |

* The Cs-137 daughter Ba-137m is assumed to be present at 0.946 of the Cs-137 concentration. (0.946 is the branching ratio for the decay of Cs-137 to Ba-137m).

The ground shine is dependent on the area of ground contamination which in turn depends on how wide the plume has spread by the time it has reached the vicinity of the receptor. A plume width based on gaussian diffusion can be calculated based on a quantity referred to as σ_y for the plume model. The X/Q is based on F stability. The formula for σ_y for F stability is taken from PNL 1988 and is given by:

$$\sigma_y = A_y x^{B_y} \quad (2)$$

where $A_y = 0.0722$ and $B_y = 0.9031$.

The $\sigma_y = 4.62$ m at 100 m. The gaussian plume theoretical width in the transverse direction is infinite but the majority of the material will be contained in a finite width. If the amount of material were to be packed into an interval such that the concentration is uniform and equal to the maximum concentration the width is $(2\pi)^{1/2}\sigma_y$. The plume width is $(2\pi)^{1/2} 4.62 = 11.58$ m. The contamination will be assumed to be spread over an area with this width. The plume length will be assumed to extend 20 m towards the source and 20 m away from the source (40 m total). The contamination extends to infinity but a calculation assuming 10 m in length in each direction (instead of 20 m) produced only a 6% difference in dose rate, so the use of 20 m is a good approximation of the length of the contamination that contributes to the gamma ray doses. The concentration and surface contamination are calculated using equation 1.

The doses are computed based on a rectangular source area around the receptor with dimensions of 40 m by 11.58 m. The dose is calculated at the midpoint of rectangle at a height of 1 m above the ground. The surface concentrations in Table 2 are multiplied by 463 m² to produce a total source term. The surface concentration was modeled as a uniform layer 0.001 m thick. An additional correction is applied to compensate for the fact that the concentration will be higher toward the source than away from it. X/Qs at 80 m and 120 m in the east direction were calculated using the GXQ code (Hey 1993). The east

direction produces the maximum X/Q (WHC 1996a). The GXQ output is shown in attachment 2. The X/Q at 80 m is 0.0499 s/m³ and at 120 m is 0.0248 s/m³. The average X/Q is therefore is 0.0374 s/m³. The total activities were increased by 0.0374/0.0341 = 1.1 to compensate for this non-linearity in the atmospheric dispersion coefficients.

The total activity deposited on the ground is given in Table 3 for each isotope.

Table 3 Total Activities for Ground Shine Calculation.

| Isotope | Total activities Bq |
|---------|------------------------|
| Co-60 | 2.63 E+08 |
| Cs-137* | 6.27 E+10 |
| Eu-154 | 3.63 E+09 |
| Eu-155 | 3.13 E+06 |

* The Cs-137 daughter Ba-137m is assumed to be present at 0.946 the Cs-137 concentration. (0.946 is the branching ratio for the decay of Cs-137 to Ba-137m).

The dose rate from the ground contamination was calculated with MICROSIELD Version 3 (Grove 1988). The computer code output file is given in Attachment 3. The dose rate is 20.4 mr/hr (2.04 x 10⁻⁰⁴ Sv/hr). The receptor is assumed to remain at the worst case location for 12 hours. The ground contamination would continue to produce a dose rate after the 12 hours but people are assumed to be removed from the contaminated area involved after 12 hours. For a 12 hour exposure, the dose is 2.45 x 10⁻³ Sv.

The inhalation dose for this accident scenario is given by (WHC 1996a):

$$D = Q \times X/Q' \times BR \times ULD \quad (3)$$

where D = Inhalation dose (Sv)

$$Q = \text{Release quantity} = 0.001 \text{ L/s} \times 3600 \text{ s} = 3.6 \text{ L}$$

$$X/Q' = 0.0341 \text{ s/m}^3$$

$$BR = \text{Breathing rate} = 3.3 \times 10^{-4} \text{ m}^3/\text{s} \text{ for light activity}$$

$$ULD = 2.2 \times 10^5 \text{ Sv/L (from SARR-016, WHC, 1996a)}$$

The inhalation dose is 8.91 Sv.

The ground shine dose divided by the inhalation dose is therefore:

$$2.45 \times 10^{-3} \text{ Sv} / 8.91 \text{ Sv} = 2.75 \times 10^{-4}$$

This calculation was made for an arbitrary release of 0.001 s/L. However it can be seen from equations 1 and 3 that both the inhalation and ground shine

doses are directly proportional to the release rate, and thus the conclusion that the ground shine dose is insignificant relative to inhalation dose would apply for all release rates. Both doses are directly proportion to the X/Q , so the conclusion would also apply at all receptor locations. The composite picked (SST solids) is the worst case composite since it is relatively high in gamma emitter, and relatively low in transuranics which contribute heavily to the inhalation dose calculation, so this conclusion would also apply to the other composites. It is possible to look at more detailed modelling of the ground contamination (for instances looking at different stability classes), but the correction will not affect the conclusion that the ground contamination dose is much less than the inhalation dose, since assumptions are conservative, and the results indicate that the ground shine dose is over three orders of magnitude less than the inhalation doses.

The dose from inhalation assumes that the particles inhaled are of a respirable size. The dose from ground shine can be produced by particles of larger than respirable size. However, particles of larger than respirable size tend to drop out of the plume very quickly, and are not transported to the vicinity of the receptor. Thus particles of larger than respirable size will not contribute significantly to the ground shine dose for the onsite or offsite individual. Elevated releases can result in longer range transport of larger particles, but the tank farm doses are based on ground level releases.

Not including the ground shine doses therefore does not affect the conclusions of the safety analysis.

5. REFERENCES

Grove 1988, *MICROSHIELD Version 3*, Grove Engineering Inc., 15125 Shady Grove Road, Rockville, Maryland.

Hey, B. E., 1993, *GXQ Program Users Guide*, WHC-SD-GN-SWD-3002, Westinghouse Hanford Company, Richland, Wa.

PNL, 1988, B. A. Napier, et al, *GENII - The Hanford Environmental Radiation Dosimetry Software System, Volume 1: Conceptual Representation*, PNL-6584, Pacific Northwest Laboratory, Richland Wa.

WHC, 1996a, J.C. Van Keuren, *Tank Waste Compositions and Atmospheric Dispersion Coefficients for Use in Safety Analysis Consequence Assessments*, WHC-SD-WM-SARR-016, Rev 2, Richland Wa.

WHC-SD-WM-CN-080, Rev 0

Attachment 1 GENII output files

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: SST Solids -Inhalation + Submersion

Executed on: 10/07/96 at 09:16:28

Page A. 1

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

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

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

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

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

Input file name: \GENII\sstsolip.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Library - Times<100 years (23-July-93 PDR)
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

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

| Release Radio- nuclide | Air Bq/yr | Surface Water Bq/yr | Buried Source Bq/m3 |
|------------------------------|--------------|---------------------------|---------------------------|
| C 14 | 1.2E+05 | 0.0E+00 | 0.0E+00 |
| CO60 | 4.2E+08 | 0.0E+00 | 0.0E+00 |
| SE79 | 1.7E+04 | 0.0E+00 | 0.0E+00 |
| SR90 | 1.6E+12 | 0.0E+00 | 0.0E+00 |
| Y 90 | 1.6E+12 | 0.0E+00 | 0.0E+00 |
| TC99 | 1.2E+10 | 0.0E+00 | 0.0E+00 |
| RU106 | 7.2E+04 | 0.0E+00 | 0.0E+00 |
| SB125 | 1.8E+08 | 0.0E+00 | 0.0E+00 |
| I 129 | 6.4E+06 | 0.0E+00 | 0.0E+00 |
| CS134 | 1.4E+06 | 0.0E+00 | 0.0E+00 |
| CS137 | 1.0E+11 | 0.0E+00 | 0.0E+00 |
| CE144 | 3.4E+02 | 0.0E+00 | 0.0E+00 |
| PM147 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| EU154 | 5.8E+09 | 0.0E+00 | 0.0E+00 |
| EU155 | 5.0E+06 | 0.0E+00 | 0.0E+00 |
| NP237 | 3.0E+07 | 0.0E+00 | 0.0E+00 |
| PU238 | 1.9E+08 | 0.0E+00 | 0.0E+00 |
| PU239 | 4.4E+08 | 0.0E+00 | 0.0E+00 |
| PU241 | 3.2E+09 | 0.0E+00 | 0.0E+00 |
| AM241 | 2.3E+08 | 0.0E+00 | 0.0E+00 |
| CM242 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CM244 | 2.3E+06 | 0.0E+00 | 0.0E+00 |

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

3.4E-02 Input E/Q value (s/m3)

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

1.0E+00 Fraction of time spent in cloud

===== INHALATION =====

WHC-SD-WM-CN-080, Rev 0

Resuspension not considered

=====

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: SST Solids -Inhalation + Submersion

Executed on: 10/07/96 at 09:16:54

Page C. 1

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

| Organ | Committed Dose Equivalent | Weighting Factors | Weighted Dose Equivalent |
|------------------------------------|---------------------------------|----------------------|--------------------------------|
| Gonads | 3.4E-01 | 2.5E-01 | 8.4E-02 |
| Breast | 1.7E-02 | 1.5E-01 | 2.5E-03 |
| R Marrow | 7.1E+00 | 1.2E-01 | 8.5E-01 |
| Lung | 4.0E-01 | 1.2E-01 | 4.8E-02 |
| Thyroid | 1.6E-02 | 3.0E-02 | 4.9E-04 |
| Bone Sur | 3.5E+01 | 3.0E-02 | 1.1E+00 |
| Liver | 4.0E+00 | 6.0E-02 | 2.4E-01 |
| Ll Int. | 3.0E-01 | 6.0E-02 | 1.8E-02 |
| UL Int. | 1.3E-01 | 6.0E-02 | 7.5E-03 |
| S Int. | 3.9E-02 | 6.0E-02 | 2.3E-03 |
| Stomach | 2.7E-02 | 6.0E-02 | 1.6E-03 |
| Internal Effective Dose Equivalent | | | 2.3E+00 |
| External Dose | | | 1.5E-04 |
| Annual Effective Dose Equivalent | | | 2.3E+00 |

 Controlling Organ: Bone Sur
 Controlling Pathway: Inh
 Controlling Radionuclide: SR90

 Total Inhalation EDE: 2.3E+00
 Total Ingestion EDE: 0.0E+00

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: SST Solids -Inhalation + Submersion

Executed on: 10/07/96 at 09:16:54

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

| | Dose Commitment Year | | | | |
|-------------------------|-----------------------------------|---------|---------|-----------|--|
| | 1 | 2 | 3 | ... | |
| Internal Intake Year: 3 | | | 0.0E+00 | ... | |
| | | 0.0E+00 | 0.0E+00 | ... | |
| 2 | | + | + | | Internal Effective Dose Equivalent |
| 1 | 2.5E-01 + 1.4E-01 + 1.3E-01 + ... | | | = 2.3E+00 | |
| | | | | | |
| Internal Annual Dose | 2.5E-01 + 1.4E-01 + 1.3E-01 + ... | | | = 2.3E+00 | Cumulative Internal Dose |
| | + | + | + | + | |
| External Annual Dose | 1.5E-04 | 0.0E+00 | 0.0E+00 | ... | 1.5E-04 |
| | | | | | |
| Annual Dose | 2.5E-01 + 1.4E-01 + 1.3E-01 + ... | | | = 2.3E+00 | Cumulative Dose |
| | | | | 2.5E-01 | Maximum Annual Dose Occurred In Year 1 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: SST Solids -Inhalation + Submersion

Executed on: 10/07/96 at 09:16:54

Page C. 3

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

Committed Dose Equivalent by Exposure Pathway

| Pathway | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Inhale | 4.0E-01 | 2.7E-02 | 3.9E-02 | 1.3E-01 | 3.0E-01 | 3.5E+01 | 7.1E+00 | 3.4E-01 |
| Total | 4.0E-01 | 2.7E-02 | 3.9E-02 | 1.3E-01 | 3.0E-01 | 3.5E+01 | 7.1E+00 | 3.4E-01 |

| Pathway | Ovaries | Muscle | Thyroid | Kidneys | Liver | Spleen |
|---------|---------|---------|---------|---------|---------|---------|
| Inhale | 3.3E-01 | 1.7E-02 | 1.6E-02 | 2.2E-03 | 4.0E+00 | 6.3E-10 |
| Total | 3.3E-01 | 1.7E-02 | 1.6E-02 | 2.2E-03 | 4.0E+00 | 6.3E-10 |

External Dose by Exposure Pathway

| Pathway | |
|---------|---------|
| Plume | 1.5E-04 |
| Total | 1.5E-04 |

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GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: SST Solids -Inhalation + Submersion

Executed on: 10/07/96 at 09:16:54

Page C. 4

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|
| C 14 | 8.0E-10 | 8.0E-10 | 8.0E-10 | 8.0E-10 | 8.0E-10 | 9.8E-10 | 1.0E-09 | 8.0E-10 |
| CO 60 | 1.7E-03 | 1.3E-04 | 3.4E-35 | 4.6E-05 | 3.8E-05 | 6.6E-05 | 7.8E-05 | 8.0E-06 |
| SE 79 | 1.9E-09 | 1.2E-10 | 1.2E-10 | 1.3E-10 | 1.7E-10 | 1.4E-10 | 1.4E-10 | 1.1E-10 |
| SR 90 | 2.7E-02 | 7.4E-03 | 7.9E-33 | 1.8E-02 | 5.6E-02 | 1.2E+01 | 2.5E+00 | 6.8E-03 |
| Y 90 | 1.7E-01 | 7.9E-03 | 2.0E-32 | 9.5E-02 | 2.3E-01 | 2.9E-04 | 2.9E-04 | 9.7E-06 |
| TC 99 | 2.4E-03 | 6.4E-04 | 1.0E-35 | 3.1E-05 | 8.1E-05 | 6.9E-06 | 6.9E-06 | 5.7E-06 |
| RU 106 | 8.3E-07 | 2.3E-09 | 2.8E-39 | 1.1E-08 | 3.0E-08 | 1.5E-09 | 1.6E-09 | 9.7E-10 |
| SB 125 | 4.6E-05 | 1.3E-06 | 1.0E-36 | 2.8E-06 | 6.8E-06 | 2.3E-06 | 1.1E-06 | 1.8E-07 |
| TE 125M | 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 129 | 2.2E-08 | 6.7E-09 | 5.7E-09 | 5.7E-09 | 5.7E-09 | 7.9E-09 | 8.6E-09 | 5.3E-09 |
| CS 134 | 1.9E-07 | 1.9E-07 | 2.2E-07 | 2.1E-07 | 2.2E-07 | 1.7E-07 | 1.9E-07 | 2.1E-07 |
| CS 137 | 9.8E-03 | 9.6E-03 | 1.0E-02 | 9.9E-03 | 1.0E-02 | 8.9E-03 | 9.3E-03 | 9.7E-03 |
| CE 144 | 3.0E-09 | 4.6E-12 | 8.4E-12 | 4.2E-11 | 1.3E-10 | 1.8E-11 | 1.1E-11 | 7.2E-13 |
| PR 144M | 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 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 |
| FM 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 |
| FU 154 | 5.1E-03 | 1.1E-03 | 1.1E-03 | 1.6E-03 | 1.2E-03 | 3.4E-02 | 6.9E-03 | 3.8E-04 |
| EU 155 | 6.6E-07 | 4.3E-08 | 4.3E-08 | 8.4E-08 | 1.2E-07 | 8.2E-06 | 8.4E-07 | 9.5E-09 |
| CM 244 | 5.2E-04 | 4.4E-08 | 7.3E-08 | 2.9E-07 | 8.1E-07 | 3.0E-02 | 2.5E-03 | 4.0E-04 |
| 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 |
| NP 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 |
| PJ 238 | 3.8E-02 | 3.4E-06 | 5.5E-06 | 2.3E-05 | 6.3E-05 | 4.0E+00 | 3.2E-01 | 5.6E-02 |
| PU 241 | 2.7E-04 | 1.4E-06 | 1.5E-06 | 3.4E-06 | 5.8E-06 | 1.5E+00 | 1.2E-01 | 2.3E-02 |
| U 237 | 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 | 4.7E-02 | 9.1E-06 | 1.1E-05 | 3.4E-05 | 8.3E-05 | 5.7E+00 | 4.5E-01 | 8.0E-02 |
| NP 237 | 5.5E-03 | 6.5E-06 | 7.8E-06 | 1.1E-05 | 1.7E-05 | 1.3E+00 | 1.1E-01 | 9.5E-03 |
| PA 233 | 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 | 8.5E-02 | 7.5E-06 | 1.2E-05 | 4.8E-05 | 1.4E-04 | 1.1E+01 | 8.4E-01 | 1.5E-01 |
| Total | 4.0E-01 | 2.7E-02 | 3.9E-02 | 1.3E-01 | 3.0E-01 | 3.5E+01 | 7.1E+00 | 3.4E-01 |

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: SST Solids -Inhalation + Submersion

Executed on: 10/07/96 at 09:16:54

Page C. 5

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Ovaries | Muscle | Thyroid | Kidneys | Liver | Spleen |
|--------------|---------|---------|---------|---------|---------|---------|
| C 14 | 8.0E-10 | 8.1E-10 | 8.0E-10 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CO 60 | 2.3E-05 | 8.5E-05 | 7.3E-05 | 0.0E+00 | 1.6E-04 | 0.0E+00 |

WHC-SD-WM-CN-080, Rev 0

| | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|
| SE 79 | 1.2E-10 | 1.1E-10 | 1.1E-10 | 1.6E-09 | 8.1E-10 | 5.5E-10 |
| SR 90 | 6.8E-03 | 6.7E-03 | 6.8E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| Y 90 | 9.5E-06 | 9.4E-06 | 9.5E-06 | 0.0E+00 | 2.9E-04 | 0.0E+00 |
| TC 99 | 5.7E-06 | 5.7E-06 | 1.5E-04 | 0.0E+00 | 7.8E-06 | 0.0E+00 |
| RU 106 | 1.1E-09 | 1.5E-09 | 1.4E-09 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| SB 125 | 7.2E-07 | 8.2E-07 | 6.4E-07 | 0.0E+00 | 1.7E-06 | 0.0E+00 |
| TE 125M | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| I 129 | 5.7E-09 | 1.4E-08 | 9.8E-05 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CS 134 | 1.7E-07 | 1.7E-07 | 1.7E-07 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CS 137 | 9.0E-03 | 8.8E-03 | 8.8E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CE 144 | 9.1E-13 | 1.3E-12 | 1.1E-12 | 0.0E+00 | 9.9E-11 | 7.9E-11 |
| PR 144M | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PR 144 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PM 147 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| EU 154 | 7.8E-04 | 1.0E-03 | 4.6E-04 | 2.2E-03 | 2.7E-02 | 0.0E+00 |
| EU 155 | 2.0E-08 | 3.5E-08 | 1.4E-08 | 9.5E-08 | 2.7E-06 | 0.0E+00 |
| CM 244 | 4.1E-04 | 2.9E-08 | 2.6E-08 | 0.0E+00 | 6.2E-03 | 0.0E+00 |
| CM 242 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PJ 238 | 5.5E-02 | 2.1E-06 | 2.0E-06 | 0.0E+00 | 7.4E-01 | 0.0E+00 |
| PJ 241 | 2.3E-02 | 1.4E-06 | 6.1E-07 | 0.0E+00 | 2.4E-01 | 0.0E+00 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 7.9E-02 | 7.8E-06 | 4.4E-06 | 0.0E+00 | 1.0E+00 | 0.0E+00 |
| NP 237 | 9.4E-03 | 8.8E-06 | 6.8E-06 | 0.0E+00 | 5.6E-02 | 0.0E+00 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PJ 239 | 1.5E-01 | 4.6E-06 | 4.6E-06 | 0.0E+00 | 1.9E+00 | 0.0E+00 |
| ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Total | 3.3E-01 | 1.7E-02 | 1.6E-02 | 2.2E-03 | 4.0E+00 | 6.3E-10 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: SST Solids -Inhalation + Submersion

Executed on: 10/07/96 at 09:16:54

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

| Radio-nuclide | Inhalation Effective Dose Equivalent | Ingestion Effective Dose Equivalent | External Dose | Internal Effective Dose Equivalent | Annual Effective Dose Equivalent |
|---------------|--------------------------------------|-------------------------------------|---------------|------------------------------------|----------------------------------|
| C 14 | 7.8E-10 | 0.0E+00 | 1.8E-15 | 7.8E-10 | 7.8E-10 |
| CO 60 | 2.6E-04 | 0.0E+00 | 1.9E-06 | 2.6E-04 | 2.6E-04 |
| SE 79 | 4.9E-10 | 0.0E+00 | 1.9E-16 | 4.9E-10 | 4.9E-10 |
| SR 90 | 9.9E-01 | 0.0E+00 | 6.0E-07 | 9.9E-01 | 9.9E-01 |
| Y 90 | 4.2E-02 | 0.0E+00 | 2.2E-05 | 4.2E-02 | 4.2E-02 |
| TC 99 | 3.4E-04 | 0.0E+00 | 8.6E-10 | 3.4E-04 | 3.4E-04 |
| RU 106 | 1.0E-07 | 0.0E+00 | 3.2E-11 | 1.0E-07 | 1.0E-07 |
| SB 125 | 6.9E-06 | 0.0E+00 | 1.6E-07 | 6.9E-06 | 7.0E-06 |
| TE 125M | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| I 129 | 2.9E-06 | 0.0E+00 | 1.1E-10 | 2.9E-06 | 2.9E-06 |
| CS 134 | 1.8E-07 | 0.0E+00 | 4.4E-09 | 1.8E-07 | 1.9E-07 |
| CS 137 | 8.9E-03 | 0.0E+00 | 1.1E-04 | 8.9E-03 | 9.0E-03 |
| CE 144 | 3.8E-10 | 0.0E+00 | 9.0E-15 | 3.8E-10 | 3.8E-10 |
| PR 144M | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PR 144 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PM 147 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| EU 154 | 4.8E-03 | 0.0E+00 | 1.3E-05 | 4.8E-03 | 4.9E-03 |
| EU 155 | 6.2E-07 | 0.0E+00 | 3.9E-10 | 6.2E-07 | 6.2E-07 |
| CM 244 | 1.7E-03 | 0.0E+00 | 5.9E-13 | 1.7E-03 | 1.7E-03 |
| CM 242 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 2.2E-01 | 0.0E+00 | 5.7E-11 | 2.2E-01 | 2.2E-01 |
| PU 241 | 8.0E-02 | 0.0E+00 | 2.3E-15 | 8.0E-02 | 8.0E-02 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 3.1E-01 | 0.0E+00 | 4.7E-09 | 3.1E-01 | 3.1E-01 |
| NP 237 | 5.8E-02 | 0.0E+00 | 7.8E-10 | 5.8E-02 | 5.8E-02 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 5.9E-01 | 0.0E+00 | 8.7E-11 | 5.9E-01 | 5.9E-01 |

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: SST Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:24:13

Page A. 1

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

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

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

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

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

Input file name: \GENII\sstliqip.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Library - Times<100 years (23-July-93 PDR)
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

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

| Radio- nuclide | Air Bq/yr | Surface Water Bq/yr | Buried Source Bq/m3 |
|----------------|-----------|---------------------|---------------------|
| C 14 | 1.0E+05 | 0.0E+00 | 0.0E+00 |
| CO60 | 9.5E+06 | 0.0E+00 | 0.0E+00 |
| SR90 | 1.1E+10 | 0.0E+00 | 0.0E+00 |
| Y 90 | 1.1E+10 | 0.0E+00 | 0.0E+00 |
| TC99 | 1.7E+07 | 0.0E+00 | 0.0E+00 |
| RU106 | 9.9E+02 | 0.0E+00 | 0.0E+00 |
| SB125 | 3.4E+04 | 0.0E+00 | 0.0E+00 |
| I 129 | 1.0E+04 | 0.0E+00 | 0.0E+00 |
| CS134 | 1.2E+05 | 0.0E+00 | 0.0E+00 |
| CS137 | 2.2E+10 | 0.0E+00 | 0.0E+00 |
| CE144 | 9.1E+00 | 0.0E+00 | 0.0E+00 |
| EU154 | 2.4E+09 | 0.0E+00 | 0.0E+00 |
| EU155 | 5.9E+07 | 0.0E+00 | 0.0E+00 |
| NP237 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU238 | 9.2E+04 | 0.0E+00 | 0.0E+00 |
| PU239 | 3.6E+07 | 0.0E+00 | 0.0E+00 |
| PU241 | 2.6E+08 | 0.0E+00 | 0.0E+00 |
| AM241 | 4.2E+07 | 0.0E+00 | 0.0E+00 |
| CM242 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CM244 | 4.2E+05 | 0.0E+00 | 0.0E+00 |

===== AIR TRANSPORT =====
 3.4E-02 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE =====
 1.0E+00 Fraction of time spent in cloud

===== INHALATION =====
 Resuspension not considered

WHC-SD-WM-CN-080, Rev 0

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: SST Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:24:37

Page C. 1

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

| Organ | Committed Dose Equivalent | Weighting Factors | Weighted Dose Equivalent |
|------------------------------------|---------------------------|-------------------|--------------------------|
| Gonads | 3.1E-02 | 2.5E-01 | 7.8E-03 |
| Breast | 2.5E-03 | 1.5E-01 | 3.7E-04 |
| R Marrow | 2.0E-01 | 1.2E-01 | 2.4E-02 |
| Lung | 2.1E-02 | 1.2E-01 | 2.6E-03 |
| Thyroid | 2.2E-03 | 3.0E-02 | 6.7E-05 |
| Bone Sur | 2.1E+00 | 3.0E-02 | 6.4E-02 |
| Liver | 3.7E-01 | 6.0E-02 | 2.2E-02 |
| LL Int. | 4.7E-03 | 6.0E-02 | 2.8E-04 |
| UL Int. | 3.7E-03 | 6.0E-02 | 2.2E-04 |
| S Int. | 2.9E-03 | 6.0E-02 | 1.7E-04 |
| Stomach | 2.8E-03 | 6.0E-02 | 1.7E-04 |
| Internal Effective Dose Equivalent | | | 1.2E-01 |
| External Dose | | | 2.9E-05 |
| Annual Effective Dose Equivalent | | | 1.2E-01 |

 Controlling Organ: Bone Sur
 Controlling Pathway: Inh
 Controlling Radionuclide: AM241

 Total Inhalation EDE: 1.2E-01
 Total Ingestion EDE: 0.0E+00

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: SST Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:24:37

Page C. 2

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

| | | Dose Commitment Year | | | | |
|----------------------|---|----------------------|---------|---------|-----------------|--|
| | | 1 | 2 | 3 | ... | |
| Internal Intake | 3 | | | 0.0E+00 | ... | |
| | | | | + | | |
| | 2 | | 0.0E+00 | 0.0E+00 | ... | Internal Effective Dose Equivalent |
| | | | + | + | | |
| | 1 | 8.2E-03 | 4.3E-03 | 3.9E-03 | + ... = 1.2E-01 | |
| | | | | | | |
| Internal Annual Dose | | 8.2E-03 | 4.3E-03 | 3.9E-03 | + ... = 1.2E-01 | Cumulative Internal Dose |
| | | + | + | + | + | |
| External Annual Dose | | 2.9E-05 | 0.0E+00 | 0.0E+00 | ... | 2.9E-05 |
| | | | | | | |
| Annual Dose | | 8.2E-03 | 4.3E-03 | 3.9E-03 | + ... = 1.2E-01 | Cumulative Dose |
| | | | | | | 8.2E-03 |
| | | | | | | Maximum Annual Dose Occurred In Year 1 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: SST Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:24:37

Page C. 3

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

Committed Dose Equivalent by Exposure Pathway

| Pathway | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Inhale | 2.1E-02 | 2.8E-03 | 2.9E-03 | 3.7E-03 | 4.7E-03 | 2.1E+00 | 2.0E-01 | 3.1E-02 |
| Total | 2.1E-02 | 2.8E-03 | 2.9E-03 | 3.7E-03 | 4.7E-03 | 2.1E+00 | 2.0E-01 | 3.1E-02 |

| Pathway | Ovaries | Muscle | Thyroid | Kidneys | Liver | Spleen |
|---------|---------|---------|---------|---------|---------|---------|
| Inhale | 3.1E-02 | 2.5E-03 | 2.2E-03 | 9.2E-04 | 3.7E-01 | 2.1E-12 |
| Total | 3.1E-02 | 2.5E-03 | 2.2E-03 | 9.2E-04 | 3.7E-01 | 2.1E-12 |

External Dose by Exposure Pathway

| | |
|---------|---------|
| Pathway | ----- |
| Plume | 2.9E-05 |
| Total | 2.9E-05 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: SST Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:24:37

Page C. 4

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|
| C 14 | 6.3E-10 | 6.3E-10 | 6.3E-10 | 6.3E-10 | 6.3E-10 | 7.7E-10 | 7.8E-10 | 6.3E-10 |
| CO 60 | 3.9E-05 | 3.1E-06 | 7.9E-07 | 1.1E-06 | 8.8E-07 | 1.5E-06 | 1.8E-06 | 1.9E-07 |
| SR 90 | 1.8E-04 | 4.9E-05 | 5.3E-05 | 1.2E-04 | 3.7E-04 | 7.8E-02 | 3.5E-02 | 4.6E-05 |
| Y 90 | 1.2E-03 | 5.3E-05 | 1.3E-04 | 6.4E-04 | 1.6E-03 | 1.9E-06 | 1.9E-06 | 6.5E-08 |
| TC 99 | 3.2E-06 | 8.7E-07 | 1.4E-08 | 4.2E-08 | 1.1E-07 | 9.3E-09 | 9.3E-09 | 7.8E-09 |
| RU 106 | 1.1E-08 | 3.2E-11 | 3.7E-11 | 1.4E-10 | 4.1E-10 | 2.0E-11 | 2.2E-11 | 1.3E-11 |
| SB 125 | 8.7E-09 | 2.4E-10 | 2.0E-10 | 5.3E-10 | 1.3E-09 | 4.4E-10 | 2.1E-10 | 3.4E-11 |
| TE 125M | 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 129 | 3.3E-11 | 1.0E-11 | 8.7E-12 | 8.7E-12 | 8.7E-12 | 1.2E-11 | 1.3E-11 | 8.0E-12 |
| CS 134 | 1.6E-08 | 1.7E-08 | 2.0E-08 | 1.8E-08 | 2.0E-08 | 1.5E-08 | 1.7E-08 | 1.8E-08 |
| CS 137 | 2.2E-03 | 2.2E-03 | 2.3E-03 | 2.2E-03 | 2.3E-03 | 2.0E-03 | 2.1E-03 | 2.2E-03 |
| CE 144 | 7.9E-11 | 1.2E-13 | 2.2E-13 | 1.1E-12 | 3.4E-12 | 4.8E-13 | 2.9E-13 | 1.9E-14 |
| PR 144M | 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 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 |
| EU 154 | 2.1E-03 | 4.7E-04 | 4.5E-04 | 6.5E-04 | 4.9E-04 | 1.4E-02 | 2.9E-03 | 1.6E-04 |
| EU 155 | 7.8E-06 | 5.0E-07 | 5.0E-07 | 9.9E-07 | 1.4E-06 | 9.7E-05 | 9.9E-06 | 1.1E-07 |
| CM 244 | 9.5E-05 | 8.0E-09 | 1.3E-08 | 5.2E-08 | 1.5E-07 | 5.5E-03 | 4.5E-04 | 7.3E-05 |
| 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 |
| NP 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 |
| PU 238 | 1.8E-05 | 1.6E-09 | 2.6E-09 | 1.1E-08 | 3.0E-08 | 1.9E-03 | 1.5E-04 | 2.7E-05 |
| PU 241 | 2.1E-05 | 1.1E-07 | 1.2E-07 | 2.8E-07 | 4.6E-07 | 1.2E-01 | 9.6E-03 | 1.8E-03 |
| U 237 | 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 | 8.5E-03 | 1.6E-06 | 2.1E-06 | 6.1E-06 | 1.5E-05 | 1.0E+00 | 8.1E-02 | 1.4E-02 |
| NP 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PA 233 | 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 | 7.0E-03 | 6.2E-07 | 9.8E-07 | 4.0E-06 | 1.1E-05 | 8.9E-01 | 6.9E-02 | 1.2E-02 |
| Total | 2.1E-02 | 2.8E-03 | 2.9E-03 | 3.7E-03 | 4.7E-03 | 2.1E+00 | 2.0E-01 | 3.1E-02 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: SST Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:24:37

Page C. 5

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Ovaries | Muscle | Thyroid | Kidneys | Liver | Spleen |
|--------------|---------|---------|---------|---------|---------|---------|
| C 14 | 6.3E-10 | 6.4E-10 | 6.3E-10 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CO 60 | 5.3E-07 | 2.0E-06 | 1.7E-06 | 0.0E+00 | 3.7E-06 | 0.0E+00 |
| SR 90 | 4.6E-05 | 4.4E-05 | 4.6E-05 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| Y 90 | 6.4E-08 | 6.2E-08 | 6.4E-08 | 0.0E+00 | 1.9E-06 | 0.0E+00 |
| TC 99 | 7.8E-09 | 7.8E-09 | 2.1E-07 | 0.0E+00 | 1.1E-08 | 0.0E+00 |
| RU 106 | 1.4E-11 | 2.0E-11 | 1.9E-11 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| SB 125 | 1.4E-10 | 1.6E-10 | 1.2E-10 | 0.0E+00 | 3.3E-10 | 0.0E+00 |
| TE 125M | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| I 129 | 8.7E-12 | 2.1E-11 | 1.5E-07 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CS 134 | 1.5E-08 | 1.5E-08 | 1.5E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CS 137 | 2.0E-03 | 2.0E-03 | 2.0E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CE 144 | 2.4E-14 | 3.5E-14 | 2.9E-14 | 0.0E+00 | 2.6E-12 | 2.1E-12 |
| PR 144M | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PR 144 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| EU 154 | 3.2E-04 | 4.3E-04 | 1.9E-04 | 9.2E-04 | 1.1E-02 | 0.0E+00 |
| EU 155 | 2.4E-07 | 4.1E-07 | 1.7E-07 | 1.1E-06 | 3.1E-05 | 0.0E+00 |
| CM 244 | 7.4E-05 | 5.2E-09 | 4.7E-09 | 0.0E+00 | 1.1E-03 | 0.0E+00 |
| DM 242 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 2.6E-05 | 1.0E-09 | 9.7E-10 | 0.0E+00 | 3.5E-04 | 0.0E+00 |
| PU 241 | 1.8E-03 | 1.2E-07 | 4.9E-08 | 0.0E+00 | 1.9E-02 | 0.0E+00 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 1.4E-02 | 1.4E-06 | 8.0E-07 | 0.0E+00 | 1.8E-01 | 0.0E+00 |
| NP 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 1.2E-02 | 3.8E-07 | 3.7E-07 | 0.0E+00 | 1.5E-01 | 0.0E+00 |
| Total | 3.1E-02 | 2.5E-03 | 2.2E-03 | 9.2E-04 | 3.7E-01 | 2.1E-12 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: SST Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:24:37

Page C. 6

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

| Radio-nuclide | Inhalation Effective Dose Equivalent | Ingestion Effective Dose Equivalent | External Dose | Internal Effective Dose Equivalent | Annual Effective Dose Equivalent |
|---------------|--------------------------------------|-------------------------------------|---------------|------------------------------------|----------------------------------|
| C 14 | 6.1E-10 | 0.0E+00 | 1.6E-15 | 6.1E-10 | 6.1E-10 |
| CO 60 | 6.0E-06 | 0.0E+00 | 4.3E-08 | 6.0E-06 | 6.0E-06 |
| SR 90 | 6.6E-03 | 0.0E+00 | 4.2E-09 | 6.6E-03 | 6.6E-03 |
| Y 90 | 2.8E-04 | 0.0E+00 | 1.5E-07 | 2.8E-04 | 2.8E-04 |
| TC 99 | 4.6E-07 | 0.0E+00 | 1.2E-12 | 4.6E-07 | 4.6E-07 |
| RU 106 | 1.4E-09 | 0.0E+00 | 4.6E-13 | 1.4E-09 | 1.4E-09 |
| SB 125 | 1.3E-09 | 0.0E+00 | 3.1E-11 | 1.3E-09 | 1.3E-09 |
| TE 125M | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| I 129 | 4.5E-09 | 0.0E+00 | 1.7E-13 | 4.5E-09 | 4.5E-09 |
| CS 134 | 1.6E-08 | 0.0E+00 | 3.8E-10 | 1.6E-08 | 1.6E-08 |
| CS 137 | 2.0E-03 | 0.0E+00 | 2.4E-05 | 2.0E-03 | 2.1E-03 |
| CE 144 | 1.0E-11 | 0.0E+00 | 2.4E-16 | 1.0E-11 | 1.0E-11 |
| PR 144M | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PR 144 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| EU 154 | 2.0E-03 | 0.0E+00 | 5.5E-06 | 2.0E-03 | 2.0E-03 |
| EU 155 | 7.3E-06 | 0.0E+00 | 4.6E-09 | 7.3E-06 | 7.3E-06 |
| CM 244 | 3.1E-04 | 0.0E+00 | 1.1E-13 | 3.1E-04 | 3.1E-04 |
| CM 242 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 1.1E-04 | 0.0E+00 | 2.7E-14 | 1.1E-04 | 1.1E-04 |
| PU 241 | 6.4E-03 | 0.0E+00 | 1.8E-16 | 6.4E-03 | 6.4E-03 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 5.6E-02 | 0.0E+00 | 8.4E-10 | 5.6E-02 | 5.6E-02 |
| NP 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 4.8E-02 | 0.0E+00 | 7.1E-12 | 4.8E-02 | 4.8E-02 |

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: DST Solids - Inhalation + submersion.

Executed on: 10/07/96 at 09:33:07

Page A. 1

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

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

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

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

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

Input file name: \GENII\dtsolip.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Library - Times<100 years (23-July-93 PDR)
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

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

| Radio- nuclide | Air Bq/yr | Surface Water Bq/yr | Buried Source Bc/m3 |
|-------------------|--------------|---------------------------|---------------------------|
| C 14 | 1.6E+05 | 0.0E+00 | 0.0E+00 |
| CO60 | 1.5E+07 | 0.0E+00 | 0.0E+00 |
| SR90 | 5.2E+10 | 0.0E+00 | 0.0E+00 |
| Y 90 | 5.2E+10 | 0.0E+00 | 0.0E+00 |
| TC99 | 6.2E+07 | 0.0E+00 | 0.0E+00 |
| I 129 | 2.0E+04 | 0.0E+00 | 0.0E+00 |
| CS134 | 9.4E+06 | 0.0E+00 | 0.0E+00 |
| CS137 | 5.9E+10 | 0.0E+00 | 0.0E+00 |
| EU154 | 3.0E+08 | 0.0E+00 | 0.0E+00 |
| EU155 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP237 | 8.1E+05 | 0.0E+00 | 0.0E+00 |
| PU238 | 7.2E+07 | 0.0E+00 | 0.0E+00 |
| PU239 | 1.6E+09 | 0.0E+00 | 0.0E+00 |
| PU241 | 3.8E+09 | 0.0E+00 | 0.0E+00 |
| AM241 | 2.7E+09 | 0.0E+00 | 0.0E+00 |
| CM242 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CM244 | 1.6E+07 | 0.0E+00 | 0.0E+00 |

===== AIR TRANSPORT =====
 3.4E-02 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE =====
 1.0E+00 Fraction of time spent in cloud

===== INHALATION =====
 Resuspension not considered

WHC-SD-WM-CN-080, Rev 0

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: DST Solids - Inhalation + submersion.

Executed on: 10/07/96 at 09:33:28

Page C. 1

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

| Organ | Committed Dose Equivalent | Weighting Factors | Weighted Dose Equivalent |
|------------------------------------|---------------------------|-------------------|--------------------------|
| Gonads | 1.5E+00 | 2.5E-01 | 3.8E-01 |
| Breast | 5.6E-03 | 1.5E-01 | 8.5E-04 |
| R Marrow | 8.6E+00 | 1.2E-01 | 1.0E+00 |
| Lung | 8.8E-01 | 1.2E-01 | 1.1E-01 |
| Thyroid | 5.6E-03 | 3.0E-02 | 1.7E-04 |
| Bone Sur | 1.1E+02 | 3.0E-02 | 3.3E+00 |
| Liver | 1.9E+01 | 6.0E-02 | 1.1E+00 |
| LL Int. | 1.7E-02 | 6.0E-02 | 1.0E-03 |
| UL Int. | 1.0E-02 | 6.0E-02 | 6.2E-04 |
| S Int. | 7.1E-03 | 6.0E-02 | 4.3E-04 |
| Stomach | 6.4E-03 | 6.0E-02 | 3.9E-04 |
| Internal Effective Dose Equivalent | | | 5.9E+00 |
| External Dose | | | 6.5E-05 |
| Annual Effective Dose Equivalent | | | 5.9E+00 |

 Controlling Organ: Bone Sur
 Controlling Pathway: Inh
 Controlling Radionuclide: AM241

 Total Inhalation EDE: 5.9E+00
 Total Ingestion EDE: 0.0E+00

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: DST Solids - Inhalation + submersion.

Executed on: 10/07/96 at 09:33:28

Page C. 2

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

| | Dose Commitment Year | | | | |
|-----------------------|----------------------|-----------|-----------|-----------------|--|
| | 1 | 2 | 3 | ... | |
| Internal Intake Year: | 3 | | | | |
| | | | 0.0E+00 | ... | |
| | 2 | | | | |
| | | 0.0E+00 | 0.0E+00 | ... | |
| | 1 | | | | |
| | 2.7E-01 | + 1.8E-01 | + 1.7E-01 | + ... = 5.9E+00 | Internal Effective Dose Equivalent |
| | | | | | |
| Internal Annual Dose | 2.7E-01 | + 1.8E-01 | + 1.7E-01 | + ... = 5.9E+00 | Cumulative Internal Dose |
| | + | + | + | + | |
| External Annual Dose | 6.5E-05 | 0.0E+00 | 0.0E+00 | ... | 6.5E-05 |
| | | | | | |
| Annual Dose | 2.7E-01 | + 1.8E-01 | + 1.7E-01 | + ... = 5.9E+00 | Cumulative Dose |
| | | | | | 2.7E-01 |
| | | | | | Maximum Annual Dose Occurred In Year 1 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: DST Solids - Inhalation + submersion.

Executed on: 10/07/96 at 09:33:28

Page C. 3

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

Committed Dose Equivalent by Exposure Pathway

| Pathway | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Inhale | 8.8E-01 | 6.4E-03 | 7.1E-03 | 1.0E-02 | 1.7E-02 | 1.1E+02 | 8.6E+00 | 1.5E+00 |
| Total | 8.8E-01 | 6.4E-03 | 7.1E-03 | 1.0E-02 | 1.7E-02 | 1.1E+02 | 8.6E+00 | 1.5E+00 |

| Pathway | Ovaries | Muscle | Thyroid | Kidneys | Liver |
|---------|---------|---------|---------|---------|---------|
| Inhale | 1.5E+00 | 5.6E-03 | 5.6E-03 | 1.2E-04 | 1.9E+01 |
| Total | 1.5E+00 | 5.6E-03 | 5.6E-03 | 1.2E-04 | 1.9E+01 |

External Dose by Exposure Pathway

| Pathway | |
|---------|---------|
| Plume | 6.5E-05 |
| Total | 6.5E-05 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: DST Solids - Inhalation + submersion.

Executed on: 10/07/96 at 09:33:28

Page C. 4

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|
| C 14 | 1.0E-09 | 1.0E-09 | 1.0E-09 | 1.0E-09 | 1.0E-09 | 1.3E-09 | 1.3E-09 | 1.0E-09 |
| CO 60 | 6.0E-05 | 4.8E-06 | 1.2E-06 | 1.6E-06 | 1.4E-06 | 2.4E-06 | 2.8E-06 | 2.9E-07 |
| SR 90 | 8.8E-04 | 2.4E-04 | 2.6E-04 | 5.9E-04 | 1.8E-03 | 3.8E-01 | 1.7E-01 | 2.2E-04 |
| Y 90 | 5.7E-03 | 2.6E-04 | 6.5E-04 | 3.1E-03 | 7.7E-03 | 9.4E-06 | 9.4E-06 | 3.2E-07 |
| TC 99 | 1.2E-05 | 3.2E-06 | 5.0E-08 | 1.5E-07 | 4.1E-07 | 3.4E-08 | 3.4E-08 | 2.9E-08 |
| I 129 | 6.9E-11 | 2.1E-11 | 1.8E-11 | 1.8E-11 | 1.8E-11 | 2.5E-11 | 2.8E-11 | 1.7E-11 |
| CS 134 | 1.3E-06 | 1.3E-06 | 1.5E-06 | 1.4E-06 | 1.5E-06 | 1.2E-06 | 1.3E-06 | 1.4E-06 |
| CS 137 | 5.9E-03 | 5.7E-03 | 6.0E-03 | 5.9E-03 | 6.0E-03 | 5.3E-03 | 5.6E-03 | 5.8E-03 |
| EU 154 | 2.7E-04 | 6.0E-05 | 5.6E-05 | 8.2E-05 | 6.1E-05 | 1.8E-03 | 3.6E-04 | 2.0E-05 |
| EU 155 | 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 | 3.6E-03 | 3.1E-07 | 5.0E-07 | 2.0E-06 | 5.6E-06 | 2.1E-01 | 1.7E-02 | 2.8E-03 |
| 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 |
| NP 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 |
| PU 238 | 1.5E-02 | 1.3E-06 | 2.1E-06 | 8.9E-06 | 2.4E-05 | 1.6E+00 | 1.2E-01 | 2.1E-02 |
| PU 241 | 3.2E-04 | 1.6E-06 | 1.8E-06 | 4.1E-06 | 6.9E-06 | 1.8E+00 | 1.4E-01 | 2.7E-02 |
| U 237 | 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 | 5.4E-01 | 1.0E-04 | 1.3E-04 | 3.9E-04 | 9.6E-04 | 6.6E+01 | 5.1E+00 | 9.2E-01 |
| NP 237 | 1.5E-04 | 1.7E-07 | 2.1E-07 | 2.9E-07 | 4.6E-07 | 3.5E-02 | 2.8E-03 | 2.6E-04 |
| PA 233 | 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 | 3.1E-01 | 2.7E-05 | 4.3E-05 | 1.7E-04 | 5.0E-04 | 3.9E+01 | 3.0E+00 | 5.4E-01 |
| Total | 8.8E-01 | 6.4E-03 | 7.1E-03 | 1.0E-02 | 1.7E-02 | 1.1E+02 | 8.6E+00 | 1.5E+00 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: DST Solids - Inhalation + submersion.

Executed on: 10/07/96 at 09:33:28

Page C. 5

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Ovaries | Muscle | Thyroid | Kidneys | Liver |
|--------------|---------|---------|---------|---------|---------|
| C 14 | 1.0E-09 | 1.0E-09 | 1.0E-09 | 0.0E+00 | 0.0E+00 |
| CO 60 | 8.2E-07 | 3.1E-06 | 2.6E-06 | 0.0E+00 | 5.8E-06 |
| SR 90 | 2.2E-04 | 2.2E-04 | 2.2E-04 | 0.0E+00 | 0.0E+00 |
| Y 90 | 3.1E-07 | 3.1E-07 | 3.1E-07 | 0.0E+00 | 9.4E-06 |
| TC 99 | 2.9E-08 | 2.9E-08 | 7.7E-07 | 0.0E+00 | 3.9E-08 |
| I 129 | 1.8E-11 | 4.4E-11 | 3.1E-07 | 0.0E+00 | 0.0E+00 |
| CS 134 | 1.2E-06 | 1.2E-06 | 1.2E-06 | 0.0E+00 | 0.0E+00 |
| CS 137 | 5.4E-03 | 5.3E-03 | 5.3E-03 | 0.0E+00 | 0.0E+00 |
| EU 154 | 4.1E-05 | 5.4E-05 | 2.4E-05 | 1.2E-04 | 1.4E-03 |
| EU 155 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CM 244 | 2.8E-03 | 2.0E-07 | 1.8E-07 | 0.0E+00 | 4.3E-02 |
| CM 242 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 2.1E-02 | 8.1E-07 | 7.9E-07 | 0.0E+00 | 2.8E-01 |
| PU 241 | 2.7E-02 | 1.7E-06 | 7.3E-07 | 0.0E+00 | 2.8E-01 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 9.1E-01 | 9.0E-05 | 5.1E-05 | 0.0E+00 | 1.2E+01 |
| NP 237 | 2.5E-04 | 2.4E-07 | 1.8E-07 | 0.0E+00 | 1.5E-03 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 5.4E-01 | 1.7E-05 | 1.6E-05 | 0.0E+00 | 6.8E+00 |
| Total | 1.5E+00 | 5.6E-03 | 5.6E-03 | 1.2E-04 | 1.9E+01 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: DST Solids - Inhalation + submersion.

Executed on: 10/07/96 at 09:33:28

Page C. 6

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

| Radio-nuclide | Inhalation Effective Dose Equivalent | Ingestion Effective Dose Equivalent | External Dose | Internal Effective Dose Equivalent | Annual Effective Dose Equivalent |
|---------------|--------------------------------------|-------------------------------------|---------------|------------------------------------|----------------------------------|
| C 14 | 1.0E-09 | 0.0E+00 | 2.4E-15 | 1.0E-09 | 1.0E-09 |
| CO 60 | 9.2E-06 | 0.0E+00 | 6.9E-08 | 9.2E-06 | 9.3E-06 |
| SR 90 | 3.2E-02 | 0.0E+00 | 2.0E-08 | 3.2E-02 | 3.2E-02 |
| Y 90 | 1.4E-03 | 0.0E+00 | 7.1E-07 | 1.4E-03 | 1.4E-03 |
| TC 99 | 1.7E-06 | 0.0E+00 | 4.4E-12 | 1.7E-06 | 1.7E-06 |
| I 129 | 9.4E-09 | 0.0E+00 | 3.4E-13 | 9.4E-09 | 9.4E-09 |
| CS 134 | 1.3E-06 | 0.0E+00 | 2.9E-08 | 1.3E-06 | 1.3E-06 |
| CS 137 | 5.4E-03 | 0.0E+00 | 6.3E-05 | 5.4E-03 | 5.4E-03 |
| EU 154 | 2.5E-04 | 0.0E+00 | 6.8E-07 | 2.5E-04 | 2.5E-04 |
| EU 155 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CM 244 | 1.2E-02 | 0.0E+00 | 4.0E-12 | 1.2E-02 | 1.2E-02 |
| CM 242 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 8.6E-02 | 0.0E+00 | 2.1E-11 | 8.6E-02 | 8.6E-02 |
| PU 241 | 9.5E-02 | 0.0E+00 | 2.7E-15 | 9.5E-02 | 9.5E-02 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 3.6E+00 | 0.0E+00 | 5.4E-08 | 3.6E+00 | 3.6E+00 |
| NP 237 | 1.6E-03 | 0.0E+00 | 2.2E-11 | 1.6E-03 | 1.6E-03 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 2.1E+00 | 0.0E+00 | 3.1E-10 | 2.1E+00 | 2.1E+00 |

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: DST Liquids - Inhalation + Submersion

Executed on: 10/07/96 at 09:46:34

Page A. 1

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

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

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

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

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

Input file name: \GENII\dstliqip.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Library - Times < 100 years (23-July-93 PDR)
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

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

| Release Radio- nuclide | Air Bq/yr | Surface Water Bq/yr | Buried Source Bq/m3 |
|------------------------------|--------------|---------------------------|---------------------------|
| C 14 | 2.3E+05 | 0.0E+00 | 0.0E+00 |
| CO60 | 7.0E+06 | 0.0E+00 | 0.0E+00 |
| SR90 | 4.6E+09 | 0.0E+00 | 0.0E+00 |
| Y 90 | 4.6E+09 | 0.0E+00 | 0.0E+00 |
| TC99 | 1.1E+07 | 0.0E+00 | 0.0E+00 |
| I 129 | 2.0E+04 | 0.0E+00 | 0.0E+00 |
| CS134 | 6.1E+06 | 0.0E+00 | 0.0E+00 |
| CS137 | 5.9E+10 | 0.0E+00 | 0.0E+00 |
| PM147 | 3.6E+07 | 0.0E+00 | 0.0E+00 |
| EU154 | 4.2E+07 | 0.0E+00 | 0.0E+00 |
| EU155 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP237 | 2.3E+05 | 0.0E+00 | 0.0E+00 |
| PU238 | 1.8E+06 | 0.0E+00 | 0.0E+00 |
| PU239 | 7.7E+06 | 0.0E+00 | 0.0E+00 |
| PU241 | 1.8E+07 | 0.0E+00 | 0.0E+00 |
| AM241 | 3.4E+07 | 0.0E+00 | 0.0E+00 |
| CM242 | 1.1E+02 | 0.0E+00 | 0.0E+00 |
| CM244 | 1.2E+05 | 0.0E+00 | 0.0E+00 |

===== AIR TRANSPORT =====
 3.4E-02 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE =====
 1.0E+00 Fraction of time spent in cloud

===== INHALATION =====
 Resuspension not considered

WHC-SD-WM-CN-080, Rev 0

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: DST Liquids - Inhalation + Submersion

Executed on: 10/07/96 at 09:46:56

Page C. 1

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

| Organ | Committed Dose Equivalent | Weighting Factors | Weighted Dose Equivalent |
|------------------------------------|---------------------------|-------------------|--------------------------|
| Gonads | 2.1E-02 | 2.5E-01 | 5.2E-03 |
| Breast | 5.3E-03 | 1.5E-01 | 7.9E-04 |
| R Marrow | 1.1E-01 | 1.2E-01 | 1.3E-02 |
| Lung | 1.5E-02 | 1.2E-01 | 1.8E-03 |
| Thyroid | 5.3E-03 | 3.0E-02 | 1.6E-04 |
| Bone Sur | 1.1E+00 | 3.0E-02 | 3.4E-02 |
| Liver | 1.9E-01 | 6.0E-02 | 1.1E-02 |
| LL Int. | 6.9E-03 | 6.0E-02 | 4.1E-04 |
| UL Int. | 6.3E-03 | 6.0E-02 | 3.8E-04 |
| S Int. | 6.1E-03 | 6.0E-02 | 3.7E-04 |
| Stomach | 5.8E-03 | 6.0E-02 | 3.5E-04 |
| Internal Effective Dose Equivalent | | | 6.7E-02 |
| External Dose | | | 6.3E-05 |
| Annual Effective Dose Equivalent | | | 6.7E-02 |

 Controlling Organ: Bone Sur
 Controlling Pathway: Inh
 Controlling Radionuclide: AM241

 Total Inhalation EDE: 6.7E-02
 Total Ingestion EDE: 0.0E+00

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: DST Liquids - Inhalation + Submersion

Executed on: 10/07/96 at 09:46:56

Page C. 2

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

| | | Dose Commitment Year | | | | |
|-----------------------|---|----------------------|-----------|-----------|-----------------|--|
| | | 1 | 2 | 3 | ... | |
| Internal Intake Year: | 3 | | | 0.0E+00 | ... | |
| | 2 | | 0.0E+00 | 0.0E+00 | ... | |
| | 1 | 8.0E-03 | + 2.5E-03 | + 2.0E-03 | + ... = 6.7E-02 | Internal Effective Dose Equivalent |
| Internal Annual Dose | | 8.0E-03 | + 2.5E-03 | + 2.0E-03 | + ... = 6.7E-02 | Cumulative Internal Dose |
| External Annual Dose | | 6.3E-05 | 0.0E+00 | 0.0E+00 | ... | 6.3E-05 |
| Annual Dose | | 8.1E-03 | + 2.5E-03 | + 2.0E-03 | + ... = 6.7E-02 | Cumulative Dose |
| | | | | | | Maximum Annual Dose Occurred In Year 1 |
| | | | | | 8.1E-03 | |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: DST Liquids - Inhalation + Submersion

Executed on: 10/07/96 at 09:46:56

Page C. 3

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

Committed Dose Equivalent by Exposure Pathway

| Pathway | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Inhale | 1.5E-02 | 5.8E-03 | 6.1E-03 | 6.3E-03 | 6.9E-03 | 1.1E+00 | 1.1E-01 | 2.1E-02 |
| Total | 1.5E-02 | 5.8E-03 | 6.1E-03 | 6.3E-03 | 6.9E-03 | 1.1E+00 | 1.1E-01 | 2.1E-02 |

| Pathway | Ovaries | Muscle | Thyroid | Kidneys | Liver |
|---------|---------|---------|---------|---------|---------|
| Inhale | 2.0E-02 | 5.3E-03 | 5.3E-03 | 1.6E-05 | 1.9E-01 |
| Total | 2.0E-02 | 5.3E-03 | 5.3E-03 | 1.6E-05 | 1.9E-01 |

External Dose by Exposure Pathway

| Pathway | |
|---------|---------|
| Plume | 6.3E-05 |
| Total | 6.3E-05 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: DST Liquids - Inhalation + Submersion

Executed on: 10/07/96 at 09:46:56

Page C. 4

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|
| C 14 | 1.5E-09 | 1.5E-09 | 1.5E-09 | 1.5E-09 | 1.5E-09 | 1.8E-09 | 1.8E-09 | 1.5E-09 |
| CO 60 | 2.8E-05 | 2.2E-06 | 5.7E-07 | 7.7E-07 | 6.3E-07 | 1.1E-06 | 1.3E-06 | 1.3E-07 |
| SR 90 | 7.8E-05 | 2.1E-05 | 2.3E-05 | 5.2E-05 | 1.6E-04 | 3.4E-02 | 1.5E-02 | 2.0E-05 |
| Y 90 | 5.0E-04 | 2.3E-05 | 5.7E-05 | 2.8E-04 | 6.8E-04 | 8.3E-07 | 8.3E-07 | 2.8E-08 |
| TC 99 | 2.0E-06 | 5.5E-07 | 8.6E-09 | 2.6E-08 | 7.0E-08 | 5.9E-09 | 5.9E-09 | 4.9E-09 |
| I 129 | 6.9E-11 | 2.1E-11 | 1.8E-11 | 1.8E-11 | 1.8E-11 | 2.5E-11 | 2.8E-11 | 1.7E-11 |
| CS 134 | 8.1E-07 | 8.2E-07 | 9.7E-07 | 8.9E-07 | 9.7E-07 | 7.4E-07 | 8.2E-07 | 8.9E-07 |
| CS 137 | 5.9E-03 | 5.7E-03 | 6.0E-03 | 5.9E-03 | 6.0E-03 | 5.3E-03 | 5.6E-03 | 5.8E-03 |
| PM 147 | 3.2E-05 | 1.6E-08 | 4.0E-08 | 2.3E-07 | 6.8E-07 | 8.3E-06 | 6.6E-07 | 4.5E-11 |
| EU 154 | 3.7E-05 | 8.3E-06 | 7.8E-06 | 1.1E-05 | 8.5E-06 | 2.5E-04 | 5.0E-05 | 2.8E-06 |
| EU 155 | 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 | 2.8E-05 | 2.4E-09 | 3.9E-09 | 1.5E-08 | 4.3E-08 | 1.6E-03 | 1.3E-04 | 2.2E-05 |
| CM 242 | 1.8E-08 | 2.0E-12 | 3.1E-12 | 1.3E-11 | 3.8E-11 | 5.8E-08 | 4.9E-09 | 7.2E-10 |
| NP 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 |
| PU 238 | 3.6E-04 | 3.2E-08 | 5.2E-08 | 2.2E-07 | 6.0E-07 | 3.8E-02 | 3.1E-03 | 5.3E-04 |
| PU 241 | 1.5E-06 | 7.6E-09 | 8.6E-09 | 1.9E-08 | 3.2E-08 | 8.4E-03 | 6.6E-04 | 1.3E-04 |
| U 237 | 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 | 6.9E-03 | 1.3E-06 | 1.7E-06 | 4.9E-06 | 1.2E-05 | 8.3E-01 | 6.5E-02 | 1.2E-02 |
| NP 237 | 4.2E-05 | 4.9E-08 | 6.0E-08 | 8.3E-08 | 1.3E-07 | 1.0E-02 | 8.0E-04 | 7.3E-05 |
| PA 233 | 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 | 1.5E-03 | 1.3E-07 | 2.1E-07 | 8.4E-07 | 2.4E-06 | 1.9E-01 | 1.5E-02 | 2.6E-03 |
| Total | 1.5E-02 | 5.8E-03 | 6.1E-03 | 6.3E-03 | 6.9E-03 | 1.1E+00 | 1.1E-01 | 2.1E-02 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: DST Liquids - Inhalation + Submersion

Executed on: 10/07/96 at 09:46:56

Page C. 5

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Ovaries | Muscle | Thyroid | Kidneys | Liver |
|--------------|---------|---------|---------|---------|---------|
| C 14 | 1.5E-09 | 1.5E-09 | 1.5E-09 | 0.0E+00 | 0.0E+00 |
| CO 60 | 3.8E-07 | 1.4E-06 | 1.2E-06 | 0.0E+00 | 2.7E-06 |
| SR 90 | 2.0E-05 | 1.9E-05 | 2.0E-05 | 0.0E+00 | 0.0E+00 |
| Y 90 | 2.8E-08 | 2.7E-08 | 2.8E-08 | 0.0E+00 | 8.3E-07 |
| TC 99 | 4.9E-09 | 4.9E-09 | 1.3E-07 | 0.0E+00 | 6.7E-09 |
| I 129 | 1.8E-11 | 4.4E-11 | 3.1E-07 | 0.0E+00 | 0.0E+00 |
| CS 134 | 7.4E-07 | 7.4E-07 | 7.4E-07 | 0.0E+00 | 0.0E+00 |
| CS 137 | 5.4E-03 | 5.3E-03 | 5.3E-03 | 0.0E+00 | 0.0E+00 |
| PM 147 | 4.5E-11 | 5.7E-11 | 4.9E-11 | 0.0E+00 | 2.2E-06 |
| EU 154 | 5.6E-06 | 7.5E-06 | 3.3E-06 | 1.6E-05 | 2.0E-04 |
| EU 155 | 0.0E+00 | 0.0E+00 | 0.0E-00 | 0.0E+00 | 0.0E+00 |
| CM 244 | 2.2E-05 | 1.5E-09 | 1.4E-09 | 0.0E+00 | 3.3E-04 |
| CM 242 | 7.1E-10 | 1.2E-12 | 1.2E-12 | 0.0E+00 | 1.4E-08 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E-00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 5.2E-04 | 2.0E-08 | 1.9E-08 | 0.0E+00 | 7.0E-03 |
| PU 241 | 1.3E-04 | 8.0E-09 | 3.4E-09 | 0.0E+00 | 1.3E-03 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E-00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 1.1E-02 | 1.1E-06 | 6.5E-07 | 0.0E+00 | 1.5E-01 |
| NP 237 | 7.2E-05 | 6.8E-08 | 5.2E-08 | 0.0E+00 | 4.3E-04 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E-00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 2.6E-03 | 8.1E-08 | 7.9E-08 | 0.0E+00 | 3.3E-02 |
| Total | 2.0E-02 | 5.3E-03 | 5.3E-03 | 1.6E-05 | 1.9E-01 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: DST Liquids - Inhalation + Submersion

Executed on: 10/07/96 at 09:46:56

Page C. 6

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

| Radio-nuclide | Inhalation Effective Dose Equivalent | Ingestion Effective Dose Equivalent | External Dose | Internal Effective Dose Equivalent | Annual Effective Dose Equivalent |
|---------------|--------------------------------------|-------------------------------------|---------------|------------------------------------|----------------------------------|
| C 14 | 1.5E-09 | 0.0E+00 | 3.5E-15 | 1.5E-09 | 1.5E-09 |
| CO 60 | 4.3E-06 | 0.0E+00 | 3.3E-08 | 4.3E-06 | 4.3E-06 |
| SR 90 | 2.9E-03 | 0.0E+00 | 1.8E-09 | 2.9E-03 | 2.9E-03 |
| Y 90 | 1.2E-04 | 0.0E+00 | 6.4E-08 | 1.2E-04 | 1.2E-04 |
| TC 99 | 2.9E-07 | 0.0E+00 | 7.9E-13 | 2.9E-07 | 2.9E-07 |
| I 129 | 9.4E-09 | 0.0E+00 | 3.4E-13 | 9.4E-09 | 9.4E-09 |
| CS 134 | 7.9E-07 | 0.0E+00 | 1.9E-08 | 7.9E-07 | 8.1E-07 |
| CS 137 | 5.4E-03 | 0.0E+00 | 6.3E-05 | 5.4E-03 | 5.4E-03 |
| PM 147 | 4.3E-06 | 0.0E+00 | 1.4E-12 | 4.3E-06 | 4.3E-06 |
| EU 154 | 3.5E-05 | 0.0E+00 | 9.5E-08 | 3.5E-05 | 3.5E-05 |
| EU 155 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CM 244 | 9.4E-05 | 0.0E+00 | 3.1E-14 | 9.4E-05 | 9.4E-05 |
| CM 242 | 5.5E-09 | 0.0E+00 | 3.2E-17 | 5.5E-09 | 5.5E-09 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 2.1E-03 | 0.0E+00 | 5.2E-13 | 2.1E-03 | 2.1E-03 |
| PU 241 | 4.4E-04 | 0.0E+00 | 1.2E-17 | 4.4E-04 | 4.4E-04 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 4.5E-02 | 0.0E+00 | 6.9E-10 | 4.5E-02 | 4.5E-02 |
| NP 237 | 4.5E-04 | 0.0E+00 | 6.1E-12 | 4.5E-04 | 4.5E-04 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 1.0E-02 | 0.0E+00 | 1.5E-12 | 1.0E-02 | 1.0E-02 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: AWF Solids - inhalation + submersion.

Executed on: 10/07/96 at 09:58:46

Page A. 1

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

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

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

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

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

Input file name: \GENII\awfisol.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Library - Times<100 years (23-July-93 PDR)
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

=====

| Release Radio- nuclide | -----Release Terms----- | | |
|------------------------------|-------------------------|---------------------------|---------------------------|
| | Air Bq/yr | Surface Water Bq/yr | Buried Source Bq/m3 |
| C 14 | 1.0E+05 | 0.0E+00 | 0.0E+00 |
| CO60 | 4.9E+08 | 0.0E+00 | 0.0E+00 |
| SR90 | 2.9E+12 | 0.0E+00 | 0.0E+00 |
| Y 90 | 2.9E+12 | 0.0E+00 | 0.0E+00 |
| TC99 | 2.8E+08 | 0.0E+00 | 0.0E+00 |
| I 129 | 4.1E+06 | 0.0E+00 | 0.0E+00 |
| CS134 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CS137 | 9.8E+10 | 0.0E+00 | 0.0E+00 |
| EU154 | 1.1E+10 | 0.0E+00 | 0.0E+00 |
| NP237 | 9.9E+08 | 0.0E+00 | 0.0E+00 |
| PU238 | 6.7E+07 | 0.0E+00 | 0.0E+00 |
| PU239 | 4.4E+08 | 0.0E+00 | 0.0E+00 |
| PU241 | 1.7E+09 | 0.0E+00 | 0.0E+00 |
| AM241 | 1.1E+10 | 0.0E+00 | 0.0E+00 |
| CM242 | 2.0E+02 | 0.0E+00 | 0.0E+00 |
| CM244 | 6.1E+07 | 0.0E+00 | 0.0E+00 |

===== AIR TRANSPORT =====
 3.4E-02 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE =====
 1.0E+00 Fraction of time spent in cloud

===== INHALATION =====
 Resuspension not considered

=====

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: AWF Solids - inhalation + submersion.

Executed on: 10/07/96 at 09:59:07

Page C. 1

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

| Organ | Committed Dose Equivalent | Weighting Factors | Weighted Dose Equivalent |
|------------------------------------|---------------------------|-------------------|--------------------------|
| Gonads | 4.2E+00 | 2.5E-01 | 1.1E+00 |
| Breast | 2.4E-02 | 1.5E-01 | 3.5E-03 |
| R Marrow | 3.5E+01 | 1.2E-01 | 4.2E+00 |
| Lung | 2.9E+00 | 1.2E-01 | 3.4E-01 |
| Thyroid | 2.3E-02 | 3.0E-02 | 6.8E-04 |
| Bone Sur | 3.4E+02 | 3.0E-02 | 1.0E+01 |
| Liver | 5.1E+01 | 6.0E-02 | 3.1E+00 |
| LL Int. | 5.5E-01 | 6.0E-02 | 3.3E-02 |
| UL Int. | 2.2E-01 | 6.0E-02 | 1.3E-02 |
| S Int. | 6.4E-02 | 6.0E-02 | 3.8E-03 |
| Stomach | 4.1E-02 | 6.0E-02 | 2.4E-03 |
| Internal Effective Dose Equivalent | | | 1.9E+01 |
| External Dose | | | 1.8E-04 |
| Annual Effective Dose Equivalent | | | 1.9E+01 |

 Controlling Organ: Bone Sur
 Controlling Pathway: Inh
 Controlling Radionuclide: AM241

 Total Inhalation EDE: 1.9E+01
 Total Ingestion EDE: 0.0E+00

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: AWF Solids - inhalation + submersion.

Executed on: 10/07/96 at 09:59:07

Page C. 2

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

| | Dose Commitment Year | | | | |
|-----------------------|----------------------|---------|---------|---------------|--|
| | 1 | 2 | 3 | ... | |
| Internal Intake Year: | 3 | | | | |
| | | | 0.0E+00 | ... | |
| | 2 | 0.0E+00 | 0.0E+00 | ... | |
| | 1 | 1.1E+00 | 6.9E-01 | 6.6E-01 + ... | = 1.9E+01 |
| | | | | | |
| Internal Annual Dose | 1.1E+00 | 6.9E-01 | 6.6E-01 | + ... | = 1.9E+01 |
| | | + | + | + | + |
| External Annual Dose | 1.8E-04 | 0.0E+00 | 0.0E+00 | ... | 1.8E-04 |
| | | | | | |
| Annual Dose | 1.1E+00 | 6.9E-01 | 6.6E-01 | + ... | = 1.9E+01 |
| | | | | | Maximum Annual Dose Occurred In Year 1 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: AWF Solids - inhalation + submersion.

Executed on: 10/07/96 at 09:59:07

Page C. 3

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

Committed Dose Equivalent by Exposure Pathway

| Pathway | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Inhale | 2.9E+00 | 4.1E-02 | 6.4E-02 | 2.2E-01 | 5.5E-01 | 3.4E+02 | 3.5E+01 | 4.2E+00 |
| Total | 2.9E+00 | 4.1E-02 | 6.4E-02 | 2.2E-01 | 5.5E-01 | 3.4E+02 | 3.5E+01 | 4.2E+00 |

| Pathway | Ovaries | Muscle | Thyroid | Kidneys | Liver |
|---------|---------|---------|---------|---------|---------|
| Inhale | 4.1E+00 | 2.4E-02 | 2.3E-02 | 4.1E-03 | 5.1E+01 |
| Total | 4.1E+00 | 2.4E-02 | 2.3E-02 | 4.1E-03 | 5.1E+01 |

External Dose by Exposure Pathway

| Pathway | |
|---------|---------|
| Plume | 1.8E-04 |
| Total | 1.8E-04 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: AWF Solids - inhalation + submersion.

Executed on: 10/07/96 at 09:59:07

Page C. 4

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|
| C 14 | 6.3E-10 | 6.3E-10 | 6.3E-10 | 6.3E-10 | 6.3E-10 | 7.7E-10 | 7.8E-10 | 6.3E-10 |
| CO 60 | 1.9E-03 | 1.5E-04 | 4.0E-05 | 5.3E-05 | 4.4E-05 | 7.7E-05 | 9.1E-05 | 9.4E-06 |
| SR 90 | 4.9E-02 | 1.4E-02 | 1.5E-02 | 3.3E-02 | 1.0E-01 | 2.2E+01 | 9.6E+00 | 1.3E-02 |
| Y 90 | 3.2E-01 | 1.5E-02 | 3.6E-02 | 1.7E-01 | 4.3E-01 | 5.3E-04 | 5.3E-04 | 1.8E-05 |
| TC 99 | 5.4E-05 | 1.5E-05 | 2.3E-07 | 7.0E-07 | 1.9E-06 | 1.6E-07 | 1.6E-07 | 1.3E-07 |
| I 129 | 1.4E-08 | 4.3E-09 | 3.6E-09 | 3.6E-09 | 3.6E-09 | 5.1E-09 | 5.5E-09 | 3.4E-09 |
| 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 |
| CS 137 | 9.8E-03 | 9.6E-03 | 1.0E-02 | 9.9E-03 | 1.0E-02 | 8.9E-03 | 9.3E-03 | 9.7E-03 |
| EU 154 | 9.4E-03 | 2.1E-03 | 2.0E-03 | 2.9E-03 | 2.2E-03 | 6.4E-02 | 1.3E-02 | 7.1E-04 |
| CM 244 | 1.4E-02 | 1.2E-06 | 1.9E-06 | 7.6E-06 | 2.1E-05 | 8.1E-01 | 6.5E-02 | 1.1E-02 |
| CM 242 | 3.5E-08 | 3.9E-12 | 6.0E-12 | 2.5E-11 | 7.4E-11 | 1.1E-07 | 9.4E-09 | 1.4E-09 |
| NP 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 |
| PU 238 | 1.4E-02 | 1.2E-06 | 2.0E-06 | 8.3E-06 | 2.2E-05 | 1.4E+00 | 1.2E-01 | 2.0E-02 |
| PU 241 | 1.4E-04 | 7.2E-07 | 8.2E-07 | 1.8E-06 | 3.0E-06 | 8.0E-01 | 6.3E-02 | 1.2E-02 |
| U 237 | 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 | 2.2E+00 | 4.2E-04 | 5.3E-04 | 1.6E-03 | 3.8E-03 | 2.6E+02 | 2.1E+01 | 3.7E+00 |
| NP 237 | 1.8E-01 | 2.1E-04 | 2.5E-04 | 3.5E-04 | 5.6E-04 | 4.2E+01 | 3.4E+00 | 3.1E-01 |
| PA 233 | 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 | 8.5E-02 | 7.5E-06 | 1.2E-05 | 4.8E-05 | 1.4E-04 | 1.1E+01 | 8.4E-01 | 1.5E-01 |
| Total | 2.9E+00 | 4.1E-02 | 6.4E-02 | 2.2E-01 | 5.5E-01 | 3.4E+02 | 3.5E+01 | 4.2E+00 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: AWF Solids - inhalation + submersion.

Executed on: 10/07/96 at 09:59:07

Page C. 5

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Ovaries | Muscle | Thyroid | Kidneys | Liver |
|--------------|---------|---------|---------|---------|---------|
| C 14 | 6.3E-10 | 6.4E-10 | 6.3E-10 | 0.0E+00 | 0.0E+00 |
| CO 60 | 2.6E-05 | 9.9E-05 | 8.5E-05 | 0.0E+00 | 1.9E-04 |
| SR 90 | 1.3E-02 | 1.2E-02 | 1.3E-02 | 0.0E+00 | 0.0E+00 |
| Y 90 | 1.7E-05 | 1.7E-05 | 1.7E-05 | 0.0E+00 | 5.3E-04 |
| TC 99 | 1.3E-07 | 1.3E-07 | 3.5E-06 | 0.0E+00 | 1.8E-07 |
| I 129 | 3.6E-09 | 8.7E-09 | 6.2E-05 | 0.0E+00 | 0.0E+00 |
| CS 134 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CS 137 | 9.0E-03 | 8.8E-03 | 8.8E-03 | 0.0E+00 | 0.0E+00 |
| EU 154 | 1.4E-03 | 1.9E-03 | 8.5E-04 | 4.1E-03 | 5.0E-02 |
| CM 244 | 1.1E-02 | 7.6E-07 | 6.9E-07 | 0.0E+00 | 1.6E-01 |
| CM 242 | 1.4E-09 | 2.2E-12 | 2.2E-12 | 0.0E+00 | 2.7E-08 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 2.0E-02 | 7.5E-07 | 7.3E-07 | 0.0E+00 | 2.6E-01 |
| PU 241 | 1.2E-02 | 7.6E-07 | 3.2E-07 | 0.0E+00 | 1.2E-01 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 3.6E+00 | 3.6E-04 | 2.0E-04 | 0.0E+00 | 4.7E+01 |
| NP 237 | 3.0E-01 | 2.9E-04 | 2.2E-04 | 0.0E+00 | 1.8E+00 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 1.5E-01 | 4.6E-06 | 4.6E-06 | 0.0E+00 | 1.9E+00 |
| Total | 4.1E+00 | 2.4E-02 | 2.3E-02 | 4.1E-03 | 5.1E+01 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: AWF Solids - inhalation + submersion.

Executed on: 10/07/96 at 09:59:07

Page C. 6

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

| Radio-nuclide | Inhalation Effective Dose Equivalent | Ingestion Effective Dose Equivalent | External Dose | Internal Effective Dose Equivalent | Annual Effective Dose Equivalent |
|---------------|--------------------------------------|-------------------------------------|---------------|------------------------------------|----------------------------------|
| C 14 | 6.1E-10 | 0.0E+00 | 1.6E-15 | 6.1E-10 | 6.1E-10 |
| CO 60 | 3.0E-04 | 0.0E+00 | 2.3E-06 | 3.0E-04 | 3.0E-04 |
| SR 90 | 1.8E+00 | 0.0E+00 | 1.1E-06 | 1.8E+00 | 1.8E+00 |
| Y 90 | 7.8E-02 | 0.0E+00 | 3.9E-05 | 7.8E-02 | 7.8E-02 |
| TC 99 | 7.8E-06 | 0.0E+00 | 2.0E-11 | 7.8E-06 | 7.8E-06 |
| I 129 | 1.9E-06 | 0.0E+00 | 6.8E-11 | 1.9E-06 | 1.9E-06 |
| CS 134 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CS 137 | 8.9E-03 | 0.0E+00 | 1.1E-04 | 8.9E-03 | 9.0E-03 |
| EU 154 | 8.9E-03 | 0.0E+00 | 2.5E-05 | 8.9E-03 | 9.0E-03 |
| CM 244 | 4.6E-02 | 0.0E+00 | 1.6E-11 | 4.6E-02 | 4.6E-02 |
| CM 242 | 1.1E-08 | 0.0E+00 | 5.9E-17 | 1.1E-08 | 1.1E-08 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 7.9E-02 | 0.0E+00 | 2.0E-11 | 7.9E-02 | 7.9E-02 |
| PU 241 | 4.2E-02 | 0.0E+00 | 1.2E-15 | 4.2E-02 | 4.2E-02 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 1.4E+01 | 0.0E+00 | 2.2E-07 | 1.4E+01 | 1.4E+01 |
| NP 237 | 1.9E+00 | 0.0E+00 | 2.7E-08 | 1.9E+00 | 1.9E+00 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 5.9E-01 | 0.0E+00 | 8.7E-11 | 5.9E-01 | 5.9E-01 |

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: AWF Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:52:17

Page A. 1

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

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

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

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

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

Input file name: \GENII\awfliq.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Library - Times<100 years (23-July-93 PDR)
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

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

| Radio- nuclide | Air Bq/yr | Surface Water Bq/yr | Buried Source Bc/m3 |
|-------------------|--------------|---------------------------|---------------------------|
| C 14 | 5.8E+04 | 0.0E+00 | 0.0E+00 |
| CO60 | 7.7E+05 | 0.0E+00 | 0.0E+00 |
| SR90 | 5.6E+09 | 0.0E+00 | 0.0E+00 |
| Y 90 | 5.6E+09 | 0.0E+00 | 0.0E+00 |
| Tc99 | 1.2E+07 | 0.0E+00 | 0.0E+00 |
| I 129 | 4.4E+01 | 0.0E+00 | 0.0E+00 |
| CS134 | 1.3E+04 | 0.0E+00 | 0.0E+00 |
| CS137 | 8.8E+10 | 0.0E+00 | 0.0E+00 |
| NP237 | 9.2E+04 | 0.0E+00 | 0.0E+00 |
| PU238 | 2.8E+03 | 0.0E+00 | 0.0E+00 |
| PU239 | 1.2E+06 | 0.0E+00 | 0.0E+00 |
| PU241 | 3.4E+05 | 0.0E+00 | 0.0E+00 |
| AM241 | 1.1E+06 | 0.0E+00 | 0.0E+00 |
| CM242 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| CM244 | 1.1E+04 | 0.0E+00 | 0.0E+00 |

===== AIR TRANSPORT =====
 3.4E-02 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE =====
 1.0E+00 Fraction of time spent in cloud

===== INHALATION =====
 Resuspension not considered

Input prepared by: _____ Date: _____

WHC-SD-WM-CN-080, Rev 0

Input checked by: _____ Date: _____

=====

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: AWF Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:52:37

Page C. 1

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

| Organ | Committed Dose Equivalent | Weighting Factors | Weighted Dose Equivalent |
|------------------------------------|---------------------------|-------------------|--------------------------|
| Gonads | 9.6E-03 | 2.5E-01 | 2.4E-03 |
| Breast | 7.9E-03 | 1.5E-01 | 1.2E-03 |
| R Marrow | 3.1E-02 | 1.2E-01 | 3.8E-03 |
| Lung | 1.0E-02 | 1.2E-01 | 1.2E-03 |
| Thyroid | 7.9E-03 | 3.0E-02 | 2.4E-04 |
| Bone Sur | 1.1E-01 | 3.0E-02 | 3.3E-03 |
| Liver | 1.0E-02 | 6.0E-02 | 6.1E-04 |
| LL Int. | 1.0E-02 | 6.0E-02 | 6.0E-04 |
| UL Int. | 9.3E-03 | 6.0E-02 | 5.6E-04 |
| S Int. | 9.1E-03 | 6.0E-02 | 5.5E-04 |
| Stomach | 8.7E-03 | 6.0E-02 | 5.2E-04 |
| Internal Effective Dose Equivalent | | | 1.5E-02 |
| External Dose | | | 9.4E-05 |
| Annual Effective Dose Equivalent | | | 1.5E-02 |

 Controlling Organ: Bone Sur
 Controlling Pathway: Inh
 Controlling Radionuclide: CS137

 Total Inhalation EDE: 1.5E-02
 Total Ingestion EDE: 0.0E+00

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: AWF Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:52:37

Page C. 2

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

| | Dose Commitment Year | | | | |
|-----------------------|----------------------|-----------|---------------------------|---------------------------|--|
| | 1 | 2 | 3 | ... | |
| Internal Intake Year: | 3 | | | | |
| | | | 0.0E+00 | ... | |
| | 2 | 0.0E+00 | 0.0E+00 | ... | Internal Effective Dose Equivalent |
| | 1 | 8.1E-03 | + 1.2E-03 | + 4.8E-04 + ... = 1.5E-02 | |
| | | | | | |
| Internal Annual Dose | 8.1E-03 | + 1.2E-03 | + 4.8E-04 + ... = 1.5E-02 | | Cumulative Internal Dose |
| | | + | + | + | |
| External Annual Dose | 9.4E-05 | 0.0E+00 | 0.0E+00 | ... | 9.4E-05 |
| | | | | | |
| Annual Dose | 8.1E-03 | + 1.2E-03 | + 4.8E-04 + ... = 1.5E-02 | | Cumulative Dose |
| | | | | 8.1E-03 | Maximum Annual Dose Occurred In Year 1 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: AWF Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:52:37

Page C. 3

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

Committed Dose Equivalent by Exposure Pathway

| Pathway | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone Su | R Marro | Testes |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Inhale | 1.0E-02 | 8.7E-03 | 9.1E-03 | 9.3E-03 | 1.0E-02 | 1.1E-01 | 3.1E-02 | 9.6E-03 |
| Total | 1.0E-02 | 8.7E-03 | 9.1E-03 | 9.3E-03 | 1.0E-02 | 1.1E-01 | 3.1E-02 | 9.6E-03 |

| Pathway | Ovaries | Muscle | Thyroid | Liver |
|---------|---------|---------|---------|---------|
| Inhale | 8.9E-03 | 7.9E-03 | 7.9E-03 | 1.0E-02 |
| Total | 8.9E-03 | 7.9E-03 | 7.9E-03 | 1.0E-02 |

External Dose by Exposure Pathway

| Pathway | |
|---------|---------|
| Plume | 9.4E-05 |
| Total | 9.4E-05 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: AWF Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:52:37

Page C. 4

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Lung | Stomach | S Int. | UL Int. | LL Int. | Bone.Su | R Marro | Testes |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|
| C 14 | 3.7E-10 | 3.7E-10 | 3.7E-10 | 3.7E-10 | 3.7E-10 | 4.5E-10 | 4.6E-10 | 3.7E-10 |
| CD 60 | 3.1E-06 | 2.4E-07 | 6.3E-08 | 8.4E-08 | 7.0E-08 | 1.2E-07 | 1.4E-07 | 1.5E-08 |
| SR 90 | 9.4E-05 | 2.6E-05 | 2.8E-05 | 6.3E-05 | 2.0E-04 | 4.1E-02 | 1.8E-02 | 2.4E-05 |
| Y 90 | 6.1E-04 | 2.8E-05 | 6.9E-05 | 3.3E-04 | 8.2E-04 | 1.0E-06 | 1.0E-06 | 3.4E-08 |
| TC 99 | 2.4E-06 | 6.4E-07 | 1.0E-08 | 3.1E-08 | 8.1E-08 | 6.9E-09 | 6.9E-09 | 3.7E-09 |
| I 129 | 1.5E-13 | 4.7E-14 | 4.0E-14 | 4.0E-14 | 4.0E-14 | 5.5E-14 | 6.0E-14 | 3.7E-14 |
| CS 134 | 1.8E-09 | 1.8E-09 | 2.1E-09 | 1.9E-09 | 2.1E-09 | 1.6E-09 | 1.8E-09 | 1.9E-09 |
| CS 137 | 8.8E-03 | 8.6E-03 | 9.0E-03 | 8.9E-03 | 9.0E-03 | 8.0E-03 | 8.3E-03 | 8.8E-03 |
| CM 244 | 2.4E-06 | 2.0E-10 | 3.4E-10 | 1.3E-09 | 3.7E-09 | 1.4E-04 | 1.1E-05 | 1.9E-06 |
| 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 |
| NP 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 |
| PU 238 | 5.8E-07 | 5.1E-11 | 8.3E-11 | 3.5E-10 | 9.6E-10 | 6.1E-05 | 4.9E-06 | 8.5E-07 |
| PU 241 | 2.8E-08 | 1.4E-10 | 1.6E-10 | 3.6E-10 | 6.1E-10 | 1.6E-04 | 1.3E-05 | 2.4E-06 |
| U 237 | 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 | 2.2E-04 | 4.2E-08 | 5.3E-08 | 1.6E-07 | 3.8E-07 | 2.6E-02 | 2.1E-03 | 3.7E-04 |
| NP 237 | 1.6E-05 | 1.9E-08 | 2.3E-08 | 3.2E-08 | 5.1E-08 | 3.9E-03 | 3.1E-04 | 2.8E-05 |
| PA 233 | 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 | 2.4E-04 | 2.1E-08 | 3.4E-08 | 1.4E-07 | 3.9E-07 | 3.0E-02 | 2.4E-03 | 4.2E-04 |
| Total | 1.0E-02 | 8.7E-03 | 9.1E-03 | 9.3E-03 | 1.0E-02 | 1.1E-01 | 3.1E-02 | 9.6E-03 |

WHC-SD-WM-CN-080, Rev 0

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: AWF Liquids - INHALATION + SUBMERSTION

Executed on: 10/07/96 at 09:52:37

Page C. 5

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

Committed Dose Equivalent by Radionuclide

| Radionuclide | Ovaries | Muscle | Thyroid | Liver |
|--------------|---------|---------|---------|---------|
| C 14 | 3.7E-10 | 3.8E-10 | 3.7E-10 | 0.0E+00 |
| CO 60 | 4.2E-08 | 1.6E-07 | 1.4E-07 | 3.0E-07 |
| SR 90 | 2.4E-05 | 2.3E-05 | 2.4E-05 | 0.0E+00 |
| Y 90 | 3.3E-08 | 3.3E-08 | 3.3E-08 | 1.0E-06 |
| TC 99 | 5.7E-09 | 5.7E-09 | 1.5E-07 | 7.8E-09 |
| I 129 | 4.0E-14 | 9.5E-14 | 6.8E-10 | 0.0E+00 |
| CS 134 | 1.6E-09 | 1.6E-09 | 1.6E-09 | 0.0E+00 |
| CS 137 | 8.1E-03 | 7.9E-03 | 7.9E-03 | 0.0E+00 |
| CM 244 | 1.9E-06 | 1.3E-10 | 1.2E-10 | 2.8E-05 |
| CM 242 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 8.3E-07 | 3.2E-11 | 3.1E-11 | 1.1E-05 |
| PU 241 | 2.4E-06 | 1.5E-10 | 6.5E-11 | 2.5E-05 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 3.6E-04 | 3.6E-08 | 2.0E-08 | 4.7E-03 |
| NP 237 | 2.8E-05 | 2.6E-08 | 2.0E-08 | 1.7E-04 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 4.2E-04 | 1.3E-08 | 1.3E-08 | 5.3E-03 |
| Total | 8.9E-03 | 7.9E-03 | 7.9E-03 | 1.0E-02 |

WHC-SD-WM-CN-080, Rev 0

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: AMF Liquids - INHALATION + SUBMERSION

Executed on: 10/07/96 at 09:52:37

Page C. 6

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

| Radio-nuclide | Inhalation Effective Dose Equivalent | Ingestion Effective Dose Equivalent | External Dose | Internal Effective Dose Equivalent | Annual Effective Dose Equivalent |
|---------------|--------------------------------------|-------------------------------------|---------------|------------------------------------|----------------------------------|
| C 14 | 3.6E-10 | 0.0E+00 | 8.9E-16 | 3.6E-10 | 3.6E-10 |
| CO 60 | 4.7E-07 | 0.0E+00 | 3.6E-09 | 4.7E-07 | 4.8E-07 |
| SR 90 | 3.5E-03 | 0.0E+00 | 2.1E-09 | 3.5E-03 | 3.5E-03 |
| Y 90 | 1.5E-04 | 0.0E+00 | 7.7E-08 | 1.5E-04 | 1.5E-04 |
| TC 99 | 3.4E-07 | 0.0E+00 | 8.6E-13 | 3.4E-07 | 3.4E-07 |
| I 129 | 2.0E-11 | 0.0E+00 | 7.4E-16 | 2.0E-11 | 2.0E-11 |
| CS 134 | 1.7E-09 | 0.0E+00 | 4.1E-11 | 1.7E-09 | 1.8E-09 |
| CS 137 | 8.0E-03 | 0.0E+00 | 9.3E-05 | 8.0E-03 | 8.1E-03 |
| CM 244 | 8.0E-06 | 0.0E+00 | 2.8E-15 | 8.0E-06 | 8.0E-06 |
| CM 242 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NP 238 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 238 | 3.4E-06 | 0.0E+00 | 8.2E-16 | 3.4E-06 | 3.4E-06 |
| PU 241 | 8.4E-06 | 0.0E+00 | 2.4E-19 | 8.4E-06 | 8.4E-06 |
| U 237 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| AM 241 | 1.4E-03 | 0.0E+00 | 2.2E-11 | 1.4E-03 | 1.4E-03 |
| NP 237 | 1.7E-04 | 0.0E+00 | 2.4E-12 | 1.7E-04 | 1.7E-04 |
| PA 233 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PU 239 | 1.6E-03 | 0.0E+00 | 2.4E-13 | 1.6E-03 | 1.6E-03 |

WHC-SD-WM-CN-080, Rev 0

Attachment 2 GXQ Output File

WHC-SD-WM-CN-080, Rev 0

Current Input File Name: grnd.IN

GXQ Version 4.0
December 19, 1994

General Purpose Atmospheric Dispersion Code
Produced by Westinghouse Hanford Company

Users Guide documented in WHC-SD-GN-SWD-30002 Rev. 1.
Validation documented in WHC-SD-GN-SWD-30003 Rev. 1.

Code Custodian is: Brit E. Hey
Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
(509) 376-2921

Run Date = 10/02/96
Run Time = 10:45:07.58

INPUT ECHO:

TWRS FSAR 80, 100, 120m X/Qs

c GXQ Version 4.0 Input File

c mode

1

c

c MODE CHOICE:

c mode = 1 then X/Q based on Hanford site specific meteorology

c mode = 2 then X/Q based on atmospheric stability class and wind speed

c mode = 3 then X/Q plot file is created

c

c LOGICAL CHOICES:

c ifox inorm icdf ichk isite ipop

T F F F F F F

c ifox = t then joint frequency used to compute frequency to exceed X/Q

c = f then joint frequency used to compute annual average X/Q

c inorm = t then joint frequency data is normalized (as in GENII)

c = f then joint frequency data is un-normalized

c icdf = t then cumulative distribution file created (CDF.OUT)

c = f then no cumulative distribution file created

c ichk = t then X/Q parameter print option turned on

c = f then no parameter print

c isite = t then X/Q based on joint frequency data for all 16 sectors

c = f then X/Q based on joint frequency data of individual sectors

c ipop = t then X/Q is population weighted

c = f then no population weighting

c

c X/Q AND WIND SPEED ADJUSTMENT MODELS:

c ipuff ldep lsrc lwind

0 0 0 0

c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:

c iwake ipm iflow ientr

0 0 0 0

c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:

c (irise igrnd)iwash igrav

0 0 0 0

c ipuff = 1 then X/Q calculated using puff model

c = 0 then X/Q calculated using default continuous plume model

c ldep = 1 then plume depletion model turned on (Chamberlain model)

c lsrc = 1 then X/Q multiplied by scalar

c = 2 then X/Q adjusted by wind speed function

c lwind = 1 then wind speed corrected for plume height

c iwake = 1 then NRC RG 1.145 building wake model turned on

c = 2 then MACCS virtual distance building wake model turned on

c ipm = 1 then NRC RG 1.145 plume meander model turned on

c = 2 then 5th Power Law plume meander model turned on

c = 3 then sector average model turned on

c iflow = 1 then sigmas adjusted for volume flow rate

c ientr = 1 then method of Pasquill used to account for entrainment

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```

c rise = 1 then MACCS buoyant plume rise model turned on
  = 2 then ISC2 moment/m buoyancy plume rise model turned on
c igrnd = 1 then Mills buoyant plume rise modification for ground effects
c lwash = 1 then stack downwash model turned on
c igrav = 1 then gravitational settling model turned on
  = 0 unless specified otherwise, 0 turns model off
c
c PARAMETER INPUT:
c
c release      reference      mixing      frequency
c height      anemometer     height     to
c hs(m)       ha(m)           hm(m)     exceed
c                                     Cx(%)
c
c 0.00000E+00  1.00000E+01  1.00000E+03  5.00000E-01
c
c initial      initial      initial      deposition      gravitational
c plume        plume        plume        duration        settling
c width        height     release     velocity        velocity
c Wb(m)        Hb(m)        trd(hr)     vd(m/s)         vg(m/s)
c
c 0.00000E+00  0.00000E+00  0.00000E+00  1.00000E-03  1.00000E-03
c
c ambient      initial      initial      release         convective
c temperature  plume        plume        diameter       heat release
c Tamb(C)      TO(C)        flow rate   d(m)           rate(1)
c                                     VD(m3/s)    qh(w)
c
c 2.00000E+01  2.20000E+01  1.00000E+00  1.00000E+00  0.00000E+00
c
c (1) if zero then buoyant flux based on plume/ambient temperature difference.
c
c X/Q          Wind
c scaling      Speed
c factor       Exponent
c c(?)         a(?)
c
c 1.00000E+00  7.80000E-01
c
c RECEPTOR DEPENDENT DATA (no line limit)
c FOR MODE    make      RECEPTOR DEPENDENT DATA
c 1 (site specific)  sector distance receptor-height
c 2 (by class & wind speed)  class windspeed distance offset receptor-height
c 3 (create plot file)      class windspeed xmax imax ymax jmax xqmin power
c
c RECEPTOR PARAMETER DESCRIPTION
c sector = 0, 1, 2... (all, S, SSW, etc..)
c distance = receptor distance (m)
c receptor height = height of receptor (m)
c class = 1, 2, 3, 4, 5, 6, 7 (P-G stability class A, B, C, D, E, F, G)
c windspeed = anemometer wind speed (m/s)
c offset = offset from plume centerline (m)
c xmax = maximum distance to plot or calculate to (m)
c imax = distance intervals
c ymax = maximum offset to plot (m)
c jmax = offset intervals
c xqmin = minimum scaled X/Q to calculate
c power = exponent in power function step size
c
MODE:
Site specific X/Q calculated.

LOGICAL CHOICES:
Joint frequency used to calculate X/Q based on frequency of exceedance.
No normalization of joint frequency.
X/Q calculated for single sector.

MODELS SELECTED:
Default Gaussian plume model selected.

WARNING/ERROR MESSAGES:

```

WHC-SD-WM-CN-080, Rev 0

JOINT FREQUENCY DATA:
 200 AREA (HMS) - 10 M - Pasquill A - G (1983 - 1991 Average)
 Created 8/26/92 KR

TWRS FSAR 80, 100, 120m X/Qs

| SECTOR | DISTANCE (m) | RECEPT HEIGHT (m) | SECT. FREQ. (%) | POPULATION | TOTAL | AVERAGE | ATM. STAB. CLASS | WIND SPEED (m/s) |
|--------|-----------------|-------------------------|-----------------------|------------|-----------------------------|---------------------------------------|------------------------|------------------------|
| | | | | | POPULATION X/Q (s/m3) | INDIVIDUAL SCALED X/Q (s/m3) | | |
| E | 80 | 0 | 14.05 | 1 | 4.99E-02 | 4.99E-02 | F | 0.89 |
| E | 90 | 0 | 14.05 | 1 | 4.08E-02 | 4.08E-02 | F | 0.89 |
| E | 100 | 0 | 14.05 | 1 | 3.41E-02 | 3.41E-02 | F | 0.89 |
| E | 110 | 0 | 14.05 | 1 | 2.88E-02 | 2.88E-02 | F | 0.89 |
| E | 120 | 0 | 14.05 | 1 | 2.48E-02 | 2.48E-02 | F | 0.89 |

WHC-SD-WM-CN-080, Rev 0

Attachment 3 MICROSIELD Output File

Microshield 3.12

=====
 (WESTINGHOUSE HANFORD CO. - #090)

Page : 1
 File : GRNDDEP3.MSH
 Run date: October 15, 1996
 Run time: 4:57 p.m.

File Ref: _____
 Date: ___/___/___
 By: _____
 Checked: _____

CASE: ground deposition 40 x 11.58 m vd=0.01 m/s

GEOMETRY 11: Rectangular solid source - slab shields

| | | | |
|---|----|-------|-----|
| Distance to detector..... | X | 100.1 | cm. |
| Source width..... | W | 4000. | " |
| Source length..... | L | 1160. | " |
| Rectangular solid, thickness toward dose pt.. | T1 | 0.1 | " |
| Thickness of second shield..... | T2 | 100. | " |

Source Volume: 464000 cubic centimeters

MATERIAL DENSITIES (g/cc):

| Material | Source | Shield 2 |
|-----------|--------|----------|
| Air | | .001220 |
| Aluminum | | |
| Carbon | | |
| Concrete | 1.40 | |
| Hydrogen | | |
| Iron | | |
| Lead | | |
| Lithium | | |
| Nickel | | |
| Tin | | |
| Titanium | | |
| Tungsten | | |
| Urania | | |
| Uranium | | |
| Water | | |
| Zirconium | | |

CASE: ground deposition 40 x 11.58 m vd=0.01 m/s

BUILDUP FACTOR: based on TAYLOR method.
Using the characteristics of the materials in shield 1.

INTEGRATION PARAMETERS:

| | |
|--|----|
| Number of lateral angle segments (Ntheta)..... | 11 |
| Number of azimuthal angle segments (Npsi)..... | 11 |
| Number of radial segments (Nradius)..... | 11 |

SOURCE NUCLIDES:

| Nuclide | Curies | Nuclide | Curies | Nuclide | Curies |
|---------|------------|---------|------------|---------|------------|
| Ba-137m | 1.6027e+00 | Co-60 | 7.1081e-03 | Cs-137 | 1.6946e+00 |
| Eu-154 | 9.8108e-02 | Eu-155 | 8.4595e-05 | | |

RESULTS:


| Group # | Energy (MeV) | Activity (photons/sec) | Dose point flux MeV/(sq cm)/sec | Dose rate (mr/hr) |
|---------|--------------|------------------------|---------------------------------|-------------------|
| 1 | 1.3049 | 1.717e+09 | 5.333e+02 | 9.676e-01 |
| 2 | 1.0401 | 1.312e+09 | 3.270e+02 | 6.260e-01 |
| 3 | .7790 | 1.445e+09 | 2.726e+02 | 5.510e-01 |
| 4 | .6638 | 5.365e+10 | 8.745e+03 | 1.814e+01 |
| 5 | .4766 | 7.860e+06 | 9.460e-01 | 1.930e-03 |
| 6 | .4453 | 1.830e+07 | 2.061e+00 | 4.215e-03 |
| 7 | .3984 | 7.602e+06 | 7.680e-01 | 1.576e-03 |
| 8 | .2422 | 2.397e+08 | 1.488e+01 | 2.890e-02 |
| 9 | .1953 | 8.246e+06 | 4.147e-01 | 7.601e-04 |
| 10 | .1172 | 1.469e+09 | 4.489e+01 | 7.085e-02 |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| TOTALS: | | 5.988e+10 | 9.942e+03 | 2.039e+01 |

Attachment 4 Peer Review and HEDOP Checklists

PEER REVIEW CHECKLIST

Document Reviewed: Comparison of Radiological Dose Pathways for Tank Farm
 Accidents, WHC-SD-WM-CN-80
 Author: J. C. Van Keuren
 Date: October 1996
 Scope of Review: Entire Document

| Yes | No | NA | |
|-------------------------------------|--------------------------|-------------------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Previous reviews complete and cover analysis, up to scope of this review, with no gaps. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Problem completely defined. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Accident scenarios developed in a clear and logical manner. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Necessary assumptions explicitly stated and supported. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Computer codes and data files documented. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Data used in calculations explicitly stated in document. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Data checked for consistency with original source information as applicable. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Mathematical derivations checked including dimensional consistency of results. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Models appropriate and used within range of validity or use outside range of established validity justified. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Software input correct and consistent with document reviewed. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Software output consistent with input and with results reported in document reviewed. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Limits/criteria/guidelines applied to analysis results are appropriate and referenced. Limits/criteria/guidelines checked against references. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Safety margins consistent with good engineering practices. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Conclusions consistent with analytical results and applicable limits. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Results and conclusions address all points required in the problem statement. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Format consistent with appropriate NRC Regulatory Guide or other standards |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Review calculations, comments, and/or notes are attached. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Document approved. |

D.A. Himes 
 Reviewer (Printed Name and Signature)

10/17/96
 Date

HEDOP REVIEW CHECKLIST

Document Reviewed: Comparison of Radiological Dose Pathways for Tank Farm Accidents, WHC-SD-WM-CN-80
 Author: J. C. Van Keuren
 Date: October 1996
 Scope of Review: Entire Document

YES NO* N/A

- | | | | |
|-------------------------------------|--------------------------|-------------------------------------|--|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 1. A detailed technical review and approval of the environmental transport and dose calculation portion of the analysis has been performed and documented. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 2. Detailed technical review(s) and approval(s) of scenario and release determinations have been performed and documented. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 3. HEDOP-approved code(s) were used. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 4. Receptor locations were selected according to HEDOP recommendations. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 5. All applicable environmental pathways and code options were included and are appropriate for the calculations. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 6. Hanford site data were used. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 7. Model adjustments external to the computer program were justified and performed correctly. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 8. The analysis is consistent with HEDOP recommendations. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 9. Supporting notes, calculations, comments, comment resolutions, or other information is attached. (Use the "Page 1 of X" page numbering format and sign and date each added page.) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | | 10. Approval is granted on behalf of the Hanford Environmental Dose Overview Panel. |

* All "NO" responses must be explained and use of nonstandard methods justified.

DA. Himes
10/17/96

 HEDOP-Approved Reviewer (Printed Name and Signature) _____ Date

COMMENTS (add additional signed and dated pages if necessary):

DISTRIBUTION SHEET

| | | |
|--|----------------------|-----------------------|
| To | From | Page 1 of 1 |
| Distribution | Consequence Analysis | Date October 17, 1996 |
| Project Title/Work Order | | EDT No. 619416 |
| Comparison of Radiological Dose Pathways for Tank Farm Accidents | | ECN No. |

| Name | MSIN | Text With All Attach. | Text Only | Attach./ Appendix Only | EDT/ECN Only |
|------------------------|-------|-----------------------------|-----------|------------------------------|-----------------|
| C. Carro | A2-34 | X | | | |
| G. L. Dunford | A2-34 | X | | | |
| D. A. Himes | A3-34 | X | | | |
| D. S. Leach | A3-34 | X | | | |
| J. C. Van Keuren | A3-34 | X | | | |
| TWRS S&L Project Files | A2-26 | X | | | |
| Central Files | A3-88 | X | | | |