KEWAUNEE NUCLEAR POWER PLANT

OFFSITE DOSE CALCULATION MANUAL

## Abstract

This document has been developed in accordance with the Wisconsin Public Service Corporation (WPSC) commitment made by letter dated August 21, 1984 (from D. C. Hintz to S. A. Varga). It provides the current methodologies and parameters to be used in the calculation of offsite doses due to radioactive gaseous and liquid effluents and gaseous and liquid effluent monitoring alarm/trip setpoints for the Kewaunee Nuclear Power Plant. To develop this document, WPSC contracted the J. Stewart Bland Consultants, Inc. of Maryland; however, rigorous review and final acceptance of this document has been provided by WPSC. Implementation of this document is the responsiblity of WPSC.

December 18, 1984

# KEWAUNEE NUCLEAR POWER PLANT
# OFFSITE DOSE CALCULATION MANUAL

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# KEWAUNEE NUCLEAR POWER PLANT
# OFFSITE DOSE CALCULATION MANUAL

## Introduction

The Kewaunee Offsite Dose Calculation Manual (ODCM) describes the methodology and parameters used in: 1) the calculation of radioactive liquid and gaseous effluent monitoring instrumentation alarm/trip setpoints; and 2) the calculation of radioactive liquid and gaseous concentrations, dose rates and cumulative quarterly and yearly doses. The methodology stated in this manual is acceptable for use in demonstrating compliance with 10 CFR 20.106, 10 CFR 50, Appendix I and 40 CFR 190.

More conservative calculational methods and/or conditions (e.g., location and/or exposure pathways) expected to yield higher computed doses than appropriate for the maximally exposed person may be assumed in the dose evaluations.

The ODCM will be maintained at the station for use as a reference guide and training document of accepted methodologies and calculations. Changes will be made to the ODCM calculational methodologies and parameters as is deemed necessary to assure reasonable conservatism in keeping with the principles of 10 CFR 50.36a and Appendix I for demonstrating radioactive effluents are ALARA.

NOTE: The technical specification sections as referenced in this ODCM are those as exist in the NRC generic PWR Radiological Effluent Technical Specifications (RETS, NUREG-0472). After development of the Kewaunee RETS, the current parenthetical technical specification section references will be revised to appropriately reference the actual Kewaunee RETS sections.

KEWAUNEE NUCLEAR POWER PLANT
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## 1.0 Liquid Effluents

### 1.1 Radiation Monitoring Instrumentation and Controls

The liquid effluent monitoring instrumentation and controls installed at Kewaunee for controlling and monitoring normal radioactive material releases in accordance with 10 CFR 50, Appendix A, Criteria 60 and 64, are summarized as follows:

1) Alarm (and Automatic Termination) - R-18 provides this function on the liquid radwaste effluent line, R-19 on the Steam Generator blowdown.

2) Alarm (only) - R-20 and R-16 provide alarm functions for the Service Water discharges.

3) Composite Samples - Samples are collected weekly from the steam generator blowdown and analyzed by gamma spectroscopy. Samples are collected weekly from the Turbine Building Sump and analyzed by gamma spectroscopy. The weekly samples are composited for monthly tritium and gross alpha analyses and for quarterly Sr-89 and 90 analyses. During periods of identified primary-to-secondary leakage (with the secondary activity > 1.0E-05 uCi/ml), grab samples from the Turbine Building sump are collected daily and analyzed by gamma spectroscopy. These samples are composited for monthly tritium and gross alpha analyses and for quarterly Sr-89 and 90 analyses.

4) Liquid Tank Controls - All radioactive liquid tanks are located inside the Auxiliary Building and contain the suitable confinement systems and drains to prevent direct, unmonitored release to the environment.

A liquid radioactive waste flow diagram with the applicable, associated radiation monitoring instrumentation and controls is presented as Figure 1.

## 1.2 Liquid Effluent Monitor Setpoint Determination

Per the requirements of Technical Specification (3.3.3.10), alarm setpoints shall be established for the liquid effluent monitoring instrumentation to ensure that the release concentration limits of Specification (3.11.1.1) are met (i.e., the concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in 10 CFR 20, Appendix B, Table II, Column 2, for radionuclides and 2.0E-04 uCi/ml for dissolved or entrained noble gases). The following equation* must be satisfied to meet the liquid effluent restrictions:

$$c \leq \frac{C\,(F+f)}{f} \qquad (1.1)$$

where:

C = the effluent concentration limit of Technical Specification (3.11.1.1) implementing the 10 CFR 20 MPC for the site, in uCi/ml

c = the setpoint, in uCi/ml, of the radioactivity monitor measuring the radioactivity concentration in the effluent line prior to dilution and subsequent release; the setpoint, which is proportional to the volumetric flow of the effluent line and inversely proportional to the volumetric flow of the dilution stream plus the effluent stream, represents a value which, if exceeded, would result in concentrations exceeding the limits of 10 CFR 20 in the unrestricted area

f = the flow rate at the radiation monitor location, in volume per unit time, but in the same units as F, below

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* Adapted from NUREG-0133

F = the dilution water flow rate as measured prior to the release point, in volume per unit time

[Note that if no dilution is provided, $c \leq C$. Also, note that when (F) is large compared to (f), then $(F + f) \approx F$.]

1.2.1 Liquid Effluent Monitors (Radwaste, Steam Generator Blowdown and Service Water). The setpoints for the liquid effluent monitors at the Kewaunee Nuclear Power Plant is determined by the following equations:

$$SP \leq \frac{MPC_e * SEN * CW}{RR} + bkg \qquad (1.2)$$

and

$$MPC_e = \frac{\sum (C_i * MPC_i)}{\sum C_i} \qquad (1.3)$$

where:

SP = alarm setpoint corresponding to the maximum allowable release rate (cp

$MPC_e$ = an effective MPC value for the mixture of radionuclides in the effluent stream (uCi/ml)

$C_i$ = the concentration of radionuclide i in the liquid effluent (uCi)

$MPC_i$ = the MPC value corresponding to radionuclide i from 10 CFR 20, Appendix B, Table II, Column 2 (uCi/ml)

SEN = the sensitivity value to which the monitor is calibrated (cpm per uCi/ml)

CW = the circulating water flow rate (dilution water flow) at the time of release (gal/min)

RR = the liquid effluent release rate (gal/min)

bkg = the background of the monitor (cpm)

The radioactivity monitor setpoint equation (1.2) remains valid during outages when the circulating water dilution is at its lowest. Reduction of the waste stream flow (RR) may be necessary during these periods to meet the discharge criteria. At its lowest value, CW will equal RR and equation (1.2) reverts to the following equation:

$$SP \leq MPC_e * SEN + bkg \qquad (1.4)$$

1.2.2 Conservative Default Values. Conservative alarm setpoints may be determined through the use of generic, default parameters. Table A summarizes all current default values in use for Kewaunee. They are based upon the following:

a) substitution of the default effective MPC value of 1.0E-05 uCi/ml (refer to Appendix C for justification);
b) substitutions of the lowest operational circulating water flow, in gal/min; and,
c) substitutions of the highest effluent release rate, in gal/min.

## 1.3 Liquid Effluent Concentration Limits - 10 CFR 20

Technical Specification (3.11.1.1) limits the concentration of radioactive material in liquid effluents (after dilution in the Circulating Water System) to less than the concentrations as specified in 10 CFR 20, Appendix B, Table II, Column 2 for radionuclides other than noble gases. Noble gases are limited to a diluted concentration of 2E-04 uCi/ml. Release rates are controlled and radiation monitor alarm setpoints are established to ensure that these concentration limits are not exceeded. In the event any liquid release results in an alarm setpoint being exceeded, an evaluation of compliance with the concentration limits of Technical Specification (3.11.1.1) may be performed using the following equation:

$$\sum [(C_i \div MPC_i) * (RR \div CW)] \leq 1$$

where:

$C_i$ = concentration of radionuclide i in the undiluted liquid effluent (uCi/ml)

$MPC_i$ = the MPC value corresponding to radionuclide i from 10 CFR 20, Appendix B, Table II, Column 2 (uCi/ml)
= 2E-04 uCi/ml for dissolved or entrained noble gases

RR = the liquid effluent release rate (gal/min)

CW = the circulating water flow rate (dilution water flow) at the time of the release (gal/min)

## 1.4 Liquid Effluent Dose Calculation - 10 CFR 50

Technical Specification (3.11.1.2) limits the dose or dose commitment to members of the public from radioactive materials in liquid effluents from the Kewaunee Nuclear Power Plant to:

- during any calendar quarter;
  $\leq$ 1.5 mrem to total body
  $\leq$ 5.0 mrem to any organ

- during any calendar year;
  $\leq$ 3.0 mrem to total body
  $\leq$ 10.0 mrem to any organ.

Per the surveillance requirements of Technical Specification (4.11.1.2), the following calculational methods may be used for determining the dose or dose commitment due to the liquid radioactive effluents from Kewaunee.

$$D_o = \frac{1.67E\text{-}02 * VOL}{CW} * \sum(C_i * A_{io}) \qquad (1.5)$$

where:

$D_o$ = dose or dose commitment to organ o, including total body (mrem)

$A_{io}$ = site-related ingestion dose commitment factor to the total body or any organ o for radionuclide i (mrem/hr per uCi/ml)

$C_i$ = average concentration of radionuclide i, in undiluted liquid effluent representative of the volume VOL (uCi/ml)

VOL = volume of liquid effluent released (gal)

CW = average circulating water discharge rate during release period (gal/min)

1.67E-02 = conversion factor (hr/min)

The site-related ingestion dose/dose commitment factors ($A_{io}$) are presented in Table B and have been derived in accordance with guidance of NUREG-0133 by the equation:

$$A_{io} = 1.14E+05 \left[(U_w + D_w) + (U_F * BF_i)\right] DF_i \qquad (1.6)$$

where:

$A_{io}$ = composite dose parameter for the total body or critical organ o of an adult for radionuclide i, for the fish ingestion and water consumption pathways (mrem/hr per uCi/ml)

1.14E+05 = conversion factor (pCi/uCi * ml/kg + hr/yr)

$U_w$ = adult water consumption (730 kg/yr)

$D_w$ = dilution factor from the near field area within 1/4 mile of the release point to the nearest potable water intake for the adult water consumption (84*, unitless)

$U_F$ = adult fish consumption (21 kg/yr)

$BF_i$ = bioaccumulation factor for radionuclide i in fish from Table C (pCi/kg per pCi/l)

$DF_i$ = dose conversion factor for nuclide i for adults in pre-selected organ, o, from Table E-11 of Regulatory Guide 1.109 (mrem/pCi)

The radionuclides included in the periodic dose assessment per the requirements of Technical Specification (3/4.11.1.2) are those as identified by gamma spectral analysis of the liquid waste samples collected and analyzed per the requirements of Technical Specification (3/4.11.1.1, Table 4.11-1).

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* Adapted from the Kewaunee Final Environmental Statement, Section V.

Radionuclides requiring radiochemical analysis (e.g., Sr-89 and Sr-90) will be added to the dose analysis at a frequency consistant with the required minimum analysis frequency of Table (4.11-1).

In lieu of the individual radionuclide dose assessment as presented above, the following simplified dose calculational equation may be used for demonstrating compliance with the dose limits of Technical Specification (3.11.1.2). (Refer to Appendix A for the derivation and justification for this simplified method.)

Total Body

$$D_{tb} = \frac{9.67E+03 * VOL}{CW} * \sum C_i \qquad (1.7)$$

Maximum Organ

$$D_{max} = \frac{1.18E+04 * VOL}{CW} * \sum C_i \qquad (1.8)$$

where:

| | | |
|---|---|---|
| $C_i$ | = | average concentration of radionuclide i, in undiluted liquid effluent representative of the volume VOL (uCi/ml) |
| VOL | = | volume of liquid effluent released (gal) |
| CW | = | average circulating water discharge rate during release period (gal/min) |
| $D_{tb}$ | = | conservatively evaluated total body dose (mrem) |
| $D_{max}$ | = | conservatively evaluated maximum organ dose (mrem) |
| 9.67E+03 | = | conversion factor (hr/min) and the conservative total body dose conversion factor (Cs-134, total body -- 5.79E+05 mrem/hr per uCi/ml) |
| 1.18E+04 | = | conversion factor (hr/min) and the conservative maximum organ dose conversion factor (Cs-134, liver -- 7.09E+05 mrem/hr per uCi/ml) |

## 1.5 Liquid Effluent Dose Projections

Technical Specification (3.11.1.3) requires that the liquid radioactive waste processing system be used to reduce the radioactive material levels in the liquid waste prior to release when the quarterly projected doses exceed:

- 0.18 mrem to the total body, or
- 0.62 mrem to any organ.

The applicable liquid waste streams and processing systems are as delineated in Figure 1.

Dose projections are made at least once per 31 days by the following equations:

$$D_{tbp} = D_{tb} (91 \div d) \quad (1.9)$$

$$D_{maxp} = D_{max} (91 \div d) \quad (1.10)$$

where:

$D_{tbp}$ = the total body dose projection for current calendar quarter (mrem)

$D_{tb}$ = the total body dose to date for current calendar quarter as determined by equation (1.5) or (1.7) (mrem)

$D_{maxp}$ = the maximum organ dose projection for current calendar quarter (mrem)

$D_{max}$ = the maximum organ dose to date for current calendar quarter as determined by equation (1.5) or (1.8) (mrem)

d = the number of days to date for current calendar quarter

91 = the number of days in a calendar quarter

## 2.0 Gaseous Effluents

### 2.1 Radiation Monitoring Instrumentation and Controls

The gaseous effluent monitoring instrumentation and controls at Kewaunee for controlling and monitoring normal radioactive material releases in accordance with 10 CFR 50, Appendix A, Criteria 60 and 64, are summarized as follows:

1) Waste Gas Holdup System - The vent header gases are collected by the waste gas holdup system. Gases may be recycled to provide cover gas for the CVCS hold-up tank or held in the waste gas tanks for decay prior to release. Waste gas decay tanks are batch released after sampling and analysis. The tanks are discharged via the Auxiliary Building vent. R-13 and/or R-14 provide noble gas monitoring and automatic isolation.

2) Condenser Evacuation System - The air ejector discharge is monitored by R-15. Releases from this system are via the Auxiliary Building vent and are monitored by R-13 and/or R-14.

3) Containment Purge - Containment purge and ventilation is via the containment stack. The stack radiation monitoring system consists of: a) a noble gas activity monitor providing alarm and automatic termination of release (R-12 and R-21); b) an iodine sampler; and c) a particulate sampler. Effluent flow rates are determined empirically as a function of fan operation (fan curves). Sampler flow rates are determined by flow rate instrumentation.

4) Auxiliary Building Vent - The Auxiliary Building vent receives discharges from the waste gas holdup system, condenser evacuation system, fuel storage area ventilation, Auxiliary Building radwaste processing area ventilation, and Auxiliary Building general area. All effluents pass through: a) a noble gas monitor - R-13 and/or R-14; b) an iodine sampler (R-13A); and c) a particulate sampler (R-13A). The noble gas monitor (R-13 and/or R-14) provides auto isolation of any waste gas decay tank releases and diverts other releases through the special ventilation

system. Effluent flow rates are determined empirically as a function of fan operation (fan curves). Sampler flow rates are determined by flow rate instrumentation.

A gaseous radioactive waste flow diagram with the applicable, associated radiation monitoring instrumentation and controls is presented as Figure 2.

## 2.2 Gaseous Effluent Monitor Setpoint Determination

2.2.1 Containment and Auxiliary Building Vent Monitor. Per the requirements of Technical Specification (3.3.3.11), alarm setpoints shall be established for the gaseous effluent monitoring instrumentation to ensure that the release rate of noble gases does not exceed corresponding dose rate at the site boundary of 500 mrem/year to the total body or 3000 mrem/year to the skin. Based on a grab sample analysis of the applicable release (i.e., grab sample of the Containment vent or Auxiliary Building vent), the radiation monitoring alarm setpoints may be established by the following calculational method:

$$FRAC = [4.72E+02 * X/Q * VF * \sum (C_i * K_i)] \div 500 \qquad (2.1)$$

$$FRAC = [4.72E+02 * X/Q * VF * \sum (C_i * (L_i + 1.1\ M_i))] \div 3000 \qquad (2.2)$$

where:

- FRAC = fraction of the allowable release rate based on the identified radionuclide concentrations and the release flow rate
- X/Q = annual average meteorological dispersion to the controlling site boundary location ($sec/m^3$)
- VF = ventilation system flow rate for the applicable release point and monitor ($ft^3/min$)
- $C_i$ = concentration of noble gas radionuclide i as determined by radioanalysis of grab sample ($uCi/cm^3$)
- $K_i$ = total body dose conversion factor for noble gas radionuclide i (mrem/yr per $uCi/m^3$, from Table D)
- $L_i$ = beta skin dose conversion factor for noble gas radionuclide i (mrem/yr per $uCi/m^3$, from Table D)

$M_i$ = gamma air dose conversion factor for noble gas radionuclide i (mrad/yr per uCi/$m^3$, from Table D)

1.1 = mrem skin dose per mrad gamma air dose (mrem/mrad)

4.72E+02 = conversion factor ($cm^3/ft^3$ * min/sec)

500 = total body dose rate limit (mrem/yr)

3000 = skin dose rate limit (mrem/yr)

Based on the more limiting FRAC (i.e., higher value) as determined above, the alarm setpoint for the Containment and Auxiliary Building vent monitors at Kewaunee may be calculated:

$$SP = [\sum C_i * SEN * FRAC] + bkg \qquad (2.3)$$

where:

SP = alarm setpoint corresponding to the maximum allowable release rate (cpm)

SEN = monitor sensitivity (cpm per uCi/$cm^3$)

bkg = background of the monitor (cpm)

2.2.2 Conservative Default Values. A conservative alarm setpoint can be established, in lieu of the individual radionuclide evaluation based on the grab sample analysis, to eliminate the potential of periodically having to adjust the setpoint to reflect minor changes in radionuclide distribution and variations in release flow rate. The alarm setpoint may be conservatively determined by the default values presented in Table E. These values are based upon:

- the maximum ventilation flow rate; and
- a radionuclide distribution* comprised of 95% Xe-133, 2% Xe-135, 1% Xe-133m, 1% Kr-88 and 1% Kr-85

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* Adopted from ANSI N237-1976/ANS-18.1, Source Term Specifications, Table 6

For this radionuclide distribution, the alarm setpoint based on the total body dose rate is more restrictive than the corresponding setpoint based on the skin dose rate. The resulting conservative, default setpoints are presented in Table E.

## 2.3 Gaseous Effluent Instantaneous Dose Rate Calculations - 10 CFR 20

2.3.1 Site Boundary Dose Rate - Noble Gases. Technical Specification (3.11.2.1a) limits the dose rate at the site boundary due to noble gas releases to $\leq$500 mrem/yr, total body and $\leq$3000 mrem/yr, skin. Radiation monitor alarm setpoint are established to ensure that these release limits are not exceeded. In the event any gaseous releases from the station results in the alarm setpoints being exceeded, an evaluation of the unrestricted area dose rate resulting from the release may be performed using the following equations:

$$\dot{D}_{tb} = X/Q * \sum (K_i * \dot{Q}_i) \qquad (2.4)$$

and

$$\dot{D}_s = X/Q * \sum ((L_i + 1.1M_i) * \dot{Q}_i) \qquad (2.5)$$

where:

- $\dot{D}_{tb}$ = total body dose rate (mrem/yr)
- $\dot{D}_s$ = skin dose rate (mrem/yr)
- $X/Q$ = atmospheric dispersion to the controlling site boundary (sec/$m^3$)
- $\dot{Q}_i$ = average release rate of radionuclide i over the release period under evaluation (uCi/sec)
- $K_i$ = total body dose conversion factor for noble gas radionuclide i (mrem/yr per uCi/$m^3$, from Table D)
- $L_i$ = beta skin dose conversion factor for noble gas radionuclide i (mrem/yr per uCi/$m^3$, from Table D)
- $M_i$ = gamma air dose conversion factor for noble gas radionuclide i (mrad/yr per uCi/$m^3$, from Table D)
- 1.1 = mrem skin dose per mrad gamma air dose (mrem/mrad)

Actual meteorological conditions concurrent with the release period or the default, annual average dispersion parameters as presented in Table F may be used for evaluating the gaseous effluent dose rate.

2.3.2 Site Boundary Dose Rate - Radioiodine and Particulates. Technical Specification (3.11.2.1.b) limits the dose rate to $\leq$1500 mrem/yr to any organ for I-131 and particulates with half-lives greater than 8 days. To demonstrate compliance with this limit, an evaluation is performed at a frequency no greater than that corresponding to the sampling and analysis time period (e.g., nominally once per 7 days). The following equation may be used for the dose rate evaluation:

$$\dot{D}_o = X/Q * \sum (R_i * \dot{Q}_i) \qquad (2.6)$$

where:

$\dot{D}_o$ = average organ dose rate over the sampling time period (mrem/yr)

X/Q = atmospheric dispersion to the controlling site boundary for the inhalation pathway (sec/$m^3$)

$R_i$ = dose parameter for radionuclide i, (mrem/yr per uCi/$m^3$) for the child inhalation pathway from Table G

$\dot{Q}_i$ = average release rate over the appropriate sampling period and analysis frequency for radionuclide i -- I-131 or other radionuclide in particulate form with half-life greater than 8 days (uCi/sec)

By substituting 1500 mrem/yr for $D_o$ solving for Q, an allowable release rate for I-131 can be determined. Based on the annual average meteorological dispersion (see Table F) and the most limiting potential pathway, age group and organ (inhalation pathway, child thyroid -- $R_i$ = 1.62E+07 mrem/yr per uCi/$m^3$), the allowable release rate for I-131 is 12.8 uCi/sec. An added conservatism factor of 0.5 has been included in this calculation to account for any potential dose contribution from other radioactive particulate material. For a 7 day period which is the nominal sampling and analysis frequency for I-131, the cumulative allowable release is 7.8 Ci. Therefore, as long as the I-131 releases in any 7

day period do not exceed 7.8 Ci, no additional analyses are needed to verify compliance with the Technical Specification (3.11.2.1b) limits on allowable release rate.

## 2.4 Gaseous Effluent Dose Calculations - 10 CFR 50

2.4.1 Unrestricted Area Dose - Noble Gases. Technical Specification (3.11.2.2) requires a periodic assessment of releases of noble gases to evaluate compliance with the quarterly dose limits of ($\leq$5 mrad, gamma-air and $\leq$10 mrad, beta-air) and the calendar year limits ($\leq$10 mrad, gamma-air and $\leq$20 mrad, beta-air). The following equations may be used to calculate the gamma-air and beta-air doses:

$$D_\gamma = 3.17E\text{-}08 * X/Q * \sum (M_i * Q_i) \quad (2.7)$$

and

$$D_\beta = 3.17E\text{-}08 * X/Q * \sum (N_i * Q_i) \quad (2.8)$$

where:

$D_\gamma$ = air dose due to gamma emissions for noble gas radionuclides (mrad)

$D_\beta$ = air dose due to beta emissions for noble gas radionuclides (mrad)

X/Q = atmospheric dispersion to the controlling site boundary (sec/$m^3$)

$Q_i$ = cumulative release of noble gas radionuclide i over the period of interest (uCi)

$M_i$ = air dose factor due to gamma emissions from noble gas radionuclide i (mrad/yr per uCi/$m^3$, from Table D)

$N_i$ = air dose factor due to beta emissions from noble gas radionuclide i (mrad/yr per uCi/$m^3$, Table D)

3.17E-08 = conversion factor (yr/sec)

In lieu of the individual noble gas radionuclide dose assessment as presented above, the following simplified dose calculational equation may be used for verifying compliance with the dose limits of Technical Specification (3.11.2.2). (Refer to Appendix B for the derivation and justification for this simplified method.)

$$D_{\gamma} = \frac{3.17E\text{-}08}{0.50} * X/Q * M_{eff} * \sum Q_i \qquad (2.9)$$

and

$$D_{\beta} = \frac{3.17E\text{-}08}{0.50} * X/Q * N_{eff} * \sum Q_i \qquad (2.10)$$

where:

$M_{eff}$ = 5.2E+02 effective gamma-air dose factor (mrad/yr per uCi/$m^3$)
$N_{eff}$ = 1.1E+03 effective beta-air dose factor (mrad/yr per uCi/$m^3$)
0.50 = conservatism factor

Actual meteorological conditions concurrent with the release period or the default, annual average dispersion parameters as presented in Table F, may be used for the evaluation of the gamma-air and beta-air doses.

2.4.2 Unrestricted Area Dose - Radioiodine and Particulates. Per the requirements of Technical Specification (3.11.2.3), a periodic assessment shall be performed to evaluate compliance with the quarterly dose limit ($\leq$7.5 mrem) and calendar year limit ($\leq$15 mrem) to any organ. The following equation may be used to evaluate the maximum organ dose due to releases of I-131 and particulates with half-lives greater than 8 days:

$$D_{aop} = 3.17E\text{-}08 * W * SF_p * \sum (R_i * Q_i) \qquad (2.11)$$

where:

$D_{aop}$ = dose or dose commitment for age group a to organ o, including the total body, via pathway p from I-131 and radionuclides in particulate form with half-life greater than eight days (mrem)

$W$ = atmospheric dispersion parameter to the controlling location(s) as identified in Table F

- $X/Q$ = atmospheric dispersion for inhalation pathway and H-3 dose contribution via other pathways ($sec/m^3$)
- $D/Q$ = atmospheric deposition for vegetation, milk and ground plane exposure pathways ($m^{-2}$)

$R_i$ = dose factor for radionuclide i, (mrem/yr per $uCi/m^3$) or ($m^2$ - mrem/yr per uCi/sec) from Table G-1 through G-4 for each age group a and the applicable pathway p as identified in Table F. Values for $R_i$ were derived in accordance with the methods described in NUREG-0133.

$Q_i$ = cumulative release over the period of interest for radionuclide i -- I-131 or radioactive material in particulate form with half-life greater than 8 days (uCi).

$SF_p$ = seasonal correction factor to account for the fraction of the year that the applicable exposure pathway does not exist.

- = 0.5, for milk and vegetation pathways
- = 1.0, for inhalation and ground plane exposure pathways

In lieu of the individual radionuclide (I-131 and particulates) dose assessment as presented above, the following simplified dose calculational equation may be used for verifying compliance with the dose limits of Technical Specification (3.11.2.3).

$$D_{max} = 1.59E\text{-}08 * W * R_{I-131} * \sum Q_i \qquad (2.12)$$

where:

$D_{max}$ = maximum organ dose (mrem)

$R_{I-131}$ = I-131 dose parameter for the thyroid for the identified controlling pathway

- = 1.05E+12, infant thyroid dose parameter with the cow-milk pathway controlling ($m^2$ - mrem/yr per uCi/sec)

1.59E-08 = conversion factor (yr/sec) multiplied by the applicable seasonal correction factor (0.5)

The ground plane exposure and inhalation pathways need not be considered when the above simplified calculational method is used because of the overall negligible contribution of these pathways to the total thyroid dose. It is recognized that for some particulate radionuclides (e.g., Co-60 and Cs-137), the ground exposure pathway may represent a higher dose contribution than either the vegetation or milk pathway. However, use of the I-131 thyroid dose parameter for all radionuclides will maximize the organ dose calculation, especially considering that no other radionuclide has a higher dose parameter for any organ via any pathway than I-131 for the thyroid via the milk pathway.

The location of exposure pathways and the maximum organ dose calculation may be based on the available pathways in the surrounding environment of Kewaunee as identified by the annual land-use census (Technical Specification 3.12.2). Otherwise, the dose will be evaluated based on the predetermined controlling pathways as identified in Table F.

## 2.5 Gaseous Effluent Dose Projection

Technical Specification (3.11.2.4) requires that the Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System be used to reduce radioactive material levels prior to discharge when projected doses exceed one-half the annual design objective rate in any calendar quarter, i.e., exceeding:

- 0.62 mrad/quarter, gamma air;
- 1.25 mrad/quarter, beta air; or
- 0.94 mrem/quarter, maximum organ.

The applicable gaseous release sources and processing systems are as delineated in Figure 2.

Dose projections are performed at least once per 31 days by the following equations:

$$D_{\gamma p} = D_{\gamma} * (91 \div d) \qquad (2.13)$$

$$D_{\beta p} = D_{\beta} * (91 \div d) \qquad (2.14)$$

$$D_{maxp} = D_{max} * (91 \div d) \quad (2.15)$$

where:

$D_{\gamma p}$ = gamma air dose projection for current calendar quarter (mrad)

$D_{\gamma}$ = gamma air dose to date for current calendar quarter as determined by equation (2.7) or (2.9) (mrad)

$D_{\beta p}$ = beta air dose projection for current calendar quarter (mrad)

$D_{\beta}$ = beta air dose to date for current calendar quarter as determined by equation (2.8) or (2.10) (mrad)

$D_{maxp}$ = maximum organ dose projection for current calendar quarter (mrem)

$D_{max}$ = maximum organ dose to date for current calendar quarter as determined by equation (2.11) or (2.12) (mrem)

d = number of days to date in current calendar quarter

91 = number of days in a calendar quarter

## 2.6 Environmental Radiation Protection Standards 40 CFR 190

For the purpose of implementing RETS Technical Specification 3.11.3 on the EPA environmental radiation protection standard and 6.9.1.13 on reporting requirements, dose calculations may be performed using the above equations with the substitution of average or actual meteorological parameters for the period of interest and actual applicable pathways. Any exposure attributable to on-site sources will be evaluated based on the results of the environmental monitoring program (TLD measurements) or by calculational methods.

Figure 1
Liquid Radioactive Effluent Flow Diagram

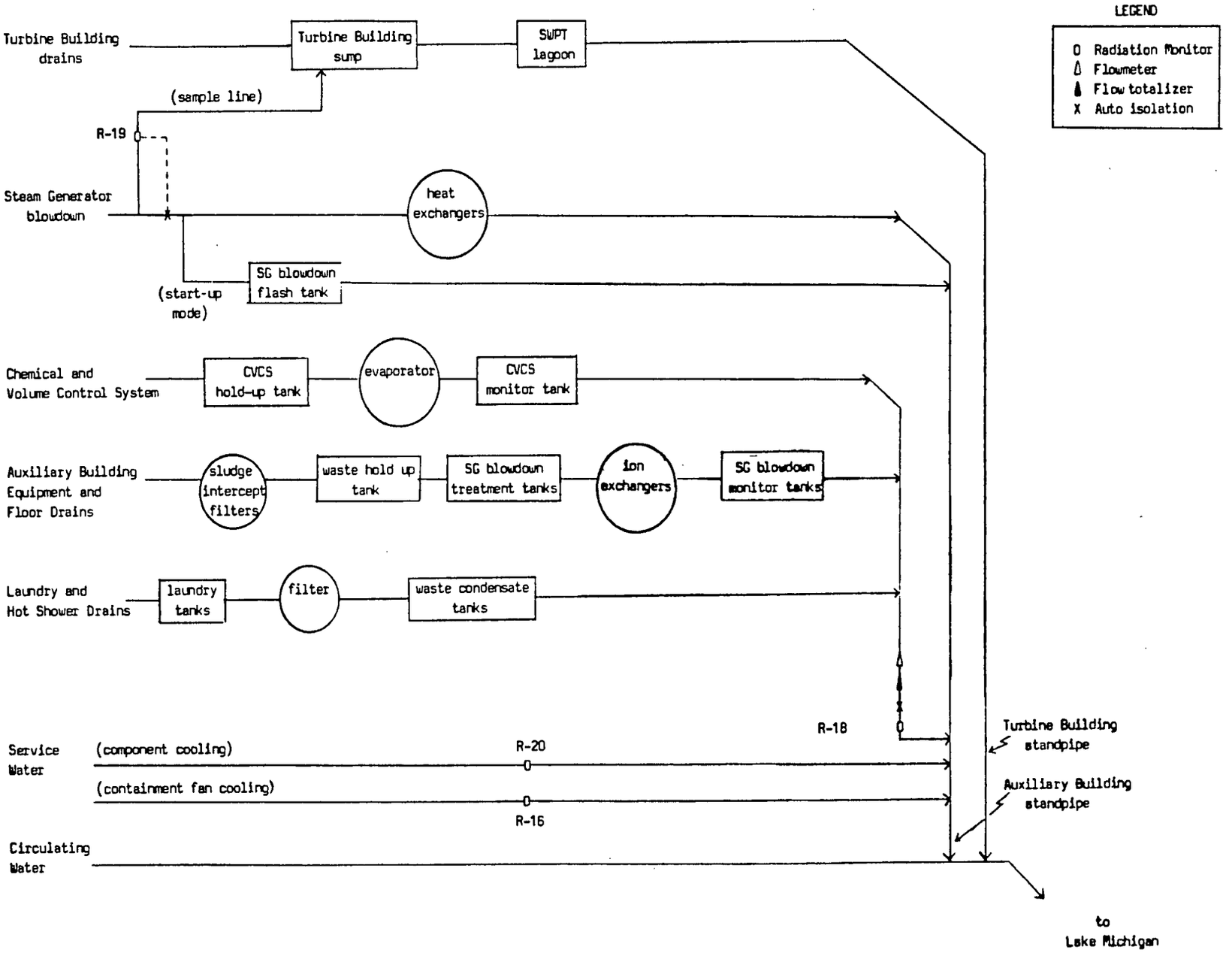
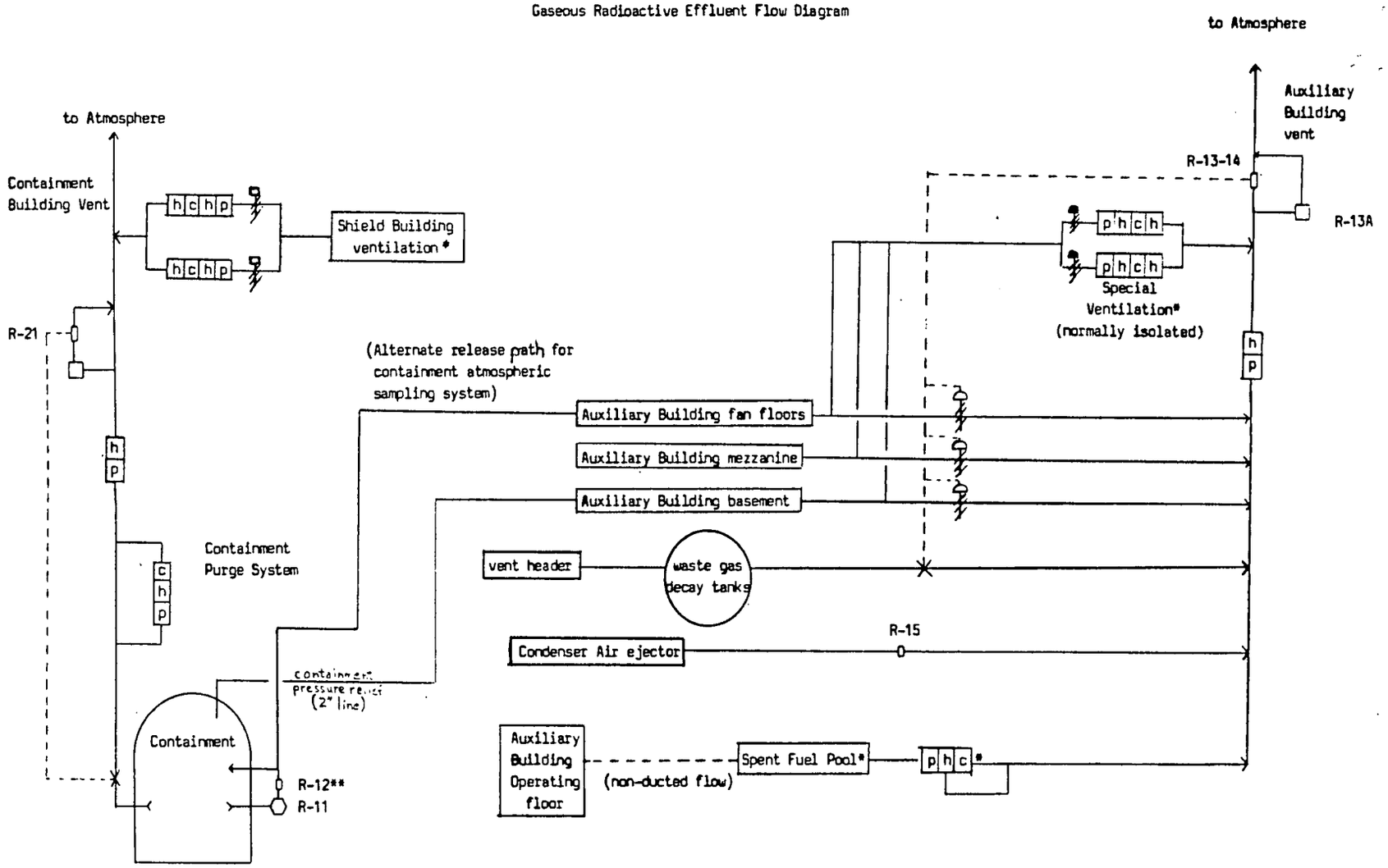


Figure 2
Gaseous Radioactive Effluent Flow Diagram




* The spent fuel pool, shield building ventilation and special ventilation are ESF systems and not part of the normal effluent processing system. They are included for completeness only.

** The containment atmospheric samplers (R-12 and R-11) can also be aligned as needed for sampling containment vent.

LEGEND

| | |
|---|---|
| ⊡ | Radiation Monitor |
| ⬡ | Sampler/monitor |
| X | Auto isolation |
| □ | Sample point |
| p | Prefilter |
| h | HEPA filter |
| c | Charcoal filter |
| | air operated damper |
| | cylinder operated damper |

Table A
Parameters for Liquid Alarm Setpoint Determinations

| Parameter | Actual Value | Default Value | Units | Comments |
|---|---|---|---|---|
| $MPC_e$ | calculated | 1.0E-05* | uCi/ml | calculate for each batch to be released |
| $C_i$ | measured | N/A | uCi/ml | taken from gamma spectral analysis of liquid effluent |
| $MPC_i$ | as determined | N/A | uCi/ml | taken from 10 CFR 20, Appendix B, Table II, Col. 2. |
| SEN R-18 | as determined | 7.14E+06 | cpm per uCi/ml | radwaste effluent |
| R-19 | | 7.50E+06 | | Steam Generator blowdown |
| R-20 | | 1.50E+08 | | Service Water - component cooling |
| R-16 | | 7.67E+06 | | Service Water - Containment fan cooling |
| CW | as determined | 2.58E+05 | gpm | Circulating Water System, default = winter, single CW pump |
| RR R-18 | as determined | 8.0E+01 | gpm | determined prior to release; release rate can be adjusted for Technical Specification compliance |
| R-19 | as determined | 2.0E+02 | | Steam Generator A and B combined |
| R-20 | | 5.0E+03 | | Service Water - component cooling |
| R-16 | | 1.5E+03 | | Service Water - Containment fan cooling |
| bkg R-18 | as determined | 2.0E+03 | cpm | Nominal values only; actual values may be used in lieu of these reference values |
| R-19 | | 8.0E+01 | | |
| R-20 | | 6.0E+01 | | |
| R-16 | | 8.0E+01 | | |
| SP R-18 | calculated | 2.3E+05(+bkg) | cpm | Default alarm setpoints; more conservative values may be used as deem appropriate and desirable for assuring regulatory compliance and for maintaining releases ALARA. |
| R-19 | calculated | 9.7E+04(+bkg) | | |
| R-20 | calculated | 7.7E+04(+bkg) | | |
| R-16 | calculated | 1.3E+04(+bkg) | | |
| SP (with no Circulating Water System flow, CW=0) | | | | |
| R-18 | calculated | 8.9E+03(+bkg) | cpm | For outages with no Circulating Water System flow (CW=0) and a dilution flow as provided by the Service Water system of 10,000 gpm, total. |
| R-19 | calculated | 3.7E+03(+bkg) | | |
| R-20 | calculated | 3.0E+03(+bkg) | | |
| R-16 | calculated | 5.1E+02(+bkg) | | |

* Refer to Appendix C for derivation
** Based on Drawing E-2021-81-2, "Integrated Logic Diagram - Radiation Monitoring System"

Table B

Site Related Ingestion Dose Committment Factors

$A_{io}$ (mrem/hr per uCi/ml)

| Nuclide | Bone | Liver | T body | Thyroid | Kidney | Lung | GI LLI |
|---|---|---|---|---|---|---|---|
| H-3 | 0.00E-01 | 3.30E-01 | 3.30E-01 | 3.30E-01 | 3.30E-01 | 3.30E-01 | 3.30E-01 |
| C-14 | 3.13E+04 | 6.26E+03 | 6.26E+03 | 6.26E+03 | 6.26E+03 | 6.26E+03 | 6.26E+03 |
| Na-24 | 4.09E+02 | 4.09E+02 | 4.09E+02 | 4.09E+02 | 4.09E+02 | 4.09E+02 | 4.09E+02 |
| Cr-51 | -- | -- | 1.28E+00 | 7.23E-01 | 2.81E-01 | 1.69E+00 | 3.21E+02 |
| Mn-54 | -- | 4.38E+03 | 8.36E+02 | -- | 1.30E+03 | -- | 1.34E+04 |
| Mn-56 | -- | 1.10E+02 | 1.96E+01 | -- | 1.40E+02 | -- | 3.52E+03 |
| Fe-55 | 6.61E+02 | 4.57E+02 | 1.06E+02 | -- | -- | 2.55E+02 | 2.62E+02 |
| Fe-59 | 1.04E+03 | 2.45E+03 | 9.40E+02 | -- | -- | 6.85E+02 | 8.17E+03 |
| Co-58 | -- | 8.99E+01 | 2.02E+02 | -- | -- | -- | 1.82E+03 |
| Co-60 | -- | 2.58E+02 | 5.70E+02 | -- | -- | -- | 4.85E+03 |
| Ni-63 | 3.13E+04 | 2.17E+03 | 1.05E+03 | -- | -- | -- | 4.52E+02 |
| Ni-65 | 1.25E+02 | 1.65E+01 | 7.52E+00 | -- | -- | -- | 4.18E+02 |
| Cu-64 | -- | 1.01E+01 | 4.72E+00 | -- | 2.53E+01 | -- | 8.57E+02 |
| Zn-65 | 2.32E+04 | 7.38E+04 | 3.33E+04 | -- | 4.93E+04 | -- | 4.05E+04 |
| Zn-69 | 4.93E+01 | 9.43E+01 | 6.56E+00 | -- | 6.13E+01 | -- | 1.42E+01 |
| Br-83 | -- | -- | 4.05E+01 | -- | -- | -- | 5.83E+01 |
| Br-84 | -- | -- | 5.24E+01 | -- | -- | -- | 4.12E-04 |
| Br-85 | -- | -- | 2.15E+00 | -- | -- | -- | 1.01E-15 |
| Rb-86 | -- | 1.01E+05 | 4.71E+04 | -- | -- | -- | 1.99E+04 |
| Rb-88 | -- | 2.90E+02 | 1.54E+02 | -- | -- | -- | 4.00E-09 |
| Rb-89 | -- | 1.92E+02 | 1.35E+02 | -- | -- | -- | 1.12E-11 |
| Sr-89 | 2.24E+04 | -- | 6.44E+02 | -- | -- | -- | 3.60E+03 |
| Sr-90 | 5.52E+05 | -- | 1.35E+05 | -- | -- | -- | 1.59E+04 |
| Sr-91 | 4.13E+02 | -- | 1.67E+01 | -- | -- | -- | 1.97E+03 |
| Sr-92 | 1.57E+02 | -- | 6.77E+00 | -- | -- | -- | 3.10E+03 |
| Y-90 | 5.85E-01 | -- | 1.57E-02 | -- | -- | -- | 6.21E+03 |
| Y-91M | 5.53E-03 | -- | 2.14E-04 | -- | -- | -- | 1.02E-02 |
| Y-91 | 8.58E+00 | -- | 2.29E-01 | -- | -- | -- | 4.72E+03 |
| Y-92 | 5.14E-02 | -- | 1.50E-03 | -- | -- | -- | 9.00E+02 |
| Y-93 | 1.63E-01 | -- | 4.50E-03 | -- | -- | -- | 5.17E+03 |
| Zr-95 | 2.70E-01 | 8.67E-02 | 5.87E-02 | -- | 1.36E-01 | -- | 2.75E+02 |
| Zr-97 | 1.49E-02 | 3.01E-03 | 1.38E-03 | -- | 4.55E-03 | -- | 9.34E+02 |
| Nb-95 | 4.47E+02 | 2.49E+02 | 1.34E+02 | -- | 2.46E+02 | -- | 1.51E+06 |
| Mo-99 | -- | 1.07E+02 | 2.04E+01 | -- | 2.43E+02 | -- | 2.49E+02 |
| Tc-99M | 9.11E-03 | 2.58E-02 | 3.28E-01 | -- | 3.91E-01 | 1.26E-02 | 1.52E+01 |
| Tc-101 | 9.37E-03 | 1.35E-02 | 1.32E-01 | -- | 2.43E-01 | 6.90E-03 | 4.06E-14 |
| Ru-103 | 4.61E+00 | -- | 1.99E+00 | -- | 1.76E+01 | -- | 5.39E+02 |

| Nuclide | Bone | Liver | T body | Thyroid | Kidney | Lung | GI LLI |
|---|---|---|---|---|---|---|---|
| Ru-105 | 3.84E-01 | -- | 1.52E-01 | -- | 4.96E+00 | -- | 2.35E+02 |
| Ru-106 | 6.86E+01 | -- | 8.68E+00 | -- | 1.32E+02 | -- | 4.44E+03 |
| Ag-110m | 1.04E+00 | 9.62E-01 | 5.71E-01 | -- | 1.89E+00 | -- | 3.93E-02 |
| Sb-124 | 9.46E+00 | 1.79E-01 | 3.75E+00 | 2.30E-02 | -- | 7.37E+00 | 2.69E+02 |
| Sb-125 | 6.05E+00 | 6.76E-02 | 1.44E+00 | 6.15E-03 | -- | 4.66E+00 | 6.66E+01 |
| Te-125M | 2.57E+03 | 9.31E+02 | 3.44E+02 | 7.73E+02 | 1.04E+04 | -- | 1.03E+04 |
| Te-127M | 6.49E+03 | 2.32E+03 | 7.91E+02 | 1.66E+03 | 2.64E+04 | -- | 2.18E+04 |
| Te-127 | 1.05E+02 | 3.80E+01 | 2.28E+01 | 7.81E+01 | 4.29E+02 | -- | 8.32E+03 |
| Te-129M | 1.10E+04 | 4.11E+03 | 1.74E+03 | 3.79E+03 | 4.60E+04 | -- | 5.55E+04 |
| Te-129 | 3.01E+01 | 1.13E+01 | 7.33E+00 | 2.31E+01 | 1.27E+02 | -- | 2.27E+01 |
| Te-131M | 1.66E+03 | 8.11E+02 | 6.76E+02 | 1.28E+03 | 8.22E+03 | -- | 8.05E+04 |
| Te-131 | 1.89E+01 | 7.89E+00 | 5.96E+00 | 1.55E+01 | 8.27E+01 | -- | 2.67E+00 |
| Te-132 | 2.42E+03 | 1.56E+03 | 1.47E+03 | 1.73E+03 | 1.50E+04 | -- | 7.39E+04 |
| I-130 | 7.49E+00 | 2.00E+01 | 7.01E+00 | 7.01E+02 | 3.19E+01 | -- | 3.76E+00 |
| I-131 | 1.54E+02 | 2.20E+02 | 1.26E+02 | 7.20E+04 | 3.76E+02 | -- | 5.79E+01 |
| I-132 | 7.49E+00 | 2.00E+01 | 7.01E+00 | 7.01E+02 | 3.19E+01 | -- | 3.76E+00 |
| I-133 | 5.24E+01 | 9.11E+01 | 2.78E+01 | 1.34E+04 | 1.59E+02 | -- | 8.19E+01 |
| I-134 | 3.91E+00 | 1.06E+01 | 3.80E+00 | 1.84E+02 | 1.69E+01 | -- | 9.26E-03 |
| I-135 | 1.63E+01 | 4.28E+01 | 1.58E+01 | 2.82E+03 | 6.86E+01 | -- | 4.83E+01 |
| Cs-134 | 2.98E+05 | 7.09E+05 | 5.79E+05 | -- | 2.29E+05 | 7.61E+04 | 1.24E+04 |
| Cs-136 | 3.12E+04 | 1.23E+05 | 8.86E+04 | -- | 6.85E+04 | 9.39E+03 | 1.40E+04 |
| Cs-137 | 3.82E+05 | 5.22E+05 | 3.42E+05 | -- | 1.77E+05 | 5.89E+04 | 1.01E+04 |
| Cs-138 | 2.64E+02 | 5.22E+02 | 2.59E+02 | -- | 3.89E+02 | 3.79E+01 | 2.23E-03 |
| Ba-139 | 1.02E+00 | 7.30E-04 | 3.00E-02 | -- | 6.83E-04 | 4.14E-04 | 1.82E+00 |
| Ba-140 | 2.15E+02 | 2.69E-01 | 1.41E+01 | -- | 9.16E-02 | 1.54E-01 | 4.42E+02 |
| Ba-141 | 4.98E-01 | 3.76E-04 | 1.68E-02 | -- | 3.50E-04 | 2.13E-04 | 2.35E-10 |
| Ba-142 | 2.25E-01 | 2.31E-04 | 1.42E-02 | -- | 1.95E-04 | 1.31E-04 | 3.17E-19 |
| La-140 | 1.52E-01 | 7.67E-02 | 2.03E-02 | -- | -- | -- | 5.63E+03 |
| La-142 | 7.79E-03 | 3.54E-03 | 8.82E-04 | -- | -- | -- | 2.59E+01 |
| Ce-141 | 3.17E-02 | 2.14E-02 | 2.43E-03 | -- | 9.95E-03 | -- | 8.19E+01 |
| Ce-143 | 5.58E-03 | 4.13E+00 | 4.57E-04 | -- | 1.78E-03 | -- | 1.54E+02 |
| Ce-144 | 1.65E+00 | 6.90E-01 | 8.87E-02 | -- | 4.10E-01 | -- | 5.58E+02 |
| Pr-143 | 5.60E-01 | 2.25E-01 | 2.77E-02 | -- | 1.30E-01 | -- | 2.45E+03 |
| Pr-144 | 1.83E-03 | 7.61E-04 | 9.31E-05 | -- | 4.29E-04 | -- | 2.63E-10 |
| Nd-147 | 3.83E-01 | 4.42E-01 | 2.65E-02 | -- | 2.59E-01 | -- | 2.12E+03 |
| W-187 | 2.96E+02 | 2.47E+02 | 8.65E+01 | -- | -- | -- | 8.05E+04 |
| Np-239 | 2.97E-02 | 2.92E-03 | 1.61E-03 | -- | 9.10E-03 | -- | 5.98E+02 |

Table C
Bioaccumulation Factors (BFi)
(pCi/kg per pCi/liter)*

| Element | Freshwater Fish |
|---|---|
| H | 9.0E-01 |
| C | 4.6E+03 |
| Na | 1.0E+02 |
| P | 3.0E+03 |
| Cr | 2.0E+02 |
| Mn | 4.0E+02 |
| Fe | 1.0E+02 |
| Co | 5.0E+01 |
| Ni | 1.0E+02 |
| Cu | 5.0E+01 |
| Zn | 2.0E+03 |
| Br | 4.2E+02 |
| Rb | 2.0E+03 |
| Sr | 3.0E+01 |
| Y | 2.5E+01 |
| Zr | 3.3E+00 |
| Nb | 3.0E+04 |
| Mo | 1.0E+01 |
| Tc | 1.5E+01 |
| Ru | 1.0E+01 |
| Rh | 1.0E+01 |
| Ag | 2.3E+00 |
| Sb | 1.0E+00 |
| Te | 4.0E+02 |
| I | 1.5E+01 |
| Cs | 2.0E+03 |
| Ba | 4.0E+00 |
| La | 2.5E+01 |
| Ce | 1.0E+00 |
| Pr | 2.5E+01 |
| Nd | 2.5E+01 |
| W | 1.2E+03 |
| Np | 1.0E+01 |

* Values in this Table are taken from Regulatory Guide 1.109 except for phosphorus which is adapted from NUREG/CR-1336 and silver and antimony which are taken from UCRL 50564, Rev. 1, October 1972.

Table D

Dose Factors for Noble Gases

| Radionuclide | Total Body Dose Factor $K_i$ (mrem/yr per uCi/$m^3$) | Skin Dose Factor $L_i$ (mrem/yr per uCi/$m^3$) | Gamma Air Dose Factor $M_i$ (mrad/yr per uCi/$m^3$) | Beta Air Dose Factor $N_i$ (mrad/yr per uCi/$m^3$) |
|---|---|---|---|---|
| Kr-83m | 7.56E-02 | ------ | 1.93E+01 | 2.88E+02 |
| Kr-85m | 1.17E+03 | 1.46E+03 | 1.23E+03 | 1.97E+03 |
| Kr-85 | 1.61E+01 | 1.34E+03 | 1.72E+01 | 1.95E+03 |
| Kr-87 | 5.92E+03 | 9.73E+03 | 6.17E+03 | 1.03E+04 |
| Kr-88 | 1.47E+04 | 2.37E+03 | 1.52E+04 | 2.93E+03 |
| Kr-89 | 1.66E+04 | 1.01E+04 | 1.73E+04 | 1.06E+04 |
| Kr-90 | 1.56E+04 | 7.29E+03 | 1.63E+04 | 7.83E+03 |
| Xe-131m | 9.15E+01 | 4.76E+02 | 1.56E+02 | 1.11E+03 |
| Xe-133m | 2.51E+02 | 9.94E+02 | 3.27E+02 | 1.48E+03 |
| Xe-133 | 2.94E+02 | 3.06E+02 | 3.53E+02 | 1.05E+03 |
| Xe-135m | 3.12E+03 | 7.11E+02 | 3.36E+03 | 7.39E+02 |
| Xe-135 | 1.81E+03 | 1.86E+03 | 1.92E+03 | 2.46E+03 |
| Xe-137 | 1.42E+03 | 1.22E+04 | 1.51E+03 | 1.27E+04 |
| Xe-138 | 8.83E+03 | 4.13E+03 | 9.21E+03 | 4.75E+03 |
| Ar-41 | 8.84E+03 | 2.69E+03 | 9.30E+03 | 3.28E+03 |

Table E

Parameters for Gaseous Alarm Setpoint Determinations

| Parameter | Actual Value | Default Value | Units | Comments |
|---|---|---|---|---|
| X/Q | calculated | 3.60E-06 | $sec/m^3$ | licensing technical specification value |
| VF | fan curves | 33,000 | cfm | Containment - normal plus purge modes |
| | | 54,000 | cfm | Auxiliary Building - normal operation |
| $C_i$ | measured | N/A | $uCi/cm^3$ | |
| $K_i$ | nuclide specific | N/A | mrem/yr per $uCi/m^3$ | Values from Table D |
| $L_i$ | nuclide specific | N/A | mrem/yr per $uCi/m^3$ | Values from Table D |
| $M_i$ | nuclide specific | N/A | mrad/yr per $uCi/m^3$ | Values from Table D |
| SEN*R-12 | as | 1.1E+06 | cpm per $uCi/cm^3$ | Containment |
| R-21 | determined | 4.0E+07 | | Containment |
| R-13 | | 8.3E+07 | | Auxiliary Building |
| R-14 | | 8.8E+07 | | Auxiliary Building |
| bkg R-12 | as | 4.00E+02 | cpm | Nominal values only; actual values may be |
| R-21 | determined | 4.00E+01 | | used in lieu of these reference values. |
| R-13 | | 6.00E+02 | | |
| R-14 | | 9.00E+02 | | |
| SP R-12 | calculated | 2.1E+04(+bkg) | cpm | Default alarm setpoints; more conservative |
| R-21 | calculated | 7.7E+05(+bkg) | | values may be used as deemed appropriate and |
| R-13 | calculated | 9.8E+05(+bkg) | | desirable for ensuring regulatory compliance |
| R-14 | calculated | 1.0E+06(+bkg) | | and for maintaining releases ALARA. |

* Conservatively based on Xe-133 sensitivity

Table F

Controlling Locations, Pathways and

Atmospheric Dispersion for Dose Calculations

| Technical Specification | Location | Pathway(s) | Atmospheric Dispersion X/Q ($sec/m^3$) | Atmospheric Dispersion D/Q ($1/m^2$) |
|---|---|---|---|---|
| 3.11.2.1a | site boundary (1300 m, N) | noble gases direct exposure | 3.6E-06 | N/A |
| 3.11.2.1b | site boundary (1300 m, N) | inhalation | 3.6E-06 | N/A |
| 3.11.2.2 | site boundary (1300 m, N) | gamma-air beta-air | 3.6E-06 | N/A |
| 3.11.2.3 | residence/dairy (1 mile W) | milk and ground plane | 5.6E-07 | 5.6E-09 |

## TABLE G-1

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : ADULT
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3 | 1.264E+03 | 1.264E+03 | 0.000E-01 | 1.264E+03 | 1.264E+03 | 1.264E+03 | 1.264E+03 | 1.264E+03 | W. BODY |
| 2 | C-14 | 3.408E+03 | 3.408E+03 | 1.816E+04 | 3.408E+03 | 3.408E+03 | 3.408E+03 | 3.408E+03 | 3.408E+03 | BONE |
| 3 | NA-24 | 1.024E+04 | 1.024E+04 | 1.024E+04 | 1.024E+04 | 1.024E+04 | 1.024E+04 | 1.024E+04 | 0.000E-01 | W. BODY |
| 4 | P-32 | 5.008E+04 | 0.000E-01 | 1.320E+06 | 7.712E+04 | 0.000E-01 | 0.000E-01 | 8.640E+04 | 0.000E-01 | BONE |
| 5 | SC-46 | 2.480E+05 | 0.000E-01 | 4.408E+05 | 8.560E+05 | 8.000E+05 | 0.000E-01 | 2.584E+05 | 0.000E-01 | LIVER |
| 6 | CR-51 | 1.000E+02 | 5.952E+01 | 0.000E-01 | 0.000E-01 | 2.280E+01 | 1.440E+04 | 3.320E+03 | 0.000E-01 | LUNG |
| 7 | MN-54 | 6.296E+03 | 0.000E-01 | 0.000E-01 | 3.960E+04 | 9.840E+03 | 1.400E+06 | 7.736E+04 | 0.000E-01 | LUNG |
| 8 | MN-56 | 1.832E-01 | 0.000E-01 | 0.000E-01 | 1.240E+00 | 1.304E+00 | 9.440E+03 | 2.024E+04 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 3.944E+03 | 0.000E-01 | 2.456E+04 | 1.696E+04 | 0.000E-01 | 7.208E+04 | 6.032E+03 | 0.000E-01 | LUNG |
| 10 | FE-59 | 1.056E+04 | 0.000E-01 | 1.176E+04 | 2.776E+04 | 0.000E-01 | 1.016E+06 | 1.880E+05 | 0.000E-01 | LUNG |
| 11 | CO-58 | 2.072E+03 | 0.000E-01 | 0.000E-01 | 1.584E+03 | 0.000E-01 | 9.280E+05 | 1.064E+05 | 0.000E-01 | LUNG |
| 12 | CO-60 | 1.480E+04 | 0.000E-01 | 0.000E-01 | 1.152E+04 | 0.000E-01 | 5.968E+06 | 2.848E+05 | 0.000E-01 | LUNG |
| 13 | NI-59 | 5.416E+03 | 0.000E-01 | 3.248E+04 | 1.168E+04 | 0.000E-01 | 6.568E+01 | 4.888E+03 | 0.000E-01 | LUNG |
| 14 | NI-63 | 1.448E+04 | 0.000E-01 | 4.320E+05 | 3.144E+04 | 0.000E-01 | 1.784E+05 | 1.336E+04 | 0.000E-01 | BONE |
| 15 | NI-65 | 9.120E-02 | 0.000E-01 | 1.536E+00 | 2.096E-01 | 0.000E-01 | 5.600E+03 | 1.232E+04 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 6.152E-01 | 0.000E-01 | 0.000E-01 | 1.464E+00 | 4.624E+00 | 6.784E+03 | 4.896E+04 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 4.656E+04 | 0.000E-01 | 3.240E+04 | 1.032E+05 | 6.896E+04 | 8.640E+05 | 5.344E+04 | 0.000E-01 | LUNG |
| 18 | ZN-69 | 4.520E-03 | 0.000E-01 | 3.384E-02 | 6.512E-02 | 4.216E-02 | 9.200E+02 | 1.632E+01 | 0.000E-01 | LUNG |
| 19 | BR-83 | 2.408E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.320E+02 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 3.128E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.640E-03 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 1.280E+01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 5.896E+04 | 0.000E-01 | 0.000E-01 | 1.352E+05 | 0.000E-01 | 0.000E-01 | 1.664E+04 | 0.000E-01 | LIVER |
| 23 | RB-88 | 1.928E+02 | 0.000E-01 | 0.000E-01 | 3.872E+02 | 0.000E-01 | 0.000E-01 | 3.344E-09 | 0.000E-01 | LIVER |
| 24 | RB-89 | 1.696E+02 | 0.000E-01 | 0.000E-01 | 2.560E+02 | 0.000E-01 | 0.000E-01 | 9.280E-12 | 0.000E-01 | LIVER |
| 25 | SR-89 | 8.720E+03 | 0.000E-01 | 3.040E+05 | 0.000E-01 | 0.000E-01 | 1.400E+06 | 3.496E+05 | 0.000E-01 | LUNG |
| 26 | SR-90 | 6.096E+06 | 0.000E-01 | 9.920E+07 | 0.000E-01 | 0.000E-01 | 9.600E+06 | 7.216E+05 | 0.000E-01 | BONE |
| 27 | SR-91 | 2.504E+00 | 0.000E-01 | 6.192E+01 | 0.000E-01 | 0.000E-01 | 3.648E+04 | 1.912E+05 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 2.912E-01 | 0.000E-01 | 6.744E+00 | 0.000E-01 | 0.000E-01 | 1.648E+04 | 4.304E+04 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 5.608E+01 | 0.000E-01 | 2.088E+03 | 0.000E-01 | 0.000E-01 | 1.696E+05 | 5.056E+05 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 1.016E-02 | 0.000E-01 | 2.608E-01 | 0.000E-01 | 0.000E-01 | 1.920E+03 | 1.328E+00 | 0.000E-01 | LUNG |
| 31 | Y-91 | 1.240E+04 | 0.000E-01 | 4.624E+05 | 0.000E-01 | 0.000E-01 | 1.704E+06 | 3.848E+05 | 0.000E-01 | LUNG |
| 32 | Y-92 | 3.016E-01 | 0.000E-01 | 1.032E+01 | 0.000E-01 | 0.000E-01 | 1.568E+04 | 7.352E+04 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 2.608E+00 | 0.000E-01 | 9.440E+01 | 0.000E-01 | 0.000E-01 | 4.848E+04 | 4.216E+05 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 2.328E+04 | 0.000E-01 | 1.072E+05 | 3.440E+04 | 5.416E+04 | 1.768E+06 | 1.504E+05 | 0.000E-01 | LUNG |
| 35 | ZR-97 | 9.040E+00 | 0.000E-01 | 9.600E+01 | 1.960E+01 | 2.968E+01 | 7.872E+04 | 5.232E+05 | 0.000E-01 | GI-LLI |

TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : ADULT
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 4.208E+03 | 0.000E-01 | 1.408E+04 | 7.816E+03 | 7.736E+03 | 5.048E+05 | 1.040E+05 | 4.208E+03 | LUNG |
| 37 | NB-97 | 2.048E-02 | 0.000E-01 | 2.224E-01 | 5.624E-02 | 6.544E-02 | 2.400E+03 | 2.416E+02 | 0.000E-01 | LUNG |
| 38 | MO-99 | 2.296E+01 | 0.000E-01 | 0.000E-01 | 1.208E+02 | 2.912E+02 | 9.120E+04 | 2.480E+05 | 0.000E-01 | GI-LLI |
| 39 | TC-99M | 3.704E-02 | 0.000E-01 | 1.032E-03 | 2.912E-03 | 4.416E-02 | 7.640E+02 | 4.160E+03 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 5.904E-04 | 0.000E-01 | 4.176E-05 | 6.016E-05 | 1.080E-03 | 3.992E+02 | 1.088E-11 | 0.000E-01 | LUNG |
| 41 | RU-103 | 6.584E+02 | 0.000E-01 | 1.528E+03 | 0.000E-01 | 5.832E+03 | 5.048E+05 | 1.104E+05 | 0.000E-01 | LUNG |
| 42 | RU-105 | 3.112E-01 | 0.000E-01 | 7.904E-01 | 0.000E-01 | 1.016E+00 | 1.096E+04 | 4.816E+04 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 8.720E+03 | 0.000E-01 | 6.912E+04 | 0.000E-01 | 1.336E+05 | 9.360E+06 | 9.120E+05 | 0.000E-01 | LUNG |
| 44 | AG-110M | 5.944E+03 | 0.000E-01 | 1.080E+04 | 1.000E+04 | 1.968E+04 | 4.632E+06 | 3.024E+05 | 0.000E-01 | LUNG |
| 45 | CD-115M | 6.360E+03 | 0.000E-01 | 0.000E-01 | 1.968E+05 | 1.584E+05 | 1.408E+06 | 3.840E+05 | 0.000E-01 | LUNG |
| 46 | SB-124 | 1.240E+04 | 7.552E+01 | 3.120E+04 | 5.888E+02 | 0.000E-01 | 2.480E+06 | 4.064E+05 | 0.000E-01 | LUNG |
| 47 | TE-125M | 4.672E+02 | 1.048E+03 | 3.416E+03 | 1.584E+03 | 1.240E+04 | 3.136E+05 | 7.064E+04 | 0.000E-01 | LUNG |
| 48 | TE-127M | 1.568E+03 | 3.288E+03 | 1.264E+04 | 5.768E+03 | 4.576E+04 | 9.600E+05 | 1.496E+05 | 0.000E-01 | LUNG |
| 49 | TE-127 | 3.096E-01 | 1.056E+00 | 1.400E+00 | 6.424E-01 | 5.096E+00 | 6.512E+03 | 5.736E+04 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 1.584E+03 | 3.440E+03 | 9.760E+03 | 4.672E+03 | 3.656E+04 | 1.160E+06 | 3.832E+05 | 0.000E-01 | LUNG |
| 51 | TE-129 | 1.240E-02 | 3.896E-02 | 4.976E-02 | 2.392E-02 | 1.872E-01 | 1.936E+03 | 1.568E+02 | 0.000E-01 | LUNG |
| 52 | TE-131M | 2.904E+01 | 5.504E+01 | 6.992E+01 | 4.360E+01 | 3.088E+02 | 1.456E+05 | 5.560E+05 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 3.592E-03 | 9.360E-03 | 1.112E-02 | 5.952E-03 | 4.368E-02 | 1.392E+03 | 1.840E+01 | 0.000E-01 | LUNG |
| 54 | TE-132 | 1.616E+02 | 1.896E+02 | 2.600E+02 | 2.152E+02 | 1.456E+03 | 2.880E+05 | 5.096E+05 | 0.000E-01 | GI-LLI |
| 55 | I-130 | 5.280E+03 | 1.136E+06 | 4.576E+03 | 1.344E+04 | 2.088E+04 | 0.000E-01 | 7.688E+03 | 0.000E-01 | THYROID |
| 56 | I-131 | 2.048E+04 | 1.192E+07 | 2.520E+04 | 3.576E+04 | 6.128E+04 | 0.000E-01 | 6.280E+03 | 0.000E-01 | THYROID |
| 57 | I-132 | 1.160E+03 | 1.144E+05 | 1.160E+03 | 3.256E+03 | 5.104E+03 | 0.000E-01 | 4.064E+02 | 0.000E-01 | THYROID |
| 58 | I-133 | 4.520E+03 | 2.152E+06 | 8.640E+03 | 1.480E+04 | 2.584E+04 | 0.000E-01 | 8.880E+03 | 0.000E-01 | THYROID |
| 59 | I-134 | 6.152E+02 | 2.984E+04 | 6.440E+02 | 1.728E+03 | 2.752E+03 | 0.000E-01 | 1.008E+00 | 0.000E-01 | THYROID |
| 60 | I-135 | 2.568E+03 | 4.480E+05 | 2.680E+03 | 6.984E+03 | 1.112E+04 | 0.000E-01 | 5.248E+03 | 0.000E-01 | THYROID |
| 61 | CS-134 | 7.280E+05 | 0.000E-01 | 3.728E+05 | 8.480E+05 | 2.872E+05 | 9.760E+04 | 1.040E+04 | 0.000E-01 | LIVER |
| 62 | CS-136 | 1.104E+05 | 0.000E-01 | 3.904E+04 | 1.464E+05 | 8.560E+04 | 1.200E+04 | 1.168E+04 | 0.000E-01 | LIVER |
| 63 | CS-137 | 4.280E+05 | 0.000E-01 | 4.784E+05 | 6.208E+05 | 2.224E+05 | 7.520E+01 | 8.400E+03 | 0.000E-01 | LIVER |
| 64 | CS-138 | 3.240E+02 | 0.000E-01 | 3.312E+02 | 6.208E+02 | 4.800E+02 | 4.856E+01 | 1.864E-03 | 0.000E-01 | LIVER |
| 65 | CS-139 | 1.112E+02 | 0.000E-01 | 2.048E+02 | 2.904E+02 | 2.440E+02 | 2.272E+01 | 0.000E-01 | 0.000E-01 | LIVER |
| 66 | BA-139 | 2.736E-02 | 0.000E-01 | 9.360E-01 | 6.656E-04 | 6.224E-04 | 3.760E+03 | 8.960E+02 | 0.000E-01 | LUNG |
| 67 | BA-140 | 2.568E+03 | 0.000E-01 | 3.904E+04 | 4.904E+01 | 1.672E+01 | 1.272E+06 | 2.184E+05 | 0.000E-01 | LUNG |
| 68 | BA-141 | 3.360E-03 | 0.000E-01 | 1.000E-01 | 7.528E-05 | 7.000E-05 | 1.936E+03 | 1.160E-07 | 0.000E-01 | LUNG |
| 69 | BA-142 | 1.656E-03 | 0.000E-01 | 2.632E-02 | 2.704E-05 | 2.288E-05 | 1.192E+03 | 1.568E-16 | 0.000E-01 | LUNG |
| 70 | LA-140 | 4.584E+01 | 0.000E-01 | 3.440E+02 | 1.736E+02 | 0.000E-01 | 1.360E+05 | 4.584E+05 | 0.000E-01 | GI-LLI |

TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : ADULT
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 7.720E-02 | 0.000E-01 | 6.832E-01 | 3.104E-01 | 0.000E-01 | 6.328E+03 | 2.112E+03 | 7.720E-02 | LUNG |
| 72 | CE-141 | 1.528E+03 | 0.000E-01 | 1.992E+04 | 1.352E+04 | 6.264E+03 | 3.616E+05 | 1.200E+05 | 0.000E-01 | LUNG |
| 73 | CE-143 | 1.528E+01 | 0.000E-01 | 1.864E+02 | 1.376E+02 | 6.080E+01 | 7.976E+04 | 2.264E+05 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 1.840E+05 | 0.000E-01 | 3.432E+06 | 1.432E+06 | 8.480E+05 | 7.776E+06 | 8.160E+05 | 0.000E-01 | LUNG |
| 75 | PR-143 | 4.640E+02 | 0.000E-01 | 9.360E+03 | 3.752E+03 | 2.160E+03 | 2.808E+05 | 2.000E+05 | 0.000E-01 | LUNG |
| 76 | PR-144 | 1.528E-03 | 0.000E-01 | 3.008E-02 | 1.248E-02 | 7.048E-03 | 1.016E+03 | 2.152E-08 | 0.000E-01 | LUNG |
| 77 | ND-147 | 3.648E+02 | 0.000E-01 | 5.272E+03 | 6.096E+03 | 3.560E+03 | 2.208E+05 | 1.728E+05 | 0.000E-01 | LUNG |
| 78 | W-185 | 5.479E+01 | 0.000E-01 | 1.560E+03 | 5.176E+02 | 0.000E-01 | 4.456E+05 | 8.560E+04 | 0.000E-01 | LUNG |
| 79 | W-187 | 2.480E+00 | 0.000E-01 | 8.480E+00 | 7.080E+00 | 0.000E-01 | 2.904E+04 | 1.552E+05 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 4.856E+06 | 0.000E-01 | 8.000E+07 | 0.000E-01 | 1.872E+07 | 3.920E+08 | 3.872E+05 | 0.000E-01 | LUNG |
| 81 | U-238 | 4.536E+06 | 0.000E-01 | 7.664E+07 | 0.000E-01 | 1.744E+07 | 3.664E+08 | 9.240E+05 | 0.000E-01 | LUNG |
| 82 | NP-239 | 1.240E+01 | 0.000E-01 | 2.296E+02 | 2.256E+01 | 7.000E+01 | 3.760E+04 | 1.192E+05 | 0.000E-01 | GI-LLI |

## TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : TEEN
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3 | 1.272E+03 | 1.272E+03 | 0.000E-01 | 1.272E+03 | 1.272E+03 | 1.272E+03 | 1.272E+03 | 1.272E+03 | W. BODY |
| 2 | C-14 | 4.872E+03 | 4.872E+03 | 2.600E+04 | 4.872E+03 | 4.872E+03 | 4.872E+03 | 4.872E+03 | 4.872E+03 | BONE |
| 3 | NA-24 | 1.376E+04 | 1.376E+04 | 1.376E+04 | 1.376E+04 | 1.376E+04 | 1.376E+04 | 1.376E+04 | 0.000E-01 | W. BODY |
| 4 | P-32 | 7.160E+04 | 0.000E-01 | 1.888E+06 | 1.096E+05 | 0.000E-01 | 0.000E-01 | 9.280E+04 | 0.000E-01 | BONE |
| 5 | SC-46 | 2.488E+05 | 0.000E-01 | 4.408E+05 | 8.560E+05 | 8.000E+05 | 0.000E-01 | 2.584E+05 | 0.000E-01 | LIVER |
| 6 | CR-51 | 1.352E+02 | 7.496E+01 | 0.000E-01 | 0.000E-01 | 3.072E+01 | 2.096E+04 | 3.000E+03 | 0.000E-01 | LUNG |
| 7 | MN-54 | 8.400E+03 | 0.000E-01 | 0.000E-01 | 5.112E+04 | 1.272E+04 | 1.984E+06 | 6.680E+04 | 0.000E-01 | LUNG |
| 8 | MN-56 | 2.520E-01 | 0.000E-01 | 0.000E-01 | 1.696E+00 | 1.792E+00 | 1.520E+04 | 5.744E+01 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 5.544E+03 | 0.000E-01 | 3.344E+04 | 2.384E+04 | 0.000E-01 | 1.240E+05 | 6.392E+03 | 0.000E-01 | LUNG |
| 10 | FE-59 | 1.432E+04 | 0.000E-01 | 1.592E+04 | 3.696E+04 | 0.000E-01 | 1.528E+06 | 1.784E+05 | 0.000E-01 | LUNG |
| 11 | CO-58 | 2.776E+03 | 0.000E-01 | 0.000E-01 | 2.072E+03 | 0.000E-01 | 1.344E+06 | 9.520E+04 | 0.000E-01 | LUNG |
| 12 | CO-60 | 1.984E+04 | 0.000E-01 | 0.000E-01 | 1.512E+04 | 0.000E-01 | 8.720E+06 | 2.592E+05 | 0.000E-01 | LUNG |
| 13 | NI-59 | 5.416E+03 | 0.000E-01 | 3.248E+04 | 1.168E+04 | 0.000E-01 | 6.568E+04 | 4.888E+03 | 0.000E-01 | LUNG |
| 14 | NI-63 | 1.976E+04 | 0.000E-01 | 5.800E+05 | 4.344E+04 | 0.000E-01 | 3.072E+05 | 1.416E+04 | 0.000E-01 | BONE |
| 15 | NI-65 | 1.272E-01 | 0.000E-01 | 2.184E+00 | 2.928E-01 | 0.000E-01 | 9.360E+03 | 3.672E+04 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 8.480E-01 | 0.000E-01 | 0.000E-01 | 2.032E+00 | 6.408E+00 | 1.112E+04 | 6.144E+04 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 6.240E+04 | 0.000E-01 | 3.856E+04 | 1.336E+05 | 8.640E+04 | 1.240E+06 | 4.664E+04 | 0.000E-01 | LUNG |
| 18 | ZN-69 | 6.456E-03 | 0.000E-01 | 4.832E-02 | 9.200E-02 | 6.024E-02 | 1.584E+03 | 2.848E+02 | 0.000E-01 | LUNG |
| 19 | BR-83 | 3.440E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 4.328E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 1.832E+01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 8.400E+04 | 0.000E-01 | 0.000E-01 | 1.904E+05 | 0.000E-01 | 0.000E-01 | 1.768E+04 | 0.000E-01 | LIVER |
| 23 | RB-88 | 2.720E+02 | 0.000E-01 | 0.000E-01 | 5.456E+02 | 0.000E-01 | 0.000E-01 | 2.920E-05 | 0.000E-01 | LIVER |
| 24 | RB-89 | 2.328E+02 | 0.000E-01 | 0.000E-01 | 3.520E+02 | 0.000E-01 | 0.000E-01 | 3.376E-07 | 0.000E-01 | LIVER |
| 25 | SR-89 | 1.248E+04 | 0.000E-01 | 4.344E+05 | 0.000E-01 | 0.000E-01 | 2.416E+06 | 3.712E+05 | 0.000E-01 | LUNG |
| 26 | SR-90 | 6.680E+06 | 0.000E-01 | 1.080E+08 | 0.000E-01 | 0.000E-01 | 1.648E+07 | 7.648E+05 | 0.000E-01 | BONE |
| 27 | SR-91 | 3.512E+00 | 0.000E-01 | 8.800E+01 | 0.000E-01 | 0.000E-01 | 6.072E+04 | 2.592E+05 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 4.064E-01 | 0.000E-01 | 9.520E+00 | 0.000E-01 | 0.000E-01 | 2.744E+04 | 1.192E+05 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 8.000E+01 | 0.000E-01 | 2.984E+03 | 0.000E-01 | 0.000E-01 | 2.928E+05 | 5.592E+05 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 1.416E-02 | 0.000E-01 | 3.704E-01 | 0.000E-01 | 0.000E-01 | 3.200E+03 | 3.016E+01 | 0.000E-01 | LUNG |
| 31 | Y-91 | 1.768E+04 | 0.000E-01 | 4.608E+05 | 0.000E-01 | 0.000E-01 | 2.936E+06 | 4.080E+05 | 0.000E-01 | LUNG |
| 32 | Y-92 | 4.288E-01 | 0.000E-01 | 1.472E+01 | 0.000E-01 | 0.000E-01 | 2.680E+04 | 1.648E+05 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 3.720E+00 | 0.000E-01 | 1.352E+02 | 0.000E-01 | 0.000E-01 | 8.320E+04 | 5.792E+05 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 3.152E+04 | 0.000E-01 | 1.456E+05 | 4.584E+04 | 6.736E+04 | 2.688E+06 | 1.488E+05 | 0.000E-01 | LUNG |
| 35 | ZR-97 | 1.256E+01 | 0.000E-01 | 1.376E+02 | 2.720E+01 | 4.120E+01 | 1.296E+05 | 6.304E+05 | 0.000E-01 | GI-LLI |

## TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : TEEN
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 5.664E+03 | 0.000E-01 | 1.856E+04 | 1.032E+04 | 1.000E+04 | 7.512E+05 | 9.680E+04 | 5.664E+03 | LUNG |
| 37 | NB-97 | 2.048E-02 | 0.000E-01 | 2.224E-01 | 5.624E-02 | 6.544E-02 | 2.400E+03 | 2.416E+02 | 0.000E-01 | LUNG |
| 38 | MO-99 | 3.224E+01 | 0.000E-01 | 0.000E-01 | 1.698E+02 | 4.112E+02 | 1.536E+05 | 2.688E+05 | 0.000E-01 | GI-LLI |
| 39 | TC-99M | 4.992E-02 | 0.000E-01 | 1.384E-03 | 3.864E-03 | 5.760E-02 | 1.152E+03 | 6.128E+03 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 8.240E-04 | 0.000E-01 | 5.920E-05 | 8.400E-05 | 1.520E-03 | 6.672E+02 | 8.720E-07 | 0.000E-01 | LUNG |
| 41 | RU-103 | 8.960E+02 | 0.000E-01 | 2.104E+03 | 0.000E-01 | 7.432E+03 | 7.832E+05 | 1.088E+05 | 0.000E-01 | LUNG |
| 42 | RU-105 | 4.336E-01 | 0.000E-01 | 1.120E+00 | 0.000E-01 | 1.408E+00 | 1.816E+04 | 9.040E+04 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 1.240E+04 | 0.000E-01 | 9.840E+04 | 0.000E-01 | 1.904E+05 | 1.608E+07 | 9.600E+05 | 0.000E-01 | LUNG |
| 44 | AG-110M | 7.992E+03 | 0.000E-01 | 1.384E+04 | 1.312E+04 | 2.504E+04 | 6.752E+06 | 2.728E+05 | 0.000E-01 | LUNG |
| 45 | CD-115M | 6.360E+03 | 0.000E-01 | 0.000E-01 | 1.968E+05 | 1.584E+05 | 1.408E+06 | 3.840E+05 | 0.000E-01 | LUNG |
| 46 | SB-124 | 1.240E+04 | 7.552E+01 | 3.120E+04 | 5.888E+02 | 0.000E-01 | 2.480E+06 | 4.034E+05 | 0.000E-01 | LUNG |
| 47 | TE-125M | 6.672E+02 | 1.400E+03 | 4.880E+03 | 2.240E+03 | 0.000E-01 | 5.360E+05 | 7.504E+04 | 0.000E-01 | LUNG |
| 48 | TE-127M | 2.184E+03 | 4.384E+03 | 1.800E+04 | 8.160E+03 | 6.536E+04 | 1.656E+06 | 1.592E+05 | 0.000E-01 | LUNG |
| 49 | TE-127 | 4.416E-01 | 1.416E+00 | 2.008E+00 | 9.120E-01 | 7.280E+00 | 1.120E+04 | 8.080E+04 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 2.248E+03 | 4.576E+03 | 1.392E+04 | 6.584E+03 | 5.192E+04 | 1.976E+06 | 4.048E+05 | 0.000E-01 | LUNG |
| 51 | TE-129 | 1.768E-02 | 5.184E-02 | 7.096E-02 | 3.376E-02 | 2.656E-01 | 3.296E+03 | 1.416E+03 | 0.000E-01 | LUNG |
| 52 | TE-131M | 4.024E+01 | 7.248E+01 | 9.840E+01 | 6.008E+01 | 4.392E+02 | 2.376E+05 | 6.208E+05 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 5.040E-03 | 1.240E-02 | 1.576E-02 | 8.320E-03 | 6.176E-02 | 2.336E+03 | 1.512E+01 | 0.000E-01 | LUNG |
| 54 | TE-132 | 2.192E+02 | 2.456E+02 | 3.600E+02 | 2.904E+02 | 1.952E+03 | 4.488E+05 | 4.632E+05 | 0.000E-01 | GI-LLI |
| 55 | I-130 | 7.168E+03 | 1.488E+06 | 6.240E+03 | 1.792E+04 | 2.752E+04 | 0.000E-01 | 9.120E+03 | 0.000E-01 | THYROID |
| 56 | I-131 | 2.640E+04 | 1.464E+07 | 3.544E+04 | 4.912E+04 | 8.400E+04 | 0.000E-01 | 6.488E+03 | 0.000E-01 | THYROID |
| 57 | I-132 | 1.576E+03 | 1.512E+05 | 1.592E+03 | 4.376E+03 | 6.920E+03 | 0.000E-01 | 1.272E+03 | 0.000E-01 | THYROID |
| 58 | I-133 | 6.224E+03 | 2.920E+06 | 1.216E+04 | 2.048E+04 | 3.592E+04 | 0.000E-01 | 1.032E+04 | 0.000E-01 | THYROID |
| 59 | I-134 | 8.400E+02 | 3.952E+04 | 8.880E+02 | 2.320E+03 | 3.664E+03 | 0.000E-01 | 2.040E+01 | 0.000E-01 | THYROID |
| 60 | I-135 | 3.488E+03 | 6.208E+05 | 3.696E+03 | 9.440E+03 | 1.480E+04 | 0.000E-01 | 6.952E+03 | 0.000E-01 | THYROID |
| 61 | CS-134 | 5.488E+05 | 0.000E-01 | 5.024E+05 | 1.128E+06 | 3.752E+05 | 1.464E+05 | 9.760E+03 | 0.000E-01 | LIVER |
| 62 | CS-136 | 1.368E+05 | 0.000E-01 | 5.152E+04 | 1.936E+05 | 1.104E+05 | 1.776E+04 | 1.088E+04 | 0.000E-01 | LIVER |
| 63 | CS-137 | 3.112E+05 | 0.000E-01 | 6.704E+05 | 8.480E+05 | 3.040E+05 | 1.208E+05 | 8.480E+03 | 0.000E-01 | LIVER |
| 64 | CS-138 | 4.464E+02 | 0.000E-01 | 4.656E+02 | 8.560E+02 | 6.624E+02 | 7.872E+01 | 2.704E-01 | 0.000E-01 | LIVER |
| 65 | CS-139 | 1.112E+02 | 0.000E-01 | 2.048E+02 | 2.904E+02 | 2.440E+02 | 2.272E+01 | 0.000E-01 | 0.000E-01 | LIVER |
| 66 | BA-139 | 3.896E-02 | 0.000E-01 | 1.336E+00 | 9.440E-04 | 8.880E-04 | 6.464E+03 | 6.448E+03 | 0.000E-01 | LUNG |
| 67 | BA-140 | 3.520E+03 | 0.000E-01 | 5.472E+04 | 6.704E+01 | 2.280E+01 | 2.032E+06 | 2.288E+05 | 0.000E-01 | LUNG |
| 68 | BA-141 | 4.744E-03 | 0.000E-01 | 1.424E-01 | 1.056E-04 | 9.840E-05 | 3.288E+03 | 7.464E-04 | 0.000E-01 | LUNG |
| 69 | BA-142 | 2.272E-03 | 0.000E-01 | 3.696E-02 | 3.704E-05 | 3.136E-05 | 1.912E+03 | 4.792E-10 | 0.000E-01 | LUNG |
| 70 | LA-140 | 6.256E+01 | 0.000E-01 | 4.792E+02 | 2.360E+02 | 0.000E-01 | 2.144E+05 | 4.872E+05 | 0.000E-01 | GI-LLI |

TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : TEEN
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 1.056E-01 | 0.000E-01 | 9.600E-01 | 4.248E-01 | 0.000E-01 | 1.016E+04 | 1.200E+04 | 1.056E-01 | GI-LLI |
| 72 | CE-141 | 2.168E+03 | 0.000E-01 | 2.840E+04 | 1.876E+04 | 8.830E+03 | 6.136E+05 | 1.264E+05 | 0.000E-01 | LUNG |
| 73 | CE-143 | 2.160E+01 | 0.000E-01 | 2.656E+02 | 1.936E+02 | 8.640E+01 | 1.304E+05 | 2.552E+05 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 2.624E+05 | 0.000E-01 | 4.888E+06 | 2.024E+06 | 1.208E+06 | 1.336E+07 | 8.640E+05 | 0.000E-01 | LUNG |
| 75 | PR-143 | 6.624E+02 | 0.000E-01 | 1.336E+04 | 5.312E+03 | 3.088E+03 | 4.832E+05 | 2.136E+05 | 0.000E-01 | LUNG |
| 76 | PR-144 | 2.176E-03 | 0.000E-01 | 4.296E-02 | 1.760E-02 | 1.008E-02 | 1.752E+03 | 2.352E-04 | 0.000E-01 | LUNG |
| 77 | ND-147 | 5.128E+02 | 0.000E-01 | 7.864E+03 | 8.560E+03 | 5.024E+03 | 3.720E+05 | 1.824E+05 | 0.000E-01 | LUNG |
| 78 | W-185 | 5.448E+01 | 0.000E-01 | 1.560E+03 | 5.176E+02 | 0.000E-01 | 4.456E+05 | 8.560E+04 | 0.000E-01 | LUNG |
| 79 | W-187 | 3.432E+00 | 0.000E-01 | 1.200E+01 | 9.760E+00 | 0.000E-01 | 4.736E+04 | 1.768E+05 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 4.856E+06 | 0.000E-01 | 8.000E+07 | 0.000E-01 | 1.872E+07 | 3.920E+08 | 3.872E+05 | 0.000E-01 | LUNG |
| 81 | U-238 | 4.536E+06 | 0.000E-01 | 7.664E+07 | 0.000E-01 | 1.744E+07 | 3.664E+08 | 8.240E+05 | 0.000E-01 | LUNG |
| 82 | NP-239 | 1.768E+01 | 0.000E-01 | 3.384E+02 | 3.192E+01 | 1.000E+02 | 6.488E+04 | 1.320E+05 | 0.000E-01 | GI-LLI |

## TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : CHILD
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3 | 1.125E+03 | 1.125E+03 | 0.000E-01 | 1.125E+03 | 1.125E+03 | 1.125E+03 | 1.125E+03 | 1.125E+03 | W. BODY |
| 2 | C-14 | 6.734E+03 | 6.734E+03 | 3.589E+04 | 6.734E+03 | 6.734E+03 | 6.734E+03 | 6.734E+03 | 6.734E+03 | BONE |
| 3 | NA-24 | 1.609E+04 | 1.609E+04 | 1.609E+04 | 1.609E+04 | 1.609E+04 | 1.609E+04 | 1.609E+04 | 0.000E-01 | W. BODY |
| 4 | P-32 | 9.879E+04 | 0.000E-01 | 2.605E+06 | 1.143E+05 | 0.000E-01 | 0.000E-01 | 4.218E+04 | 0.000E-01 | BONE |
| 5 | SC-46 | 1.151E+05 | 0.000E-01 | 2.039E+05 | 3.959E+05 | 3.700E+05 | 0.000E-01 | 1.195E+05 | 0.000E-01 | LIVER |
| 6 | CR-51 | 1.543E+02 | 8.547E+01 | 0.000E-01 | 0.000E-01 | 2.431E+01 | 1.698E+04 | 1.084E+03 | 0.000E-01 | LUNG |
| 7 | MN-54 | 9.509E+03 | 0.000E-01 | 0.000E-01 | 4.292E+04 | 1.003E+04 | 1.576E+06 | 2.290E+04 | 0.000E-01 | LUNG |
| 8 | MN-56 | 3.119E-01 | 0.000E-01 | 0.000E-01 | 1.658E+00 | 1.672E+00 | 1.313E+04 | 1.232E+05 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 7.770E+03 | 0.000E-01 | 4.736E+04 | 2.516E+04 | 0.000E-01 | 1.110E+05 | 2.867E+03 | 0.000E-01 | LUNG |
| 10 | FE-59 | 1.669E+04 | 0.000E-01 | 2.068E+04 | 3.345E+04 | 0.000E-01 | 1.269E+06 | 7.067E+04 | 0.000E-01 | LUNG |
| 11 | CO-58 | 3.163E+03 | 0.000E-01 | 0.000E-01 | 1.772E+03 | 0.000E-01 | 1.106E+06 | 3.437E+04 | 0.000E-01 | LUNG |
| 12 | CO-60 | 2.264E+04 | 0.000E-01 | 0.000E-01 | 1.313E+04 | 0.000E-01 | 7.067E+06 | 9.620E+04 | 0.000E-01 | LUNG |
| 13 | NI-59 | 2.505E+03 | 0.000E-01 | 1.502E+04 | 5.402E+03 | 0.000E-01 | 3.038E+04 | 2.261E+03 | 0.000E-01 | LUNG |
| 14 | NI-63 | 2.797E+04 | 0.000E-01 | 8.214E+05 | 4.625E+04 | 0.000E-01 | 2.749E+05 | 6.327E+03 | 0.000E-01 | BONE |
| 15 | NI-65 | 1.643E-01 | 0.000E-01 | 2.990E+00 | 2.956E-01 | 0.000E-01 | 8.177E+03 | 8.399E+04 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 1.073E+00 | 0.000E-01 | 0.000E-01 | 1.994E+00 | 6.031E+00 | 9.583E+03 | 3.670E+04 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 7.030E+04 | 0.000E-01 | 4.255E+04 | 1.132E+05 | 7.141E+04 | 9.953E+05 | 1.632E+04 | 0.000E-01 | LUNG |
| 18 | ZN-69 | 8.917E-03 | 0.000E-01 | 6.697E-02 | 9.657E-02 | 5.842E-02 | 1.421E+03 | 1.017E+04 | 0.000E-01 | GI-LLI |
| 19 | BR-83 | 4.736E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 5.476E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 2.531E+01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 1.143E+05 | 0.000E-01 | 0.000E-01 | 1.983E+05 | 0.000E-01 | 0.000E-01 | 7.992E+03 | 0.000E-01 | LIVER |
| 23 | RB-88 | 3.663E+02 | 0.000E-01 | 0.000E-01 | 5.624E+02 | 0.000E-01 | 0.000E-01 | 1.724E+01 | 0.000E-01 | LIVER |
| 24 | RB-89 | 2.897E+02 | 0.000E-01 | 0.000E-01 | 3.452E+02 | 0.000E-01 | 0.000E-01 | 1.891E+00 | 0.000E-01 | LIVER |
| 25 | SR-89 | 1.724E+04 | 0.000E-01 | 5.994E+05 | 0.000E-01 | 0.000E-01 | 2.157E+06 | 1.672E+05 | 0.000E-01 | LUNG |
| 26 | SR-90 | 6.438E+06 | 0.000E-01 | 1.010E+08 | 0.000E-01 | 0.000E-01 | 1.476E+07 | 3.434E+05 | 0.000E-01 | BONE |
| 27 | SR-91 | 4.508E+00 | 0.000E-01 | 1.214E+02 | 0.000E-01 | 0.000E-01 | 5.328E+04 | 1.739E+05 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 5.254E-01 | 0.000E-01 | 1.310E+01 | 0.000E-01 | 0.000E-01 | 2.401E+04 | 2.423E+05 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 1.106E+02 | 0.000E-01 | 4.107E+03 | 0.000E-01 | 0.000E-01 | 2.616E+05 | 2.679E+05 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 1.843E-02 | 0.000E-01 | 5.069E-01 | 0.000E-01 | 0.000E-01 | 2.812E+03 | 1.717E+03 | 0.000E-01 | LUNG |
| 31 | Y-91 | 2.439E+01 | 0.000E-01 | 9.139E+05 | 0.000E-01 | 0.000E-01 | 2.627E+06 | 1.839E+05 | 0.000E-01 | LUNG |
| 32 | Y-92 | 5.809E-01 | 0.000E-01 | 2.035E+01 | 0.000E-01 | 0.000E-01 | 2.390E+04 | 2.390E+05 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 5.106E+00 | 0.000E-01 | 1.865E+02 | 0.000E-01 | 0.000E-01 | 7.437E+04 | 3.885E+05 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 3.700E+04 | 0.000E-01 | 1.898E+05 | 4.181E+04 | 5.957E+04 | 2.231E+06 | 6.105E+04 | 0.000E-01 | LUNG |
| 35 | ZR-97 | 1.598E+01 | 0.000E-01 | 1.876E+02 | 2.716E+01 | 3.885E+01 | 1.132E+05 | 3.511E+05 | 0.000E-01 | GI-LLI |

## TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : CHILD
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 6.549E+03 | 0.000E-01 | 2.349E+04 | 9.176E+03 | 8.621E+03 | 6.142E+05 | 3.700E+04 | 6.549E+03 | LUNG |
| 37 | NB-97 | 9.472E-03 | 0.000E-01 | 1.029E-01 | 2.601E-02 | 3.027E-02 | 1.110E+03 | 1.117E+02 | 0.000E-01 | LUNG |
| 38 | MO-99 | 4.255E+01 | 0.000E-01 | 0.000E-01 | 1.724E+02 | 3.922E+02 | 1.354E+05 | 1.265E+05 | 0.000E-01 | LUNG |
| 39 | TC-99M | 5.772E-02 | 0.000E-01 | 1.780E-03 | 3.482E-03 | 5.069E-02 | 9.509E+02 | 4.810E+03 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 1.077E-03 | 0.000E-01 | 8.103E-05 | 8.510E-05 | 1.450E-03 | 5.846E+02 | 1.632E+01 | 0.000E-01 | LUNG |
| 41 | RU-103 | 1.073E+03 | 0.000E-01 | 2.867E+03 | 0.000E-01 | 7.030E+03 | 6.623E+05 | 4.477E+04 | 0.000E-01 | LUNG |
| 42 | RU-105 | 5.550E-01 | 0.000E-01 | 1.528E+00 | 0.000E-01 | 1.343E+00 | 1.591E+04 | 9.953E+04 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 1.691E+04 | 0.000E-01 | 1.362E+05 | 0.000E-01 | 1.839E+05 | 1.432E+07 | 4.292E+05 | 0.000E-01 | LUNG |
| 44 | AG-110M | 9.139E+03 | 0.000E-01 | 1.687E+04 | 1.140E+04 | 2.124E+04 | 5.476E+06 | 1.003E+05 | 0.000E-01 | LUNG |
| 45 | CD-115M | 2.941E+03 | 0.000E-01 | 0.000E-01 | 9.102E+04 | 7.326E+04 | 6.512E+05 | 1.776E+05 | 0.000E-01 | LUNG |
| 46 | SB-124 | 5.735E+03 | 3.493E+01 | 1.443E+04 | 2.723E+02 | 0.000E-01 | 1.147E+06 | 1.896E+05 | 0.000E-01 | LUNG |
| 47 | TE-125M | 9.139E+02 | 1.924E+03 | 6.734E+03 | 2.327E+03 | 0.000E-01 | 4.773E+05 | 3.378E+04 | 0.000E-01 | LUNG |
| 48 | TE-127M | 3.027E+03 | 6.068E+03 | 2.486E+04 | 8.547E+03 | 6.364E+04 | 1.480E+06 | 7.141E+04 | 0.000E-01 | LUNG |
| 49 | TE-127 | 6.105E-01 | 1.961E+00 | 2.771E+00 | 9.509E-01 | 7.067E+00 | 1.003E+04 | 5.624E+04 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 3.041E+03 | 6.327E+03 | 1.920E+04 | 6.845E+03 | 5.032E+04 | 1.761E+06 | 1.817E+05 | 0.000E-01 | LUNG |
| 51 | TE-129 | 2.383E-02 | 7.141E-02 | 9.768E-02 | 3.496E-02 | 2.568E-01 | 2.934E+03 | 2.549E+04 | 0.000E-01 | GI-LLI |
| 52 | TE-131M | 5.069E+01 | 9.768E+01 | 1.343E+02 | 5.920E+01 | 3.996E+02 | 2.057E+05 | 3.078E+05 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 6.586E-03 | 1.698E-02 | 2.172E-02 | 8.436E-03 | 5.883E-02 | 2.053E+03 | 1.332E+03 | 0.000E-01 | LUNG |
| 54 | TE-132 | 2.634E+02 | 3.175E+02 | 4.810E+02 | 2.723E+02 | 1.772E+03 | 3.774E+05 | 1.376E+05 | 0.000E-01 | LUNG |
| 55 | I-130 | 8.436E+03 | 1.846E+06 | 8.177E+03 | 1.639E+04 | 2.446E+04 | 0.000E-01 | 5.104E+03 | 0.000E-01 | THYROID |
| 56 | I-131 | 2.727E+04 | 1.624E+07 | 4.810E+04 | 4.810E+04 | 7.801E+04 | 0.000E-01 | 2.842E+03 | 0.000E-01 | THYROID |
| 57 | I-132 | 1.876E+03 | 1.935E+05 | 2.116E+03 | 4.070E+03 | 6.253E+03 | 0.000E-01 | 3.200E+03 | 0.000E-01 | THYROID |
| 58 | I-133 | 7.696E+03 | 3.848E+06 | 1.658E+04 | 2.031E+04 | 3.378E+04 | 0.000E-01 | 5.476E+03 | 0.000E-01 | THYROID |
| 59 | I-134 | 9.953E+02 | 5.069E+04 | 1.173E+03 | 2.161E+03 | 3.300E+03 | 0.000E-01 | 9.546E+02 | 0.000E-01 | THYROID |
| 60 | I-135 | 4.144E+03 | 7.918E+05 | 4.921E+03 | 8.732E+03 | 1.339E+04 | 0.000E-01 | 4.440E+03 | 0.000E-01 | THYROID |
| 61 | CS-134 | 2.246E+05 | 0.000E-01 | 6.512E+05 | 1.014E+06 | 3.304E+05 | 1.210E+05 | 3.848E+03 | 0.000E-01 | LIVER |
| 62 | CS-136 | 1.162E+05 | 0.000E-01 | 6.512E+04 | 1.709E+05 | 9.546E+04 | 1.454E+04 | 4.181E+03 | 0.000E-01 | LIVER |
| 63 | CS-137 | 1.284E+05 | 0.000E-01 | 9.065E+05 | 8.251E+05 | 2.823E+05 | 1.040E+05 | 3.619E+03 | 0.000E-01 | BONE |
| 64 | CS-138 | 5.550E+02 | 0.000E-01 | 6.327E+02 | 8.399E+02 | 6.216E+02 | 6.908E+01 | 2.697E+02 | 0.000E-01 | LIVER |
| 65 | CS-139 | 5.143E+01 | 0.000E-01 | 9.472E+01 | 1.343E+02 | 1.128E+02 | 1.051E+01 | 0.000E-01 | 0.000E-01 | LIVER |
| 66 | BA-139 | 5.365E-02 | 0.000E-01 | 1.843E+00 | 9.842E-04 | 8.621E-04 | 5.772E+03 | 5.772E+04 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 4.329E+03 | 0.000E-01 | 7.400E+04 | 6.475E+01 | 2.113E+01 | 1.743E+06 | 1.017E+05 | 0.000E-01 | LUNG |
| 68 | BA-141 | 6.364E-03 | 0.000E-01 | 1.957E-01 | 1.091E-04 | 9.472E-05 | 2.919E+03 | 2.753E+02 | 0.000E-01 | LUNG |
| 69 | BA-142 | 2.790E-03 | 0.000E-01 | 4.995E-02 | 3.600E-05 | 2.912E-05 | 1.643E+03 | 2.742E+00 | 0.000E-01 | LUNG |
| 70 | LA-140 | 7.548E+01 | 0.000E-01 | 6.438E+02 | 2.250E+02 | 0.000E-01 | 1.828E+05 | 2.257E+05 | 0.000E-01 | GI-LLI |

**TABLE G-1 (CONT)**

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : CHILD
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 1.291E-01 | 0.000E-01 | 1.295E+00 | 4.107E-01 | 0.000E-01 | 8.695E+03 | 7.585E+04 | 1.291E-01 | GI-LLI |
| 72 | CE-141 | 2.897E+03 | 0.000E-01 | 3.922E+04 | 1.954E+04 | 8.547E+03 | 5.439E+05 | 5.661E+04 | 0.000E-01 | LUNG |
| 73 | CE-143 | 2.875E+01 | 0.000E-01 | 3.659E+02 | 1.987E+02 | 8.362E+01 | 1.154E+05 | 1.273E+05 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 3.615E+05 | 0.000E-01 | 6.771E+06 | 2.116E+06 | 1.173E+06 | 1.195E+07 | 3.885E+05 | 0.000E-01 | LUNG |
| 75 | PR-143 | 9.139E+02 | 0.000E-01 | 1.846E+04 | 5.550E+03 | 3.001E+03 | 4.329E+05 | 9.731E+04 | 0.000E-01 | LUNG |
| 76 | PR-144 | 2.997E-03 | 0.000E-01 | 5.957E-02 | 1.846E-02 | 9.768E-03 | 1.565E+03 | 1.969E+02 | 0.000E-01 | LUNG |
| 77 | ND-147 | 6.808E+02 | 0.000E-01 | 1.080E+04 | 8.732E+03 | 4.810E+03 | 3.282E+05 | 8.214E+04 | 0.000E-01 | LUNG |
| 78 | W-185 | 2.520E+01 | 0.000E-01 | 7.215E+02 | 2.494E+02 | 0.000E-01 | 2.061E+05 | 3.959E+04 | 0.000E-01 | LUNG |
| 79 | W-187 | 4.329E+00 | 0.000E-01 | 1.632E+01 | 9.657E+00 | 0.000E-01 | 4.107E+04 | 9.102E+04 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 2.246E+06 | 0.000E-01 | 3.700E+07 | 0.000E-01 | 8.658E+06 | 1.813E+08 | 1.791E+05 | 0.000E-01 | LUNG |
| 81 | U-238 | 2.098E+06 | 0.000E-01 | 3.545E+07 | 0.000E-01 | 8.066E+06 | 1.695E+08 | 3.811E+05 | 0.000E-01 | LUNG |
| 82 | NP-239 | 2.349E+01 | 0.000E-01 | 4.662E+02 | 3.345E+01 | 9.731E+01 | 5.809E+04 | 6.401E+04 | 0.000E-01 | GI-LLI |

## TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : INFANT
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3 | 6.468E+02 | 6.468E+02 | 0.000E-01 | 6.468E+02 | 6.468E+02 | 6.468E+02 | 6.468E+02 | 6.468E+02 | W. BODY |
| 2 | C-14 | 5.306E+03 | 5.306E+03 | 2.646E+04 | 5.306E+03 | 5.306E+03 | 5.306E+03 | 5.306E+03 | 5.306E+03 | BONE |
| 3 | NA-24 | 1.056E+04 | 1.056E+04 | 1.056E+04 | 1.056E+04 | 1.056E+04 | 1.056E+04 | 1.056E+04 | 0.000E-01 | W. BODY |
| 4 | P-32 | 7.742E+04 | 0.000E-01 | 2.030E+06 | 1.124E+05 | 0.000E-01 | 0.000E-01 | 1.610E+04 | 0.000E-01 | BONE |
| 5 | SC-46 | 4.354E+04 | 0.000E-01 | 7.714E+04 | 1.498E+05 | 1.400E+05 | 0.000E-01 | 4.522E+04 | 0.000E-01 | LIVER |
| 6 | CR-51 | 8.946E+01 | 5.754E+01 | 0.000E-01 | 0.000E-01 | 1.323E+01 | 1.284E+01 | 3.570E+02 | 0.000E-01 | LUNG |
| 7 | MN-54 | 4.984E+03 | 0.000E-01 | 0.000E-01 | 1.652E+04 | 4.984E+03 | 9.996E+05 | 7.056E+03 | 0.000E-01 | LUNG |
| 8 | MN-56 | 2.212E-01 | 0.000E-01 | 0.000E-01 | 1.540E+00 | 1.100E+00 | 1.253E+04 | 7.168E+04 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 3.332E+03 | 0.000E-01 | 1.974E+04 | 1.175E+04 | 0.000E-01 | 8.694E+04 | 1.095E+03 | 0.000E-01 | LUNG |
| 10 | FE-59 | 9.478E+03 | 0.000E-01 | 1.357E+04 | 2.352E+04 | 0.000E-01 | 1.015E+06 | 2.470E+04 | 0.000E-01 | LUNG |
| 11 | CO-58 | 1.820E+03 | 0.000E-01 | 0.000E-01 | 1.219E+03 | 0.000E-01 | 7.770E+05 | 1.113E+04 | 0.000E-01 | LUNG |
| 12 | CO-60 | 1.177E+04 | 0.000E-01 | 0.000E-01 | 8.022E+03 | 0.000E-01 | 4.508E+06 | 3.192E+04 | 0.000E-01 | LUNG |
| 13 | NI-59 | 9.478E+02 | 0.000E-01 | 5.684E+03 | 2.044E+03 | 0.000E-01 | 1.149E+04 | 8.551E+02 | 0.000E-01 | LUNG |
| 14 | NI-63 | 1.161E+04 | 0.000E-01 | 3.388E+05 | 2.044E+04 | 0.000E-01 | 2.086E+05 | 2.422E+03 | 0.000E-01 | BONE |
| 15 | NI-65 | 1.231E-01 | 0.000E-01 | 2.394E+00 | 2.842E-01 | 0.000E-01 | 8.120E+03 | 5.012E+04 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 7.742E-01 | 0.000E-01 | 0.000E-01 | 1.876E+00 | 3.976E+00 | 9.296E+03 | 1.498E+04 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 3.100E+04 | 0.000E-01 | 1.932E+04 | 6.258E+04 | 3.240E+04 | 6.469E+05 | 5.139E+04 | 0.000E-01 | LUNG |
| 18 | ZN-69 | 7.182E-03 | 0.000E-01 | 5.390E-02 | 9.674E-02 | 4.018E-02 | 1.470E+03 | 1.322E+04 | 0.000E-01 | GI-LLI |
| 19 | BR-83 | 3.808E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 4.004E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 2.044E+01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 8.820E+04 | 0.000E-01 | 0.000E-01 | 1.904E+05 | 0.000E-01 | 0.000E-01 | 3.038E+03 | 0.000E-01 | LIVER |
| 23 | RB-88 | 2.870E+02 | 0.000E-01 | 0.000E-01 | 5.572E+02 | 0.000E-01 | 0.000E-01 | 3.388E+02 | 0.000E-01 | LIVER |
| 24 | RB-89 | 2.058E+02 | 0.000E-01 | 0.000E-01 | 3.206E+02 | 0.000E-01 | 0.000E-01 | 6.818E+01 | 0.000E-01 | LIVER |
| 25 | SR-89 | 1.141E+04 | 0.000E-01 | 3.976E+05 | 0.000E-01 | 0.000E-01 | 2.030E+06 | 6.398E+04 | 0.000E-01 | LUNG |
| 26 | SR-90 | 2.590E+06 | 0.000E-01 | 4.088E+07 | 0.000E-01 | 0.000E-01 | 1.124E+07 | 1.310E+05 | 0.000E-01 | BONE |
| 27 | SR-91 | 3.458E+00 | 0.000E-01 | 9.562E+01 | 0.000E-01 | 0.000E-01 | 5.264E+04 | 7.336E+04 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 3.906E-01 | 0.000E-01 | 1.050E+01 | 0.000E-01 | 0.000E-01 | 2.380E+04 | 1.400E+05 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 8.820E+01 | 0.000E-01 | 3.290E+03 | 0.000E-01 | 0.000E-01 | 2.688E+05 | 1.040E+05 | 0.000E-01 | LUNG |
| 30 | Y-91M | 1.386E-02 | 0.000E-01 | 4.074E-01 | 0.000E-01 | 0.000E-01 | 2.786E+03 | 2.352E+03 | 0.000E-01 | LUNG |
| 31 | Y-91 | 1.568E+04 | 0.000E-01 | 5.880E+05 | 0.000E-01 | 0.000E-01 | 2.450E+06 | 7.028E+04 | 0.000E-01 | LUNG |
| 32 | Y-92 | 4.606E-01 | 0.000E-01 | 1.638E+01 | 0.000E-01 | 0.000E-01 | 2.450E+04 | 1.266E+05 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 4.074E+00 | 0.000E-01 | 1.498E+02 | 0.000E-01 | 0.000E-01 | 7.644E+04 | 1.666E+05 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 2.030E+04 | 0.000E-01 | 1.154E+05 | 2.786E+04 | 3.108E+04 | 1.750E+06 | 2.170E+04 | 0.000E-01 | LUNG |
| 35 | ZR-97 | 1.170E+01 | 0.000E-01 | 1.498E+02 | 2.562E+01 | 2.590E+01 | 1.103E+05 | 1.400E+05 | 0.000E-01 | GI-LLI |

## TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : INFANT
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 3.780E+03 | 0.000E-01 | 1.568E+04 | 6.426E+03 | 4.718E+03 | 4.788E+05 | 1.267E+04 | 3.780E+03 | LUNG |
| 37 | NB-97 | 3.584E-03 | 0.000E-01 | 3.892E-02 | 9.842E-03 | 1.145E-02 | 4.200E+02 | 4.228E+01 | 0.000E-01 | LUNG |
| 38 | MO-99 | 3.234E+01 | 0.000E-01 | 0.000E-01 | 1.652E+02 | 2.646E+02 | 1.348E+05 | 4.872E+04 | 0.000E-01 | LUNG |
| 39 | TC-99M | 3.724E-02 | 0.000E-01 | 1.397E-03 | 2.884E-03 | 3.108E-02 | 8.106E+02 | 2.030E+03 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 8.120E-04 | 0.000E-01 | 6.510E-05 | 8.232E-05 | 9.786E-04 | 5.838E+02 | 8.442E+02 | 0.000E-01 | GI-LLI |
| 41 | RU-103 | 6.790E+02 | 0.000E-01 | 2.016E+03 | 0.000E-01 | 4.242E+03 | 5.515E+05 | 1.610E+04 | 0.000E-01 | LUNG |
| 42 | RU-105 | 4.102E-01 | 0.000E-01 | 1.224E+00 | 0.000E-01 | 8.988E-01 | 1.568E+04 | 4.844E+04 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 1.088E+04 | 0.000E-01 | 8.680E+04 | 0.000E-01 | 1.065E+05 | 1.156E+07 | 1.638E+05 | 0.000E-01 | LUNG |
| 44 | AG-110M | 4.998E+03 | 0.000E-01 | 9.982E+03 | 7.224E+03 | 1.092E+04 | 3.668E+06 | 3.304E+04 | 0.000E-01 | LUNG |
| 45 | CD-115M | 1.113E+03 | 0.000E-01 | 0.000E-01 | 3.444E+04 | 2.772E+04 | 2.464E+05 | 6.720E+04 | 0.000E-01 | LUNG |
| 46 | SB-124 | 2.170E+03 | 1.322E+01 | 5.460E+03 | 1.030E+02 | 0.000E-01 | 4.340E+05 | 7.112E+04 | 0.000E-01 | LUNG |
| 47 | TE-125M | 6.580E+02 | 1.624E+03 | 4.760E+03 | 1.988E+03 | 0.000E-01 | 4.466E+05 | 1.291E+04 | 0.000E-01 | LUNG |
| 48 | TE-127M | 2.072E+03 | 4.872E+03 | 1.666E+04 | 6.902E+03 | 3.752E+04 | 1.312E+06 | 2.730E+04 | 0.000E-01 | LUNG |
| 49 | TE-127 | 4.886E-01 | 1.848E+00 | 2.226E+00 | 9.534E-01 | 4.858E+00 | 1.035E+04 | 2.436E+04 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 2.226E+03 | 5.474E+03 | 1.414E+04 | 6.090E+03 | 3.178E+04 | 1.680E+06 | 6.902E+04 | 0.000E-01 | LUNG |
| 51 | TE-129 | 1.876E-02 | 6.748E-02 | 7.882E-02 | 3.472E-02 | 1.750E-01 | 2.996E+03 | 2.632E+04 | 0.000E-01 | GI-LLI |
| 52 | TE-131M | 3.626E+01 | 8.932E+01 | 1.067E+02 | 5.502E+01 | 2.646E+02 | 1.980E+05 | 1.191E+05 | 0.000E-01 | LUNG |
| 53 | TE-131 | 4.998E-03 | 1.582E-02 | 1.736E-02 | 8.218E-03 | 3.990E-02 | 2.058E+03 | 8.218E+03 | 0.000E-01 | GI-LLI |
| 54 | TE-132 | 1.764E+02 | 2.786E+02 | 3.724E+02 | 2.366E+02 | 1.035E+03 | 3.402E+05 | 4.410E+04 | 0.000E-01 | LUNG |
| 55 | I-130 | 5.572E+03 | 1.596E+06 | 6.356E+03 | 1.397E+04 | 1.526E+04 | 0.000E-01 | 1.988E+03 | 0.000E-01 | THYROID |
| 56 | I-131 | 1.960E+04 | 1.484E+07 | 3.794E+04 | 4.438E+04 | 5.180E+04 | 0.000E-01 | 1.058E+03 | 0.000E-01 | THYROID |
| 57 | I-132 | 1.259E+03 | 1.694E+05 | 1.694E+03 | 3.542E+03 | 3.948E+03 | 0.000E-01 | 1.904E+03 | 0.000E-01 | THYROID |
| 58 | I-133 | 5.600E+03 | 3.556E+06 | 1.324E+04 | 1.918E+04 | 2.240E+04 | 0.000E-01 | 2.156E+03 | 0.000E-01 | THYROID |
| 59 | I-134 | 6.650E+02 | 4.452E+04 | 9.212E+02 | 1.876E+03 | 2.086E+03 | 0.000E-01 | 1.289E+03 | 0.000E-01 | THYROID |
| 60 | I-135 | 2.772E+03 | 6.958E+05 | 3.864E+03 | 7.602E+03 | 8.470E+03 | 0.000E-01 | 1.834E+03 | 0.000E-01 | THYROID |
| 61 | CS-134 | 7.448E+04 | 0.000E-01 | 3.962E+05 | 7.028E+05 | 1.904E+05 | 7.966E+04 | 1.334E+03 | 0.000E-01 | LIVER |
| 62 | CS-136 | 5.292E+04 | 0.000E-01 | 4.830E+04 | 1.345E+05 | 5.642E+04 | 1.176E+04 | 1.428E+03 | 0.000E-01 | LIVER |
| 63 | CS-137 | 4.550E+04 | 0.000E-01 | 5.488E+05 | 6.118E+05 | 1.722E+05 | 7.126E+04 | 1.334E+03 | 0.000E-01 | LIVER |
| 64 | CS-138 | 3.976E+02 | 0.000E-01 | 5.054E+02 | 7.812E+02 | 4.102E+02 | 6.538E+01 | 8.764E+02 | 0.000E-01 | GI-LLI |
| 65 | CS-139 | 1.946E+01 | 0.000E-01 | 3.584E+01 | 5.002E+01 | 4.270E+01 | 3.976E+00 | 0.000E-01 | 0.000E-01 | LIVER |
| 66 | BA-139 | 4.298E-02 | 0.000E-01 | 1.484E+00 | 9.842E-04 | 5.922E-04 | 5.950E+03 | 5.096E+04 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 2.898E+03 | 0.000E-01 | 5.600E+04 | 5.600E+01 | 1.343E+01 | 1.596E+06 | 3.836E+04 | 0.000E-01 | LUNG |
| 68 | BA-141 | 4.970E-03 | 0.000E-01 | 1.568E-01 | 1.078E-04 | 6.496E-05 | 2.968E+03 | 4.746E+03 | 0.000E-01 | GI-LLI |
| 69 | BA-142 | 1.960E-03 | 0.000E-01 | 3.976E-02 | 3.304E-05 | 1.904E-05 | 1.554E+03 | 6.930E+02 | 0.000E-01 | LUNG |
| 70 | LA-140 | 5.152E+01 | 0.000E-01 | 5.054E+02 | 2.002E+02 | 0.000E-01 | 1.680E+05 | 8.484E+04 | 0.000E-01 | LUNG |

## TABLE G-1 (CONT)

Pathway Dose Parameters
$R_i$ (mrem/yr per uCi/$m^3$)

AGE : INFANT
PATHWAY : INHALATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 9.044E-02 | 0.000E-01 | 1.030E+00 | 3.766E-01 | 0.000E-01 | 8.218E+03 | 5.950E+04 | 9.044E-02 | GI-LLI |
| 72 | CE-141 | 1.988E+03 | 0.000E-01 | 2.772E+04 | 1.666E+04 | 5.250E+03 | 5.166E+05 | 2.156E+04 | 0.000E-01 | LUNG |
| 73 | CE-143 | 2.212E+01 | 0.000E-01 | 2.926E+02 | 1.932E+02 | 5.642E+01 | 1.162E+05 | 4.970E+04 | 0.000E-01 | LUNG |
| 74 | CE-144 | 1.764E+05 | 0.000E-01 | 3.192E+06 | 1.211E+06 | 5.376E+05 | 9.842E+06 | 1.484E+05 | 0.000E-01 | LUNG |
| 75 | PR-143 | 6.986E+02 | 0.000E-01 | 1.400E+04 | 5.236E+03 | 1.974E+03 | 4.326E+05 | 3.724E+04 | 0.000E-01 | LUNG |
| 76 | PR-144 | 2.408E-03 | 0.000E-01 | 4.788E-02 | 1.848E-02 | 6.720E-03 | 1.610E+03 | 4.204E+03 | 0.000E-01 | GI-LLI |
| 77 | ND-147 | 4.998E+02 | 0.000E-01 | 7.938E+03 | 8.134E+03 | 3.150E+03 | 3.220E+05 | 3.122E+04 | 0.000E-01 | LUNG |
| 78 | W-185 | 9.534E+00 | 0.000E-01 | 2.730E+02 | 9.058E+01 | 0.000E-01 | 7.798E+04 | 1.498E+04 | 0.000E-01 | LUNG |
| 79 | W-187 | 3.122E+00 | 0.000E-01 | 1.296E+01 | 9.016E+00 | 0.000E-01 | 3.962E+04 | 3.556E+04 | 0.000E-01 | LUNG |
| 80 | U-235 | 8.498E+05 | 0.000E-01 | 1.400E+07 | 0.000E-01 | 3.276E+06 | 6.860E+07 | 6.776E+04 | 0.000E-01 | LUNG |
| 81 | U-238 | 7.938E+05 | 0.000E-01 | 1.341E+07 | 0.000E-01 | 3.052E+06 | 6.412E+07 | 1.442E+05 | 0.000E-01 | LUNG |
| 82 | NP-239 | 1.876E+01 | 0.000E-01 | 3.710E+02 | 3.318E+01 | 6.622E+01 | 5.950E+04 | 2.492E+04 | 0.000E-01 | LUNG |

## TABLE G-2

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ADULT
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3* | 2.260E+03 | 2.260E+03 | 0.000E-01 | 2.260E+03 | 2.260E+03 | 2.260E+03 | 2.260E+03 | 2.260E+03 | W. BODY |
| 2 | C-14* | 1.793E+05 | 1.793E+05 | 8.966E+05 | 1.793E+05 | 1.793E+05 | 1.793E+05 | 1.793E+05 | 1.793E+05 | BONE |
| 3 | NA-24 | 2.692E+05 | 2.692E+05 | 2.692E+05 | 2.692E+05 | 2.692E+05 | 2.692E+05 | 2.692E+05 | 0.000E-01 | W. BODY |
| 4 | P-32 | 5.433E+07 | 0.000E-01 | 1.406E+09 | 8.740E+07 | 0.000E-01 | 0.000E-01 | 1.580E+08 | 0.000E-01 | BONE |
| 5 | SC-46 | 1.414E+05 | 0.000E-01 | 2.505E+05 | 4.910E+05 | 4.547E+05 | 0.000E-01 | 2.369E+09 | 0.000E-01 | GI-LLI |
| 6 | CR-51 | 4.656E+04 | 2.783E+04 | 0.000E-01 | 0.000E-01 | 1.026E+04 | 6.178E+04 | 1.171E+07 | 0.000E-01 | GI-LLI |
| 7 | MN-54 | 5.969E+07 | 0.000E-01 | 0.000E-01 | 3.128E+08 | 9.309E+07 | 0.000E-01 | 9.583E+08 | 0.000E-01 | GI-LLI |
| 8 | MN-56 | 2.730E+00 | 0.000E-01 | 0.000E-01 | 1.539E+01 | 1.954E+01 | 0.000E-01 | 4.912E+02 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 3.376E+07 | 0.000E-01 | 2.096E+08 | 1.448E+08 | 0.000E-01 | 8.077E+07 | 8.306E+07 | 0.000E-01 | BONE |
| 10 | FE-59 | 1.135E+08 | 0.000E-01 | 1.260E+08 | 2.961E+08 | 0.000E-01 | 8.273E+07 | 9.869E+08 | 0.000E-01 | GI-LLI |
| 11 | CO-58 | 6.939E+07 | 0.000E-01 | 0.000E-01 | 3.096E+07 | 0.000E-01 | 0.000E-01 | 6.274E+08 | 0.000E-01 | GI-LLI |
| 12 | CO-60 | 3.686E+08 | 0.000E-01 | 0.000E-01 | 1.671E+08 | 0.000E-01 | 0.000E-01 | 3.139E+09 | 0.000E-01 | GI-LLI |
| 13 | NI-59 | 1.306E+08 | 0.000E-01 | 7.830E+08 | 2.685E+08 | 0.000E-01 | 0.000E-01 | 5.530E+07 | 0.000E-01 | BONE |
| 14 | NI-63 | 3.489E+08 | 0.000E-01 | 1.040E+10 | 7.211E+08 | 0.000E-01 | 0.000E-01 | 1.505E+08 | 0.000E-01 | BONE |
| 15 | NI-65 | 3.537E+00 | 0.000E-01 | 5.967E+01 | 7.752E+00 | 0.000E-01 | 0.000E-01 | 1.966E+02 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 4.267E+03 | 0.000E-01 | 0.000E-01 | 9.090E+03 | 2.292E+04 | 0.000E-01 | 7.748E+05 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 4.556E+08 | 0.000E-01 | 3.168E+08 | 1.008E+09 | 6.742E+08 | 0.000E-01 | 6.350E+08 | 0.000E-01 | LIVER |
| 18 | ZN-69 | 1.040E-06 | 0.000E-01 | 7.819E-06 | 1.495E-05 | 9.716E-06 | 0.000E-01 | 2.247E-06 | 0.000E-01 | LIVER |
| 19 | BR-83 | 3.087E+00 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 4.446E+00 | 0.000E-01 | GI-LLI |
| 20 | BR-84 | 2.009E-11 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.577E-16 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 1.019E+09 | 0.000E-01 | 0.000E-01 | 2.187E+08 | 0.000E-01 | 0.000E-01 | 4.311E+07 | 0.000E-01 | LIVER |
| 23 | RB-89 | 9.892E-23 | 0.000E-01 | 0.000E-01 | 1.863E-22 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | LIVER |
| 24 | RB-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 25 | SR-89 | 2.857E+09 | 0.000E-01 | 9.954E+09 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.596E+09 | 0.000E-01 | BONE |
| 26 | SR-90 | 1.481E+11 | 0.000E-01 | 6.046E+11 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.747E+10 | 0.000E-01 | BONE |
| 27 | SR-91 | 1.215E+04 | 0.000E-01 | 3.009E+05 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.433E+06 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 1.784E+01 | 0.000E-01 | 4.125E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 8.172E+03 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 3.566E+02 | 0.000E-01 | 1.330E+04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.410E+08 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 1.909E-10 | 0.000E-01 | 4.930E-09 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.448E-08 | 0.000E-01 | GI-LLI |
| 31 | Y-91 | 1.368E+05 | 0.000E-01 | 5.116E+06 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.816E+09 | 0.000E-01 | GI-LLI |
| 32 | Y-92 | 2.615E-02 | 0.000E-01 | 8.946E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.567E+04 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 4.751E+00 | 0.000E-01 | 1.721E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 5.457E+06 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 2.596E+05 | 0.000E-01 | 1.196E+06 | 3.835E+05 | 6.019E+05 | 0.000E-01 | 1.216E+09 | 0.000E-01 | GI-LLI |
| 35 | ZR-97 | 3.094E+01 | 0.000E-01 | 3.354E+02 | 6.767E+01 | 1.022E+02 | 0.000E-01 | 2.096E+07 | 0.000E-01 | GI-LLI |

* Units are (mrem/yr per uCi/$m^3$)

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ADULT
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | ND-95 | 4.254E+04 | 0.000E-01 | 1.423E+05 | 7.914E+04 | 7.822E+04 | 0.000E-01 | 4.803E+09 | 0.000E-01 | GI-LLI |
| 37 | NB-97 | 2.516E-07 | 0.000E-01 | 2.730E-06 | 6.889E-07 | 8.037E-07 | 0.000E-01 | 2.542E-03 | 0.000E-01 | GI-LLI |
| 38 | MO-99 | 1.167E+06 | 0.000E-01 | 0.000E-01 | 6.136E+06 | 1.390E+07 | 0.000E-01 | 1.422E+07 | 0.000E-01 | GI-LLI |
| 39 | TC-99M | 1.113E+02 | 0.000E-01 | 3.093E+00 | 8.740E+00 | 1.327E+02 | 4.283E+00 | 5.172E+03 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 41 | RU-103 | 2.074E+06 | 0.000E-01 | 4.815E+06 | 0.000E-01 | 1.837E+07 | 0.000E-01 | 5.621E+08 | 0.000E-01 | GI-LLI |
| 42 | RU-105 | 2.104E+01 | 0.000E-01 | 5.330E+01 | 0.000E-01 | 6.888E+02 | 0.000E-01 | 3.261E+04 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 2.441E+07 | 0.000E-01 | 1.929E+08 | 0.000E-01 | 3.724E+08 | 0.000E-01 | 1.248E+10 | 0.000E-01 | GI-LLI |
| 44 | AG-110M | 5.796E+06 | 0.000E-01 | 1.055E+07 | 9.758E+06 | 1.919E+07 | 0.000E-01 | 3.952E+09 | 0.000E-01 | GI-LLI |
| 45 | CD-115M | 1.648E+06 | 0.000E-01 | 0.000E-01 | 5.157E+07 | 4.092E+07 | 0.000E-01 | 2.169E+09 | 0.000E-01 | GI-LLI |
| 46 | SB-124 | 4.115E+07 | 2.517E+05 | 1.042E+08 | 1.965E+06 | 0.000E-01 | 8.081E+07 | 2.947E+09 | 0.000E-01 | GI-LLI |
| 47 | TE-125M | 1.296E+07 | 2.909E+07 | 9.672E+07 | 3.504E+07 | 3.934E+08 | 0.000E-01 | 3.862E+08 | 0.000E-01 | KIDNEY |
| 48 | TE-127M | 4.255E+07 | 8.924E+07 | 3.492E+08 | 1.248E+08 | 1.418E+09 | 0.000E-01 | 1.171E+09 | 0.000E-01 | KIDNEY |
| 49 | TE-127 | 1.230E+03 | 4.211E+03 | 5.684E+03 | 2.041E+03 | 2.315E+04 | 0.000E-01 | 4.485E+05 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 3.955E+07 | 8.584E+07 | 2.499E+08 | 9.323E+07 | 1.043E+09 | 0.000E-01 | 1.258E+09 | 0.000E-01 | GI-LLI |
| 51 | TE-129 | 1.904E-04 | 5.997E-04 | 7.813E-04 | 2.936E-04 | 3.284E-03 | 0.000E-01 | 5.897E-04 | 0.000E-01 | KIDNEY |
| 52 | TE-131M | 3.705E+05 | 7.043E+05 | 9.092E+05 | 4.446E+05 | 4.504E+06 | 0.000E-01 | 4.415E+07 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 4.341E-16 | 1.131E-15 | 1.375E-15 | 5.744E-16 | 6.023E-15 | 0.000E-01 | 1.947E-16 | 0.000E-01 | KIDNEY |
| 54 | TE-132 | 2.600E+06 | 3.058E+06 | 4.282E+06 | 2.769E+06 | 2.668E+07 | 0.000E-01 | 1.310E+08 | 0.000E-01 | GI-LLI |
| 55 | I-130 | 4.591E+05 | 9.861E+07 | 3.944E+05 | 1.163E+06 | 1.816E+06 | 0.000E-01 | 1.002E+06 | 0.000E-01 | THYROID |
| 56 | I-131 | 6.622E+07 | 3.787E+10 | 8.079E+07 | 1.155E+08 | 1.981E+08 | 0.000E-01 | 3.049E+07 | 0.000E-01 | THYROID |
| 57 | I-132 | 4.968E+01 | 4.969E+03 | 5.308E+01 | 1.420E+02 | 2.262E+02 | 0.000E-01 | 2.667E+01 | 0.000E-01 | THYROID |
| 58 | I-133 | 1.103E+06 | 5.318E+08 | 2.080E+06 | 3.619E+06 | 6.314E+06 | 0.000E-01 | 3.252E+06 | 0.000E-01 | THYROID |
| 59 | I-134 | 8.305E-05 | 4.024E-03 | 8.548E-05 | 2.322E-04 | 3.693E-04 | 0.000E-01 | 2.024E-07 | 0.000E-01 | THYROID |
| 60 | I-135 | 3.691E+04 | 6.597E+06 | 3.820E+04 | 1.000E+05 | 1.604E+05 | 0.000E-01 | 1.130E+05 | 0.000E-01 | THYROID |
| 61 | CS-134 | 9.076E+09 | 0.000E-01 | 4.666E+09 | 1.110E+10 | 3.593E+09 | 1.193E+09 | 1.943E+08 | 0.000E-01 | LIVER |
| 62 | CS-136 | 1.195E+08 | 0.000E-01 | 4.204E+07 | 1.660E+08 | 9.235E+07 | 1.266E+07 | 1.896E+07 | 0.000E-01 | LIVER |
| 63 | CS-137 | 5.696E+09 | 0.000E-01 | 6.358E+09 | 8.696E+09 | 2.952E+09 | 9.813E+08 | 1.683E+08 | 0.000E-01 | LIVER |
| 64 | CS-138 | 3.554E-11 | 0.000E-01 | 3.633E-11 | 7.174E-11 | 5.272E-11 | 5.206E-12 | 3.061E-16 | 0.000E-01 | LIVER |
| 65 | CS-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 66 | BA-139 | 7.925E-04 | 0.000E-01 | 2.707E-02 | 1.928E-05 | 1.803E-05 | 1.094E-05 | 4.000E-02 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 8.405E+06 | 0.000E-01 | 1.283E+08 | 1.611E+05 | 5.479E+04 | 9.227E+04 | 2.642E+08 | 0.000E-01 | GI-LLI |
| 68 | BA-141 | 3.389E-23 | 0.000E-01 | 1.004E-21 | 7.589E-25 | 7.056E-25 | 0.000E-01 | 0.000E-01 | 0.000E-01 | BONE |
| 69 | BA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 70 | LA-140 | 2.634E+02 | 0.000E-01 | 1.978E+03 | 9.968E+02 | 0.000E-01 | 0.000E-01 | 7.318E+07 | 0.000E-01 | GI-LLI |

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ADULT
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYRGID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 1.508E-05 | 0.000E-01 | 1.331E-04 | 6.051E-05 | 0.000E-01 | 0.000E-01 | 4.419E-01 | 0.000E-01 | GI-LLI |
| 72 | CE-141 | 1.511E+04 | 0.000E-01 | 1.970E+05 | 1.332E+05 | 6.189E+04 | 0.000E-01 | 5.094E+08 | 0.000E-01 | GI-LLI |
| 73 | CE-143 | 8.154E+01 | 0.000E-01 | 9.966E+02 | 7.369E+05 | 3.244E+02 | 0.000E-01 | 2.754E+07 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 1.765E+06 | 0.000E-01 | 3.288E+07 | 1.375E+07 | 8.153E+06 | 0.000E-01 | 1.112E+10 | 0.000E-01 | GI-LLI |
| 75 | PR-143 | 3.101E+03 | 0.000E-01 | 6.256E+04 | 2.509E+04 | 1.448E+04 | 0.000E-01 | 2.740E+08 | 0.000E-01 | GI-LLI |
| 76 | PR-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 77 | ND-147 | 2.303E+03 | 0.000E-01 | 3.330E+04 | 3.849E+04 | 2.250E+04 | 0.000E-01 | 1.849E+08 | 0.000E-01 | GI-LLI |
| 78 | W-185 | 6.065E+05 | 0.000E-01 | 1.734E+07 | 5.766E+06 | 0.000E-01 | 0.000E-01 | 6.663E+08 | 0.000E-01 | GI-LLI |
| 79 | W-187 | 1.112E+04 | 0.000E-01 | 3.806E+04 | 3.181E+04 | 0.000E-01 | 0.000E-01 | 1.042E+07 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 3.895E+09 | 0.000E-01 | 6.427E+10 | 0.000E-01 | 1.499E+10 | 0.000E-01 | 6.259E+09 | 0.000E-01 | BONE |
| 81 | U-238 | 3.646E+09 | 0.000E-01 | 6.147E+10 | 0.000E-01 | 1.402E+10 | 0.000E-01 | 1.336E+10 | 0.000E-01 | BONE |
| 82 | NP-239 | 7.693E+01 | 0.000E-01 | 1.419E+03 | 1.396E+02 | 4.354E+02 | 0.000E-01 | 2.853E+07 | 0.000E-01 | GI-LLI |

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : TEEN
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3 * | 2.588E+03 | 2.588E+03 | 0.000E-01 | 2.588E+03 | 2.588E+03 | 2.588E+03 | 2.588E+03 | 2.588E+03 | W. BODY |
| 2 | C-14 * | 2.907E+05 | 2.907E+05 | 1.454E+06 | 2.907E+05 | 2.907E+05 | 2.907E+05 | 2.907E+05 | 2.907E+05 | BONE |
| 3 | NA-24 | 2.390E+05 | 2.390E+05 | 2.390E+05 | 2.390E+05 | 2.390E+05 | 2.390E+05 | 2.390E+05 | 0.000E-01 | W. BODY |
| 4 | P-32 | 6.247E+07 | 0.000E-01 | 1.611E+09 | 9.983E+07 | 0.000E-01 | 0.000E-01 | 1.354E+08 | 0.000E-01 | BONE |
| 5 | SC-46 | 1.549E+05 | 0.000E-01 | 2.745E+05 | 5.380E+05 | 4.981E+05 | 0.000E-01 | 2.595E+09 | 0.000E-01 | GI-LLI |
| 6 | CR-51 | 6.186E+04 | 3.437E+04 | 0.000E-01 | 0.000E-01 | 1.356E+04 | 8.832E+04 | 1.040E+07 | 0.000E-01 | GI-LLI |
| 7 | MN-54 | 9.010E+07 | 0.000E-01 | 0.000E-01 | 4.543E+08 | 1.355E+08 | 0.000E-01 | 9.318E+08 | 0.000E-01 | GI-LLI |
| 8 | MN-56 | 2.468E+00 | 0.000E-01 | 0.000E-01 | 1.388E+01 | 1.757E+01 | 0.000E-01 | 9.134E+02 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 5.388E+07 | 0.000E-01 | 3.259E+08 | 2.310E+08 | 0.000E-01 | 1.466E+08 | 1.000E+09 | 0.000E-01 | BONE |
| 10 | FE-59 | 1.615E+08 | 0.000E-01 | 1.792E+08 | 4.181E+08 | 0.000E-01 | 1.318E+08 | 9.888E+08 | 0.000E-01 | GI-LLI |
| 11 | CO-58 | 1.013E+08 | 0.000E-01 | 0.000E-01 | 4.394E+07 | 0.000E-01 | 0.000E-01 | 6.057E+08 | 0.000E-01 | GI-LLI |
| 12 | CO-60 | 5.599E+08 | 0.000E-01 | 0.000E-01 | 2.486E+08 | 0.000E-01 | 0.000E-01 | 3.239E+09 | 0.000E-01 | GI-LLI |
| 13 | NI-59 | 1.482E+08 | 0.000E-01 | 8.880E+08 | 3.045E+08 | 0.000E-01 | 0.000E-01 | 6.271E+07 | 0.000E-01 | BONE |
| 14 | NI-63 | 5.448E+08 | 0.000E-01 | 1.606E+10 | 1.135E+09 | 0.000E-01 | 0.000E-01 | 1.806E+08 | 0.000E-01 | BONE |
| 15 | NI-65 | 3.233E+00 | 0.000E-01 | 5.554E+01 | 7.097E+00 | 0.000E-01 | 0.000E-01 | 3.819E+02 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 3.874E+03 | 0.000E-01 | 0.000E-01 | 8.235E+03 | 2.084E+04 | 0.000E-01 | 6.388E+05 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 6.854E+08 | 0.000E-01 | 4.231E+08 | 1.469E+09 | 9.403E+08 | 0.000E-01 | 6.222E+08 | 0.000E-01 | LIVER |
| 18 | ZN-69 | 9.764E-07 | 0.000E-01 | 7.323E-06 | 1.395E-05 | 9.116E-06 | 0.000E-01 | 2.570E-05 | 0.000E-01 | GI-LLI |
| 19 | BR-83 | 2.892E+00 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 1.827E-11 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 1.280E+08 | 0.000E-01 | 0.000E-01 | 2.725E+08 | 0.000E-01 | 0.000E-01 | 4.033E+07 | 0.000E-01 | LIVER |
| 23 | RB-88 | 9.172E-23 | 0.000E-01 | 0.000E-01 | 1.721E-22 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | LIVER |
| 24 | RB-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 25 | SR-89 | 4.330E+08 | 0.000E-01 | 1.512E+10 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.801E+09 | 0.000E-01 | BONE |
| 26 | SR-90 | 1.854E+11 | 0.000E-01 | 7.507E+11 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.107E+10 | 0.000E-01 | BONE |
| 27 | SR-91 | 1.118E+04 | 0.000E-01 | 2.811E+05 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.275E+06 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 1.637E+01 | 0.000E-01 | 3.840E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 9.782E+03 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 3.347E+02 | 0.000E-01 | 1.243E+04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.025E+08 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 1.755E-10 | 0.000E-01 | 4.591E-09 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.168E-07 | 0.000E-01 | GI-LLI |
| 31 | Y-91 | 2.103E+05 | 0.000E-01 | 7.842E+06 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 3.215E+09 | 0.000E-01 | GI-LLI |
| 32 | Y-92 | 2.432E-02 | 0.000E-01 | 8.407E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.307E+04 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 4.424E+00 | 0.000E-01 | 1.614E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 4.930E+06 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 3.808E+05 | 0.000E-01 | 1.755E+06 | 5.538E+05 | 4.303E+12 | 0.000E-01 | 1.278E+09 | 0.000E-01 | KIDNEY |
| 35 | ZR-97 | 2.830E+01 | 0.000E-01 | 3.105E+02 | 6.144E+01 | 9.314E+01 | 0.000E-01 | 1.664E+07 | 0.000E-01 | GI-LLI |

* Units are (mrem/yr per uCi/$m^3$)

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : TEEN
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 5.865E+04 | 0.000E-01 | 1.921E+05 | 1.065E+05 | 1.033E+05 | 0.000E-01 | 4.554E+08 | 0.000E-01 | GI-LLI |
| 37 | NB-97 | 1.651E-07 | 0.000E-01 | 1.791E-06 | 4.521E-07 | 5.274E-07 | 0.000E-01 | 1.668E-03 | 0.000E-01 | GI-LLI |
| 38 | MO-99 | 1.074E+06 | 0.000E-01 | 0.000E-01 | 5.634E+06 | 1.289E+07 | 0.000E-01 | 1.009E+07 | 0.000E-01 | KIDNEY |
| 39 | TC-99M | 9.861E+01 | 0.000E-01 | 2.728E+00 | 7.610E+00 | 1.134E+02 | 4.224E+00 | 4.996E+03 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 41 | RU-103 | 2.946E+06 | 0.000E-01 | 6.891E+06 | 0.000E-01 | 2.429E+07 | 0.000E-01 | 5.756E+08 | 0.000E-01 | GI-LLI |
| 42 | RU-105 | 1.922E+01 | 0.000E-01 | 4.952E+01 | 0.000E-01 | 6.247E+02 | 0.000E-01 | 3.998E+04 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 3.903E+07 | 0.000E-01 | 3.097E+08 | 0.000E-01 | 5.973E+08 | 0.000E-01 | 1.495E+10 | 0.000E-01 | GI-LLI |
| 44 | AG-110M | 8.735E+06 | 0.000E-01 | 1.517E+07 | 1.436E+07 | 2.739E+07 | 0.000E-01 | 4.034E+09 | 0.000E-01 | GI-LLI |
| 45 | CD-115M | 1.726E+06 | 0.000E-01 | 0.000E-01 | 5.401E+07 | 4.285E+07 | 0.000E-01 | 2.272E+09 | 0.000E-01 | GI-LLI |
| 46 | SB-124 | 4.433E+07 | 2.712E+05 | 1.122E+08 | 2.116E+06 | 0.000E-01 | 8.706E+07 | 3.175E+09 | 0.000E-01 | GI-LLI |
| 47 | TE-125M | 1.986E+07 | 4.150E+07 | 1.486E+08 | 5.352E+07 | 0.000E-01 | 0.000E-01 | 4.383E+08 | 0.000E-01 | GI-LLI |
| 48 | TE-127M | 6.559E+07 | 1.312E+08 | 5.515E+08 | 1.956E+08 | 2.236E+09 | 0.000E-01 | 1.374E+09 | 0.000E-01 | KIDNEY |
| 49 | TE-127 | 1.153E+03 | 3.696E+03 | 5.358E+03 | 1.899E+03 | 2.170E+04 | 0.000E-01 | 4.137E+05 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 5.689E+07 | 1.160E+08 | 3.594E+08 | 1.334E+08 | 1.504E+09 | 0.000E-01 | 1.349E+09 | 0.000E-01 | KIDNEY |
| 51 | TE-129 | 1.780E-04 | 5.225E-04 | 7.315E-04 | 2.727E-04 | 3.070E-03 | 0.000E-01 | 4.001E-03 | 0.000E-01 | GI-LLI |
| 52 | TE-131M | 3.366E+05 | 6.070E+05 | 8.416E+05 | 4.035E+05 | 4.208E+06 | 0.000E-01 | 3.239E+07 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 3.994E-16 | 9.848E-16 | 1.278E-15 | 5.267E-16 | 5.588E-15 | 0.000E-01 | 1.049E-16 | 0.000E-01 | KIDNEY |
| 54 | TE-132 | 2.319E+06 | 2.598E+06 | 3.891E+06 | 2.464E+06 | 2.364E+07 | 0.000E-01 | 7.805E+07 | 0.000E-01 | GI-LLI |
| 55 | I-130 | 4.074E+05 | 8.320E+07 | 3.527E+05 | 1.020E+06 | 1.572E+06 | 0.000E-01 | 7.841E+05 | 0.000E-01 | THYROID |
| 56 | I-131 | 5.783E+07 | 3.141E+10 | 7.689E+07 | 1.076E+08 | 1.853E+08 | 0.000E-01 | 2.129E+07 | 0.000E-01 | THYROID |
| 57 | I-132 | 4.496E+01 | 4.221E+03 | 4.789E+01 | 1.253E+02 | 1.973E+02 | 0.000E-01 | 5.457E+01 | 0.000E-01 | THYROID |
| 58 | I-133 | 9.998E+05 | 4.576E+08 | 1.932E+06 | 3.278E+06 | 5.749E+06 | 0.000E-01 | 2.480E+06 | 0.000E-01 | THYROID |
| 59 | I-134 | 7.356E-05 | 3.413E-03 | 7.726E-05 | 2.048E-04 | 3.228E-04 | 0.000E-01 | 2.699E-06 | 0.000E-01 | THYROID |
| 60 | I-135 | 3.293E+04 | 5.715E+06 | 3.452E+04 | 8.884E+04 | 1.403E+05 | 0.000E-01 | 9.846E+04 | 0.000E-01 | THYROID |
| 61 | CS-134 | 7.750E+09 | 0.000E-01 | 7.097E+09 | 1.670E+10 | 5.309E+09 | 2.027E+09 | 2.077E+08 | 0.000E-01 | LIVER |
| 62 | CS-136 | 1.133E+08 | 0.000E-01 | 4.289E+07 | 1.689E+08 | 9.187E+07 | 1.418E+07 | 1.359E+07 | 0.000E-01 | LIVER |
| 63 | CS-137 | 1.695E+09 | 0.000E-01 | 1.013E+10 | 1.318E+10 | 4.586E+09 | 1.782E+09 | 1.918E+08 | 0.000E-01 | LIVER |
| 64 | CS-138 | 3.218E-11 | 0.000E-01 | 3.352E-11 | 6.436E-11 | 4.751E-11 | 5.529E-12 | 2.920E-14 | 0.000E-01 | LIVER |
| 65 | CS-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 66 | BA-139 | 7.417E-04 | 0.000E-01 | 2.545E-02 | 1.791E-05 | 1.688E-05 | 1.234E-05 | 2.271E-01 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 8.882E+06 | 0.000E-01 | 1.378E+08 | 1.689E+05 | 5.727E+04 | 1.136E+05 | 2.126E+08 | 0.000E-01 | GI-LLI |
| 68 | BA-141 | 3.134E-23 | 0.000E-01 | 9.387E-22 | 7.009E-25 | 6.505E-25 | 4.798E-25 | 0.000E-01 | 0.000E-01 | BONE |
| 69 | BA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 70 | LA-140 | 2.362E+02 | 0.000E-01 | 1.807E+03 | 8.878E+02 | 0.000E-01 | 0.000E-01 | 5.098E+07 | 0.000E-01 | GI-LLI |

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : TEEN
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 1.351E-05 | 0.000E-01 | 1.221E-04 | 5.424E-05 | 0.000E-01 | 0.000E-01 | 1.651E+00 | 0.000E-01 | GI-LLI |
| 72 | CE-141 | 2.169E+04 | 0.000E-01 | 2.827E+05 | 1.888E+05 | 8.886E+04 | 0.000E-01 | 5.399E+08 | 0.000E-01 | GI-LLI |
| 73 | CE-143 | 7.571E+01 | 0.000E-01 | 9.315E+02 | 6.778E+05 | 3.040E+02 | 0.000E-01 | 2.037E+07 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 2.833E+06 | 0.000E-01 | 5.271E+07 | 2.181E+07 | 1.303E+07 | 0.000E-01 | 1.325E+10 | 0.000E-01 | GI-LLI |
| 75 | PR-143 | 3.482E+03 | 0.000E-01 | 6.995E+04 | 2.793E+04 | 1.623E+04 | 0.000E-01 | 2.301E+08 | 0.000E-01 | GI-LLI |
| 76 | PR-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 77 | ND-147 | 2.356E+03 | 0.000E-01 | 3.617E+04 | 3.933E+04 | 2.310E+04 | 0.000E-01 | 1.419E+08 | 0.000E-01 | GI-LLI |
| 78 | W-185 | 6.613E+05 | 0.000E-01 | 1.891E+07 | 6.287E+06 | 0.000E-01 | 0.000E-01 | 7.265E+08 | 0.000E-01 | GI-LLI |
| 79 | W-187 | 1.011E+04 | 0.000E-01 | 3.540E+04 | 2.885E+04 | 0.000E-01 | 0.000E-01 | 7.809E+06 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 4.417E+09 | 0.000E-01 | 7.289E+10 | 0.000E-01 | 1.700E+10 | 0.000E-01 | 7.099E+09 | 0.000E-01 | BONE |
| 81 | U-238 | 4.136E+09 | 0.000E-01 | 6.971E+10 | 0.000E-01 | 1.591E+10 | 0.000E-01 | 1.509E+10 | 0.000E-01 | BONE |
| 82 | NP-239 | 7.217E+01 | 0.000E-01 | 1.378E+03 | 1.299E+02 | 4.078E+02 | 0.000E-01 | 2.090E+07 | 0.000E-01 | GI-LLI |

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : CHILD
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3* | 4.008E+03 | 4.008E+03 | 0.000E-01 | 4.008E+03 | 4.008E+03 | 4.008E+03 | 4.008E+03 | 4.008E+03 | W. BODY |
| 2 | C-14* | 7.008E+05 | 7.008E+05 | 3.504E+06 | 7.008E+05 | 7.008E+05 | 7.008E+05 | 7.008E+05 | 7.008E+05 | BONE |
| 3 | NA-24 | 3.732E+05 | 3.732E+05 | 3.732E+05 | 3.732E+05 | 3.732E+05 | 3.732E+05 | 3.732E+05 | 0.000E-01 | W. BODY |
| 4 | P-32 | 1.301E+08 | 0.000E-01 | 3.375E+09 | 1.579E+08 | 0.000E-01 | 0.000E-01 | 9.326E+07 | 0.000E-01 | BONE |
| 5 | SC-46 | 1.239E+05 | 0.000E-01 | 2.195E+05 | 4.302E+05 | 3.983E+05 | 0.000E-01 | 2.075E+09 | 0.000E-01 | GI-LLI |
| 6 | CR-51 | 1.175E+05 | 6.522E+04 | 0.000E-01 | 0.000E-01 | 1.782E+04 | 1.191E+05 | 6.232E+06 | 0.000E-01 | GI-LLI |
| 7 | MN-54 | 1.770E+08 | 0.000E-01 | 0.000E-01 | 6.646E+08 | 1.863E+08 | 0.000E-01 | 5.578E+08 | 0.000E-01 | LIVER |
| 8 | MN-56 | 4.100E+00 | 0.000E-01 | 0.000E-01 | 1.816E+01 | 2.197E+01 | 0.000E-01 | 2.632E+03 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 1.317E+08 | 0.000E-01 | 8.012E+08 | 4.250E+08 | 0.000E-01 | 2.404E+08 | 7.873E+07 | 0.000E-01 | BONE |
| 10 | FE-59 | 3.200E+08 | 0.000E-01 | 3.970E+08 | 6.423E+08 | 0.000E-01 | 1.862E+09 | 6.688E+08 | 0.000E-01 | GI-LLI |
| 11 | CO-58 | 1.987E+08 | 0.000E-01 | 0.000E-01 | 6.490E+07 | 0.000E-01 | 0.000E-01 | 3.786E+08 | 0.000E-01 | GI-LLI |
| 12 | CO-60 | 1.116E+09 | 0.000E-01 | 0.000E-01 | 3.783E+08 | 0.000E-01 | 0.000E-01 | 2.095E+09 | 0.000E-01 | GI-LLI |
| 13 | NI-59 | 1.190E+08 | 0.000E-01 | 7.182E+08 | 2.463E+08 | 0.000E-01 | 0.000E-01 | 5.072E+07 | 0.000E-01 | BONE |
| 14 | NI-63 | 1.343E+09 | 0.000E-01 | 3.949E+10 | 2.114E+09 | 0.000E-01 | 0.000E-01 | 1.424E+08 | 0.000E-01 | BONE |
| 15 | NI-65 | 5.601E+00 | 0.000E-01 | 1.019E+02 | 9.595E+00 | 0.000E-01 | 0.000E-01 | 1.175E+03 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 6.561E+03 | 0.000E-01 | 0.000E-01 | 1.086E+04 | 2.624E+04 | 0.000E-01 | 5.098E+05 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 1.344E+09 | 0.000E-01 | 8.112E+08 | 2.161E+09 | 1.382E+09 | 0.000E-01 | 3.795E+08 | 0.000E-01 | LIVER |
| 18 | ZN-69 | 1.804E-06 | 0.000E-01 | 1.351E-05 | 1.952E-05 | 1.184E-05 | 0.000E-01 | 1.230E-03 | 0.000E-01 | GI-LLI |
| 19 | BR-83 | 5.334E+00 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 3.101E-11 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 2.767E+08 | 0.000E-01 | 0.000E-01 | 4.500E+08 | 0.000E-01 | 0.000E-01 | 2.895E+07 | 0.000E-01 | LIVER |
| 23 | RB-88 | 1.651E-22 | 0.000E-01 | 0.000E-01 | 2.376E-22 | 0.000E-01 | 0.000E-01 | 1.166E-23 | 0.000E-01 | LIVER |
| 24 | RB-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 25 | SR-89 | 1.025E+09 | 0.000E-01 | 3.590E+10 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.390E+09 | 0.000E-01 | BONE |
| 26 | SR-90 | 3.152E+11 | 0.000E-01 | 1.243E+12 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.675E+10 | 0.000E-01 | BONE |
| 27 | SR-91 | 1.953E+04 | 0.000E-01 | 5.175E+05 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.143E+06 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 2.821E+01 | 0.000E-01 | 7.038E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.333E+04 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 6.177E+02 | 0.000E-01 | 2.309E+04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 6.570E+07 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 3.063E-10 | 0.000E-01 | 8.417E-09 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.648E-05 | 0.000E-01 | GI-LLI |
| 31 | Y-91 | 4.990E+05 | 0.000E-01 | 1.866E+07 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.486E+09 | 0.000E-01 | GI-LLI |
| 32 | Y-92 | 4.430E-02 | 0.000E-01 | 1.548E+00 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 4.473E+04 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 8.164E+00 | 0.000E-01 | 2.973E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 4.434E+06 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 7.702E+05 | 0.000E-01 | 3.936E+06 | 8.652E+05 | 1.238E+06 | 0.000E-01 | 9.025E+08 | 0.000E-01 | GI-LLI |
| 35 | ZR-97 | 4.833E+01 | 0.000E-01 | 5.669E+02 | 8.191E+01 | 1.176E+02 | 0.000E-01 | 1.241E+07 | 0.000E-01 | GI-LLI |

* Units are (mrem/yr per uCi/$m^3$)

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : CHILD
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 1.141E+05 | 0.000E-01 | 4.101E+05 | 1.597E+05 | 1.500E+05 | 0.000E-01 | 2.953E+08 | 0.000E-01 | GI-LLI |
| 37 | NB-97 | 1.022E-07 | 0.000E-01 | 1.109E-06 | 2.799E-07 | 3.265E-07 | 0.000E-01 | 1.033E-03 | 0.000E-01 | GI-LLI |
| 38 | MO-99 | 1.903E+06 | 0.000E-01 | 0.000E-01 | 7.693E+06 | 1.643E+07 | 0.000E-01 | 6.362E+06 | 0.000E-01 | KIDNEY |
| 39 | TC-99M | 1.526E+02 | 0.000E-01 | 4.695E+00 | 9.208E+00 | 1.338E+02 | 4.675E+00 | 5.240E+03 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 41 | RU-103 | 5.959E+06 | 0.000E-01 | 1.550E+07 | 0.000E-01 | 3.902E+07 | 0.000E-01 | 4.008E+08 | 0.000E-01 | GI-LLI |
| 42 | RU-105 | 3.290E+01 | 0.000E-01 | 9.070E+01 | 0.000E-01 | 7.973E+02 | 0.000E-01 | 5.920E+04 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 9.308E+07 | 0.000E-01 | 7.459E+08 | 0.000E-01 | 1.007E+09 | 0.000E-01 | 1.160E+10 | 0.000E-01 | GI-LLI |
| 44 | AG-110M | 1.736E+07 | 0.000E-01 | 3.216E+07 | 2.172E+07 | 4.046E+07 | 0.000E-01 | 2.584E+09 | 0.000E-01 | GI-LLI |
| 45 | CD-115M | 1.359E+06 | 0.000E-01 | 0.000E-01 | 4.251E+07 | 3.373E+07 | 0.000E-01 | 1.789E+09 | 0.000E-01 | GI-LLI |
| 46 | SB-124 | 3.524E+07 | 2.156E+05 | 8.921E+07 | 1.686E+06 | 0.000E-01 | 6.921E+07 | 2.521E+09 | 0.000E-01 | GI-LLI |
| 47 | TE-125M | 4.683E+07 | 9.859E+07 | 3.512E+08 | 9.520E+07 | 0.000E-01 | 0.000E-01 | 3.389E+08 | 0.000E-01 | BONE |
| 48 | TE-127M | 1.569E+08 | 3.161E+08 | 1.322E+09 | 3.559E+08 | 3.769E+09 | 0.000E-01 | 1.070E+09 | 0.000E-01 | KIDNEY |
| 49 | TE-127 | 2.120E+03 | 6.843E+03 | 9.887E+03 | 2.664E+03 | 2.813E+04 | 0.000E-01 | 3.862E+05 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 1.297E+08 | 2.693E+08 | 8.354E+08 | 2.333E+08 | 2.453E+09 | 0.000E-01 | 1.019E+09 | 0.000E-01 | KIDNEY |
| 51 | TE-129 | 3.215E-04 | 9.664E-04 | 1.355E-03 | 3.781E-04 | 3.963E-03 | 0.000E-01 | 8.431E-02 | 0.000E-01 | GI-LLI |
| 52 | TE-131M | 5.658E+05 | 1.093E+06 | 1.537E+06 | 5.316E+05 | 5.146E+06 | 0.000E-01 | 2.156E+07 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 7.003E-16 | 1.800E-15 | 2.353E-15 | 7.174E-16 | 7.117E-15 | 0.000E-01 | 1.236E-14 | 0.000E-01 | GI-LLI |
| 54 | TE-132 | 3.727E+06 | 4.494E+06 | 6.972E+06 | 3.086E+06 | 2.865E+07 | 0.000E-01 | 3.106E+07 | 0.000E-01 | GI-LLI |
| 55 | I-130 | 6.443E+05 | 1.378E+08 | 6.189E+05 | 1.251E+06 | 1.869E+06 | 0.000E-01 | 5.850E+05 | 0.000E-01 | THYROID |
| 56 | I-131 | 8.175E+07 | 4.757E+10 | 1.430E+08 | 1.439E+08 | 2.362E+08 | 0.000E-01 | 1.281E+07 | 0.000E-01 | THYROID |
| 57 | I-132 | 7.181E+01 | 7.245E+03 | 8.498E+01 | 1.562E+02 | 2.390E+02 | 0.000E-01 | 1.838E+02 | 0.000E-01 | THYROID |
| 58 | I-133 | 1.649E+06 | 8.094E+08 | 3.523E+06 | 4.356E+06 | 7.261E+06 | 0.000E-01 | 1.756E+06 | 0.000E-01 | THYROID |
| 59 | I-134 | 1.173E-04 | 5.864E-03 | 1.373E-04 | 2.549E-04 | 3.898E-04 | 0.000E-01 | 1.690E-04 | 0.000E-01 | THYROID |
| 60 | I-135 | 5.220E+04 | 9.774E+06 | 6.130E+04 | 1.103E+05 | 1.692E+05 | 0.000E-01 | 8.407E+04 | 0.000E-01 | THYROID |
| 61 | CS-134 | 5.549E+09 | 0.000E-01 | 1.603E+10 | 2.631E+10 | 8.152E+09 | 2.925E+09 | 1.418E+08 | 0.000E-01 | LIVER |
| 62 | CS-136 | 1.434E+08 | 0.000E-01 | 8.062E+07 | 2.216E+08 | 1.180E+08 | 1.760E+07 | 7.787E+06 | 0.000E-01 | LIVER |
| 63 | CS-137 | 3.380E+09 | 0.000E-01 | 2.392E+10 | 2.290E+10 | 7.462E+09 | 2.685E+09 | 1.434E+08 | 0.000E-01 | BONE |
| 64 | CS-138 | 5.375E-11 | 0.000E-01 | 6.097E-11 | 8.476E-11 | 5.963E-11 | 6.417E-12 | 3.904E-11 | 0.000E-01 | LIVER |
| 65 | CS-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 66 | BA-139 | 1.360E-03 | 0.000E-01 | 4.693E-02 | 2.505E-05 | 2.188E-05 | 1.474E-05 | 2.709E+00 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 1.611E+07 | 0.000E-01 | 2.761E+08 | 2.419E+05 | 7.875E+04 | 1.442E+05 | 1.399E+08 | 0.000E-01 | BONE |
| 68 | BA-141 | 5.638E-23 | 0.000E-01 | 1.732E-21 | 9.699E-25 | 8.392E-25 | 5.698E-24 | 9.872E-22 | 0.000E-01 | BONE |
| 69 | BA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 70 | LA-140 | 3.535E+02 | 0.000E-01 | 3.246E+03 | 1.134E+03 | 0.000E-01 | 0.000E-01 | 3.162E+07 | 0.000E-01 | GI-LLI |

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : CHILD
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 2.209E-05 | 0.000E-01 | 2.213E-04 | 7.054E-05 | 0.000E-01 | 0.000E-01 | 1.398E+01 | 0.000E-01 | GI-LLI |
| 72 | CE-141 | 4.854E+04 | 0.000E-01 | 6.555E+05 | 3.269E+05 | 1.433E+05 | 0.000E-01 | 4.070E+09 | 0.000E-01 | GI-LLI |
| 73 | CE-143 | 1.347E+02 | 0.000E-01 | 1.715E+03 | 9.300E+05 | 3.902E+02 | 0.000E-01 | 1.362E+07 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 6.780E+06 | 0.000E-01 | 1.270E+08 | 3.982E+07 | 2.205E+07 | 0.000E-01 | 1.038E+10 | 0.000E-01 | GI-LLI |
| 75 | PR-143 | 7.216E+03 | 0.000E-01 | 1.454E+05 | 4.367E+04 | 2.365E+04 | 0.000E-01 | 1.569E+08 | 0.000E-01 | GI-LLI |
| 76 | PR-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.632E-23 | 0.000E-01 | GI-LLI |
| 77 | ND-147 | 4.479E+03 | 0.000E-01 | 7.140E+04 | 5.783E+04 | 3.173E+04 | 0.000E-01 | 9.161E+07 | 0.000E-01 | GI-LLI |
| 78 | W-185 | 5.279E+05 | 0.000E-01 | 1.509E+07 | 5.019E+06 | 0.000E-01 | 0.000E-01 | 5.800E+08 | 0.000E-01 | GI-LLI |
| 79 | W-187 | 1.711E+04 | 0.000E-01 | 6.439E+04 | 3.813E+04 | 0.000E-01 | 0.000E-01 | 5.359E+06 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 3.573E+09 | 0.000E-01 | 5.895E+10 | 0.000E-01 | 1.375E+10 | 0.000E-01 | 5.741E+09 | 0.000E-01 | BONE |
| 81 | U-238 | 3.345E+09 | 0.000E-01 | 5.638E+10 | 0.000E-01 | 1.286E+10 | 0.000E-01 | 1.220E+10 | 0.000E-01 | BONE |
| 82 | NP-239 | 1.281E+02 | 0.000E-01 | 2.544E+03 | 1.827E+02 | 5.282E+02 | 0.000E-01 | 1.352E+07 | 0.000E-01 | GI-LLI |

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : INFANT
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3* | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 2 | C-14* | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 3 | NA-24 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 4 | P-32 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 5 | SC-46 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 6 | CR-51 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 7 | MN-54 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 8 | MN-56 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 9 | FE-55 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 10 | FE-59 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 11 | CO-58 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 12 | CO-60 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 13 | NI-59 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 14 | NI-63 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 15 | NI-65 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 16 | CU-64 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 17 | ZN-65 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 18 | ZN-69 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 19 | BR-83 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 23 | RB-88 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 24 | RB-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 25 | SR-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 26 | SR-90 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 27 | SR-91 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 28 | SR-92 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 29 | Y-90 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 30 | Y-91M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 31 | Y-91 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 32 | Y-92 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 33 | Y-93 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 34 | ZR-95 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 35 | ZR-97 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |

* Units are (mrem/yr per uCi/$m^3$)

## TABLE G-2 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : INFANT
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 37 | NB-97 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 38 | MO-99 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 39 | TC-99M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 40 | TC-101 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 41 | RU-103 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 42 | RU-105 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 43 | RU-106 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 44 | AG-110M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 45 | CD-115M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 46 | SB-124 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 47 | TE-125M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 48 | TE-127M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 49 | TE-127 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 50 | TE-129M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 51 | TE-129 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 52 | TE-131M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 53 | TE-131 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 54 | TE-132 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 55 | I-130 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 56 | I-131 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 57 | I-132 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 58 | I-133 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 59 | I-134 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 60 | I-135 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 61 | CS-134 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 62 | CS-136 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 63 | CS-137 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 64 | CS-138 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 65 | CS-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 66 | BA-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 67 | BA-140 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 68 | BA-141 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 69 | BA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 70 | LA-140 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |

**TABLE G-2 (CONT)**

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : INFANT
PATHWAY : VEGETATION

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 72 | CE-141 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 73 | CE-143 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 74 | CE-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 75 | PR-143 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 76 | PR-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 77 | ND-147 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 78 | W-185 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 79 | W-187 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 80 | U-235 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 81 | U-238 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 82 | NP-239 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |

**TABLE** G-3

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ADULT
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3* | 7.629E+02 | 7.629E+02 | 0.000E-01 | 7.629E+02 | 7.629E+02 | 7.629E+02 | 7.629E+02 | 7.629E+02 | W. BODY |
| 2 | C-14 | 7.263E+04 | 7.263E+04 | 3.632E+05 | 7.263E+04 | 7.263E+04 | 7.263E+04 | 7.263E+04 | 7.263E+04 | BONE |
| 3 | NA-24 | 2.459E+06 | 2.459E+06 | 2.459E+06 | 2.459E+06 | 2.459E+06 | 2.459E+06 | 2.459E+06 | 0.000E-01 | W. BODY |
| 4 | P-32 | 6.610E+08 | 0.000E-01 | 1.710E+10 | 1.063E+09 | 0.000E-01 | 0.000E-01 | 1.923E+09 | 0.000E-01 | BONE |
| 5 | SC-46 | 1.013E+02 | 0.000E-01 | 1.794E+02 | 3.517E+02 | 3.256E+02 | 0.000E-01 | 1.697E+06 | 0.000E-01 | GI-LLI |
| 6 | CR-51 | 2.860E+04 | 1.709E+04 | 0.000E-01 | 0.000E-01 | 6.300E+03 | 3.795E+04 | 7.193E+06 | 0.000E-01 | GI-LLI |
| 7 | MN-54 | 1.605E+06 | 0.000E-01 | 0.000E-01 | 8.414E+06 | 2.504E+06 | 0.000E-01 | 2.577E+07 | 0.000E-01 | GI-LLI |
| 8 | MN-56 | 7.324E-04 | 0.000E-01 | 0.000E-01 | 4.129E-03 | 5.242E-03 | 0.000E-01 | 1.318E-01 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 4.045E+06 | 0.000E-01 | 2.511E+07 | 1.735E+07 | 0.000E-01 | 9.680E+06 | 9.954E+06 | 0.000E-01 | BONE |
| 10 | FE-59 | 2.675E+07 | 0.000E-01 | 2.969E+07 | 6.978E+07 | 0.000E-01 | 1.950E+07 | 2.326E+08 | 0.000E-01 | GI-LLI |
| 11 | CO-58 | 1.059E+07 | 0.000E-01 | 0.000E-01 | 4.724E+06 | 0.000E-01 | 0.000E-01 | 9.575E+07 | 0.000E-01 | GI-LLI |
| 12 | CO-60 | 3.619E+07 | 0.000E-01 | 0.000E-01 | 1.641E+07 | 0.000E-01 | 0.000E-01 | 3.032E+08 | 0.000E-01 | GI-LLI |
| 13 | NI-59 | 8.441E+07 | 0.000E-01 | 5.059E+08 | 1.735E+08 | 0.000E-01 | 0.000E-01 | 3.573E+07 | 0.000E-01 | BONE |
| 14 | NI-63 | 2.257E+08 | 0.000E-01 | 6.729E+09 | 4.664E+08 | 0.000E-01 | 0.000E-01 | 9.731E+07 | 0.000E-01 | BONE |
| 15 | NI-65 | 2.195E-02 | 0.000E-01 | 3.702E-01 | 4.810E-02 | 0.000E-01 | 0.000E-01 | 1.220E+00 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 1.108E+04 | 0.000E-01 | 0.000E-01 | 2.361E+04 | 5.952E+04 | 0.000E-01 | 2.012E+06 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 1.972E+09 | 0.000E-01 | 1.371E+09 | 4.363E+09 | 2.918E+09 | 0.000E-01 | 2.748E+09 | 0.000E-01 | LIVER |
| 18 | ZN-69 | 6.506E-13 | 0.000E-01 | 4.892E-12 | 9.356E-12 | 6.079E-12 | 0.000E-01 | 1.406E-12 | 0.000E-01 | LIVER |
| 19 | BR-83 | 1.020E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.469E-01 | 0.000E-01 | GI-LLI |
| 20 | BR-84 | 1.419E-23 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.114E-28 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 1.207E+09 | 0.000E-01 | 0.000E-01 | 2.591E+09 | 0.000E-01 | 0.000E-01 | 5.109E+08 | 0.000E-01 | LIVER |
| 23 | RB-88 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 24 | RB-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 25 | SR-89 | 4.162E+07 | 0.000E-01 | 1.450E+09 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.326E+08 | 0.000E-01 | BONE |
| 26 | SR-90 | 1.148E+10 | 0.000E-01 | 4.680E+10 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.352E+09 | 0.000E-01 | BONE |
| 27 | SR-91 | 1.160E+03 | 0.000E-01 | 2.872E+04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.368E+05 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 2.092E-02 | 0.000E-01 | 4.836E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 9.582E+00 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 1.903E+00 | 0.000E-01 | 7.096E+01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 7.524E+05 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 2.485E-21 | 0.000E-01 | 6.418E-20 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.885E-19 | 0.000E-01 | GI-LLI |
| 31 | Y-91 | 2.296E+02 | 0.000E-01 | 8.589E+03 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 4.727E+06 | 0.000E-01 | GI-LLI |
| 32 | Y-92 | 1.628E-06 | 0.000E-01 | 5.568E-05 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 9.753E-01 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 6.398E-03 | 0.000E-01 | 2.317E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 7.349E+03 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 2.059E+02 | 0.000E-01 | 9.483E+02 | 3.041E+02 | 4.773E+02 | 0.000E-01 | 9.639E+05 | 0.000E-01 | GI-LLI |
| 35 | ZR-97 | 3.989E-02 | 0.000E-01 | 4.323E-01 | 8.724E-02 | 1.318E-01 | 0.000E-01 | 2.702E+04 | 0.000E-01 | GI-LLI |

* Units are (mrem/yr per uCi/$m^3$)

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ADULT
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 2.468E+04 | 0.000E-01 | 8.253E+04 | 4.591E+04 | 4.538E+04 | 0.000E-01 | 2.786E+08 | 0.000E-01 | GI-LLI |
| 37 | NB-97 | 5.419E-13 | 0.000E-01 | 5.880E-12 | 1.484E-12 | 1.731E-12 | 0.000E-01 | 5.475E-09 | 0.000E-01 | GI-LLI |
| 38 | MO-99 | 4.705E+06 | 0.000E-01 | 0.000E-01 | 2.473E+07 | 5.600E+07 | 0.000E-01 | 5.732E+07 | 0.000E-01 | GI-LLI |
| 39 | TC-99M | 1.216E+02 | 0.000E-01 | 3.378E+00 | 9.545E+00 | 1.450E+02 | 4.677E+00 | 5.648E+03 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 41 | RU-103 | 4.398E+02 | 0.000E-01 | 1.021E+03 | 0.000E-01 | 3.896E+03 | 0.000E-01 | 1.192E+05 | 0.000E-01 | GI-LLI |
| 42 | RU-105 | 3.425E-04 | 0.000E-01 | 8.676E-04 | 0.000E-01 | 1.121E-02 | 0.000E-01 | 5.307E-01 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 2.582E+03 | 0.000E-01 | 2.040E+04 | 0.000E-01 | 3.939E+04 | 0.000E-01 | 1.321E+06 | 0.000E-01 | GI-LLI |
| 44 | AG-110M | 3.200E+07 | 0.000E-01 | 5.825E+07 | 5.388E+07 | 1.059E+08 | 0.000E-01 | 2.199E+10 | 0.000E-01 | GI-LLI |
| 45 | CD-115M | 3.981E+04 | 0.000E-01 | 0.000E-01 | 1.246E+06 | 9.884E+05 | 0.000E-01 | 5.240E+07 | 0.000E-01 | GI-LLI |
| 46 | SB-124 | 1.021E+07 | 6.243E+04 | 2.584E+07 | 4.873E+05 | 0.000E-01 | 2.005E+07 | 7.310E+08 | 0.000E-01 | GI-LLI |
| 47 | TE-125M | 2.183E+06 | 4.902E+06 | 1.630E+07 | 5.905E+06 | 6.629E+07 | 0.000E-01 | 6.507E+07 | 0.000E-01 | KIDNEY |
| 48 | TE-127M | 5.579E+06 | 1.170E+07 | 4.578E+07 | 1.636E+07 | 1.860E+08 | 0.000E-01 | 1.535E+08 | 0.000E-01 | KIDNEY |
| 49 | TE-127 | 1.442E+02 | 4.937E+02 | 6.663E+02 | 2.393E+02 | 2.714E+03 | 0.000E-01 | 5.259E+04 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 9.511E+06 | 2.064E+07 | 6.009E+07 | 2.242E+07 | 2.508E+08 | 0.000E-01 | 3.026E+08 | 0.000E-01 | GI-LLI |
| 51 | TE-129 | 8.203E-11 | 2.584E-10 | 3.367E-10 | 1.265E-10 | 1.415E-09 | 0.000E-01 | 2.541E-10 | 0.000E-01 | KIDNEY |
| 52 | TE-131M | 1.470E+05 | 2.795E+05 | 3.608E+05 | 1.764E+05 | 1.787E+06 | 0.000E-01 | 1.752E+07 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.913E-32 | 0.000E-01 | 0.000E-01 | 0.000E-01 | KIDNEY |
| 54 | TE-132 | 1.452E+06 | 1.709E+06 | 2.392E+06 | 1.547E+06 | 1.490E+07 | 0.000E-01 | 7.319E+07 | 0.000E-01 | GI-LLI |
| 55 | I-130 | 4.980E+05 | 1.070E+08 | 4.278E+05 | 1.262E+06 | 1.969E+06 | 0.000E-01 | 1.086E+06 | 0.000E-01 | THYROID |
| 56 | I-131 | 2.428E+08 | 1.389E+11 | 2.963E+08 | 4.237E+08 | 7.264E+08 | 0.000E-01 | 1.118E+08 | 0.000E-01 | THYROID |
| 57 | I-132 | 1.405E-01 | 1.405E+01 | 1.501E-01 | 4.015E-01 | 6.397E-01 | 0.000E-01 | 7.543E-02 | 0.000E-01 | THYROID |
| 58 | I-133 | 2.056E+06 | 9.910E+08 | 3.877E+06 | 6.743E+06 | 1.177E+07 | 0.000E-01 | 6.041E+06 | 0.000E-01 | THYROID |
| 59 | I-134 | 1.834E-12 | 8.885E-11 | 1.887E-12 | 5.128E-12 | 8.155E-12 | 0.000E-01 | 4.469E-15 | 0.000E-01 | THYROID |
| 60 | I-135 | 1.222E+04 | 2.184E+06 | 1.265E+04 | 3.312E+04 | 5.311E+04 | 0.000E-01 | 3.741E+04 | 0.000E-01 | THYROID |
| 61 | CS-134 | 1.100E+10 | 0.000E-01 | 5.652E+09 | 1.345E+10 | 4.353E+09 | 1.445E+09 | 2.354E+08 | 0.000E-01 | LIVER |
| 62 | CS-136 | 7.425E+08 | 0.000E-01 | 2.613E+08 | 1.032E+09 | 5.739E+08 | 7.867E+07 | 1.172E+08 | 0.000E-01 | LIVER |
| 63 | CS-137 | 6.813E+09 | 0.000E-01 | 7.381E+09 | 1.009E+10 | 3.427E+09 | 1.139E+09 | 1.954E+08 | 0.000E-01 | LIVER |
| 64 | CS-138 | 1.013E-23 | 0.000E-01 | 1.036E-23 | 2.045E-23 | 1.503E-23 | 1.484E-24 | 8.724E-29 | 0.000E-01 | LIVER |
| 65 | CS-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 66 | BA-139 | 1.298E-09 | 0.000E-01 | 4.434E-08 | 3.159E-11 | 2.953E-11 | 1.792E-11 | 7.863E-08 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 1.760E+06 | 0.000E-01 | 2.686E+07 | 3.374E+04 | 1.147E+04 | 1.932E+04 | 5.531E+07 | 0.000E-01 | GI-LLI |
| 68 | BA-141 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 69 | BA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 70 | LA-140 | 6.025E-01 | 0.000E-01 | 4.523E+00 | 2.280E+00 | 0.000E-01 | 0.000E-01 | 1.674E+05 | 0.000E-01 | GI-LLI |

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ADULT
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 1.038E-12 | 0.000E-01 | 9.161E-12 | 4.165E-12 | 0.000E-01 | 0.000E-01 | 3.042E-08 | 0.000E-01 | GI-LLI |
| 72 | CE-141 | 3.715E+02 | 0.000E-01 | 4.844E+03 | 3.276E+03 | 1.521E+03 | 0.000E-01 | 1.252E+07 | 0.000E-01 | GI-LLI |
| 73 | CE-143 | 3.406E+00 | 0.000E-01 | 4.162E+01 | 3.078E+04 | 1.355E+01 | 0.000E-01 | 1.150E+06 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 1.920E+04 | 0.000E-01 | 3.577E+05 | 1.495E+05 | 8.868E+04 | 0.000E-01 | 1.209E+08 | 0.000E-01 | GI-LLI |
| 75 | PR-143 | 7.823E+00 | 0.000E-01 | 1.578E+02 | 6.331E+01 | 3.654E+01 | 0.000E-01 | 6.914E+05 | 0.000E-01 | GI-LLI |
| 76 | PR-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 77 | ND-147 | 6.509E+00 | 0.000E-01 | 9.412E+01 | 1.088E+02 | 6.359E+01 | 0.000E-01 | 5.222E+05 | 0.000E-01 | GI-LLI |
| 78 | W-185 | 4.539E+04 | 0.000E-01 | 1.298E+06 | 4.315E+05 | 0.000E-01 | 0.000E-01 | 4.987E+07 | 0.000E-01 | GI-LLI |
| 79 | W-187 | 1.915E+03 | 0.000E-01 | 6.551E+03 | 5.476E+03 | 0.000E-01 | 0.000E-01 | 1.794E+06 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 1.878E+08 | 0.000E-01 | 3.099E+09 | 0.000E-01 | 7.226E+08 | 0.000E-01 | 3.018E+08 | 0.000E-01 | BONE |
| 81 | U-238 | 1.758E+08 | 0.000E-01 | 2.964E+09 | 0.000E-01 | 6.763E+08 | 0.000E-01 | 6.415E+08 | 0.000E-01 | BONE |
| 82 | NP-239 | 1.979E-01 | 0.000E-01 | 3.652E+00 | 3.591E-01 | 1.120E+00 | 0.000E-01 | 7.365E+04 | 0.000E-01 | GI-LLI |

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : TEEN
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3 * | 9.938E+02 | 9.938E+02 | 0.000E-01 | 9.938E+02 | 9.938E+02 | 9.938E+02 | 9.938E+02 | 9.938E+02 | W. BODY |
| 2 | C-14 | 1.340E+05 | 1.340E+05 | 6.699E+05 | 1.340E+05 | 1.340E+05 | 1.340E+05 | 1.340E+05 | 1.340E+05 | BONE |
| 3 | NA-24 | 4.294E+06 | 4.294E+06 | 4.294E+06 | 4.294E+06 | 4.294E+06 | 4.294E+06 | 4.294E+06 | 0.000E-01 | W. BODY |
| 4 | P-32 | 1.223E+09 | 0.000E-01 | 3.155E+10 | 1.955E+09 | 0.000E-01 | 0.000E-01 | 2.652E+09 | 0.000E-01 | BONE |
| 5 | SC-46 | 1.307E+02 | 0.000E-01 | 2.315E+02 | 4.538E+02 | 4.202E+02 | 0.000E-01 | 2.189E+06 | 0.000E-01 | GI-LLI |
| 6 | CR-51 | 4.994E+04 | 2.775E+04 | 0.000E-01 | 0.000E-01 | 1.095E+04 | 7.131E+04 | 8.393E+06 | 0.000E-01 | GI-LLI |
| 7 | MN-54 | 2.779E+06 | 0.000E-01 | 0.000E-01 | 1.402E+07 | 4.181E+06 | 0.000E-01 | 2.874E+07 | 0.000E-01 | GI-LLI |
| 8 | MN-56 | 1.302E-03 | 0.000E-01 | 0.000E-01 | 7.320E-03 | 9.265E-03 | 0.000E-01 | 4.819E-01 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 7.364E+06 | 0.000E-01 | 4.454E+07 | 3.158E+07 | 0.000E-01 | 2.003E+07 | 1.367E+07 | 0.000E-01 | BONE |
| 10 | FE-59 | 4.670E+07 | 0.000E-01 | 5.182E+07 | 1.209E+08 | 0.000E-01 | 3.813E+07 | 2.860E+08 | 0.000E-01 | GI-LLI |
| 11 | CO-58 | 1.833E+07 | 0.000E-01 | 0.000E-01 | 7.953E+06 | 0.000E-01 | 0.000E-01 | 1.096E+08 | 0.000E-01 | GI-LLI |
| 12 | CO-60 | 6.262E+07 | 0.000E-01 | 0.000E-01 | 2.780E+07 | 0.000E-01 | 0.000E-01 | 3.621E+08 | 0.000E-01 | GI-LLI |
| 13 | NI-59 | 1.089E+08 | 0.000E-01 | 6.528E+08 | 2.238E+08 | 0.000E-01 | 0.000E-01 | 4.610E+07 | 0.000E-01 | BONE |
| 14 | NI-63 | 4.007E+08 | 0.000E-01 | 1.182E+10 | 8.348E+08 | 0.000E-01 | 0.000E-01 | 1.329E+08 | 0.000E-01 | BONE |
| 15 | NI-65 | 3.945E-02 | 0.000E-01 | 6.777E-01 | 8.659E-02 | 0.000E-01 | 0.000E-01 | 4.496E+00 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 1.979E+04 | 0.000E-01 | 0.000E-01 | 4.206E+04 | 1.064E+05 | 0.000E-01 | 3.262E+06 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 3.411E+09 | 0.000E-01 | 2.106E+09 | 7.312E+09 | 4.680E+09 | 0.000E-01 | 3.097E+09 | 0.000E-01 | LIVER |
| 18 | ZN-69 | 1.201E-12 | 0.000E-01 | 9.008E-12 | 1.716E-11 | 1.121E-11 | 0.000E-01 | 3.162E-11 | 0.000E-01 | GI-LLI |
| 19 | BR-83 | 1.879E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 2.537E-23 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 2.219E+09 | 0.000E-01 | 0.000E-01 | 4.723E+09 | 0.000E-01 | 0.000E-01 | 6.989E+08 | 0.000E-01 | LIVER |
| 23 | RB-88 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 24 | RB-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 25 | SR-89 | 7.655E+07 | 0.000E-01 | 2.673E+09 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 3.184E+08 | 0.000E-01 | BONE |
| 26 | SR-90 | 1.633E+10 | 0.000E-01 | 6.612E+10 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.856E+09 | 0.000E-01 | BONE |
| 27 | SR-91 | 2.090E+03 | 0.000E-01 | 5.274E+04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.392E+05 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 3.773E-02 | 0.000E-01 | 8.852E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.255E+01 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 3.512E+00 | 0.000E-01 | 1.304E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.075E+06 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 4.492E-21 | 0.000E-01 | 1.175E-19 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 5.548E-18 | 0.000E-01 | GI-LLI |
| 31 | Y-91 | 4.236E+02 | 0.000E-01 | 1.590E+04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 6.476E+06 | 0.000E-01 | GI-LLI |
| 32 | Y-92 | 2.976E-06 | 0.000E-01 | 1.029E-04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.823E+00 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 1.171E-02 | 0.000E-01 | 4.273E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.305E+04 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 3.598E+02 | 0.000E-01 | 1.650E+03 | 5.233E+02 | 4.065E+09 | 0.000E-01 | 1.209E+06 | 0.000E-01 | KIDNEY |
| 35 | ZR-97 | 7.172E-02 | 0.000E-01 | 7.870E-01 | 1.557E-01 | 2.361E-01 | 0.000E-01 | 4.217E+04 | 0.000E-01 | GI-LLI |

* Units are (mrem/yr per uCi/$m^3$)

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : TEEN
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 4.297E+04 | 0.000E-01 | 1.407E+05 | 7.807E+04 | 7.567E+04 | 0.000E-01 | 3.339E+08 | 0.000E-01 | GI-LLI |
| 37 | NB-97 | 6.992E-13 | 0.000E-01 | 7.587E-12 | 1.915E-12 | 2.234E-12 | 0.000E-01 | 7.064E-09 | 0.000E-01 | GI-LLI |
| 38 | MO-99 | 8.514E+06 | 0.000E-01 | 0.000E-01 | 4.464E+07 | 1.022E+08 | 0.000E-01 | 7.996E+07 | 0.000E-01 | KIDNEY |
| 39 | TC-99M | 2.117E+02 | 0.000E-01 | 5.858E+00 | 1.634E+01 | 2.435E+02 | 9.070E+00 | 1.073E+04 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 41 | RU-103 | 7.761E+02 | 0.000E-01 | 1.816E+03 | 0.000E-01 | 6.401E+03 | 0.000E-01 | 1.517E+05 | 0.000E-01 | GI-LLI |
| 42 | RU-105 | 6.150E-04 | 0.000E-01 | 1.585E-03 | 0.000E-01 | 1.999E-02 | 0.000E-01 | 1.279E+00 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 4.729E+03 | 0.000E-01 | 3.752E+04 | 0.000E-01 | 7.237E+04 | 0.000E-01 | 1.800E+06 | 0.000E-01 | GI-LLI |
| 44 | AG-110M | 5.543E+07 | 0.000E-01 | 9.629E+07 | 9.113E+07 | 1.738E+08 | 0.000E-01 | 2.560E+10 | 0.000E-01 | GI-LLI |
| 45 | CD-115M | 5.136E+04 | 0.000E-01 | 0.000E-01 | 1.607E+06 | 1.275E+06 | 0.000E-01 | 6.761E+07 | 0.000E-01 | GI-LLI |
| 46 | SB-124 | 1.317E+07 | 8.056E+04 | 3.334E+07 | 6.288E+05 | 0.000E-01 | 2.586E+07 | 9.432E+08 | 0.000E-01 | GI-LLI |
| 47 | TE-125M | 4.018E+06 | 8.397E+06 | 3.006E+07 | 1.083E+07 | 0.000E-01 | 0.000E-01 | 8.867E+07 | 0.000E-01 | GI-LLI |
| 48 | TE-127M | 1.003E+07 | 2.007E+07 | 8.438E+07 | 2.993E+07 | 3.420E+08 | 0.000E-01 | 2.103E+08 | 0.000E-01 | KIDNEY |
| 49 | TE-127 | 2.658E+02 | 8.520E+02 | 1.235E+03 | 4.377E+02 | 5.003E+03 | 0.000E-01 | 9.536E+04 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 1.740E+07 | 3.547E+07 | 1.099E+08 | 4.079E+07 | 4.599E+08 | 0.000E-01 | 4.127E+08 | 0.000E-01 | KIDNEY |
| 51 | TE-129 | 1.508E-10 | 4.428E-10 | 6.199E-10 | 2.311E-10 | 2.601E-09 | 0.000E-01 | 3.390E-09 | 0.000E-01 | GI-LLI |
| 52 | TE-131M | 2.627E+05 | 4.736E+05 | 6.566E+05 | 3.149E+05 | 3.283E+06 | 0.000E-01 | 2.527E+07 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 3.490E-32 | 0.000E-01 | 0.000E-01 | 0.000E-01 | KIDNEY |
| 54 | TE-132 | 2.548E+06 | 2.851E+06 | 4.275E+06 | 2.707E+06 | 2.597E+07 | 0.000E-01 | 8.574E+07 | 0.000E-01 | GI-LLI |
| 55 | I-130 | 8.689E+05 | 1.774E+08 | 7.521E+05 | 2.176E+06 | 3.351E+06 | 0.000E-01 | 1.672E+06 | 0.000E-01 | THYROID |
| 56 | I-131 | 4.043E+08 | 2.196E+11 | 5.376E+08 | 7.526E+08 | 1.296E+09 | 0.000E-01 | 1.489E+08 | 0.000E-01 | THYROID |
| 57 | I-132 | 2.500E-01 | 2.347E+01 | 2.662E-01 | 6.965E-01 | 1.097E+00 | 0.000E-01 | 3.034E-01 | 0.000E-01 | THYROID |
| 58 | I-133 | 3.663E+06 | 1.677E+09 | 7.080E+06 | 1.201E+07 | 2.106E+07 | 0.000E-01 | 9.088E+06 | 0.000E-01 | THYROID |
| 59 | I-134 | 3.194E-12 | 1.482E-10 | 3.355E-12 | 8.892E-12 | 1.402E-11 | 0.000E-01 | 1.172E-13 | 0.000E-01 | THYROID |
| 60 | I-135 | 2.144E+04 | 3.721E+06 | 2.248E+04 | 5.705E+04 | 9.137E+04 | 0.000E-01 | 6.411E+04 | 0.000E-01 | THYROID |
| 61 | CS-134 | 1.072E+10 | 0.000E-01 | 9.815E+09 | 2.310E+10 | 7.340E+09 | 2.802E+09 | 2.873E+08 | 0.000E-01 | LIVER |
| 62 | CS-136 | 1.176E+09 | 0.000E-01 | 4.449E+08 | 1.750E+09 | 9.529E+08 | 1.502E+08 | 1.409E+08 | 0.000E-01 | LIVER |
| 63 | CS-137 | 6.202E+09 | 0.000E-01 | 1.338E+10 | 1.781E+10 | 6.059E+09 | 2.354E+09 | 2.533E+08 | 0.000E-01 | LIVER |
| 64 | CS-138 | 1.804E-23 | 0.000E-01 | 1.879E-23 | 3.607E-23 | 2.663E-23 | 3.099E-24 | 1.637E-26 | 0.000E-01 | LIVER |
| 65 | CS-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 66 | BA-139 | 2.389E-09 | 0.000E-01 | 8.199E-08 | 5.769E-11 | 5.438E-11 | 3.976E-11 | 7.314E-07 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 3.124E+06 | 0.000E-01 | 4.849E+07 | 5.941E+04 | 2.015E+04 | 3.995E+04 | 7.478E+07 | 0.000E-01 | GI-LLI |
| 68 | BA-141 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 69 | BA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 70 | LA-140 | 1.062E+00 | 0.000E-01 | 8.124E+00 | 3.992E+00 | 0.000E-01 | 0.000E-01 | 2.292E+05 | 0.000E-01 | GI-LLI |

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : TEEN
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 1.828E-12 | 0.000E-01 | 1.653E-11 | 7.341E-12 | 0.000E-01 | 0.000E-01 | 2.235E-07 | 0.000E-01 | GI-LLI |
| 72 | CE-141 | 6.811E+02 | 0.000E-01 | 8.881E+03 | 5.929E+03 | 2.791E+03 | 0.000E-01 | 1.696E+07 | 0.000E-01 | GI-LLI |
| 73 | CE-143 | 6.217E+00 | 0.000E-01 | 7.649E+01 | 5.566E+04 | 2.497E+01 | 0.000E-01 | 1.673E+06 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 3.537E+04 | 0.000E-01 | 6.582E+05 | 2.724E+05 | 1.627E+05 | 0.000E-01 | 1.655E+08 | 0.000E-01 | GI-LLI |
| 75 | PR-143 | 1.443E+01 | 0.000E-01 | 2.900E+02 | 1.158E+02 | 6.730E+01 | 0.000E-01 | 9.541E+05 | 0.000E-01 | GI-LLI |
| 76 | PR-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 77 | ND-147 | 1.180E+01 | 0.000E-01 | 1.811E+02 | 1.969E+02 | 1.157E+02 | 0.000E-01 | 7.105E+05 | 0.000E-01 | GI-LLI |
| 78 | W-185 | 5.857E+04 | 0.000E-01 | 1.675E+06 | 5.568E+05 | 0.000E-01 | 0.000E-01 | 6.434E+07 | 0.000E-01 | GI-LLI |
| 79 | W-187 | 3.422E+03 | 0.000E-01 | 1.198E+04 | 9.767E+03 | 0.000E-01 | 0.000E-01 | 2.643E+06 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 2.423E+08 | 0.000E-01 | 3.999E+09 | 0.000E-01 | 9.324E+08 | 0.000E-01 | 3.894E+08 | 0.000E-01 | BONE |
| 81 | U-238 | 2.269E+08 | 0.000E-01 | 3.824E+09 | 0.000E-01 | 8.726E+08 | 0.000E-01 | 8.277E+08 | 0.000E-01 | BONE |
| 82 | NP-239 | 3.651E-01 | 0.000E-01 | 6.969E+00 | 6.573E-01 | 2.063E+00 | 0.000E-01 | 1.057E+05 | 0.000E-01 | GI-LLI |

**TABLE G-3 (CONT)**

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : CHILD
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3* | 1.570E+03 | 1.570E+03 | 0.000E-01 | 1.570E+03 | 1.570E+03 | 1.570E+03 | 1.570E+03 | 1.570E+03 | W. BODY |
| 2 | C-14 | 3.294E+05 | 3.294E+05 | 1.647E+06 | 3.294E+05 | 3.294E+05 | 3.294E+05 | 3.294E+05 | 3.294E+05 | BONE |
| 3 | NA-24 | 8.932E+06 | 8.932E+06 | 8.932E+06 | 8.932E+06 | 8.932E+06 | 8.932E+06 | 8.932E+06 | 0.000E-01 | W. BODY |
| 4 | P-32 | 2.999E+09 | 0.000E-01 | 7.781E+10 | 3.641E+09 | 0.000E-01 | 0.000E-01 | 2.150E+09 | 0.000E-01 | BONE |
| 5 | SC-46 | 1.078E+02 | 0.000E-01 | 1.910E+02 | 3.744E+02 | 3.466E+02 | 0.000E-01 | 1.806E+06 | 0.000E-01 | GI-LLI |
| 6 | CR-51 | 1.019E+05 | 5.654E+04 | 0.000E-01 | 0.000E-01 | 1.545E+04 | 1.032E+05 | 5.402E+06 | 0.000E-01 | GI-LLI |
| 7 | MN-54 | 5.585E+06 | 0.000E-01 | 0.000E-01 | 2.097E+07 | 5.879E+06 | 0.000E-01 | 1.760E+07 | 0.000E-01 | LIVER |
| 8 | MN-56 | 2.882E-03 | 0.000E-01 | 0.000E-01 | 1.277E-02 | 1.544E-02 | 0.000E-01 | 1.850E+00 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 1.837E+07 | 0.000E-01 | 1.118E+08 | 5.930E+07 | 0.000E-01 | 3.354E+07 | 1.098E+07 | 0.000E-01 | BONE |
| 10 | FE-59 | 9.686E+07 | 0.000E-01 | 1.202E+08 | 1.944E+08 | 0.000E-01 | 5.637E+07 | 2.025E+08 | 0.000E-01 | GI-LLI |
| 11 | CO-58 | 3.719E+07 | 0.000E-01 | 0.000E-01 | 1.215E+07 | 0.000E-01 | 0.000E-01 | 7.088E+07 | 0.000E-01 | GI-LLI |
| 12 | CO-60 | 1.273E+08 | 0.000E-01 | 0.000E-01 | 4.318E+07 | 0.000E-01 | 0.000E-01 | 2.391E+08 | 0.000E-01 | GI-LLI |
| 13 | NI-59 | 8.985E+07 | 0.000E-01 | 5.386E+08 | 1.847E+08 | 0.000E-01 | 0.000E-01 | 3.803E+07 | 0.000E-01 | BONE |
| 14 | NI-63 | 1.008E+09 | 0.000E-01 | 2.964E+10 | 1.587E+09 | 0.000E-01 | 0.000E-01 | 1.069E+08 | 0.000E-01 | BONE |
| 15 | NI-65 | 9.107E-02 | 0.000E-01 | 1.657E+00 | 1.560E-01 | 0.000E-01 | 0.000E-01 | 1.911E+01 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 4.465E+04 | 0.000E-01 | 0.000E-01 | 7.392E+04 | 1.786E+05 | 0.000E-01 | 3.470E+06 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 6.847E+09 | 0.000E-01 | 4.132E+09 | 1.101E+10 | 6.937E+09 | 0.000E-01 | 1.933E+09 | 0.000E-01 | LIVER |
| 18 | ZN-69 | 2.958E-12 | 0.000E-01 | 2.214E-11 | 3.200E-11 | 1.941E-11 | 0.000E-01 | 2.017E-09 | 0.000E-01 | GI-LLI |
| 19 | BR-83 | 4.617E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 5.739E-23 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 5.387E+09 | 0.000E-01 | 0.000E-01 | 8.760E+09 | 0.000E-01 | 0.000E-01 | 5.635E+08 | 0.000E-01 | LIVER |
| 23 | RB-88 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 24 | RB-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 25 | SR-89 | 1.890E+08 | 0.000E-01 | 6.616E+09 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.561E+08 | 0.000E-01 | BONE |
| 26 | SR-90 | 2.833E+10 | 0.000E-01 | 1.117E+11 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.505E+09 | 0.000E-01 | BONE |
| 27 | SR-91 | 4.885E+03 | 0.000E-01 | 1.294E+05 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.858E+05 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 8.668E-02 | 0.000E-01 | 2.162E+00 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 4.094E+01 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 8.637E+00 | 0.000E-01 | 3.227E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 9.187E+05 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 1.045E-20 | 0.000E-01 | 2.871E-19 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 5.622E-16 | 0.000E-01 | GI-LLI |
| 31 | Y-91 | 1.044E+03 | 0.000E-01 | 3.904E+04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 5.200E+06 | 0.000E-01 | GI-LLI |
| 32 | Y-92 | 7.226E-06 | 0.000E-01 | 2.525E-04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 7.296E+00 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 2.881E-02 | 0.000E-01 | 1.049E+00 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.565E+04 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 7.538E+02 | 0.000E-01 | 3.852E+03 | 9.468E+02 | 1.212E+03 | 0.000E-01 | 8.833E+05 | 0.000E-01 | GI-LLI |
| 35 | ZR-97 | 1.633E-01 | 0.000E-01 | 1.915E+00 | 2.767E-01 | 3.972E-01 | 0.000E-01 | 4.191E+04 | 0.000E-01 | GI-LLI |

* Units are (mrem/yr per uCi/$m^3$)

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : CHILD
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 8.842E+04 | 0.000E-01 | 3.178E+05 | 1.237E+05 | 1.162E+05 | 0.000E-01 | 2.289E+08 | 0.000E-01 | GI-LLI |
| 37 | NB-97 | 5.768E-13 | 0.000E-01 | 6.259E-12 | 1.580E-12 | 1.843E-12 | 0.000E-01 | 5.828E-09 | 0.000E-01 | GI-LLI |
| 38 | MO-99 | 2.009E+07 | 0.000E-01 | 0.000E-01 | 8.123E+07 | 1.735E+08 | 0.000E-01 | 6.719E+07 | 0.000E-01 | KIDNEY |
| 39 | TC-99M | 4.367E+02 | 0.000E-01 | 1.344E+01 | 2.635E+01 | 3.829E+02 | 1.338E+01 | 1.499E+04 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 41 | RU-103 | 1.651E+03 | 0.000E-01 | 4.294E+03 | 0.000E-01 | 1.081E+04 | 0.000E-01 | 1.110E+05 | 0.000E-01 | GI-LLI |
| 42 | RU-105 | 1.403E-03 | 0.000E-01 | 3.868E-03 | 0.000E-01 | 3.400E-02 | 0.000E-01 | 2.525E+00 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 1.153E+04 | 0.000E-01 | 9.240E+04 | 0.000E-01 | 1.248E+05 | 0.000E-01 | 1.437E+06 | 0.000E-01 | GI-LLI |
| 44 | AG-110M | 1.128E+08 | 0.000E-01 | 2.089E+08 | 1.411E+08 | 2.627E+08 | 0.000E-01 | 1.678E+10 | 0.000E-01 | GI-LLI |
| 45 | CD-115M | 4.237E+04 | 0.000E-01 | 0.000E-01 | 1.326E+06 | 1.052E+06 | 0.000E-01 | 5.578E+07 | 0.000E-01 | GI-LLI |
| 46 | SB-124 | 1.086E+07 | 6.646E+04 | 2.751E+07 | 5.188E+05 | 0.000E-01 | 2.134E+07 | 7.782E+08 | 0.000E-01 | GI-LLI |
| 47 | TE-125M | 9.841E+06 | 2.072E+07 | 7.380E+07 | 2.000E+07 | 0.000E-01 | 0.000E-01 | 7.121E+07 | 0.000E-01 | BONE |
| 48 | TE-127M | 2.469E+07 | 4.974E+07 | 2.680E+08 | 5.601E+07 | 5.932E+08 | 0.000E-01 | 1.684E+08 | 0.000E-01 | KIDNEY |
| 49 | TE-127 | 6.513E+02 | 2.102E+03 | 3.037E+03 | 8.190E+02 | 8.641E+03 | 0.000E-01 | 1.187E+05 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 4.205E+07 | 8.734E+07 | 2.709E+08 | 7.565E+07 | 7.955E+08 | 0.000E-01 | 3.304E+08 | 0.000E-01 | KIDNEY |
| 51 | TE-129 | 3.630E-10 | 1.091E-09 | 1.530E-09 | 4.269E-10 | 4.475E-09 | 0.000E-01 | 9.520E-09 | 0.000E-01 | GI-LLI |
| 52 | TE-131M | 5.894E+05 | 1.137E+06 | 1.599E+06 | 5.528E+05 | 5.351E+06 | 0.000E-01 | 2.242E+07 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 0.000E-01 | 1.499E-32 | 1.959E-32 | 0.000E-01 | 5.923E-32 | 0.000E-01 | 1.029E-31 | 0.000E-01 | GI-LLI |
| 54 | TE-132 | 5.457E+06 | 6.578E+06 | 1.021E+07 | 4.517E+06 | 4.194E+07 | 0.000E-01 | 4.547E+07 | 0.000E-01 | GI-LLI |
| 55 | I-130 | 1.831E+06 | 3.916E+08 | 1.759E+06 | 3.554E+06 | 5.313E+06 | 0.000E-01 | 1.663E+06 | 0.000E-01 | THYROID |
| 56 | I-131 | 7.452E+08 | 4.336E+11 | 1.304E+09 | 1.312E+09 | 2.153E+09 | 0.000E-01 | 1.167E+08 | 0.000E-01 | THYROID |
| 57 | I-132 | 5.321E-01 | 5.369E+01 | 6.298E-01 | 1.157E+00 | 1.771E+00 | 0.000E-01 | 1.362E+00 | 0.000E-01 | THYROID |
| 58 | I-133 | 8.050E+06 | 3.952E+09 | 1.720E+07 | 2.127E+07 | 3.545E+07 | 0.000E-01 | 8.573E+06 | 0.000E-01 | THYROID |
| 59 | I-134 | 6.786E-12 | 3.393E-10 | 7.942E-12 | 1.475E-11 | 2.256E-11 | 0.000E-01 | 9.781E-12 | 0.000E-01 | THYROID |
| 60 | I-135 | 4.529E+04 | 8.481E+06 | 5.319E+04 | 9.575E+04 | 1.468E+05 | 0.000E-01 | 7.295E+04 | 0.000E-01 | THYROID |
| 61 | CS-134 | 7.836E+09 | 0.000E-01 | 2.264E+10 | 3.715E+10 | 1.151E+10 | 4.131E+09 | 2.002E+08 | 0.000E-01 | LIVER |
| 62 | CS-136 | 1.786E+09 | 0.000E-01 | 1.004E+09 | 2.760E+09 | 1.470E+09 | 2.192E+08 | 9.699E+07 | 0.000E-01 | LIVER |
| 63 | CS-137 | 4.555E+09 | 0.000E-01 | 3.224E+10 | 3.086E+10 | 1.006E+10 | 3.618E+09 | 1.932E+08 | 0.000E-01 | BONE |
| 64 | CS-138 | 4.014E-23 | 0.000E-01 | 4.554E-23 | 6.331E-23 | 4.454E-23 | 4.793E-24 | 2.916E-23 | 0.000E-01 | LIVER |
| 65 | CS-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 66 | BA-139 | 5.839E-09 | 0.000E-01 | 2.015E-07 | 1.075E-10 | 9.392E-11 | 6.326E-11 | 1.163E-05 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 6.831E+06 | 0.000E-01 | 1.170E+08 | 1.025E+05 | 3.338E+04 | 6.113E+04 | 5.930E+07 | 0.000E-01 | BONE |
| 68 | BA-141 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 69 | BA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 70 | LA-140 | 2.119E+00 | 0.000E-01 | 1.945E+01 | 6.799E+00 | 0.000E-01 | 0.000E-01 | 1.895E+05 | 0.000E-01 | GI-LLI |

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : CHILD
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 3.984E-12 | 0.000E-01 | 3.992E-11 | 1.272E-11 | 0.000E-01 | 0.000E-01 | 2.522E-06 | 0.000E-01 | GI-LLI |
| 72 | CE-141 | 1.620E+03 | 0.000E-01 | 2.187E+04 | 1.091E+04 | 4.781E+03 | 0.000E-01 | 1.361E+07 | 0.000E-01 | GI-LLI |
| 73 | CE-143 | 1.474E+01 | 0.000E-01 | 1.877E+02 | 1.018E+05 | 4.270E+01 | 0.000E-01 | 1.490E+06 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 8.660E+04 | 0.000E-01 | 1.623E+06 | 5.087E+05 | 2.816E+05 | 0.000E-01 | 1.326E+08 | 0.000E-01 | GI-LLI |
| 75 | PR-143 | 3.561E+01 | 0.000E-01 | 7.177E+02 | 2.155E+02 | 1.167E+02 | 0.000E-01 | 7.744E+05 | 0.000E-01 | GI-LLI |
| 76 | PR-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 77 | ND-147 | 2.788E+01 | 0.000E-01 | 4.444E+02 | 3.600E+02 | 1.975E+02 | 0.000E-01 | 5.703E+05 | 0.000E-01 | GI-LLI |
| 78 | W-185 | 4.832E+04 | 0.000E-01 | 1.382E+06 | 4.594E+05 | 0.000E-01 | 0.000E-01 | 5.308E+07 | 0.000E-01 | GI-LLI |
| 79 | W-187 | 7.719E+03 | 0.000E-01 | 2.905E+04 | 1.720E+04 | 0.000E-01 | 0.000E-01 | 2.417E+06 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 1.999E+08 | 0.000E-01 | 3.299E+09 | 0.000E-01 | 7.693E+08 | 0.000E-01 | 3.213E+08 | 0.000E-01 | BONE |
| 81 | U-238 | 1.872E+08 | 0.000E-01 | 3.155E+09 | 0.000E-01 | 7.199E+08 | 0.000E-01 | 6.809E+09 | 0.000E-01 | BONE |
| 82 | NP-239 | 8.657E-01 | 0.000E-01 | 1.715E+01 | 1.232E+00 | 3.561E+00 | 0.000E-01 | 9.115E+04 | 0.000E-01 | GI-LLI |

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : INFANT
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3* | 2.382E+03 | 2.382E+03 | 0.000E-01 | 2.382E+03 | 2.382E+03 | 2.382E+03 | 2.382E+03 | 2.382E+03 | W. BODY |
| 2 | C-14 | 6.888E+05 | 6.888E+05 | 3.226E+06 | 6.888E+05 | 6.888E+05 | 6.888E+05 | 6.888E+05 | 6.888E+05 | BONE |
| 3 | NA-24 | 1.555E+07 | 1.555E+07 | 1.555E+07 | 1.555E+07 | 1.555E+07 | 1.555E+07 | 1.555E+07 | 0.000E-01 | W. BODY |
| 4 | P-32 | 6.215E+09 | 0.000E-01 | 1.603E+11 | 9.432E+09 | 0.000E-01 | 0.000E-01 | 2.169E+09 | 0.000E-01 | BONE |
| 5 | SC-46 | 1.078E+02 | 0.000E-01 | 1.910E+02 | 3.744E+02 | 3.466E+02 | 0.000E-01 | 1.806E+06 | 0.000E-01 | GI-LLI |
| 6 | CR-51 | 1.614E+05 | 1.053E+05 | 0.000E-01 | 0.000E-01 | 2.300E+04 | 2.049E+05 | 4.704E+06 | 0.000E-01 | GI-LLI |
| 7 | MN-54 | 8.839E+06 | 0.000E-01 | 0.000E-01 | 3.900E+07 | 8.643E+06 | 0.000E-01 | 1.433E+07 | 0.000E-01 | LIVER |
| 8 | MN-56 | 5.389E-03 | 0.000E-01 | 0.000E-01 | 3.126E-02 | 2.687E-02 | 0.000E-01 | 2.840E+00 | 0.000E-01 | GI-LLI |
| 9 | FE-55 | 2.333E+07 | 0.000E-01 | 1.351E+08 | 8.729E+07 | 0.000E-01 | 4.267E+07 | 1.108E+07 | 0.000E-01 | BONE |
| 10 | FE-59 | 1.544E+08 | 0.000E-01 | 2.243E+08 | 3.918E+08 | 0.000E-01 | 1.158E+08 | 1.872E+08 | 0.000E-01 | LIVER |
| 11 | CO-58 | 6.029E+07 | 0.000E-01 | 0.000E-01 | 2.430E+07 | 0.000E-01 | 0.000E-01 | 6.055E+07 | 0.000E-01 | GI-LLI |
| 12 | CO-60 | 2.081E+08 | 0.000E-01 | 0.000E-01 | 8.815E+07 | 0.000E-01 | 0.000E-01 | 2.098E+08 | 0.000E-01 | GI-LLI |
| 13 | NI-59 | 8.985E+07 | 0.000E-01 | 5.386E+08 | 1.847E+08 | 0.000E-01 | 0.000E-01 | 3.803E+07 | 0.000E-01 | BONE |
| 14 | NI-63 | 1.212E+09 | 0.000E-01 | 3.493E+10 | 2.160E+09 | 0.000E-01 | 0.000E-01 | 1.074E+08 | 0.000E-01 | BONE |
| 15 | NI-65 | 1.806E-01 | 0.000E-01 | 3.508E+00 | 3.971E-01 | 0.000E-01 | 0.000E-01 | 3.023E+01 | 0.000E-01 | GI-LLI |
| 16 | CU-64 | 8.509E+04 | 0.000E-01 | 0.000E-01 | 1.837E+05 | 3.108E+05 | 0.000E-01 | 3.772E+06 | 0.000E-01 | GI-LLI |
| 17 | ZN-65 | 8.777E+09 | 0.000E-01 | 5.550E+09 | 1.903E+10 | 9.229E+09 | 0.000E-01 | 1.608E+10 | 0.000E-01 | LIVER |
| 18 | ZN-69 | 6.319E-12 | 0.000E-01 | 4.717E-11 | 8.493E-11 | 3.529E-11 | 0.000E-01 | 6.926E-09 | 0.000E-01 | GI-LLI |
| 19 | BR-83 | 9.802E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 20 | BR-84 | 1.107E-22 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 1.098E+10 | 0.000E-01 | 0.000E-01 | 2.223E+10 | 0.000E-01 | 0.000E-01 | 5.687E+08 | 0.000E-01 | LIVER |
| 23 | RB-88 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.311E-32 | 0.000E-01 | 0.000E-01 | 1.274E-32 | 0.000E-01 | LIVER |
| 24 | RB-89 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 25 | SR-89 | 3.609E+08 | 0.000E-01 | 1.258E+10 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.586E+08 | 0.000E-01 | BONE |
| 26 | SR-90 | 3.096E+10 | 0.000E-01 | 1.216E+11 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.518E+09 | 0.000E-01 | BONE |
| 27 | SR-91 | 9.759E+03 | 0.000E-01 | 2.696E+05 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 3.192E+05 | 0.000E-01 | GI-LLI |
| 28 | SR-92 | 1.707E-01 | 0.000E-01 | 4.597E+00 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 4.956E+01 | 0.000E-01 | GI-LLI |
| 29 | Y-90 | 1.830E+01 | 0.000E-01 | 6.823E+02 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 9.422E+05 | 0.000E-01 | GI-LLI |
| 30 | Y-91M | 2.075E-20 | 0.000E-01 | 6.088E-19 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 2.029E-15 | 0.000E-01 | GI-LLI |
| 31 | Y-91 | 1.952E+03 | 0.000E-01 | 7.327E+04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 5.252E+06 | 0.000E-01 | GI-LLI |
| 32 | Y-92 | 1.508E-05 | 0.000E-01 | 5.367E-04 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.024E+01 | 0.000E-01 | GI-LLI |
| 33 | Y-93 | 6.093E-02 | 0.000E-01 | 2.237E+00 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 1.767E+04 | 0.000E-01 | GI-LLI |
| 34 | ZR-95 | 1.182E+03 | 0.000E-01 | 6.841E+03 | 1.667E+03 | 1.797E+03 | 0.000E-01 | 8.302E+05 | 0.000E-01 | GI-LLI |
| 35 | ZR-97 | 3.178E-01 | 0.000E-01 | 4.054E+00 | 6.958E-01 | 7.013E-01 | 0.000E-01 | 4.438E+04 | 0.000E-01 | GI-LLI |

* Units are (mrem/yr per uCi/$m^3$)

## TABLE G-3 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : INFANT
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 1.412E+05 | 0.000E-01 | 5.932E+05 | 2.444E+05 | 1.751E+05 | 0.000E-01 | 2.062E+08 | 0.000E-01 | GI-LLI |
| 37 | NB-97 | 5.768E-13 | 0.000E-01 | 6.259E-12 | 1.580E-12 | 1.843E-12 | 0.000E-01 | 5.828E-09 | 0.000E-01 | GI-LLI |
| 38 | MO-99 | 4.049E+07 | 0.000E-01 | 0.000E-01 | 2.077E+08 | 3.103E+08 | 0.000E-01 | 6.841E+07 | 0.000E-01 | KIDNEY |
| 39 | TC-99M | 7.424E+02 | 0.000E-01 | 2.795E+01 | 5.765E+01 | 6.202E+02 | 3.013E+01 | 1.674E+04 | 0.000E-01 | GI-LLI |
| 40 | TC-101 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 41 | RU-103 | 2.908E+03 | 0.000E-01 | 8.694E+03 | 0.000E-01 | 1.809E+04 | 0.000E-01 | 1.057E+05 | 0.000E-01 | GI-LLI |
| 42 | RU-105 | 2.747E-03 | 0.000E-01 | 8.156E-03 | 0.000E-01 | 5.997E-02 | 0.000E-01 | 3.245E+00 | 0.000E-01 | GI-LLI |
| 43 | RU-106 | 2.377E+04 | 0.000E-01 | 1.903E+05 | 0.000E-01 | 2.251E+05 | 0.000E-01 | 1.445E+06 | 0.000E-01 | GI-LLI |
| 44 | AG-110M | 1.864E+08 | 0.000E-01 | 3.860E+08 | 2.817E+08 | 4.030E+08 | 0.000E-01 | 1.461E+10 | 0.000E-01 | GI-LLI |
| 45 | CD-115M | 4.237E+04 | 0.000E-01 | 0.000E-01 | 1.326E+06 | 1.052E+06 | 0.000E-01 | 5.578E+07 | 0.000E-01 | GI-LLI |
| 46 | SB-124 | 1.086E+07 | 6.646E+04 | 2.751E+07 | 5.188E+05 | 0.000E-01 | 2.134E+07 | 7.782E+08 | 0.000E-01 | GI-LLI |
| 47 | TE-125M | 2.039E+07 | 5.076E+07 | 1.508E+08 | 5.043E+07 | 0.000E-01 | 0.000E-01 | 7.186E+07 | 0.000E-01 | BONE |
| 48 | TE-127M | 5.097E+07 | 1.217E+08 | 4.211E+08 | 1.397E+08 | 1.037E+09 | 0.000E-01 | 1.699E+08 | 0.000E-01 | KIDNEY |
| 49 | TE-127 | 1.396E+03 | 5.249E+03 | 6.449E+03 | 2.160E+03 | 1.573E+04 | 0.000E-01 | 1.354E+05 | 0.000E-01 | GI-LLI |
| 50 | TE-129M | 8.567E+07 | 2.136E+08 | 5.563E+08 | 1.908E+08 | 1.391E+09 | 0.000E-01 | 3.321E+08 | 0.000E-01 | KIDNEY |
| 51 | TE-129 | 7.568E-10 | 2.717E-09 | 3.242E-09 | 1.110E-09 | 8.071E-09 | 0.000E-01 | 2.591E-07 | 0.000E-01 | GI-LLI |
| 52 | TE-131M | 1.121E+06 | 2.753E+06 | 3.375E+06 | 1.359E+06 | 9.347E+06 | 0.000E-01 | 2.297E+07 | 0.000E-01 | GI-LLI |
| 53 | TE-131 | 1.166E-32 | 3.705E-32 | 4.153E-32 | 1.534E-32 | 1.062E-31 | 0.000E-01 | 1.678E-30 | 0.000E-01 | GI-LLI |
| 54 | TE-132 | 9.711E+06 | 1.536E+07 | 2.102E+07 | 1.041E+07 | 6.508E+07 | 0.000E-01 | 3.850E+07 | 0.000E-01 | KIDNEY |
| 55 | I-130 | 3.193E+06 | 8.915E+08 | 3.614E+06 | 7.952E+06 | 8.735E+06 | 0.000E-01 | 1.705E+06 | 0.000E-01 | THYROID |
| 56 | I-131 | 1.410E+09 | 1.054E+12 | 2.722E+09 | 3.207E+09 | 3.745E+09 | 0.000E-01 | 1.145E+08 | 0.000E-01 | THYROID |
| 57 | I-132 | 9.446E-01 | 1.244E+02 | 1.307E+00 | 2.653E+00 | 2.960E+00 | 0.000E-01 | 2.149E+00 | 0.000E-01 | THYROID |
| 58 | I-133 | 1.549E+07 | 9.619E+09 | 3.633E+07 | 5.289E+07 | 6.219E+07 | 0.000E-01 | 8.951E+06 | 0.000E-01 | THYROID |
| 59 | I-134 | 1.200E-11 | 7.866E-10 | 1.647E-11 | 3.374E-11 | 3.772E-11 | 0.000E-01 | 3.489E-11 | 0.000E-01 | THYROID |
| 60 | I-135 | 8.025E+04 | 1.973E+07 | 1.106E+05 | 2.201E+05 | 2.453E+05 | 0.000E-01 | 7.964E+04 | 0.000E-01 | THYROID |
| 61 | CS-134 | 6.868E+09 | 0.000E-01 | 3.647E+10 | 6.801E+10 | 1.751E+10 | 7.178E+09 | 1.848E+08 | 0.000E-01 | LIVER |
| 62 | CS-136 | 2.153E+09 | 0.000E-01 | 1.961E+09 | 5.768E+09 | 2.299E+09 | 4.700E+08 | 8.759E+07 | 0.000E-01 | LIVER |
| 63 | CS-137 | 4.269E+09 | 0.000E-01 | 5.146E+10 | 6.024E+10 | 1.617E+10 | 6.546E+09 | 1.083E+08 | 0.000E-01 | LIVER |
| 64 | CS-138 | 7.569E-23 | 0.000E-01 | 9.607E-23 | 1.562E-22 | 7.789E-23 | 1.216E-23 | 2.497E-22 | 0.000E-01 | GI-LLI |
| 65 | CS-139 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 66 | BA-139 | 1.241E-08 | 0.000E-01 | 4.287E-07 | 2.842E-10 | 1.708E-10 | 1.723E-10 | 2.715E-05 | 0.000E-01 | GI-LLI |
| 67 | BA-140 | 1.241E+07 | 0.000E-01 | 2.408E+08 | 2.408E+05 | 5.718E+04 | 1.479E+05 | 5.916E+07 | 0.000E-01 | BONE |
| 68 | BA-141 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 69 | BA-142 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 70 | LA-140 | 4.122E+00 | 0.000E-01 | 4.064E+01 | 1.602E+01 | 0.000E-01 | 0.000E-01 | 1.882E+05 | 0.000E-01 | GI-LLI |

**TABLE G-3 (CONT)**

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : INFANT
PATHWAY : COW MILK

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 7.367E-12 | 0.000E-01 | 8.380E-11 | 3.078E-11 | 0.000E-01 | 0.000E-01 | 5.226E-06 | 0.000E-01 | GI-LLI |
| 72 | CE-141 | 3.112E+03 | 0.000E-01 | 4.335E+04 | 2.644E+04 | 8.153E+03 | 0.000E-01 | 1.366E+07 | 0.000E-01 | GI-LLI |
| 73 | CE-143 | 3.008E+01 | 0.000E-01 | 3.974E+02 | 2.637E+05 | 7.680E+01 | 0.000E-01 | 1.539E+06 | 0.000E-01 | GI-LLI |
| 74 | CE-144 | 1.303E+05 | 0.000E-01 | 2.325E+06 | 9.518E+05 | 3.846E+05 | 0.000E-01 | 1.334E+08 | 0.000E-01 | GI-LLI |
| 75 | PR-143 | 7.360E+01 | 0.000E-01 | 1.485E+03 | 5.552E+02 | 2.064E+02 | 0.000E-01 | 7.835E+05 | 0.000E-01 | GI-LLI |
| 76 | PR-144 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 77 | ND-147 | 5.543E+01 | 0.000E-01 | 8.809E+02 | 9.043E+02 | 3.488E+02 | 0.000E-01 | 5.734E+05 | 0.000E-01 | GI-LLI |
| 78 | W-185 | 4.832E+04 | 0.000E-01 | 1.382E+06 | 4.594E+05 | 0.000E-01 | 0.000E-01 | 5.308E+07 | 0.000E-01 | GI-LLI |
| 79 | W-187 | 1.469E+04 | 0.000E-01 | 6.114E+04 | 4.252E+04 | 0.000E-01 | 0.000E-01 | 2.498E+06 | 0.000E-01 | GI-LLI |
| 80 | U-235 | 1.999E+08 | 0.000E-01 | 3.299E+09 | 0.000E-01 | 7.693E+08 | 0.000E-01 | 3.213E+08 | 0.000E-01 | BONE |
| 81 | U-238 | 1.872E+08 | 0.000E-01 | 3.155E+09 | 0.000E-01 | 7.199E+08 | 0.000E-01 | 6.829E+08 | 0.000E-01 | BONE |
| 82 | NP-239 | 1.833E+00 | 0.000E-01 | 3.626E+01 | 3.244E+00 | 6.468E+00 | 0.000E-01 | 9.373E+04 | 0.000E-01 | GI-LLI |

## TABLE G-4

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ALL
PATHWAY : GROUND PLANE

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H-3 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 2 | C-14 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 3 | NA-24 | 1.198E+07 | 1.198E+07 | 1.198E+07 | 1.198E+07 | 1.198E+07 | 1.198E+07 | 1.198E+07 | 1.389E+07 | SKIN |
| 4 | P-32 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 5 | SC-46 | 8.321E+08 | 8.321E+08 | 8.321E+08 | 8.321E+08 | 8.321E+08 | 8.321E+08 | 8.321E+08 | 9.601E+08 | SKIN |
| 6 | CR-51 | 4.668E+06 | 4.668E+06 | 4.668E+06 | 4.668E+06 | 4.668E+06 | 4.668E+06 | 4.668E+06 | 5.517E+06 | SKIN |
| 7 | MN-54 | 1.384E+09 | 1.384E+09 | 1.384E+09 | 1.384E+09 | 1.384E+09 | 1.384E+09 | 1.384E+09 | 1.622E+09 | SKIN |
| 8 | MN-56 | 9.030E+05 | 9.030E+05 | 9.030E+05 | 9.030E+05 | 9.030E+05 | 9.030E+05 | 9.030E+05 | 1.067E+06 | SKIN |
| 9 | FE-55 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 10 | FE-59 | 2.725E+08 | 2.725E+08 | 2.725E+08 | 2.725E+08 | 2.725E+08 | 2.725E+08 | 2.725E+08 | 3.202E+08 | SKIN |
| 11 | CO-58 | 3.833E+08 | 3.833E+08 | 3.833E+08 | 3.833E+08 | 3.833E+08 | 3.833E+08 | 3.833E+08 | 4.490E+08 | SKIN |
| 12 | CO-60 | 2.152E+10 | 2.152E+10 | 2.152E+10 | 2.152E+10 | 2.152E+10 | 2.152E+10 | 2.152E+10 | 2.532E+10 | SKIN |
| 13 | NI-59 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 14 | NI-63 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 15 | NI-65 | 2.970E+05 | 2.970E+05 | 2.970E+05 | 2.970E+05 | 2.970E+05 | 2.970E+05 | 2.970E+05 | 3.451E+05 | SKIN |
| 16 | CU-64 | 6.051E+05 | 6.051E+05 | 6.051E+05 | 6.051E+05 | 6.051E+05 | 6.051E+05 | 6.051E+05 | 6.858E+05 | SKIN |
| 17 | ZN-65 | 7.410E+08 | 7.410E+08 | 7.410E+08 | 7.410E+08 | 7.410E+08 | 7.410E+08 | 7.410E+08 | 8.522E+08 | SKIN |
| 18 | ZN-69 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 19 | BR-83 | 4.887E+03 | 4.887E+03 | 4.887E+03 | 4.887E+03 | 4.887E+03 | 4.887E+03 | 4.887E+03 | 7.102E+03 | SKIN |
| 20 | BR-84 | 2.022E+05 | 2.022E+05 | 2.022E+05 | 2.022E+05 | 2.022E+05 | 2.022E+05 | 2.022E+05 | 2.358E+05 | SKIN |
| 21 | BR-85 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 22 | RB-86 | 8.963E+06 | 8.963E+06 | 8.963E+06 | 8.963E+06 | 8.963E+06 | 8.963E+06 | 8.963E+06 | 1.024E+07 | SKIN |
| 23 | RB-88 | 3.287E+04 | 3.287E+04 | 3.287E+04 | 3.287E+04 | 3.287E+04 | 3.287E+04 | 3.287E+04 | 3.756E+04 | SKIN |
| 24 | RB-89 | 1.209E+05 | 1.209E+05 | 1.209E+05 | 1.209E+05 | 1.209E+05 | 1.209E+05 | 1.209E+05 | 1.450E+05 | SKIN |
| 25 | SR-89 | 2.160E+04 | 2.160E+04 | 2.160E+04 | 2.160E+04 | 2.160E+04 | 2.160E+04 | 2.160E+04 | 2.507E+04 | SKIN |
| 26 | SR-90 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 27 | SR-91 | 2.145E+06 | 2.145E+06 | 2.145E+06 | 2.145E+06 | 2.145E+06 | 2.145E+06 | 2.145E+06 | 2.507E+06 | SKIN |
| 28 | SR-92 | 7.762E+05 | 7.762E+05 | 7.762E+05 | 7.762E+05 | 7.762E+05 | 7.762E+05 | 7.762E+05 | 8.625E+05 | SKIN |
| 29 | Y-90 | 4.497E+03 | 4.497E+03 | 4.497E+03 | 4.497E+03 | 4.497E+03 | 4.497E+03 | 4.497E+03 | 5.314E+03 | SKIN |
| 30 | Y-91M | 1.004E+05 | 1.004E+05 | 1.004E+05 | 1.004E+05 | 1.004E+05 | 1.004E+05 | 1.004E+05 | 1.163E+05 | SKIN |
| 31 | Y-91 | 1.074E+06 | 1.074E+06 | 1.074E+06 | 1.074E+06 | 1.074E+06 | 1.074E+06 | 1.074E+06 | 1.209E+06 | SKIN |
| 32 | Y-92 | 1.804E+05 | 1.804E+05 | 1.804E+05 | 1.804E+05 | 1.804E+05 | 1.804E+05 | 1.804E+05 | 1.916E+05 | SKIN |
| 33 | Y-93 | 1.849E+05 | 1.849E+05 | 1.849E+05 | 1.849E+05 | 1.849E+05 | 1.849E+05 | 1.849E+05 | 2.531E+05 | SKIN |
| 34 | ZR-95 | 2.513E+08 | 2.513E+08 | 2.513E+08 | 2.513E+08 | 2.513E+08 | 2.513E+08 | 2.513E+08 | 2.915E+08 | SKIN |
| 35 | ZR-97 | 2.958E+06 | 2.958E+06 | 2.958E+06 | 2.958E+06 | 2.958E+06 | 2.958E+06 | 2.958E+06 | 3.443E+06 | SKIN |

## TABLE G-4 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ALL
PATHWAY : GROUND PLANE

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 36 | NB-95 | 1.366E+08 | 1.366E+08 | 1.366E+08 | 1.366E+08 | 1.366E+08 | 1.366E+08 | 1.366E+08 | 1.607E+08 | SKIN |
| 37 | NB-97 | 1.797E+05 | 1.797E+05 | 1.797E+05 | 1.797E+05 | 1.797E+05 | 1.797E+05 | 1.797E+05 | 2.109E+05 | SKIN |
| 38 | MO-99 | 3.990E+06 | 3.990E+06 | 3.990E+06 | 3.990E+06 | 3.990E+06 | 3.990E+06 | 3.990E+06 | 4.620E+06 | SKIN |
| 39 | TC-99M | 1.845E+05 | 1.845E+05 | 1.845E+05 | 1.845E+05 | 1.845E+05 | 1.845E+05 | 1.845E+05 | 2.115E+05 | SKIN |
| 40 | TC-101 | 2.034E+04 | 2.034E+04 | 2.034E+04 | 2.034E+04 | 2.034E+04 | 2.034E+04 | 2.034E+04 | 2.260E+04 | SKIN |
| 41 | RU-103 | 1.093E+08 | 1.093E+08 | 1.093E+08 | 1.093E+08 | 1.093E+08 | 1.093E+08 | 1.093E+08 | 1.275E+08 | SKIN |
| 42 | RU-105 | 6.373E+05 | 6.373E+05 | 6.373E+05 | 6.373E+05 | 6.373E+05 | 6.373E+05 | 6.373E+05 | 7.223E+05 | SKIN |
| 43 | RU-106 | 4.239E+08 | 4.239E+08 | 4.239E+08 | 4.239E+08 | 4.239E+08 | 4.239E+08 | 4.239E+08 | 5.086E+08 | SKIN |
| 44 | AG-110M | 3.460E+09 | 3.460E+09 | 3.460E+09 | 3.460E+09 | 3.460E+09 | 3.460E+09 | 3.460E+09 | 4.037E+09 | SKIN |
| 45 | CD-115M | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 46 | SB-124 | 5.994E+08 | 5.994E+08 | 5.994E+08 | 5.994E+08 | 5.994E+08 | 5.994E+08 | 5.994E+08 | 6.916E+08 | SKIN |
| 47 | TE-125M | 1.555E+06 | 1.555E+06 | 1.555E+06 | 1.555E+06 | 1.555E+06 | 1.555E+06 | 1.555E+06 | 2.133E+06 | SKIN |
| 48 | TE-127M | 9.165E+04 | 9.165E+04 | 9.165E+04 | 9.165E+04 | 9.165E+04 | 9.165E+04 | 9.165E+04 | 1.083E+05 | SKIN |
| 49 | TE-127 | 2.991E+03 | 2.991E+03 | 2.991E+03 | 2.991E+03 | 2.991E+03 | 2.991E+03 | 2.991E+03 | 3.290E+03 | SKIN |
| 50 | TE-129M | 1.967E+07 | 1.967E+07 | 1.967E+07 | 1.967E+07 | 1.967E+07 | 1.967E+07 | 1.967E+07 | 2.300E+07 | SKIN |
| 51 | TE-129 | 2.639E+04 | 2.639E+04 | 2.639E+04 | 2.639E+04 | 2.639E+04 | 2.639E+04 | 2.639E+04 | 3.122E+04 | SKIN |
| 52 | TE-131M | 8.023E+06 | 8.023E+06 | 8.023E+06 | 8.023E+06 | 8.023E+06 | 8.023E+06 | 8.023E+06 | 9.456E+06 | SKIN |
| 53 | TE-131 | 2.926E+04 | 2.926E+04 | 2.926E+04 | 2.926E+04 | 2.926E+04 | 2.926E+04 | 2.926E+04 | 3.458E+07 | SKIN |
| 54 | TE-132 | 4.220E+06 | 4.220E+06 | 4.220E+06 | 4.220E+06 | 4.220E+06 | 4.220E+06 | 4.220E+06 | 4.965E+06 | SKIN |
| 55 | I-130 | 5.539E+06 | 5.539E+06 | 5.539E+06 | 5.539E+06 | 5.539E+06 | 5.539E+06 | 5.539E+06 | 6.726E+06 | SKIN |
| 56 | I-131 | 1.722E+07 | 1.722E+07 | 1.722E+07 | 1.722E+07 | 1.722E+07 | 1.722E+07 | 1.722E+07 | 2.091E+07 | SKIN |
| 57 | I-132 | 1.239E+06 | 1.239E+06 | 1.239E+06 | 1.238E+06 | 1.238E+06 | 1.238E+06 | 1.238E+06 | 1.457E+06 | SKIN |
| 58 | I-133 | 2.453E+06 | 2.453E+06 | 2.453E+06 | 2.453E+06 | 2.453E+06 | 2.453E+06 | 2.453E+06 | 2.983E+06 | SKIN |
| 59 | I-134 | 4.460E+05 | 4.460E+05 | 4.460E+05 | 4.460E+05 | 4.460E+05 | 4.460E+05 | 4.460E+05 | 5.296E+05 | SKIN |
| 60 | I-135 | 2.520E+06 | 2.520E+06 | 2.520E+06 | 2.520E+06 | 2.520E+06 | 2.520E+06 | 2.520E+06 | 2.940E+06 | SKIN |
| 61 | CS-134 | 6.834E+09 | 6.834E+09 | 6.834E+09 | 6.834E+09 | 6.834E+09 | 6.834E+09 | 6.834E+09 | 7.972E+09 | SKIN |
| 62 | CS-136 | 1.491E+08 | 1.491E+08 | 1.491E+08 | 1.491E+08 | 1.491E+08 | 1.491E+08 | 1.491E+08 | 1.690E+08 | SKIN |
| 63 | CS-137 | 1.030E+10 | 1.030E+10 | 1.030E+10 | 1.030E+10 | 1.030E+10 | 1.030E+10 | 1.030E+10 | 1.202E+10 | SKIN |
| 64 | CS-138 | 3.597E+05 | 3.597E+05 | 3.597E+05 | 3.597E+05 | 3.597E+05 | 3.597E+05 | 3.597E+05 | 4.111E+05 | SKIN |
| 65 | CS-139 | 3.115E+04 | 3.115E+04 | 3.115E+04 | 3.115E+04 | 3.115E+04 | 3.115E+04 | 3.115E+04 | 3.561E+04 | SKIN |
| 66 | BA-139 | 1.059E+05 | 1.059E+05 | 1.059E+05 | 1.059E+05 | 1.059E+05 | 1.059E+05 | 1.059E+05 | 1.191E+05 | SKIN |
| 67 | BA-140 | 2.051E+07 | 2.051E+07 | 2.051E+07 | 2.051E+07 | 2.051E+07 | 2.051E+07 | 2.051E+07 | 2.343E+07 | SKIN |
| 68 | BA-141 | 4.179E+04 | 4.179E+04 | 4.179E+04 | 4.179E+04 | 4.179E+04 | 4.179E+04 | 4.179E+04 | 4.762E+04 | SKIN |
| 69 | BA-142 | 4.486E+04 | 4.486E+04 | 4.486E+04 | 4.486E+04 | 4.486E+04 | 4.486E+04 | 4.486E+04 | 5.110E+04 | SKIN |
| 70 | LA-140 | 1.924E+07 | 1.924E+07 | 1.924E+07 | 1.924E+07 | 1.924E+07 | 1.924E+07 | 1.924E+07 | 2.181E+07 | SKIN |

## TABLE G-4 (CONT)

Pathway Dose Parameters
$R_i$ ($m^2$ - mrem/yr per uCi/sec)

AGE : ALL
PATHWAY : GROUND PLANE

| NO | ISOTOPE | W. BODY | THYROID | BONE | LIVER | KIDNEY | LUNG | GI-LLI | SKIN | CRITICAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 71 | LA-142 | 7.359E+05 | 7.359E+05 | 7.359E+05 | 7.359E+05 | 7.359E+05 | 7.359E+05 | 7.359E+05 | 8.830E+05 | SKIN |
| 72 | CE-141 | 1.365E+07 | 1.365E+07 | 1.365E+07 | 1.365E+07 | 1.365E+07 | 1.365E+07 | 1.365E+07 | 1.539E+07 | SKIN |
| 73 | CE-143 | 2.314E+06 | 2.314E+06 | 2.314E+06 | 2.314E+06 | 2.314E+06 | 2.314E+06 | 2.314E+06 | 2.630E+06 | SKIN |
| 74 | CE-144 | 6.934E+07 | 6.934E+07 | 6.934E+07 | 6.934E+07 | 6.934E+07 | 6.934E+07 | 6.934E+07 | 8.017E+07 | SKIN |
| 75 | PR-143 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 76 | PR-144 | 1.833E+03 | 1.833E+03 | 1.833E+03 | 1.833E+03 | 1.833E+03 | 1.833E+03 | 1.833E+03 | 2.108E+03 | SKIN |
| 77 | ND-147 | 8.389E+06 | 8.389E+06 | 8.389E+06 | 8.389E+06 | 8.389E+06 | 8.389E+06 | 8.389E+06 | 1.007E+07 | SKIN |
| 78 | W-185 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 79 | W-187 | 2.358E+06 | 2.358E+06 | 2.358E+06 | 2.358E+06 | 2.358E+06 | 2.358E+06 | 2.358E+06 | 2.739E+06 | SKIN |
| 80 | U-235 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 81 | U-238 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | 0.000E-01 | W. BODY |
| 82 | NP-239 | 1.703E+06 | 1.703E+06 | 1.703E+06 | 1.703E+06 | 1.703E+06 | 1.703E+06 | 1.703E+06 | 1.972E+06 | SKIN |

# APPENDIX A
# TECHNICAL BASIS FOR EFFECTIVE DOSE FACTORS - LIQUID EFFLUENT RELEASES

# APPENDIX A

## Technical Basis for Effective Dose Factors - Liquid Effluent Releases

The radioactive liquid effluents for the fuel cycle years 1983, 1982 and 1981 were evaluated to determine the dose contribution of the radionuclide distribution. This analysis was performed to evaluate the use of a limited dose analysis for determining environmental doses, providing a simplified method of determining compliance with the dose limits of Technical Specification 3.11.1.2. For the radionuclide distribution of effluents from the Kewaunee Nuclear Power Plant, the controlling organ is either the GI-LLI or the liver. The calculated GI-LLI dose is almost exclusively dictated by the Nb-95 releases; the liver dose is mostly a function of the Cs-134 and Cs-137 releases. The radionuclides, Co-58, Co-60, Sr-90, Cs-134 and Cs-137 contribute essentially all of the calculated total body dose. The results of this evaluation are presented in Table A-1.

For purposes of simplifying the details of the dose calculational process, it is conservative to identify a controlling, dose significant radionuclide and limit the calculational process to the use of the dose conversion factor for this nuclide. Multiplication of the total release (i.e., cumulative activity for all radionuclides) by this dose conversion factor provides for a dose calculational method that is simplified while also being conservative.

For the evaluation of the maximum organ dose, it is conservative to use the Cs-134 dose conversion factor (7.09E+05 mrem/hr per uCi/ml, liver). Only the reactor-generated radionuclide Nb-95 has a higher dose conversion factor (1.51E+06 mrem/hr per uCi/ml, GI-LLI). However, since Nb-95 releases are typically less than 5% of the total releases, it is conservative to use the Cs-134 factor. By this approach, the maximum organ dose will be routinely overestimated. For 1983, using this simplified conservative method would overestimate the maximum organ dose by a factor of 85; for 1982, the conservatism is a factor of 35; and for 1981, a factor of 21.

For the total body calculation, the Cs-134 dose factor (5.79E+05 mrem/hr per uCi/ml, total body) is the highest among the identified dominant nuclides. For 1981, using this simplified conservative dose calculational method would overestimate the total body dose by a factor of 26; for 1982, the conservatism is a factor of 50; and for 1983, a factor of 34.

For evaluating compliance with the dose limits of Technical Specification 3.11.1.2, the following simplified equations may be used:

Total Body

$$D_{tb} = \frac{1.67E\text{-}02 * VOL}{CW} * A_{Cs\text{-}134,TB} * \sum C_i \qquad (A.1)$$

where:

$D_{tb}$ = dose to the total body (mrem)

$A_{Cs\text{-}134,TB}$ = 5.79E+05, total body ingestion dose conversion factor for Cs-134 (mrem/hr per uCi/ml)

VOL = volume of liquid effluent released (gal)

$\sum C_i$ = total concentration of all radionuclides (uCi/ml)

CW = average circulating water discharge rate during release period (gal/min)

1.67E-02 = conversion factor (hr/min)

Substituting the value for the Cs-134 total body dose conversion factor, the equation simplified to:

$$D_{tb} = \frac{9.67E+03 * VOL}{CW} * \sum C_i \qquad (A.2)$$

Maximum Organ

$$D_{max} = \frac{1.67E\text{-}02 * VOL * A_{Cs-134,L}}{CW} * \sum C_i \qquad (A.3)$$

where:

$D_{max}$ = maximum organ dose (mrem)

$A_{Cs-134,L}$ = 7.09E+05, liver ingestion dose conversion factor for Cs-134 (mrem/hr per uCi/ml)

Substituting the value for $A_{Cs-134,Liver}$, the equation simplifies to:

$$D_{max} = \frac{1.18E+04 * VOL}{CW} * \sum C_i \qquad (A.4)$$

Only the total body dose need be evaluated by this simplified method since it represents the more limiting (compared with the maximum organ dose) for demonstrating compliance with Technical Specification 3.11.1.2.

Tritium is not included in the limited analysis dose assessment for liquid releases, because the potential dose resulting from normal reactor releases is negligible. The average annual tritium release from the Kewaunee Nuclear Plant to Lake Michigan is approximately 300 curies. The calculated total body dose from such a release is 1.36E-02 mrem/yr via the fish ingestion and drinking water pathways. This amounts to 0.45% of the design objective dose of 3 mrem/yr. Furthermore, the release of tritium is a function of operating time and power level and is essentially unrelated to radwaste system operation.

Table A-1

Adult Dose Contributions

Fish and Drinking Water Pathways

| Radio-Nuclide | 1984-83 Fuel Cycle Release (Ci) | TB Dose Frac. | GI-LLI Dose Frac. | Liver Dose Frac. | 1983-82 Fuel Cycle Release (Ci) | TB Dose Frac. | GI-LLI Dose Frac. | Liver Dose Frac. | 1982-81 Fuel Cycle Release (Ci) | TB Dose Frac. | GI-LLI Dose Frac. | Liver Dose Frac. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Co-58 | 5.91E-01 | 0.01 | 0.02 | * | 2.27E-01 | 0.01 | 0.18 | * | 8.51E-01 | 0.01 | 0.37 | * |
| Co-60 | 1.29E-01 | * | 0.01 | * | 2.36E-01 | 0.02 | 0.49 | 0.01 | 3.66E-01 | 0.01 | 0.43 | * |
| Ag-110m | 8.41E-02 | * | * | * | 1.57E-01 | * | * | * | 2.06E-02 | * | * | * |
| Sb-124 | 9.46E-02 | * | * | * | 3.78E-03 | * | * | * | 2.88E-02 | * | * | * |
| Sb-125 | 4.60E-02 | * | * | * | 8.06E-03 | * | * | * | 2.07E-02 | * | * | * |
| Nb-95 | 3.91E-02 | * | 0.96 | * | 3.67E-04 | * | 0.24 | * | N/D | * | * | * |
| Cs-137 | 3.24E-02 | 0.64 | 0.01 | 0.69 | 2.08E-02 | 0.94 | 0.09 | 0.96 | 5.53E-02 | 0.62 | 0.14 | 0.68 |
| Cs-134 | 1.06E-02 | 0.35 | * | 0.31 | 4.52E-04 | 0.03 | * | 0.03 | 1.93E-02 | 0.37 | 0.06 | 0.32 |
| Total | 1.03E+00 | | | | 6.53E-01 | | | | 1.36E+00 | | | |

* less than 0.01

N/D = not detected

# APPENDIX B
# TECHNICAL BASES FOR EFFECTIVE DOSE FACTORS - GASEOUS RADIOACTIVE EFFLUENTS

# APPENDIX B
## Technical Bases for Effective Dose Factors - Gaseous Radioactive Effluents

### Overview

The evaluation of doses due to releases of radioactive material to the atmosphere can be simplified by the use of effective dose transfer factors instead of using dose factors which are radionuclide specific. These effective factors, which can be based on typical radionuclide distributions of releases, can be applied to the total radioactivity released to approximate the dose in the environment (i.e., instead of having to perform individual radionuclide dose analyses only a single multiplication ($K_{eff}$, $M_{eff}$ or $N_{eff}$) times the total quantity of radioactive material released would be needed). This approach provides a reasonable estimate of the actual dose while eliminating the need for a detailed calculational technique.

### Determination of Effective Dose Factors

Effective dose transfer factors are calculated by the following equations:

$$K_{eff} = \sum (K_i * f_i) \qquad (B.1)$$

where:

- $K_{eff}$ = the effective total body dose factor due to gamma emissions from all noble gases released
- $K_i$ = the total body dose factor due to gamma emissions from each noble gas radionuclide i released
- $f_i$ = the fractional abundance of noble gas radionuclide i relative to the total noble gas activity

$$(L + 1.1\ M)_{eff} = \sum ((L_i + 1.1\ M_i) * f_i) \quad (B.2)$$

where:

$(L + 1.1\ M)_{eff}$ = the effective skin dose factor due to beta and gamma emissions from all noble gases released

$(L_i + 1.1\ M_i)$ = the skin dose factor due to beta and gamma emissions from each noble gas radionuclide i released

$$M_{eff} = \sum (M_i * f_i) \quad (B.3)$$

where:

$M_{eff}$ = the effective air dose factor due to gamma emissions from all noble gases released

$M_i$ = the air dose factor due to gamma emissions from each noble gas radionuclide i released

$$N_{eff} = \sum (N_i * f_i) \quad (B.4)$$

where:

$N_{eff}$ = the effective air dose factor due to beta emissions from all noble gases released

$N_i$ = the air dose factor due to beta emissions from each noble gas radionuclide i released

Normally, it would be expected that past radioactive effluent data would be used for the determination of the effective dose factors. However, the noble gas releases from Kewaunee have been maintained to such negligible quantities that the inherent variability in the data makes any meaningful evaluations difficult. For the past three years, the total noble gas releases have been limited to 6 Ci for 1981, 56 Ci for 1982, and 167 Ci for 1983. therefore, in order to provide a reasonable basis for the derivation of the effective noble gas dose factors, the

primary coolant source term from ANSI N237-1976/ANS-18.1, "Source Term Specifications," has been used as representing a typical distribution. The effective dose factors as derived are presented in Table B-1.

Application

To provide an additional degree of conservatism, a factor of 0.50 is introduced into the dose calculational process when the effective dose transfer factor is used. This conservatism provides additional assurance that the evaluation of doses by the use of a single effective factor will not significantly underestimate any actual doses in the environment.

For evaluating compliance with the dose limits of Technical Specification 3.11.2.2, the following simplified equations may be used:

$$D_{\gamma} = \frac{3.17E\text{-}08}{0.50} * X/Q * M_{eff} * \sum Q_i \qquad (B.5)$$

$$D_{\beta} = \frac{3.17E\text{-}08}{0.50} * X/Q * N_{eff} * \sum Q_i \qquad (B.6)$$

where:

$D_{\gamma}$ = air dose due to gamma emissions for the cumulative release of all noble gases (mrad)

$D_{\beta}$ = air dose due to beta emissions for the cumulative release of all noble gases (mrad)

X/Q = atmospheric dispersion to the controlling site boundary ($sec/m^3$)

$M_{eff}$ = 5.3E+02, effective gamma-air dose factor (mrad/yr per $uCi/m^3$)

$N_{eff}$ = 1.1E+03, effective beta-air dose factor (mrad/yr per $uCi/m^3$)

$\sum Q_i$ = cumulative release for all noble gas radionuclides (uCi)
3.17E-08 = conversion factor (yr/sec)
0.50 = conservatism factor to account for the variability in the effluent data

Combining the constants, the dose calculational equations simplify to:

$$D_\gamma = 3.5E\text{-}05 * X/Q * \sum Q_i \quad \text{(B.7)}$$

and

$$D_\beta = 7.0E\text{-}05 * X/Q * \sum Q_i \quad \text{(B.8)}$$

The effective dose factors are used on a very limited basis for the purpose of facilitating the timely assessment of radioactive effluent releases, particularly during periods of computer malfunction where a detailed dose assessment may be unavailable. Dose assessments using the detailed, radionuclide dependent calculation are performed at least every six months for preparation of the Semi-Annual Radioactive Effluent Reports. Comparisons can be performed at this time to assure that the use of the effective dose factors does not substantially underestimate actual doses.

Table B-1

Effective Dose Factors

Noble Gases - Total Body and Skin

| Radionuclide | $f_i$* | Total Body Effective Dose Factor $K_{eff}$ (mrem/yr per uCi/$m^3$) | Skin Effective Dose Factor $(L+ 1.1\ M)_{eff}$ (mrem/yr per uCi/$m^3$) |
|---|---|---|---|
| Kr-85 | 0.01 | -- | 1.4E+01 |
| Kr-88 | 0.01 | 1.5E+02 | 1.9E+02 |
| Xe-133m | 0.01 | 2.5E+00 | 1.4E+01 |
| Xe-133 | 0.95 | 3.0E+02 | 6.6E+02 |
| Xe-135 | 0.02 | 3.6E+01 | 7.9E+01 |
| Total | | 4.8E+02 | 9.6E+02 |

Noble Gases - Air

| Radionuclide | $f_i$* | Total Body Effective Dose Factor $M_{eff}$ (mrad/yr per uCi/$m^3$) | Skin Effective Dose Factor $N_{eff}$ (mrad/yr per uCi/$m^3$) |
|---|---|---|---|
| Kr-85 | 0.01 | -- | 2.0E+01 |
| Kr-88 | 0.01 | 1.5E+02 | 2.9E+01 |
| Xe-133m | 0.01 | 3.3E+00 | 1.5E+01 |
| Xe-133 | 0.95 | 3.4E+02 | 1.0E+03 |
| Xe-135 | 0.02 | 3.8E+01 | 4.9E+01 |
| Total | | 5.3E+02 | 1.1E+03 |

# APPENDIX C
# EVALUATION OF CONSERVATIVE, DEFAULT MPC VALUE FOR LIQUID EFFLUENTS

# Appendix C
## Evaluation of Conservative, Default MPC Value for Liquid Effluents

In accordance with the requirements of Technical Specification (3.3.3.10) the radioactive liquid effluent monitors shall be operable with alarm setpoints established to ensure that the concentration of radioactive material at the discharge point does not exceed the MPC value of 10 CFR 20, Appendix B, Table II, Column 2. The determination of allowable radionuclide concentration and corresponding alarm setpoint is a function of the individual radionuclide distribution and corresponding MPC values.

In order to limit the need for routinely having to reestablish the alarm setpoints as a function of changing radionuclide distributions, a default alarm setpoint can be established. This default setpoint can be conservatively based on an evaluation of the radionuclide distribution of the liquid effluents from Kewaunee and the effective MPC value for this distribution.

The effective MPC value for a radionuclide distribution can be calculated by the equation:

$$MPC_e = \frac{\sum (C_i * MPC_i)}{\sum C_i} \qquad (C.1)$$

where:

$MPC_e$ = an effective MPC value for a mixture of radionuclide (uCi/ml)

$C_i$ = concentration of radionuclide i in the mixture

$MPC_i$ = the 10 CFR 20, Appendix B, Table II, Column 2 MPC value for radionuclide i (uCi/ml)

Based on the above equation and the radionuclide distribution in the effluents for past years from Kewaunee, an effective MPC value can be determined. Results are presented in Table C-1.

Based on the annual radionuclide distributions, the most limiting effective MPC was for the calendar year 1983, with a calculated value of 6.6E-05 uCi/ml. For conservatism in establishing the alarm setpoints, a default effective MPC value of 1.0E-05 uCi/ml has been selected. The overall conservatism of this value is reaffirmed for future releases considering that 1.0E-05 uCi/ml is more restrictive than the individual MPC values for the principal fission and activation products of Co-58, Co-60 and Cs-137 and is only slightly higher than the 9.0E-06 uCi/ml MPC value for Cs-134.

Table C-1
Calculation of Effective MPC

| Nuclide | MPC (uCi/ml) | Activity Released (Ci) 1976 - 1981 avg. | 1982 | 1983 |
|---|---|---|---|---|
| Sr-89 | 3E-06 | 1.0E-03 | 3E-05 | 2E-04 |
| Sr-90 | 3E-07 | 2.5E-04 | 5E-05 | 1.2E-04 |
| Nb-95 | 1E-04 | 5.4E-03 | 2.4E-03 | 2.5E-03 |
| I-131 | 3E-07 | 1.9E-02 | -- | 3E-05 |
| I-133 | 1E-06 | 7.4E-04 | -- | 2E-05 |
| Cs-134 | 9E-06 | 7.4E-02 | 1.1E-02 | 9.1E-04 |
| Cs-136 | 6E-05 | 5.2E-04 | -- | -- |
| Cs-137 | 2E-05 | 5.7E-02 | 4.7E-02 | 2.1E-02 |
| Cs-138 | -- | 1.2E-04 | -- | -- |
| Ba-140 | 2E-05 | 4.5E-04 | -- | 6E-06 |
| Mn-54 | 1E-04 | 4.5E-02 | 9E-03 | 3.6E-03 |
| Co-57 | 4E-04 | 3.1E-04 | 1.7E-04 | 1.8E-04 |
| Co-58 | 9E-05 | 5.5E-01 | 8.1E-01 | 2.1E-01 |
| Co-60 | 3E-05 | 1.6E-01 | 3.7E-01 | 2.0E-01 |
| Sb-124 | 2E-05 | 3.4E-02 | 3E-02 | 3.8E-03 |
| Sb-125 | 1E-04 | 3.4E-02 | 1.8E-02 | 8.4E-03 |
| Cr-51 | 2E-03 | 4.6E-02 | 1E-02 | 2.8E-03 |
| Ag-110m | 3E-05 | 4.3E-02 | 1.5E-01 | 7.2E-02 |
| Na-24 | 3E-05 | 9.7E-03 | 1E-03 | 8.3E-04 |
| Fe-59 | 5E-05 | 6.1E-03 | 4.4E-03 | -- |
| Sn-113 | 8E-05 | 6.1E-04 | 1E-04 | 8E-05 |
| Zr-95 | 6E-05 | 2.2E-03 | 8E-04 | 4E-04 |
| Total | | 1.09 | 1.46 | 0.527 |
| $\sum(C_i * MPC_i)$ | | 1.59E-04 | 1.14E-04 | 3.47E-05 |
| $MPC_e$(uCi/ml) | | 1.5E-04 | 7.8E-05 | 6.6E-05 |