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Calculation of Hazard Category 2/3 Threshold Quantities Using Contemporary Dosimetric Data

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OAK RIDGE NATIONAL LABORATORY
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Nuclear and Radiological Protection Division

CALCULATION OF HAZARD CATEGORY 2/3 THRESHOLD QUANTITIES USING CONTEMPORARY DOSIMETRIC DATA

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CONTENTS

ACRONYMS, ABBREVIATIONS, AND INITIALISM

ALI	Annual Limit for Intake
AMAD	Average Mean Aerodynamic Diameter
AMDC	Atomic Mass Data Center
BR	Breathing Rate
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
CSDE	Cloud Shine Dose Equivalent
CTA	Central Technical Authority
DAC	Derived Airborne Concentration
DC	Dose Coefficient
DOE	U. S. Department of Energy
ENSDF	Evaluated Nuclear Structure Data File
EPA	U. S. Environmental Protection Agency
FGR	Federal Guidance Report
HC	Hazard Category
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IMP	Institute of Modern Physics
IOP	Internal Operating Procedure
JAERI	Japan Atomic Energy Research Institute
MIRD	Medical Internal Radiation Dose
MS	Microsoft
NNDC	National Nuclear Data Center
NNSA	National Nuclear Security Administration

NRC	U. S. Nuclear Regulatory Commission
NTD	Nuclear Transformation Data
ORNL	Oak Ridge National Laboratory
RF	Release Fraction
RV	Release Value
SFF	Spontaneous Fission Factor
SI	International System of Units
TFG	Tritium Focus Group
TQ	Threshold Quantity

ABSTRACT

The purpose of this report is to describe the methodology and selection of input data utilized to calculate updated Hazard Category 2 and Hazard Category 3 Threshold Quantities (TQs) using contemporary dosimetric information. The calculation of the updated TQs will be considered for use in the revision to the Department of Energy (DOE) Technical Standard (STD-) 1027-92 Change Notice (CN)-1, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports."

The updated TQs documented in this report complement an effort previously undertaken by the National Nuclear Security Administration (NNSA), which in 2014 issued revised Supplemental Guidance documenting the calculation of updated TQs for approximately 100 radionuclides listed in DOE-STD-1027-92, CN-1. The calculations documented in this report complement the NNSA effort by expanding the set of radionuclides to more than 1,250 radionuclides with a published TQ.

The development of this report was sponsored by the Department of Energy's Office of Nuclear Safety (AU-30) within the Associate Under Secretary for Environment, Health, Safety, and Security organization.

1. INTRODUCTION

1.1 PURPOSE

The purpose of this report is to document the technical basis, methodologies, input document, and supporting calculations utilized in the calculation of updated Hazard Category (HC)-2 and HC-3 Threshold Quantities (TQs) for possible inclusion in a revision to DOE-STD-1027.

1.2 REPORT ORGANIZATION

This report is organized as follows:

- Section 2: Background

  This section discusses the use of HC-2 and HC-3 TQs and the regulatory allowances specific to the calculation of updated TQs.

- Section 3: Input Data Selection and Hierarchy

  This section discusses the selection of contemporary dosimetric data (e.g., inhalation dose coefficients, ingestion dose coefficients, air-immersion dose coefficients, and nuclear transformation data). Since multiple data sources are used in calculation of updated HC-2 and HC-3 TQs, this section outlines the organizational hierarchy to be employed for consistent selection of input data. This section also discusses the resolution of radionuclide nomenclature issues identified amongst the various input documents.

- Section 4: Methodology

  This section outlines the specific methodology and equations to be used for the calculation of the HC-2 and HC-3 TQs. This section also discusses issues arising from the selection of suitable inhalation dose coefficients when more than one value is provided for a specific radionuclide. Finally, this section will discuss the applicability of assumptions made in the development of the methodology for the point source exposure pathway (i.e., Direct Exposure).

- Section 5: Discussion of Results

  This section discusses the results of the calculation of the updated HC-2 and HC-3 TQs.

- Section 6: Quality Assurance

  This section discusses the quality assurance practices used throughout the preparation of this report and the calculation of the updated TQs.

- Appendix A: Calculation of Hazard Category 2 Threshold Quantities Using Maximum Dose Coefficients

  This appendix provides a data table documenting the selected maximum inhalation and air-immersion dose coefficients and the selected nuclear transformation data. A second data table is provided documenting the calculated HC-2 TQs using the selected input data.

- Appendix B: Calculation of Hazard Category 2 Threshold Quantities Using Recommended Dose Coefficients

  This appendix provides a data table documenting the selected recommended inhalation dose coefficients, the selected maximum air-immersion dose coefficients, and the selected nuclear transformation data. A second data table is provided documenting the calculated HC-2 TQs using the selected input data. The second data table also includes the HC-2 TQs calculated by the NNSA for comparative purposes.

- Appendix C: Calculation of Hazard Category 3 Threshold Quantities

  This appendix provides a data table documenting the selected maximum inhalation, ingestion, and air-immersion dose coefficients as well as the selected nuclear transformation data. A second data table is provided documenting the calculated HC-3 TQs using the selected input data. The second data table also includes the HC-3 TQs calculated by the NNSA for comparative purposes

- Appendix D: Selection of Master Radionuclide List

  This appendix provides a data table documenting the compilation of a master list of radionuclides based on the various input documentations used for the calculation of the HC-2 and HC-3 TQs.

- Appendix E: Precision Limitations for the Calculation of the Effective Exposure Duration

  This appendix documents the precision limitations encountered using an Excel Spreadsheet to calculate the effective exposure duration used for the following HC-3 exposure pathways: (i) water ingestion and (ii) direct exposure. This appendix also discusses how the precision issue was resolved to ensure an accurate calculation of the affected exposure pathways.

2. BACKGROUND

2.1 ORIGIN OF THE EXISTING HAZARD CATEGORIZATION THRESHOLD QUANTITIES

The U. S. Department of Energy (DOE) categorizes nuclear facilities in accordance with the requirements specified in DOE-STD-1027-92, Change Notice 1, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports." (1) The standard requires an assessment of the facility radiological and fissionable material inventories when determining the facility categorization.

When the categorization of the facility is conducted solely on the basis of its radiological inventory, the standard prescribes the use of Hazard Category (HC) specific Threshold Quantities (TQs). The determination of the categorization is conducted through the use of the following equation:

$$Sum\ of\ Ratios_j = \sum \frac{Q_i}{TQ_{i,j}}$$

Where;

Q_i = Quantity of radionuclide "i" [Ci or gm]

TQ_i = Threshold Quantity of Radionuclide "i" for Hazard Category "j" [Ci or gm]

In accordance with the requirement of DOE-STD-1027-92, facilities or facility segments where there are combinations of radioactive materials should be designated as Category 2 or 3 if the sum of the ratios of the quantity of each material to the Category 2 or 3 thresholds exceeds one. DOE-STD-1027-92 and its associated LANL Fact Sheets (2) (3) provide the current set of HC-2 and HC-3 TQs for conducting the sum of ratio calculations.

2.2 AVAILABILITY OF UPDATED DOSIMETRIC DATA

The derivation of the HC-2 and HC-3 TQs is associated with available dosimetric data prior to the issuance of DOE-STD-1027. The dosimetric data included inhalation dose coefficients (DCs), ingestion DCs, and nuclear transformation data (NTD) (e.g., half-life and average photon energy data). Since the initial publication of DOE-STD-1027 in 1992, updated dosimetric data has become available.

In 2011 (revised and reissued in 2014), the NNSA issued a supplemental guidance to DOE-STD-1027, outlining specific guidance associated with the calculation of updated HC-2 and HC-3 TQs using the updated dosimetry. (4) The NNSA justified the use of new DCs in recent Publications by the International Commission on Radiological Protection (ICRP); specifically ICRP Pub-68 "Dose Coefficients for Intakes of Radionuclides by Workers," (5) and ICRP Pub-72 "Age-dependent Doses to the Members of the Public from Intake of Radionuclides - Part 5 Compilation of Ingestion and Inhalation Coefficients." (6)

Since the NNSA effort to establish ground rules for the use of new DCs, the availability of DCs has expanded with the issuance of the following reports:

- ICRP Pub-119, "Compendium of Dose Coefficients based on ICRP Publication 60." (7)
- DOE-STD-1196-2011, "Derived Concentration Technical Standard." (8)

Additionally, a report by the Japan Atomic Energy Research Institute (JAERI) was issued in 2002 which derived DCs for radionuclides not listed in the ICRP publications. (9) Finally, the ICRP updated the radionuclide specific NTD with the issuance of Pub-107 "Nuclear Decay Data for Dosimetric Calculations." (10)

2.3 SCOPE AND LIMITATIONS

This report will calculate updated HC-2 and HC-3 TQs using updated dosimetry data. The NNSA Supplemental Guidance (4) to DOE-STD-1027-92 outlines the guidelines for calculating updated TQs. Specifically, the NNSA states:

> "When implementing this [Supplemental Directive] SD G, for radionuclides not listed in Table 1 of Attachment 2, the threshold values should be calculated in accordance with Attachment 4 of this SD G."[*]

Given that the use of HC-2 and HC-3 TQs are within the context of compliance with DOE regulatory requirements, the NNSA supplemental guidance will be adhered to with respect to the allowed use of new DCs within the existing methodology expectations. Any noted issues with the methodology will be discussed and recommendations provided for consideration when a revision to the methodology occurs.

Although the guidelines in the NNSA Supplemental Guidance (4) are specifically associated with the calculation of radionuclides not listed in the NNSA Supplemental Guidance, the radionuclides in the NNSA Supplemental Guidance will be included in this calculation. The recalculated HC-2 and HC-3 TQs will then be compared to the TQs previously published in the NNSA Supplemental Guidance as a verification of an accurate implementation of the methodology.

Thus, this report will apply the guidelines in the NNSA Supplemental Guidance (4) (i) to calculate the updated TQs of radionuclides not listed in the NNSA Supplemental Guidance, and (ii) to recalculate the TQs of those radionuclides listed in the NNSA Supplemental Guidance.

[*] NNSA SD 1027 (11-28-11), pg AT2-1, Note

3. INPUT DATA SELECTION AND HIERARCHY

3.1 DEFINING THE DOSE COEFFICIENT INPUT DATA PUBLICATIONS

In ascertaining the acceptability of contemporary sources of the DCs needed, a review of the pedigree of the DCs previously utilized by the DOE for establishing HC-2 and HC-3 TQs is performed. This review establishes the requirements used to identify and justify the use of contemporary DC data sources.

3.1.1 Dose Coefficients Utilized by DOE-STD-1027-92 for Calculating HC-2 and HC-3 TQs

The DCs utilized for the derivation of the HC-2 and HC-3 TQs published in DOE-STD-1027-92 (1) and the supporting LANL Fact Sheets (2) (3) are listed in Table 3.1. Upon inspection, it is noted that multiple publications were utilized for obtaining the various DCs. The use of multiple publications is attributed to the fact that the HC-2 TQ is based on a dose to a member of the public whereas the HC-3 TQ is based on a dose to a worker. Similarly, the publications utilized for calculating HC-3 TQs contain DCs derived using dosimetric models specific to workers.

Table 3.1 – Origin of Nuclear Transformation Data and the Associated Dose Coefficients Used For Calculating HC-2/3 TQs in DOE-STD-1027-92

	Dose Coefficient	**Dose Coefficient Publication**	**Supporting Nuclear Transformation Data (NTD)**
HC-2 TQ	Air Immersion DC	DOE/EH-0070 *(1988)* (11)	DOE/TIC-11026 *(1981)* (12)
	Inhalation DC	DOE/EH-0071 *(1988)* (13)	ICRP Pub-38 *(1983)* (14)
HC-3 TQ	Inhalation DC	ICRP Pub-30 (*1978)* (15)	
	Ingestion DC		
	Air Immersion DC		
	Avg. Photon Energy	**	**

NOTE:

** The EPA Technical Background Document, 102RQ-RN-5-13 (16), does not state nor infer the source of the radionuclide specific average photon intensity data.

The various DCs were derived by the respective publication via the use of accepted dosimetric models (ingestion, inhalation, and air immersion) and the use of published nuclear transformation data (NTD). The NTD publications listed in Table 3.1 provide information associated with the radionuclide specific radioactive decay characteristics (e.g., half-life, decay modes, and decay energy/intensity). The NTD is based on data files obtained from the Evaluated Nuclear Structure Data File (ENSDF) system. The ENSDF serves as a principal source of data for nuclear structure research, nuclear spectroscopy applications, medical internal radiation dose (MIRD), and publications such as Nuclear Data Sheets and the Table of Isotopes. The ENSDF is maintained by the National Nuclear Data Center (NNDC) by the Brookhaven National Laboratory.

3.1.2 Selection of Contemporary Dose Coefficient Publications

Since the publication of the HC-2 and HC-3 TQs in DOE-STD-1027-92, the DC data source publications have become superseded by subsequent issuance of similar publications. Specifically:

- The NTD information in DOE/TIC-11026 has been superseded by more recent publications from the International Commission on Radiological Protection (ICRP), specifically ICRP Pub-38 (1983) and it successor, ICRP Pub-107 (2008). (10) These ICRP Publications utilize NTD from contemporaneous ENSDF data files.

- The ingestion and inhalation DCs contained within DOE/EH-0071 have been superseded in their usage by subsequent ICRP publications; ICRP Pub-72 (6) and its successor document, ICRP Pub-119. (7)

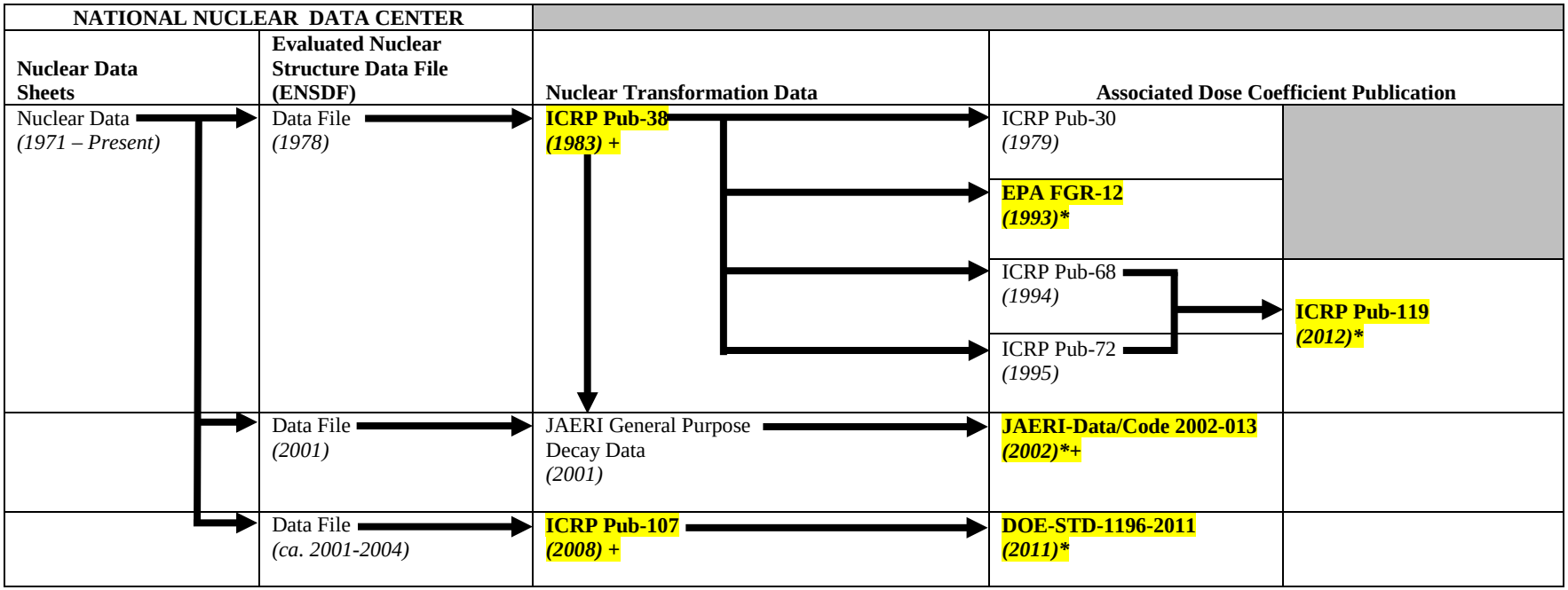
- The external DCs (e.g., air immersion) contained within DOE/EH-0070 have been superseded by a subsequent EPA publication, Federal Guidance Report No. 12. (17)

The relationship of these various publications is diagrammed in Figure 3.1. A key observation to be noted in Figure 3.1 is that the underlying NTD used in the derivation of the various ingestion, inhalation, and air immersion DCs in FGR-12 and ICRP Pub-119 originate from ICRP Pub-38. As such, the continued use of ICRP Pub-38 is necessary, even though the ICRP has superseded Pub-38 with the issuance of Pub-107.

Although Pub-38 will still be used in conjunction with the DCs from FGR-12 and Pub-119, it is noted that Pub-107 expanded the radionuclide NTD to 1,252 radionuclides (as compared to the 825 radionuclides with NTD in Pub-38). In recognition of the expanded radionuclide data set in Pub-107, the radionuclides unique to Pub-107 (i.e., not part of the published data in Pub-38) are also assessed in this report for the calculation of HC-2 and HC-3 TQs. DOE-STD-1196-2011 (8) has been identified as a contemporaneous publication with inhalation and air immersion DCs based on Pub-107. It is noted however that DOE-STD-1196-2011 specifically states that the published DCs are computed in a manner similar to ICRP Pub-72 and Federal Guidance Report 13. (18) Since ICRP Pub-72 is specific to public dose calculations, then DOE-STD-1196-2011 will be restricted in use for only HC-2 TQ calculations.

Finally, in 2002, the Japan Atomic Energy Research Institute (JAERI) published a report which provided ingestion and inhalation DCs for radionuclides not addressed by ICRP Pub-68 nor by ICRP Pub-72. (9) The JAERI report noted that the inhalation and ingestion DCs were calculated using tissue and radiation weighting factors recommended in ICRP Pub-60, the human respiratory tract model of ICRP Pub-66, and the biokinetic models of ICRP Pubs-56, 67, 69, and 71. Also, effective dose rates for inert gases (air immersion DCs) were calculated using the methodology described in ICRP Pub-30 and FGR-12. Since the JAERI publication followed the methods of similar ICRP Publications, the DCs are acceptable for use for calculating HC-2 and HC-3 TQs. NOTE: The ICRP Publications only calculate ingestion and inhalation DCs for radionuclides with a half-life equal to or greater than 10 minutes. The JAERI report contains ingestion and inhalation DCs for radionuclides which include some with half-lives less than 10 minutes. To maintain consistency with the ICRP convention, ingestion and inhalation DCs will only be used for radionuclides with half-lives equal to or greater than 10 minutes.

The relationship of the various contemporary DC input documents is illustrated in Figure 3.1.



Notes:

* Publications containing ingestion, inhalation, and/or air immersion DCs selected for use in calculating updated HC-2 and HC-3 TQs in this report.

\+ Publications containing NTD selected for use of average photon energy/intensity data and for calculating specific activity (using published half-life data).

Highlighting indicates publications used herein as input data for calculating updated HC-2 and HC-3 TQs.

Figure 3.1 – Relationship of Dose Coefficient Publications

A summary of the selected publications containing contemporary DCs used for the calculation of HC-2 and HC-3 TQs is listed in Table 3.2.

Table 3.2 – Selection of Contemporary Dose Coefficient Publications for Calculating HC-2 and HC-3 TQs

Dose Coefficient Category	Selected Publication	Applicability	
		HC-2 TQ Calculation	HC-3 TQ Calculation
Inhalation DCs	ICRP Pub-119	X	X
	DOE-STD-1196-2011	X	
	JAERI-Data/Code 2002-013	X	X
Ingestion DCs	ICRP Pub-119		X
	DOE-STD-1196-2011		
	JAERI-Data/Code 2002-013		X
Air Immersion DCs	ICRP Pub-119		X
	FGR-12	X	
	DOE-STD-1196-2011	X	
Avg. Photon Energy/Intensity Data	ICRP Pub-38		X
	ICRP Pub-107		X

3.1.3 Hierarchy of Selected Contemporary Dose Coefficient Publications

3.1.3.1 Family of Data Concept

As noted in Table 3.2, multiple publications containing contemporary DCs were selected for use in calculating the HC-2 and HC-3 TQs. The selection of multiple publications was in recognition that no single data source contains all DCs for the scope of radionuclides involved. Accordingly, a hierarchical ranking of the input data is required to ensure a proper calculation of the HC-2 and HC-3 TQs.

For the task at hand, a high level grouping of the information can be made based on the "family of data" concept. As noted in Figure 3.1, the contemporary DC publications can be grouped in accordance with the NTD used in derivation of the ingestion, inhalation and air immersion DCs. Under this "family of data" concept, the NTD and the selected DCs are used together for computing a TQ value.

1. **<u>ICRP Pub-38 Family of Data</u>**
   Under the "family of data" concept, the highest ranking data set is assigned to ICRP Pub-38 and its family of publications. The ICRP Pub-38 family ranking is based on the observation that the majority of the available inhalation and ingestion dose coefficients for both worker dose assessments and for members of the public dose assessments currently reside within ICRP Pub-119. The publications assigned to the ICRP Pub-38 family of data include the following:
   - ICRP Pub-38
   - ICRP Pub-119
   - FGR-12

2. **ICRP Pub-107 Family of Data**
   The second highest ranking data set is assigned to ICRP Pub-107 and its family of publications. The ICRP Pub-107 family ranking is based on the observation that ICRP Pub-107 provides a substantial increase in the overall radionuclide data set. Whereas ICRP Pub-38 provides NTD for 838 radionuclides, ICRP Pub-107 expands the available data set to 1252 radionuclides (an additional 414 radionuclides). The publications assigned to the ICRP Pub-107 family of data include the following:
   - ICRP Pub-107
   - DOE-STD-1196-2011

3. **JAERI-Data/Code 2002-013 Family of Data**
   The third highest ranking data set is assigned to JAERI-Data/Code 2002-013. This designation is based on the observation that the JAERI data is considered to be a minor supplemental source of information outside of the ICRP publications. The publications assigned to the JAERI-Data/Code 2002-013 family of data include the following:
   - JAERI-Data/Code 2002-013

Under this "family of data" concept, the NTD and the DCs are all selected from the same family of data, if possible. If an input element is not available from within the family of data, then the next lower "family of data" level is searched for the necessary data element. This search continues until all lower family of data levels has been exhausted.

3.1.3.2 Summary of Dose Coefficient Selection Order

Based on the "family of data" hierarchy concept, the DC publications can be ranked for their use for the calculation of HC-2 and HC-3 TQs. Table 3.3 lists the relevant DC publications in accordance with the DC data type it is associated with for the calculation of HC-2 TQs. Similarly, Table 3.4 lists the relevant DC publications in accordance with the DC data type it is associated with for the calculation of HC-3 TQs.

Table 3.3 – Hierarchical Organization of Contemporary Dose Coefficient Publications for HC-2 TQ Calculations

Data Type	Selection Order	Publication	Relevant Dose Coefficient Table
Inhalation DCs	1	ICRP Pub-119	**Annex G:** *Effective Dose Coefficients for Inhalation of Radionuclides for Members of the Public* **Annex H:** *Dose Coefficients for Inhalation of Soluble or Reactive Gases and Vapours For Members of the Public*
	2	DOE-STD-1196-2011	**Table A-2:** *Effective Dose Coefficients from Inhaled Air*
	3	JAERI-Data/Code 2002-013	**Table 5:** *Effective Dose Coefficients for Members of the Public – Inhalation Dose Coefficients, $e(\tau)$, to age 70 y (Sv Bq^{-1})* **Table 7:** *Effective Dose Coefficients for Members of the Public – Inhalation Dose Coefficients, $e(\tau)$, to age 70 y (Sv Bq^{-1}) for Soluble or Reactive Gases and Vapours (Class SR-1 and SR-2)*
Air Immersion DCs	1	FGR-12	**Table A.1:** *Summary Information on the Nuclear Transformation of the Radionuclides*
	2	DOE-STD-1196-2011	**Table A-3:** *Effective Dose Coefficients from Air Submersion*
Half-Life Data	1	ICRP Pub-38	**Entire Report**
	2	ICRP Pub-107	**Table A.1:** *Properties of the Radionuclides: ICRP-07 Collection*
	3	JAERI-Data/Code 2002-013	**Table 1:** *Radionuclides Included in Dose Coefficient Database (Ingestion and Inhalation of Particulates)* **Table 2:** *Radionuclides Included in Dose Coefficient Database (Inert Gases)*

Table 3.4 – Hierarchical Organization of Contemporary Dose Coefficient Publications for HC-3 TQ Calculations

Data Type	Selection Order	Publication	Relevant Dose Coefficient Table
Inhalation DCs	1	ICRP Pub-119	**Annex A:** *Effective Dose Coefficients for Ingested and Inhaled Particulates for Workers* **Annex B:** *Effective Dose Coefficients for Inhalation of Soluble or Reactive Gases for Workers*
	2	JAERI-Data/Code 2002-013	**Table 3:** *Effective Dose Coefficients for Workers – Ingestion and Inhalation of Particulates* **Table 6:** *Effective Dose Coefficients for Workers – Soluble or Reactive Gases (Class SR-1 and SR-2)*
Ingestion DCs	1	ICRP Pub-119	**Annex A:** *Effective Dose Coefficients for Ingested and Inhaled Particulates for Workers*
	2	JAERI-Data/Code 2002-013	**Table 3:** *Effective Dose Coefficients for Workers – Ingestion and Inhalation of Particulates*
Air Immersion DCs	1	ICRP Pub-119	**Annex C:** *Effective Dose Rates for Exposure of Workers or Adult Members of the Public to Inert Gases*
	2	JAERI-Data/Code 2002-013	**Table 8:** *Effective Dose Rates for Exposure of Adults – Inert Gases (Class SR-0)*
Half-Life Data and Average Photon Energy/Intensity Data	1	ICRP Pub-38	**Entire Report**
	2	ICRP Pub-107	**Table A.1:** *Properties of the Radionuclides: ICRP-07 Collection*
	3	JAERI-Data/Code 2002-013 *(only for half-life data selection, publication does not provide photon energy data)*	**Table 1:** *Radionuclides Included in Dose Coefficient Database (Ingestion and Inhalation of Particulates)* **Table 2:** *Radionuclides Included in Dose Coefficient Database (Inert Gases)*

3.2 DEFINING THE LIST OF RADIONUCLIDES

The contemporary dosimetry publications selected for use define the set of radionuclides for which HC-2 and HC-3 TQs will be calculated.

3.2.1 Developing the Master List of Radionuclides

The following NTD publications were utilized in constructing a master list of radionuclides:

1. ICRP Pub-38
2. ICRP Pub-107
3. JAERI-Data/Code 2002-013

The order of selection was based on the hierarchical "family of data" as previously discussed.

3.2.2 Reconciliation of Radionuclide Nomenclature Differences

The use of various NTD publications and their derivative publication that span various agencies (ICRP, DOE, EPA, JAERI) has resulted in noted differences in radionuclide nomenclature. Specifically:

- The treatment of isomer states (i.e., a radionuclide with two different half-lives) has been addressed by the use of the "l" and "s" suffix to denote long and short.

- There are several instances where updated NTD in ICRP Pub-107 has changed a radionuclide identified in ICRP Pub-38 as an isomer to a meta-stable state. An example of this is the radionuclide Eu-150 which was identified in ICRP Pub-38 as existing in an isomeric state (Eu-150a with $t_{1/2}$ =12.62 h and Eu-150b with $t_{1/2}$ =34.2 y).[†] In comparison, ICRP Pub-107 incorporated revised NTD which no longer designated Eu-150 as an isomer, but as a single decay scheme (Eu-150 with $t_{1/2}$ =36.9 y), with a companion metastable state (Eu-150m with $t_{1/2}$ =12.8 h). When such nomenclature differences were encountered, the "family of data" hierarchy was used to resolve the nomenclature discrepancy. As such, since ICRP Pub-38 is higher in the "family of data" hierarchy, the name was resolved and established as Eu-150l and Eu-150s.

- Several other instances were noted where ground state and meta-stable state radionuclide definitions differed amongst the publications. An example of this would be Ta-180, which ICRP Pub-38 identifies as having both a ground state (Ta-180 with $t_{1/2}$ = 1E+13 y) and meta-stable state (Ta-180m with $t_{1/2}$ = 8.1 h). The updated NTD in ICRP Pub-107 no longer includes the meta-stable state and identifies Ta-180 has having the previous meta-stable state half-life ($t_{1/2}$ =8.152 h). As before, the "family of data" hierarchy was used to resolve the nomenclature discrepancy. As such, since ICRP Pub-38 is higher in the "family of data" hierarchy, the name was resolved and established as Ta-180 and Ta-180m.

A summary of the nomenclature resolution is presented in the form of a crosswalk in Table 3.5. A complete listing of the master radionuclide list is documented in Appendix D of this report.

[†] The isomeric suffix designators "a" and "b" are unique to the electronic data file containing ICRP Pub-38 NTD. FGR-12 includes the use of the isomeric designators "a" and "b" in both the hard bound copy and electronic data file. Similarly, "m" and "n" suffix designators are universally used to indicate isomers for meta-state radionuclides.

Table 3.5 – Radionuclide Nomenclature Crosswalk										
	DOE-STD-1196		FGR-12		ICRP-38		ICRP-107		JAERI	
MASTER LIST	Nuclide	Half-life (Units)	Nuclide	Half-life (Units)	Nuclide	Half-life (Units)	Nuclide	Half-life (Units)	Nuclide	Half-life (Units)
Eu-150l	Eu-150	36.9 y	Eu-150b	34.2 y	Eu-150b	34.2 y	Eu-150	36.9 y		
Eu-150s	Eu-150m	12.8 h	Eu-150a	12.62 h	Eu-150a	12.62 h	Eu-150m	12.8 h		
Eu-152ml	Eu-152m	9.3116 h	Eu-152m	9.32 h	Eu-152m	9.32 h	Eu-152m	9.3116 h		
Eu-152ms	Eu-152n	96 m					Eu-152n	96 m	Eu-152n	96 m
In-110l	In-110	4.9 h	In-110b	4.9 h	In-110b	4.9 h	In-110	4.9 h		
In-110s	In-110m	69.1 m	In-110a	69.1 m	In-110a	69.1 m	In-110m	69.1 m		
Ir-186l	Ir-186	16.64 h	Ir-186a	15.8 h	Ir-186a	15.8 h	Ir-186	16.64 h		
Ir-186s	Ir-186m	1.92 h	Ir-186b	1.75 h	Ir-186b	1.75 h	Ir-186m	1.92 h		
Ir-190ms	Ir-190m	1.12 h	Ir-190m	1.2 h	Ir-190m	1.2 h	Ir-190m	1.12 h		
Ir-190ml	Ir-190n	3.087 h	Ir-190n	3.1 h	Ir-190n	3.1 h	Ir-190n	3.087 h		
Ir-192ms	Ir-192m	1.45 m					Ir-192m	1.45 m		
Ir-192ml	Ir-192n	241 y	Ir-192m	241 y	Ir-192m	241 y	Ir-192n	241 y		
Nb-89l	Nb-89	2.03 h	Nb-89b	122 m	Nb-89b	122 m	Nb-89	2.03 h		
Nb-89s	Nb-89m	66 m	Nb-89a	66 m	Nb-89a	66 m	Nb-89m	66 m		
Nb-98	Nb-98m	51.3 m	Nb-98	51.5 m	Nb-98	51.5 m	Nb-98m	51.3 m		
Np-236l	Np-236	154000 y	Np-236a	115000 y	Np-236a	115000 y	Np-236	154000 y		
Np-236s	Np-236m	22.5 h	Np-236b	22.5 h	Np-236b	22.5 h	Np-236m	22.5 h		
Re-182l	Re-182	64 h	Re-182b	64 h	Re-182b	64 h	Re-182	64 h		
Re-182s	Re-182m	12.7 h	Re-182a	12.7 h	Re-182a	12.7 h	Re-182m	12.7 h		
Rh-102	Rh-102m	3.742 y	Rh-102	2.9 y	Rh-102	2.9 y	Rh-102m	3.742 y		
Rh-102m	Rh-102	207 d	Rh-102m	207 d	Rh-102m	207 d	Rh-102	207 d		
Sb-120s	Sb-120	15.89 m	Sb-120a	15.89 m	Sb-120a	15.89 m	Sb-120	15.89 m		
Sb-120l	Sb-120m	5.76 d	Sb-120b	5.76 d	Sb-120b	5.76 d	Sb-120m	5.76 d		
Sb-124ms	Sb-124m	93 s	Sb-124m	93 s	Sb-124m	93 s	Sb-124m	93 s	Sb-124m	1.55 m
Sb-124ml	Sb-124n	20.2 m	Sb-124n	20.2 m	Sb-124n	20.2 m	Sb-124n	20.2 m		
Sb-128l	Sb-128	9.01 h	Sb-128b	9.01 h	Sb-128b	9.01 h	Sb-128	9.01 h		
Sb-128s	Sb-128m	10.4 m	Sb-128a	10.4 m	Sb-128a	10.4 m	Sb-128m	10.4 m		

Table 3.5 – Radionuclide Nomenclature Crosswalk (continued)										
MASTER LIST	**DOE-STD-1196**		**FGR-12**		**ICRP-38**		**ICRP-107**		**JAERI**	
	Nuclide	**Half-life (Units)**	**Nuclide**	**Half-life (Units)**	**Nuclide**	**Half-life (Units)**	**Nuclide**	**Half-life (Units)**	**Nuclide**	**Half-life (Units)**
Ta-178s	Ta-178	9.31 m	Ta-178a	9.31 m	Ta-178a	9.31 m	Ta-178	9.31 m	Ta-178	9.31 m
Ta-178l	Ta-178m	2.36 h	Ta-178b	2.2 h	Ta-178b	2.2 h	Ta-178m	2.36 h		
Ta-180			Ta-180	1E+13 y	Ta-180	1E+13 y				
Ta-180m	Ta-180	8.152 h	Ta-180m	8.1 h	Ta-180m	8.1 h	Ta-180	8.152 h		
Tb-156ml	Tb-156m	24.4 h	Tb-156m	24.4 h	Tb-156m	24.4 h	Tb-156m	24.4 h		
Tb-156ms	Tb-156n	5.3 h	Tb-156n	5 h	Tb-156n	5 h	Tb-156n	5.3 h		

3.3 OTHER INPUT DATA

3.3.1 Atomic Mass Data

Using the methodology described in Section 4 of this report will allow for the calculation of HC-2 and HC-3 TQs in terms of activity (e.g., curies). Through the use of a radionuclide specific activity value, the calculated TQs can be equivalently expressed in terms of mass (e.g., grams). In order to calculate a radionuclide specific activity value, the atomic mass of the associated radionuclide is required.

The Atomic Mass Data Center (AMDC) maintains the official isotope mass tables. The AMDC is hosted by the Institute of Modern Physics (IMP), Chinese Academy of Sciences, Lanzhou, China, with a mirror site maintained by the International Atomic Energy Agency (IAEA). The latest version of the atomic mass data is dated March 1, 2017. (19) The data file contains atomic mass values for atomic mass entities ranging from A= 0 to 295.

3.3.2 Element Specific Constants

3.3.2.1 HC-2 Element Specific Constants

The calculation of HC-2 TQs requires the identification of element specific release fractions. The release fraction (RF) is a numerical representation of the fractional amount of the facility radioactive inventory which is lofted into an airborne plume. The RFs used for the calculation of HC-2 TQs is specified in accordance with Attachment 1 (page A-8) of DOE-STD-1027-92 CN-1, (1) which states:

Table 3.6 – Element Specific Assigned Airborne Release Fractions Used In The Calculation of Hazard Category 2 Threshold Quantities

	Element Class	**Assigned Airborne Release Fraction (RF)**
1.	Gases (such as tritium, krypton, xenon, argon, radon, chlorine, etc.)	1.0
2.	Highly volatile/combustible (phosphorus, sulfur, potassium, iodine, sodium, bromine)	0.5
3.	Semi-volatile (selenium, mercury, cesium, polonium, tellurium, ruthenium, carbon)	1 E-2
4.	Solid/Powder/Liquid (All materials not listed above)	1 E-3

3.3.2.2 HC-3 Element Specific Constants

The calculation of HC-3 TQs requires the identification of three element specific constants; (i) airborne release fraction (for the inhalation and food ingestion exposure pathways), (ii) the sorption coefficient (for the water ingestion exposure pathway, and (iii) the soil to plant concentration factor (for the food ingestion exposure pathway).

These element specific constants were obtained from the following tables in the EPA Technical Background Document (16) and are listed in Table 3.7:

- Exhibit A-1: Inhalation Release Fractions
- Exhibit B-2: Sorption Coefficient Values
- Exhibit C-1: Soil To Plant Concentration Factors

The element specific constants in Table 3.7 have not been altered and represent the published values contained within the EPA Technical Background Document. For several elements, the EPA Technical Background Document did not provide for an element specific constant. These instances are identified in the table with the symbol "--," and the associated pathway was not evaluated for the element. A justification for this disposition is explained as follows:

- **Boron:** The EPA Technical Background Document did not provide any element specific constants for boron. No radionuclides associated with boron are on the master radionuclide list (Appendix D, Table D.1). Therefore, no element specific constants are required for boron.
- **Carbon:** As noted in Appendix E of the EPA Technical Background Document, carbon radionuclides were only evaluated for the inhalation, water ingestion, and direct exposure pathways.[‡] This report follows the same convention as established in the EPA Technical Background Document and only evaluates the inhalation, water ingestion, and direct exposure pathways for carbon radionuclides.
- **Helium:** The EPA Technical Background Document did not provide an element specific airborne release fraction (RF) nor an element specific sorption coefficient (K_d) for helium. No radionuclides associated with helium are on the master radionuclide list (Appendix D, Table D.1). Therefore, no element specific constants are required for helium.
- **Hydrogen:** As noted in Appendix E of the EPA Technical Background Document, the lone hydrogen radionuclide (i.e, H-3) was only evaluated for the inhalation and water ingestion pathways.[§] This report follows the same convention as established in the EPA Technical Background Document and only evaluates the inhalation and water ingestion pathways for hydrogen radionuclides.
- **Lithium:** The EPA Technical Background Document did not provide any element specific constants for lithium. No radionuclides associated with the element lithium are on the master radionuclide list (Appendix D, Table D.1). Therefore, no element specific constants are required for lithium.

[‡] The direct exposure pathway was only evaluated in the EPA Technical Background Document when there was a photon emission component associated with the decay of the radionuclide. As such, the EPA Technical Background Document evaluated the direct exposure pathway for C-11 since it had a photon emission component, whereas C-14 was not evaluated for the direct exposure pathway since there was no photon emission component associated with the its decay.

[§] The direct exposure pathway was not evaluated in the EPA Technical Background Document since there was no photon emission component associated with the decay of H-3. The updated input documentation used in this report similarly notes there is no photon emission component associated with the decay of H-3.

- **Neon:** The EPA Technical Background Document did not provide any element specific constants for neon. There are two radionuclides associated with neon on the master radionuclide list (Appendix D, Table D.1); Ne-19 ($t_{1/2}$ = 17.22 s) and Ne-24 ($t_{1/2}$ = 3.38 m). Since these radionuclides each have a half-life less than 10 minutes, the inhalation and ingestion pathways are not evaluated (Refer to section 3.1.2 for a discussion of the 10 minute half-life evaluation threshold). Therefore, no element specific constants are required for neon.

- **Nitrogen:** The EPA Technical Background Document did not provide any element specific constants for nitrogen. There are two radionuclides associated with nitrogen on the master radionuclide list (Appendix D, Table D.1); N-13 ($t_{1/2}$ = 9.965 m) and N-16 ($t_{1/2}$ = 7.13 s). Since these radionuclides each have a half-life less than 10 minutes, the inhalation and ingestion pathways are not evaluated (Refer to section 3.1.2 for a discussion of the 10 minute half-life evaluation threshold). Therefore, no element specific constants are required for nitrogen.

- **Oxygen:** The EPA Technical Background Document did not provide any element specific constants for oxygen. There are three radionuclides associated with oxygen on the master radionuclide list (Appendix D, Table D.1); O-14 ($t_{1/2}$ =70.599 s), O-15 ($t_{1/2}$ =122.24 s) and O-19 ($t_{1/2}$ = 26.91 s). Since these radionuclides each have a half-life less than 10 minutes, the inhalation and ingestion pathways are not evaluated (Refer to section 3.1.2 for a discussion of the 10 minute half-life evaluation threshold). Therefore, no element specific constants are required for oxygen.

Table 3.7 – Elemental Data Used In The Calculation of Hazard Category 3 Threshold Quantities				
Symbol	**Name**	**Airborne Release Fraction** [**] **(RF)**	**Sorption Coefficient** [††] **(K_d)**	**Soil to Plant Concentration Factor** [‡‡] **(B_v)**
Ac	Actinium	0.001	1000	0.0035
Al	Aluminum	0.01	0	0.004
Am	Americium	0.001	1000	0.0055
Sb	Antimony	0.01	1	0.2
Ar	Argon	1.0	0	0
As	Arsenic	0.01	0	0.04
At	Astatine	0.001	0	1
Ba	Barium	0.01	100	0.15
Bk	Berkelium	0.001	700	0.001
Be	Beryllium	0.01	75	0.01
Bi	Bismuth	0.01	10	0.035
B	Boron	--	--	--
Br	Bromine	0.01	0	1.5
Cd	Cadmium	0.01	50-100	0.55
Ca	Calcium	0.01	15	3.5
Cf	Californium	0.001	0	0.001
C	Carbon	0.5	0	--
Ce	Cerium	0.01	2000	0.01
Cs	Cesium	0.01	2000	0.08
Cl	Chlorine	0.01	0	70
Cr	Chromium	0.01	0	0.0075
Co	Cobalt	0.001	2000	0.02
Cu	Copper	0.01	0	0.4
Cm	Curium	0.001	500	0.00085
Dy	Dysprosium	0.01	0	0.01
Es	Einsteinium	0.001	0	0.001
Er	Erbium	0.01	0	0.01
Eu	Europium	0.01	500	0.01
Fm	Fermium	0.001	0	0.001
F	Fluorine	0.01	0	0.06
Fr	Francium	0.01	200	0.03
Gd	Gadolinium	0.01	500-1000	0.01
Ga	Gallium	0.01	0	0.004
Ge	Germanium	0.01	0	0.4
Au	Gold	0.01	0	0.4
Hf	Hafnium	0.01	0	0.0035

[**] From Exhibit A-1 of the EPA Technical Background Document, 102RQ-RN-5-13
[††] From Exhibit B-2 of the EPA Technical Background Document, 102RQ-RN-5-13
[‡‡] From Exhibit C-1 of the EPA Technical Background Document, 102RQ-RN-5-13

Table 3.7 – Elemental Data Used In The Calculation of Hazard Category 3 Threshold Quantities (continued)				
Symbol	**Name**	**Airborne Release Fraction (RF)**	**Sorption Coefficient (K_d)**	**Soil to Plant Concentration Factor (B_v)**
He	Helium	--	--	0.01
Ho	Holmium	0.01	600	0.01
H	Hydrogen	0.5	0	--
In	Indium	0.01	0	0.004
I	Iodine	0.5	3	0.15
Ir	Iridium	0.001	0	0.055
Fe	Iron	0.01	150	0.004
Kr	Krypton	1.0	0	0
La	Lanthanum	0.01	0	0.01
Pb	Lead	0.01	4000	0.045
Li	Lithium	--	--	--
Lu	Lutetium	0.01	0	0.01
Mg	Magnesium	0.01	0	1
Mn	Manganese	0.01	0	0.25
Md	Mendelevium	0.001	0	0.001
Hg	Mercury	0.01	0	0.9
Mo	Molybdenum	0.01	5	0.25
Nd	Neodymium	0.01	500	0.01
Ne	Neon	--	--	--
Np	Neptunium	0.001	10	0.1
Ni	Nickel	0.01	100	0.06
Nb	Niobium	0.01	2000	0.02
N	Nitrogen	--	--	--
Os	Osmium	0.01	0	0.015
O	Oxygen	--	--	--
Pd	Palladium	0.01	50-100	0.15
P	Phosphorus	0.5	0	3.5
Pt	Platinum	0.01	0	0.095
Pu	Plutonium	0.001	100-10000	0.00045
Po	Polonium	0.01	25	0.0025
K	Potassium	0.01	35	1
Pr	Praseodymium	0.01	500-1000	0.01
Pm	Promethium	0.01	1000-10000	0.01
Pa	Protactinium	0.001	4000	0.0025
Ra	Radium	0.001	100-10000	0.015
Rn	Radon	1.0	0	0
Re	Rhenium	0.01	0	1.5
Rh	Rhodium	0.01	0	0.15
Rb	Rubidium	0.01	500	0.15
Ru	Ruthenium	0.01	0-500	0.075
Sm	Samarium	0.01	500-1000	0.01
Sc	Scandium	0.01	0	0.006
Se	Selenium	0.01	10	0.025

Table 3.7 – Elemental Data Used In The Calculation of Hazard Category 3 Threshold Quantities (continued)				
Symbol	**Name**	**Airborne Release Fraction (RF)**	**Sorption Coefficient (K_d)**	**Soil to Plant Concentration Factor (B_v)**
Si	Silicon	0.01	0	0.35
Ag	Silver	0.01	50-100	0.4
Na	Sodium	0.01	10	0.075
Sr	Strontium	0.01	100	2.5
S	Sulfur	0.5	0	1.5
Ta	Tantalum	0.001	0	0.01
Tc	Technetium	0.01	0	9.5
Te	Tellurium	0.01	50-100	0.025
Tb	Terbium	0.01	500-1000	0.01
Tl	Thallium	0.01	2	0.004
Th	Thorium	0.001	1000-10000	0.00085
Tm	Thulium	0.01	0	0.01
Sn	Tin	0.01	50-100	0.03
Ti	Titanium	0.01	0	0.0055
W	Tungsten	0.01	0	0.045
U	Uranium	0.001	1-50	0.0085
V	Vanadium	0.01	0	0.0055
Xe	Xenon	1.0	0	0
Yb	Ytterbium	0.01	0	0.01
Y	Yttrium	0.01	500	0.015
Zn	Zinc	0.01	0	1.5
Zr	Zirconium	0.01	2000	0.002
Bk-249, Bk-250, Es-254m RF based on NUREG-1140 release fraction for "any other beta-gamma emitter."				

3.3.3 Breathing Rate

3.3.3.1 Breathing Rates Used By DOE-STD-1027-92

For Hazard Category 2, DOE-STD-1027-92 specifies a breathing rate, also referred to as the respiration rate, of $3.5x10^{-4}$ m^3/s, (=21 L/min) a value which is assumed equal to the standard value for an active man. A literature review indicates this recommended breathing rate is approximately the same value specified by ICRP Pub-23 (20) for an adult male engaged in light-activity (=20 L/min).[§§]

For Hazard Category 3, DOE-STD-1027-92 uses a breathing rate of 2.3×10^7 cm^3/day (=$2.64x10^{-4}$ m^3/s) as specified in Appendix A of the EPA Technical Background Document. (16) A literature review indicates this recommended breathing rate is equal to the time-averaged breathing rates for an adult male engaged in 8-hr of working (light-activity), 8-hr of non-occupational activity, and 8-hr of resting as specified by ICRP Pub-23. (20) [***]

3.3.3.2 Updated Breathing Rate

In 1994, the ICRP updated the human respiratory tract model with the issuance of Pub-66, *Human Respiratory Tract Model for Radiological Protection*. (21) Pub-66 defined light-work for workers on the following basis: 2.5-hr sitting (with an inhalation rate of 0.54 m^3/hr), and 5.5-hr of light exercise (with an inhalation rate of 1.5 m^3/hr).[†††] This definition of light-work results in a recommended time-averaged breathing rate of $3.3333x10^{-4}$ m^3/s.

$$BR_{Light-Activity} = \frac{\left(0.54\frac{m^3}{hr} * 2.5\ hr\right) + \left(1.5\frac{m^3}{hr} * 5.5\ hr\right)}{2.5\ hr + 5.5\ hr} = 1.2\frac{m^3}{hr} = 3.3x10^{-4}\frac{m^3}{s}$$

3.3.3.3 Justification for Use of Updated Breathing Rate

The primary justification for the use of an updated breathing rate is based on the derivation of the DCs in Pub-68 and Pub-72 reliance on the revised human respiratory tract model as defined in Pub-66. As noted in a Supplemental Guidance (4) to DOE-STD-1027-92, the National Nuclear Security Administration (NNSA) noted that the Central Technical Authority (CTA) issued a memorandum regarding the clarification of dose calculation parameters, specifically for the preparation of safety basis documents for transuranic waste facilities. The NNSA Supplemental Guidance (on page AT4-4) cites the following from the CTA memorandum (emphasis added by the Supplemental Directive in italics):

> …the Standard specifies the use of 3.3×10^{-4} m^3/s as BR [breathing rate] in conjunction with dose conversion factors (DCFs) from International Commission on Radiation Protection (ICRP) Publications 72 and 68. *The DCFs in ICRP 72 and 68 are based on a model described in ICRP 66. ICRP 66 provides a range of BRs depending on the age and sex of the person and the type of activity being modeled.* The BR specified in the Standard has been called into question because it is not specifically listed in ICRP 66. Since the DCFs in ICRP 72 and 68 are based on the ICRP 66 model, a conclusion was drawn that the BR used in dose calculations must be one of the values explicitly used in ICRP 66.

[§§] ICRP Pub 23, pg. 347 (Table 120)
[***] ICRP Pub 23, pg. 346
[†††] ICRP Pub 66, pg 23 (Table 6)

> *The BR in the Standard represents a weighted average of two BRs in ICRP 66. This average BR is widely used. It is defined and used in ICRP 68* [worker dose coefficients] *to represent light work: a combination of 2½ hours of rest/sitting and 5½ hours of light exercise, as defined in ICRP 66. This BR is used by DOE in 10 C.F.R. 835, Occupational Radiation Protection, for establishing derived air concentrations for worker protection and in its toolbox modeling codes.*
>
> *…The DCFs documented in ICRP 72* [public dose coefficients] *are not explicitly linked to the BRs identified in ICRP 66. Therefore, using a BR that is within the range specified in ICRP 66 and in conjunction with the DCFs in ICRP 72 is acceptable for a member of the public at a similar activity level. Using this criterion, the BR used in the Standard is within the range of BR values given in ICRP 66 and is reasonable for calculating dose to the public, assuming that the activity level being modeled is the same. That is, the BR specified in DOE-STD-5506 is consistent with that in ICRP 72 for calculating public doses.* If a higher activity is likely for a member of the public based on the local conditions at the site boundary, it may then be appropriate to use a higher BR within the range provided in ICRP 66 in the dose calculations.

The NNSA Supplemental Directive concludes that the CTA position supports the use of an updated breathing rate of 3.3333×10^{-4} m^3/s as an appropriate value to use in conjunction with dose conversion factors pertaining to both the worker (Pub 68) and the public (Pub 72).

This report expands the list of DC publications used for the calculation of HC-2 and HC-3 TQs beyond the NNSA CTA justification associated with the use of Pub-68 and Pub-72. However, as previously discussed, and as illustrated in Figure 3.1, the inhalation DCs derived in DOE-STD-1196-2011[‡‡‡] and JAERI-Data/Code 2002-013[§§§] are computed in a manner consistent with Pub-68 and Pub-72. [****]

Accordingly, the use of the updated breathing rate is within the scope of the justification proffered by the NNSA CTA. Therefore, the HC-2 and HC-3 TQs in this report will utilize the Pub-66 recommended light-work time-averaged breathing rate of 3.3333×10^{-4} m^3/s.

3.3.4 Atmospheric Dispersion Coefficients (χ/Q)

Atmospheric dispersion coefficients (χ/Q) are utilized to determine the degree by which a passing radioactive plume has dispersed by the time it reaches the downwind location of the analyzed receptor. Since the downwind location of the analyzed receptor differs between the HC-2 and the HC-3 TQ methodologies, the atmospheric dispersion coefficients will be different.

3.3.4.1 Hazard Category 2 Atmospheric Dispersion Coefficient

DOE-STD-1027-92 specifies that for the calculation of HC-2 TQs, the analyzed receptor is located 300 meters downwind from a surface level atmospheric release of radiological material. The release is assumed to disperse in the form of a Gaussian plume. The meteorological conditions of the plume

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‡‡‡ DOE-STD-1196-2011, pg 2, "The DCSs of this standard are based on age-specific effective dose coefficients computed in the manner of ICRP Publication 72…."

§§§ JAERI-Data/Code 2002-013, pg i, "The dose coefficients were calculated with the computer code DOCAP based on the respiratory tract model and biokinetic model of ICRP. The effective dose rates were calculated by considering both external irradiation from the surrounding cloud and irradiation of the lungs from the gas within them. The calculated results are presented as tables, which are the same forms as those in ICRP Publs. 68 and 72."

**** FGR-12 is only utilized in this report for air-immersion DCs in support of the calculation of HC-2 TQs. The assessment of the air immersion dose component in the HC-2 TQ calculation does not require the use of a breathing rate.

dispersion are modeled via a no-bouyancy Pasquill stability class D with a wind speed of 4.5 m/s. As noted in Figure 3.2, (22) and as stated in DOE-STD-1027-92, these conditions yield a χ/Q of approximately $1x10^{-4}$ s/m^3 when the deposition velocity (for both wet and dry deposition) is assumed to be 1 cm/s.

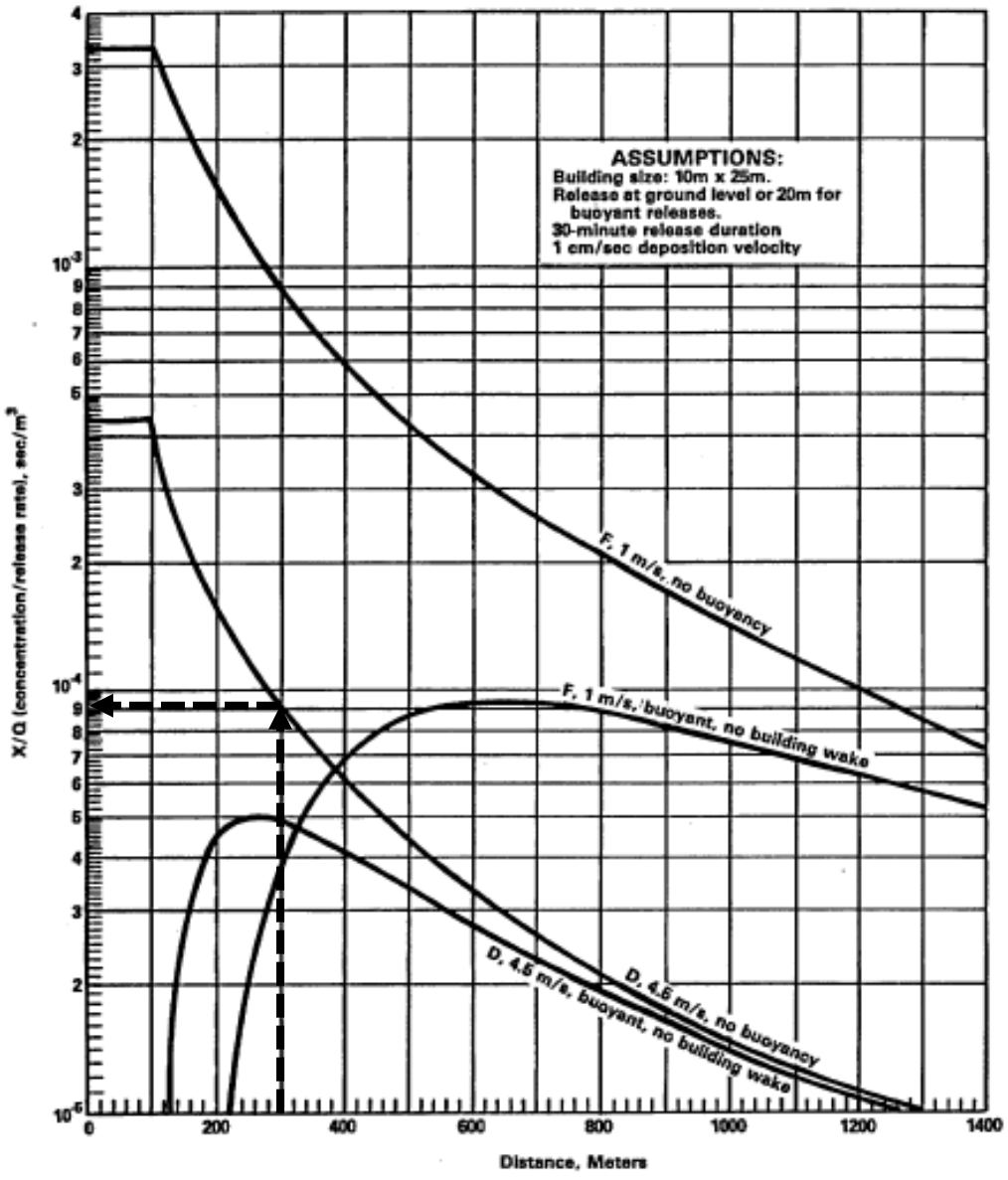

Figure 3.2 - Atmospheric Dispersion Verses Distance (Figure 1 from NUREG-1140)

3.3.4.2 Hazard Category 3 Atmospheric Dispersion Coefficient

DOE-STD-1027-92 defers to the EPA Technical Background Document regarding the specification of the atmospheric dispersion coefficient used for calculating the HC-3 TQs. Per the EPA, the distance from the point source release to the receptor location is assumed to be 30 meters. Additionally, it is assumed that a Gaussian distribution of the released contaminant is established almost immediately within the plume and is fully developed at 30 meters. The meteorological conditions of the plume dispersion are modeled via a

Pasquill stability class D with a wind speed of 1 m/s. As noted in Figure 3.3, (16) the EPA concluded that these conditions yield a χ/Q of approximately 8.4×10^{-7} day/m^3 ($=7.2 \times 10^{-2}$ s/m^3) when the deposition velocity (for both wet and dry deposition) is assumed to be 1,000 meter/day (=1.16 cm/s). [††††]

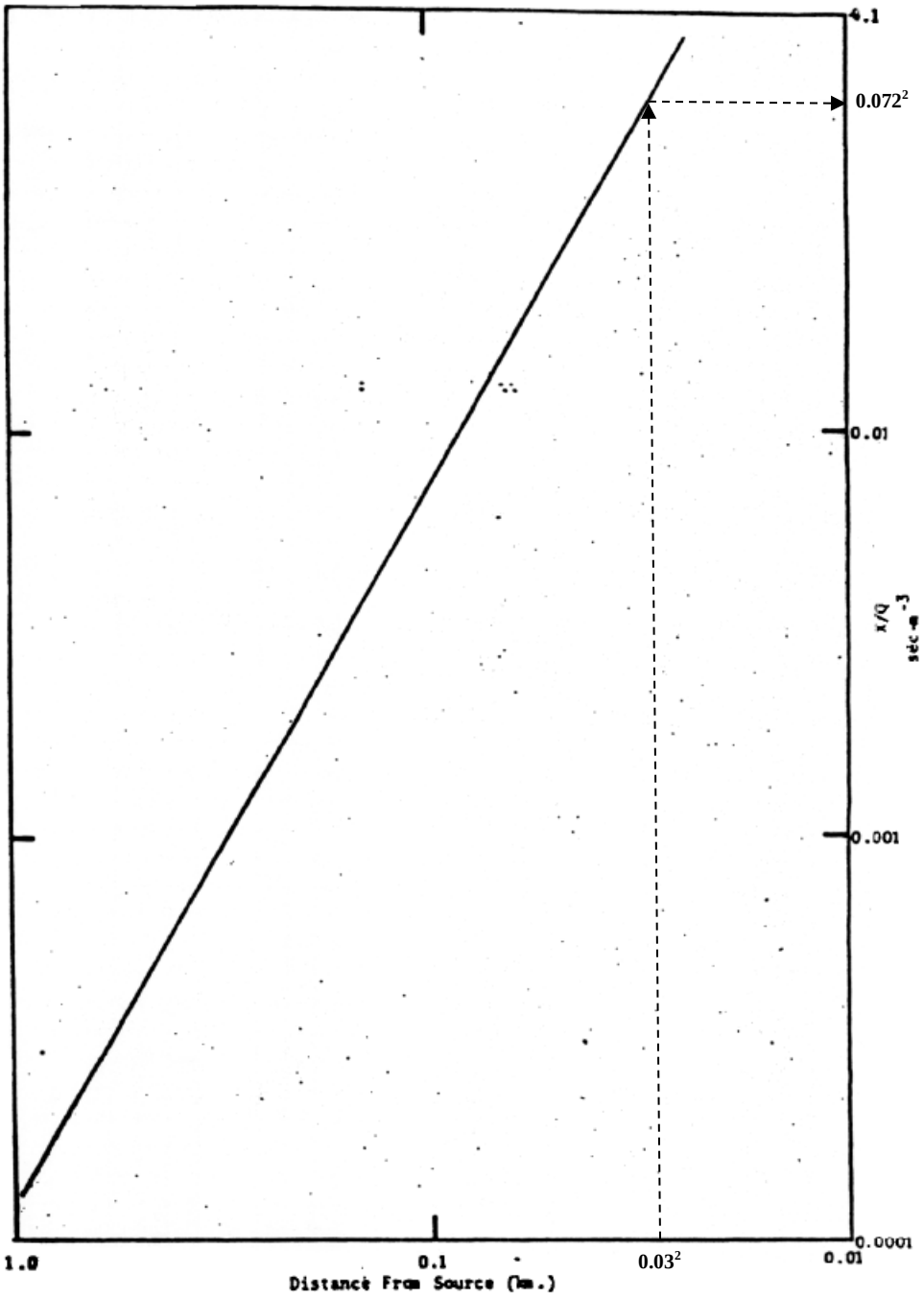

Figure 3.3 - Atmospheric Dispersion Verses Distance (Exhibit A-2 from 102RQ-RN-5-13)

[††††] 102RQ-RN-5-13, pg. C-6

3.3.5 Miscellaneous Inputs and Conversion Factors

3.3.5.1 Avogadro's constant

The calculation of Specific Activity requires the use of Avogadro's constant. DOE-STD-1027-92 does not explicitly state nor imply the value of Avogadro's constant used in calculating specific activity (for converting TQ values from activity to mass). The LANL HC-2 Fact Sheet (2) and the LANL HC-3 Fact Sheet (3) respectively use a value of 6.023×10^{23} for Avogadro's constant.

A literature research noted that the Committee on Data for Science and Technology (CODATA) in a 2014 update, specifies a published value of $6.022\ 140\ 857 \times 10^{23}$ mol^{-1} (23). A sampling of CODATA publications was conducted to determine if there were any previous changes in the value recommended for Avogadro's constant. The results of the sampling, presented in Table 3.8, note that a truncated version of the constant would result in a value of 6.022×10^{23} mol^{-1} for all sampled publications going back as far as 1969.

Table 3.8 – Review of Values for Avogadro's Constant as Recommended by CODATA

CODATA	Publication	Avogadro's Constant
1969	Reviews of Modern Physics Volume 41, No. 3 July 1969 (24)	$6.022\ 169 \times 10^{26}$ $kmole^{-1}$
1986	Reviews of Modern Physics Volume 59, No. 4 Oct 1987 (25)	$6.022\ 136\ 7 \times 10^{23}$ mol^{-1}
2002	Reviews of Modern Physics Volume 77, No. 1 Jan 2005 (26)	$6.022\ 141\ 5 \times 10^{23}$ mol^{-1}
2006	Reviews of Modern Physics Volume 80, No. 2 Apr-June 2008 (27)	$6.022\ 141\ 79 \times 10^{23}$ mol^{-1}
2014	Reviews of Modern Physics Volume 88, No. 3 July-Sept 2016 (23)	$6.022\ 140\ 857 \times 10^{23}$ mol^{-1}

Based on the literature review of the CODATA recommended values for Avogadro's constant from 1969 to the present, the value used in the TQ calculations will be 6.022×10^{23} mol^{-1} instead of the value used in the LANL Fact Sheets.

3.3.5.2 Conversion Factors

Dose Equivalent and Activity Conversion Factors

The contemporary publications selected for use provide inhalation, ingestion, and air immersion DCs utilizing the International System of Units (SI). Specifically, the DCs expressed dose equivalent in seiverts (Sv) and activity in becquerels (Bq). However, the dose equivalent limits specified for the respective HC-2 and HC-3 calculations are expressed in units of roentgen equivalent man (rem). Also, the calculated TQs in terms of activity are expressed as curies (Ci). Accordingly, the following dosimetric conversion factors are utilized in this report:

Dose Equivalent (28)	$0.01 \frac{Sv}{rem}$
Activity (29)	$3.7x10^{10} \frac{Bq}{Ci}$

Time Conversion Factors

Half-life data is obtained from ICRP Pub 38, Pub 107, and JAERI-Data/Code 2002-013. The half-life data is considered to be a NTD, and as such would be formatted in accordance with ENSDF protocols. The NNDC has issued guidance pertaining to the specification requirements for half-life data. Per the ENSDF preparation manual, valid symbols for half-life units are as follows:

- Y, D, H, M, S, MS, US, NS, PS, FS, AS……for year, day, hour, minute, second(s), 10^{-3} s, 10^{-6} s, 10^{-9} s, 10^{-12} s, 10^{-15} s, and 10^{-18} s….respectively.

A review of ICRP Pub 38, Pub 107, and JAERI-Data/Code 2002-013 NTD noted the smallest reported half-life was in micro-seconds (μs = 10^{-6} s). As such, the following time conversions in Table 3.9 are used in the calculations.

Table 3.9 – Time Conversion Factors

Unit	Value (s)
y	31556952
d	86400
h	3600
m	60
s	1
ms	0.001
μs	0.000001

The duration of a year (3.1557×10^7 s) is based on a mean Gregorian year (365.2425 days per year). ‡‡‡‡

‡‡‡‡ The current calendar system is established to be the Gregorian calendar, which is based on a cycle of 400 years. Within the 400 year cycle, every 4th year is a leap year (addition of an extra day), except for the 100th, 200th and 300th year in the cycle which do not have a leap day. (36) This results in a total of 97 leaps days during the 400 year cycle. Accordingly, a mean Gregorian year is $365 \frac{97}{400}$ days = 365.2425 days.

4. METHODOLOGY

4.1 HAZARD CATEGORY 2 THRESHOLD QUANTITIES METHODOLOGY

4.1.1 HC-2 Threshold Quantity Exposure Pathway Model

The derivation of the HC-2 TQs is based on the cumulative dose contribution associated with a person subjected to a passing atmospheric radioactive plume. The specific doses assessed in the model include: (i) the internal dose received as a result of the inhalation of radionuclides contained within the plume, and (ii) external dose received as a result of being submersed in a radioactive gas plume.

Accordingly, the calculation of HC-2 TQs is expressed as follows: (1)

$$TQ_{HC2} = \frac{1\ rem}{RF * SA * {}^{X}/_{Q} * (DC_{inhal} * BR + DC_{sub})} \qquad \text{Eqn. 1}$$

Where;

TQ_{HC2} = Quantity of material used as threshold (grams)

RF = Airborne release fraction of material averaged over an entire facility (unitless)

SA = Specific activity of radionuclide released (Ci/gm)

X/Q = Meteorological dispersion coefficient (1E-4 sec/m^3)

DC_{inhal} = Inhalation Dose Coefficient (Sv/Bq)

BR = Respiration rate (3.3333E-4 m^3/sec)

DC_{sub} = Air Immersion Dose Coefficient (Sv/sec per Bq/m^3)

Table 3.3 of this report details the criteria associated with the selection of inhalation DCs and air immersion DCs. The airborne release fractions were selected in as directed per Table 3.6 of this report. The TQ value is converted to grams by dividing the HC-2 TQ (Ci) by the specific activity (Ci/g). The specific activity is calculated using the following equation: (2)

$$\mathrm{SA} = \frac{\ln(2) * \mathrm{N_A}}{\mathrm{AW} * t_{1/2} * \left(3.1557x10^{7}\frac{s}{yr}\right) * \left(3.7x10^{10}\frac{Bq}{Ci}\right)} \qquad \text{Eqn. 2}$$

Where;[§§§§]

SA = Specific Activity (Ci/g)

N_A = Avogadro's Number (6.022 x 10^{23})

AW = Atomic Weight (i.e., from the Atomic Mass Data Center)

$t_{1/2}$ = Half-life (yr)

[§§§§] As noted in Section 3.3.5.2 of this report, a time conversion factor of 3.1557x10^7 sec/yr is based on a mean Gregorian year. The time conversion value of 3.154x10^7 sec/yr as cited in the LANL Fact Sheet, Reference (2), is equivalent to 365 days. This calculation will use the mean Gregorian year length of time (3.1557x10^7 sec/yr) since it accounts for the 97 leap years in the 400-yr Gregorian calendar cycle.

4.2 HAZARD CATEGORY 3 THRESHOLD QUANTITIES METHODOLOGY

The calculation of HC-3 TQ values is based on the calculation of pathway specific TQs associated with five dose exposure pathways:

- Inhalation
- Ingestion (of food)
- Ingestion (of water)
- Direct Exposure (via point source)
- Air Submersion (in a radioactive cloud)

The limiting exposure pathway is the exposure pathway that results in an effective dose of 10 rem at 30 meters with the smallest amount (i.e., activity) of an isotope.

This methodology is derived from the five exposure pathway methodology presented in the EPA Technical Background Document (16) and modified for a dose exposure of 10 rem (instead of the 0.5 rem dose exposure used in the EPA calculations). The following sections detail the methodologies for calculating pathway specific TQs.

4.2.1 Inhalation Exposure Pathway

The inhalation exposure pathway threshold quantity (TQ_{inh}) is expressed as follows (Equation 3):

$$TQ_{HC3,inhale} = \frac{10\ rem}{R * \left(\chi/Q\right) * BR * DC_{inhal}} * \frac{0.01 \frac{Sv}{rem}}{3.7x10^{10} \frac{Bq}{Ci}} \qquad \text{Eqn. 3}$$

Where;

$TQ_{HC3,inhale}$	= Inhalation pathway threshold quantity [Ci];
R	= Airborne release fraction [dimensionless];
χ/Q	= Meteorological dispersion coefficient 30 meters from ground level release [$7.2x10^{-2}$ s/m^3];
BR	= Breathing Rate [$3.3333x10^{-4}$ m^3/s]; and
DC_{inhal}	= Inhalation dose coefficient [Sv/Bq].

Table 3.4 of this report details the criteria associated with the selection of inhalation DCs. The airborne release fractions were selected as directed per Table 3.7 of this report.

4.2.2 Food Ingestion Exposure Pathway

The food ingestion exposure pathway threshold quantity ($TQ_{HC3,food}$) is expressed as follows (Equation 4):

$$TQ_{HC3,food} = \frac{10\,rem}{DF * FC * CT * R * DC_{ingest}} * \frac{0.01\frac{Sv}{rem}}{3.7x10^{10}\frac{Bq}{Ci}} \quad \text{Eqn. 4}$$

Where;

$TQ_{HC3,food}$ = Food ingestion pathway threshold quantity [Ci];

DF = Dilution factor accounting for the transfer of radionuclides from air to vegetation (Ci/kg of vegetables at the point of exposure per curies released to the atmosphere, [kg^{-1}]);

FC = Food (i.e., leafy vegetable) consumption rate of reference man [0.175 kg/day];

CT = Contact Time (effective time over which contaminated vegetables are ingested [days];

R = Airborne release fraction [dimensionless]; and

DC_{ingest} = Ingestion dose coefficient [Sv/Bq].

Table 3.4 of this report details the criteria associated with the selection of ingestion DCs. The airborne release fractions were selected as directed per Table 3.7 of this report. The dilution factor (DF) is calculated in accordance with the following equation:

$$\text{DF} = 1x10^{-4} + (3.5x10^{-6} * B_V);\ [kg^{-1}] \quad \text{Eqn. 5}$$

Where;

B_V = Concentration ratio for the transfer of the element to the edible portion of a crop from dry soil (dimensionless)

Values for B_V were taken from Table 3.7 of this report. Values for Contact Time (CT) were determined using the following equation as specified in the EPA Technical Background Document:

$$\text{CT} = \left(\frac{1 - \exp(-[(\lambda_I + \lambda_W)\mathrm{t}_G])}{\lambda_I + \lambda_W}\right);\ [days] \quad \text{Eqn. 6}$$

Where;

λ_I = Radionuclide decay constant [day^{-1}] = $\ln(2)/t_{1/2}$;

$t_{1/2}$ = Radionuclide half-life [days];

λ_W = Weathering decay constant [day^{-1}] = ln(2)/14 days; and

t_G = Growing season time [60 days].

Radionuclide half–life data was obtained from the master isotope list in Appendix D of this report (Table D.1).

4.2.3 Ground Water Ingestion Exposure Pathway

The ground water ingestion exposure pathway threshold quantity ($TQ_{HC3,water}$) is expressed as follows (Equation 7):

$$TQ_{HC3,water} = \frac{10\,rem}{DF * \left[\frac{1-\exp(-\lambda * CT)}{\lambda}\right] * WC * DC_{ingest}} * \frac{0.01\frac{Sv}{rem}}{3.7x10^{10}\frac{Bq}{Ci}} \qquad \text{Eqn. 7}$$

Where;

$TQ_{HC3,water}$ = Water ingestion pathway threshold quantity [Ci];

DF = Dilution Factor [L^{-1}];

λ = Radionuclide decay constant [day^{-1}] = $\ln(2)/t_{1/2;}$

R_d = Retardation Factor [1 day];

CT = Contact time [9 days];

WC = Water consumption of reference man [2 L/day]; and

DC_{ingest} = Ingestion dose coefficient [Sv/Bq].

Table 3.4 of this report details the criteria associated with the selection of ingestion DCs. Radionuclide half–life data was obtained from the master isotope list in Appendix D of this report (Table D.1).
The dilution factor (DF) is calculated in accordance with the following equation:

$$\text{DF} = \left[7.6x10^{-8} * \exp\left(-4.2 * \frac{R_d}{t_{\frac{1}{2}}}\right)\right];\ [L^{-1}] \qquad \text{Eqn. 8}$$

Where;

R_d = Retardation Factor (1 day)

The EPA noted that radioisotopes with a retardation factor greater than one will have a calculated ground water ingestion release value much larger in comparison with the other pathway release values. Accordingly, the EPA did not develop separate ground water ingestion release value equations for situations where the retardation factor is greater than one. As noted by the EPA, when the sorption coefficient, K_d, is equal to zero, the retardation factor is equal to one. When the sorption coefficient becomes larger, however, the retardation factor increases rapidly. Values for the sorption coefficient were obtained from Table 3.7 of this report. Consistent with the EPA methodology, ground water pathway release values were only calculated for radioisotopes that had a reported sorption coefficient (K_d) less than one.

4.2.4 External Pathway Exposure Pathways

The methodology for the determination of release values for external exposure to radiation is dependent upon the form of the radionuclide released. For specific noble gas radioisotopes (argon, krypton, and xenon), the release values are based on exposure due to total body submersion in a radioactive gas cloud. For all other radionuclides, the direct exposure release values are based on the quantity of radioactivity received by an individual exposed to a point source of radiation.

4.2.4.1 Direct (a.k.a., Point Source) Exposure Pathway

Except for noble gases[*****], the Direct Exposure release value is based on a gamma dose incurred over a 24-hour period from a point source located 30 meters away. The equation for calculating the Direct Exposure pathway threshold quantity is expressed as (Equation 9):

$$TQ_{\mathrm{HC3,direct}} = \frac{10\ \mathrm{rem} * \mathrm{S}^2 * C_{gamma}}{\mathrm{E}_1 * \mu_a * \left(24\frac{hr}{day}\right) * \left(\frac{1-\exp(-\lambda t)}{\lambda}\right) * \exp\left[\left(-100\frac{cm}{m}\right)\mu_a S\right]} \qquad \text{Eqn. 9}$$

Where;

$TQ_{HC3,direct}$ = Direct exposure pathway threshold quantity [Ci];

S = Distance from the point source [30 m];

C_{gamma} = Equation coefficient [$6.41 \times 10^{-5}\ \frac{\mathrm{Ci-MeV-hr}}{rem-m^2-cm}$];

E_1 = Sum of the products of the photon energies and the photon fraction or intensities [MeV];

μ_a = Linear energy absorption coefficient for gamma rays in air [$3.7 \times 10^{-5}\ cm^{-1}$];

λ = Radionuclide decay constant [day^{-1}] = $\ln(2)/t_{1/2}$;

t = Duration of exposure [1 day].

Radionuclide half–life data was obtained from the master isotope list in Appendix D of this report (Table D.1). Table 3.4 of this report details the criteria associated with the selection of the value for the average photon energy.

4.2.4.2 Air Immersion Exposure Pathway

For noble gases (argon, krypton, and xenon), the air immersion release value is based on the dose an individual receives when submerged in a cloud of the radioactive gas. The release value for the air immersion pathway threshold quantity is expressed as (Equation 10):

[*****] The ICRP has not published air immersion DCs for radon radionuclides in Pub-119. Accordingly, radon radionuclides are considered only for the TQ_{direct} exposure pathway.

$$TQ_{HC3,sub} = \frac{10\ rem}{\left(\chi/_{Q}\right) * \left(day/_{86{,}400\ sec}\right) * DC_{sub}} * \frac{0.01 \frac{Sv}{rem}}{3.7x10^{10} \frac{Bq}{Ci}} \qquad \text{Eqn. 10}$$

Where;

$TQ_{HC3,sub}$ = Submersion Dose Threshold Quantity [Ci];

χ/Q = Meteorological dispersion coefficient 30 meters from ground level release [$7.2x10^{-2}$ s/m^3]; and

DC_{sub} = Air Immersion Dose Coefficient [Sv/day per Bq/m^3].

Table 3.4 of this report details the criteria associated with the selection of air immersion DCs.

4.2.5 Determination of the HC-3 TQ Value

After calculating the pathway specific TQ values, the HC-3 TQ is determined by selecting the pathway with the lowest calculated activity content that results in a 10-rem dose to the receptor located 30-meters from the facility.

$$TQ_{HC3} = \min \begin{bmatrix} TQ_{HC3,inhale}, \\ TQ_{HC3,food}, \\ TQ_{HC3,water}, \\ TQ_{HC3,direct}, \\ TQ_{HC3,sub} \end{bmatrix} \qquad \text{Eqn. 11}$$

4.3 GUIDANCE ON THE USE OF SELECTED INPUT DATA

4.3.1 HC-2 Inhalation Dose Coefficient Selection Criteria

As noted in Table 3.1, the inhalation DCs used for calculating the HC-2 TQs in DOE-STD-1027-92 were obtained from DOE/EH-0071. (13) The publication provided inhalation DCs for the following lung retention classes: D (daily), W (weekly), and Y (yearly). Per the guidance of DOE/EH-0071, "if the class is unknown, use the largest value."

As noted in Table 3.2, DOE/EH-0071 is superseded by contemporary publications with updated DCs. The bulk of the inhalation DCs used in the HC-2 TQ calculation will be obtained from ICRP Pub-119 which is a compendium of DCs previously published in Pub-68 (worker) and Pub-72 (public). Table 2 ("Age-Dependent Doses From Intake of Radionuclides") of Pub-72 (which is not reproduced in Pub-119) describes a modified criterion for the selection of inhalation DCs. Specifically; Table 2 of Pub-72 designates, by element, a recommended default absorption class. The recommended default absorption class was used in the calculation of updated TQs in the NNSA Supplemental Guidance to DOE-STD-1027-92 (4).

In recognition of the differing guidance, this report undertook an effort to calculate the HC-2 TQs using the guidance of Table 2 of ICRP Pub-72 (consistent with the calculated updated TQs in the NNSA Supplemental Guidance) and also calculated the HC-2 TQs using the guidance of DOE/EH-0071 (using the maximum inhalation DC regardless of the recommended inhalation clearance class).

4.3.1.1 Criteria for the Selection of the HC-2 Maximum Inhalation Dose Coefficient

As observed in Table 3.3, both ICRP Pub-119 and JAERI-Data/Code 2002-013 have more than one table that provide radionuclide specific inhalation DCs. Both the ICRP and the JAERI publication have one table providing DCs (for each analyzed lung clearance class) based on the inhalation of air-borne particulates, and a second table providing inhalation DCs based on the inhalation of gases/vapours. DOE-STD-1196-2011 also includes both particulate inhalation DCs, as well as gases/vapours inhalation DCs. However unlike the other publications, the particulate inhalation DCs and the gases/vapours inhalation DCs in DOE-STD-1196-2011 are all listed in a single data table.

The maximum inhalation DC was selected in consideration of both the particulate inhalation DC and the gases/vapours inhalation DC. Typically, the maximum inhalation DC used in the HC-2 TQ calculation was from the inhaled particulate table. However, 48 radionuclides were identified as having the gas/vapor form as the maximum inhalation DC (Table 4.1).

Table 4.1 – Radionuclides With Gas/Vapour as Maximum Inhalation DC for HC-2 TQ Calculation

Hg-190	I-118	I-131	Ru-95
Hg-191m	I-119	I-132	Ru-97
Hg-192	I-120	I-132m	Te-114
Hg-193	I-120m	I-133	Te-119m
Hg-193m	I-121	I-134	Te-121
Hg-194	I-123	I-135	Te-123
Hg-195	I-124	Ni-56	Te-131
Hg-195m	I-125	Ni-57	Te-131m
Hg-197	I-126	Ni-59	Te-132
Hg-197m	I-128	Ni-63	Te-133
Hg-199m	I-129	Ni-65	Te-133m
Hg-203	I-130	Ru-94	Te-134

The selection of the maximum inhalation DCs and air immersion DCs is documented in Appendix A, Table A.1.

4.3.1.2 Criteria for the Selection of the HC-2 Recommended Inhalation Dose Coefficient

The selection process for using the recommended default absorption class inhalation DCs per Table 2 of ICRP Pub-72 required the following modification to the selection criteria used for identifying the maximum inhalation DC:

- If a radionuclide is not associated with an element identified in Table 2 of ICRP Pub-72 as a candidate for using a recommended default absorption class, then the inhalation DC was selected in the same manner as described for the maximum inhalation DC per Section 4.3.1.1.

- If a radionuclide is associated with an element identified in Table 2 of ICRP Pub-72 as a candidate for using a recommended default absorption class, then only the particulate inhalation DC for the recommended absorption class was used. Table 4.2 summarizes the elements from ICRP Pub-72 that were identified as using a default lung absorption class, as well as those using a maximum lung absorption class.

Table 4.2 – Elements With Recommended Default Lung Absorption Class and Maximum Lung Absorption Class Per ICRP 72			
Element	**Symbol**	**Max/Rec.**	**Rec. Lung Absorption Type**
Actinium	Ac	Max	
Silver	Ag	Rec	M
Aluminum	Al	Max	
Americium	Am	Rec	M
Arsenic	As	Max	
Astatine	At	Max	
Gold	Au	Max	
Barium	Ba	Rec	M
Beryllium	Be	Max	
Bismuth	Bi	Max	
Berkelium	Bk	Max	
Bromine	Br	Max	
Carbon	C	Rec	M
Calcium	Ca	Rec	M
Cadmium	Cd	Max	
Cerium	Ce	Rec	M
Californium	Cf	Max	
Chlorine	Cl	Max	
Curium	Cm	Rec	M
Cobalt	Co	Rec	M
Chromium	Cr	Max	
Cesium	Cs	Rec	F
Copper	Cu	Max	
Dysprosium	Dy	Max	
Erbium	Er	Max	
Einsteinium	Es	Max	
Europium	Eu	Max	
Fluorine	F	Max	
Iron	Fe	Rec	M
Fermium	Fm	Max	
Francium	Fr	Max	
Gallium	Ga	Max	
Gadolinium	Gd	Max	
Germanium	Ge	Max	

Table 4.2 – Elements With Recommended Default Lung Absorption Class and Maximum Lung Absorption Class Per ICRP 72 (continued)			
Element	**Symbol**	**Max/Rec.**	**Rec. Lung Absorption Type**
Hafnium	Hf	Max	
Mercury	Hg	Max	
Holmium	Ho	Max	
Iodine	I	Rec	F
Indium	In	Max	
Iridium	Ir	Max	
Potassium	K	Max	
Lanthanum	La	Max	
Lutetium	Lu	Max	
Mendelevium	Md	Max	
Magnesium	Mg	Max	
Manganese	Mn	Max	
Molybdenum	Mo	Rec	M
Sodium	Na	Max	
Niobium	Nb	Rec	M
Neodymium	Nd	Max	
Nickel	Ni	Rec	M
Neptunium	Np	Rec	M
Osmium	Os	Max	
Phosphorus	P	Max	
Protactinium	Pa	Max	
Lead	Pb	Rec	M
Palladium	Pd	Max	
Promethium	Pm	Max	
Polonium	Po	Rec	M
Praseodymium	Pr	Max	
Platinum	Pt	Max	
Plutonium	Pu	Rec	M
Radium	Ra	Rec	M
Rubidium	Rb	Max	
Rhenium	Re	Max	
Rhodium	Rh	Max	
Ruthenium	Ru	Rec	M
Sulfur	S	Rec	M
Antimony	Sb	Rec	M
Scandium	Sc	Max	

Table 4.2 – Elements With Recommended Default Lung Absorption Class and Maximum Lung Absorption Class Per ICRP 72 (continued)			
Element	**Symbol**	**Max/Rec.**	**Rec. Lung Absorption Type**
Selenium	Se	Rec	F
Silicon	Si	Max	
Samarium	Sm	Max	
Tin	Sn	Max	
Strontium	Sr	Rec	M
Tantalum	Ta	Max	
Terbium	Tb	Max	
Technetium	Tc	Rec	M
Tellurium	Te	Rec	M
Thorium	Th	Rec	S
Titanium	Ti	Max	
Thallium	Tl	Max	
Thulium	Tm	Max	
Uranium	U	Rec	M
Vanadium	V	Max	
Tungsten	W	Max	
Yttrium	Y	Max	
Ytterbium	Yb	Max	
Zinc	Zn	Rec	M
Zirconium	Zr	Rec	M
Radon	Rn	Max	
Hydrogen	H	Rec	M

The selection of the recommended inhalation DCs and maximum air immersion DCs is documented in Appendix B, Table B.1.

4.3.2 HC-3 Inhalation, Air Immersion, Ingestion Dose Coefficient Selection Criteria

As noted in Table 3.1, the inhalation DCs used for calculating the HC-3 TQs in DOE-STD-1027-92 were obtained from ICRP Pub-30. (15) The publication provided inhalation DCs for the following lung retention classes: D (daily), W (weekly), and Y (yearly). Per the guidance of the EPA Technical Background Document; (16)

> "The inhalation ALIs [Annual Limits for Intake][†††††] used in the calculations are taken from ICRP's Publication 30 after being converted from becquerels to microcuries. When more than one ALI was given for a particular radionuclide, the lowest value was used for the calculations. This assures that the most hazardous chemical form of a radionuclide is used in the release value calculations."[‡‡‡‡‡]

Also specified in Table 3.1, the ingestion DCs used for calculating the HC-3 TQs in DOE-STD-1027-92 were obtained from ICRP Pub-30. Per the guidance of the EPA Technical Background Document:

> The ingestion ALIs used in the calculation are taken from ICRP's Publication 30 after conversion from becquerels to microcuries. Where more than one ALI was given for a particular radionuclide, the lowest value was used in the calculations."[§§§§§]

As noted in Table 3.2, ICRP Pub 30 is superseded by contemporary publications with updated DCs. The bulk of the ingestion and inhalation DCs used in the HC-3 TQ calculation will be obtained from ICRP Pub-119 which is a compendium of DCs previously published in Pub-68 (worker) and Pub-72 (public). Unlike ICRP Pub-72, Pub-68 does not provide for a recommended default lung absorption class.

4.3.2.1 Criteria for the Selection of the HC-3 Maximum Inhalation Dose Coefficient and Maximum Air Immersion Dose Coefficient

As observed in Table 3.4, both ICRP Pub-119 and JAERI-Data/Code 2002-013 have more than one table that provide radionuclide specific inhalation DCs. Both the ICRP and the JAERI publications have one table providing DCs (for each analyzed lung clearance class) based on the inhalation of air-borne particulates, and a second table providing inhalation DCs based on the inhalation of gases/vapours.

The maximum inhalation DC was selected in consideration of both the particulate inhalation DC and the gases/vapours inhalation DC. Typically, the maximum inhalation DC used in the HC-3 TQ calculation was from the inhaled particulate table. However, 51 radionuclides were identified as having the gas/vapor form as the maximum inhalation DC (Table 4.3).

[†††††] It should be noted that the ICRP switched from using Annual Limits for Intake (ALIs) to DCs by the time Pub-68 was published. The ICRP noted in Pub-68 that the ALI for any radionuclide can be obtained by dividing the annual average effective dose limit (0.02 Sv) by the dose coefficient *e*(50); which is expressed as follows: $ALI = \frac{0.02}{e(50)}$. Since the ALI is inversely proportional to the e(50) DC, then the larger the DC, the lower the ALI. Therefore, when selecting the lowest ALI per the EPA Technical Background Document, the application to Pub-68 would involve the selection of the maximum DC.

[‡‡‡‡‡] 102RQ-RN-5-13, pg A-2

[§§§§§] 102RQ-RN-5-13, pg B-2

Table 4.3 – Radionuclides With Gas/Vapour as Maximum Inhalation DC for HC-3 TQ Calculation		
C-11	Hg-203	I-132
C-14	Hg-205	I-132m
H-3	Hg-206	I-133
Hg-187	I-118	I-134
Hg-187m	I-119	I-135
Hg-188	I-120	Ni-56
Hg-190	I-120m	Ni-59
Hg-191m	I-121	Ni-63
Hg-192	I-122	Ni-65
Hg-193	I-123	Te-121
Hg-193m	I-124	Te-121m
Hg-194	I-125	Te-123
Hg-195	I-126	Te-131
Hg-195m	I-128	Te-131m
Hg-197	I-129	Te-132
Hg-197m	I-130	Te-133
Hg-199m	I-131	Te-133m

The selected maximum inhalation DCs and air immersion DCs are documented in Appendix C, Table C.1.

4.3.2.2 Criteria for the Selection of the HC-3 Maximum Ingestion Dose Coefficient

As observed in Table 3.4, ICRP Pub-119 and JAERI-Data/Code 2002-013 only have one table each that provides radionuclide specific ingestion DCs. As such, following similar guidance used by the EPA Technical Background Document, when more than one ingestion DC was reported for a particular radionuclide, the maximum value was used in the calculations.

The selected maximum ingestion DCs are documented in Appendix C, Table C.1.

4.3.3 Direct Exposure Pathway TQ Calculation Considerations

4.3.3.1 Assessment of the Exclusion of the Neutron Dose Exposure Pathway

The direct exposure pathway methodology calculates a TQ assuming the facility inventory behaves like a fixed-point source. The methodology for calculating the direct exposure TQ as outlined in Section 4.2.4.1. of this report assumes the exposure is solely due to photon exposure. Other radiations (alpha, beta, neutron) are not included in the methodology for the following reasons:

- Alpha particles in air will be attenuated before reaching the location of the receptor. Alpha particle energies as high as 8-MeV are reported to have a mean range of approximately 7-cm.

(30)[******] As such, the assumption of no alpha exposure dose to a receptor located 30-meters away is considered to be valid.

- Similarly, most beta particles in air will be attenuated before reaching the location of the receptor. Beta particle energies as high as 4-MeV are reported to have a maximum range of approximately 800 inches (20.3-m) (30)[††††††] As such, the assumption of no beta exposure dose to a receptor located 30-meters away is considered to be valid.

- The EPA Technical Background Document evaluated the potential exposure pathway Release Value (RV) associated with an exposure to neutrons resulting from spontaneous fission. The EPA concluded that the calculated neutron exposure RV[‡‡‡‡‡‡] would be "….uniformly higher than release values calculated on the basis of inhalation……" [§§§§§§] Given this observation, the EPA concluded that the calculation of direct exposure pathways would be solely attributed to photon exposure. The basis for this conclusion is reliant upon use of radionuclide Spontaneous Fission Factors (SFFs) published prior to the issuance of NTD used in this report. To ascertain the validity of this conclusion, updated SFFs from ICRP Pub-107 will be used to calculate TQ values for the neutron exposure pathway. The methodology for calculating the neutron exposure pathway TQs will be as described by the EPA Technical Background Document, adjusted for 10-rem exposure (Equation 12):

$$TQ_{HC3,neutron} = \frac{0.25}{\text{SFF}} * \frac{10\ rem}{0.5\ rem} \qquad \text{Eqn. 12}$$

4.3.3.2 Assessment of the Average Photon Intensity Data

The EPA Technical Background methodology for the direct exposure pathway selected a value for the linear energy absorption coefficient for gamma rays in air of 3.7×10^{-5} cm^{-1}, based on an exposure to a 1 MeV gamma ray. As noted in Figure 4.1, (31) the linear energy absorption coefficient varies with gamma (a.k.a., x-ray) energy. The EPA justified the selection of the linear energy absorption coefficient value on the following premise:

> "The value varies with the energy of the gamma ray involved but is approximately correct ($\pm$15%) for gamma rays with energies ranging from about 0.07 MeV to about 2 MeV. Therefore, recognizing the relatively small error, this single value for μ_a is used for all radionuclides for the sake of simplicity."[********]

[******] The Health Physics and Radiological Health Handbook, 1984, Figure 6.13
[††††††] The Health Physics and Radiological Health Handbook, 1984, Figure 6.11
[‡‡‡‡‡‡] The "Release Value" (RV) is defined by the EPA as 0.5 rem to a receptor located 30-meters from a point source. Since the HC-3 TQ is based on 10 rem exposure to a receptor located 30-meters away, the EPA calculated RV is 1/20th of a HC-3 TQ.
[§§§§§§] 102RQ-RN-5-13, pg D-11
[********] 102RQ-RN-5-13, pg D-3

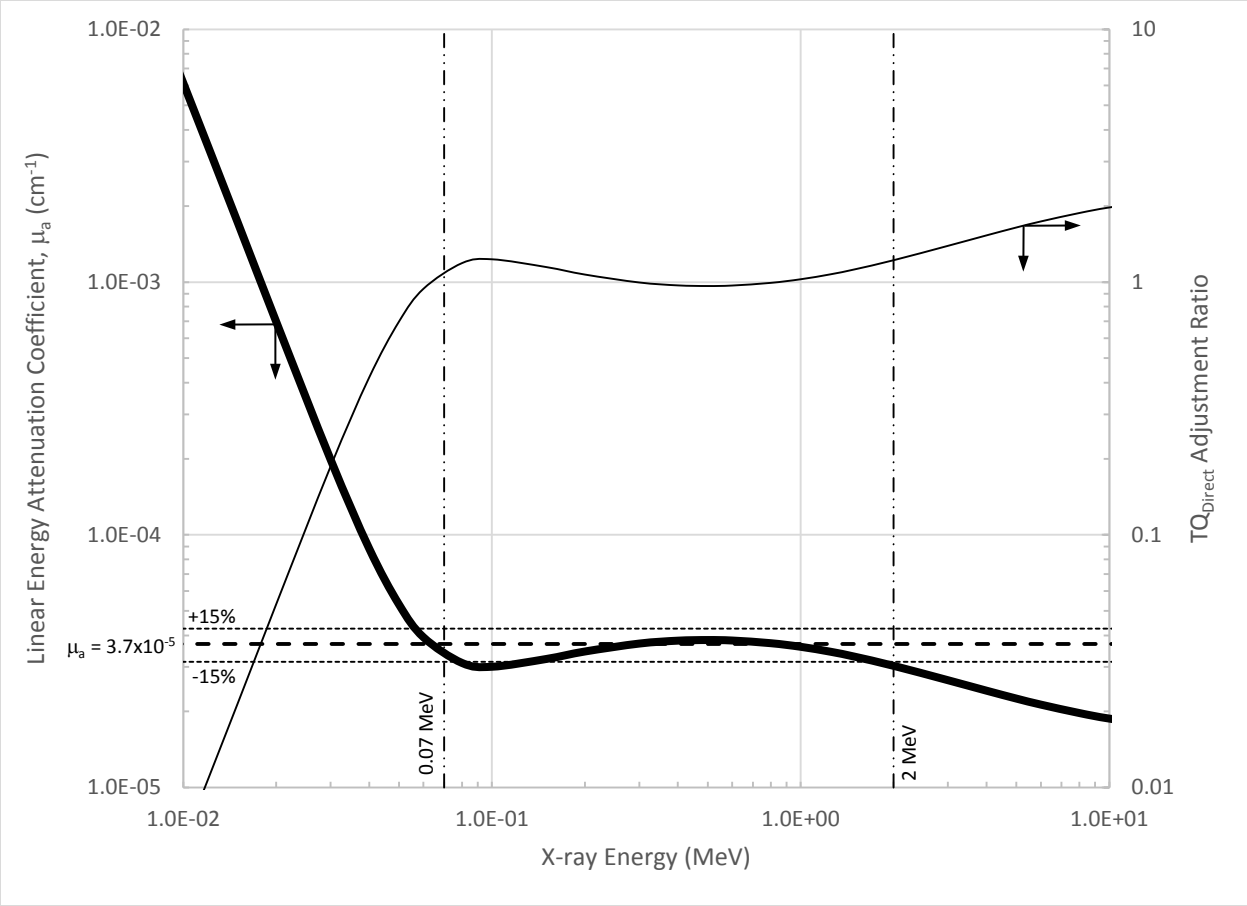

Figure 4.1 - Linear Energy Absorption Coefficient for X-rays in Air (dry)

A review of the NTD that will be used for the calculation of the direct exposure TQ indicates that only 60% of all radionuclides have an average photon energy within the range of 0.07 MeV to 2 MeV (Table 4.4).

Table 4.4 – Distribution of Average Photon Intensity Amongst 1,283 Radionuclides

Average Photon Energy (E_1)	No. of Radionuclides	%
E_1 = 0 MeV	96	7%
0.07 MeV > E_1 > 0 MeV	253	20%
2 MeV $\geq E_1 \geq$ 0.07 MeV	766	60%
E_1 > 2 MeV	168	13%

Excluding the 7% of radionuclides with no reported E_1 value, this means 33% of the radionuclide set has an average photon energy value outside of the applicable range associated with the use of the selected value for μ_a. The impact of using a single value for μ_a can be assessed by comparing the calculated value for TQ_{direct} using the linear energy absorption coefficient based on the radionuclide specific average photon energy. Equation 13 represents this concept as a ratio expressed as follows:

$$TQ_{direct}\ Adjustment\ Ratio = \frac{\mathrm{TQ}_{HC3,direct}^{\mu_a\ per\ Figure\ 4.1}}{\mathrm{TQ}_{HC3,direct}^{\mu_a=3.7x10^{-5}}} = \frac{20728}{\mu_a * \exp[-\mu_a]} \qquad \text{Eqn. 13}$$

Equation 13 has been plotted in Figure 4.1 to indicate the TQ_{Direct} Adjustment Ratio. It is observed that the TQ_{Direct} Adjustment Ratio does not vary much within the range 0.07 MeV to 2 MeV. However, when $E_1 > 2$ MeV, the ratio slowly increases to a value of approximately 2 at 10 MeV. This indicates that the calculated value for TQ_{direct} would be twice that otherwise calculated using the EPA methodology which uses a fixed value for μ_a. Since the EPA methodology would calculate a lower value for TQ_{direct}, the use of the EPA methodology is conservative.

Conversely, as noted in Figure 4.1, the linear energy absorption coefficient rapidly increases for $E_1 < 0.07$ MeV. Per Equation 13, this results in the TQ_{direct} Adjustment Ratio becoming substantially less than 1. At an E_1 value of 0.02 MeV, the TQ_{direct} Adjustment Ratio drops to 0.01. This indicates that the calculated value for TQ_{direct} would be 1% that calculated using the EPA methodology using a fixed value for μ_a. In other words, the EPA methodology is over-predicting the value for TQ_{direct} by several orders of magnitude for decreasing values of E_1 below 0.07 MeV.

Additionally, a footnote in to the Release Value table in Appendix E of the EPA Technical Background Document notes that RVs are not calculated for the direct pathway if the value for E_1 is less than 0.07 MeV. Specifically, this footnote in the EPA Technical Background Document states;

> "No gamma rays are emitted or the gamma rays which are emitted have gamma ray energies of less than 0.07 MeV and are strongly attenuated in air. No release value for the direct exposure pathway was calculated."[†††††††]

As observed in Figure 4.1 and as discussed above, the EPA assertion that the gamma rays are strongly attenuated when E_1 is less than 0.07 MeV is an incorrect conclusion.

In light of the results of Equation 13, this report will calculate TQ_{direct} values for all radionuclides, even when the value for E_1 is less than 0.07 MeV. Since the scope of the calculations performed are limited to the existing methodology as described in Section 4 of this report, the value for u_a will be maintained as $3.7x10^{-5}$ cm^{-1}.

4.3.4 Calculation of Tritium Threshold Quantities

As noted in Attachment 1 of DOE-STD-1027-92, the current HC-2 and HC-3 TQ values for tritium are based on the recommendations of the DOE Tritium Focus Group (TFG). During the development of the NNSA Supplemental Guidance to DOE-STD-1027, the NNSA requested the TFG to evaluate the revised HC-2 and HC-3 TQ values and provide a recommendation on the appropriate value to use. The TFG responded to the NNSA in August 2010 with the following:

> The position of the TFG is to retain the existing DOE-STD-1027 thresholds for tritium Category 2 and Category 3 nuclear facilities as is.[‡‡‡‡‡‡]

[†††††††] 102RQ-RN-5-13, pg E-33
[‡‡‡‡‡‡] NNSA SD 1027, pg AT4-5

In June 2013, the NNSA was notified that the TFG had recently met since the publication of the initial issuance of the NNSA Supplemental Guidance to DOE-STD-1027. The TFG voted to continue to endorse the Threshold Quantities as is currently [recommended] while working on new values for recommendation.

While it is recognized that the use of the tritium HC-2 and HC-3 TQs is limited to the thresholds as recommended by the TFG, this report will calculate the HC-2 and HC-3 TQs using the methodology as specified in Sections 4.1 and 4.2, respectively, of this report. The calculation of tritium HC-2 and HC-3 thresholds is provided solely for reference purposes only with the understanding they cannot be used without the review and approval of the TFG.

5. CALCULATIONS

The calculation of the updated HC-2 TQs was performed in MS Excel® file *HC2 Updated TQs_ORNL TM-2017 467.xlsx*. The calculation of the updated HC-3 TQs was performed in MS Excel® file *HC3 Updated TQs_ORNL TM-2017 467.xlsx*. These spreadsheets are available upon request to the author of this calculation or through the ORNL Nuclear and Criticality Safety Services group. The following sections explain the organization and purpose of the spreadsheets.

5.1 HAZARD CATEGORY 2 TQ CALCULATIONS

5.1.1 Worksheet: Master Isotope List

The worksheet Master Isotope List lists the radionuclides and half-life data from the following input documents:

- DOE-STD-1196-2011, CN-1
- FGR-12
- ICRP Pub-38
- ICRP Pub-107
- JAERI-Data/Code 2002-013

This worksheet performs the selection of the half-life based on the "family of data" hierarchy established in Table 3.3 of this report. This worksheet is included as Table D.1 in Appendix D of this report.

5.1.2 Worksheet: Immersion DCs

The worksheet Immersion DCs lists the available air immersion DCs from the following input documents:

- FGR-12
- DOE-STD-1196-2011, CN-1

This worksheet performs the selection of the air-immersion DCs based on the "family of data" hierarchy established in Table 3.3 of this report.

5.1.3 Worksheet: Inhalation DCs_Max

The worksheet Inhalation DCs_Max lists the available inhalation DCs from the following input documents:

- ICRP Pub-119 (listed as ICRP-72 since the selection is for public inhalation DCs)
- DOE-STD-1196-2011, CN-1
- JAERI-Data/Code 2002-013

The inhalation DC reported from each publication is based on the selection of the radionuclide specific maximum inhalation DCs. The available maximum inhalation DC is based on consideration of particulate inhalation DCs and gases/vapours inhalation DCs (when provided). This worksheet performs the selection of the inhalation DCs based on the "family of data" hierarchy established in Table 3.3 of this report.

5.1.4 Worksheet: Inhalation DCs_ Rec

The worksheet Inhalation DCs_Rec lists the available inhalation DCs from the following input documents:

- ICRP Pub-119 (listed as ICRP-72 since the selection is for public inhalation DCs)
- DOE-STD-1196-2011, CN-1
- JAERI-Data/Code 2002-013

The inhalation DC reported from each publication is based on the recommended default lung absorption class specified in Table 4.2 of this report. If the radionuclide is associated with an element with a recommended default lung absorption class, then the inhalation DC was reported solely from the particulate inhalation data for the recommended default lung class. If the radionuclide is associated with an element without a recommended default lung absorption class, then the inhalation DC was reported in consideration of particulate inhalation DCs and gases/vapours inhalation DCs (when provided). This worksheet performs the selection of the inhalation DCs based on the "family of data" hierarchy established in Table 3.3 of this report.

5.1.5 Worksheet: Input Data Summary_Max

The worksheet Input Data Summary_Max summarizes the selected inhalation and air immersion DCs used for the calculation of the updated HC-2 TQs based on the maximum inhalation DCs. This worksheet is included as Table A.1 in Appendix A of this report.

5.1.6 Worksheet: Input Data Summary_Rec

The worksheet Input Data Summary_Rec summarizes the selected inhalation and air immersion DCs used for the calculation of the updated HC-2 TQs based on the recommended default lung absorption class inhalation DCs. This worksheet is included as Table B.1 in Appendix B of this report.

5.1.7 Worksheet: HC-2 TQ Calc_Max

The worksheet HC-2 TQ Calc_Max performs the calculation of the radionuclide specific HC-2 TQs using the maximum inhalation and air-immersion DCs. The calculated TQ is based on the inhalation exposure methodology discussed in Section 4.1.1 (Equation 1).

5.1.8 Worksheet: HC-2 TQ Calc_Rec

The worksheet HC-2 TQ Calc_Rec performs the of calculation the radionuclide specific HC-2 TQs using the recommended inhalation DCs and the maximum air-immersion DCs. The calculated TQ is based on the inhalation exposure methodology discussed in Section 4.1.1 (Equation 1).

5.1.9 Worksheet: HC-2 TQ Summary

The worksheet HC-2 TQ Summary lists the final HC-2 TQs for the following calculations:

- HC-2 TQs calculated using the maximum inhalation and air-immersion DCs.
- HC-2 TQs calculated using the recommended default lung absorption class inhalation DCs and the maximum air-immersion DCs.

This worksheet also lists the HC-2 TQs from the NNSA Supplemental Guidance document. The HC-2 TQs associated with the maximum inhalation and air-immersion DCs are included as Table A.2 in Appendix A of this report. The HC-2 TQs associated with the recommended default lung absorption class inhalation DCs and the maximum air-immersion DCs are included as Table B.2 in Appendix B of this report. Table B.2 in Appendix B also includes the updated HC-2 TQs from the NNSA Supplemental Guidance.

5.1.10 Worksheets Based on Input Documentation

The following worksheets contain the input data used in the calculation of the HC-2 TQs:

- Worksheet: G1_ICRP72 (from ICRP Pub-119)
- Worksheet: H1_ICRP72 (from ICRP Pub-119)
- Worksheet: 1196 Table A-2 (from DOE-STD-1196-2011, CN-1)
- Worksheet: 1196 Table A-3 (from DOE-STD-1196-2011, CN-1)
- Worksheet: JAERI_Table 5 (from JAERI-Data/Code 2002-013)
- Worksheet: JAERI_Table 7 (from JAERI-Data/Code 2002-013)
- Worksheet: FGR12 Air Immersion (from FGR-12)
- Worksheet: 1027_RFs (from DOE-STD-1027-92, CN-1)
- Worksheet: Ame2016 (from Atomic Mass Data Center; file mass16.txt)
- Worksheet: ICRP72_RecTable (from ICRP Pub-72)
- Worksheet: NNSA_TQs (from NNSA SD 1027, Admin Change 1)

Manipulations of the input data have been highlighted in orange. Corrections to the input data or alterations to the data selection functions (due to input data formatting issues) have been highlighted in yellow.

There also is a Worksheet: Constants, which contains universally used input constants (i.e., breathing rate, χ/Q, and Avogadro's Constant), conversion factors (dose and activity), and time conversion factors.

5.2 HAZARD CATEGORY 3 CALCULATIONS

5.2.1 Worksheet: Master Isotope List

The worksheet Master Isotope List lists the radionuclides and half-life data from the following input documents:

- DOE-STD-1196-2011, CN-1
- FGR-12
- ICRP Pub-38
- ICRP Pub-107
- JAERI-Data/Code 2002-013

This worksheet performs the selection of the half-life based on the "family of data" hierarchy established in Table 3.4 of this report. This worksheet is included as Table D. 1 in Appendix D of this report.

5.2.2 Worksheet: Photon Energy List

The worksheet Photon Energy List contains the available radionuclide specific average photon energy values from the following input documents:

- ICRP Pub-38
- ICRP Pub-107

This worksheet performs the selection of the average photon energy values based on the "family of data" hierarchy established in Table 3.4 of this report.

5.2.3 Worksheet: Immersion DCs

The worksheet Immersion DCs lists the available air immersion DCs from the following input documents:

- ICRP Pub-119 (listed as ICRP-68 since the selection is for worker air-immersion DCs)
- JAERI-Data/Code 2002-013

This worksheet performs the selection of the air-immersion DCs based on the "family of data" hierarchy established in Table 3.4 of this report.

5.2.4 Worksheet: Ingestion DCs

The worksheet Ingestion DCs lists the available ingestion DCs from the following input documents:

- ICRP Pub-119 (listed as ICRP-68 since the selection is for worker air-immersion DCs)
- JAERI-Data/Code 2002-013

The ingestion DCs reported from each publication are based on the selection of the radionuclide specific maximum ingestion DCs. When more than one ingestion DC is provided for a particular radionuclide, the maximum value is reported. This worksheet performs the selection of the ingestion DCs based on the "family of data" hierarchy established in Table 3.4 of this report.

5.2.5 Worksheet: Inhalation DCs

The worksheet Inhalation DCs lists the available inhalation DCs from the following input documents:

- ICRP Pub-119 (listed as ICRP-68 since the selection is for worker air-immersion DCs)
- JAERI-Data/Code 2002-013

The inhalation DCs reported from each publication are based on the selection of the radionuclide specific maximum inhalation DCs. When more than one ingestion DC is provided for a particular radionuclide, the maximum value is reported. The available maximum inhalation DC is based on consideration of particulate inhalation DCs and gases/vapours inhalation DCs (when provided). This worksheet performs the selection of the inhalation DCs based on the "family of data" hierarchy established in Table 3.4 of this report.

5.2.6 Worksheet: Input Data Summary

The worksheet Input Data Summary summarizes the selected inhalation, ingestion, and air immersion DCs used for the calculation of the updated HC-3 TQs. This worksheet is included as Table C.1 in Appendix C of this report.

5.2.7 Worksheet: HC-3 SF

The worksheet HC-3 SF performs the calculation specific to a neutron exposure dose associated with the exposure for radionuclides that spontaneously fission. The calculated pathway TQ is based on the methodology for a neutron emitting source in Section 4.3.3.1 (Equation 12). The results of this calculation are used solely for comparative purposes to validate the original conclusion made by the EPA with respect to disregarding the neutron dose exposure for the external exposure pathway.

5.2.8 Worksheet: HC-3 External

The worksheet HC-3 External performs the calculation for the external exposure pathway TQ value. For noble gases (except radon), the calculated pathway TQ is based on the air-immersion methodology in Section 4.2.4.2 (Equation 10). For all other radionuclides, the calculated pathway TQ is based on the point source (i.e., direct exposure) methodology in Section 4.2.4.1 (Equation 9).

5.2.9 Worksheet: HC-3 Water

The worksheet HC-3 Water performs the calculation for the water ingestion exposure pathway TQ value. The calculated pathway TQ is based on the ground water ingestion exposure methodology in Section 4.2.3 (Equation 7). The Dilution Factor, used in this pathway TQ calculation, is calculated in accordance with Equation 8.

5.2.10 Worksheet: HC-3 Food

The worksheet HC-3 Food performs the calculation for the food ingestion exposure pathway TQ value. The calculated pathway TQ is based on the food ingestion exposure methodology in Section 4.2.2 (Equation 4). The Dilution Factor, used in this pathway TQ calculation, is calculated in accordance with Equation 5. The Contact Time, also used in this pathway TQ calculation, is calculated in accordance with Equation 6.

5.2.11 Worksheet: HC-3 Inhalation

The worksheet HC-3 Inhalation performs the calculation for the inhalation exposure pathway TQ value. The calculated pathway TQ is based on the inhalation exposure methodology in Section 4.2.1 (Equation 3).

5.2.12 Worksheet: HC-3 TQ Summary

The worksheet HC-3 TQ Summary lists the following pathway TQs:

- Inhalation exposure pathway TQ.
- Water ingestion exposure pathway TQ.
- Food ingestion exposure pathway TQ.
- Direct exposure (a.k.a., point-source) pathway TQ.
- Air Immersion pathway TQ.

The worksheet selects the final HC-3 TQs in accordance with Equation 11 found in Section 4.2.5. This worksheet also lists the updated HC-3 TQs from the NNSA Supplemental Guidance document. This table is included as Table C.2 in Appendix C of this report.

5.2.13 Worksheets Based on Input Documentation

The following worksheets contain the input data used in the calculation of the HC-3 TQs:

- Worksheet: A1_ICRP68 (from ICRP Pub-119)
- Worksheet: B1_ICRP68 (from ICRP Pub-119)
- Worksheet: C1_ICRP68 (from ICRP Pub-119)
- Worksheet: JAERI_Table 3 (from JAERI-Data/Code 2002-013)
- Worksheet: JAERI_Table 6 (from JAERI-Data/Code 2002-013)
- Worksheet: JAERI_Table 8 (from JAERI-Data/Code 2002-013)
- Worksheet: 1027_RFs (from DOE-STD-1027-92, CN-1)
- Worksheet: Ame2016 (from Atomic Mass Data Center; file mass16.txt)
- Worksheet: ICRP07_NDX (from ICRP Pub-107)
- Worksheet: ICRP38_NDX (from ICRP Pub-38)
- Worksheet: NNSA_TQs (from NNSA SD 1027, Admin Change 1)

Manipulations of the input data have been highlighted in orange. Corrections to the input data or alterations of the data selection functions (due to input data formatting issues) have been highlighted in yellow.

There also is a Worksheet: Constants, which contains universally used input constants (i.e., breathing rate, χ/Q, and Avogadro's Constant), pathway specific constants, conversion factors (dose and activity), and time conversion factors.

6. DISCUSSION OF RESULTS

Using the input data as described in Section 3, and the methodology as described in Section 4, updated HC-2 and HC-3 TQs have been calculated for more than 1,200 radionuclides. The updated HC-2 and HC-3 TQs are reported in the following tables:

- Updated HC-2 TQs using maximum inhalation DCs: Table A.2
- Updated HC-2 TQs using recommended inhalation DCs: Table B.2
- Updated HC-3 TQs: Table C.2

6.1 EXPANSION OF THE SET OF RADIONUCLIDES WITH HC-2 AND HC-3 TQS

One benefit of this report is the expansion of the available number of radionuclides with a published HC-2 and HC-3 TQ. This report increases the total number of radionuclides with an updated HC-2 TQ to 1,262 and the total number of radionuclides with an updated HC-3 TQ to 1,253 radionuclides. This is a substantial increase in the number of radionuclides with a published TQ as compared to the publications listed in Table 6.1. The increase in the number of radionuclides with a published TQ is attributed to the increase in the available dose coefficients for calculating the TQs.

Table 6.1 – Number of Radionuclides with Calculated HC-2 and HC-3 Threshold Quantities

Publication	HC-2	HC-3
DOE-STD-1027-92, CN-1	94	94
LANL Fact Sheets	97	757
NNSA SD 1027	98	98
ORNL/TM-2017/467	1,262	1,253

6.2 RADIONUCLIDES WITHOUT A CALCULATED TQ VALUE

6.2.1 Radionuclides without a Category 2 Threshold Quantity

Of the 1,283 radionuclides on the Master Radionuclide List, 21 radionuclides did not have a calculated updated HC-2 TQ. These radionuclides all have a half-life less than 10 minutes. As noted in Section 3.1.2, inhalation dose coefficients would only be used if the radionuclide had a half-life equal to or greater than 10 minutes. The 10-minute threshold is based on ICRP practices which only provide inhalation dose coefficients for radionuclides with a half-life equal to or greater than 10 minutes.

Additionally, the 21 radionuclides without a calculated updated TQ did not have a published air-immersion coefficient. Even without the use of an available inhalation dose coefficient, a HC-2 TQ can still be calculated solely on the basis of the use of an air-immersion dose coefficient (in fact, 363 radionuclides have an updated HC-2 TQ based solely on the use of an air-immersion dose coefficient).

The 21 radionuclides for which an updated HC-2 TQ was not calculated are listed in Table 6.2.

Table 6.2 – Radionuclides Without An Updated HC-2 TQ		
At-219	Hg-188	Lu-168m
Au-188	Ho-152	Os-177
Au-189m	Ir-179	Os-179
Ce-131m	Ir-181	Pm-138
Er-155	Lu-164	Po-212
Hg-187	Lu-166	Pt-183
Hg-187m	Lu-166m	Tm-159

6.2.2 Radionuclides without a Category 3 Threshold Quantity

Of the 1,283 radionuclides on the Master Radionuclide List, 30 radionuclides did not have a calculated updated HC-3 TQ. These radionuclides all have a half-life less than 10 minutes. As noted in Section 3.1.2, inhalation and ingestion dose coefficients would only be used if the radionuclide had a half-life equal to or greater than 10 minutes. The 10-minute threshold is based on ICRP practices which only provide inhalation and ingestion dose coefficients for radionuclides with a half-life equal to or greater than 10 minutes.

Additionally, the 30 radionuclides without a calculated updated HC-3 TQ did not have a published air-immersion coefficient (for calculating the air-immersion exposure pathway TQ) and did not have a published average photon energy value (for calculating the direct exposure pathway TQ). Even without the use of available inhalation and ingestion dose coefficients, a HC-3 TQ can still be calculated solely on the basis of the use of the external exposure pathway (in fact, 328 radionuclides have an updated HC-3 TQ based solely on an evaluation of the direct exposure pathway TQ and 36 radionuclides have an updated TQ based solely on an evaluation of the air-immersion exposure pathway).

The 30 radionuclides for which an updated HC-3 TQ was not calculated are listed in Table 6.3.

Table 6.3 – Radionuclides Without An Updated HC-3 TQ		
At-219	Ir-179	Po-213
Au-188	Ir-181	Po-214
Au-189m	Lu-164	Po-216
Bi-212n	Lu-166	Po-218
Ce-131m	Lu-166m	Pt-183
Er-155	Lu-168m	Rn-215
Hg-187	Os-177	Rn-216
Hg-187m	Os-179	Rn-217
Hg-188	Pm-138	Tm-159
Ho-152	Po-212	U-235m

6.3 ASSESSMENT OF EXCLUSION OF NEUTRON DOSE EXPOSURE PATHWAY

As noted in Section 4.3.3.1, the methodology employed in the calculation of the direct exposure (i.e., point-source) pathway specified that the neutron dose contribution from radionuclides which spontaneously fission did not need to be considered. The EPA justification for this assertion was based on a comparison of the calculated neutron exposure pathway release value against the inhalation exposure pathway release value. Through this comparative process, the EPA noted that the release value associated with a neutron exposure pathway was always higher than the inhalation exposure pathway release value. Based on this comparison, the EPA concluded the neutron exposure dose pathway would never be the limiting pathway, and as such, could be dropped from further consideration.

With the availability of updated dosimetric data, the original EPA justification can be revisited to determine if it is still applicable. Using the spontaneous fission yield data (i.e., the spontaneous fission factor (SFF)) contained within ICRP Pub-107, the neutron exposure pathway TQ can be calculated using Equation 12, as reported in Table 6.4.

Table 6.4 – Radionuclides Included in ICRP Publication 107 Which Decay By Spontaneous Fission

Isotope	Spontaneous Fission Factor (10)	Neutron Exposure HC-3 TQ (Ci)	Inhalation HC-3 TQ (Ci)	Inhalation Exposure TQ > Neutron Exposure TQ?
Cf-246	2.50E-06	2.00E+06	2.66E+02	--
Cf-248	2.90E-05	1.72E+05	1.36E+01	--
Cf-249	5.02E-09	9.96E+08	1.69E+00	--
Cf-250	7.70E-04	6.49E+03	3.49E+00	--
Cf-252	3.09E-02	1.62E+02	6.20E+00	--
Cf-254	9.97E-01	5.02E+00	3.02E+00	--
Cm-240	3.90E-08	1.28E+08	3.85E+01	--
Cm-242	6.37E-08	7.85E+07	2.33E+01	--
Cm-244	1.37E-06	3.65E+06	4.47E+00	--
Cm-245	6.10E-09	8.20E+08	2.79E+00	--
Cm-246	2.63E-04	1.90E+04	2.79E+00	--
Cm-248	8.39E-02	5.96E+01	7.98E-01	--
Cm-250	7.40E-01	6.76E+00	1.41E-01	--
Es-253	8.90E-08	5.62E+07	4.47E+01	--
Es-254	3.00E-08	1.67E+08	1.40E+01	--
Es-254m	4.50E-04	1.11E+04	2.54E+01	--
Es-255	4.50E-05	1.11E+05	3.10E+01	--
Fm-252	2.30E-05	2.17E+05	3.72E+02	--
Fm-254	5.92E-04	8.45E+03	1.45E+03	--
Fm-255	2.30E-07	2.17E+07	4.30E+02	--
Fm-256	9.19E-01	5.44E+00	1.60E+01	No
Fm-257	2.10E-03	2.38E+03	1.69E+01	--

Table 6.4 – Radionuclides Included in ICRP Publication 107 Which Decay By Spontaneous Fission (continued)				
Isotope	**Spontaneous Fission Factor** (10)	**Neutron Exposure HC-3 TQ (Ci)**	**Inhalation HC-3 TQ (Ci)**	**Inhalation Exposure TQ > Neutron Exposure TQ?**
Pu-236	1.37E-09	3.65E+09	6.20E+00	--
Pu-238	1.85E-09	2.70E+09	2.60E+00	--
Pu-240	5.75E-08	8.70E+07	2.38E+00	--
Pu-242	5.54E-06	9.03E+05	2.54E+00	--
Pu-244	1.21E-03	4.13E+03	2.54E+00	--
U-238	5.45E-07	9.17E+06	1.53E+01	--

A review of the results in Table 6.5 notes that only one radionuclide has a calculated neutron exposure pathway TQ value less than the inhalation exposure pathway TQ value. That radionuclide, Fm-256, has a relatively high spontaneous fission yield (0.919), thereby resulting in a calculated neutron exposure pathway TQ of 5.44 Ci, which is less than the corresponding inhalation exposure pathway TQ value of 16 Ci.

It is noted that the EPA did not include an adjustment for the half-life of the radionuclides which are undergoing spontaneous fission. This is in contrast to the methodology employed by the EPA in the calculation of the photon exposure pathway where the period of exposure was adjusted to account for the half-life of the radionuclides. As noted by the EPA, the equation used to adjust the exposure time is expressed as follows (Equation 14): §§§§§§§

$$T = \frac{1 - \exp(-\lambda * t)}{\lambda} \qquad \text{Eqn. 14}$$

Where;

T = Adjusted exposure duration [day]

λ = Radionuclide decay constant [day^{-1}] = $\ln(2)/t_{1/2}$

t = Duration of exposure [1 day]

Since Fm-256 has a half-life of 157.6 min (= 0.1094 days), then the adjusted exposure duration is calculated to be:

$$T = \frac{1 - \exp\left(-\frac{\ln(2)}{0.1094}\ d^{-1} * 1\ d\right)}{\frac{\ln(2)}{0.1094}\ \mathrm{d}^{-1}} = 0.1576\ d$$

§§§§§§§ In the EPA derivation of the equation, the time unit conversion factor is used to ensure "T" is in units of hours. This conversion is necessitated by the fact that the photon exposure rate was expressed in units of rem/hour. For Equation 12, the calculated TQ is in units of rem for a 1 day unadjusted exposure duration. Therefore, the time conversion factor of 24 hr/day is not needed for the purpose of accounting for the neutron dose adjusted exposure duration.

As such, the effective exposure duration for Fm-256 is only 0.1576 day, and not the full 1 day assumed in the derivation of Equation 12. Therefore the neutron exposure pathway TQ for Fm-256, when accounting for decay, is 34.5 Ci. This adjusted neutron exposure pathway TQ is now greater than the inhalation exposure pathway TQ of 16 Ci.

Based on the adjusted neutron exposure pathway for Fm-256, the inhalation exposure continues to be the limiting pathway with respect to the neutron exposure pathway for all analyzed radionuclides with spontaneous fission yield data in ICRP Pub-107. Therefore, the EPA conclusion that the neutron exposure dose pathway would never be the limiting pathway is confirmed to still be an accurate statement.

6.4 COMPARISON TO NNSA CALCULATED UPDATED TQS

6.4.1 Comparison of Category 2 TQs

The updated HC-2 TQs (in terms of activity, Ci) calculated in this report were within $\pm$ 5% for 93 out of 98 radionuclides contained within the NNSA Supplemental Guidance. Two of the five radionuclides that differed by more than $\pm$5% were H-3 (tritium) and Rn-222. As noted in the NNSA Supplemental Guidance to DOE-STD-1027, the values for H-3 and Rn-222 were not calculated using updated dosimetric data, rather they were left unchanged from the values specified in DOE-STD-1027-92, CN-1. The other three radionuclides are listed Table 6.5.

Table 6.5 – Comparison of Updated HC-2 TQs (activity)

Radionuclide	NNSA SD 1027 (Ci)	ORNL/TM-2017/467 (Ci)	ΔActivity	Probable Reason For Difference (if known)
Hg-203	3.33E+05	1.15E+05	-65%	NNSA used max particulate inhalation DC (2.4E-09 Sv/Bq). This report selected vapor form as max DC (7.0E-09 Sv/Bq). The relative ratio of these DCs accounts for the difference.
Kr-85	1.06E+07	2.27E+07	114%	NNSA used ICRP Pub-72 (2.55E-16 Sv/s per Bq/m^3). This report used FGR-12 (1.19E-16 Sv/s per Bq/m^3). The relative ratio of these DCs accounts for the difference.
Xe-133	1.95E+06	1.73E+06	-11%	NNSA used ICRP Pub-72 (1.39E-15 Sv/s per Bq/m^3). This report used FGR-12 (1.56E-15 Sv/s per Bq/m^3). The relative ratio of these DCs accounts for the difference.

For Hg-203, the difference in the updated HC-2 TQ calculation has been attributed to the data selection criteria in this report which supplemented the inhalation DC data set to include gases/vapours based inhalation DCs. For both Kr-85 and Xe-133, the NNSA updated HC-2 TQs were based on the air-immersion DCs from ICRP Pub-72 whereas this report utilized the air-immersion DCs from FGR-12 for the associated radionuclides.

The updated HC-2 TQs (in terms of mass, g) calculated in this report were within $\pm$ 5% for 91 out of 98 radionuclides contained within the NNSA Supplemental Guidance. Similar to the activity comparison, H-3 and Rn-222 have different values since they were not calculated by the NNSA using updated dosimetric data. The other five radionuclides are listed in Table 6.6.

Table 6.6 – Comparison of Updated HC-2 TQs (mass)				
Radionuclide	**NNSA SD 1027 (g)**	**ORNL/TM-2017/467 (g)**	**ΔMass**	**Probable Reason for Difference (if known)**
Am-242m	2.09E+01	2.26E+01	8%	Suspect difference in the calculated Specific Activity since the TQ(Ci) values matched.
Ge-68	8.16E+01	8.68E+01	6%	Suspect difference in the calculated Specific Activity since the TQ(Ci) values matched.
Hg-203	2.41E+01	8.35E+00	-65%	NNSA probably used max particulate inhalation DC (2.4E-09 Sv/Bq). This report selected vapor form as max DC (7.0E-09 Sv/Bq). The relative ratio of these DCs accounts for the difference.
Kr-85	2.70E+04	5.78E+04	114%	NNSA used ICRP Pub-72 (2.55E-16 Sv/s per Bq/m^3). This report used FGR-12 (1.19E-16 Sv/s per Bq/m^3). The relative ratio of these DCs accounts for the difference.
Xe-133	1.04E+01	9.25E+00	-11%	NNSA used ICRP Pub-72 (1.39E-15 Sv/s per Bq/m^3). This report used FGR-12 (1.56E-15 Sv/s per Bq/m^3). The relative ratio of these DCs accounts for the difference.

For Am-242m and Ge-68, it is suspected that there are differences in the specific activity values between the NNSA Supplemental Guidance and this report since the activity based TQ value matched. For Hg-203, it appears the NNSA TQ value is based on the maximum particulate inhalation DC whereas this report calculated the TQ using the vapor inhalation DC, which was higher than the particulate inhalation DC. For Kr-85 and Xe-133, the differences in the TQ values are explained by the NNSA most likely using ICRP Pub-72 air-immersion DCs whereas this report selected air-immersion DCs from FGR-12 for these two radionuclides.

6.4.2 Comparison of Category 3 TQs

The updated HC-3 TQs (in terms of activity, Ci) calculated in this report were within $\pm$ 5% for 96 out of 98 radionuclides contained within the NNSA Supplemental Guidance. The only radionuclides that differed more than +5% were H-3 (tritium) and Rn-222. As noted in the NNSA Supplemental Guidance to DOE-STD-1027, the values for H-3 and Rn-222 were not calculated using updated dosimetric data, rather they were left unchanged from the values specified in DOE-STD-1027-92, CN-1.

The updated HC-3 TQs (in terms of mass, g) calculated in this report were within $\pm$ 5% for 93 out of 98 radionuclides contained within the NNSA Supplemental Guidance. Similar to the activity comparison, H-3 and Rn-222 have different values since they were not calculated by the NNSA using updated dosimetric data. The other three radionuclides are listed in Table 6.7.

Table 6.7 – Comparison of Updated HC-3 TQs (mass)				
Radionuclide	**NNSA SD 1027 (g)**	**ORNL/TM-2017/467 (g)**	**ΔMass**	**Reason for Difference (if known)**
Am-242m	3.07E-01	3.28E-01	7%	Suspect difference in the calculated Specific Activity since the TQ(Ci) values matched.
Cd-113	8.77E+13	9.29E+13	6%	Suspect difference in the calculated Specific Activity. The TQ(Ci) values only differed by 2%.
Ge-68	8.79E-02	9.54E-02	8%	Suspect difference in the calculated Specific Activity since the TQ(Ci) values matched.

For Am-242m and Ge-68, it is suspected that there are differences in the specific activity values between the NNSA Supplemental Guidance and this report since the activity based TQ value matched. Similarly, it is suspected for Cd-113 that there are differences in the specific activity values between the NNSA Supplemental Guidance and this report since the activity based TQ values only differed by 2%.

Finally, a review of the data also noted that the limiting pathway used for the selection of the final HC-3 TQs were a match for 96 of 98 radionuclides, with H-3 and Rn-222 again being the only difference.

6.5 COMPENSATION FOR EXCEL CALCULATION PRECISION ISSUES

During the execution of the calculation of the HC-3 TQs for the water ingestion exposure pathway and the direct exposure pathway, calculational stabilities were identified in the calculation of the effective exposure duration. These calculational instabilities have been attributed to the limitations associated with the significant figures retained by MS Excel® to describe a number. Although MS Excel® can display numbers up to 30 decimal places, its precision for a specific number is confined to 15 significant figures.

As described in Appendix E of this report, the instabilities in the calculation of the effective exposure duration were observed to occur for radionuclides with a half-life in excess of 8E+12 days (~2.19E+10 y). For radionuclides with increasingly larger half-life values, the calculation instabilities were noted to become worse, resulting in significant deviation from the expected calculated value. To compensate for this issue and preserve calculational accuracy, a conditional statement was used in the MS Excel calculations for the effective exposure duration (also referred to as the Contact Time (CT) by the EPA) for the Water Ingestion pathway and the Direct Exposure pathway.

- If the radionuclide half-life was noted to be less than or equal to1E+12 days, the CT was calculated using Equation E-1.

- Otherwise, if the radionuclide half-life was noted to be greater than 1E+12 days, the CT was set to be equal to the actual exposure duration (9 days for the Water Ingestion pathway and 1 day for the Direct Exposure pathway).

This modification to the CT equation preserved the accuracy of the calculated CT for radionuclides with very large half-life values. Further discussion of this issue can be found in Appendix E of this report.

7. QUALITY ASSURANCE

7.1 REPORT PREPARATION

7.1.1 Development of Final Report and Supporting Calculations

The development (including the format and content organization), review, and publication of this report was conducted in accordance with the Oak Ridge National Laboratory (ORNL) Standards-Based Management System (SBMS) Subject Area: *Publications and Other Scientific Communications*, Procedure: *Review and Approval of Scientific Communications Internally* (32).

The intermediate and final calculations produced in support of the development of this report were conducted in accordance with the ORNL Nuclear and Radiological Protection Division (NRPD) Nuclear and Criticality Safety Services (NCSS) Internal Operation Procedure (IOP): *Calculation Production and Control Procedure*. (33) The IOP specifies requirements associated with the creation, review, and approval of calculations, computational analyses, and qualitative analyses developed by the Facility and Accelerator Safety staff within the NCSS group.[********]

The development of all calculations and the preparation of the report were conducted by a qualified and experienced analyst with detailed knowledge of the methodologies and assumptions involved in the calculation of the updated HC-2 and HC-3 TQs.

The spreadsheet software application Microsoft (MS) Excel ® was exclusively utilized for executing all intermediate and final calculations. As specified in the ORNL SBMS Subject Area: *Software Quality Assurance*; (34), the use of MS Excel can be exempted from ORNL Software Quality Assurance requirements provided the following stipulation is satisfied:

> Software calculations written for use with commercial off-the-shelf software (e.g., Excel spreadsheet applications) which are not intended to be used repeatedly and the results are verified by other methods such as hand calculations, peer review, or an applicable organizational quality assurance process.

For this effort, a peer review process was employed as a verification of the applicability, adequacy, and accuracy of the assumptions, calculations, and conclusions documented in this report.

7.2 TECHNICAL REVIEWS

7.2.1 Peer Review

A peer review process was utilized for conducting an independent verification of the intermediate and final calculations produced in support of this report. The peer reviewer fulfilled the following roles: (i) perform a verification of the validity and accuracy of the intermediate and final calculations (i.e., the calculation checker), and (ii) served as an independent technical reviewer of the final report. To ensure the review was conducted independently, the peer reviewer did not participate in the development of the calculation spreadsheets and did not participate in the development of the report.

[********] The report format and organization described by the IOP is based on issuance of an internal document. The SBMS Subject Area provides guidance for the release of external publications, such as the case for this report. As noted on page 5 of NCSS-FS-04, R2: “In the case of any inconsistencies with this IOP, the SBMS documents prevail.” Accordingly, the format, organizational content, and approval requirements for this report are based on the guidelines specified in the SBMS Subject Area: *Publications and Other Scientific Communications*.

In support of the calculation checker role, the peer reviewer performed the following tasks:

- Reviewed and verified input data in the spreadsheets. The review consisted of ensuring the proper input data was utilized as described in Sections 3 and 4 of this report. Additionally, the reviewer conducted a verification sampling of the input data. The verification sampling involved a comparison of randomly selected input data which was then compared to the published reference or electronic data source.

- The peer reviewer verified intermediate and final calculations were accurate by verifying that computation formulas were correct. This verification included 100% cell verifications to ensure the formulas were correctly copied down their respective columns. Lookup functions and cell formulas which were utilized to import data values from the various worksheets were verified for proper syntax and correct retrieval of the requested data. These lookup functions and cell formulas were checked to ensure the same function / formula was copied correctly to 100% of the cells down a column.

- Any errors found during the peer review were reported back to the author/calculation developer for required corrections. All corrections were subsequently reviewed by the peer reviewer to ensure an adequate resolution of the identified errors.

In support of the independent technical reviewer role, the peer reviewer performed the following tasks:

- Verified all references cited in the report.

- Verified assumptions in the report have been adequately identified, described, justified, and are reasonable.

- Verified the described input selection organization hierarchy described in Section 3 matched the usage in the spreadsheets.

- Verified the described methodology and associated equations were properly transcribed from the applicable references.

- Provided editorial recommendations in support of ensuring technical clarity of the overall report.

7.2.2 Department of Energy Independent Technical Review

An independent technical review of the report was conducted by a DOE-assigned representative in support of the Department of Energy's Office of Nuclear Safety (AU-30), within the Associate Under Secretary for Environment, Health, Safety and Security organization. The DOE-assigned review involved an individual with knowledge of the requirements associated with DOE-STD-1027 and the methodologies and assumptions used in the calculation of the updated HC-2 and HC-3 TQs. The DOE-assigned reviewer did not participate in the development of the report, did not participate in the development of the intermediate and final calculations, and did not collaborate with the assigned peer reviewer. As such, the DOE-assigned representative is considered to be a qualified independent reviewer of the assumptions, assertions, and conclusions made in this report.

The objectives of the DOE Independent Technical Review are summarized as follows:

- Confirmed the logic, assumptions, and methodology used to expand the list of radioisotopes and to calculate updated HC-2 and HC-3 TQs.

- Confirmed completeness of information presented in the report to support an update to DOE-STD-1027-92.

- Performed a spot check of final results presented in the report.

- Verified the document preparation process reflected adequate quality assurance measures.

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APPENDIX A. CALCULATION OF HAZARD CATEGORY 2 THRESHOLD QUANTITIES USING MAXIMUM DOSE COEFFICIENTS

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APPENDIX A. CALCULATION OF HAZARD CATEGORY 2 THRESHOLD QUANTITIES USING MAXIMUM DOSE COEFFICIENTS

This appendix contains the following tables:

- Table A.1: Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs
- Table A.2: HC-2 TQs Using Maximum Inhalation DCs

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Ac-223	Ac-223	223.019	Actinium	1.00E-03	ICRP-38	2.20E+00	m	1.32E+02	3.83E+08	--	--	--	FGR-12	2.07E-16
Ac-224	Ac-224	224.022	Actinium	1.00E-03	ICRP-38	2.90E+00	h	1.04E+04	4.82E+06	ICRP-72	1.30E-07	S	FGR-12	9.00E-15
Ac-225	Ac-225	225.023	Actinium	1.00E-03	ICRP-38	1.00E+01	d	8.64E+05	5.80E+04	ICRP-72	8.50E-06	S	FGR-12	7.21E-16
Ac-226	Ac-226	226.026	Actinium	1.00E-03	ICRP-38	2.90E+01	h	1.04E+05	4.78E+05	ICRP-72	1.30E-06	S	FGR-12	6.03E-15
Ac-227	Ac-227	227.028	Actinium	1.00E-03	ICRP-38	2.18E+01	y	6.87E+08	7.23E+01	ICRP-72	5.50E-04	F	FGR-12	5.82E-18
Ac-228	Ac-228	228.031	Actinium	1.00E-03	ICRP-38	6.13E+00	h	2.21E+04	2.24E+06	ICRP-72	2.50E-08	F	FGR-12	4.78E-14
Ac-229	Ac-229	229.033	Actinium	1.00E-03	JAERI	6.27E+01	m	3.76E+03	1.31E+07	JAERI	3.50E-11	M	--	--
Ac-230	Ac-230	230.036	Actinium	1.00E-03	ICRP-107	1.22E+02	s	1.22E+02	4.02E+08	--	--	--	DOE-STD-1196	2.66E-14
Ac-231	Ac-231	231.038	Actinium	1.00E-03	ICRP-107	7.50E+00	m	4.50E+02	1.09E+08	--	--	--	DOE-STD-1196	1.84E-14
Ac-232	Ac-232	232.042	Actinium	1.00E-03	ICRP-107	1.19E+02	s	1.19E+02	4.09E+08	--	--	--	DOE-STD-1196	5.65E-14
Ac-233	Ac-233	233.044	Actinium	1.00E-03	ICRP-107	1.45E+02	s	1.45E+02	3.34E+08	--	--	--	DOE-STD-1196	2.29E-14
Ag-100m	Ag-100	99.916	Silver	1.00E-03	ICRP-107	2.24E+00	m	1.34E+02	8.40E+08	--	--	--	DOE-STD-1196	1.33E-13
Ag-101	Ag-101	100.913	Silver	1.00E-03	ICRP-107	1.11E+01	m	6.66E+02	1.68E+08	DOE-STD-1196	1.65E-11	S	DOE-STD-1196	7.19E-14
Ag-102	Ag-102	101.912	Silver	1.00E-03	ICRP-38	1.29E+01	m	7.74E+02	1.43E+08	ICRP-72	1.80E-11	S	FGR-12	1.67E-13
Ag-102m	Ag-102	101.912	Silver	1.00E-03	ICRP-107	7.70E+00	m	4.62E+02	2.40E+08	--	--	--	DOE-STD-1196	9.72E-14
Ag-103	Ag-103	102.909	Silver	1.00E-03	ICRP-38	6.57E+01	m	3.94E+03	2.78E+07	ICRP-72	2.70E-11	S	FGR-12	3.68E-14
Ag-104	Ag-104	103.909	Silver	1.00E-03	ICRP-38	6.92E+01	m	4.15E+03	2.61E+07	ICRP-72	3.70E-11	S	FGR-12	1.32E-13
Ag-104m	Ag-104	103.909	Silver	1.00E-03	ICRP-38	3.35E+01	m	2.01E+03	5.40E+07	ICRP-72	2.60E-11	S	FGR-12	5.82E-14
Ag-105	Ag-105	104.907	Silver	1.00E-03	ICRP-38	4.10E+01	d	3.54E+06	3.04E+04	ICRP-72	8.10E-10	S	FGR-12	2.45E-14
Ag-105m	Ag-105	104.907	Silver	1.00E-03	ICRP-107	7.23E+00	m	4.34E+02	2.48E+08	--	--	--	DOE-STD-1196	4.42E-17
Ag-106	Ag-106	105.907	Silver	1.00E-03	ICRP-38	2.40E+01	m	1.44E+03	7.41E+07	ICRP-72	1.60E-11	S	FGR-12	3.39E-14
Ag-106m	Ag-106	105.907	Silver	1.00E-03	ICRP-38	8.41E+00	d	7.27E+05	1.47E+05	ICRP-72	1.10E-09	F	FGR-12	1.38E-13
Ag-108	Ag-108	107.906	Silver	1.00E-03	ICRP-38	2.37E+00	m	1.42E+02	7.35E+08	--	--	--	FGR-12	9.28E-16
Ag-108m	Ag-108	107.906	Silver	1.00E-03	ICRP-38	1.27E+02	y	4.01E+09	2.61E+01	ICRP-72	3.70E-08	S	FGR-12	7.80E-14
Ag-109m	Ag-109	108.905	Silver	1.00E-03	ICRP-38	3.96E+01	s	3.96E+01	2.62E+09	--	--	--	FGR-12	1.92E-16
Ag-110	Ag-110	109.906	Silver	1.00E-03	ICRP-38	2.46E+01	s	2.46E+01	4.17E+09	--	--	--	FGR-12	1.78E-15
Ag-110m	Ag-110	109.906	Silver	1.00E-03	ICRP-38	2.50E+02	d	2.16E+07	4.75E+03	ICRP-72	1.20E-08	S	FGR-12	1.36E-13
Ag-111	Ag-111	110.905	Silver	1.00E-03	ICRP-38	7.45E+00	d	6.44E+05	1.58E+05	ICRP-72	1.70E-09	S	FGR-12	1.29E-15
Ag-111m	Ag-111	110.905	Silver	1.00E-03	ICRP-107	6.48E+01	s	6.48E+01	1.57E+09	--	--	--	DOE-STD-1196	1.68E-16
Ag-112	Ag-112	111.907	Silver	1.00E-03	ICRP-38	3.12E+00	h	1.12E+04	8.98E+06	ICRP-72	1.70E-10	S	FGR-12	3.34E-14
Ag-113	Ag-113	112.907	Silver	1.00E-03	ICRP-107	5.37E+00	h	1.93E+04	5.17E+06	DOE-STD-1196	1.97E-10	S	DOE-STD-1196	3.83E-15
Ag-113m	Ag-113	112.907	Silver	1.00E-03	ICRP-107	6.87E+01	s	6.87E+01	1.45E+09	--	--	--	DOE-STD-1196	9.55E-15
Ag-114	Ag-114	113.909	Silver	1.00E-03	ICRP-107	4.60E+00	s	4.60E+00	2.15E+10	--	--	--	DOE-STD-1196	1.46E-14
Ag-115	Ag-115	114.909	Silver	1.00E-03	ICRP-38	2.00E+01	m	1.20E+03	8.18E+07	ICRP-72	2.90E-11	S	FGR-12	3.61E-14
Ag-116	Ag-116	115.911	Silver	1.00E-03	ICRP-107	2.68E+00	m	1.61E+02	6.05E+08	--	--	--	DOE-STD-1196	1.07E-13
Ag-117	Ag-117	116.912	Silver	1.00E-03	ICRP-107	7.36E+01	s	7.36E+01	1.31E+09	--	--	--	DOE-STD-1196	6.50E-14
Ag-99	Ag-99	98.918	Silver	1.00E-03	ICRP-107	1.24E+02	s	1.24E+02	9.20E+08	--	--	--	DOE-STD-1196	1.08E-13
Al-26	Al-26	25.987	Aluminum	1.00E-03	ICRP-38	7.16E+05	y	2.26E+13	1.92E-02	ICRP-72	2.00E-08	M	FGR-12	1.36E-13
Al-28	Al-28	27.982	Aluminum	1.00E-03	ICRP-38	2.24E+00	m	1.34E+02	3.00E+09	--	--	--	FGR-12	9.28E-14
Al-29	Al-29	28.980	Aluminum	1.00E-03	ICRP-107	6.56E+00	m	3.94E+02	9.89E+08	--	--	--	DOE-STD-1196	6.71E-14
Am-237	Am-237	237.050	Americium	1.00E-03	ICRP-38	7.30E+01	m	4.38E+03	1.09E+07	ICRP-72	2.60E-11	S	FGR-12	1.70E-14
Am-238	Am-238	238.052	Americium	1.00E-03	ICRP-38	9.80E+01	m	5.88E+03	8.06E+06	ICRP-72	1.90E-10	F	FGR-12	4.33E-14
Am-239	Am-239	239.053	Americium	1.00E-03	ICRP-38	1.19E+01	h	4.28E+04	1.10E+06	ICRP-72	2.40E-10	S	FGR-12	1.04E-14
Am-240	Am-240	240.055	Americium	1.00E-03	ICRP-38	5.08E+01	h	1.83E+05	2.57E+05	ICRP-72	4.30E-10	M	FGR-12	5.00E-14
Am-241	Am-241	241.057	Americium	1.00E-03	ICRP-38	4.32E+02	y	1.36E+10	3.43E+00	ICRP-72	9.60E-05	F	FGR-12	8.18E-16

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Am-242	Am-242	242.060	Americium	1.00E-03	ICRP-38	1.60E+01	h	5.77E+04	8.08E+05	ICRP-72	2.00E-08	S	FGR-12	6.15E-16
Am-242m	Am-242	242.060	Americium	1.00E-03	ICRP-38	1.52E+02	y	4.80E+09	9.72E+00	ICRP-72	9.20E-05	F	FGR-12	3.17E-17
Am-243	Am-243	243.061	Americium	1.00E-03	ICRP-38	7.38E+03	y	2.33E+11	1.99E-01	ICRP-72	9.60E-05	F	FGR-12	2.18E-15
Am-244	Am-244	244.064	Americium	1.00E-03	ICRP-38	1.01E+01	h	3.64E+04	1.27E+06	ICRP-72	3.70E-09	F	FGR-12	3.85E-14
Am-244m	Am-244	244.064	Americium	1.00E-03	ICRP-38	2.60E+01	m	1.56E+03	2.96E+07	ICRP-72	1.60E-10	F	FGR-12	6.13E-17
Am-245	Am-245	245.066	Americium	1.00E-03	ICRP-38	2.05E+00	h	7.38E+03	6.24E+06	ICRP-72	5.60E-11	S	FGR-12	1.46E-15
Am-246	Am-246	246.070	Americium	1.00E-03	ICRP-38	3.90E+01	m	2.34E+03	1.96E+07	ICRP-72	6.90E-11	S	FGR-12	3.28E-14
Am-246m	Am-246	246.070	Americium	1.00E-03	ICRP-38	2.50E+01	m	1.50E+03	3.06E+07	ICRP-72	2.30E-11	S	FGR-12	5.03E-14
Am-247	Am-247	247.072	Americium	1.00E-03	ICRP-107	2.30E+01	m	1.38E+03	3.31E+07	DOE-STD-1196	3.17E-11	S	DOE-STD-1196	5.85E-15
Ar-37	Ar-37	36.967	Argon	1.00E+00	ICRP-38	3.50E+01	d	3.03E+06	1.01E+05	--	--	--	FGR-12	1.27E-19
Ar-39	Ar-39	38.964	Argon	1.00E+00	ICRP-38	2.69E+02	y	8.49E+09	3.41E+01	--	--	--	FGR-12	9.10E-18
Ar-41	Ar-41	40.965	Argon	1.00E+00	ICRP-38	1.83E+00	h	6.58E+03	4.19E+07	--	--	--	FGR-12	6.50E-14
Ar-42	Ar-42	41.963	Argon	1.00E+00	ICRP-107	3.29E+01	y	1.04E+09	2.59E+02	--	--	--	DOE-STD-1196	1.26E-16
Ar-43	Ar-43	42.966	Argon	1.00E+00	ICRP-107	5.37E+00	m	3.22E+02	8.15E+08	--	--	--	DOE-STD-1196	7.55E-14
Ar-44	Ar-44	43.965	Argon	1.00E+00	ICRP-107	1.19E+01	m	7.12E+02	3.60E+08	--	--	--	DOE-STD-1196	9.46E-14
As-68	As-68	67.937	Arsenic	1.00E-03	ICRP-107	1.52E+02	s	1.52E+02	1.10E+09	--	--	--	DOE-STD-1196	1.76E-13
As-69	As-69	68.932	Arsenic	1.00E-03	ICRP-38	1.52E+01	m	9.12E+02	1.79E+08	ICRP-72	2.10E-11	M	FGR-12	4.89E-14
As-70	As-70	69.931	Arsenic	1.00E-03	ICRP-38	5.26E+01	m	3.16E+03	5.11E+07	ICRP-72	6.70E-11	M	FGR-12	2.04E-13
As-71	As-71	70.927	Arsenic	1.00E-03	ICRP-38	6.48E+01	h	2.33E+05	6.82E+05	ICRP-72	4.00E-10	M	FGR-12	2.74E-14
As-72	As-72	71.927	Arsenic	1.00E-03	ICRP-38	2.60E+01	h	9.36E+04	1.68E+06	ICRP-72	9.00E-10	M	FGR-12	8.78E-14
As-73	As-73	72.924	Arsenic	1.00E-03	ICRP-38	8.03E+01	d	6.94E+06	2.23E+04	ICRP-72	1.00E-09	M	FGR-12	1.90E-16
As-74	As-74	73.924	Arsenic	1.00E-03	ICRP-38	1.78E+01	d	1.53E+06	9.95E+04	ICRP-72	2.10E-09	M	FGR-12	3.65E-14
As-76	As-76	75.922	Arsenic	1.00E-03	ICRP-38	2.63E+01	h	9.48E+04	1.57E+06	ICRP-72	7.40E-10	M	FGR-12	2.13E-14
As-77	As-77	76.921	Arsenic	1.00E-03	ICRP-38	3.88E+01	h	1.40E+05	1.05E+06	ICRP-72	3.90E-10	M	FGR-12	4.31E-16
As-78	As-78	77.922	Arsenic	1.00E-03	ICRP-38	9.07E+01	m	5.44E+03	2.66E+07	ICRP-72	8.90E-11	M	FGR-12	6.32E-14
As-79	As-79	78.921	Arsenic	1.00E-03	ICRP-107	9.01E+00	m	5.41E+02	2.64E+08	--	--	--	DOE-STD-1196	2.25E-15
At-204	At-204	203.987	Astatine	1.00E-03	ICRP-107	9.20E+00	m	5.52E+02	1.00E+08	--	--	--	DOE-STD-1196	1.04E-13
At-205	At-205	204.986	Astatine	1.00E-03	ICRP-107	2.62E+01	m	1.57E+03	3.50E+07	DOE-STD-1196	7.83E-10	S	DOE-STD-1196	5.22E-14
At-206	At-206	205.987	Astatine	1.00E-03	ICRP-107	3.06E+01	m	1.84E+03	2.98E+07	DOE-STD-1196	2.62E-10	S	DOE-STD-1196	1.12E-13
At-207	At-207	206.986	Astatine	1.00E-03	ICRP-38	1.80E+00	h	6.48E+03	8.41E+06	ICRP-72	2.30E-09	M	FGR-12	6.52E-14
At-208	At-208	207.987	Astatine	1.00E-03	ICRP-107	1.63E+00	h	5.87E+03	9.24E+06	DOE-STD-1196	6.56E-10	S	DOE-STD-1196	1.40E-13
At-209	At-209	208.986	Astatine	1.00E-03	ICRP-107	5.41E+00	h	1.95E+04	2.77E+06	DOE-STD-1196	3.04E-09	S	DOE-STD-1196	1.03E-13
At-210	At-210	209.987	Astatine	1.00E-03	ICRP-107	8.10E+00	h	2.92E+04	1.84E+06	DOE-STD-1196	1.17E-08	S	DOE-STD-1196	1.40E-13
At-211	At-211	210.987	Astatine	1.00E-03	ICRP-38	7.21E+00	h	2.60E+04	2.06E+06	ICRP-72	1.10E-07	M	FGR-12	1.59E-15
At-215	At-215	214.999	Astatine	1.00E-03	ICRP-38	1.00E-01	ms	1.00E-04	5.25E+14	--	--	--	FGR-12	9.22E-18
At-216	At-216	216.002	Astatine	1.00E-03	ICRP-38	3.00E-01	ms	3.00E-04	1.74E+14	--	--	--	FGR-12	6.24E-17
At-217	At-217	217.005	Astatine	1.00E-03	ICRP-38	3.23E-02	s	3.23E-02	1.61E+12	--	--	--	FGR-12	1.48E-17
At-218	At-218	218.009	Astatine	1.00E-03	ICRP-38	2.00E+00	s	2.00E+00	2.59E+10	--	--	--	FGR-12	1.19E-16
At-219	At-219	219.011	Astatine	1.00E-03	ICRP-107	5.60E+01	s	5.60E+01	9.20E+08	--	--	--	--	--
At-220	At-220	220.015	Astatine	1.00E-03	ICRP-107	3.71E+00	m	2.23E+02	2.30E+08	--	--	--	DOE-STD-1196	2.09E-14
Au-186	Au-186	185.966	Gold	1.00E-03	ICRP-107	1.07E+01	m	6.42E+02	9.45E+07	DOE-STD-1196	2.43E-11	S	DOE-STD-1196	6.87E-14
Au-187	Au-187	186.965	Gold	1.00E-03	ICRP-107	8.40E+00	m	5.04E+02	1.20E+08	--	--	--	DOE-STD-1196	4.96E-14
Au-188	Au-188	187.965	Gold	1.00E-03	JAERI	8.84E+00	m	5.30E+02	1.13E+08	--	--	--	--	--
Au-189m	Au-189	188.964	Gold	1.00E-03	JAERI	4.59E+00	m	2.75E+02	2.17E+08	--	--	--	--	--
Au-190	Au-190	189.965	Gold	1.00E-03	ICRP-107	4.28E+01	m	2.57E+03	2.31E+07	DOE-STD-1196	2.90E-11	S	DOE-STD-1196	1.16E-13
Au-191	Au-191	190.964	Gold	1.00E-03	ICRP-107	3.18E+00	h	1.14E+04	5.16E+06	DOE-STD-1196	7.56E-11	S	DOE-STD-1196	2.55E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Au-192	Au-192	191.965	Gold	1.00E-03	ICRP-107	4.94E+00	h	1.78E+04	3.30E+06	DOE-STD-1196	1.15E-10	S	DOE-STD-1196	9.29E-14
Au-193	Au-193	192.964	Gold	1.00E-03	ICRP-38	1.77E+01	h	6.35E+04	9.20E+05	ICRP-72	1.20E-10	S	FGR-12	6.83E-15
Au-193m	Au-193	192.964	Gold	1.00E-03	ICRP-107	3.90E+00	s	3.90E+00	1.50E+10	--	--	--	DOE-STD-1196	8.37E-15
Au-194	Au-194	193.965	Gold	1.00E-03	ICRP-38	3.95E+01	h	1.42E+05	4.09E+05	ICRP-72	2.40E-10	S	FGR-12	5.29E-14
Au-195	Au-195	194.965	Gold	1.00E-03	ICRP-38	1.83E+02	d	1.58E+07	3.66E+03	ICRP-72	1.70E-09	S	FGR-12	3.21E-15
Au-195m	Au-195	194.965	Gold	1.00E-03	ICRP-38	3.05E+01	s	3.05E+01	1.90E+09	--	--	--	FGR-12	9.37E-15
Au-196	Au-196	195.967	Gold	1.00E-03	ICRP-107	6.18E+00	d	5.34E+05	1.08E+05	DOE-STD-1196	3.78E-10	M	DOE-STD-1196	2.02E-14
Au-196m	Au-196	195.967	Gold	1.00E-03	ICRP-107	9.60E+00	h	3.46E+04	1.67E+06	DOE-STD-1196	5.00E-10	S	DOE-STD-1196	9.70E-15
Au-198	Au-198	197.968	Gold	1.00E-03	ICRP-38	2.70E+00	d	2.33E+05	2.45E+05	ICRP-72	8.60E-10	S	FGR-12	1.94E-14
Au-198m	Au-198	197.968	Gold	1.00E-03	ICRP-38	2.30E+00	d	1.99E+05	2.87E+05	ICRP-72	2.00E-09	S	FGR-12	2.66E-14
Au-199	Au-199	198.969	Gold	1.00E-03	ICRP-38	3.14E+00	d	2.71E+05	2.09E+05	ICRP-72	7.90E-10	S	FGR-12	4.08E-15
Au-200	Au-200	199.971	Gold	1.00E-03	ICRP-38	4.84E+01	m	2.90E+03	1.94E+07	ICRP-72	3.50E-11	S	FGR-12	1.37E-14
Au-200m	Au-200	199.971	Gold	1.00E-03	ICRP-38	1.87E+01	h	6.73E+04	8.38E+05	ICRP-72	7.20E-10	S	FGR-12	1.01E-13
Au-201	Au-201	200.972	Gold	1.00E-03	ICRP-38	2.64E+01	m	1.58E+03	3.54E+07	ICRP-72	1.70E-11	M	FGR-12	2.57E-15
Au-202	Au-202	201.974	Gold	1.00E-03	ICRP-107	2.88E+01	s	2.88E+01	1.94E+09	--	--	--	DOE-STD-1196	8.90E-15
Ba-124	Ba-124	123.915	Barium	1.00E-03	ICRP-107	1.10E+01	m	6.60E+02	1.38E+08	DOE-STD-1196	2.71E-11	S	DOE-STD-1196	2.51E-14
Ba-126	Ba-126	125.911	Barium	1.00E-03	ICRP-38	9.65E+01	m	5.79E+03	1.55E+07	ICRP-72	1.10E-10	S	FGR-12	7.03E-15
Ba-127	Ba-127	126.911	Barium	1.00E-03	ICRP-107	1.27E+01	m	7.62E+02	1.17E+08	DOE-STD-1196	1.34E-11	S	DOE-STD-1196	3.28E-14
Ba-128	Ba-128	127.908	Barium	1.00E-03	ICRP-38	2.43E+00	d	2.10E+05	4.20E+05	ICRP-72	1.40E-09	S	FGR-12	2.86E-15
Ba-129	Ba-129	128.909	Barium	1.00E-03	ICRP-107	2.23E+00	h	8.03E+03	1.09E+07	DOE-STD-1196	3.44E-11	S	DOE-STD-1196	1.44E-14
Ba-129m	Ba-129	128.909	Barium	1.00E-03	ICRP-107	2.16E+00	h	7.78E+03	1.13E+07	DOE-STD-1196	5.57E-11	S	DOE-STD-1196	7.20E-14
Ba-131	Ba-131	130.907	Barium	1.00E-03	ICRP-38	1.18E+01	d	1.02E+06	8.45E+04	ICRP-72	8.70E-10	S	FGR-12	2.10E-14
Ba-131m	Ba-131	130.907	Barium	1.00E-03	ICRP-38	1.46E+01	m	8.76E+02	9.84E+07	ICRP-72	7.80E-12	S	FGR-12	3.04E-15
Ba-133	Ba-133	132.906	Barium	1.00E-03	ICRP-38	1.07E+01	y	3.39E+08	2.50E+02	ICRP-72	1.00E-08	S	FGR-12	1.78E-14
Ba-133m	Ba-133	132.906	Barium	1.00E-03	ICRP-38	3.89E+01	h	1.40E+05	6.06E+05	ICRP-72	4.60E-10	S	FGR-12	2.62E-15
Ba-135m	Ba-135	134.906	Barium	1.00E-03	ICRP-38	2.87E+01	h	1.03E+05	8.09E+05	ICRP-72	3.60E-10	S	FGR-12	2.32E-15
Ba-137m	Ba-137	136.906	Barium	1.00E-03	ICRP-38	2.55E+00	m	1.53E+02	5.38E+08	--	--	--	FGR-12	2.88E-14
Ba-139	Ba-139	138.909	Barium	1.00E-03	ICRP-38	8.27E+01	m	4.96E+03	1.64E+07	ICRP-72	5.90E-11	S	FGR-12	2.17E-15
Ba-140	Ba-140	139.911	Barium	1.00E-03	ICRP-38	1.27E+01	d	1.10E+06	7.33E+04	ICRP-72	5.80E-09	S	FGR-12	8.58E-15
Ba-141	Ba-141	140.914	Barium	1.00E-03	ICRP-38	1.83E+01	m	1.10E+03	7.30E+07	ICRP-72	3.40E-11	S	FGR-12	4.16E-14
Ba-142	Ba-142	141.916	Barium	1.00E-03	ICRP-38	1.06E+01	m	6.36E+02	1.25E+08	ICRP-72	2.20E-11	S	FGR-12	5.15E-14
Be-10	Be-10	10.014	Beryllium	1.00E-03	ICRP-38	1.60E+06	y	5.05E+13	2.23E-02	ICRP-72	3.50E-08	S	FGR-12	1.12E-17
Be-7	Be-7	7.017	Beryllium	1.00E-03	ICRP-38	5.33E+01	d	4.61E+06	3.49E+05	ICRP-72	5.50E-11	S	FGR-12	2.36E-15
Bi-197	Bi-197	196.979	Bismuth	1.00E-03	ICRP-107	9.30E+00	m	5.58E+02	1.03E+08	--	--	--	DOE-STD-1196	7.85E-14
Bi-200	Bi-200	199.978	Bismuth	1.00E-03	ICRP-38	3.64E+01	m	2.18E+03	2.58E+07	ICRP-72	3.30E-11	M	FGR-12	1.16E-13
Bi-201	Bi-201	200.977	Bismuth	1.00E-03	ICRP-38	1.08E+02	m	6.48E+03	8.66E+06	ICRP-72	6.60E-11	M	FGR-12	6.51E-14
Bi-202	Bi-202	201.978	Bismuth	1.00E-03	ICRP-38	1.67E+00	h	6.01E+03	9.29E+06	ICRP-72	5.50E-11	M	FGR-12	1.33E-13
Bi-203	Bi-203	202.977	Bismuth	1.00E-03	ICRP-38	1.18E+01	h	4.23E+04	1.31E+06	ICRP-72	2.60E-10	M	FGR-12	1.20E-13
Bi-204	Bi-204	203.978	Bismuth	1.00E-03	ICRP-38	1.12E+01	h	4.04E+04	1.37E+06	DOE-STD-1196	3.81E-10	S	DOE-STD-1196	1.35E-13
Bi-205	Bi-205	204.977	Bismuth	1.00E-03	ICRP-38	1.53E+01	d	1.32E+06	4.16E+04	ICRP-72	9.30E-10	M	FGR-12	8.49E-14
Bi-206	Bi-206	205.978	Bismuth	1.00E-03	ICRP-38	6.24E+00	d	5.39E+05	1.02E+05	ICRP-72	1.70E-09	M	FGR-12	1.61E-13
Bi-207	Bi-207	206.978	Bismuth	1.00E-03	ICRP-38	3.80E+01	y	1.20E+09	4.55E+01	ICRP-72	5.60E-09	M	FGR-12	7.54E-14
Bi-208	Bi-208	207.980	Bismuth	1.00E-03	ICRP-107	3.68E+05	y	1.16E+13	4.67E-03	DOE-STD-1196	3.83E-08	S	DOE-STD-1196	1.35E-13
Bi-210	Bi-210	209.984	Bismuth	1.00E-03	ICRP-38	5.01E+00	d	4.33E+05	1.24E+05	ICRP-72	9.30E-08	M	FGR-12	3.29E-17
Bi-210m	Bi-210	209.984	Bismuth	1.00E-03	ICRP-38	3.00E+06	y	9.47E+13	5.67E-04	ICRP-72	3.40E-06	M	FGR-12	1.22E-14
Bi-211	Bi-211	210.987	Bismuth	1.00E-03	ICRP-38	2.14E+00	m	1.28E+02	4.16E+08	--	--	--	FGR-12	2.22E-15

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Bi-212	Bi-212	211.991	Bismuth	1.00E-03	ICRP-38	6.06E+01	m	3.63E+03	1.46E+07	ICRP-72	3.10E-08	M	FGR-12	9.24E-15
Bi-212n	Bi-212	211.991	Bismuth	1.00E-03	ICRP-107	7.00E+00	m	4.20E+02	1.27E+08	--	--	--	DOE-STD-1196	3.89E-16
Bi-213	Bi-213	212.994	Bismuth	1.00E-03	ICRP-38	4.57E+01	m	2.74E+03	1.93E+07	ICRP-72	3.00E-08	M	FGR-12	6.39E-15
Bi-214	Bi-214	213.999	Bismuth	1.00E-03	ICRP-38	1.99E+01	m	1.19E+03	4.42E+07	ICRP-72	1.40E-08	M	FGR-12	7.65E-14
Bi-215	Bi-215	215.002	Bismuth	1.00E-03	ICRP-107	7.60E+00	m	4.56E+02	1.15E+08	--	--	--	DOE-STD-1196	1.18E-14
Bi-216	Bi-216	216.006	Bismuth	1.00E-03	ICRP-107	2.17E+00	m	1.30E+02	4.01E+08	--	--	--	DOE-STD-1196	3.41E-14
Bk-244	Bk-244	244.065	Berkelium	1.00E-03	JAERI	4.35E+00	h	1.57E+04	2.95E+06	JAERI	1.00E-09	M	--	--
Bk-245	Bk-245	245.066	Berkelium	1.00E-03	ICRP-38	4.94E+00	d	4.27E+05	1.08E+05	ICRP-72	2.10E-09	M	FGR-12	1.04E-14
Bk-246	Bk-246	246.069	Berkelium	1.00E-03	ICRP-38	1.83E+00	d	1.58E+05	2.90E+05	ICRP-72	3.30E-10	M	FGR-12	4.59E-14
Bk-247	Bk-247	247.070	Berkelium	1.00E-03	ICRP-38	1.38E+03	y	4.35E+10	1.05E+00	ICRP-72	6.90E-05	M	FGR-12	4.71E-15
Bk-248m	Bk-248	248.073	Berkelium	1.00E-03	ICRP-107	2.37E+01	h	8.53E+04	5.33E+05	DOE-STD-1196	2.81E-08	F	DOE-STD-1196	2.28E-15
Bk-249	Bk-249	249.075	Berkelium	1.00E-03	ICRP-38	3.20E+02	d	2.76E+07	1.64E+03	ICRP-72	1.60E-07	M	FGR-12	8.21E-20
Bk-250	Bk-250	250.078	Berkelium	1.00E-03	ICRP-38	3.22E+00	h	1.16E+04	3.89E+06	ICRP-72	1.00E-09	M	FGR-12	4.38E-14
Bk-251	Bk-251	251.081	Berkelium	1.00E-03	ICRP-107	5.56E+01	m	3.34E+03	1.35E+07	DOE-STD-1196	5.09E-11	M	DOE-STD-1196	3.56E-15
Br-72	Br-72	71.937	Bromine	5.00E-01	ICRP-107	7.86E+01	s	7.86E+01	2.00E+09	--	--	--	DOE-STD-1196	1.41E-13
Br-73	Br-73	72.932	Bromine	5.00E-01	ICRP-107	3.40E+00	m	2.04E+02	7.58E+08	--	--	--	DOE-STD-1196	6.52E-14
Br-74	Br-74	73.930	Bromine	5.00E-01	ICRP-38	2.53E+01	m	1.52E+03	1.01E+08	ICRP-72	3.80E-11	M	FGR-12	2.38E-13
Br-74m	Br-74	73.930	Bromine	5.00E-01	ICRP-38	4.15E+01	m	2.49E+03	6.13E+07	ICRP-72	6.20E-11	M	FGR-12	2.08E-13
Br-75	Br-75	74.926	Bromine	5.00E-01	ICRP-38	9.80E+01	m	5.88E+03	2.56E+07	ICRP-72	5.30E-11	M	FGR-12	5.84E-14
Br-76	Br-76	75.925	Bromine	5.00E-01	ICRP-38	1.62E+01	h	5.83E+04	2.55E+06	ICRP-72	4.10E-10	M	FGR-12	1.34E-13
Br-76m	Br-76	75.925	Bromine	5.00E-01	ICRP-107	1.31E+00	s	1.31E+00	1.13E+11	--	--	--	DOE-STD-1196	9.66E-16
Br-77	Br-77	76.921	Bromine	5.00E-01	ICRP-38	5.60E+01	h	2.02E+05	7.27E+05	ICRP-72	8.40E-11	M	FGR-12	1.51E-14
Br-77m	Br-77	76.921	Bromine	5.00E-01	ICRP-107	4.28E+00	m	2.57E+02	5.71E+08	--	--	--	DOE-STD-1196	5.96E-16
Br-78	Br-78	77.921	Bromine	5.00E-01	ICRP-107	6.46E+00	m	3.88E+02	3.74E+08	--	--	--	DOE-STD-1196	4.69E-14
Br-80	Br-80	79.919	Bromine	5.00E-01	ICRP-38	1.74E+01	m	1.04E+03	1.35E+08	ICRP-72	9.40E-12	M	FGR-12	3.85E-15
Br-80m	Br-80	79.919	Bromine	5.00E-01	ICRP-38	4.42E+00	h	1.59E+04	8.87E+06	ICRP-72	7.60E-11	M	FGR-12	3.11E-16
Br-82	Br-82	81.917	Bromine	5.00E-01	ICRP-38	3.53E+01	h	1.27E+05	1.08E+06	ICRP-72	6.30E-10	M	FGR-12	1.30E-13
Br-82m	Br-82	81.917	Bromine	5.00E-01	ICRP-107	6.13E+00	m	3.68E+02	3.74E+08	--	--	--	DOE-STD-1196	1.59E-16
Br-83	Br-83	82.915	Bromine	5.00E-01	ICRP-38	2.39E+00	h	8.60E+03	1.58E+07	ICRP-72	4.80E-11	M	FGR-12	3.82E-16
Br-84	Br-84	83.916	Bromine	5.00E-01	ICRP-38	3.18E+01	m	1.91E+03	7.05E+07	ICRP-72	3.70E-11	M	FGR-12	9.41E-14
Br-84m	Br-84	83.916	Bromine	5.00E-01	ICRP-107	6.00E+00	m	3.60E+02	3.73E+08	--	--	--	DOE-STD-1196	1.31E-13
Br-85	Br-85	84.916	Bromine	5.00E-01	ICRP-107	2.90E+00	m	1.74E+02	7.64E+08	--	--	--	DOE-STD-1196	3.98E-15
C-10	C-10	10.017	Carbon	1.00E-02	ICRP-107	1.93E+01	s	1.93E+01	5.85E+10	--	--	--	DOE-STD-1196	7.90E-14
C-11	C-11	11.011	Carbon	1.00E-02	ICRP-38	2.04E+01	m	1.22E+03	8.38E+08	ICRP-72	1.80E-11	M	FGR-12	4.89E-14
C-14	C-14	14.003	Carbon	1.00E-02	ICRP-38	5.73E+03	y	1.81E+11	4.46E+00	ICRP-72	5.80E-09	S	FGR-12	2.24E-19
Ca-41	Ca-41	40.962	Calcium	1.00E-03	ICRP-38	1.40E+05	y	4.42E+12	6.23E-02	ICRP-72	1.80E-10	S	--	--
Ca-45	Ca-45	44.956	Calcium	1.00E-03	ICRP-38	1.63E+02	d	1.41E+07	1.78E+04	ICRP-72	3.70E-09	S	FGR-12	8.63E-19
Ca-47	Ca-47	46.955	Calcium	1.00E-03	ICRP-38	4.53E+00	d	3.91E+05	6.14E+05	ICRP-72	2.10E-09	S	FGR-12	5.36E-14
Ca-49	Ca-49	48.956	Calcium	1.00E-03	ICRP-38	8.72E+00	m	5.23E+02	4.41E+08	--	--	--	FGR-12	1.73E-13
Cd-101	Cd-101	100.919	Cadmium	1.00E-03	ICRP-107	1.36E+00	m	8.16E+01	1.37E+09	--	--	--	DOE-STD-1196	1.17E-13
Cd-102	Cd-102	101.914	Cadmium	1.00E-03	ICRP-107	5.50E+00	m	3.30E+02	3.35E+08	--	--	--	DOE-STD-1196	3.73E-14
Cd-103	Cd-103	102.913	Cadmium	1.00E-03	ICRP-107	7.30E+00	m	4.38E+02	2.50E+08	--	--	--	DOE-STD-1196	1.00E-13
Cd-104	Cd-104	103.910	Cadmium	1.00E-03	ICRP-38	5.77E+01	m	3.46E+03	3.14E+07	ICRP-72	3.50E-11	S	FGR-12	1.14E-14
Cd-105	Cd-105	104.909	Cadmium	1.00E-03	ICRP-107	5.55E+01	m	3.33E+03	3.23E+07	DOE-STD-1196	2.86E-11	S	DOE-STD-1196	6.13E-14
Cd-107	Cd-107	106.907	Cadmium	1.00E-03	ICRP-38	6.49E+00	h	2.34E+04	4.52E+06	ICRP-72	8.30E-11	M	FGR-12	6.02E-16
Cd-109	Cd-109	108.905	Cadmium	1.00E-03	ICRP-38	4.64E+02	d	4.01E+07	2.58E+03	ICRP-72	8.10E-09	F	FGR-12	2.94E-16

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Cd-111m	Cd-111	110.904	Cadmium	1.00E-03	ICRP-107	4.85E+01	m	2.91E+03	3.50E+07	DOE-STD-1196	2.66E-11	S	DOE-STD-1196	1.20E-14
Cd-113	Cd-113	112.904	Cadmium	1.00E-03	ICRP-38	9.30E+15	y	2.93E+23	3.40E-13	ICRP-72	1.20E-07	F	FGR-12	1.45E-18
Cd-113m	Cd-113	112.904	Cadmium	1.00E-03	ICRP-38	1.36E+01	y	4.29E+08	2.33E+02	ICRP-72	1.10E-07	F	FGR-12	6.94E-18
Cd-115	Cd-115	114.905	Cadmium	1.00E-03	ICRP-38	5.35E+01	h	1.92E+05	5.10E+05	ICRP-72	1.10E-09	S	FGR-12	1.12E-14
Cd-115m	Cd-115	114.905	Cadmium	1.00E-03	ICRP-38	4.46E+01	d	3.85E+06	2.55E+04	ICRP-72	7.70E-09	S	FGR-12	1.17E-15
Cd-117	Cd-117	116.907	Cadmium	1.00E-03	ICRP-38	2.49E+00	h	8.96E+03	1.08E+07	ICRP-72	1.70E-10	S	FGR-12	5.45E-14
Cd-117m	Cd-117	116.907	Cadmium	1.00E-03	ICRP-38	3.36E+00	h	1.21E+04	7.98E+06	ICRP-72	2.10E-10	S	FGR-12	1.05E-13
Cd-118	Cd-118	117.907	Cadmium	1.00E-03	ICRP-107	5.03E+01	m	3.02E+03	3.17E+07	DOE-STD-1196	9.60E-11	S	DOE-STD-1196	7.25E-17
Cd-119	Cd-119	118.910	Cadmium	1.00E-03	ICRP-107	2.69E+00	m	1.61E+02	5.88E+08	--	--	--	DOE-STD-1196	7.96E-14
Cd-119m	Cd-119	118.910	Cadmium	1.00E-03	ICRP-107	2.20E+00	m	1.32E+02	7.19E+08	--	--	--	DOE-STD-1196	1.11E-13
Ce-130	Ce-130	129.915	Cerium	1.00E-03	ICRP-107	2.29E+01	m	1.37E+03	6.32E+07	DOE-STD-1196	4.27E-11	S	DOE-STD-1196	2.14E-14
Ce-131	Ce-131	130.914	Cerium	1.00E-03	ICRP-107	1.02E+01	m	6.12E+02	1.41E+08	DOE-STD-1196	1.68E-11	S	DOE-STD-1196	7.43E-14
Ce-131m	Ce-131	130.914	Cerium	1.00E-03	JAERI	5.00E+00	m	3.00E+02	2.87E+08	--	--	--	--	--
Ce-132	Ce-132	131.911	Cerium	1.00E-03	ICRP-107	3.51E+00	h	1.26E+04	6.77E+06	DOE-STD-1196	1.72E-10	S	DOE-STD-1196	1.09E-14
Ce-133	Ce-133	132.912	Cerium	1.00E-03	ICRP-107	9.70E+01	m	5.82E+03	1.46E+07	DOE-STD-1196	6.21E-11	S	DOE-STD-1196	2.28E-14
Ce-133m	Ce-133	132.912	Cerium	1.00E-03	ICRP-107	4.90E+00	h	1.76E+04	4.81E+06	DOE-STD-1196	1.42E-10	S	DOE-STD-1196	7.95E-14
Ce-134	Ce-134	133.909	Cerium	1.00E-03	ICRP-38	7.20E+01	h	2.59E+05	3.25E+05	ICRP-72	1.30E-09	M	FGR-12	4.71E-16
Ce-135	Ce-135	134.909	Cerium	1.00E-03	ICRP-38	1.76E+01	h	6.34E+04	1.32E+06	ICRP-72	5.00E-10	S	FGR-12	8.54E-14
Ce-137	Ce-137	136.908	Cerium	1.00E-03	ICRP-38	9.00E+00	h	3.24E+04	2.54E+06	ICRP-72	1.00E-11	S	FGR-12	8.81E-16
Ce-137m	Ce-137	136.908	Cerium	1.00E-03	ICRP-38	3.44E+01	h	1.24E+05	6.65E+05	ICRP-72	4.40E-10	S	FGR-12	1.96E-15
Ce-139	Ce-139	138.907	Cerium	1.00E-03	ICRP-38	1.38E+02	d	1.19E+07	6.83E+03	ICRP-72	1.90E-09	S	FGR-12	6.73E-15
Ce-141	Ce-141	140.908	Cerium	1.00E-03	ICRP-38	3.25E+01	d	2.81E+06	2.85E+04	ICRP-72	3.80E-09	S	FGR-12	3.43E-15
Ce-143	Ce-143	142.912	Cerium	1.00E-03	ICRP-38	3.30E+01	h	1.19E+05	6.64E+05	ICRP-72	8.30E-10	S	FGR-12	1.29E-14
Ce-144	Ce-144	143.914	Cerium	1.00E-03	ICRP-38	2.84E+02	d	2.46E+07	3.19E+03	ICRP-72	5.30E-08	S	FGR-12	8.53E-16
Ce-145	Ce-145	144.917	Cerium	1.00E-03	ICRP-107	3.01E+00	m	1.81E+02	4.31E+08	--	--	--	DOE-STD-1196	3.64E-14
Ce-146	Ce-146	145.919	Cerium	1.00E-03	JAERI	1.35E+01	m	8.11E+02	9.53E+07	JAERI	2.60E-11	S	--	--
Cf-244	Cf-244	244.066	Californium	1.00E-03	ICRP-38	1.94E+01	m	1.16E+03	3.97E+07	ICRP-72	1.40E-08	M	FGR-12	6.91E-18
Cf-246	Cf-246	246.069	Californium	1.00E-03	ICRP-38	3.57E+01	h	1.29E+05	3.57E+05	ICRP-72	4.50E-07	M	FGR-12	5.48E-18
Cf-247	Cf-247	247.071	Californium	1.00E-03	ICRP-107	3.11E+00	h	1.12E+04	4.08E+06	DOE-STD-1196	5.22E-11	F	DOE-STD-1196	3.58E-15
Cf-248	Cf-248	248.072	Californium	1.00E-03	ICRP-38	3.34E+02	d	2.88E+07	1.58E+03	ICRP-72	8.80E-06	M	FGR-12	4.73E-18
Cf-249	Cf-249	249.075	Californium	1.00E-03	ICRP-38	3.51E+02	y	1.11E+10	4.09E+00	ICRP-72	7.00E-05	M	FGR-12	1.58E-14
Cf-250	Cf-250	250.076	Californium	1.00E-03	ICRP-38	1.31E+01	y	4.13E+08	1.09E+02	ICRP-72	3.40E-05	M	FGR-12	4.50E-18
Cf-251	Cf-251	251.080	Californium	1.00E-03	ICRP-38	8.98E+02	y	2.83E+10	1.59E+00	ICRP-72	7.10E-05	M	FGR-12	5.58E-15
Cf-252	Cf-252	252.082	Californium	1.00E-03	ICRP-38	2.64E+00	y	8.32E+07	5.38E+02	ICRP-72	2.00E-05	M	FGR-12	5.06E-18
Cf-253	Cf-253	253.085	Californium	1.00E-03	ICRP-38	1.78E+01	d	1.54E+06	2.90E+04	ICRP-72	1.30E-06	M	FGR-12	1.08E-18
Cf-254	Cf-254	254.087	Californium	1.00E-03	ICRP-38	6.05E+01	d	5.23E+06	8.49E+03	ICRP-72	4.10E-05	M	FGR-12	1.47E-20
Cf-255	Cf-255	255.091	Californium	1.00E-03	ICRP-107	8.50E+01	m	5.10E+03	8.67E+06	DOE-STD-1196	7.35E-09	S	DOE-STD-1196	1.16E-16
Cf-256	Cf-256	256.093	Californium	1.00E-03	JAERI	1.23E+01	m	7.38E+02	5.97E+07	JAERI	1.90E-06	M	--	--
Cl-34	Cl-34	33.974	Chlorine	1.00E+00	ICRP-107	1.53E+00	s	1.53E+00	2.18E+11	--	--	--	DOE-STD-1196	4.77E-14
Cl-34m	Cl-34	33.974	Chlorine	1.00E+00	ICRP-107	3.20E+01	m	1.92E+03	1.73E+08	DOE-STD-1196	5.50E-11	S	DOE-STD-1196	1.03E-13
Cl-36	Cl-36	35.968	Chlorine	1.00E+00	ICRP-38	3.01E+05	y	9.50E+12	3.30E-02	ICRP-72	7.30E-09	M	FGR-12	2.23E-17
Cl-38	Cl-38	37.968	Chlorine	1.00E+00	ICRP-38	3.72E+01	m	2.23E+03	1.33E+08	ICRP-72	4.50E-11	M	FGR-12	7.87E-14
Cl-39	Cl-39	38.968	Chlorine	1.00E+00	ICRP-38	5.56E+01	m	3.34E+03	8.68E+07	ICRP-72	4.60E-11	M	FGR-12	7.29E-14
Cl-40	Cl-40	39.970	Chlorine	1.00E+00	ICRP-107	1.35E+00	m	8.10E+01	3.48E+09	--	--	--	DOE-STD-1196	2.09E-13
Cm-238	Cm-238	238.053	Curium	1.00E-03	ICRP-38	2.40E+00	h	8.64E+03	5.49E+06	ICRP-72	4.90E-09	S	FGR-12	3.25E-15
Cm-239	Cm-239	239.055	Curium	1.00E-03	ICRP-107	2.90E+00	h	1.04E+04	4.52E+06	DOE-STD-1196	8.06E-11	S	DOE-STD-1196	1.05E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Cm-240	Cm-240	240.056	Curium	1.00E-03	ICRP-38	2.70E+01	d	2.33E+06	2.01E+04	ICRP-72	3.50E-06	S	FGR-12	6.00E-18
Cm-241	Cm-241	241.058	Curium	1.00E-03	ICRP-38	3.28E+01	d	2.83E+06	1.65E+04	ICRP-72	3.70E-08	M	FGR-12	2.31E-14
Cm-242	Cm-242	242.059	Curium	1.00E-03	ICRP-38	1.63E+02	d	1.41E+07	3.31E+03	ICRP-72	5.90E-06	S	FGR-12	5.69E-18
Cm-243	Cm-243	243.061	Curium	1.00E-03	ICRP-38	2.85E+01	y	8.99E+08	5.16E+01	ICRP-72	6.90E-05	F	FGR-12	5.88E-15
Cm-244	Cm-244	244.063	Curium	1.00E-03	ICRP-38	1.81E+01	y	5.72E+08	8.09E+01	ICRP-72	5.70E-05	F	FGR-12	4.91E-18
Cm-245	Cm-245	245.065	Curium	1.00E-03	ICRP-38	8.50E+03	y	2.68E+11	1.72E-01	ICRP-72	9.90E-05	F	FGR-12	3.96E-15
Cm-246	Cm-246	246.067	Curium	1.00E-03	ICRP-38	4.73E+03	y	1.49E+11	3.07E-01	ICRP-72	9.80E-05	F	FGR-12	4.46E-18
Cm-247	Cm-247	247.070	Curium	1.00E-03	ICRP-38	1.56E+07	y	4.92E+14	9.28E-05	ICRP-72	9.00E-05	F	FGR-12	1.50E-14
Cm-248	Cm-248	248.072	Curium	1.00E-03	ICRP-38	3.39E+05	y	1.07E+13	4.25E-03	ICRP-72	3.60E-04	F	FGR-12	3.39E-18
Cm-249	Cm-249	249.076	Curium	1.00E-03	ICRP-38	6.42E+01	m	3.85E+03	1.18E+07	ICRP-72	4.00E-11	F	FGR-12	9.36E-16
Cm-250	Cm-250	250.078	Curium	1.00E-03	ICRP-38	6.90E+03	y	2.18E+11	2.07E-01	ICRP-72	2.10E-03	F	DOE-STD-1196	6.52E-13
Cm-251	Cm-251	251.082	Curium	1.00E-03	ICRP-107	1.68E+01	m	1.01E+03	4.46E+07	DOE-STD-1196	2.79E-11	S	DOE-STD-1196	5.20E-15
Co-54m	Co-54	53.948	Cobalt	1.00E-03	ICRP-107	1.48E+00	m	8.88E+01	2.35E+09	--	--	--	DOE-STD-1196	1.85E-13
Co-55	Co-55	54.942	Cobalt	1.00E-03	ICRP-38	1.75E+01	h	6.31E+04	3.25E+06	ICRP-72	5.30E-10	S	FGR-12	9.78E-14
Co-56	Co-56	55.940	Cobalt	1.00E-03	ICRP-38	7.88E+01	d	6.80E+06	2.96E+04	ICRP-72	6.70E-09	S	FGR-12	1.83E-13
Co-57	Co-57	56.936	Cobalt	1.00E-03	ICRP-38	2.71E+02	d	2.34E+07	8.47E+03	ICRP-72	1.00E-09	S	FGR-12	5.61E-15
Co-58	Co-58	57.936	Cobalt	1.00E-03	ICRP-38	7.08E+01	d	6.12E+06	3.18E+04	ICRP-72	2.10E-09	S	FGR-12	4.76E-14
Co-58m	Co-58	57.936	Cobalt	1.00E-03	ICRP-38	9.15E+00	h	3.29E+04	5.91E+06	ICRP-72	1.70E-11	S	FGR-12	8.77E-20
Co-60	Co-60	59.934	Cobalt	1.00E-03	ICRP-38	5.27E+00	y	1.66E+08	1.13E+03	ICRP-72	3.10E-08	S	FGR-12	1.26E-13
Co-60m	Co-60	59.934	Cobalt	1.00E-03	ICRP-38	1.05E+01	m	6.28E+02	3.00E+08	ICRP-72	1.40E-12	S	FGR-12	2.17E-16
Co-61	Co-61	60.932	Cobalt	1.00E-03	ICRP-38	1.65E+00	h	5.94E+03	3.12E+07	ICRP-72	5.10E-11	S	FGR-12	3.94E-15
Co-62	Co-62	61.934	Cobalt	1.00E-03	ICRP-107	1.50E+00	m	9.00E+01	2.02E+09	--	--	--	DOE-STD-1196	7.92E-14
Co-62m	Co-62	61.934	Cobalt	1.00E-03	ICRP-38	1.39E+01	m	8.35E+02	2.18E+08	ICRP-72	2.10E-11	S	FGR-12	1.37E-13
Cr-48	Cr-48	47.954	Chromium	1.00E-03	ICRP-38	2.30E+01	h	8.27E+04	2.85E+06	ICRP-72	2.20E-10	S	FGR-12	2.06E-14
Cr-49	Cr-49	48.951	Chromium	1.00E-03	ICRP-38	4.21E+01	m	2.53E+03	9.13E+07	ICRP-72	3.50E-11	S	FGR-12	5.03E-14
Cr-51	Cr-51	50.945	Chromium	1.00E-03	ICRP-38	2.77E+01	d	2.39E+06	9.25E+04	ICRP-72	3.70E-11	S	FGR-12	1.51E-15
Cr-55	Cr-55	54.941	Chromium	1.00E-03	ICRP-107	3.50E+00	m	2.10E+02	9.79E+08	--	--	--	DOE-STD-1196	1.00E-15
Cr-56	Cr-56	55.941	Chromium	1.00E-03	ICRP-107	5.94E+00	m	3.56E+02	5.66E+08	--	--	--	DOE-STD-1196	3.47E-15
Cs-121	Cs-121	120.917	Cesium	1.00E-02	ICRP-107	1.55E+02	s	1.55E+02	6.02E+08	--	--	--	DOE-STD-1196	5.41E-14
Cs-121m	Cs-121	120.917	Cesium	1.00E-02	ICRP-107	1.22E+02	s	1.22E+02	7.65E+08	--	--	--	DOE-STD-1196	5.38E-14
Cs-123	Cs-123	122.913	Cesium	1.00E-02	ICRP-107	5.88E+00	m	3.53E+02	2.60E+08	--	--	--	DOE-STD-1196	4.89E-14
Cs-124	Cs-124	123.912	Cesium	1.00E-02	ICRP-107	3.08E+01	s	3.08E+01	2.96E+09	--	--	--	DOE-STD-1196	5.43E-14
Cs-125	Cs-125	124.910	Cesium	1.00E-02	ICRP-38	4.50E+01	m	2.70E+03	3.35E+07	ICRP-72	2.30E-11	S	FGR-12	3.22E-14
Cs-126	Cs-126	125.909	Cesium	1.00E-02	ICRP-38	1.64E+00	m	9.84E+01	9.11E+08	--	--	--	FGR-12	5.24E-14
Cs-127	Cs-127	126.907	Cesium	1.00E-02	ICRP-38	6.25E+00	h	2.25E+04	3.95E+06	ICRP-72	3.80E-11	S	FGR-12	1.93E-14
Cs-128	Cs-128	127.908	Cesium	1.00E-02	ICRP-38	3.90E+00	m	2.34E+02	3.77E+08	--	--	--	FGR-12	4.32E-14
Cs-129	Cs-129	128.906	Cesium	1.00E-02	ICRP-38	3.21E+01	h	1.15E+05	7.58E+05	ICRP-72	7.70E-11	S	FGR-12	1.24E-14
Cs-130	Cs-130	129.907	Cesium	1.00E-02	ICRP-38	2.99E+01	m	1.79E+03	4.84E+07	ICRP-72	1.40E-11	M	FGR-12	2.45E-14
Cs-130m	Cs-130	129.907	Cesium	1.00E-02	ICRP-107	3.46E+00	m	2.08E+02	4.18E+08	--	--	--	DOE-STD-1196	2.01E-15
Cs-131	Cs-131	130.905	Cesium	1.00E-02	ICRP-38	9.69E+00	d	8.37E+05	1.03E+05	ICRP-72	4.70E-11	S	FGR-12	3.28E-16
Cs-132	Cs-132	131.906	Cesium	1.00E-02	ICRP-38	6.48E+00	d	5.59E+05	1.53E+05	ICRP-72	3.00E-10	S	FGR-12	3.34E-14
Cs-134	Cs-134	133.907	Cesium	1.00E-02	ICRP-38	2.06E+00	y	6.51E+07	1.29E+03	ICRP-72	2.00E-08	S	FGR-12	7.57E-14
Cs-134m	Cs-134	133.907	Cesium	1.00E-02	ICRP-38	2.90E+00	h	1.04E+04	8.07E+06	ICRP-72	6.00E-11	S	FGR-12	9.05E-16
Cs-135	Cs-135	134.906	Cesium	1.00E-02	ICRP-38	2.30E+06	y	7.26E+13	1.15E-03	ICRP-72	8.60E-09	S	FGR-12	5.65E-19
Cs-135m	Cs-135	134.906	Cesium	1.00E-02	ICRP-38	5.30E+01	m	3.18E+03	2.63E+07	ICRP-72	1.60E-11	S	FGR-12	7.76E-14
Cs-136	Cs-136	135.907	Cesium	1.00E-02	ICRP-38	1.31E+01	d	1.13E+06	7.33E+04	ICRP-72	2.80E-09	S	FGR-12	1.06E-13

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Cs-137	Cs-137	136.907	Cesium	1.00E-02	ICRP-38	3.00E+01	y	9.47E+08	8.70E+01	ICRP-72	3.90E-08	S	FGR-12	7.74E-18
Cs-138	Cs-138	137.911	Cesium	1.00E-02	ICRP-38	3.22E+01	m	1.93E+03	4.23E+07	ICRP-72	4.30E-11	S	FGR-12	1.21E-13
Cs-138m	Cs-138	137.911	Cesium	1.00E-02	ICRP-107	2.91E+00	m	1.75E+02	4.69E+08	--	--	--	DOE-STD-1196	1.92E-14
Cs-139	Cs-139	138.913	Cesium	1.00E-02	ICRP-107	9.27E+00	m	5.56E+02	1.46E+08	--	--	--	DOE-STD-1196	1.66E-14
Cs-140	Cs-140	139.917	Cesium	1.00E-02	ICRP-107	6.37E+01	s	6.37E+01	1.27E+09	--	--	--	DOE-STD-1196	8.89E-14
Cu-57	Cu-57	56.949	Copper	1.00E-03	ICRP-38	2.33E+02	ms	2.33E-01	8.50E+11	--	--	--	DOE-STD-1196	5.65E-14
Cu-59	Cu-59	58.939	Copper	1.00E-03	ICRP-107	8.15E+01	s	8.15E+01	2.35E+09	--	--	--	DOE-STD-1196	6.68E-14
Cu-60	Cu-60	59.937	Copper	1.00E-03	ICRP-38	2.32E+01	m	1.39E+03	1.35E+08	ICRP-72	3.40E-11	S	FGR-12	1.98E-13
Cu-61	Cu-61	60.933	Copper	1.00E-03	ICRP-38	3.41E+00	h	1.23E+04	1.51E+07	ICRP-72	7.80E-11	S	FGR-12	3.99E-14
Cu-62	Cu-62	61.933	Copper	1.00E-03	ICRP-38	9.74E+00	m	5.84E+02	3.12E+08	--	--	--	FGR-12	4.86E-14
Cu-64	Cu-64	63.930	Copper	1.00E-03	ICRP-38	1.27E+01	h	4.57E+04	3.86E+06	ICRP-72	1.20E-10	S	FGR-12	9.10E-15
Cu-66	Cu-66	65.929	Copper	1.00E-03	ICRP-38	5.10E+00	m	3.06E+02	5.59E+08	--	--	--	FGR-12	4.46E-15
Cu-67	Cu-67	66.928	Copper	1.00E-03	ICRP-38	6.19E+01	h	2.23E+05	7.57E+05	ICRP-72	6.10E-10	S	FGR-12	5.41E-15
Cu-69	Cu-69	68.929	Copper	1.00E-03	ICRP-107	2.85E+00	m	1.71E+02	9.57E+08	--	--	--	DOE-STD-1196	2.53E-14
Dy-148	Dy-148	147.927	Dysprosium	1.00E-03	ICRP-107	3.30E+00	m	1.98E+02	3.85E+08	--	--	--	DOE-STD-1196	3.15E-14
Dy-149	Dy-149	148.927	Dysprosium	1.00E-03	ICRP-107	4.20E+00	m	2.52E+02	3.01E+08	--	--	--	DOE-STD-1196	7.52E-14
Dy-150	Dy-150	149.926	Dysprosium	1.00E-03	ICRP-107	7.17E+00	m	4.30E+02	1.75E+08	--	--	--	DOE-STD-1196	1.18E-14
Dy-151	Dy-151	150.926	Dysprosium	1.00E-03	ICRP-107	1.79E+01	m	1.07E+03	6.96E+07	DOE-STD-1196	1.51E-10	S	DOE-STD-1196	6.28E-14
Dy-152	Dy-152	151.925	Dysprosium	1.00E-03	ICRP-107	2.38E+00	h	8.57E+03	8.67E+06	DOE-STD-1196	7.46E-11	S	DOE-STD-1196	1.18E-14
Dy-153	Dy-153	152.926	Dysprosium	1.00E-03	ICRP-107	6.40E+00	h	2.30E+04	3.20E+06	DOE-STD-1196	1.51E-10	S	DOE-STD-1196	3.82E-14
Dy-154	Dy-154	153.924	Dysprosium	1.00E-03	ICRP-107	3.00E+06	y	9.47E+13	7.74E-04	DOE-STD-1196	2.74E-05	F	--	--
Dy-155	Dy-155	154.926	Dysprosium	1.00E-03	ICRP-38	1.00E+01	h	3.60E+04	2.02E+06	ICRP-72	7.70E-11	M	FGR-12	2.77E-14
Dy-157	Dy-157	156.925	Dysprosium	1.00E-03	ICRP-38	8.10E+00	h	2.92E+04	2.47E+06	ICRP-72	3.00E-11	M	FGR-12	1.63E-14
Dy-159	Dy-159	158.926	Dysprosium	1.00E-03	ICRP-38	1.44E+02	d	1.25E+07	5.69E+03	ICRP-72	3.70E-10	M	FGR-12	1.25E-15
Dy-165	Dy-165	164.932	Dysprosium	1.00E-03	ICRP-38	2.33E+00	h	8.40E+03	8.14E+06	ICRP-72	6.00E-11	M	FGR-12	1.20E-15
Dy-165m	Dy-165	164.932	Dysprosium	1.00E-03	ICRP-107	1.26E+00	m	7.54E+01	9.07E+08	--	--	--	DOE-STD-1196	7.08E-16
Dy-166	Dy-166	165.933	Dysprosium	1.00E-03	ICRP-38	8.16E+01	h	2.94E+05	2.31E+05	ICRP-72	1.90E-09	M	FGR-12	1.40E-15
Dy-167	Dy-167	166.936	Dysprosium	1.00E-03	ICRP-107	6.20E+00	m	3.72E+02	1.82E+08	--	--	--	DOE-STD-1196	2.40E-14
Dy-168	Dy-168	167.937	Dysprosium	1.00E-03	ICRP-107	8.70E+00	m	5.22E+02	1.29E+08	--	--	--	DOE-STD-1196	1.73E-14
Er-154	Er-154	153.933	Erbium	1.00E-03	ICRP-107	3.73E+00	m	2.24E+02	3.27E+08	--	--	--	DOE-STD-1196	2.24E-15
Er-155	Er-155	154.933	Erbium	1.00E-03	JAERI	5.30E+00	m	3.18E+02	2.29E+08	--	--	--	--	--
Er-156	Er-156	155.931	Erbium	1.00E-03	ICRP-107	1.95E+01	m	1.17E+03	6.18E+07	DOE-STD-1196	2.38E-11	S	DOE-STD-1196	1.72E-15
Er-159	Er-159	158.931	Erbium	1.00E-03	ICRP-107	3.60E+01	m	2.16E+03	3.29E+07	DOE-STD-1196	2.07E-11	S	DOE-STD-1196	4.36E-14
Er-161	Er-161	160.930	Erbium	1.00E-03	ICRP-38	3.24E+00	h	1.17E+04	6.01E+06	ICRP-72	4.80E-11	M	FGR-12	4.42E-14
Er-163	Er-163	162.930	Erbium	1.00E-03	ICRP-107	7.50E+01	m	4.50E+03	1.54E+07	DOE-STD-1196	1.56E-12	S	DOE-STD-1196	9.82E-16
Er-165	Er-165	164.931	Erbium	1.00E-03	ICRP-38	1.04E+01	h	3.73E+04	1.83E+06	ICRP-72	7.90E-12	M	FGR-12	1.11E-15
Er-167m	Er-167	166.932	Erbium	1.00E-03	ICRP-38	2.28E+00	s	2.28E+00	2.96E+10	--	--	--	DOE-STD-1196	4.03E-15
Er-169	Er-169	168.935	Erbium	1.00E-03	ICRP-38	9.30E+00	d	8.04E+05	8.31E+04	ICRP-72	1.00E-09	M	FGR-12	1.74E-18
Er-171	Er-171	170.938	Erbium	1.00E-03	ICRP-38	7.52E+00	h	2.71E+04	2.44E+06	ICRP-72	2.20E-10	M	FGR-12	1.78E-14
Er-172	Er-172	171.939	Erbium	1.00E-03	ICRP-38	4.93E+01	h	1.77E+05	3.70E+05	ICRP-72	1.10E-09	M	FGR-12	2.47E-14
Er-173	Er-173	172.942	Erbium	1.00E-03	ICRP-107	1.43E+00	m	8.60E+01	7.58E+08	--	--	--	DOE-STD-1196	3.73E-14
Es-249	Es-249	249.076	Einsteinium	1.00E-03	ICRP-107	1.02E+02	m	6.13E+03	7.39E+06	DOE-STD-1196	2.49E-10	M	DOE-STD-1196	1.77E-14
Es-250	Es-250	250.079	Einsteinium	1.00E-03	ICRP-38	2.10E+00	h	7.56E+03	5.97E+06	ICRP-72	6.30E-10	M	FGR-12	1.90E-14
Es-250m	Es-250	250.079	Einsteinium	1.00E-03	ICRP-107	2.22E+00	h	7.99E+03	5.64E+06	DOE-STD-1196	1.59E-09	F	DOE-STD-1196	2.49E-14
Es-251	Es-251	251.080	Einsteinium	1.00E-03	ICRP-38	3.30E+01	h	1.19E+05	3.78E+05	ICRP-72	2.10E-09	M	FGR-12	4.13E-15
Es-253	Es-253	253.085	Einsteinium	1.00E-03	ICRP-38	2.05E+01	d	1.77E+06	2.52E+04	ICRP-72	2.70E-06	M	FGR-12	1.83E-17

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Es-254	Es-254	254.088	Einsteinium	1.00E-03	ICRP-38	2.76E+02	d	2.38E+07	1.86E+03	ICRP-72	8.60E-06	M	FGR-12	1.93E-16
Es-254m	Es-254	254.088	Einsteinium	1.00E-03	ICRP-38	3.93E+01	h	1.41E+05	3.14E+05	ICRP-72	4.70E-07	M	FGR-12	2.25E-14
Es-255	Es-255	255.090	Einsteinium	1.00E-03	ICRP-107	3.98E+01	d	3.44E+06	1.29E+04	DOE-STD-1196	4.95E-06	S	DOE-STD-1196	4.95E-17
Es-256	Es-256	256.094	Einsteinium	1.00E-03	ICRP-107	2.54E+01	m	1.52E+03	2.89E+07	DOE-STD-1196	4.55E-08	S	DOE-STD-1196	4.33E-16
Eu-142	Eu-142	141.923	Europium	1.00E-03	ICRP-107	2.34E+00	s	2.34E+00	3.40E+10	--	--	--	DOE-STD-1196	5.78E-14
Eu-142m	Eu-142	141.923	Europium	1.00E-03	ICRP-107	1.22E+00	m	7.34E+01	1.08E+09	--	--	--	DOE-STD-1196	1.58E-13
Eu-143	Eu-143	142.920	Europium	1.00E-03	ICRP-107	2.59E+00	m	1.55E+02	5.08E+08	--	--	--	DOE-STD-1196	5.26E-14
Eu-144	Eu-144	143.919	Europium	1.00E-03	ICRP-107	1.02E+01	s	1.02E+01	7.69E+09	--	--	--	DOE-STD-1196	5.18E-14
Eu-145	Eu-145	144.916	Europium	1.00E-03	ICRP-38	5.94E+00	d	5.13E+05	1.52E+05	ICRP-72	5.50E-10	M	FGR-12	7.22E-14
Eu-146	Eu-146	145.917	Europium	1.00E-03	ICRP-38	4.61E+00	d	3.98E+05	1.94E+05	ICRP-72	8.00E-10	M	FGR-12	1.23E-13
Eu-147	Eu-147	146.917	Europium	1.00E-03	ICRP-38	2.40E+01	d	2.07E+06	3.70E+04	ICRP-72	1.10E-09	M	FGR-12	2.32E-14
Eu-148	Eu-148	147.918	Europium	1.00E-03	ICRP-38	5.45E+01	d	4.71E+06	1.62E+04	ICRP-72	2.60E-09	M	FGR-12	1.06E-13
Eu-149	Eu-149	148.918	Europium	1.00E-03	ICRP-38	9.31E+01	d	8.04E+06	9.42E+03	ICRP-72	2.90E-10	M	FGR-12	2.25E-15
Eu-150l	Eu-150	149.920	Europium	1.00E-03	ICRP-38	3.42E+01	y	1.08E+09	6.97E+01	ICRP-72	5.30E-08	M	FGR-12	7.17E-14
Eu-150s	Eu-150	149.920	Europium	1.00E-03	ICRP-38	1.26E+01	h	4.54E+04	1.66E+06	ICRP-72	1.90E-10	M	FGR-12	2.21E-15
Eu-152	Eu-152	151.922	Europium	1.00E-03	ICRP-38	1.33E+01	y	4.21E+08	1.77E+02	ICRP-72	4.20E-08	M	FGR-12	5.65E-14
Eu-152ml	Eu-152	151.922	Europium	1.00E-03	ICRP-38	9.32E+00	h	3.36E+04	2.21E+06	ICRP-72	2.20E-10	M	FGR-12	1.42E-14
Eu-152ms	Eu-152	151.922	Europium	1.00E-03	ICRP-107	9.60E+01	m	5.76E+03	1.29E+07	DOE-STD-1196	1.01E-11	M	DOE-STD-1196	2.63E-15
Eu-154	Eu-154	153.923	Europium	1.00E-03	ICRP-38	8.80E+00	y	2.78E+08	2.64E+02	ICRP-72	5.30E-08	M	FGR-12	6.14E-14
Eu-154m	Eu-154	153.923	Europium	1.00E-03	ICRP-107	4.60E+01	m	2.76E+03	2.66E+07	DOE-STD-1196	4.76E-12	S	DOE-STD-1196	2.15E-15
Eu-155	Eu-155	154.923	Europium	1.00E-03	ICRP-38	4.96E+00	y	1.57E+08	4.65E+02	ICRP-72	6.90E-09	M	FGR-12	2.49E-15
Eu-156	Eu-156	155.925	Europium	1.00E-03	ICRP-38	1.52E+01	d	1.31E+06	5.51E+04	ICRP-72	3.40E-09	M	FGR-12	6.75E-14
Eu-157	Eu-157	156.925	Europium	1.00E-03	ICRP-38	1.52E+01	h	5.45E+04	1.32E+06	ICRP-72	2.80E-10	M	FGR-12	1.17E-14
Eu-158	Eu-158	157.928	Europium	1.00E-03	ICRP-38	4.59E+01	m	2.75E+03	2.59E+07	ICRP-72	4.70E-11	M	FGR-12	5.27E-14
Eu-159	Eu-159	158.929	Europium	1.00E-03	ICRP-107	1.81E+01	m	1.09E+03	6.54E+07	DOE-STD-1196	2.85E-11	S	DOE-STD-1196	1.32E-14
F-17	F-17	17.002	Fluorine	1.00E+00	ICRP-107	6.45E+01	s	6.45E+01	1.03E+10	--	--	--	DOE-STD-1196	4.60E-14
F-18	F-18	18.001	Fluorine	1.00E+00	ICRP-38	1.10E+02	m	6.59E+03	9.52E+07	ICRP-72	5.90E-11	S	FGR-12	4.90E-14
Fe-52	Fe-52	51.948	Iron	1.00E-03	ICRP-38	8.28E+00	h	2.98E+04	7.29E+06	ICRP-72	6.30E-10	S	FGR-12	3.54E-14
Fe-53	Fe-53	52.945	Iron	1.00E-03	ICRP-107	8.51E+00	m	5.11E+02	4.17E+08	--	--	--	DOE-STD-1196	5.35E-14
Fe-53m	Fe-53	52.945	Iron	1.00E-03	ICRP-107	2.53E+00	m	1.52E+02	1.41E+09	--	--	--	DOE-STD-1196	1.44E-13
Fe-55	Fe-55	54.938	Iron	1.00E-03	ICRP-38	2.70E+00	y	8.52E+07	2.41E+03	ICRP-72	7.70E-10	F	DOE-STD-1196	6.69E-24
Fe-59	Fe-59	58.935	Iron	1.00E-03	ICRP-38	4.45E+01	d	3.85E+06	4.98E+04	ICRP-72	4.00E-09	S	FGR-12	5.97E-14
Fe-60	Fe-60	59.934	Iron	1.00E-03	ICRP-38	1.00E+05	y	3.16E+12	5.96E-02	ICRP-72	2.80E-07	F	FGR-12	1.95E-19
Fe-61	Fe-61	60.937	Iron	1.00E-03	ICRP-107	5.98E+00	m	3.59E+02	5.16E+08	--	--	--	DOE-STD-1196	6.68E-14
Fe-62	Fe-62	61.937	Iron	1.00E-03	ICRP-107	6.80E+01	s	6.80E+01	2.68E+09	--	--	--	DOE-STD-1196	2.32E-14
Fm-251	Fm-251	251.082	Fermium	1.00E-03	ICRP-107	5.30E+00	h	1.91E+04	2.35E+06	DOE-STD-1196	2.16E-09	S	DOE-STD-1196	6.35E-15
Fm-252	Fm-252	252.082	Fermium	1.00E-03	ICRP-38	2.27E+01	h	8.17E+04	5.48E+05	ICRP-72	3.20E-07	M	FGR-12	5.03E-18
Fm-253	Fm-253	253.085	Fermium	1.00E-03	ICRP-38	3.00E+00	d	2.59E+05	1.72E+05	ICRP-72	4.00E-07	M	FGR-12	3.53E-15
Fm-254	Fm-254	254.087	Fermium	1.00E-03	ICRP-38	3.24E+00	h	1.17E+04	3.81E+06	ICRP-72	6.10E-08	M	FGR-12	6.57E-18
Fm-255	Fm-255	255.090	Fermium	1.00E-03	ICRP-38	2.01E+01	h	7.23E+04	6.12E+05	ICRP-72	2.70E-07	M	FGR-12	1.10E-16
Fm-256	Fm-256	256.092	Fermium	1.00E-03	ICRP-107	1.58E+02	m	9.46E+03	4.66E+06	DOE-STD-1196	2.85E-07	S	DOE-STD-1196	6.07E-13
Fm-257	Fm-257	257.095	Fermium	1.00E-03	ICRP-38	1.01E+02	d	8.68E+06	5.05E+03	ICRP-72	7.10E-06	M	FGR-12	4.66E-15
Fr-212	Fr-212	211.996	Francium	1.00E-03	ICRP-107	2.00E+01	m	1.20E+03	4.43E+07	DOE-STD-1196	6.98E-09	S	DOE-STD-1196	5.26E-14
Fr-219	Fr-219	219.009	Francium	1.00E-03	ICRP-38	2.10E+01	ms	2.10E-02	2.45E+12	--	--	--	FGR-12	1.66E-16
Fr-220	Fr-220	220.012	Francium	1.00E-03	ICRP-38	2.74E+01	s	2.74E+01	1.87E+09	--	--	--	FGR-12	4.92E-16
Fr-221	Fr-221	221.014	Francium	1.00E-03	ICRP-38	4.80E+00	m	2.88E+02	1.77E+08	--	--	--	FGR-12	1.46E-15

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Fr-222	Fr-222	222.018	Francium	1.00E-03	ICRP-38	1.44E+01	m	8.64E+02	5.88E+07	ICRP-72	1.40E-08	F	FGR-12	1.17E-16
Fr-223	Fr-223	223.020	Francium	1.00E-03	ICRP-38	2.18E+01	m	1.31E+03	3.87E+07	ICRP-72	8.90E-10	F	FGR-12	2.29E-15
Fr-224	Fr-224	224.023	Francium	1.00E-03	ICRP-107	3.33E+00	m	2.00E+02	2.52E+08	--	--	--	DOE-STD-1196	2.62E-14
Fr-227	Fr-227	227.032	Francium	1.00E-03	ICRP-107	2.47E+00	m	1.48E+02	3.35E+08	--	--	--	DOE-STD-1196	2.00E-14
Ga-64	Ga-64	63.937	Gallium	1.00E-03	ICRP-107	2.63E+00	m	1.58E+02	1.12E+09	--	--	--	DOE-STD-1196	1.64E-13
Ga-65	Ga-65	64.933	Gallium	1.00E-03	ICRP-38	1.52E+01	m	9.12E+02	1.91E+08	ICRP-72	1.70E-11	M	FGR-12	5.65E-14
Ga-66	Ga-66	65.932	Gallium	1.00E-03	ICRP-38	9.40E+00	h	3.38E+04	5.06E+06	ICRP-72	4.40E-10	M	FGR-12	1.29E-13
Ga-67	Ga-67	66.928	Gallium	1.00E-03	ICRP-38	7.83E+01	h	2.82E+05	5.98E+05	ICRP-72	2.40E-10	M	FGR-12	7.20E-15
Ga-68	Ga-68	67.928	Gallium	1.00E-03	ICRP-38	6.80E+01	m	4.08E+03	4.07E+07	ICRP-72	4.90E-11	M	FGR-12	4.58E-14
Ga-70	Ga-70	69.926	Gallium	1.00E-03	ICRP-38	2.12E+01	m	1.27E+03	1.27E+08	ICRP-72	1.60E-11	M	FGR-12	4.62E-16
Ga-72	Ga-72	71.926	Gallium	1.00E-03	ICRP-38	1.41E+01	h	5.08E+04	3.09E+06	ICRP-72	5.30E-10	M	FGR-12	1.39E-13
Ga-73	Ga-73	72.925	Gallium	1.00E-03	ICRP-38	4.91E+00	h	1.77E+04	8.75E+06	ICRP-72	1.40E-10	M	FGR-12	1.48E-14
Ga-74	Ga-74	73.927	Gallium	1.00E-03	ICRP-107	8.12E+00	m	4.87E+02	3.13E+08	--	--	--	DOE-STD-1196	1.55E-13
Gd-142	Gd-142	141.928	Gadolinium	1.00E-03	ICRP-107	7.02E+01	s	7.02E+01	1.13E+09	--	--	--	DOE-STD-1196	4.78E-14
Gd-143m	Gd-143	142.927	Gadolinium	1.00E-03	ICRP-107	1.10E+02	s	1.10E+02	7.18E+08	--	--	--	DOE-STD-1196	9.77E-14
Gd-144	Gd-144	143.923	Gadolinium	1.00E-03	ICRP-107	4.47E+00	m	2.68E+02	2.92E+08	--	--	--	DOE-STD-1196	4.25E-14
Gd-145	Gd-145	144.922	Gadolinium	1.00E-03	ICRP-38	2.29E+01	m	1.37E+03	5.67E+07	ICRP-72	2.00E-11	M	FGR-12	1.15E-13
Gd-145m	Gd-145	144.922	Gadolinium	1.00E-03	ICRP-107	8.50E+01	s	8.50E+01	9.16E+08	--	--	--	DOE-STD-1196	3.08E-14
Gd-146	Gd-146	145.918	Gadolinium	1.00E-03	ICRP-38	4.83E+01	d	4.17E+06	1.85E+04	ICRP-72	6.40E-09	M	FGR-12	9.95E-15
Gd-147	Gd-147	146.919	Gadolinium	1.00E-03	ICRP-38	3.81E+01	h	1.37E+05	5.60E+05	ICRP-72	4.00E-10	M	FGR-12	6.45E-14
Gd-148	Gd-148	147.918	Gadolinium	1.00E-03	ICRP-38	9.30E+01	y	2.93E+09	2.60E+01	ICRP-72	2.60E-05	F	--	--
Gd-149	Gd-149	148.919	Gadolinium	1.00E-03	ICRP-38	9.40E+00	d	8.12E+05	9.33E+04	ICRP-72	7.30E-10	M	FGR-12	1.92E-14
Gd-150	Gd-150	149.919	Gadolinium	1.00E-03	ICRP-107	1.79E+06	y	5.65E+13	1.33E-03	DOE-STD-1196	2.56E-05	F	--	--
Gd-151	Gd-151	150.920	Gadolinium	1.00E-03	ICRP-38	1.20E+02	d	1.04E+07	7.21E+03	ICRP-72	8.60E-10	M	FGR-12	2.20E-15
Gd-152	Gd-152	151.920	Gadolinium	1.00E-03	ICRP-38	1.08E+14	y	3.41E+21	2.18E-11	ICRP-72	1.90E-05	F	--	--
Gd-153	Gd-153	152.922	Gadolinium	1.00E-03	ICRP-38	2.42E+02	d	2.09E+07	3.53E+03	ICRP-72	2.10E-09	F	FGR-12	3.71E-15
Gd-159	Gd-159	158.926	Gadolinium	1.00E-03	ICRP-38	1.86E+01	h	6.68E+04	1.06E+06	ICRP-72	2.70E-10	M	FGR-12	2.21E-15
Gd-162	Gd-162	161.931	Gadolinium	1.00E-03	ICRP-107	8.40E+00	m	5.04E+02	1.38E+08	--	--	--	DOE-STD-1196	1.86E-14
Ge-66	Ge-66	65.934	Germanium	1.00E-03	ICRP-38	2.27E+00	h	8.17E+03	2.09E+07	ICRP-72	9.10E-11	M	FGR-12	3.25E-14
Ge-67	Ge-67	66.933	Germanium	1.00E-03	ICRP-38	1.87E+01	m	1.12E+03	1.50E+08	ICRP-72	2.50E-11	M	FGR-12	6.86E-14
Ge-68	Ge-68	67.928	Germanium	1.00E-03	ICRP-38	2.88E+02	d	2.49E+07	6.67E+03	ICRP-72	1.40E-08	M	FGR-12	7.37E-20
Ge-69	Ge-69	68.928	Germanium	1.00E-03	ICRP-38	3.91E+01	h	1.41E+05	1.16E+06	ICRP-72	2.90E-10	M	FGR-12	4.27E-14
Ge-71	Ge-71	70.925	Germanium	1.00E-03	ICRP-38	1.18E+01	d	1.02E+06	1.56E+05	ICRP-72	1.10E-11	M	FGR-12	7.47E-20
Ge-75	Ge-75	74.923	Germanium	1.00E-03	ICRP-38	8.28E+01	m	4.97E+03	3.03E+07	ICRP-72	3.60E-11	M	FGR-12	1.68E-15
Ge-77	Ge-77	76.924	Germanium	1.00E-03	ICRP-38	1.13E+01	h	4.07E+04	3.61E+06	ICRP-72	3.70E-10	M	FGR-12	5.32E-14
Ge-78	Ge-78	77.923	Germanium	1.00E-03	ICRP-38	8.70E+01	m	5.22E+03	2.77E+07	ICRP-72	9.50E-11	M	FGR-12	1.34E-14
H-3	H-3	3.016	Hydrogen	1.00E+00	ICRP-38	1.24E+01	y	3.90E+08	9.60E+03	ICRP-72	2.60E-10	S	FGR-12	3.31E-19
Hf-167	Hf-167	166.943	Hafnium	1.00E-03	ICRP-107	2.05E+00	m	1.23E+02	5.49E+08	--	--	--	DOE-STD-1196	2.73E-14
Hf-169	Hf-169	168.941	Hafnium	1.00E-03	ICRP-107	3.24E+00	m	1.94E+02	3.44E+08	--	--	--	DOE-STD-1196	2.78E-14
Hf-170	Hf-170	169.940	Hafnium	1.00E-03	ICRP-38	1.60E+01	h	5.76E+04	1.15E+06	ICRP-72	3.20E-10	M	FGR-12	2.52E-14
Hf-172	Hf-172	171.939	Hafnium	1.00E-03	ICRP-38	1.87E+00	y	5.90E+07	1.11E+03	ICRP-72	3.20E-08	F	FGR-12	4.06E-15
Hf-173	Hf-173	172.941	Hafnium	1.00E-03	ICRP-38	2.40E+01	h	8.64E+04	7.55E+05	ICRP-72	1.60E-10	M	FGR-12	1.85E-14
Hf-174	Hf-174	173.940	Hafnium	1.00E-03	ICRP-107	2.00E+15	y	6.31E+22	1.03E-12	DOE-STD-1196	3.20E-05	F	--	--
Hf-175	Hf-175	174.942	Hafnium	1.00E-03	ICRP-38	7.00E+01	d	6.05E+06	1.07E+04	ICRP-72	1.20E-09	M	FGR-12	1.69E-14
Hf-177m	Hf-177	176.943	Hafnium	1.00E-03	ICRP-38	5.14E+01	m	3.08E+03	2.07E+07	ICRP-72	9.00E-11	M	FGR-12	1.06E-13
Hf-178m	Hf-178	177.944	Hafnium	1.00E-03	ICRP-38	3.10E+01	y	9.78E+08	6.48E+01	ICRP-72	2.60E-07	F	FGR-12	1.12E-13

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Hf-179m	Hf-179	178.946	Hafnium	1.00E-03	ICRP-38	2.51E+01	d	2.17E+06	2.91E+04	ICRP-72	3.80E-09	M	FGR-12	4.21E-14
Hf-180m	Hf-180	179.947	Hafnium	1.00E-03	ICRP-38	5.50E+00	h	1.98E+04	3.17E+06	ICRP-72	1.30E-10	M	FGR-12	4.74E-14
Hf-181	Hf-181	180.949	Hafnium	1.00E-03	ICRP-38	4.24E+01	d	3.66E+06	1.70E+04	ICRP-72	5.00E-09	M	FGR-12	2.62E-14
Hf-182	Hf-182	181.951	Hafnium	1.00E-03	ICRP-38	9.00E+06	y	2.84E+14	2.18E-04	ICRP-72	3.10E-07	F	FGR-12	1.14E-14
Hf-182m	Hf-182	181.951	Hafnium	1.00E-03	ICRP-38	6.15E+01	m	3.69E+03	1.68E+07	ICRP-72	4.60E-11	M	FGR-12	4.43E-14
Hf-183	Hf-183	182.954	Hafnium	1.00E-03	ICRP-38	6.40E+01	m	3.84E+03	1.61E+07	ICRP-72	5.70E-11	M	FGR-12	3.63E-14
Hf-184	Hf-184	183.955	Hafnium	1.00E-03	ICRP-38	4.12E+00	h	1.48E+04	4.13E+06	ICRP-72	3.30E-10	M	FGR-12	1.14E-14
Hg-187	Hg-187	186.970	Mercury	1.00E-02	JAERI	2.20E+00	m	1.32E+02	4.57E+08	--	--	--	--	--
Hg-187m	Hg-187	186.970	Mercury	1.00E-02	JAERI	2.40E+00	m	1.44E+02	4.19E+08	--	--	--	--	--
Hg-188	Hg-188	187.968	Mercury	1.00E-02	JAERI	3.25E+00	m	1.95E+02	3.08E+08	--	--	--	--	--
Hg-190	Hg-190	189.966	Mercury	1.00E-02	ICRP-107	2.00E+01	m	1.20E+03	4.95E+07	DOE-STD-1196	8.33E-11	V	DOE-STD-1196	7.74E-15
Hg-191m	Hg-191	190.967	Mercury	1.00E-02	ICRP-107	5.08E+01	m	3.05E+03	1.94E+07	DOE-STD-1196	3.47E-10	V	DOE-STD-1196	6.73E-14
Hg-192	Hg-192	191.966	Mercury	1.00E-02	ICRP-107	4.85E+00	h	1.75E+04	3.37E+06	DOE-STD-1196	1.08E-09	V	DOE-STD-1196	1.10E-14
Hg-193	Hg-193	192.967	Mercury	1.00E-02	ICRP-38	3.50E+00	h	1.26E+04	4.64E+06	ICRP-72	1.10E-09	V	FGR-12	8.69E-15
Hg-193m	Hg-193	192.967	Mercury	1.00E-02	ICRP-38	1.11E+01	h	4.00E+04	1.46E+06	ICRP-72	3.10E-09	V	FGR-12	5.05E-14
Hg-194	Hg-194	193.965	Mercury	1.00E-02	ICRP-38	2.60E+02	y	8.20E+09	7.09E+00	ICRP-72	4.00E-08	V	FGR-12	6.92E-19
Hg-195	Hg-195	194.967	Mercury	1.00E-02	ICRP-38	9.90E+00	h	3.56E+04	1.62E+06	ICRP-72	1.40E-09	V	FGR-12	9.20E-15
Hg-195m	Hg-195	194.967	Mercury	1.00E-02	ICRP-38	4.16E+01	h	1.50E+05	3.86E+05	ICRP-72	8.20E-09	V	FGR-12	9.63E-15
Hg-197	Hg-197	196.967	Mercury	1.00E-02	ICRP-38	6.41E+01	h	2.31E+05	2.48E+05	ICRP-72	4.40E-09	V	FGR-12	2.66E-15
Hg-197m	Hg-197	196.967	Mercury	1.00E-02	ICRP-38	2.38E+01	h	8.57E+04	6.68E+05	ICRP-72	5.80E-09	V	FGR-12	4.05E-15
Hg-199m	Hg-199	198.968	Mercury	1.00E-02	ICRP-38	4.26E+01	m	2.56E+03	2.22E+07	ICRP-72	1.80E-10	V	FGR-12	8.36E-15
Hg-203	Hg-203	202.973	Mercury	1.00E-02	ICRP-38	4.66E+01	d	4.03E+06	1.38E+04	ICRP-72	7.00E-09	V	FGR-12	1.13E-14
Hg-205	Hg-205	204.976	Mercury	1.00E-02	ICRP-107	5.20E+00	m	3.12E+02	1.76E+08	--	--	--	DOE-STD-1196	6.19E-16
Hg-206	Hg-206	205.978	Mercury	1.00E-02	ICRP-38	8.15E+00	m	4.89E+02	1.12E+08	--	--	--	DOE-STD-1196	5.56E-15
Hg-207	Hg-207	206.982	Mercury	1.00E-02	ICRP-107	2.90E+00	m	1.74E+02	3.13E+08	--	--	--	DOE-STD-1196	1.28E-13
Ho-150	Ho-150	149.933	Holmium	1.00E-03	ICRP-107	7.68E+01	s	7.68E+01	9.80E+08	--	--	--	DOE-STD-1196	8.73E-14
Ho-152	Ho-152	151.932	Holmium	1.00E-03	JAERI	2.70E+00	m	1.62E+02	4.59E+08	--	--	--	--	--
Ho-153	Ho-153	152.930	Holmium	1.00E-03	ICRP-107	2.01E+00	m	1.21E+02	6.12E+08	--	--	--	DOE-STD-1196	4.61E-14
Ho-153m	Ho-153	152.930	Holmium	1.00E-03	ICRP-107	9.30E+00	m	5.58E+02	1.32E+08	--	--	--	DOE-STD-1196	4.72E-14
Ho-154	Ho-154	153.931	Holmium	1.00E-03	ICRP-107	1.18E+01	m	7.06E+02	1.04E+08	DOE-STD-1196	1.82E-11	S	DOE-STD-1196	8.63E-14
Ho-154m	Ho-154	153.931	Holmium	1.00E-03	ICRP-107	3.10E+00	m	1.86E+02	3.94E+08	--	--	--	DOE-STD-1196	1.09E-13
Ho-155	Ho-155	154.929	Holmium	1.00E-03	ICRP-38	4.80E+01	m	2.88E+03	2.53E+07	ICRP-72	2.00E-11	M	FGR-12	1.79E-14
Ho-156	Ho-156	155.930	Holmium	1.00E-03	ICRP-107	5.60E+01	m	3.36E+03	2.15E+07	DOE-STD-1196	6.56E-11	S	DOE-STD-1196	9.78E-14
Ho-157	Ho-157	156.928	Holmium	1.00E-03	ICRP-38	1.26E+01	m	7.56E+02	9.51E+07	ICRP-72	4.20E-12	M	FGR-12	2.24E-14
Ho-158	Ho-158	157.929	Holmium	1.00E-03	JAERI	1.13E+01	m	6.78E+02	1.05E+08	JAERI	7.80E-12	M	--	--
Ho-159	Ho-159	158.928	Holmium	1.00E-03	ICRP-38	3.30E+01	m	1.98E+03	3.59E+07	ICRP-72	6.10E-12	M	FGR-12	1.60E-14
Ho-160	Ho-160	159.929	Holmium	1.00E-03	ICRP-107	2.56E+01	m	1.54E+03	4.59E+07	DOE-STD-1196	1.63E-11	S	DOE-STD-1196	7.64E-14
Ho-161	Ho-161	160.928	Holmium	1.00E-03	ICRP-38	2.50E+00	h	9.00E+03	7.79E+06	ICRP-72	6.00E-12	M	FGR-12	1.73E-15
Ho-162	Ho-162	161.929	Holmium	1.00E-03	ICRP-38	1.50E+01	m	9.00E+02	7.74E+07	ICRP-72	2.80E-12	M	FGR-12	7.35E-15
Ho-162m	Ho-162	161.929	Holmium	1.00E-03	ICRP-38	6.80E+01	m	4.08E+03	1.71E+07	ICRP-72	2.10E-11	M	FGR-12	2.74E-14
Ho-163	Ho-163	162.929	Holmium	1.00E-03	ICRP-107	4.57E+03	y	1.44E+11	4.80E-01	DOE-STD-1196	2.82E-10	F	--	--
Ho-164	Ho-164	163.930	Holmium	1.00E-03	ICRP-38	2.90E+01	m	1.74E+03	3.96E+07	ICRP-72	8.40E-12	M	FGR-12	9.05E-16
Ho-164m	Ho-164	163.930	Holmium	1.00E-03	ICRP-38	3.75E+01	m	2.25E+03	3.06E+07	ICRP-72	1.20E-11	M	FGR-12	1.32E-15
Ho-166	Ho-166	165.932	Holmium	1.00E-03	ICRP-38	2.68E+01	h	9.65E+04	7.05E+05	ICRP-72	6.50E-10	M	FGR-12	1.42E-15
Ho-166m	Ho-166	165.932	Holmium	1.00E-03	ICRP-38	1.20E+03	y	3.79E+10	1.80E+00	ICRP-72	1.20E-07	M	FGR-12	8.45E-14
Ho-167	Ho-167	166.933	Holmium	1.00E-03	ICRP-38	3.10E+00	h	1.12E+04	6.06E+06	ICRP-72	7.10E-11	M	FGR-12	1.73E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Ho-168	Ho-168	167.936	Holmium	1.00E-03	ICRP-107	2.99E+00	m	1.79E+02	3.74E+08	--	--	--	DOE-STD-1196	4.06E-14
Ho-168m	Ho-168	167.936	Holmium	1.00E-03	ICRP-107	1.32E+02	s	1.32E+02	5.09E+08	--	--	--	DOE-STD-1196	1.50E-16
Ho-170	Ho-170	169.940	Holmium	1.00E-03	ICRP-107	2.76E+00	m	1.66E+02	4.01E+08	--	--	--	DOE-STD-1196	7.83E-14
I-118	I-118	117.913	Iodine	5.00E-01	ICRP-107	1.37E+01	m	8.22E+02	1.16E+08	DOE-STD-1196	2.03E-10	V(g)	DOE-STD-1196	9.38E-14
I-118m	I-118	117.913	Iodine	5.00E-01	ICRP-107	8.50E+00	m	5.10E+02	1.88E+08	--	--	--	DOE-STD-1196	1.71E-13
I-119	I-119	118.910	Iodine	5.00E-01	ICRP-107	1.91E+01	m	1.15E+03	8.28E+07	DOE-STD-1196	5.66E-11	V(g)	DOE-STD-1196	4.06E-14
I-120	I-120	119.910	Iodine	5.00E-01	ICRP-38	8.10E+01	m	4.86E+03	1.94E+07	ICRP-72	3.00E-10	V	FGR-12	1.38E-13
I-120m	I-120	119.910	Iodine	5.00E-01	ICRP-38	5.30E+01	m	3.18E+03	2.96E+07	ICRP-72	1.80E-10	V	FGR-12	2.65E-13
I-121	I-121	120.907	Iodine	5.00E-01	ICRP-38	2.12E+00	h	7.63E+03	1.22E+07	ICRP-72	8.60E-11	V	FGR-12	1.94E-14
I-122	I-122	121.908	Iodine	5.00E-01	ICRP-38	3.62E+00	m	2.17E+02	4.26E+08	--	--	--	FGR-12	4.56E-14
I-123	I-123	122.906	Iodine	5.00E-01	ICRP-38	1.32E+01	h	4.75E+04	1.93E+06	ICRP-72	2.10E-10	V	FGR-12	7.28E-15
I-124	I-124	123.906	Iodine	5.00E-01	ICRP-38	4.18E+00	d	3.61E+05	2.52E+05	ICRP-72	1.20E-08	V	FGR-12	5.38E-14
I-125	I-125	124.905	Iodine	5.00E-01	ICRP-38	6.01E+01	d	5.20E+06	1.74E+04	ICRP-72	1.40E-08	V	FGR-12	5.22E-16
I-126	I-126	125.906	Iodine	5.00E-01	ICRP-38	1.30E+01	d	1.12E+06	7.97E+04	ICRP-72	2.60E-08	V	FGR-12	2.15E-14
I-128	I-128	127.906	Iodine	5.00E-01	ICRP-38	2.50E+01	m	1.50E+03	5.88E+07	ICRP-72	6.50E-11	V	FGR-12	4.16E-15
I-129	I-129	128.905	Iodine	5.00E-01	ICRP-38	1.57E+07	y	4.95E+14	1.77E-04	ICRP-72	9.60E-08	V	FGR-12	3.80E-16
I-130	I-130	129.907	Iodine	5.00E-01	ICRP-38	1.24E+01	h	4.45E+04	1.95E+06	ICRP-72	1.90E-09	V	FGR-12	1.04E-13
I-130m	I-130	129.907	Iodine	5.00E-01	ICRP-107	8.84E+00	m	5.30E+02	1.64E+08	--	--	--	DOE-STD-1196	4.88E-15
I-131	I-131	130.906	Iodine	5.00E-01	ICRP-38	8.04E+00	d	6.95E+05	1.24E+05	ICRP-72	2.00E-08	V	FGR-12	1.82E-14
I-132	I-132	131.908	Iodine	5.00E-01	ICRP-38	2.30E+00	h	8.28E+03	1.03E+07	ICRP-72	3.10E-10	V	FGR-12	1.12E-13
I-132m	I-132	131.908	Iodine	5.00E-01	ICRP-38	8.36E+01	m	5.02E+03	1.71E+07	ICRP-72	2.70E-10	V	FGR-12	1.53E-14
I-133	I-133	132.908	Iodine	5.00E-01	ICRP-38	2.08E+01	h	7.49E+04	1.13E+06	ICRP-72	4.00E-09	V	FGR-12	2.94E-14
I-134	I-134	133.910	Iodine	5.00E-01	ICRP-38	5.26E+01	m	3.16E+03	2.67E+07	ICRP-72	1.50E-10	V	FGR-12	1.30E-13
I-134m	I-134	133.910	Iodine	5.00E-01	ICRP-107	3.60E+00	m	2.16E+02	3.90E+08	--	--	--	DOE-STD-1196	1.19E-14
I-135	I-135	134.910	Iodine	5.00E-01	ICRP-38	6.61E+00	h	2.38E+04	3.51E+06	ICRP-72	9.20E-10	V	FGR-12	7.98E-14
In-103	In-103	102.920	Indium	1.00E-03	ICRP-107	6.00E+01	s	6.00E+01	1.83E+09	--	--	--	DOE-STD-1196	1.30E-13
In-105	In-105	104.915	Indium	1.00E-03	ICRP-107	5.07E+00	m	3.04E+02	3.53E+08	--	--	--	DOE-STD-1196	8.97E-14
In-106	In-106	105.913	Indium	1.00E-03	ICRP-107	6.20E+00	m	3.72E+02	2.86E+08	--	--	--	DOE-STD-1196	1.63E-13
In-106m	In-106	105.913	Indium	1.00E-03	ICRP-107	5.20E+00	m	3.12E+02	3.41E+08	--	--	--	DOE-STD-1196	1.35E-13
In-107	In-107	106.910	Indium	1.00E-03	ICRP-107	3.24E+01	m	1.94E+03	5.43E+07	DOE-STD-1196	3.06E-11	S	DOE-STD-1196	7.18E-14
In-108	In-108	107.910	Indium	1.00E-03	ICRP-107	5.80E+01	m	3.48E+03	3.00E+07	DOE-STD-1196	5.71E-11	S	DOE-STD-1196	1.81E-13
In-108m	In-108	107.910	Indium	1.00E-03	ICRP-107	3.96E+01	m	2.38E+03	4.40E+07	DOE-STD-1196	4.53E-11	S	DOE-STD-1196	1.35E-13
In-109	In-109	108.907	Indium	1.00E-03	ICRP-38	4.20E+00	h	1.51E+04	6.85E+06	ICRP-72	4.20E-11	M	FGR-12	3.21E-14
In-109m	In-109	108.907	Indium	1.00E-03	ICRP-107	1.34E+00	m	8.04E+01	1.29E+09	--	--	--	DOE-STD-1196	2.74E-14
In-110l	In-110	109.907	Indium	1.00E-03	ICRP-38	4.90E+00	h	1.76E+04	5.82E+06	ICRP-72	1.30E-10	M	FGR-12	1.49E-13
In-110s	In-110	109.907	Indium	1.00E-03	ICRP-38	6.91E+01	m	4.15E+03	2.48E+07	ICRP-72	4.70E-11	M	FGR-12	7.62E-14
In-111	In-111	110.905	Indium	1.00E-03	ICRP-38	2.83E+00	d	2.45E+05	4.16E+05	ICRP-72	2.30E-10	M	FGR-12	1.86E-14
In-111m	In-111	110.905	Indium	1.00E-03	ICRP-38	7.70E+00	m	4.62E+02	2.20E+08	--	--	--	DOE-STD-1196	2.10E-14
In-112	In-112	111.906	Indium	1.00E-03	ICRP-38	1.44E+01	m	8.64E+02	1.17E+08	ICRP-72	7.40E-12	M	FGR-12	1.26E-14
In-112m	In-112	111.906	Indium	1.00E-03	ICRP-107	2.06E+01	m	1.23E+03	8.17E+07	DOE-STD-1196	2.60E-11	S	DOE-STD-1196	9.86E-16
In-113m	In-113	112.904	Indium	1.00E-03	ICRP-38	1.66E+00	h	5.97E+03	1.67E+07	ICRP-72	2.00E-11	M	FGR-12	1.21E-14
In-114	In-114	113.905	Indium	1.00E-03	ICRP-38	7.19E+01	s	7.19E+01	1.38E+09	--	--	--	FGR-12	1.39E-16
In-114m	In-114	113.905	Indium	1.00E-03	ICRP-38	4.95E+01	d	4.28E+06	2.32E+04	ICRP-72	9.30E-09	F	FGR-12	4.18E-15
In-115	In-115	114.904	Indium	1.00E-03	ICRP-38	5.10E+15	y	1.61E+23	6.10E-13	ICRP-72	3.90E-07	F	FGR-12	4.50E-18
In-115m	In-115	114.904	Indium	1.00E-03	ICRP-38	4.49E+00	h	1.61E+04	6.08E+06	ICRP-72	5.90E-11	M	FGR-12	7.39E-15
In-116m	In-116	115.905	Indium	1.00E-03	ICRP-38	5.42E+01	m	3.25E+03	3.00E+07	ICRP-72	4.50E-11	M	FGR-12	1.25E-13

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
In-117	In-117	116.905	Indium	1.00E-03	ICRP-38	4.38E+01	m	2.63E+03	3.67E+07	ICRP-72	2.90E-11	M	FGR-12	3.31E-14
In-117m	In-117	116.905	Indium	1.00E-03	ICRP-38	1.17E+02	m	6.99E+03	1.38E+07	ICRP-72	7.20E-11	M	FGR-12	4.19E-15
In-118	In-118	117.906	Indium	1.00E-03	ICRP-107	5.00E+00	s	5.00E+00	1.91E+10	--	--	--	DOE-STD-1196	5.72E-15
In-118m	In-118	117.906	Indium	1.00E-03	ICRP-107	4.36E+00	m	2.62E+02	3.65E+08	--	--	--	DOE-STD-1196	1.31E-13
In-119	In-119	118.906	Indium	1.00E-03	ICRP-38	2.40E+00	m	1.44E+02	6.59E+08	--	--	--	FGR-12	3.74E-14
In-119m	In-119	118.906	Indium	1.00E-03	ICRP-38	1.80E+01	m	1.08E+03	8.78E+07	ICRP-72	1.70E-11	M	FGR-12	6.14E-16
In-121	In-121	120.908	Indium	1.00E-03	ICRP-107	2.31E+01	s	2.31E+01	4.04E+09	--	--	--	DOE-STD-1196	4.36E-14
In-121m	In-121	120.908	Indium	1.00E-03	ICRP-107	3.88E+00	m	2.33E+02	4.01E+08	--	--	--	DOE-STD-1196	3.92E-15
Ir-179	Ir-179	178.959	Iridium	1.00E-03	JAERI	1.32E+00	m	7.90E+01	7.98E+08	--	--	--	--	--
Ir-180	Ir-180	179.959	Iridium	1.00E-03	ICRP-107	1.50E+00	m	9.00E+01	6.97E+08	--	--	--	DOE-STD-1196	7.24E-14
Ir-181	Ir-181	180.958	Iridium	1.00E-03	JAERI	4.90E+00	m	2.94E+02	2.12E+08	--	--	--	--	--
Ir-182	Ir-182	181.958	Iridium	1.00E-03	ICRP-38	1.50E+01	m	9.00E+02	6.89E+07	ICRP-72	2.40E-11	S	FGR-12	6.50E-14
Ir-183	Ir-183	182.957	Iridium	1.00E-03	ICRP-107	5.80E+01	m	3.48E+03	1.77E+07	DOE-STD-1196	4.71E-11	S	DOE-STD-1196	5.48E-14
Ir-184	Ir-184	183.957	Iridium	1.00E-03	ICRP-38	3.02E+00	h	1.09E+04	5.64E+06	ICRP-72	1.20E-10	S	FGR-12	9.38E-14
Ir-185	Ir-185	184.957	Iridium	1.00E-03	ICRP-38	1.40E+01	h	5.04E+04	1.21E+06	ICRP-72	1.90E-10	S	FGR-12	2.94E-14
Ir-186l	Ir-186	185.958	Iridium	1.00E-03	ICRP-38	1.58E+01	h	5.69E+04	1.07E+06	ICRP-72	3.20E-10	S	FGR-12	8.06E-14
Ir-186s	Ir-186	185.958	Iridium	1.00E-03	ICRP-38	1.75E+00	h	6.30E+03	9.63E+06	ICRP-72	4.40E-11	S	FGR-12	4.65E-14
Ir-187	Ir-187	186.958	Iridium	1.00E-03	ICRP-38	1.05E+01	h	3.78E+04	1.60E+06	ICRP-72	7.90E-11	S	FGR-12	1.68E-14
Ir-188	Ir-188	187.959	Iridium	1.00E-03	ICRP-38	4.15E+01	h	1.49E+05	4.02E+05	ICRP-72	4.20E-10	S	FGR-12	8.01E-14
Ir-189	Ir-189	188.959	Iridium	1.00E-03	ICRP-38	1.33E+01	d	1.15E+06	5.20E+04	ICRP-72	6.00E-10	S	FGR-12	3.21E-15
Ir-190	Ir-190	189.961	Iridium	1.00E-03	ICRP-38	1.21E+01	d	1.05E+06	5.68E+04	ICRP-72	2.40E-09	S	FGR-12	6.86E-14
Ir-190ms	Ir-190	189.961	Iridium	1.00E-03	ICRP-38	1.20E+00	h	4.32E+03	1.37E+07	ICRP-72	1.00E-11	S	FGR-12	1.27E-19
Ir-190ml	Ir-190	189.961	Iridium	1.00E-03	ICRP-38	3.10E+00	h	1.12E+04	5.32E+06	ICRP-72	8.30E-11	S	FGR-12	7.39E-14
Ir-191m	Ir-191	190.961	Iridium	1.00E-03	ICRP-38	4.94E+00	s	4.94E+00	1.20E+10	--	--	--	FGR-12	3.02E-15
Ir-192	Ir-192	191.963	Iridium	1.00E-03	ICRP-38	7.40E+01	d	6.40E+06	9.19E+03	ICRP-72	6.60E-09	S	FGR-12	3.91E-14
Ir-192ms	Ir-192	191.963	Iridium	1.00E-03	ICRP-107	1.45E+00	m	8.70E+01	6.76E+08	--	--	--	DOE-STD-1196	2.68E-18
Ir-192ml	Ir-192	191.963	Iridium	1.00E-03	ICRP-38	2.41E+02	y	7.61E+09	7.73E+00	ICRP-72	3.90E-08	S	FGR-12	7.63E-15
Ir-193m	Ir-193	192.963	Iridium	1.00E-03	ICRP-107	1.05E+01	d	9.10E+05	6.43E+04	ICRP-72	1.30E-09	S	DOE-STD-1196	1.04E-17
Ir-194	Ir-194	193.965	Iridium	1.00E-03	ICRP-38	1.92E+01	h	6.89E+04	8.44E+05	ICRP-72	5.60E-10	S	FGR-12	4.54E-15
Ir-194m	Ir-194	193.965	Iridium	1.00E-03	ICRP-38	1.71E+02	d	1.48E+07	3.94E+03	ICRP-72	1.30E-08	S	FGR-12	1.12E-13
Ir-195	Ir-195	194.966	Iridium	1.00E-03	ICRP-38	2.50E+00	h	9.00E+03	6.43E+06	ICRP-72	7.10E-11	S	FGR-12	2.32E-15
Ir-195m	Ir-195	194.966	Iridium	1.00E-03	ICRP-38	3.80E+00	h	1.37E+04	4.23E+06	ICRP-72	1.70E-10	S	FGR-12	1.93E-14
Ir-196	Ir-196	195.968	Iridium	1.00E-03	ICRP-107	5.20E+01	s	5.20E+01	1.11E+09	--	--	--	DOE-STD-1196	1.16E-14
Ir-196m	Ir-196	195.968	Iridium	1.00E-03	ICRP-107	1.40E+00	h	5.04E+03	1.14E+07	DOE-STD-1196	1.08E-10	S	DOE-STD-1196	1.10E-13
K-38	K-38	37.969	Potassium	5.00E-01	ICRP-38	7.64E+00	m	4.58E+02	6.49E+08	--	--	--	FGR-12	1.64E-13
K-40	K-40	39.964	Potassium	5.00E-01	ICRP-38	1.28E+09	y	4.04E+16	6.99E-06	ICRP-72	2.10E-09	F	FGR-12	8.05E-15
K-42	K-42	41.962	Potassium	5.00E-01	ICRP-38	1.24E+01	h	4.45E+04	6.04E+06	ICRP-72	1.20E-10	F	FGR-12	1.46E-14
K-43	K-43	42.961	Potassium	5.00E-01	ICRP-38	2.26E+01	h	8.14E+04	3.23E+06	ICRP-72	1.40E-10	F	FGR-12	4.67E-14
K-44	K-44	43.962	Potassium	5.00E-01	ICRP-38	2.21E+01	m	1.33E+03	1.93E+08	ICRP-72	2.00E-11	F	FGR-12	1.19E-13
K-45	K-45	44.961	Potassium	5.00E-01	ICRP-38	2.00E+01	m	1.20E+03	2.09E+08	ICRP-72	1.50E-11	F	FGR-12	9.67E-14
K-46	K-46	45.962	Potassium	5.00E-01	ICRP-107	1.05E+02	s	1.05E+02	2.34E+09	--	--	--	DOE-STD-1196	1.47E-13
Kr-74	Kr-74	73.933	Krypton	1.00E+00	ICRP-38	1.15E+01	m	6.90E+02	2.21E+08	--	--	--	FGR-12	5.59E-14
Kr-75	Kr-75	74.931	Krypton	1.00E+00	ICRP-107	4.29E+00	m	2.57E+02	5.85E+08	--	--	--	DOE-STD-1196	5.85E-14
Kr-76	Kr-76	75.926	Krypton	1.00E+00	ICRP-38	1.48E+01	h	5.33E+04	2.79E+06	--	--	--	FGR-12	2.03E-14
Kr-77	Kr-77	76.925	Krypton	1.00E+00	ICRP-38	7.47E+01	m	4.48E+03	3.27E+07	--	--	--	FGR-12	4.86E-14
Kr-79	Kr-79	78.920	Krypton	1.00E+00	ICRP-38	3.50E+01	h	1.26E+05	1.13E+06	--	--	--	FGR-12	1.21E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Kr-81	Kr-81	80.917	Krypton	1.00E+00	ICRP-38	2.10E+05	y	6.63E+12	2.10E-02	--	--	--	FGR-12	2.67E-16
Kr-81m	Kr-81	80.917	Krypton	1.00E+00	ICRP-38	1.30E+01	s	1.30E+01	1.07E+10	--	--	--	FGR-12	6.14E-15
Kr-83m	Kr-83	82.914	Krypton	1.00E+00	ICRP-38	1.83E+00	h	6.59E+03	2.07E+07	--	--	--	FGR-12	1.50E-18
Kr-85	Kr-85	84.913	Krypton	1.00E+00	ICRP-38	1.07E+01	y	3.38E+08	3.93E+02	--	--	--	FGR-12	1.19E-16
Kr-85m	Kr-85	84.913	Krypton	1.00E+00	ICRP-38	4.48E+00	h	1.61E+04	8.24E+06	--	--	--	FGR-12	7.48E-15
Kr-87	Kr-87	86.913	Krypton	1.00E+00	ICRP-38	7.63E+01	m	4.58E+03	2.84E+07	--	--	--	FGR-12	4.12E-14
Kr-88	Kr-88	87.914	Krypton	1.00E+00	ICRP-38	2.84E+00	h	1.02E+04	1.26E+07	--	--	--	FGR-12	1.02E-13
Kr-89	Kr-89	88.918	Krypton	1.00E+00	ICRP-107	3.15E+00	m	1.89E+02	6.71E+08	--	--	--	DOE-STD-1196	9.56E-14
La-128	La-128	127.916	Lanthanum	1.00E-03	ICRP-107	5.18E+00	m	3.11E+02	2.84E+08	--	--	--	DOE-STD-1196	1.30E-13
La-129	La-129	128.913	Lanthanum	1.00E-03	ICRP-107	1.16E+01	m	6.96E+02	1.26E+08	DOE-STD-1196	1.48E-11	S	DOE-STD-1196	4.11E-14
La-130	La-130	129.912	Lanthanum	1.00E-03	ICRP-107	8.70E+00	m	5.22E+02	1.66E+08	--	--	--	DOE-STD-1196	1.03E-13
La-131	La-131	130.910	Lanthanum	1.00E-03	ICRP-38	5.90E+01	m	3.54E+03	2.43E+07	ICRP-72	2.30E-11	M	FGR-12	3.14E-14
La-132	La-132	131.910	Lanthanum	1.00E-03	ICRP-38	4.80E+00	h	1.73E+04	4.95E+06	ICRP-72	1.60E-10	M	FGR-12	1.00E-13
La-132m	La-132	131.910	Lanthanum	1.00E-03	ICRP-107	2.43E+01	m	1.46E+03	5.87E+07	DOE-STD-1196	2.51E-11	S	DOE-STD-1196	2.95E-14
La-133	La-133	132.908	Lanthanum	1.00E-03	ICRP-107	3.91E+00	h	1.41E+04	6.03E+06	DOE-STD-1196	2.08E-11	S	DOE-STD-1196	6.39E-15
La-134	La-134	133.909	Lanthanum	1.00E-03	ICRP-38	6.67E+00	m	4.00E+02	2.11E+08	--	--	--	FGR-12	3.35E-14
La-135	La-135	134.907	Lanthanum	1.00E-03	ICRP-38	1.95E+01	h	7.02E+04	1.19E+06	ICRP-72	1.40E-11	M	FGR-12	9.21E-16
La-136	La-136	135.908	Lanthanum	1.00E-03	ICRP-107	9.87E+00	m	5.92E+02	1.40E+08	--	--	--	DOE-STD-1196	1.79E-14
La-137	La-137	136.906	Lanthanum	1.00E-03	ICRP-38	6.00E+04	y	1.89E+12	4.35E-02	ICRP-72	8.70E-09	F	FGR-12	4.06E-16
La-138	La-138	137.907	Lanthanum	1.00E-03	ICRP-38	1.35E+11	y	4.26E+18	1.92E-08	ICRP-72	1.50E-07	F	FGR-12	6.20E-14
La-140	La-140	139.909	Lanthanum	1.00E-03	ICRP-38	4.03E+01	h	1.45E+05	5.56E+05	ICRP-72	1.10E-09	M	FGR-12	1.17E-13
La-141	La-141	140.911	Lanthanum	1.00E-03	ICRP-38	3.93E+00	h	1.41E+04	5.66E+06	ICRP-72	1.50E-10	M	FGR-12	2.39E-15
La-142	La-142	141.914	Lanthanum	1.00E-03	ICRP-38	9.25E+01	m	5.55E+03	1.43E+07	ICRP-72	8.90E-11	M	FGR-12	1.44E-13
La-143	La-143	142.916	Lanthanum	1.00E-03	ICRP-38	1.42E+01	m	8.54E+02	9.25E+07	ICRP-72	2.10E-11	M	FGR-12	5.18E-15
Lu-164	Lu-164	163.941	Lutetium	1.00E-03	JAERI	3.14E+00	m	1.88E+02	3.65E+08	--	--	--	--	--
Lu-165	Lu-165	164.939	Lutetium	1.00E-03	ICRP-107	1.07E+01	m	6.44E+02	1.06E+08	DOE-STD-1196	1.63E-11	S	DOE-STD-1196	5.02E-14
Lu-166	Lu-166	165.940	Lutetium	1.00E-03	JAERI	2.65E+00	m	1.59E+02	4.28E+08	--	--	--	--	--
Lu-166m	Lu-166	165.940	Lutetium	1.00E-03	JAERI	1.41E+00	m	8.46E+01	8.04E+08	--	--	--	--	--
Lu-167	Lu-167	166.938	Lutetium	1.00E-03	ICRP-107	5.15E+01	m	3.09E+03	2.19E+07	DOE-STD-1196	4.56E-11	S	DOE-STD-1196	7.94E-14
Lu-168m	Lu-168	167.939	Lutetium	1.00E-03	JAERI	6.70E+00	m	4.02E+02	1.67E+08	--	--	--	--	--
Lu-169	Lu-169	168.938	Lutetium	1.00E-03	ICRP-38	3.41E+01	h	1.23E+05	5.45E+05	ICRP-72	3.80E-10	S	FGR-12	5.09E-14
Lu-169m	Lu-169	168.938	Lutetium	1.00E-03	ICRP-107	1.60E+02	s	1.60E+02	4.17E+08	--	--	--	DOE-STD-1196	2.52E-20
Lu-170	Lu-170	169.938	Lutetium	1.00E-03	ICRP-38	2.00E+00	d	1.73E+05	3.84E+05	ICRP-72	6.60E-10	S	FGR-12	1.28E-13
Lu-171	Lu-171	170.938	Lutetium	1.00E-03	ICRP-38	8.22E+00	d	7.10E+05	9.29E+04	ICRP-72	8.80E-10	S	FGR-12	3.25E-14
Lu-171m	Lu-171	170.938	Lutetium	1.00E-03	ICRP-107	7.90E+01	s	7.90E+01	8.35E+08	--	--	--	DOE-STD-1196	9.86E-18
Lu-172	Lu-172	171.939	Lutetium	1.00E-03	ICRP-38	6.70E+00	d	5.79E+05	1.13E+05	ICRP-72	1.60E-09	S	FGR-12	9.25E-14
Lu-172m	Lu-172	171.939	Lutetium	1.00E-03	ICRP-107	3.70E+00	m	2.22E+02	2.96E+08	--	--	--	DOE-STD-1196	3.90E-20
Lu-173	Lu-173	172.939	Lutetium	1.00E-03	ICRP-38	1.37E+00	y	4.32E+07	1.51E+03	ICRP-72	2.40E-09	S	FGR-12	5.10E-15
Lu-174	Lu-174	173.940	Lutetium	1.00E-03	ICRP-38	3.31E+00	y	1.04E+08	6.21E+02	ICRP-72	4.20E-09	M	FGR-12	5.46E-15
Lu-174m	Lu-174	173.940	Lutetium	1.00E-03	ICRP-38	1.42E+02	d	1.23E+07	5.29E+03	ICRP-72	4.20E-09	S	FGR-12	2.18E-15
Lu-176	Lu-176	175.943	Lutetium	1.00E-03	ICRP-38	3.60E+10	y	1.14E+18	5.64E-08	ICRP-72	7.00E-08	M	FGR-12	2.32E-14
Lu-176m	Lu-176	175.943	Lutetium	1.00E-03	ICRP-38	3.68E+00	h	1.32E+04	4.84E+06	ICRP-72	1.20E-10	S	FGR-12	5.87E-16
Lu-177	Lu-177	176.944	Lutetium	1.00E-03	ICRP-38	6.71E+00	d	5.80E+05	1.10E+05	ICRP-72	1.20E-09	S	FGR-12	1.62E-15
Lu-177m	Lu-177	176.944	Lutetium	1.00E-03	ICRP-38	1.61E+02	d	1.39E+07	4.59E+03	ICRP-72	1.60E-08	S	FGR-12	4.67E-14
Lu-178	Lu-178	177.946	Lutetium	1.00E-03	ICRP-38	2.84E+01	m	1.70E+03	3.72E+07	ICRP-72	2.60E-11	S	FGR-12	7.09E-15
Lu-178m	Lu-178	177.946	Lutetium	1.00E-03	ICRP-38	2.27E+01	m	1.36E+03	4.65E+07	ICRP-72	3.30E-11	S	FGR-12	5.23E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Lu-179	Lu-179	178.947	Lutetium	1.00E-03	ICRP-38	4.59E+00	h	1.65E+04	3.82E+06	ICRP-72	1.20E-10	S	FGR-12	1.52E-15
Lu-180	Lu-180	179.950	Lutetium	1.00E-03	ICRP-107	5.70E+00	m	3.42E+02	1.83E+08	--	--	--	DOE-STD-1196	7.09E-14
Lu-181	Lu-181	180.952	Lutetium	1.00E-03	ICRP-107	3.50E+00	m	2.10E+02	2.97E+08	--	--	--	DOE-STD-1196	2.58E-14
Md-257	Md-257	257.096	Mendelevium	1.00E-03	ICRP-38	5.20E+00	h	1.87E+04	2.34E+06	ICRP-72	2.50E-08	M	FGR-12	5.03E-15
Md-258	Md-258	258.098	Mendelevium	1.00E-03	ICRP-38	5.50E+01	d	4.75E+06	9.20E+03	ICRP-72	5.90E-06	M	FGR-12	5.08E-17
Mg-27	Mg-27	26.984	Magnesium	1.00E-03	ICRP-107	9.46E+00	m	5.67E+02	7.37E+08	--	--	--	DOE-STD-1196	4.16E-14
Mg-28	Mg-28	27.984	Magnesium	1.00E-03	ICRP-38	2.09E+01	h	7.53E+04	5.36E+06	ICRP-72	1.20E-09	M	FGR-12	6.79E-14
Mn-50m	Mn-50	49.954	Manganese	1.00E-03	ICRP-107	1.75E+00	m	1.05E+02	2.15E+09	--	--	--	DOE-STD-1196	2.18E-13
Mn-51	Mn-51	50.948	Manganese	1.00E-03	ICRP-38	4.62E+01	m	2.77E+03	7.99E+07	ICRP-72	4.10E-11	M	FGR-12	4.80E-14
Mn-52	Mn-52	51.946	Manganese	1.00E-03	ICRP-38	5.59E+00	d	4.83E+05	4.50E+05	ICRP-72	1.40E-09	M	FGR-12	1.72E-13
Mn-52m	Mn-52	51.946	Manganese	1.00E-03	ICRP-38	2.11E+01	m	1.27E+03	1.72E+08	ICRP-72	2.90E-11	M	FGR-12	1.20E-13
Mn-53	Mn-53	52.941	Manganese	1.00E-03	ICRP-38	3.70E+06	y	1.17E+14	1.83E-03	ICRP-72	5.40E-11	M	--	--
Mn-54	Mn-54	53.940	Manganese	1.00E-03	ICRP-38	3.13E+02	d	2.70E+07	7.75E+03	ICRP-72	1.50E-09	M	FGR-12	4.09E-14
Mn-56	Mn-56	55.939	Manganese	1.00E-03	ICRP-38	2.58E+00	h	9.28E+03	2.17E+07	ICRP-72	1.20E-10	M	FGR-12	8.61E-14
Mn-57	Mn-57	56.938	Manganese	1.00E-03	ICRP-107	8.54E+01	s	8.54E+01	2.32E+09	--	--	--	DOE-STD-1196	5.30E-15
Mn-58m	Mn-58	57.940	Manganese	1.00E-03	ICRP-107	6.52E+01	s	6.52E+01	2.99E+09	--	--	--	DOE-STD-1196	1.15E-13
Mo-101	Mo-101	100.910	Molybdenum	1.00E-03	ICRP-38	1.46E+01	m	8.77E+02	1.27E+08	ICRP-72	2.60E-11	S	FGR-12	6.87E-14
Mo-102	Mo-102	101.910	Molybdenum	1.00E-03	ICRP-107	1.13E+01	m	6.78E+02	1.63E+08	DOE-STD-1196	3.00E-11	S	DOE-STD-1196	1.02E-15
Mo-89	Mo-89	88.919	Molybdenum	1.00E-03	ICRP-107	2.11E+00	m	1.27E+02	1.00E+09	--	--	--	DOE-STD-1196	5.70E-14
Mo-90	Mo-90	89.914	Molybdenum	1.00E-03	ICRP-38	5.67E+00	h	2.04E+04	6.15E+06	ICRP-72	3.60E-10	S	FGR-12	3.93E-14
Mo-91	Mo-91	90.912	Molybdenum	1.00E-03	ICRP-107	1.55E+01	m	9.29E+02	1.34E+08	DOE-STD-1196	2.48E-11	S	DOE-STD-1196	4.50E-14
Mo-91m	Mo-91	90.912	Molybdenum	1.00E-03	ICRP-107	6.46E+01	s	6.46E+01	1.92E+09	--	--	--	DOE-STD-1196	6.45E-14
Mo-93	Mo-93	92.907	Molybdenum	1.00E-03	ICRP-38	3.50E+03	y	1.10E+11	1.10E+00	ICRP-72	2.30E-09	S	FGR-12	2.52E-17
Mo-93m	Mo-93	92.907	Molybdenum	1.00E-03	ICRP-38	6.85E+00	h	2.47E+04	4.92E+06	ICRP-72	1.70E-10	S	FGR-12	1.13E-13
Mo-99	Mo-99	98.908	Molybdenum	1.00E-03	ICRP-38	6.60E+01	h	2.38E+05	4.80E+05	ICRP-72	9.90E-10	S	FGR-12	7.28E-15
N-13	N-1	1.009	Nitrogen	1.00E+00	ICRP-38	9.97E+00	m	5.98E+02	1.87E+10	--	--	--	FGR-12	4.90E-14
N-16	N-16	16.006	Nitrogen	1.00E+00	ICRP-107	7.13E+00	s	7.13E+00	9.89E+10	--	--	--	DOE-STD-1196	2.59E-13
Na-22	Na-22	21.994	Sodium	5.00E-01	ICRP-38	2.60E+00	y	8.21E+07	6.25E+03	ICRP-72	1.30E-09	F	FGR-12	1.08E-13
Na-24	Na-24	23.991	Sodium	5.00E-01	ICRP-38	1.50E+01	h	5.40E+04	8.71E+06	ICRP-72	2.70E-10	F	FGR-12	2.18E-13
Nb-87	Nb-87	86.921	Niobium	1.00E-03	ICRP-107	3.75E+00	m	2.25E+02	5.77E+08	--	--	--	DOE-STD-1196	5.54E-14
Nb-88	Nb-88	87.918	Niobium	1.00E-03	ICRP-38	1.43E+01	m	8.58E+02	1.50E+08	ICRP-72	2.80E-11	S	FGR-12	2.02E-13
Nb-88m	Nb-88	87.918	Niobium	1.00E-03	ICRP-107	7.78E+00	m	4.67E+02	2.75E+08	--	--	--	DOE-STD-1196	1.91E-13
Nb-89l	Nb-89	88.913	Niobium	1.00E-03	ICRP-38	1.22E+02	m	7.32E+03	1.73E+07	ICRP-72	1.20E-10	S	FGR-12	6.98E-14
Nb-89s	Nb-89	88.913	Niobium	1.00E-03	ICRP-38	6.60E+01	m	3.96E+03	3.20E+07	ICRP-72	7.10E-11	S	FGR-12	9.26E-14
Nb-90	Nb-90	89.911	Niobium	1.00E-03	ICRP-38	1.46E+01	h	5.26E+04	2.39E+06	ICRP-72	6.60E-10	S	FGR-12	2.17E-13
Nb-91	Nb-91	90.907	Niobium	1.00E-03	ICRP-107	6.80E+02	y	2.15E+10	5.78E+00	DOE-STD-1196	1.97E-09	S	DOE-STD-1196	8.45E-17
Nb-91m	Nb-91	90.907	Niobium	1.00E-03	ICRP-107	6.09E+01	d	5.26E+06	2.36E+04	DOE-STD-1196	4.57E-09	S	DOE-STD-1196	1.20E-15
Nb-92	Nb-92	91.907	Niobium	1.00E-03	ICRP-107	3.47E+07	y	1.10E+15	1.12E-04	DOE-STD-1196	2.84E-08	S	DOE-STD-1196	6.83E-14
Nb-92m	Nb-92	91.907	Niobium	1.00E-03	ICRP-107	1.02E+01	d	8.77E+05	1.40E+05	DOE-STD-1196	5.19E-10	S	DOE-STD-1196	4.44E-14
Nb-93m	Nb-93	92.906	Niobium	1.00E-03	ICRP-38	1.36E+01	y	4.29E+08	2.83E+02	ICRP-72	1.80E-09	S	FGR-12	4.44E-18
Nb-94	Nb-94	93.907	Niobium	1.00E-03	ICRP-38	2.03E+04	y	6.41E+11	1.88E-01	ICRP-72	4.90E-08	S	FGR-12	7.70E-14
Nb-94m	Nb-94	93.907	Niobium	1.00E-03	ICRP-107	6.26E+00	m	3.76E+02	3.20E+08	--	--	--	DOE-STD-1196	2.15E-16
Nb-95	Nb-95	94.907	Niobium	1.00E-03	ICRP-38	3.52E+01	d	3.04E+06	3.91E+04	ICRP-72	1.80E-09	S	FGR-12	3.74E-14
Nb-95m	Nb-95	94.907	Niobium	1.00E-03	ICRP-38	8.66E+01	h	3.12E+05	3.81E+05	ICRP-72	8.80E-10	S	FGR-12	2.93E-15
Nb-96	Nb-96	95.908	Niobium	1.00E-03	ICRP-38	2.34E+01	h	8.41E+04	1.40E+06	ICRP-72	6.60E-10	S	FGR-12	1.21E-13
Nb-97	Nb-97	96.908	Niobium	1.00E-03	ICRP-38	7.21E+01	m	4.33E+03	2.69E+07	ICRP-72	4.50E-11	S	FGR-12	3.18E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Nb-97m	Nb-97	96.908	Niobium	1.00E-03	ICRP-38	6.00E+01	s	6.00E+01	1.94E+09	--	--	--	FGR-12	3.55E-14
Nb-98	Nb-98	97.910	Niobium	1.00E-03	ICRP-38	5.15E+01	m	3.09E+03	3.73E+07	ICRP-72	5.80E-11	S	FGR-12	1.21E-13
Nb-99	Nb-99	98.912	Niobium	1.00E-03	ICRP-107	1.50E+01	s	1.50E+01	7.60E+09	--	--	--	DOE-STD-1196	8.32E-15
Nb-99m	Nb-99	98.912	Niobium	1.00E-03	ICRP-107	2.60E+00	m	1.56E+02	7.31E+08	--	--	--	DOE-STD-1196	3.86E-14
Nd-134	Nd-134	133.919	Neodymium	1.00E-03	ICRP-107	8.50E+00	m	5.10E+02	1.65E+08	--	--	--	DOE-STD-1196	2.32E-14
Nd-135	Nd-135	134.918	Neodymium	1.00E-03	ICRP-107	1.24E+01	m	7.44E+02	1.12E+08	DOE-STD-1196	3.18E-11	S	DOE-STD-1196	5.63E-14
Nd-136	Nd-136	135.915	Neodymium	1.00E-03	ICRP-38	5.07E+01	m	3.04E+03	2.73E+07	ICRP-72	5.40E-11	S	FGR-12	1.27E-14
Nd-137	Nd-137	136.915	Neodymium	1.00E-03	ICRP-107	3.85E+01	m	2.31E+03	3.57E+07	DOE-STD-1196	3.39E-11	S	DOE-STD-1196	5.33E-14
Nd-138	Nd-138	137.912	Neodymium	1.00E-03	ICRP-38	5.04E+00	h	1.81E+04	4.51E+06	ICRP-72	2.50E-10	S	FGR-12	1.27E-15
Nd-139	Nd-139	138.912	Neodymium	1.00E-03	ICRP-38	2.97E+01	m	1.78E+03	4.56E+07	ICRP-72	1.00E-11	S	FGR-12	1.90E-14
Nd-139m	Nd-139	138.912	Neodymium	1.00E-03	ICRP-38	5.50E+00	h	1.98E+04	4.10E+06	ICRP-72	1.50E-10	M	FGR-12	7.63E-14
Nd-140	Nd-140	139.910	Neodymium	1.00E-03	ICRP-107	3.37E+00	d	2.91E+05	2.77E+05	DOE-STD-1196	1.33E-09	S	DOE-STD-1196	4.44E-16
Nd-141	Nd-141	140.910	Neodymium	1.00E-03	ICRP-38	2.49E+00	h	8.96E+03	8.93E+06	ICRP-72	5.00E-12	S	FGR-12	2.88E-15
Nd-141m	Nd-141	140.910	Neodymium	1.00E-03	ICRP-38	6.24E+01	s	6.24E+01	1.28E+09	--	--	--	FGR-12	3.70E-14
Nd-144	Nd-144	143.910	Neodymium	1.00E-03	ICRP-107	2.29E+15	y	7.23E+22	1.08E-12	DOE-STD-1196	2.01E-05	F	--	--
Nd-147	Nd-147	146.916	Neodymium	1.00E-03	ICRP-38	1.10E+01	d	9.49E+05	8.09E+04	ICRP-72	2.40E-09	S	FGR-12	6.19E-15
Nd-149	Nd-149	148.920	Neodymium	1.00E-03	ICRP-38	1.73E+00	h	6.23E+03	1.22E+07	ICRP-72	8.90E-11	S	FGR-12	1.81E-14
Nd-151	Nd-151	150.924	Neodymium	1.00E-03	ICRP-38	1.24E+01	m	7.46E+02	1.00E+08	ICRP-72	1.70E-11	M	FGR-12	4.48E-14
Nd-152	Nd-152	151.925	Neodymium	1.00E-03	ICRP-107	1.14E+01	m	6.84E+02	1.09E+08	DOE-STD-1196	2.80E-11	S	DOE-STD-1196	7.29E-15
Ne-19	Ne-19	19.002	Neon	1.00E+00	ICRP-38	1.72E+01	s	1.72E+01	3.45E+10	--	--	--	FGR-12	4.92E-14
Ne-24	Ne-24	23.994	Neon	1.00E+00	ICRP-107	3.38E+00	m	2.03E+02	2.32E+09	--	--	--	DOE-STD-1196	2.48E-14
Ni-56	Ni-56	55.942	Nickel	1.00E-03	ICRP-38	6.10E+00	d	5.27E+05	3.83E+05	ICRP-72	1.20E-09	V	FGR-12	8.41E-14
Ni-57	Ni-57	56.940	Nickel	1.00E-03	ICRP-38	3.61E+01	h	1.30E+05	1.53E+06	ICRP-72	5.60E-10	V	FGR-12	9.69E-14
Ni-59	Ni-59	58.934	Nickel	1.00E-03	ICRP-38	7.50E+04	y	2.37E+12	8.09E-02	ICRP-72	8.30E-10	V	DOE-STD-1196	6.92E-19
Ni-63	Ni-63	62.930	Nickel	1.00E-03	ICRP-38	9.60E+01	y	3.03E+09	5.92E+01	ICRP-72	2.00E-09	V	--	--
Ni-65	Ni-65	64.930	Nickel	1.00E-03	ICRP-38	2.52E+00	h	9.07E+03	1.92E+07	ICRP-72	3.60E-10	V	FGR-12	2.79E-14
Ni-66	Ni-66	65.929	Nickel	1.00E-03	ICRP-38	5.46E+01	h	1.97E+05	8.71E+05	ICRP-72	1.80E-09	S	FGR-12	6.16E-19
Np-231	Np-231	231.038	Neptunium	1.00E-03	JAERI	4.88E+01	m	2.93E+03	1.67E+07	JAERI	1.80E-09	S	--	--
Np-232	Np-232	232.040	Neptunium	1.00E-03	ICRP-38	1.47E+01	m	8.82E+02	5.51E+07	ICRP-72	1.20E-10	F	FGR-12	5.80E-14
Np-233	Np-233	233.041	Neptunium	1.00E-03	ICRP-38	3.62E+01	m	2.17E+03	2.23E+07	ICRP-72	1.70E-12	S	FGR-12	3.85E-15
Np-234	Np-234	234.043	Neptunium	1.00E-03	ICRP-38	4.40E+00	d	3.80E+05	1.27E+05	ICRP-72	5.50E-10	S	FGR-12	7.26E-14
Np-235	Np-235	235.044	Neptunium	1.00E-03	ICRP-38	3.96E+02	d	3.42E+07	1.40E+03	ICRP-72	6.30E-10	F	FGR-12	5.10E-17
Np-236l	Np-236	236.047	Neptunium	1.00E-03	ICRP-38	1.15E+05	y	3.63E+12	1.32E-02	ICRP-72	8.00E-06	F	FGR-12	5.36E-15
Np-236s	Np-236	236.047	Neptunium	1.00E-03	ICRP-38	2.25E+01	h	8.10E+04	5.90E+05	ICRP-72	9.00E-09	F	FGR-12	2.14E-15
Np-237	Np-237	237.048	Neptunium	1.00E-03	ICRP-38	2.14E+06	y	6.75E+13	7.05E-04	ICRP-72	5.00E-05	F	FGR-12	1.03E-15
Np-238	Np-238	238.051	Neptunium	1.00E-03	ICRP-38	2.12E+00	d	1.83E+05	2.59E+05	ICRP-72	3.50E-09	F	FGR-12	2.72E-14
Np-239	Np-239	239.053	Neptunium	1.00E-03	ICRP-38	2.36E+00	d	2.03E+05	2.32E+05	ICRP-72	1.00E-09	S	FGR-12	7.69E-15
Np-240	Np-240	240.056	Neptunium	1.00E-03	ICRP-38	6.50E+01	m	3.90E+03	1.20E+07	ICRP-72	9.00E-11	S	FGR-12	6.31E-14
Np-240m	Np-240	240.056	Neptunium	1.00E-03	ICRP-38	7.40E+00	m	4.44E+02	1.06E+08	--	--	--	FGR-12	1.62E-14
Np-241	Np-241	241.058	Neptunium	1.00E-03	ICRP-107	1.39E+01	m	8.34E+02	5.61E+07	DOE-STD-1196	1.41E-11	S	DOE-STD-1196	1.79E-15
Np-242	Np-242	242.062	Neptunium	1.00E-03	ICRP-107	2.20E+00	m	1.32E+02	3.53E+08	--	--	--	DOE-STD-1196	1.33E-14
Np-242m	Np-242	242.062	Neptunium	1.00E-03	ICRP-107	5.50E+00	m	3.30E+02	1.41E+08	--	--	--	DOE-STD-1196	4.16E-14
O-14	O-14	14.009	Oxygen	1.00E+00	ICRP-38	7.06E+01	s	7.06E+01	1.14E+10	--	--	--	DOE-STD-1196	1.63E-13
O-15	O-15	15.003	Oxygen	1.00E+00	ICRP-38	1.22E+02	s	1.22E+02	6.15E+09	--	--	--	FGR-12	4.91E-14
O-19	O-19	19.004	Oxygen	1.00E+00	ICRP-38	2.69E+01	s	2.69E+01	2.21E+10	--	--	--	DOE-STD-1196	4.60E-14
Os-177	Os-177	176.955	Osmium	1.00E-03	JAERI	2.80E+00	m	1.68E+02	3.79E+08	--	--	--	--	--

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Os-179	Os-179	178.954	Osmium	1.00E-03	JAERI	6.50E+00	m	3.90E+02	1.62E+08	--	--	--	--	--
Os-180	Os-180	179.952	Osmium	1.00E-03	ICRP-38	2.20E+01	m	1.32E+03	4.75E+07	ICRP-72	1.50E-11	S	FGR-12	2.30E-15
Os-181	Os-181	180.953	Osmium	1.00E-03	ICRP-38	1.05E+02	m	6.30E+03	9.90E+06	ICRP-72	6.50E-11	S	FGR-12	5.94E-14
Os-182	Os-182	181.952	Osmium	1.00E-03	ICRP-38	2.20E+01	h	7.92E+04	7.83E+05	ICRP-72	3.80E-10	S	FGR-12	2.01E-14
Os-183	Os-183	182.953	Osmium	1.00E-03	ICRP-107	1.30E+01	h	4.68E+04	1.32E+06	DOE-STD-1196	2.20E-10	S	DOE-STD-1196	2.66E-14
Os-183m	Os-183	182.953	Osmium	1.00E-03	ICRP-107	9.90E+00	h	3.56E+04	1.73E+06	DOE-STD-1196	1.74E-10	S	DOE-STD-1196	4.63E-14
Os-185	Os-185	184.954	Osmium	1.00E-03	ICRP-38	9.40E+01	d	8.12E+06	7.51E+03	ICRP-72	1.60E-09	S	FGR-12	3.43E-14
Os-186	Os-186	185.954	Osmium	1.00E-03	ICRP-107	2.00E+15	y	6.31E+22	9.61E-13	DOE-STD-1196	4.51E-06	S	--	--
Os-189m	Os-189	188.958	Osmium	1.00E-03	ICRP-38	6.00E+00	h	2.16E+04	2.76E+06	ICRP-72	5.30E-12	S	FGR-12	1.06E-19
Os-190m	Os-190	189.958	Osmium	1.00E-03	ICRP-38	9.90E+00	m	5.94E+02	1.00E+08	--	--	--	FGR-12	7.60E-14
Os-191	Os-191	190.961	Osmium	1.00E-03	ICRP-38	1.54E+01	d	1.33E+06	4.44E+04	ICRP-72	1.90E-09	S	FGR-12	3.21E-15
Os-191m	Os-191	190.961	Osmium	1.00E-03	ICRP-38	1.30E+01	h	4.69E+04	1.26E+06	ICRP-72	1.60E-10	S	FGR-12	2.75E-16
Os-193	Os-193	192.964	Osmium	1.00E-03	ICRP-38	3.00E+01	h	1.08E+05	5.41E+05	ICRP-72	5.20E-10	S	FGR-12	3.40E-15
Os-194	Os-194	193.965	Osmium	1.00E-03	ICRP-38	6.00E+00	y	1.89E+08	3.07E+02	ICRP-72	8.50E-08	S	FGR-12	2.75E-17
Os-196	Os-196	195.970	Osmium	1.00E-03	ICRP-107	3.49E+01	m	2.09E+03	2.75E+07	DOE-STD-1196	6.64E-11	S	DOE-STD-1196	3.64E-15
P-30	P-30	29.978	Phosphorus	5.00E-01	ICRP-38	2.50E+00	m	1.50E+02	2.51E+09	--	--	--	FGR-12	4.94E-14
P-32	P-32	31.974	Phosphorus	5.00E-01	ICRP-38	1.43E+01	d	1.23E+06	2.86E+05	ICRP-72	3.40E-09	M	FGR-12	9.90E-17
P-33	P-33	32.972	Phosphorus	5.00E-01	ICRP-38	2.54E+01	d	2.19E+06	1.56E+05	ICRP-72	1.50E-09	M	FGR-12	8.23E-19
Pa-227	Pa-227	227.029	Protactinium	1.00E-03	ICRP-38	3.83E+01	m	2.30E+03	2.16E+07	ICRP-72	8.00E-08	S	FGR-12	8.54E-16
Pa-228	Pa-228	228.031	Protactinium	1.00E-03	ICRP-38	2.20E+01	h	7.92E+04	6.25E+05	ICRP-72	7.50E-08	S	FGR-12	5.54E-14
Pa-229	Pa-229	229.032	Protactinium	1.00E-03	ICRP-107	1.50E+00	d	1.30E+05	3.80E+05	DOE-STD-1196	7.78E-09	S	DOE-STD-1196	2.33E-15
Pa-230	Pa-230	230.035	Protactinium	1.00E-03	ICRP-38	1.74E+01	d	1.50E+06	3.26E+04	ICRP-72	7.60E-07	S	FGR-12	3.13E-14
Pa-231	Pa-231	231.036	Protactinium	1.00E-03	ICRP-38	3.28E+04	y	1.03E+12	4.72E-02	ICRP-72	1.40E-04	M	FGR-12	1.72E-15
Pa-232	Pa-232	232.039	Protactinium	1.00E-03	ICRP-38	1.31E+00	d	1.13E+05	4.30E+05	ICRP-72	1.00E-08	M	FGR-12	4.56E-14
Pa-233	Pa-233	233.040	Protactinium	1.00E-03	ICRP-38	2.70E+01	d	2.33E+06	2.08E+04	ICRP-72	3.90E-09	S	FGR-12	9.35E-15
Pa-234	Pa-234	234.043	Protactinium	1.00E-03	ICRP-38	6.70E+00	h	2.41E+04	2.00E+06	ICRP-72	4.00E-10	S	FGR-12	9.34E-14
Pa-234m	Pa-234	234.043	Protactinium	1.00E-03	ICRP-38	1.17E+00	m	7.02E+01	6.87E+08	--	--	--	FGR-12	7.19E-16
Pa-235	Pa-235	235.045	Protactinium	1.00E-03	ICRP-107	2.45E+01	m	1.47E+03	3.27E+07	DOE-STD-1196	1.98E-11	S	DOE-STD-1196	3.35E-16
Pa-236	Pa-236	236.049	Protactinium	1.00E-03	ICRP-107	9.10E+00	m	5.46E+02	8.75E+07	--	--	--	DOE-STD-1196	4.36E-14
Pa-237	Pa-237	237.051	Protactinium	1.00E-03	ICRP-107	8.70E+00	m	5.22E+02	9.12E+07	--	--	--	DOE-STD-1196	2.82E-14
Pb-194	Pb-194	193.974	Lead	1.00E-03	ICRP-107	1.20E+01	m	7.20E+02	8.08E+07	DOE-STD-1196	1.57E-11	S	DOE-STD-1196	4.94E-14
Pb-195m	Pb-195	194.975	Lead	1.00E-03	ICRP-38	1.58E+01	m	9.48E+02	6.10E+07	ICRP-72	2.70E-11	S	FGR-12	7.68E-14
Pb-196	Pb-196	195.973	Lead	1.00E-03	ICRP-107	3.70E+01	m	2.22E+03	2.59E+07	DOE-STD-1196	2.99E-11	S	DOE-STD-1196	2.10E-14
Pb-197	Pb-197	196.973	Lead	1.00E-03	ICRP-107	8.00E+00	m	4.80E+02	1.19E+08	--	--	--	DOE-STD-1196	7.14E-14
Pb-197m	Pb-197	196.973	Lead	1.00E-03	ICRP-107	4.30E+01	m	2.58E+03	2.22E+07	DOE-STD-1196	5.54E-11	S	DOE-STD-1196	5.22E-14
Pb-198	Pb-198	197.972	Lead	1.00E-03	ICRP-38	2.40E+00	h	8.64E+03	6.60E+06	ICRP-72	7.00E-11	S	FGR-12	2.04E-14
Pb-199	Pb-199	198.973	Lead	1.00E-03	ICRP-38	9.00E+01	m	5.40E+03	1.05E+07	ICRP-72	3.70E-11	S	FGR-12	7.31E-14
Pb-200	Pb-200	199.972	Lead	1.00E-03	ICRP-38	2.15E+01	h	7.74E+04	7.29E+05	ICRP-72	3.50E-10	S	FGR-12	9.20E-15
Pb-201	Pb-201	200.973	Lead	1.00E-03	ICRP-38	9.40E+00	h	3.38E+04	1.66E+06	ICRP-72	1.20E-10	S	FGR-12	3.63E-14
Pb-201m	Pb-201	200.973	Lead	1.00E-03	ICRP-107	6.10E+01	s	6.10E+01	9.20E+08	--	--	--	DOE-STD-1196	1.63E-14
Pb-202	Pb-202	201.972	Lead	1.00E-03	ICRP-38	3.00E+05	y	9.47E+12	5.90E-03	ICRP-72	1.20E-08	S	FGR-12	4.52E-19
Pb-202m	Pb-202	201.972	Lead	1.00E-03	ICRP-38	3.62E+00	h	1.30E+04	4.29E+06	ICRP-72	1.00E-10	S	FGR-12	9.96E-14
Pb-203	Pb-203	202.973	Lead	1.00E-03	ICRP-38	5.21E+01	h	1.87E+05	2.97E+05	ICRP-72	2.20E-10	S	FGR-12	1.44E-14
Pb-204m	Pb-204	203.973	Lead	1.00E-03	ICRP-38	6.72E+01	m	4.03E+03	1.37E+07	DOE-STD-1196	3.54E-11	S	DOE-STD-1196	9.45E-14
Pb-205	Pb-205	204.974	Lead	1.00E-03	ICRP-38	1.43E+07	y	4.51E+14	1.22E-04	ICRP-72	8.50E-10	S	FGR-12	5.06E-19
Pb-209	Pb-209	208.981	Lead	1.00E-03	ICRP-38	3.25E+00	h	1.17E+04	4.61E+06	ICRP-72	6.10E-11	S	FGR-12	8.12E-18

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Pb-210	Pb-210	209.984	Lead	1.00E-03	ICRP-38	2.23E+01	y	7.04E+08	7.63E+01	ICRP-72	5.60E-06	S	FGR-12	5.64E-17
Pb-211	Pb-211	210.989	Lead	1.00E-03	ICRP-38	3.61E+01	m	2.17E+03	2.47E+07	ICRP-72	1.20E-08	S	FGR-12	2.49E-15
Pb-212	Pb-212	211.992	Lead	1.00E-03	ICRP-38	1.06E+01	h	3.83E+04	1.39E+06	ICRP-72	1.90E-07	S	FGR-12	6.87E-15
Pb-214	Pb-214	214.000	Lead	1.00E-03	ICRP-38	2.68E+01	m	1.61E+03	3.28E+07	ICRP-72	1.50E-08	S	FGR-12	1.18E-14
Pd-100	Pd-100	99.909	Palladium	1.00E-03	ICRP-38	3.63E+00	d	3.14E+05	3.60E+05	ICRP-72	8.50E-10	S	FGR-12	4.65E-15
Pd-101	Pd-101	100.908	Palladium	1.00E-03	ICRP-38	8.27E+00	h	2.98E+04	3.76E+06	ICRP-72	6.20E-11	S	FGR-12	1.53E-14
Pd-103	Pd-103	102.906	Palladium	1.00E-03	ICRP-38	1.70E+01	d	1.47E+06	7.48E+04	ICRP-72	4.50E-10	S	FGR-12	7.68E-17
Pd-107	Pd-107	106.905	Palladium	1.00E-03	ICRP-38	6.50E+06	y	2.05E+14	5.14E-04	ICRP-72	5.90E-10	S	--	--
Pd-109	Pd-109	108.906	Palladium	1.00E-03	ICRP-38	1.34E+01	h	4.83E+04	2.14E+06	ICRP-72	3.70E-10	S	FGR-12	2.51E-16
Pd-109m	Pd-109	108.906	Palladium	1.00E-03	ICRP-107	4.69E+00	m	2.81E+02	3.68E+08	--	--	--	DOE-STD-1196	4.59E-15
Pd-111	Pd-111	110.908	Palladium	1.00E-03	ICRP-107	2.34E+01	m	1.40E+03	7.24E+07	DOE-STD-1196	3.14E-11	S	DOE-STD-1196	2.89E-15
Pd-112	Pd-112	111.907	Palladium	1.00E-03	ICRP-107	2.10E+01	h	7.57E+04	1.33E+06	DOE-STD-1196	1.32E-09	S	DOE-STD-1196	2.68E-17
Pd-114	Pd-114	113.910	Palladium	1.00E-03	ICRP-107	2.42E+00	m	1.45E+02	6.82E+08	--	--	--	DOE-STD-1196	1.49E-15
Pd-96	Pd-96	95.918	Palladium	1.00E-03	ICRP-107	1.22E+02	s	1.22E+02	9.64E+08	--	--	--	DOE-STD-1196	6.51E-14
Pd-97	Pd-97	96.916	Palladium	1.00E-03	ICRP-107	3.10E+00	m	1.86E+02	6.26E+08	--	--	--	DOE-STD-1196	1.12E-13
Pd-98	Pd-98	97.913	Palladium	1.00E-03	ICRP-107	1.77E+01	m	1.06E+03	1.08E+08	DOE-STD-1196	3.35E-11	S	DOE-STD-1196	1.76E-14
Pd-99	Pd-99	98.912	Palladium	1.00E-03	ICRP-107	2.14E+01	m	1.28E+03	8.88E+07	DOE-STD-1196	2.28E-11	S	DOE-STD-1196	5.88E-14
Pm-136	Pm-136	135.924	Promethium	1.00E-03	ICRP-107	1.07E+02	s	1.07E+02	7.76E+08	--	--	--	DOE-STD-1196	1.25E-13
Pm-137m	Pm-137	136.920	Promethium	1.00E-03	ICRP-107	2.40E+00	m	1.44E+02	5.72E+08	--	--	--	DOE-STD-1196	8.01E-14
Pm-138	Pm-138	137.920	Promethium	1.00E-03	JAERI	3.24E+00	m	1.94E+02	4.21E+08	--	--	--	--	--
Pm-139	Pm-139	138.917	Promethium	1.00E-03	ICRP-107	4.15E+00	m	2.49E+02	3.26E+08	--	--	--	DOE-STD-1196	4.29E-14
Pm-140	Pm-140	139.916	Promethium	1.00E-03	ICRP-107	9.20E+00	s	9.20E+00	8.76E+09	--	--	--	DOE-STD-1196	4.93E-14
Pm-140m	Pm-140	139.916	Promethium	1.00E-03	ICRP-107	5.95E+00	m	3.57E+02	2.26E+08	--	--	--	DOE-STD-1196	1.39E-13
Pm-141	Pm-141	140.914	Promethium	1.00E-03	ICRP-38	2.09E+01	m	1.25E+03	6.38E+07	ICRP-72	1.50E-11	S	FGR-12	3.60E-14
Pm-142	Pm-142	141.913	Promethium	1.00E-03	ICRP-38	4.05E+01	s	4.05E+01	1.96E+09	--	--	--	FGR-12	4.22E-14
Pm-143	Pm-143	142.911	Promethium	1.00E-03	ICRP-38	2.65E+02	d	2.29E+07	3.45E+03	ICRP-72	1.50E-09	M	FGR-12	1.46E-14
Pm-144	Pm-144	143.913	Promethium	1.00E-03	ICRP-38	3.63E+02	d	3.14E+07	2.50E+03	ICRP-72	8.20E-09	M	FGR-12	7.48E-14
Pm-145	Pm-145	144.913	Promethium	1.00E-03	ICRP-38	1.77E+01	y	5.59E+08	1.39E+02	ICRP-72	3.60E-09	M	FGR-12	7.09E-16
Pm-146	Pm-146	145.915	Promethium	1.00E-03	ICRP-38	2.02E+03	d	1.75E+08	4.43E+02	ICRP-72	2.10E-08	M	FGR-12	3.59E-14
Pm-147	Pm-147	146.915	Promethium	1.00E-03	ICRP-38	2.62E+00	y	8.28E+07	9.28E+02	ICRP-72	5.00E-09	M	FGR-12	6.93E-19
Pm-148	Pm-148	147.917	Promethium	1.00E-03	ICRP-38	5.37E+00	d	4.64E+05	1.64E+05	ICRP-72	2.20E-09	S	FGR-12	2.89E-14
Pm-148m	Pm-148	147.917	Promethium	1.00E-03	ICRP-38	4.13E+01	d	3.57E+06	2.14E+04	ICRP-72	5.70E-09	S	FGR-12	9.68E-14
Pm-149	Pm-149	148.918	Promethium	1.00E-03	ICRP-38	5.31E+01	h	1.91E+05	3.96E+05	ICRP-72	7.30E-10	S	FGR-12	5.41E-16
Pm-150	Pm-150	149.921	Promethium	1.00E-03	ICRP-38	2.68E+00	h	9.65E+03	7.80E+06	ICRP-72	1.30E-10	S	FGR-12	7.17E-14
Pm-151	Pm-151	150.921	Promethium	1.00E-03	ICRP-38	2.84E+01	h	1.02E+05	7.31E+05	ICRP-72	4.60E-10	S	FGR-12	1.51E-14
Pm-152	Pm-152	151.924	Promethium	1.00E-03	ICRP-107	4.12E+00	m	2.47E+02	3.00E+08	--	--	--	DOE-STD-1196	1.45E-14
Pm-152m	Pm-152	151.924	Promethium	1.00E-03	ICRP-107	7.52E+00	m	4.51E+02	1.65E+08	--	--	--	DOE-STD-1196	7.07E-14
Pm-153	Pm-153	152.924	Promethium	1.00E-03	ICRP-107	5.25E+00	m	3.15E+02	2.34E+08	--	--	--	DOE-STD-1196	3.40E-15
Pm-154	Pm-154	153.926	Promethium	1.00E-03	ICRP-107	1.73E+00	m	1.04E+02	7.06E+08	--	--	--	DOE-STD-1196	8.73E-14
Pm-154m	Pm-154	153.926	Promethium	1.00E-03	ICRP-107	2.68E+00	m	1.61E+02	4.56E+08	--	--	--	DOE-STD-1196	8.50E-14
Po-203	Po-203	202.981	Polonium	1.00E-02	ICRP-38	3.67E+01	m	2.20E+03	2.52E+07	ICRP-72	3.60E-11	S	FGR-12	8.12E-14
Po-204	Po-204	203.980	Polonium	1.00E-02	ICRP-107	3.53E+00	h	1.27E+04	4.35E+06	DOE-STD-1196	4.61E-10	S	DOE-STD-1196	5.16E-14
Po-205	Po-205	204.981	Polonium	1.00E-02	ICRP-38	1.80E+00	h	6.48E+03	8.49E+06	ICRP-72	6.90E-11	S	FGR-12	7.80E-14
Po-206	Po-206	205.980	Polonium	1.00E-02	ICRP-107	8.80E+00	d	7.60E+05	7.20E+04	DOE-STD-1196	7.09E-08	S	DOE-STD-1196	5.33E-14
Po-207	Po-207	206.982	Polonium	1.00E-02	ICRP-38	3.50E+02	m	2.10E+04	2.60E+06	ICRP-72	8.20E-11	S	FGR-12	6.51E-14
Po-208	Po-208	207.981	Polonium	1.00E-02	ICRP-107	2.90E+00	y	9.15E+07	5.93E+02	DOE-STD-1196	7.42E-06	S	DOE-STD-1196	9.36E-19

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Po-209	Po-209	208.982	Polonium	1.00E-02	ICRP-38	1.02E+02	y	3.22E+09	1.68E+01	DOE-STD-1196	1.02E-05	S	DOE-STD-1196	2.76E-16
Po-210	Po-210	209.983	Polonium	1.00E-02	ICRP-38	1.38E+02	d	1.20E+07	4.49E+03	ICRP-72	4.30E-06	S	FGR-12	4.16E-19
Po-211	Po-211	210.987	Polonium	1.00E-02	ICRP-38	5.16E-01	s	5.16E-01	1.04E+11	--	--	--	FGR-12	3.81E-16
Po-212	Po-212	211.989	Polonium	1.00E-02	ICRP-38	3.05E-01	us	3.05E-07	1.74E+17	--	--	--	--	--
Po-212m	Po-212	211.989	Polonium	1.00E-02	ICRP-107	4.51E+01	s	4.51E+01	1.18E+09	--	--	--	DOE-STD-1196	3.99E-15
Po-213	Po-213	212.993	Polonium	1.00E-02	ICRP-38	4.20E+00	us	4.20E-06	1.26E+16	--	--	--	DOE-STD-1196	1.71E-18
Po-214	Po-214	213.995	Polonium	1.00E-02	ICRP-38	1.64E+02	us	1.64E-04	3.21E+14	--	--	--	FGR-12	4.08E-18
Po-215	Po-215	214.999	Polonium	1.00E-02	ICRP-38	1.78E-03	s	1.78E-03	2.95E+13	--	--	--	FGR-12	8.43E-18
Po-216	Po-216	216.002	Polonium	1.00E-02	ICRP-38	1.50E-01	s	1.50E-01	3.48E+11	--	--	--	FGR-12	8.29E-19
Po-218	Po-218	218.009	Polonium	1.00E-02	ICRP-38	3.05E+00	m	1.83E+02	2.83E+08	--	--	--	FGR-12	4.48E-19
Pr-134	Pr-134	133.916	Praseodymium	1.00E-03	ICRP-107	1.10E+01	m	6.60E+02	1.28E+08	DOE-STD-1196	2.52E-11	S	DOE-STD-1196	1.44E-13
Pr-134m	Pr-134	133.916	Praseodymium	1.00E-03	ICRP-107	1.70E+01	m	1.02E+03	8.26E+07	DOE-STD-1196	3.83E-11	S	DOE-STD-1196	1.08E-13
Pr-135	Pr-135	134.913	Praseodymium	1.00E-03	ICRP-107	2.40E+01	m	1.44E+03	5.81E+07	DOE-STD-1196	2.45E-11	S	DOE-STD-1196	3.89E-14
Pr-136	Pr-136	135.913	Praseodymium	1.00E-03	ICRP-38	1.31E+01	m	7.86E+02	1.06E+08	ICRP-72	1.40E-11	S	FGR-12	1.03E-13
Pr-137	Pr-137	136.911	Praseodymium	1.00E-03	ICRP-38	7.66E+01	m	4.60E+03	1.79E+07	ICRP-72	2.10E-11	S	FGR-12	2.36E-14
Pr-138	Pr-138	137.911	Praseodymium	1.00E-03	ICRP-38	1.45E+00	m	8.70E+01	9.40E+08	--	--	--	FGR-12	3.92E-14
Pr-138m	Pr-138	137.911	Praseodymium	1.00E-03	ICRP-38	2.10E+00	h	7.56E+03	1.08E+07	ICRP-72	7.40E-11	S	FGR-12	1.21E-13
Pr-139	Pr-139	138.909	Praseodymium	1.00E-03	ICRP-38	4.51E+00	h	1.62E+04	5.00E+06	ICRP-72	2.00E-11	S	FGR-12	5.17E-15
Pr-140	Pr-140	139.909	Praseodymium	1.00E-03	ICRP-107	3.39E+00	m	2.03E+02	3.96E+08	--	--	--	DOE-STD-1196	2.44E-14
Pr-142	Pr-142	141.910	Praseodymium	1.00E-03	ICRP-38	1.91E+01	h	6.89E+04	1.15E+06	ICRP-72	5.50E-10	S	FGR-12	3.15E-15
Pr-142m	Pr-142	141.910	Praseodymium	1.00E-03	ICRP-38	1.46E+01	m	8.76E+02	9.08E+07	ICRP-72	7.00E-12	S	--	--
Pr-143	Pr-143	142.911	Praseodymium	1.00E-03	ICRP-38	1.36E+01	d	1.17E+06	6.74E+04	ICRP-72	2.40E-09	S	FGR-12	2.10E-17
Pr-144	Pr-144	143.913	Praseodymium	1.00E-03	ICRP-38	1.73E+01	m	1.04E+03	7.56E+07	ICRP-72	1.80E-11	M	FGR-12	1.95E-15
Pr-144m	Pr-144	143.913	Praseodymium	1.00E-03	ICRP-38	7.20E+00	m	4.32E+02	1.81E+08	--	--	--	FGR-12	2.79E-16
Pr-145	Pr-145	144.915	Praseodymium	1.00E-03	ICRP-38	5.98E+00	h	2.15E+04	3.62E+06	ICRP-72	1.70E-10	S	FGR-12	7.36E-16
Pr-146	Pr-146	145.918	Praseodymium	1.00E-03	ICRP-107	2.42E+01	m	1.45E+03	5.34E+07	DOE-STD-1196	3.58E-11	S	DOE-STD-1196	4.92E-14
Pr-147	Pr-147	146.919	Praseodymium	1.00E-03	ICRP-38	1.36E+01	m	8.16E+02	9.41E+07	ICRP-72	1.80E-11	M	FGR-12	4.15E-14
Pr-148	Pr-148	147.922	Praseodymium	1.00E-03	ICRP-107	2.29E+00	m	1.37E+02	5.55E+08	--	--	--	DOE-STD-1196	4.83E-14
Pr-148m	Pr-148	147.922	Praseodymium	1.00E-03	ICRP-107	2.01E+00	m	1.21E+02	6.32E+08	--	--	--	DOE-STD-1196	4.37E-14
Pt-183	Pt-183	182.962	Platinum	1.00E-03	JAERI	6.50E+00	m	3.90E+02	1.58E+08	--	--	--	--	--
Pt-184	Pt-184	183.960	Platinum	1.00E-03	ICRP-107	1.73E+01	m	1.04E+03	5.91E+07	DOE-STD-1196	3.06E-11	S	DOE-STD-1196	3.02E-14
Pt-186	Pt-186	185.959	Platinum	1.00E-03	ICRP-38	2.00E+00	h	7.20E+03	8.43E+06	ICRP-72	3.30E-11	F	FGR-12	3.53E-14
Pt-187	Pt-187	186.961	Platinum	1.00E-03	ICRP-107	2.35E+00	h	8.46E+03	7.13E+06	DOE-STD-1196	8.29E-11	S	DOE-STD-1196	2.66E-14
Pt-188	Pt-188	187.959	Platinum	1.00E-03	ICRP-38	1.02E+01	d	8.81E+05	6.81E+04	ICRP-72	4.20E-10	F	FGR-12	8.86E-15
Pt-189	Pt-189	188.961	Platinum	1.00E-03	ICRP-38	1.09E+01	h	3.91E+04	1.53E+06	ICRP-72	3.80E-11	F	FGR-12	1.48E-14
Pt-190	Pt-190	189.960	Platinum	1.00E-03	ICRP-107	6.50E+11	y	2.05E+19	2.90E-09	DOE-STD-1196	5.58E-06	S	--	--
Pt-191	Pt-191	190.962	Platinum	1.00E-03	ICRP-38	2.80E+00	d	2.42E+05	2.44E+05	ICRP-72	1.10E-10	F	FGR-12	1.34E-14
Pt-193	Pt-193	192.963	Platinum	1.00E-03	ICRP-38	5.00E+01	y	1.58E+09	3.71E+01	ICRP-72	2.10E-11	F	FGR-12	3.98E-19
Pt-193m	Pt-193	192.963	Platinum	1.00E-03	ICRP-38	4.33E+00	d	3.74E+05	1.56E+05	ICRP-72	1.20E-10	F	FGR-12	4.15E-16
Pt-195m	Pt-195	194.965	Platinum	1.00E-03	ICRP-38	4.02E+00	d	3.47E+05	1.67E+05	ICRP-72	1.80E-10	F	FGR-12	2.84E-15
Pt-197	Pt-197	196.967	Platinum	1.00E-03	ICRP-38	1.83E+01	h	6.59E+04	8.69E+05	ICRP-72	8.50E-11	F	FGR-12	1.01E-15
Pt-197m	Pt-197	196.967	Platinum	1.00E-03	ICRP-38	9.44E+01	m	5.66E+03	1.01E+07	ICRP-72	2.40E-11	F	FGR-12	3.49E-15
Pt-199	Pt-199	198.971	Platinum	1.00E-03	ICRP-38	3.08E+01	m	1.85E+03	3.07E+07	ICRP-72	1.20E-11	F	FGR-12	9.73E-15
Pt-200	Pt-200	199.971	Platinum	1.00E-03	ICRP-38	1.25E+01	h	4.50E+04	1.25E+06	ICRP-72	2.20E-10	F	FGR-12	2.55E-15
Pt-202	Pt-202	201.976	Platinum	1.00E-03	ICRP-107	4.40E+01	h	1.58E+05	3.53E+05	DOE-STD-1196	2.61E-09	S	DOE-STD-1196	5.03E-16
Pu-232	Pu-232	232.041	Plutonium	1.00E-03	ICRP-107	3.37E+01	m	2.02E+03	2.40E+07	DOE-STD-1196	2.59E-08	S	DOE-STD-1196	2.31E-15

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Pu-234	Pu-234	234.043	Plutonium	1.00E-03	ICRP-38	8.80E+00	h	3.17E+04	1.52E+06	ICRP-72	2.40E-08	S	FGR-12	2.85E-15
Pu-235	Pu-235	235.045	Plutonium	1.00E-03	ICRP-38	2.53E+01	m	1.52E+03	3.16E+07	ICRP-72	1.50E-12	S	FGR-12	3.92E-15
Pu-236	Pu-236	236.046	Plutonium	1.00E-03	ICRP-38	2.85E+00	y	9.00E+07	5.31E+02	ICRP-72	4.00E-05	F	FGR-12	6.35E-18
Pu-237	Pu-237	237.048	Plutonium	1.00E-03	ICRP-38	4.53E+01	d	3.91E+06	1.22E+04	ICRP-72	3.90E-10	S	FGR-12	2.02E-15
Pu-238	Pu-238	238.050	Plutonium	1.00E-03	ICRP-38	8.77E+01	y	2.77E+09	1.71E+01	ICRP-72	1.10E-04	F	FGR-12	4.88E-18
Pu-239	Pu-239	239.052	Plutonium	1.00E-03	ICRP-38	2.41E+04	y	7.59E+11	6.21E-02	ICRP-72	1.20E-04	F	FGR-12	4.24E-18
Pu-240	Pu-240	240.054	Plutonium	1.00E-03	ICRP-38	6.54E+03	y	2.06E+11	2.28E-01	ICRP-72	1.20E-04	F	FGR-12	4.75E-18
Pu-241	Pu-241	241.057	Plutonium	1.00E-03	ICRP-38	1.44E+01	y	4.54E+08	1.03E+02	ICRP-72	2.30E-06	F	FGR-12	7.25E-20
Pu-242	Pu-242	242.059	Plutonium	1.00E-03	ICRP-38	3.76E+05	y	1.19E+13	3.92E-03	ICRP-72	1.10E-04	F	FGR-12	4.01E-18
Pu-243	Pu-243	243.062	Plutonium	1.00E-03	ICRP-38	4.96E+00	h	1.78E+04	2.60E+06	ICRP-72	8.60E-11	S	FGR-12	1.03E-15
Pu-244	Pu-244	244.064	Plutonium	1.00E-03	ICRP-38	8.26E+07	y	2.61E+15	1.77E-05	ICRP-72	1.10E-04	F	FGR-12	2.97E-18
Pu-245	Pu-245	245.068	Plutonium	1.00E-03	ICRP-38	1.05E+01	h	3.78E+04	1.22E+06	ICRP-72	4.30E-10	S	FGR-12	1.99E-14
Pu-246	Pu-246	246.070	Plutonium	1.00E-03	ICRP-38	1.09E+01	d	9.37E+05	4.89E+04	ICRP-72	8.00E-09	S	FGR-12	6.01E-15
Ra-219	Ra-219	219.010	Radium	1.00E-03	ICRP-107	1.00E+01	ms	1.00E-02	5.15E+12	--	--	--	DOE-STD-1196	7.37E-15
Ra-220	Ra-220	220.011	Radium	1.00E-03	ICRP-107	1.79E-02	s	1.79E-02	2.86E+12	--	--	--	DOE-STD-1196	2.07E-16
Ra-221	Ra-221	221.014	Radium	1.00E-03	ICRP-107	2.80E+01	s	2.80E+01	1.82E+09	--	--	--	DOE-STD-1196	1.47E-15
Ra-222	Ra-222	222.015	Radium	1.00E-03	ICRP-38	3.80E+01	s	3.80E+01	1.34E+09	--	--	--	FGR-12	4.39E-16
Ra-223	Ra-223	223.019	Radium	1.00E-03	ICRP-38	1.14E+01	d	9.88E+05	5.12E+04	ICRP-72	8.70E-06	S	FGR-12	6.09E-15
Ra-224	Ra-224	224.020	Radium	1.00E-03	ICRP-38	3.66E+00	d	3.16E+05	1.59E+05	ICRP-72	3.40E-06	S	FGR-12	4.71E-16
Ra-225	Ra-225	225.024	Radium	1.00E-03	ICRP-38	1.48E+01	d	1.28E+06	3.92E+04	ICRP-72	7.70E-06	S	FGR-12	2.79E-16
Ra-226	Ra-226	226.025	Radium	1.00E-03	ICRP-38	1.60E+03	y	5.05E+10	9.89E-01	ICRP-72	9.50E-06	S	FGR-12	3.15E-16
Ra-227	Ra-227	227.029	Radium	1.00E-03	ICRP-38	4.22E+01	m	2.53E+03	1.96E+07	ICRP-72	4.60E-10	F	FGR-12	7.41E-15
Ra-228	Ra-228	228.031	Radium	1.00E-03	ICRP-38	5.75E+00	y	1.81E+08	2.73E+02	ICRP-72	1.60E-05	S	DOE-STD-1196	2.89E-18
Ra-230	Ra-230	230.037	Radium	1.00E-03	ICRP-107	9.30E+01	m	5.58E+03	8.79E+06	DOE-STD-1196	1.35E-10	S	DOE-STD-1196	3.33E-15
Rb-77	Rb-77	76.930	Rubidium	1.00E-03	ICRP-38	3.70E+00	m	2.22E+02	6.61E+08	--	--	--	DOE-STD-1196	7.09E-14
Rb-78	Rb-78	77.928	Rubidium	1.00E-03	ICRP-107	1.77E+01	m	1.06E+03	1.37E+08	DOE-STD-1196	3.55E-11	S	DOE-STD-1196	2.04E-13
Rb-78m	Rb-78	77.928	Rubidium	1.00E-03	ICRP-107	5.74E+00	m	3.44E+02	4.20E+08	--	--	--	DOE-STD-1196	1.52E-13
Rb-79	Rb-79	78.924	Rubidium	1.00E-03	ICRP-38	2.29E+01	m	1.37E+03	1.04E+08	ICRP-72	1.60E-11	F	FGR-12	6.51E-14
Rb-80	Rb-80	79.923	Rubidium	1.00E-03	ICRP-38	3.40E+01	s	3.40E+01	4.15E+09	--	--	--	FGR-12	6.07E-14
Rb-81	Rb-81	80.919	Rubidium	1.00E-03	ICRP-38	4.58E+00	h	1.65E+04	8.46E+06	ICRP-72	3.40E-11	F	FGR-12	2.96E-14
Rb-81m	Rb-81	80.919	Rubidium	1.00E-03	ICRP-38	3.20E+01	m	1.92E+03	7.26E+07	ICRP-72	7.00E-12	F	FGR-12	1.88E-16
Rb-82	Rb-82	81.918	Rubidium	1.00E-03	ICRP-38	1.30E+00	m	7.80E+01	1.77E+09	--	--	--	FGR-12	5.30E-14
Rb-82m	Rb-82	81.918	Rubidium	1.00E-03	ICRP-38	6.20E+00	h	2.23E+04	6.17E+06	ICRP-72	1.10E-10	F	FGR-12	1.43E-13
Rb-83	Rb-83	82.915	Rubidium	1.00E-03	ICRP-38	8.62E+01	d	7.45E+06	1.83E+04	ICRP-72	6.90E-10	F	FGR-12	2.39E-14
Rb-84	Rb-84	83.914	Rubidium	1.00E-03	ICRP-38	3.28E+01	d	2.83E+06	4.75E+04	ICRP-72	1.00E-09	F	FGR-12	4.47E-14
Rb-84m	Rb-84	83.914	Rubidium	1.00E-03	ICRP-107	2.03E+01	m	1.22E+03	1.11E+08	DOE-STD-1196	1.01E-11	S	DOE-STD-1196	1.68E-14
Rb-86	Rb-86	85.911	Rubidium	1.00E-03	ICRP-38	1.87E+01	d	1.61E+06	8.14E+04	ICRP-72	9.30E-10	F	FGR-12	4.81E-15
Rb-86m	Rb-86	85.911	Rubidium	1.00E-03	ICRP-107	1.02E+00	m	6.10E+01	2.15E+09	--	--	--	DOE-STD-1196	2.44E-14
Rb-87	Rb-87	86.909	Rubidium	1.00E-03	ICRP-38	4.70E+10	y	1.48E+18	8.75E-08	ICRP-72	5.00E-10	F	FGR-12	1.82E-18
Rb-88	Rb-88	87.911	Rubidium	1.00E-03	ICRP-38	1.78E+01	m	1.07E+03	1.20E+08	ICRP-72	1.60E-11	F	FGR-12	3.36E-14
Rb-89	Rb-89	88.912	Rubidium	1.00E-03	ICRP-38	1.52E+01	m	9.12E+02	1.39E+08	ICRP-72	1.40E-11	F	FGR-12	1.06E-13
Rb-90	Rb-90	89.915	Rubidium	1.00E-03	ICRP-107	1.58E+02	s	1.58E+02	7.94E+08	--	--	--	DOE-STD-1196	1.08E-13
Rb-90m	Rb-90	89.915	Rubidium	1.00E-03	ICRP-107	2.58E+02	s	2.58E+02	4.86E+08	--	--	--	DOE-STD-1196	1.63E-13
Re-177	Re-177	176.950	Rhenium	1.00E-03	ICRP-38	1.40E+01	m	8.40E+02	7.59E+07	ICRP-72	1.40E-11	M	FGR-12	2.96E-14
Re-178	Re-178	177.951	Rhenium	1.00E-03	ICRP-38	1.32E+01	m	7.92E+02	8.00E+07	ICRP-72	1.40E-11	M	FGR-12	6.09E-14
Re-179	Re-179	178.950	Rhenium	1.00E-03	ICRP-107	1.95E+01	m	1.17E+03	5.39E+07	DOE-STD-1196	1.32E-11	S	DOE-STD-1196	4.90E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Re-180	Re-180	179.951	Rhenium	1.00E-03	ICRP-38	2.43E+00	m	1.46E+02	4.30E+08	--	--	--	FGR-12	5.72E-14
Re-181	Re-181	180.950	Rhenium	1.00E-03	ICRP-38	2.00E+01	h	7.20E+04	8.66E+05	ICRP-72	2.50E-10	M	FGR-12	3.65E-14
Re-182l	Re-182	181.951	Rhenium	1.00E-03	ICRP-38	6.40E+01	h	2.30E+05	2.69E+05	ICRP-72	1.20E-09	M	FGR-12	9.16E-14
Re-182s	Re-182	181.951	Rhenium	1.00E-03	ICRP-38	1.27E+01	h	4.57E+04	1.36E+06	ICRP-72	2.00E-10	M	FGR-12	5.78E-14
Re-183	Re-183	182.951	Rhenium	1.00E-03	ICRP-107	7.00E+01	d	6.05E+06	1.02E+04	DOE-STD-1196	3.94E-09	S	DOE-STD-1196	5.53E-15
Re-184	Re-184	183.953	Rhenium	1.00E-03	ICRP-38	3.80E+01	d	3.28E+06	1.87E+04	ICRP-72	1.90E-09	M	FGR-12	4.29E-14
Re-184m	Re-184	183.953	Rhenium	1.00E-03	ICRP-38	1.65E+02	d	1.43E+07	4.30E+03	ICRP-72	6.50E-09	M	FGR-12	1.82E-14
Re-186	Re-186	185.955	Rhenium	1.00E-03	ICRP-38	9.06E+01	h	3.26E+05	1.86E+05	ICRP-72	1.10E-09	M	FGR-12	9.19E-16
Re-186m	Re-186	185.955	Rhenium	1.00E-03	ICRP-38	2.00E+05	y	6.31E+12	9.61E-03	ICRP-72	1.20E-08	M	FGR-12	5.00E-16
Re-187	Re-187	186.956	Rhenium	1.00E-03	ICRP-38	5.00E+10	y	1.58E+18	3.82E-08	ICRP-72	6.30E-12	M	--	--
Re-188	Re-188	187.958	Rhenium	1.00E-03	ICRP-38	1.70E+01	h	6.11E+04	9.82E+05	ICRP-72	5.40E-10	M	FGR-12	2.87E-15
Re-188m	Re-188	187.958	Rhenium	1.00E-03	ICRP-38	1.86E+01	m	1.12E+03	5.38E+07	ICRP-72	1.30E-11	M	FGR-12	3.02E-15
Re-189	Re-189	188.959	Rhenium	1.00E-03	ICRP-38	2.43E+01	h	8.75E+04	6.82E+05	ICRP-72	4.30E-10	M	FGR-12	3.22E-15
Re-190	Re-190	189.962	Rhenium	1.00E-03	ICRP-107	3.10E+00	m	1.86E+02	3.19E+08	--	--	--	DOE-STD-1196	6.04E-14
Re-190m	Re-190	189.962	Rhenium	1.00E-03	ICRP-107	3.20E+00	h	1.15E+04	5.16E+06	DOE-STD-1196	2.44E-10	S	DOE-STD-1196	4.13E-14
Rh-100	Rh-100	99.908	Rhodium	1.00E-03	ICRP-38	2.08E+01	h	7.49E+04	1.51E+06	ICRP-72	3.50E-10	S	FGR-12	1.41E-13
Rh-100m	Rh-100	99.908	Rhodium	1.00E-03	ICRP-107	4.60E+00	m	2.76E+02	4.09E+08	--	--	--	DOE-STD-1196	2.03E-15
Rh-101	Rh-101	100.906	Rhodium	1.00E-03	ICRP-38	3.20E+00	y	1.01E+08	1.11E+03	ICRP-72	5.40E-09	S	FGR-12	1.21E-14
Rh-101m	Rh-101	100.906	Rhodium	1.00E-03	ICRP-38	4.34E+00	d	3.75E+05	2.98E+05	ICRP-72	2.10E-10	S	FGR-12	1.41E-14
Rh-102	Rh-102	101.907	Rhodium	1.00E-03	ICRP-38	2.90E+00	y	9.15E+07	1.21E+03	ICRP-72	1.70E-08	S	FGR-12	1.04E-13
Rh-102m	Rh-102	101.907	Rhodium	1.00E-03	ICRP-38	2.07E+02	d	1.79E+07	6.19E+03	ICRP-72	7.10E-09	S	FGR-12	2.31E-14
Rh-103m	Rh-103	102.905	Rhodium	1.00E-03	ICRP-38	5.61E+01	m	3.37E+03	3.26E+07	ICRP-72	2.70E-12	S	FGR-12	8.80E-18
Rh-104	Rh-104	103.907	Rhodium	1.00E-03	ICRP-107	4.23E+01	s	4.23E+01	2.57E+09	--	--	--	DOE-STD-1196	1.40E-15
Rh-104m	Rh-104	103.907	Rhodium	1.00E-03	ICRP-107	4.34E+00	m	2.60E+02	4.17E+08	--	--	--	DOE-STD-1196	9.14E-16
Rh-105	Rh-105	104.906	Rhodium	1.00E-03	ICRP-38	3.54E+01	h	1.27E+05	8.45E+05	ICRP-72	3.50E-10	S	FGR-12	3.72E-15
Rh-106	Rh-106	105.907	Rhodium	1.00E-03	ICRP-38	2.99E+01	s	2.99E+01	3.56E+09	--	--	--	FGR-12	1.04E-14
Rh-106m	Rh-106	105.907	Rhodium	1.00E-03	ICRP-38	1.32E+02	m	7.92E+03	1.34E+07	ICRP-72	1.10E-10	M	FGR-12	1.44E-13
Rh-107	Rh-107	106.907	Rhodium	1.00E-03	ICRP-38	2.17E+01	m	1.30E+03	8.10E+07	ICRP-72	1.70E-11	S	FGR-12	1.50E-14
Rh-108	Rh-108	107.909	Rhodium	1.00E-03	ICRP-107	1.68E+01	s	1.68E+01	6.22E+09	--	--	--	DOE-STD-1196	1.61E-14
Rh-109	Rh-109	108.909	Rhodium	1.00E-03	ICRP-107	8.00E+01	s	8.00E+01	1.29E+09	--	--	--	DOE-STD-1196	1.38E-14
Rh-94	Rh-94	93.922	Rhodium	1.00E-03	ICRP-107	7.06E+01	s	7.06E+01	1.70E+09	--	--	--	DOE-STD-1196	1.81E-13
Rh-95	Rh-95	94.916	Rhodium	1.00E-03	ICRP-107	5.02E+00	m	3.01E+02	3.95E+08	--	--	--	DOE-STD-1196	1.21E-13
Rh-95m	Rh-95	94.916	Rhodium	1.00E-03	ICRP-107	1.96E+00	m	1.18E+02	1.01E+09	--	--	--	DOE-STD-1196	4.29E-14
Rh-96	Rh-96	95.914	Rhodium	1.00E-03	ICRP-107	9.90E+00	m	5.94E+02	1.98E+08	--	--	--	DOE-STD-1196	1.81E-13
Rh-96m	Rh-96	95.914	Rhodium	1.00E-03	ICRP-107	1.51E+00	m	9.06E+01	1.30E+09	--	--	--	DOE-STD-1196	6.03E-14
Rh-97	Rh-97	96.911	Rhodium	1.00E-03	ICRP-107	3.07E+01	m	1.84E+03	6.32E+07	DOE-STD-1196	2.84E-11	S	DOE-STD-1196	6.60E-14
Rh-97m	Rh-97	96.911	Rhodium	1.00E-03	ICRP-107	4.62E+01	m	2.77E+03	4.20E+07	DOE-STD-1196	3.30E-11	S	DOE-STD-1196	1.06E-13
Rh-98	Rh-98	97.911	Rhodium	1.00E-03	ICRP-107	8.70E+00	m	5.22E+02	2.21E+08	--	--	--	DOE-STD-1196	8.34E-14
Rh-99	Rh-99	98.908	Rhodium	1.00E-03	ICRP-38	1.60E+01	d	1.38E+06	8.25E+04	ICRP-72	8.70E-10	S	FGR-12	2.85E-14
Rh-99m	Rh-99	98.908	Rhodium	1.00E-03	ICRP-38	4.70E+00	h	1.69E+04	6.74E+06	ICRP-72	4.00E-11	S	FGR-12	3.29E-14
Rn-207	Rn-207	206.991	Radon	1.00E+00	ICRP-107	9.25E+00	m	5.55E+02	9.82E+07	--	--	--	DOE-STD-1196	4.41E-14
Rn-209	Rn-209	208.990	Radon	1.00E+00	ICRP-107	2.85E+01	m	1.71E+03	3.16E+07	--	--	--	DOE-STD-1196	5.47E-14
Rn-210	Rn-210	209.990	Radon	1.00E+00	ICRP-107	2.40E+00	h	8.64E+03	6.22E+06	--	--	--	DOE-STD-1196	1.27E-14
Rn-211	Rn-211	210.991	Radon	1.00E+00	ICRP-107	1.46E+01	h	5.26E+04	1.02E+06	--	--	--	DOE-STD-1196	8.62E-14
Rn-212	Rn-212	211.991	Radon	1.00E+00	ICRP-107	2.39E+01	m	1.43E+03	3.71E+07	--	--	--	DOE-STD-1196	1.38E-14
Rn-215	Rn-215	214.999	Radon	1.00E+00	ICRP-107	2.30E+00	us	2.30E-06	2.28E+16	--	--	--	DOE-STD-1196	1.90E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Rn-216	Rn-216	216.000	Radon	1.00E+00	ICRP-107	4.50E-05	s	4.50E-05	1.16E+15	--	--	--	DOE-STD-1196	1.77E-14
Rn-217	Rn-217	217.004	Radon	1.00E+00	ICRP-107	5.40E-04	s	5.40E-04	9.63E+13	--	--	--	DOE-STD-1196	1.70E-14
Rn-218	Rn-218	218.006	Radon	1.00E+00	ICRP-38	3.50E+01	ms	3.50E-02	1.48E+12	--	--	--	FGR-12	3.65E-17
Rn-219	Rn-219	219.009	Radon	1.00E+00	ICRP-38	3.96E+00	s	3.96E+00	1.30E+10	--	--	--	FGR-12	2.68E-15
Rn-220	Rn-220	220.011	Radon	1.00E+00	ICRP-38	5.56E+01	s	5.56E+01	9.22E+08	--	--	--	FGR-12	1.85E-17
Rn-222	Rn-222	222.018	Radon	1.00E+00	ICRP-38	3.82E+00	d	3.30E+05	1.54E+05	--	--	--	FGR-12	1.91E-17
Rn-223	Rn-223	223.022	Radon	1.00E+00	ICRP-107	2.43E+01	m	1.46E+03	3.47E+07	--	--	--	DOE-STD-1196	1.56E-14
Ru-103	Ru-103	102.906	Ruthenium	1.00E-02	ICRP-38	3.93E+01	d	3.39E+06	3.23E+04	ICRP-72	3.00E-09	S	FGR-12	2.25E-14
Ru-105	Ru-105	104.908	Ruthenium	1.00E-02	ICRP-38	4.44E+00	h	1.60E+04	6.73E+06	ICRP-72	1.80E-10	S	FGR-12	3.81E-14
Ru-106	Ru-106	105.907	Ruthenium	1.00E-02	ICRP-38	3.68E+02	d	3.18E+07	3.35E+03	ICRP-72	6.60E-08	S	--	--
Ru-107	Ru-107	106.910	Ruthenium	1.00E-02	ICRP-107	3.75E+00	m	2.25E+02	4.69E+08	--	--	--	DOE-STD-1196	1.69E-14
Ru-108	Ru-108	107.910	Ruthenium	1.00E-02	ICRP-107	4.55E+00	m	2.73E+02	3.83E+08	--	--	--	DOE-STD-1196	2.92E-15
Ru-92	Ru-92	91.920	Ruthenium	1.00E-02	ICRP-107	3.65E+00	m	2.19E+02	5.60E+08	--	--	--	DOE-STD-1196	9.44E-14
Ru-94	Ru-94	93.911	Ruthenium	1.00E-02	ICRP-38	5.18E+01	m	3.11E+03	3.87E+07	ICRP-72	5.60E-11	V	FGR-12	2.54E-14
Ru-95	Ru-95	94.910	Ruthenium	1.00E-02	ICRP-107	1.64E+00	h	5.91E+03	2.01E+07	DOE-STD-1196	5.29E-11	V	DOE-STD-1196	5.68E-14
Ru-97	Ru-97	96.908	Ruthenium	1.00E-02	ICRP-38	2.90E+00	d	2.51E+05	4.65E+05	ICRP-72	1.20E-10	V	FGR-12	1.09E-14
S-35	S-35	34.969	Sulfur	5.00E-01	ICRP-38	8.74E+01	d	7.55E+06	4.27E+04	ICRP-72	1.90E-09	S	FGR-12	2.43E-19
S-37	S-37	36.971	Sulfur	5.00E-01	ICRP-107	5.05E+00	m	3.03E+02	1.01E+09	--	--	--	DOE-STD-1196	1.54E-13
S-38	S-38	37.971	Sulfur	5.00E-01	ICRP-107	1.70E+02	m	1.02E+04	2.91E+07	DOE-STD-1196	3.53E-10	S	DOE-STD-1196	8.47E-14
Sb-111	Sb-111	110.913	Antimony	1.00E-03	ICRP-107	7.50E+01	s	7.50E+01	1.36E+09	--	--	--	DOE-STD-1196	6.76E-14
Sb-113	Sb-113	112.909	Antimony	1.00E-03	ICRP-107	6.67E+00	m	4.00E+02	2.50E+08	--	--	--	DOE-STD-1196	5.71E-14
Sb-114	Sb-114	113.909	Antimony	1.00E-03	ICRP-107	3.49E+00	m	2.09E+02	4.73E+08	--	--	--	DOE-STD-1196	1.27E-13
Sb-115	Sb-115	114.907	Antimony	1.00E-03	ICRP-38	3.18E+01	m	1.91E+03	5.15E+07	ICRP-72	1.40E-11	S	FGR-12	4.32E-14
Sb-116	Sb-116	115.907	Antimony	1.00E-03	ICRP-38	1.58E+01	m	9.48E+02	1.03E+08	ICRP-72	1.30E-11	M	FGR-12	1.08E-13
Sb-116m	Sb-116	115.907	Antimony	1.00E-03	ICRP-38	6.03E+01	m	3.62E+03	2.69E+07	ICRP-72	4.90E-11	S	FGR-12	1.55E-13
Sb-117	Sb-117	116.905	Antimony	1.00E-03	ICRP-38	2.80E+00	h	1.01E+04	9.57E+06	ICRP-72	1.70E-11	S	FGR-12	7.97E-15
Sb-118	Sb-118	117.906	Antimony	1.00E-03	ICRP-38	3.60E+00	m	2.16E+02	4.43E+08	--	--	--	DOE-STD-1196	3.65E-14
Sb-118m	Sb-118	117.906	Antimony	1.00E-03	ICRP-38	5.00E+00	h	1.80E+04	5.32E+06	ICRP-72	1.20E-10	M	FGR-12	1.27E-13
Sb-119	Sb-119	118.904	Antimony	1.00E-03	ICRP-38	3.81E+01	h	1.37E+05	6.92E+05	ICRP-72	3.60E-11	S	FGR-12	2.16E-16
Sb-120s	Sb-120	119.905	Antimony	1.00E-03	ICRP-38	1.59E+01	m	9.53E+02	9.87E+07	ICRP-72	7.30E-12	S	FGR-12	2.13E-14
Sb-120l	Sb-120	119.905	Antimony	1.00E-03	ICRP-38	5.76E+00	d	4.98E+05	1.89E+05	ICRP-72	1.10E-09	S	FGR-12	1.22E-13
Sb-122	Sb-122	121.905	Antimony	1.00E-03	ICRP-38	2.70E+00	d	2.33E+05	3.97E+05	ICRP-72	1.10E-09	S	FGR-12	2.13E-14
Sb-122m	Sb-122	121.905	Antimony	1.00E-03	ICRP-107	4.19E+00	m	2.51E+02	3.68E+08	--	--	--	DOE-STD-1196	1.77E-15
Sb-124	Sb-124	123.906	Antimony	1.00E-03	ICRP-38	6.02E+01	d	5.20E+06	1.75E+04	ICRP-72	8.60E-09	S	FGR-12	9.15E-14
Sb-124ms	Sb-124	123.906	Antimony	1.00E-03	ICRP-38	9.30E+01	s	9.30E+01	9.79E+08	--	--	--	FGR-12	1.70E-14
Sb-124ml	Sb-124	123.906	Antimony	1.00E-03	ICRP-38	2.02E+01	m	1.21E+03	7.51E+07	ICRP-72	5.90E-12	S	FGR-12	6.75E-19
Sb-125	Sb-125	124.905	Antimony	1.00E-03	ICRP-38	2.77E+00	y	8.74E+07	1.03E+03	ICRP-72	1.20E-08	S	FGR-12	2.02E-14
Sb-126	Sb-126	125.907	Antimony	1.00E-03	ICRP-38	1.24E+01	d	1.07E+06	8.36E+04	ICRP-72	3.20E-09	S	FGR-12	1.37E-13
Sb-126m	Sb-126	125.907	Antimony	1.00E-03	ICRP-38	1.90E+01	m	1.14E+03	7.86E+07	ICRP-72	2.00E-11	S	FGR-12	7.50E-14
Sb-127	Sb-127	126.907	Antimony	1.00E-03	ICRP-38	3.85E+00	d	3.33E+05	2.67E+05	ICRP-72	1.90E-09	S	FGR-12	3.33E-14
Sb-128l	Sb-128	127.909	Antimony	1.00E-03	ICRP-38	9.01E+00	h	3.24E+04	2.72E+06	ICRP-72	4.20E-10	S	FGR-12	1.51E-13
Sb-128s	Sb-128	127.909	Antimony	1.00E-03	ICRP-38	1.04E+01	m	6.24E+02	1.41E+08	ICRP-72	1.50E-11	S	FGR-12	9.69E-14
Sb-129	Sb-129	128.909	Antimony	1.00E-03	ICRP-38	4.32E+00	h	1.56E+04	5.63E+06	ICRP-72	2.50E-10	S	FGR-12	7.14E-14
Sb-130	Sb-130	129.912	Antimony	1.00E-03	ICRP-38	4.00E+01	m	2.40E+03	3.62E+07	ICRP-72	5.30E-11	S	FGR-12	1.60E-13
Sb-130m	Sb-130	129.912	Antimony	1.00E-03	ICRP-107	6.30E+00	m	3.78E+02	2.30E+08	--	--	--	DOE-STD-1196	1.26E-13
Sb-131	Sb-131	130.912	Antimony	1.00E-03	ICRP-38	2.30E+01	m	1.38E+03	6.24E+07	ICRP-72	4.40E-11	M	FGR-12	9.37E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Sb-133	Sb-133	132.915	Antimony	1.00E-03	ICRP-107	2.50E+00	m	1.50E+02	5.66E+08	--	--	--	DOE-STD-1196	1.33E-13
Sc-42m	Sc-42	41.966	Scandium	1.00E-03	ICRP-107	6.20E+01	s	6.20E+01	4.34E+09	--	--	--	DOE-STD-1196	1.98E-13
Sc-43	Sc-43	42.961	Scandium	1.00E-03	ICRP-38	3.89E+00	h	1.40E+04	1.87E+07	ICRP-72	1.10E-10	S	FGR-12	5.26E-14
Sc-44	Sc-44	43.959	Scandium	1.00E-03	ICRP-38	3.93E+00	h	1.41E+04	1.82E+07	ICRP-72	1.80E-10	S	FGR-12	1.05E-13
Sc-44m	Sc-44	43.959	Scandium	1.00E-03	ICRP-38	5.86E+01	h	2.11E+05	1.22E+06	ICRP-72	1.40E-09	S	FGR-12	1.35E-14
Sc-46	Sc-46	45.955	Scandium	1.00E-03	ICRP-38	8.38E+01	d	7.24E+06	3.39E+04	ICRP-72	6.80E-09	S	FGR-12	9.98E-14
Sc-47	Sc-47	46.952	Scandium	1.00E-03	ICRP-38	3.35E+00	d	2.90E+05	8.30E+05	ICRP-72	7.30E-10	S	FGR-12	5.14E-15
Sc-48	Sc-48	47.952	Scandium	1.00E-03	ICRP-38	4.37E+01	h	1.57E+05	1.50E+06	ICRP-72	1.10E-09	S	FGR-12	1.68E-13
Sc-49	Sc-49	48.950	Scandium	1.00E-03	ICRP-38	5.74E+01	m	3.44E+03	6.69E+07	ICRP-72	4.00E-11	S	FGR-12	1.93E-16
Sc-50	Sc-50	49.952	Scandium	1.00E-03	ICRP-107	1.03E+02	s	1.03E+02	2.20E+09	--	--	--	DOE-STD-1196	1.54E-13
Se-70	Se-70	69.934	Selenium	1.00E-02	ICRP-38	4.10E+01	m	2.46E+03	6.56E+07	ICRP-72	7.60E-11	S	FGR-12	4.73E-14
Se-71	Se-71	70.932	Selenium	1.00E-02	ICRP-107	4.74E+00	m	2.84E+02	5.59E+08	--	--	--	DOE-STD-1196	7.40E-14
Se-72	Se-72	71.927	Selenium	1.00E-02	ICRP-38	8.40E+00	d	7.26E+05	2.16E+05	DOE-STD-1196	4.16E-09	S	DOE-STD-1196	6.10E-16
Se-73	Se-73	72.927	Selenium	1.00E-02	ICRP-38	7.15E+00	h	2.57E+04	6.01E+06	ICRP-72	2.10E-10	S	FGR-12	5.16E-14
Se-73m	Se-73	72.927	Selenium	1.00E-02	ICRP-38	3.90E+01	m	2.34E+03	6.61E+07	ICRP-72	2.20E-11	S	FGR-12	1.17E-14
Se-75	Se-75	74.923	Selenium	1.00E-02	ICRP-38	1.20E+02	d	1.04E+07	1.45E+04	ICRP-72	1.30E-09	S	FGR-12	1.85E-14
Se-77m	Se-77	76.920	Selenium	1.00E-02	ICRP-38	1.75E+01	s	1.75E+01	8.40E+09	--	--	--	FGR-12	4.03E-15
Se-79	Se-79	78.918	Selenium	1.00E-02	ICRP-38	6.50E+04	y	2.05E+12	6.97E-02	ICRP-72	6.80E-09	S	FGR-12	3.03E-19
Se-79m	Se-79	78.918	Selenium	1.00E-02	ICRP-107	3.92E+00	m	2.35E+02	6.08E+08	--	--	--	DOE-STD-1196	3.60E-16
Se-81	Se-81	80.918	Selenium	1.00E-02	ICRP-38	1.85E+01	m	1.11E+03	1.26E+08	ICRP-72	1.50E-11	S	FGR-12	5.24E-16
Se-81m	Se-81	80.918	Selenium	1.00E-02	ICRP-38	5.73E+01	m	3.44E+03	4.06E+07	ICRP-72	5.10E-11	S	FGR-12	6.18E-16
Se-83	Se-83	82.919	Selenium	1.00E-02	ICRP-38	2.25E+01	m	1.35E+03	1.01E+08	ICRP-72	3.40E-11	S	FGR-12	1.21E-13
Se-83m	Se-83	82.919	Selenium	1.00E-02	ICRP-107	7.01E+01	s	7.01E+01	1.94E+09	--	--	--	DOE-STD-1196	4.78E-14
Se-84	Se-84	83.918	Selenium	1.00E-02	ICRP-107	3.10E+00	m	1.86E+02	7.23E+08	--	--	--	DOE-STD-1196	1.90E-14
Si-31	Si-31	30.975	Silicon	1.00E-03	ICRP-38	1.57E+02	m	9.44E+03	3.86E+07	ICRP-72	7.90E-11	S	FGR-12	1.17E-16
Si-32	Si-32	31.974	Silicon	1.00E-03	ICRP-38	4.50E+02	y	1.42E+10	2.48E+01	ICRP-72	1.10E-07	S	FGR-12	5.24E-19
Sm-139	Sm-139	138.922	Samarium	1.00E-03	ICRP-107	2.57E+00	m	1.54E+02	5.27E+08	--	--	--	DOE-STD-1196	6.64E-14
Sm-140	Sm-140	139.919	Samarium	1.00E-03	ICRP-107	1.48E+01	m	8.89E+02	9.07E+07	DOE-STD-1196	3.92E-11	S	DOE-STD-1196	2.53E-14
Sm-141	Sm-141	140.918	Samarium	1.00E-03	ICRP-38	1.02E+01	m	6.12E+02	1.31E+08	ICRP-72	1.50E-11	M	FGR-12	6.87E-14
Sm-141m	Sm-141	140.918	Samarium	1.00E-03	ICRP-38	2.26E+01	m	1.36E+03	5.90E+07	ICRP-72	3.20E-11	M	FGR-12	9.71E-14
Sm-142	Sm-142	141.915	Samarium	1.00E-03	ICRP-38	7.25E+01	m	4.35E+03	1.83E+07	ICRP-72	7.10E-11	M	FGR-12	3.79E-15
Sm-143	Sm-143	142.915	Samarium	1.00E-03	ICRP-107	8.75E+00	m	5.25E+02	1.50E+08	--	--	--	DOE-STD-1196	2.36E-14
Sm-143m	Sm-143	142.915	Samarium	1.00E-03	ICRP-107	6.60E+01	s	6.60E+01	1.20E+09	--	--	--	DOE-STD-1196	3.11E-14
Sm-145	Sm-145	144.913	Samarium	1.00E-03	ICRP-38	3.40E+02	d	2.94E+07	2.65E+03	ICRP-72	1.60E-09	M	FGR-12	1.61E-15
Sm-146	Sm-146	145.913	Samarium	1.00E-03	ICRP-38	1.03E+08	y	3.25E+15	2.38E-05	ICRP-72	1.10E-05	M	--	--
Sm-147	Sm-147	146.915	Samarium	1.00E-03	ICRP-38	1.06E+11	y	3.35E+18	2.30E-08	ICRP-72	9.60E-06	M	--	--
Sm-148	Sm-148	147.915	Samarium	1.00E-03	ICRP-107	7.00E+15	y	2.21E+23	3.45E-13	DOE-STD-1196	2.10E-05	F	--	--
Sm-151	Sm-151	150.920	Samarium	1.00E-03	ICRP-38	9.00E+01	y	2.84E+09	2.63E+01	ICRP-72	4.00E-09	M	FGR-12	3.61E-20
Sm-153	Sm-153	152.922	Samarium	1.00E-03	ICRP-38	4.67E+01	h	1.68E+05	4.39E+05	ICRP-72	6.30E-10	M	FGR-12	2.28E-15
Sm-155	Sm-155	154.925	Samarium	1.00E-03	ICRP-38	2.21E+01	m	1.33E+03	5.49E+07	ICRP-72	1.70E-11	M	FGR-12	4.65E-15
Sm-156	Sm-156	155.926	Samarium	1.00E-03	ICRP-38	9.40E+00	h	3.38E+04	2.14E+06	ICRP-72	2.20E-10	M	FGR-12	5.43E-15
Sm-157	Sm-157	156.928	Samarium	1.00E-03	ICRP-107	8.03E+00	m	4.82E+02	1.49E+08	--	--	--	DOE-STD-1196	1.91E-14
Sn-106	Sn-106	105.917	Tin	1.00E-03	ICRP-107	1.92E+00	m	1.15E+02	9.25E+08	--	--	--	DOE-STD-1196	5.40E-14
Sn-108	Sn-108	107.912	Tin	1.00E-03	ICRP-107	1.03E+01	m	6.18E+02	1.69E+08	DOE-STD-1196	1.40E-11	S	DOE-STD-1196	2.96E-14
Sn-109	Sn-109	108.911	Tin	1.00E-03	ICRP-107	1.80E+01	m	1.08E+03	9.59E+07	DOE-STD-1196	1.44E-11	S	DOE-STD-1196	1.05E-13
Sn-110	Sn-110	109.908	Tin	1.00E-03	ICRP-38	4.00E+00	h	1.44E+04	7.13E+06	ICRP-72	1.60E-10	M	FGR-12	1.37E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Sn-111	Sn-111	110.908	Tin	1.00E-03	ICRP-38	3.53E+01	m	2.12E+03	4.80E+07	ICRP-72	1.30E-11	M	FGR-12	2.45E-14
Sn-113	Sn-113	112.905	Tin	1.00E-03	ICRP-38	1.15E+02	d	9.94E+06	1.00E+04	ICRP-72	2.70E-09	M	FGR-12	3.82E-16
Sn-113m	Sn-113	112.905	Tin	1.00E-03	ICRP-107	2.14E+01	m	1.28E+03	7.78E+07	DOE-STD-1196	5.19E-12	S	DOE-STD-1196	1.02E-16
Sn-117m	Sn-117	116.903	Tin	1.00E-03	ICRP-38	1.36E+01	d	1.18E+06	8.21E+04	ICRP-72	2.40E-09	M	FGR-12	6.82E-15
Sn-119m	Sn-119	118.903	Tin	1.00E-03	ICRP-38	2.93E+02	d	2.53E+07	3.75E+03	ICRP-72	2.20E-09	M	FGR-12	1.01E-16
Sn-121	Sn-121	120.904	Tin	1.00E-03	ICRP-38	2.71E+01	h	9.74E+04	9.58E+05	ICRP-72	2.30E-10	M	FGR-12	2.37E-18
Sn-121m	Sn-121	120.904	Tin	1.00E-03	ICRP-38	5.50E+01	y	1.74E+09	5.38E+01	ICRP-72	4.50E-09	M	FGR-12	6.02E-17
Sn-123	Sn-123	122.906	Tin	1.00E-03	ICRP-38	1.29E+02	d	1.12E+07	8.22E+03	ICRP-72	8.10E-09	M	FGR-12	4.03E-16
Sn-123m	Sn-123	122.906	Tin	1.00E-03	ICRP-38	4.01E+01	m	2.40E+03	3.82E+07	ICRP-72	2.70E-11	M	FGR-12	6.55E-15
Sn-125	Sn-125	124.908	Tin	1.00E-03	ICRP-38	9.64E+00	d	8.33E+05	1.08E+05	ICRP-72	3.10E-09	M	FGR-12	1.58E-14
Sn-125m	Sn-125	124.908	Tin	1.00E-03	ICRP-107	9.52E+00	m	5.71E+02	1.58E+08	--	--	--	DOE-STD-1196	1.60E-14
Sn-126	Sn-126	125.908	Tin	1.00E-03	ICRP-38	1.00E+05	y	3.16E+12	2.84E-02	ICRP-72	2.80E-08	M	FGR-12	2.11E-15
Sn-127	Sn-127	126.910	Tin	1.00E-03	ICRP-38	2.10E+00	h	7.56E+03	1.18E+07	ICRP-72	1.30E-10	M	FGR-12	9.59E-14
Sn-127m	Sn-127	126.910	Tin	1.00E-03	ICRP-107	4.13E+00	m	2.48E+02	3.59E+08	--	--	--	DOE-STD-1196	2.67E-14
Sn-128	Sn-128	127.911	Tin	1.00E-03	ICRP-38	5.91E+01	m	3.55E+03	2.49E+07	ICRP-72	9.20E-11	M	FGR-12	3.00E-14
Sn-129	Sn-129	128.913	Tin	1.00E-03	ICRP-107	2.23E+00	m	1.34E+02	6.54E+08	--	--	--	DOE-STD-1196	4.76E-14
Sn-130	Sn-130	129.914	Tin	1.00E-03	ICRP-107	3.72E+00	m	2.23E+02	3.89E+08	--	--	--	DOE-STD-1196	4.16E-14
Sn-130m	Sn-130	129.914	Tin	1.00E-03	ICRP-107	1.70E+00	m	1.02E+02	8.51E+08	--	--	--	DOE-STD-1196	4.20E-14
Sr-79	Sr-79	78.930	Strontium	1.00E-03	ICRP-107	2.25E+00	m	1.35E+02	1.06E+09	--	--	--	DOE-STD-1196	5.39E-14
Sr-80	Sr-80	79.925	Strontium	1.00E-03	ICRP-38	1.00E+02	m	6.00E+03	2.35E+07	ICRP-72	1.40E-10	S	FGR-12	6.53E-18
Sr-81	Sr-81	80.923	Strontium	1.00E-03	ICRP-38	2.55E+01	m	1.53E+03	9.11E+07	ICRP-72	3.70E-11	S	FGR-12	6.68E-14
Sr-82	Sr-82	81.918	Strontium	1.00E-03	ICRP-38	2.50E+01	d	2.16E+06	6.38E+04	ICRP-72	1.10E-08	S	FGR-12	6.43E-18
Sr-83	Sr-83	82.918	Strontium	1.00E-03	ICRP-38	3.24E+01	h	1.17E+05	1.17E+06	ICRP-72	3.40E-10	S	FGR-12	3.86E-14
Sr-85	Sr-85	84.913	Strontium	1.00E-03	ICRP-38	6.48E+01	d	5.60E+06	2.37E+04	ICRP-72	8.10E-10	S	FGR-12	2.42E-14
Sr-85m	Sr-85	84.913	Strontium	1.00E-03	ICRP-38	6.95E+01	m	4.17E+03	3.19E+07	ICRP-72	4.30E-12	S	FGR-12	1.05E-14
Sr-87m	Sr-87	86.909	Strontium	1.00E-03	ICRP-38	2.81E+00	h	1.01E+04	1.29E+07	ICRP-72	2.10E-11	S	FGR-12	1.52E-14
Sr-89	Sr-89	88.907	Strontium	1.00E-03	ICRP-38	5.05E+01	d	4.36E+06	2.91E+04	ICRP-72	7.90E-09	S	FGR-12	7.73E-17
Sr-90	Sr-90	89.908	Strontium	1.00E-03	ICRP-38	2.91E+01	y	9.19E+08	1.37E+02	ICRP-72	1.60E-07	S	FGR-12	7.53E-18
Sr-91	Sr-91	90.910	Strontium	1.00E-03	ICRP-38	9.50E+00	h	3.42E+04	3.63E+06	ICRP-72	4.10E-10	S	FGR-12	3.45E-14
Sr-92	Sr-92	91.911	Strontium	1.00E-03	ICRP-38	2.71E+00	h	9.76E+03	1.26E+07	ICRP-72	2.30E-10	S	FGR-12	6.79E-14
Sr-93	Sr-93	92.914	Strontium	1.00E-03	ICRP-107	7.42E+00	m	4.45E+02	2.73E+08	--	--	--	DOE-STD-1196	1.07E-13
Sr-94	Sr-94	93.915	Strontium	1.00E-03	ICRP-107	7.53E+01	s	7.53E+01	1.60E+09	--	--	--	DOE-STD-1196	6.92E-14
Ta-170	Ta-170	169.946	Tantalum	1.00E-03	ICRP-107	6.76E+00	m	4.06E+02	1.64E+08	--	--	--	DOE-STD-1196	4.88E-14
Ta-172	Ta-172	171.945	Tantalum	1.00E-03	ICRP-38	3.68E+01	m	2.21E+03	2.97E+07	ICRP-72	3.50E-11	S	FGR-12	7.59E-14
Ta-173	Ta-173	172.944	Tantalum	1.00E-03	ICRP-38	3.65E+00	h	1.31E+04	4.96E+06	ICRP-72	1.10E-10	M	FGR-12	2.75E-14
Ta-174	Ta-174	173.944	Tantalum	1.00E-03	ICRP-38	1.20E+00	h	4.32E+03	1.50E+07	ICRP-72	4.30E-11	S	FGR-12	2.97E-14
Ta-175	Ta-175	174.944	Tantalum	1.00E-03	ICRP-38	1.05E+01	h	3.78E+04	1.71E+06	ICRP-72	1.30E-10	S	FGR-12	4.55E-14
Ta-176	Ta-176	175.945	Tantalum	1.00E-03	ICRP-38	8.08E+00	h	2.91E+04	2.20E+06	ICRP-72	2.00E-10	S	FGR-12	1.09E-13
Ta-177	Ta-177	176.944	Tantalum	1.00E-03	ICRP-38	5.66E+01	h	2.04E+05	3.13E+05	ICRP-72	1.10E-10	S	FGR-12	2.53E-15
Ta-178s	Ta-178	177.946	Tantalum	1.00E-03	ICRP-38	9.31E+00	m	5.59E+02	1.13E+08	--	--	--	FGR-12	4.61E-15
Ta-178l	Ta-178	177.946	Tantalum	1.00E-03	ICRP-38	2.20E+00	h	7.92E+03	8.00E+06	ICRP-72	6.80E-11	S	FGR-12	4.75E-14
Ta-179	Ta-179	178.946	Tantalum	1.00E-03	ICRP-38	6.65E+02	d	5.74E+07	1.10E+03	ICRP-72	5.60E-10	S	FGR-12	1.09E-15
Ta-180	Ta-180	179.947	Tantalum	1.00E-03	ICRP-38	1.00E+13	y	3.16E+20	1.99E-10	ICRP-72	2.60E-08	S	FGR-12	2.59E-14
Ta-180m	Ta-180	179.947	Tantalum	1.00E-03	ICRP-38	8.10E+00	h	2.92E+04	2.15E+06	ICRP-72	4.40E-11	M	FGR-12	1.71E-15
Ta-182	Ta-182	181.950	Tantalum	1.00E-03	ICRP-38	1.15E+02	d	9.94E+06	6.24E+03	ICRP-72	1.00E-08	S	FGR-12	6.40E-14
Ta-182m	Ta-182	181.950	Tantalum	1.00E-03	ICRP-38	1.58E+01	m	9.50E+02	6.52E+07	ICRP-72	2.10E-11	S	FGR-12	1.11E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Ta-183	Ta-183	182.951	Tantalum	1.00E-03	ICRP-38	5.10E+00	d	4.41E+05	1.40E+05	ICRP-72	2.10E-09	S	FGR-12	1.31E-14
Ta-184	Ta-184	183.954	Tantalum	1.00E-03	ICRP-38	8.70E+00	h	3.13E+04	1.96E+06	ICRP-72	4.30E-10	S	FGR-12	7.80E-14
Ta-185	Ta-185	184.956	Tantalum	1.00E-03	ICRP-38	4.90E+01	m	2.94E+03	2.07E+07	ICRP-72	4.80E-11	S	FGR-12	8.73E-15
Ta-186	Ta-186	185.959	Tantalum	1.00E-03	ICRP-38	1.05E+01	m	6.30E+02	9.63E+07	ICRP-72	1.80E-11	S	FGR-12	7.53E-14
Tb-146	Tb-146	145.927	Terbium	1.00E-03	ICRP-107	2.30E+01	s	2.30E+01	3.36E+09	--	--	--	DOE-STD-1196	1.74E-13
Tb-147	Tb-147	146.924	Terbium	1.00E-03	ICRP-38	1.65E+00	h	5.94E+03	1.29E+07	ICRP-72	7.60E-11	M	FGR-12	7.78E-14
Tb-147m	Tb-147	146.924	Terbium	1.00E-03	ICRP-107	1.87E+00	m	1.12E+02	6.84E+08	--	--	--	DOE-STD-1196	9.11E-14
Tb-148	Tb-148	147.924	Terbium	1.00E-03	ICRP-107	6.00E+01	m	3.60E+03	2.12E+07	DOE-STD-1196	8.28E-11	M	DOE-STD-1196	1.11E-13
Tb-148m	Tb-148	147.924	Terbium	1.00E-03	ICRP-107	2.20E+00	m	1.32E+02	5.78E+08	--	--	--	DOE-STD-1196	1.42E-13
Tb-149	Tb-149	148.923	Terbium	1.00E-03	ICRP-38	4.15E+00	h	1.49E+04	5.07E+06	ICRP-72	4.90E-09	M	FGR-12	8.02E-14
Tb-149m	Tb-149	148.923	Terbium	1.00E-03	ICRP-107	4.16E+00	m	2.50E+02	3.03E+08	--	--	--	DOE-STD-1196	6.20E-14
Tb-150	Tb-150	149.924	Terbium	1.00E-03	ICRP-38	3.27E+00	h	1.18E+04	6.39E+06	ICRP-72	1.10E-10	M	FGR-12	8.26E-14
Tb-150m	Tb-150	149.924	Terbium	1.00E-03	ICRP-107	5.80E+00	m	3.48E+02	2.16E+08	--	--	--	DOE-STD-1196	1.12E-13
Tb-151	Tb-151	150.923	Terbium	1.00E-03	ICRP-38	1.76E+01	h	6.34E+04	1.18E+06	ICRP-72	2.30E-10	M	FGR-12	4.20E-14
Tb-151m	Tb-151	150.923	Terbium	1.00E-03	ICRP-107	2.50E+01	s	2.50E+01	2.99E+09	--	--	--	DOE-STD-1196	3.20E-15
Tb-152	Tb-152	151.924	Terbium	1.00E-03	ICRP-107	1.75E+01	h	6.30E+04	1.18E+06	DOE-STD-1196	3.82E-10	S	DOE-STD-1196	6.98E-14
Tb-152m	Tb-152	151.924	Terbium	1.00E-03	ICRP-107	4.20E+00	m	2.52E+02	2.95E+08	--	--	--	DOE-STD-1196	3.28E-14
Tb-153	Tb-153	152.923	Terbium	1.00E-03	ICRP-38	2.34E+00	d	2.02E+05	3.65E+05	ICRP-72	1.90E-10	M	FGR-12	9.89E-15
Tb-154	Tb-154	153.925	Terbium	1.00E-03	ICRP-38	2.14E+01	h	7.70E+04	9.51E+05	ICRP-72	3.60E-10	M	FGR-12	1.21E-13
Tb-155	Tb-155	154.924	Terbium	1.00E-03	ICRP-38	5.32E+00	d	4.60E+05	1.58E+05	ICRP-72	2.20E-10	M	FGR-12	5.56E-15
Tb-156	Tb-156	155.925	Terbium	1.00E-03	ICRP-38	5.34E+00	d	4.61E+05	1.57E+05	ICRP-72	1.20E-09	M	FGR-12	8.94E-14
Tb-156ml	Tb-156	155.925	Terbium	1.00E-03	ICRP-38	2.44E+01	h	8.78E+04	8.24E+05	ICRP-72	2.10E-10	M	FGR-12	7.75E-16
Tb-156ms	Tb-156	155.925	Terbium	1.00E-03	ICRP-38	5.00E+00	h	1.80E+04	4.02E+06	ICRP-72	9.60E-11	M	FGR-12	1.16E-16
Tb-157	Tb-157	156.924	Terbium	1.00E-03	ICRP-38	1.50E+02	y	4.73E+09	1.52E+01	ICRP-72	1.20E-09	M	FGR-12	6.78E-17
Tb-158	Tb-158	157.925	Terbium	1.00E-03	ICRP-38	1.50E+02	y	4.73E+09	1.51E+01	ICRP-72	4.60E-08	M	FGR-12	3.84E-14
Tb-160	Tb-160	159.927	Terbium	1.00E-03	ICRP-38	7.23E+01	d	6.25E+06	1.13E+04	ICRP-72	7.00E-09	M	FGR-12	5.54E-14
Tb-161	Tb-161	160.928	Terbium	1.00E-03	ICRP-38	6.91E+00	d	5.97E+05	1.17E+05	ICRP-72	1.30E-09	M	FGR-12	1.02E-15
Tb-162	Tb-162	161.929	Terbium	1.00E-03	ICRP-107	7.60E+00	m	4.56E+02	1.53E+08	--	--	--	DOE-STD-1196	5.04E-14
Tb-163	Tb-163	162.931	Terbium	1.00E-03	ICRP-107	1.95E+01	m	1.17E+03	5.92E+07	DOE-STD-1196	2.03E-11	S	DOE-STD-1196	3.51E-14
Tb-164	Tb-164	163.933	Terbium	1.00E-03	ICRP-107	3.00E+00	m	1.80E+02	3.82E+08	--	--	--	DOE-STD-1196	1.14E-13
Tb-165	Tb-165	164.935	Terbium	1.00E-03	ICRP-107	2.11E+00	m	1.27E+02	5.40E+08	--	--	--	DOE-STD-1196	4.04E-14
Tc-101	Tc-101	100.907	Technetium	1.00E-03	ICRP-38	1.42E+01	m	8.52E+02	1.31E+08	ICRP-72	1.20E-11	M	FGR-12	1.61E-14
Tc-102	Tc-102	101.909	Technetium	1.00E-03	ICRP-107	5.28E+00	s	5.28E+00	2.10E+10	--	--	--	DOE-STD-1196	5.85E-15
Tc-102m	Tc-102	101.909	Technetium	1.00E-03	ICRP-107	4.35E+00	m	2.61E+02	4.24E+08	--	--	--	DOE-STD-1196	1.18E-13
Tc-104	Tc-104	103.911	Technetium	1.00E-03	ICRP-38	1.82E+01	m	1.09E+03	9.94E+07	ICRP-72	2.90E-11	S	FGR-12	1.01E-13
Tc-105	Tc-105	104.912	Technetium	1.00E-03	ICRP-107	7.60E+00	m	4.56E+02	2.36E+08	--	--	--	DOE-STD-1196	3.77E-14
Tc-91	Tc-91	90.918	Technetium	1.00E-03	ICRP-107	3.14E+00	m	1.88E+02	6.59E+08	--	--	--	DOE-STD-1196	1.20E-13
Tc-91m	Tc-91	90.918	Technetium	1.00E-03	ICRP-107	3.30E+00	m	1.98E+02	6.27E+08	--	--	--	DOE-STD-1196	6.60E-14
Tc-92	Tc-92	91.915	Technetium	1.00E-03	ICRP-107	4.25E+00	m	2.55E+02	4.81E+08	--	--	--	DOE-STD-1196	1.79E-13
Tc-93	Tc-93	92.910	Technetium	1.00E-03	ICRP-38	2.75E+00	h	9.90E+03	1.23E+07	ICRP-72	3.50E-11	M	FGR-12	7.38E-14
Tc-93m	Tc-93	92.910	Technetium	1.00E-03	ICRP-38	4.35E+01	m	2.61E+03	4.65E+07	ICRP-72	1.70E-11	M	FGR-12	3.73E-14
Tc-94	Tc-94	93.910	Technetium	1.00E-03	ICRP-38	2.93E+02	m	1.76E+04	6.83E+06	ICRP-72	1.30E-10	S	FGR-12	1.30E-13
Tc-94m	Tc-94	93.910	Technetium	1.00E-03	ICRP-38	5.20E+01	m	3.12E+03	3.85E+07	ICRP-72	4.60E-11	S	FGR-12	9.18E-14
Tc-95	Tc-95	94.908	Technetium	1.00E-03	ICRP-38	2.00E+01	h	7.20E+04	1.65E+06	ICRP-72	1.10E-10	S	FGR-12	3.84E-14
Tc-95m	Tc-95	94.908	Technetium	1.00E-03	ICRP-38	6.10E+01	d	5.27E+06	2.26E+04	ICRP-72	1.20E-09	S	FGR-12	3.23E-14
Tc-96	Tc-96	95.908	Technetium	1.00E-03	ICRP-38	4.28E+00	d	3.70E+05	3.18E+05	ICRP-72	7.00E-10	S	FGR-12	1.22E-13

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Tc-96m	Tc-96	95.908	Technetium	1.00E-03	ICRP-38	5.15E+01	m	3.09E+03	3.81E+07	ICRP-72	7.50E-12	S	FGR-12	2.24E-15
Tc-97	Tc-97	96.906	Technetium	1.00E-03	ICRP-38	2.60E+06	y	8.20E+13	1.42E-03	ICRP-72	1.80E-09	S	FGR-12	3.33E-17
Tc-97m	Tc-97	96.906	Technetium	1.00E-03	ICRP-38	8.70E+01	d	7.52E+06	1.55E+04	ICRP-72	4.10E-09	S	FGR-12	4.64E-17
Tc-98	Tc-98	97.907	Technetium	1.00E-03	ICRP-38	4.20E+06	y	1.33E+14	8.69E-04	ICRP-72	4.50E-08	S	FGR-12	6.86E-14
Tc-99	Tc-99	98.906	Technetium	1.00E-03	ICRP-38	2.13E+05	y	6.72E+12	1.70E-02	ICRP-72	1.30E-08	S	FGR-12	1.62E-18
Tc-99m	Tc-99	98.906	Technetium	1.00E-03	ICRP-38	6.02E+00	h	2.17E+04	5.26E+06	ICRP-72	2.00E-11	S	FGR-12	5.89E-15
Te-113	Te-113	112.916	Tellurium	1.00E-02	ICRP-107	1.70E+00	m	1.02E+02	9.80E+08	--	--	--	DOE-STD-1196	1.05E-13
Te-114	Te-114	113.912	Tellurium	1.00E-02	ICRP-107	1.52E+01	m	9.12E+02	1.09E+08	DOE-STD-1196	3.82E-11	V	DOE-STD-1196	5.92E-14
Te-115	Te-115	114.912	Tellurium	1.00E-02	ICRP-107	5.80E+00	m	3.48E+02	2.82E+08	--	--	--	DOE-STD-1196	1.05E-13
Te-115m	Te-115	114.912	Tellurium	1.00E-02	ICRP-107	6.70E+00	m	4.02E+02	2.44E+08	--	--	--	DOE-STD-1196	1.22E-13
Te-116	Te-116	115.908	Tellurium	1.00E-02	ICRP-38	2.49E+00	h	8.96E+03	1.09E+07	ICRP-72	1.10E-10	S	FGR-12	2.29E-15
Te-117	Te-117	116.909	Tellurium	1.00E-02	ICRP-107	6.20E+01	m	3.72E+03	2.59E+07	DOE-STD-1196	3.91E-11	S	DOE-STD-1196	7.25E-14
Te-118	Te-118	117.906	Tellurium	1.00E-02	ICRP-107	6.00E+00	d	5.18E+05	1.85E+05	DOE-STD-1196	2.95E-09	S	DOE-STD-1196	1.51E-16
Te-119	Te-119	118.906	Tellurium	1.00E-02	ICRP-107	1.61E+01	h	5.78E+04	1.64E+06	DOE-STD-1196	1.32E-10	S	DOE-STD-1196	3.43E-14
Te-119m	Te-119	118.906	Tellurium	1.00E-02	ICRP-107	4.70E+00	d	4.06E+05	2.34E+05	DOE-STD-1196	7.32E-10	V	DOE-STD-1196	6.97E-14
Te-121	Te-121	120.905	Tellurium	1.00E-02	ICRP-38	1.70E+01	d	1.47E+06	6.35E+04	ICRP-72	5.10E-10	V	FGR-12	2.70E-14
Te-121m	Te-121	120.905	Tellurium	1.00E-02	ICRP-38	1.54E+02	d	1.33E+07	7.01E+03	ICRP-72	5.70E-09	S	FGR-12	9.90E-15
Te-123	Te-123	122.904	Tellurium	1.00E-02	ICRP-38	1.00E+13	y	3.16E+20	2.91E-10	ICRP-72	1.20E-08	V	FGR-12	2.15E-16
Te-123m	Te-123	122.904	Tellurium	1.00E-02	ICRP-38	1.20E+02	d	1.03E+07	8.88E+03	ICRP-72	5.10E-09	S	FGR-12	6.51E-15
Te-125m	Te-125	124.904	Tellurium	1.00E-02	ICRP-38	5.80E+01	d	5.01E+06	1.80E+04	ICRP-72	4.20E-09	S	FGR-12	4.53E-16
Te-127	Te-127	126.905	Tellurium	1.00E-02	ICRP-38	9.35E+00	h	3.37E+04	2.64E+06	ICRP-72	1.40E-10	S	FGR-12	2.42E-16
Te-127m	Te-127	126.905	Tellurium	1.00E-02	ICRP-38	1.09E+02	d	9.42E+06	9.44E+03	ICRP-72	9.80E-09	S	FGR-12	1.47E-16
Te-129	Te-129	128.907	Tellurium	1.00E-02	ICRP-38	6.96E+01	m	4.18E+03	2.10E+07	ICRP-72	3.90E-11	S	FGR-12	2.75E-15
Te-129m	Te-129	128.907	Tellurium	1.00E-02	ICRP-38	3.36E+01	d	2.90E+06	3.01E+04	ICRP-72	7.90E-09	S	FGR-12	1.55E-15
Te-131	Te-131	130.909	Tellurium	1.00E-02	ICRP-38	2.50E+01	m	1.50E+03	5.75E+07	ICRP-72	6.80E-11	V	FGR-12	2.04E-14
Te-131m	Te-131	130.909	Tellurium	1.00E-02	ICRP-38	3.00E+01	h	1.08E+05	7.98E+05	ICRP-72	2.40E-09	V	FGR-12	7.01E-14
Te-132	Te-132	131.909	Tellurium	1.00E-02	ICRP-38	7.82E+01	h	2.82E+05	3.04E+05	ICRP-72	5.10E-09	V	FGR-12	1.03E-14
Te-133	Te-133	132.911	Tellurium	1.00E-02	ICRP-38	1.25E+01	m	7.47E+02	1.14E+08	ICRP-72	5.60E-11	V	FGR-12	4.60E-14
Te-133m	Te-133	132.911	Tellurium	1.00E-02	ICRP-38	5.54E+01	m	3.32E+03	2.55E+07	ICRP-72	2.20E-10	V	FGR-12	1.14E-13
Te-134	Te-134	133.911	Tellurium	1.00E-02	ICRP-38	4.18E+01	m	2.51E+03	3.36E+07	ICRP-72	8.40E-11	V	FGR-12	4.24E-14
Th-223	Th-223	223.021	Thorium	1.00E-03	ICRP-107	6.00E-01	s	6.00E-01	8.43E+10	--	--	--	DOE-STD-1196	2.78E-15
Th-224	Th-224	224.021	Thorium	1.00E-03	ICRP-107	1.05E+00	s	1.05E+00	4.80E+10	--	--	--	DOE-STD-1196	9.75E-16
Th-226	Th-226	226.025	Thorium	1.00E-03	ICRP-38	3.09E+01	m	1.85E+03	2.69E+07	ICRP-72	6.10E-08	S	FGR-12	3.59E-16
Th-227	Th-227	227.028	Thorium	1.00E-03	ICRP-38	1.87E+01	d	1.62E+06	3.07E+04	ICRP-72	1.00E-05	S	FGR-12	4.88E-15
Th-228	Th-228	228.029	Thorium	1.00E-03	ICRP-38	1.91E+00	y	6.04E+07	8.19E+02	ICRP-72	4.00E-05	S	FGR-12	9.20E-17
Th-229	Th-229	229.032	Thorium	1.00E-03	ICRP-38	7.34E+03	y	2.32E+11	2.13E-01	ICRP-72	2.40E-04	F	FGR-12	3.83E-15
Th-230	Th-230	230.033	Thorium	1.00E-03	ICRP-38	7.70E+04	y	2.43E+12	2.02E-02	ICRP-72	1.00E-04	F	FGR-12	1.74E-17
Th-231	Th-231	231.036	Thorium	1.00E-03	ICRP-38	2.55E+01	h	9.19E+04	5.31E+05	ICRP-72	3.30E-10	S	FGR-12	5.22E-16
Th-232	Th-232	232.038	Thorium	1.00E-03	ICRP-38	1.41E+10	y	4.43E+17	1.10E-07	ICRP-72	1.10E-04	F	FGR-12	8.72E-18
Th-233	Th-233	233.042	Thorium	1.00E-03	ICRP-107	2.23E+01	m	1.34E+03	3.62E+07	DOE-STD-1196	2.12E-11	S	DOE-STD-1196	1.79E-15
Th-234	Th-234	234.044	Thorium	1.00E-03	ICRP-38	2.41E+01	d	2.08E+06	2.31E+04	ICRP-72	7.70E-09	S	FGR-12	3.38E-16
Th-235	Th-235	235.047	Thorium	1.00E-03	ICRP-107	7.10E+00	m	4.26E+02	1.13E+08	--	--	--	DOE-STD-1196	2.93E-15
Th-236	Th-236	236.050	Thorium	1.00E-03	ICRP-107	3.75E+01	m	2.25E+03	2.12E+07	DOE-STD-1196	6.71E-11	S	DOE-STD-1196	1.68E-15
Ti-44	Ti-44	43.960	Titanium	1.00E-03	ICRP-38	4.73E+01	y	1.49E+09	1.72E+02	ICRP-72	1.20E-07	S	FGR-12	5.53E-15
Ti-45	Ti-45	44.958	Titanium	1.00E-03	ICRP-38	3.08E+00	h	1.11E+04	2.26E+07	ICRP-72	9.30E-11	S	FGR-12	4.18E-14
Ti-51	Ti-51	50.947	Titanium	1.00E-03	ICRP-107	5.76E+00	m	3.46E+02	6.41E+08	--	--	--	DOE-STD-1196	1.71E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Ti-52	Ti-52	51.947	Titanium	1.00E-03	ICRP-107	1.70E+00	m	1.02E+02	2.13E+09	--	--	--	DOE-STD-1196	5.75E-15
Tl-190	Tl-190	189.974	Thallium	1.00E-03	ICRP-107	2.60E+00	m	1.56E+02	3.81E+08	--	--	--	DOE-STD-1196	5.94E-14
Tl-190m	Tl-190	189.974	Thallium	1.00E-03	ICRP-107	3.70E+00	m	2.22E+02	2.67E+08	--	--	--	DOE-STD-1196	1.11E-13
Tl-194	Tl-194	193.971	Thallium	1.00E-03	ICRP-38	3.30E+01	m	1.98E+03	2.94E+07	ICRP-72	4.40E-12	F	FGR-12	3.70E-14
Tl-194m	Tl-194	193.971	Thallium	1.00E-03	ICRP-38	3.28E+01	m	1.97E+03	2.96E+07	ICRP-72	1.90E-11	F	FGR-12	1.11E-13
Tl-195	Tl-195	194.970	Thallium	1.00E-03	ICRP-38	1.16E+00	h	4.18E+03	1.39E+07	ICRP-72	1.50E-11	F	FGR-12	6.34E-14
Tl-196	Tl-196	195.970	Thallium	1.00E-03	ICRP-107	1.84E+00	h	6.62E+03	8.69E+06	DOE-STD-1196	4.70E-11	S	DOE-STD-1196	8.80E-14
Tl-197	Tl-197	196.970	Thallium	1.00E-03	ICRP-38	2.84E+00	h	1.02E+04	5.60E+06	ICRP-72	1.40E-11	F	FGR-12	1.93E-14
Tl-198	Tl-198	197.970	Thallium	1.00E-03	ICRP-38	5.30E+00	h	1.91E+04	2.99E+06	ICRP-72	6.00E-11	F	FGR-12	1.01E-13
Tl-198m	Tl-198	197.970	Thallium	1.00E-03	ICRP-38	1.87E+00	h	6.73E+03	8.46E+06	ICRP-72	3.70E-11	F	FGR-12	5.69E-14
Tl-199	Tl-199	198.970	Thallium	1.00E-03	ICRP-38	7.42E+00	h	2.67E+04	2.12E+06	ICRP-72	1.90E-11	F	FGR-12	1.13E-14
Tl-200	Tl-200	199.971	Thallium	1.00E-03	ICRP-38	2.61E+01	h	9.40E+04	6.00E+05	ICRP-72	1.30E-10	F	FGR-12	6.42E-14
Tl-201	Tl-201	200.971	Thallium	1.00E-03	ICRP-38	3.04E+00	d	2.63E+05	2.13E+05	ICRP-72	4.40E-11	F	FGR-12	3.78E-15
Tl-202	Tl-202	201.972	Thallium	1.00E-03	ICRP-38	1.22E+01	d	1.06E+06	5.29E+04	ICRP-72	1.90E-10	F	FGR-12	2.18E-14
Tl-204	Tl-204	203.974	Thallium	1.00E-03	ICRP-38	3.78E+00	y	1.19E+08	4.64E+02	ICRP-72	3.90E-10	F	FGR-12	5.59E-17
Tl-206	Tl-206	205.976	Thallium	1.00E-03	ICRP-38	4.20E+00	m	2.52E+02	2.17E+08	--	--	--	FGR-12	6.73E-17
Tl-206m	Tl-206	205.976	Thallium	1.00E-03	ICRP-107	3.74E+00	m	2.24E+02	2.44E+08	--	--	--	DOE-STD-1196	1.09E-13
Tl-207	Tl-207	206.977	Thallium	1.00E-03	ICRP-38	4.77E+00	m	2.86E+02	1.90E+08	--	--	--	FGR-12	1.62E-16
Tl-208	Tl-208	207.982	Thallium	1.00E-03	ICRP-38	3.07E+00	m	1.84E+02	2.94E+08	--	--	--	FGR-12	1.77E-13
Tl-209	Tl-209	208.985	Thallium	1.00E-03	ICRP-38	2.20E+00	m	1.32E+02	4.09E+08	--	--	--	FGR-12	1.02E-13
Tl-210	Tl-210	209.990	Thallium	1.00E-03	ICRP-38	1.30E+00	m	7.80E+01	6.89E+08	--	--	--	DOE-STD-1196	1.32E-13
Tm-159	Tm-159	158.935	Thulium	1.00E-03	JAERI	9.13E+00	m	5.48E+02	1.30E+08	--	--	--	--	--
Tm-161	Tm-161	160.934	Thulium	1.00E-03	ICRP-107	3.02E+01	m	1.81E+03	3.87E+07	DOE-STD-1196	3.06E-11	S	DOE-STD-1196	5.89E-14
Tm-162	Tm-162	161.934	Thulium	1.00E-03	ICRP-38	2.17E+01	m	1.30E+03	5.35E+07	ICRP-72	1.60E-11	M	FGR-12	9.01E-14
Tm-163	Tm-163	162.933	Thulium	1.00E-03	ICRP-107	1.81E+00	h	6.52E+03	1.06E+07	DOE-STD-1196	4.53E-11	S	DOE-STD-1196	6.03E-14
Tm-164	Tm-164	163.934	Thulium	1.00E-03	ICRP-107	2.00E+00	m	1.20E+02	5.73E+08	--	--	--	DOE-STD-1196	3.57E-14
Tm-165	Tm-165	164.932	Thulium	1.00E-03	ICRP-107	3.01E+01	h	1.08E+05	6.32E+05	DOE-STD-1196	2.74E-10	S	DOE-STD-1196	2.40E-14
Tm-166	Tm-166	165.934	Thulium	1.00E-03	ICRP-38	7.70E+00	h	2.77E+04	2.45E+06	ICRP-72	1.70E-10	M	FGR-12	9.35E-14
Tm-167	Tm-167	166.933	Thulium	1.00E-03	ICRP-38	9.24E+00	d	7.98E+05	8.47E+04	ICRP-72	1.10E-09	M	FGR-12	6.06E-15
Tm-168	Tm-168	167.934	Thulium	1.00E-03	ICRP-107	9.31E+01	d	8.04E+06	8.35E+03	DOE-STD-1196	5.60E-09	S	DOE-STD-1196	5.51E-14
Tm-170	Tm-170	169.936	Thulium	1.00E-03	ICRP-38	1.29E+02	d	1.11E+07	5.97E+03	ICRP-72	7.00E-09	M	FGR-12	2.23E-16
Tm-171	Tm-171	170.936	Thulium	1.00E-03	ICRP-38	1.92E+00	y	6.06E+07	1.09E+03	ICRP-72	1.40E-09	M	FGR-12	2.15E-17
Tm-172	Tm-172	171.938	Thulium	1.00E-03	ICRP-38	6.36E+01	h	2.29E+05	2.87E+05	ICRP-72	1.10E-09	M	FGR-12	2.41E-14
Tm-173	Tm-173	172.940	Thulium	1.00E-03	ICRP-38	8.24E+00	h	2.97E+04	2.20E+06	ICRP-72	1.80E-10	M	FGR-12	1.85E-14
Tm-174	Tm-174	173.942	Thulium	1.00E-03	ICRP-107	5.40E+00	m	3.24E+02	2.00E+08	--	--	--	DOE-STD-1196	8.05E-14
Tm-175	Tm-175	174.944	Thulium	1.00E-03	ICRP-38	1.52E+01	m	9.12E+02	7.07E+07	ICRP-72	1.80E-11	M	FGR-12	5.13E-14
Tm-176	Tm-176	175.947	Thulium	1.00E-03	ICRP-107	1.85E+00	m	1.11E+02	5.78E+08	--	--	--	DOE-STD-1196	9.39E-14
U-227	U-227	227.031	Uranium	1.00E-03	ICRP-107	1.10E+00	m	6.60E+01	7.53E+08	--	--	--	DOE-STD-1196	4.85E-15
U-228	U-228	228.031	Uranium	1.00E-03	ICRP-107	9.10E+00	m	5.46E+02	9.06E+07	--	--	--	DOE-STD-1196	1.59E-16
U-230	U-230	230.034	Uranium	1.00E-03	ICRP-38	2.08E+01	d	1.80E+06	2.73E+04	ICRP-72	1.60E-05	S	FGR-12	5.23E-17
U-231	U-231	231.036	Uranium	1.00E-03	ICRP-38	4.20E+00	d	3.63E+05	1.35E+05	ICRP-72	5.20E-10	S	FGR-12	2.95E-15
U-232	U-232	232.037	Uranium	1.00E-03	ICRP-38	7.20E+01	y	2.27E+09	2.14E+01	ICRP-72	3.70E-05	S	FGR-12	1.42E-17
U-233	U-233	233.040	Uranium	1.00E-03	ICRP-38	1.59E+05	y	5.00E+12	9.68E-03	ICRP-72	9.60E-06	S	FGR-12	1.63E-17
U-234	U-234	234.041	Uranium	1.00E-03	ICRP-38	2.45E+05	y	7.72E+12	6.25E-03	ICRP-72	9.40E-06	S	FGR-12	7.63E-18
U-235	U-235	235.044	Uranium	1.00E-03	ICRP-38	7.04E+08	y	2.22E+16	2.16E-06	ICRP-72	8.50E-06	S	FGR-12	7.20E-15
U-235m	U-235	235.044	Uranium	1.00E-03	ICRP-107	2.60E+01	m	1.56E+03	3.08E+07	DOE-STD-1196	9.17E-16	S	--	--

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
U-236	U-236	236.046	Uranium	1.00E-03	ICRP-38	2.34E+07	y	7.39E+14	6.47E-05	ICRP-72	8.70E-06	S	FGR-12	5.01E-18
U-237	U-237	237.049	Uranium	1.00E-03	ICRP-38	6.75E+00	d	5.83E+05	8.16E+04	ICRP-72	1.90E-09	S	FGR-12	5.97E-15
U-238	U-238	238.051	Uranium	1.00E-03	ICRP-38	4.47E+09	y	1.41E+17	3.36E-07	ICRP-72	8.00E-06	S	FGR-12	3.41E-18
U-239	U-239	239.054	Uranium	1.00E-03	ICRP-38	2.35E+01	m	1.41E+03	3.34E+07	ICRP-72	2.40E-11	S	FGR-12	2.17E-15
U-240	U-240	240.057	Uranium	1.00E-03	ICRP-38	1.41E+01	h	5.08E+04	9.26E+05	ICRP-72	5.80E-10	S	FGR-12	3.93E-17
U-242	U-242	242.063	Uranium	1.00E-03	ICRP-107	1.68E+01	m	1.01E+03	4.62E+07	DOE-STD-1196	3.35E-11	S	DOE-STD-1196	1.96E-15
V-47	V-47	46.955	Vanadium	1.00E-03	ICRP-38	3.26E+01	m	1.96E+03	1.23E+08	ICRP-72	2.90E-11	M	FGR-12	4.79E-14
V-48	V-48	47.952	Vanadium	1.00E-03	ICRP-38	1.62E+01	d	1.40E+06	1.68E+05	ICRP-72	2.40E-09	M	FGR-12	1.45E-13
V-49	V-49	48.949	Vanadium	1.00E-03	ICRP-38	3.30E+02	d	2.85E+07	8.08E+03	ICRP-72	3.40E-11	M	--	--
V-50	V-50	49.947	Vanadium	1.00E-03	ICRP-107	1.50E+17	y	4.73E+24	4.77E-14	DOE-STD-1196	6.69E-08	F	DOE-STD-1196	6.87E-14
V-52	V-52	51.945	Vanadium	1.00E-03	ICRP-107	3.74E+00	m	2.25E+02	9.67E+08	--	--	--	DOE-STD-1196	7.05E-14
V-53	V-53	52.944	Vanadium	1.00E-03	ICRP-107	1.61E+00	m	9.66E+01	2.21E+09	--	--	--	DOE-STD-1196	4.93E-14
W-176	W-176	175.946	Tungsten	1.00E-03	ICRP-38	2.30E+00	h	8.28E+03	7.74E+06	ICRP-72	4.10E-11	F	FGR-12	7.02E-15
W-177	W-177	176.947	Tungsten	1.00E-03	ICRP-38	1.35E+02	m	8.10E+03	7.87E+06	ICRP-72	2.40E-11	F	FGR-12	4.26E-14
W-178	W-178	177.946	Tungsten	1.00E-03	ICRP-38	2.17E+01	d	1.87E+06	3.38E+04	ICRP-72	7.20E-11	F	FGR-12	4.62E-16
W-179	W-179	178.947	Tungsten	1.00E-03	ICRP-38	3.75E+01	m	2.25E+03	2.80E+07	ICRP-72	9.20E-13	F	FGR-12	1.83E-15
W-179m	W-179	178.947	Tungsten	1.00E-03	ICRP-107	6.40E+00	m	3.84E+02	1.64E+08	--	--	--	DOE-STD-1196	1.99E-15
W-181	W-181	180.948	Tungsten	1.00E-03	ICRP-38	1.21E+02	d	1.05E+07	5.95E+03	ICRP-72	2.70E-11	F	FGR-12	1.40E-15
W-185	W-185	184.953	Tungsten	1.00E-03	ICRP-38	7.51E+01	d	6.49E+06	9.40E+03	ICRP-72	1.20E-10	F	FGR-12	5.37E-18
W-185m	W-185	184.953	Tungsten	1.00E-03	ICRP-107	1.60E+00	m	9.58E+01	6.37E+08	--	--	--	DOE-STD-1196	9.33E-16
W-187	W-187	186.957	Tungsten	1.00E-03	ICRP-38	2.39E+01	h	8.60E+04	7.01E+05	ICRP-72	1.90E-10	F	FGR-12	2.28E-14
W-188	W-188	187.958	Tungsten	1.00E-03	ICRP-38	6.94E+01	d	6.00E+06	1.00E+04	ICRP-72	5.70E-10	F	FGR-12	9.04E-17
W-190	W-190	189.963	Tungsten	1.00E-03	ICRP-107	3.00E+01	m	1.80E+03	3.30E+07	DOE-STD-1196	8.54E-11	S	DOE-STD-1196	5.75E-15
Xe-120	Xe-120	119.912	Xenon	1.00E+00	ICRP-38	4.00E+01	m	2.40E+03	3.92E+07	--	--	--	FGR-12	1.94E-14
Xe-121	Xe-121	120.911	Xenon	1.00E+00	ICRP-38	4.01E+01	m	2.41E+03	3.88E+07	--	--	--	FGR-12	9.14E-14
Xe-122	Xe-122	121.908	Xenon	1.00E+00	ICRP-38	2.01E+01	h	7.24E+04	1.28E+06	--	--	--	FGR-12	2.46E-15
Xe-123	Xe-123	122.908	Xenon	1.00E+00	ICRP-38	2.08E+00	h	7.49E+03	1.23E+07	--	--	--	FGR-12	3.03E-14
Xe-125	Xe-125	124.906	Xenon	1.00E+00	ICRP-38	1.70E+01	h	6.12E+04	1.48E+06	--	--	--	FGR-12	1.19E-14
Xe-127	Xe-127	126.905	Xenon	1.00E+00	ICRP-38	3.64E+01	d	3.15E+06	2.83E+04	--	--	--	FGR-12	1.25E-14
Xe-127m	Xe-127	126.905	Xenon	1.00E+00	ICRP-107	6.92E+01	s	6.92E+01	1.28E+09	--	--	--	DOE-STD-1196	6.57E-15
Xe-129m	Xe-129	128.905	Xenon	1.00E+00	ICRP-38	8.00E+00	d	6.91E+05	1.27E+05	--	--	--	FGR-12	1.06E-15
Xe-131m	Xe-131	130.905	Xenon	1.00E+00	ICRP-38	1.19E+01	d	1.03E+06	8.38E+04	--	--	--	FGR-12	3.89E-16
Xe-133	Xe-133	132.906	Xenon	1.00E+00	ICRP-38	5.25E+00	d	4.53E+05	1.87E+05	--	--	--	FGR-12	1.56E-15
Xe-133m	Xe-133	132.906	Xenon	1.00E+00	ICRP-38	2.19E+00	d	1.89E+05	4.49E+05	--	--	--	FGR-12	1.37E-15
Xe-135	Xe-135	134.907	Xenon	1.00E+00	ICRP-38	9.09E+00	h	3.27E+04	2.56E+06	--	--	--	FGR-12	1.19E-14
Xe-135m	Xe-135	134.907	Xenon	1.00E+00	ICRP-38	1.53E+01	m	9.17E+02	9.12E+07	--	--	--	FGR-12	2.04E-14
Xe-137	Xe-137	136.912	Xenon	1.00E+00	ICRP-107	3.82E+00	m	2.29E+02	3.60E+08	--	--	--	DOE-STD-1196	1.04E-14
Xe-138	Xe-138	137.914	Xenon	1.00E+00	ICRP-38	1.42E+01	m	8.50E+02	9.62E+07	--	--	--	FGR-12	5.77E-14
Y-81	Y-81	80.929	Yttrium	1.00E-03	ICRP-107	7.04E+01	s	7.04E+01	1.98E+09	--	--	--	DOE-STD-1196	5.35E-14
Y-83	Y-83	82.922	Yttrium	1.00E-03	ICRP-107	7.08E+00	m	4.25E+02	3.20E+08	--	--	--	DOE-STD-1196	6.16E-14
Y-83m	Y-83	82.922	Yttrium	1.00E-03	ICRP-107	2.85E+00	m	1.71E+02	7.96E+08	--	--	--	DOE-STD-1196	3.77E-14
Y-84m	Y-84	83.921	Yttrium	1.00E-03	ICRP-107	3.95E+01	m	2.37E+03	5.67E+07	DOE-STD-1196	7.50E-11	S	DOE-STD-1196	1.84E-13
Y-85	Y-85	84.916	Yttrium	1.00E-03	ICRP-107	2.68E+00	h	9.65E+03	1.38E+07	DOE-STD-1196	1.16E-10	S	DOE-STD-1196	4.85E-14
Y-85m	Y-85	84.916	Yttrium	1.00E-03	ICRP-107	4.86E+00	h	1.75E+04	7.59E+06	DOE-STD-1196	2.04E-10	S	DOE-STD-1196	6.18E-14
Y-86	Y-86	85.915	Yttrium	1.00E-03	ICRP-38	1.47E+01	h	5.31E+04	2.47E+06	ICRP-72	4.70E-10	S	FGR-12	1.79E-13
Y-86m	Y-86	85.915	Yttrium	1.00E-03	ICRP-38	4.80E+01	m	2.88E+03	4.56E+07	ICRP-72	2.80E-11	S	FGR-12	1.06E-14

Table A.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Maximum Reported DCs (continued)														
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Y-87	Y-87	86.911	Yttrium	1.00E-03	ICRP-38	8.03E+01	h	2.89E+05	4.49E+05	ICRP-72	3.90E-10	S	FGR-12	2.15E-14
Y-87m	Y-87	86.911	Yttrium	1.00E-03	ICRP-107	1.34E+01	h	4.81E+04	2.70E+06	DOE-STD-1196	1.66E-10	S	DOE-STD-1196	1.35E-14
Y-88	Y-88	87.910	Yttrium	1.00E-03	ICRP-38	1.07E+02	d	9.21E+06	1.39E+04	ICRP-72	4.40E-09	S	FGR-12	1.37E-13
Y-89m	Y-89	88.906	Yttrium	1.00E-03	ICRP-107	1.57E+01	s	1.57E+01	8.10E+09	--	--	--	DOE-STD-1196	4.16E-14
Y-90	Y-90	89.907	Yttrium	1.00E-03	ICRP-38	6.40E+01	h	2.30E+05	5.45E+05	ICRP-72	1.50E-09	S	FGR-12	1.90E-16
Y-90m	Y-90	89.907	Yttrium	1.00E-03	ICRP-38	3.19E+00	h	1.15E+04	1.09E+07	ICRP-72	1.00E-10	S	FGR-12	3.01E-14
Y-91	Y-91	90.907	Yttrium	1.00E-03	ICRP-38	5.85E+01	d	5.06E+06	2.45E+04	ICRP-72	8.90E-09	S	FGR-12	2.60E-16
Y-91m	Y-91	90.907	Yttrium	1.00E-03	ICRP-38	4.97E+01	m	2.98E+03	4.16E+07	ICRP-72	1.10E-11	S	FGR-12	2.55E-14
Y-92	Y-92	91.909	Yttrium	1.00E-03	ICRP-38	3.54E+00	h	1.27E+04	9.63E+06	ICRP-72	1.80E-10	S	FGR-12	1.30E-14
Y-93	Y-93	92.910	Yttrium	1.00E-03	ICRP-38	1.01E+01	h	3.64E+04	3.34E+06	ICRP-72	4.20E-10	S	FGR-12	4.80E-15
Y-94	Y-94	93.912	Yttrium	1.00E-03	ICRP-38	1.91E+01	m	1.15E+03	1.05E+08	ICRP-72	2.80E-11	S	FGR-12	5.62E-14
Y-95	Y-95	94.913	Yttrium	1.00E-03	ICRP-38	1.07E+01	m	6.42E+02	1.85E+08	ICRP-72	1.60E-11	S	FGR-12	4.79E-14
Yb-162	Yb-162	161.936	Ytterbium	1.00E-03	ICRP-38	1.89E+01	m	1.13E+03	6.14E+07	ICRP-72	1.40E-11	S	FGR-12	5.66E-15
Yb-163	Yb-163	162.936	Ytterbium	1.00E-03	ICRP-107	1.11E+01	m	6.63E+02	1.04E+08	DOE-STD-1196	1.02E-11	S	DOE-STD-1196	3.29E-14
Yb-164	Yb-164	163.934	Ytterbium	1.00E-03	ICRP-107	7.58E+01	m	4.55E+03	1.51E+07	DOE-STD-1196	5.31E-11	S	DOE-STD-1196	1.61E-15
Yb-165	Yb-165	164.935	Ytterbium	1.00E-03	ICRP-107	9.90E+00	m	5.94E+02	1.15E+08	--	--	--	DOE-STD-1196	1.37E-14
Yb-166	Yb-166	165.934	Ytterbium	1.00E-03	ICRP-38	5.67E+01	h	2.04E+05	3.33E+05	ICRP-72	7.70E-10	S	FGR-12	2.86E-15
Yb-167	Yb-167	166.935	Ytterbium	1.00E-03	ICRP-38	1.75E+01	m	1.05E+03	6.44E+07	ICRP-72	6.90E-12	S	FGR-12	1.09E-14
Yb-169	Yb-169	168.935	Ytterbium	1.00E-03	ICRP-38	3.20E+01	d	2.77E+06	2.41E+04	ICRP-72	3.00E-09	S	FGR-12	1.29E-14
Yb-175	Yb-175	174.941	Ytterbium	1.00E-03	ICRP-38	4.19E+00	d	3.62E+05	1.78E+05	ICRP-72	7.30E-10	S	FGR-12	1.87E-15
Yb-177	Yb-177	176.945	Ytterbium	1.00E-03	ICRP-38	1.90E+00	h	6.84E+03	9.32E+06	ICRP-72	6.90E-11	S	FGR-12	9.23E-15
Yb-178	Yb-178	177.947	Ytterbium	1.00E-03	ICRP-38	7.40E+01	m	4.44E+03	1.43E+07	ICRP-72	7.50E-11	S	FGR-12	1.67E-15
Yb-179	Yb-179	178.950	Ytterbium	1.00E-03	ICRP-107	8.00E+00	m	4.80E+02	1.31E+08	--	--	--	DOE-STD-1196	4.40E-14
Zn-60	Zn-60	59.942	Zinc	1.00E-03	ICRP-107	2.38E+00	m	1.43E+02	1.32E+09	--	--	--	DOE-STD-1196	6.91E-14
Zn-61	Zn-61	60.940	Zinc	1.00E-03	ICRP-107	8.91E+01	s	8.91E+01	2.08E+09	--	--	--	DOE-STD-1196	7.23E-14
Zn-62	Zn-62	61.934	Zinc	1.00E-03	ICRP-38	9.26E+00	h	3.33E+04	5.46E+06	ICRP-72	5.50E-10	S	FGR-12	2.07E-14
Zn-63	Zn-63	62.933	Zinc	1.00E-03	ICRP-38	3.81E+01	m	2.29E+03	7.84E+07	ICRP-72	3.70E-11	S	FGR-12	5.32E-14
Zn-65	Zn-65	64.929	Zinc	1.00E-03	ICRP-38	2.44E+02	d	2.11E+07	8.25E+03	ICRP-72	2.20E-09	F	FGR-12	2.90E-14
Zn-69	Zn-69	68.927	Zinc	1.00E-03	ICRP-38	5.70E+01	m	3.42E+03	4.79E+07	ICRP-72	2.80E-11	S	FGR-12	2.16E-17
Zn-69m	Zn-69	68.927	Zinc	1.00E-03	ICRP-38	1.38E+01	h	4.95E+04	3.30E+06	ICRP-72	2.70E-10	S	FGR-12	1.99E-14
Zn-71	Zn-71	70.928	Zinc	1.00E-03	ICRP-107	2.45E+00	m	1.47E+02	1.08E+09	--	--	--	DOE-STD-1196	1.52E-14
Zn-71m	Zn-71	70.928	Zinc	1.00E-03	ICRP-38	3.92E+00	h	1.41E+04	1.13E+07	ICRP-72	1.60E-10	S	FGR-12	7.50E-14
Zn-72	Zn-72	71.927	Zinc	1.00E-03	ICRP-38	4.65E+01	h	1.67E+05	9.37E+05	ICRP-72	1.30E-09	S	FGR-12	6.90E-15
Zr-85	Zr-85	84.921	Zirconium	1.00E-03	ICRP-107	7.86E+00	m	4.72E+02	2.82E+08	--	--	--	DOE-STD-1196	6.74E-14
Zr-86	Zr-86	85.916	Zirconium	1.00E-03	ICRP-38	1.65E+01	h	5.94E+04	2.21E+06	ICRP-72	4.30E-10	S	FGR-12	1.28E-14
Zr-87	Zr-87	86.915	Zirconium	1.00E-03	ICRP-107	1.68E+00	h	6.05E+03	2.15E+07	DOE-STD-1196	1.08E-10	S	DOE-STD-1196	4.22E-14
Zr-88	Zr-88	87.910	Zirconium	1.00E-03	ICRP-38	8.34E+01	d	7.21E+06	1.78E+04	ICRP-72	3.60E-09	S	FGR-12	1.88E-14
Zr-89	Zr-89	88.909	Zirconium	1.00E-03	ICRP-38	7.84E+01	h	2.82E+05	4.49E+05	ICRP-72	5.50E-10	S	FGR-12	5.68E-14
Zr-89m	Zr-89	88.909	Zirconium	1.00E-03	ICRP-107	4.16E+00	m	2.50E+02	5.08E+08	--	--	--	DOE-STD-1196	2.88E-14
Zr-93	Zr-93	92.906	Zirconium	1.00E-03	ICRP-38	1.53E+06	y	4.83E+13	2.51E-03	ICRP-72	2.50E-08	F	DOE-STD-1196	6.45E-22
Zr-95	Zr-95	94.908	Zirconium	1.00E-03	ICRP-38	6.40E+01	d	5.53E+06	2.15E+04	ICRP-72	5.90E-09	S	FGR-12	3.60E-14
Zr-97	Zr-97	96.911	Zirconium	1.00E-03	ICRP-38	1.69E+01	h	6.08E+04	1.91E+06	ICRP-72	9.20E-10	M	FGR-12	9.02E-15

Table A.2 HC-2 TQs Using Maximum Inhalation DCs		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Ac-223	1.31E+10	3.41E+01
Ac-224	6.24E+04	1.29E-02
Ac-225	9.54E+02	1.64E-02
Ac-226	6.24E+03	1.30E-02
Ac-227	1.47E+01	2.04E-01
Ac-228	3.22E+05	1.44E-01
Ac-229	2.32E+08	1.77E+01
Ac-230	1.02E+08	2.53E-01
Ac-231	1.47E+08	1.35E+00
Ac-232	4.78E+07	1.17E-01
Ac-233	1.18E+08	3.54E-01
Ag-100m	2.03E+07	2.42E-02
Ag-101	3.49E+07	2.08E-01
Ag-102	1.56E+07	1.09E-01
Ag-102m	2.78E+07	1.16E-01
Ag-103	5.90E+07	2.12E+00
Ag-104	1.87E+07	7.16E-01
Ag-104m	4.04E+07	7.48E-01
Ag-105	9.18E+06	3.02E+02
Ag-105m	6.11E+10	2.47E+02
Ag-106	6.89E+07	9.30E-01
Ag-106m	5.36E+06	3.65E+01
Ag-108	2.91E+09	3.96E+00
Ag-108m	2.18E+05	8.35E+03
Ag-109m	1.41E+10	5.38E+00
Ag-110	1.52E+09	3.64E-01
Ag-110m	6.53E+05	1.37E+02
Ag-111	4.76E+06	3.01E+01
Ag-111m	1.61E+10	1.02E+01
Ag-112	3.00E+07	3.34E+00
Ag-113	3.89E+07	7.52E+00
Ag-113m	2.83E+08	1.95E-01
Ag-114	1.85E+08	8.60E-03
Ag-115	5.91E+07	7.22E-01
Ag-116	2.53E+07	4.17E-02
Ag-117	4.16E+07	3.17E-02
Ag-99	2.50E+07	2.72E-02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Al-26	3.97E+05	2.07E+07
Al-28	2.91E+07	9.71E-03
Al-29	4.03E+07	4.07E-02
Am-237	1.05E+08	9.69E+00
Am-238	2.53E+07	3.14E+00
Am-239	2.99E+07	2.71E+01
Am-240	1.40E+07	5.44E+01
Am-241	8.45E+01	2.46E+01
Am-242	4.05E+05	5.02E-01
Am-242m	8.81E+01	9.07E+00
Am-243	8.45E+01	4.24E+02
Am-244	2.13E+06	1.67E+00
Am-244m	5.06E+07	1.71E+00
Am-245	1.34E+08	2.15E+01
Am-246	4.84E+07	2.47E+00
Am-246m	4.66E+07	1.53E+00
Am-247	1.65E+08	4.98E+00
Ar-37	2.13E+10	2.11E+05
Ar-39	2.97E+08	8.71E+06
Ar-41	4.16E+04	9.93E-04
Ar-42	2.15E+07	8.28E+04
Ar-43	3.58E+04	4.39E-05
Ar-44	2.86E+04	7.93E-05
As-68	1.54E+07	1.40E-02
As-69	4.83E+07	2.69E-01
As-70	1.19E+07	2.34E-01
As-71	1.68E+07	2.47E+01
As-72	6.97E+06	4.16E+00
As-73	8.10E+06	3.63E+02
As-74	3.67E+06	3.69E+01
As-76	1.01E+07	6.43E+00
As-77	2.07E+07	1.97E+01
As-78	2.91E+07	1.09E+00
As-79	1.20E+09	4.54E+00
At-204	2.60E+07	2.59E-01
At-205	8.63E+06	2.46E-01
At-206	1.36E+07	4.55E-01
At-207	3.25E+06	3.86E-01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
At-208	7.54E+06	8.15E-01
At-209	2.42E+06	8.73E-01
At-210	6.69E+05	3.63E-01
At-211	7.37E+04	3.58E-02
At-215	2.93E+11	5.59E-04
At-216	4.33E+10	2.49E-04
At-217	1.83E+11	1.13E-01
At-218	2.27E+10	8.78E-01
At-220	1.29E+08	5.61E-01
Au-186	3.52E+07	3.72E-01
Au-187	5.45E+07	4.55E-01
Au-190	2.15E+07	9.30E-01
Au-191	5.33E+07	1.03E+01
Au-192	2.06E+07	6.23E+00
Au-193	5.77E+07	6.27E+01
Au-193m	3.23E+08	2.15E-02
Au-194	2.03E+07	4.97E+01
Au-195	4.74E+06	1.30E+03
Au-195m	2.88E+08	1.52E-01
Au-196	1.85E+07	1.72E+02
Au-196m	1.53E+07	9.20E+00
Au-198	8.83E+06	3.61E+01
Au-198m	3.90E+06	1.36E+01
Au-199	1.01E+07	4.83E+01
Au-200	1.07E+08	5.48E+00
Au-200m	7.93E+06	9.46E+00
Au-201	3.28E+08	9.26E+00
Au-202	3.04E+08	1.57E-01
Ba-124	7.92E+07	5.74E-01
Ba-126	6.19E+07	4.00E+00
Ba-127	7.25E+07	6.22E-01
Ba-128	5.76E+06	1.37E+01
Ba-129	1.04E+08	9.58E+00
Ba-129m	2.98E+07	2.65E+00
Ba-131	8.69E+06	1.03E+02
Ba-131m	4.79E+08	4.87E+00
Ba-133	8.07E+05	3.22E+03
Ba-133m	1.73E+07	2.86E+01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Ba-135m	2.21E+07	2.73E+01
Ba-137m	9.38E+07	1.74E-01
Ba-139	1.24E+08	7.56E+00
Ba-140	1.39E+06	1.90E+01
Ba-141	5.11E+07	6.99E-01
Ba-142	4.59E+07	3.68E-01
Be-10	2.32E+05	1.04E+07
Be-7	1.31E+08	3.74E+02
Bi-197	3.44E+07	3.35E-01
Bi-200	2.13E+07	8.24E-01
Bi-201	3.10E+07	3.58E+00
Bi-202	1.79E+07	1.92E+00
Bi-203	1.31E+07	9.96E+00
Bi-204	1.03E+07	7.53E+00
Bi-205	6.84E+06	1.64E+02
Bi-206	3.71E+06	3.66E+01
Bi-207	1.39E+06	3.06E+04
Bi-208	2.09E+05	4.48E+07
Bi-210	8.72E+04	7.03E-01
Bi-210m	2.38E+03	4.20E+06
Bi-211	1.22E+09	2.92E+00
Bi-212	2.61E+05	1.78E-02
Bi-212n	6.95E+09	5.48E+01
Bi-213	2.70E+05	1.40E-02
Bi-214	5.70E+05	1.29E-02
Bi-215	2.29E+08	1.99E+00
Bi-216	7.93E+07	1.98E-01
Bk-244	8.11E+06	2.75E+00
Bk-245	3.80E+06	3.53E+01
Bk-246	1.73E+07	5.98E+01
Bk-247	1.18E+02	1.12E+02
Bk-248m	2.88E+05	5.41E-01
Bk-249	5.07E+04	3.09E+01
Bk-250	7.17E+06	1.84E+00
Bk-251	1.32E+08	9.78E+00
Br-72	3.83E+04	1.92E-05
Br-73	8.29E+04	1.09E-04
Br-74	2.16E+04	2.15E-04

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Br-74m	2.36E+04	3.86E-04
Br-75	7.11E+04	2.78E-03
Br-76	2.00E+04	7.84E-03
Br-76m	5.60E+06	4.93E-05
Br-77	1.25E+05	1.72E-01
Br-77m	9.07E+06	1.59E-02
Br-78	1.15E+05	3.09E-04
Br-80	7.74E+05	5.72E-03
Br-80m	2.11E+05	2.38E-02
Br-82	1.59E+04	1.47E-02
Br-82m	3.40E+07	9.08E-02
Br-83	3.30E+05	2.09E-02
Br-84	5.08E+04	7.21E-04
Br-84m	4.13E+04	1.10E-04
Br-85	1.36E+06	1.78E-03
C-10	3.42E+06	5.85E-05
C-11	4.92E+06	5.88E-03
C-14	1.40E+05	3.14E+04
Ca-41	4.50E+07	7.23E+08
Ca-45	2.19E+06	1.23E+02
Ca-47	3.59E+06	5.84E+00
Ca-49	1.56E+07	3.55E-02
Cd-101	2.31E+07	1.69E-02
Cd-102	7.25E+07	2.16E-01
Cd-103	2.70E+07	1.08E-01
Cd-104	1.17E+08	3.74E+00
Cd-105	3.82E+07	1.18E+00
Cd-107	9.56E+07	2.12E+01
Cd-109	1.00E+06	3.87E+02
Cd-111m	1.30E+08	3.71E+00
Cd-113	6.76E+04	1.98E+17
Cd-113m	7.37E+04	3.17E+02
Cd-115	7.15E+06	1.40E+01
Cd-115m	1.05E+06	4.13E+01
Cd-117	2.43E+07	2.26E+00
Cd-117m	1.54E+07	1.94E+00
Cd-118	8.43E+07	2.66E+00
Cd-119	3.40E+07	5.78E-02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Cd-119m	2.43E+07	3.39E-02
Ce-130	7.58E+07	1.20E+00
Ce-131	3.38E+07	2.40E-01
Ce-132	3.96E+07	5.85E+00
Ce-133	6.21E+07	4.26E+00
Ce-133m	2.13E+07	4.43E+00
Ce-134	6.23E+06	1.92E+01
Ce-135	1.07E+07	8.12E+00
Ce-137	6.41E+08	2.52E+02
Ce-137m	1.82E+07	2.73E+01
Ce-139	4.22E+06	6.18E+02
Ce-141	2.13E+06	7.46E+01
Ce-143	9.33E+06	1.40E+01
Ce-144	1.53E+05	4.79E+01
Ce-145	7.43E+07	1.72E-01
Ce-146	3.12E+08	3.27E+00
Cf-244	5.79E+05	1.46E-02
Cf-246	1.80E+04	5.05E-02
Cf-247	1.29E+08	3.16E+01
Cf-248	9.21E+02	5.84E-01
Cf-249	1.16E+02	2.83E+01
Cf-250	2.38E+02	2.18E+00
Cf-251	1.14E+02	7.20E+01
Cf-252	4.05E+02	7.54E-01
Cf-253	6.24E+03	2.15E-01
Cf-254	1.98E+02	2.33E-02
Cf-255	1.10E+06	1.27E-01
Cf-256	4.27E+03	7.15E-05
Cl-34	5.67E+04	2.60E-07
Cl-34m	2.23E+04	1.29E-04
Cl-36	1.11E+03	3.36E+04
Cl-38	2.88E+04	2.17E-04
Cl-39	3.06E+04	3.53E-04
Cl-40	1.29E+04	3.71E-06
Cm-238	1.65E+06	3.01E-01
Cm-239	7.23E+07	1.60E+01
Cm-240	2.32E+03	1.15E-01
Cm-241	2.19E+05	1.32E+01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Cm-242	1.37E+03	4.15E-01
Cm-243	1.18E+02	2.28E+00
Cm-244	1.42E+02	1.76E+00
Cm-245	8.19E+01	4.77E+02
Cm-246	8.27E+01	2.69E+02
Cm-247	9.01E+01	9.71E+05
Cm-248	2.25E+01	5.30E+03
Cm-249	1.89E+08	1.61E+01
Cm-250	3.86E+00	1.86E+01
Cm-251	1.86E+08	4.18E+00
Co-54m	1.46E+07	6.20E-03
Co-55	9.85E+06	3.03E+00
Co-56	1.12E+06	3.77E+01
Co-57	7.97E+06	9.42E+02
Co-58	3.62E+06	1.14E+02
Co-58m	4.77E+08	8.07E+01
Co-60	2.58E+05	2.28E+02
Co-60m	3.95E+09	1.32E+01
Co-61	1.29E+08	4.14E+00
Co-62	3.41E+07	1.69E-02
Co-62m	1.88E+07	8.60E-02
Cr-48	2.88E+07	1.01E+01
Cr-49	4.36E+07	4.78E-01
Cr-51	1.95E+08	2.11E+03
Cr-55	2.70E+09	2.76E+00
Cr-56	7.79E+08	1.38E+00
Cs-121	5.00E+06	8.30E-03
Cs-121m	5.02E+06	6.57E-03
Cs-123	5.53E+06	2.12E-02
Cs-124	4.98E+06	1.68E-03
Cs-125	6.78E+06	2.03E-01
Cs-126	5.16E+06	5.66E-03
Cs-127	8.45E+06	2.14E+00
Cs-128	6.26E+06	1.66E-02
Cs-129	7.10E+06	9.36E+00
Cs-130	9.27E+06	1.91E-01
Cs-130m	1.34E+08	3.21E-01
Cs-131	1.69E+07	1.64E+02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Cs-132	2.03E+06	1.33E+01
Cs-134	4.01E+04	3.10E+01
Cs-134m	1.29E+07	1.60E+00
Cs-135	9.43E+04	8.18E+07
Cs-135m	3.26E+06	1.24E-01
Cs-136	2.60E+05	3.55E+00
Cs-137	2.08E+04	2.39E+02
Cs-138	2.00E+06	4.72E-02
Cs-138m	1.41E+07	3.00E-02
Cs-139	1.63E+07	1.12E-01
Cs-140	3.04E+06	2.40E-03
Cu-57	4.78E+07	5.63E-05
Cu-59	4.05E+07	1.72E-02
Cu-60	1.29E+07	9.55E-02
Cu-61	4.10E+07	2.72E+00
Cu-62	5.56E+07	1.78E-01
Cu-64	5.50E+07	1.43E+01
Cu-66	6.06E+08	1.08E+00
Cu-67	1.29E+07	1.71E+01
Cu-69	1.07E+08	1.12E-01
Dy-148	8.58E+07	2.23E-01
Dy-149	3.59E+07	1.20E-01
Dy-150	2.29E+08	1.31E+00
Dy-151	2.39E+07	3.43E-01
Dy-152	7.37E+07	8.50E+00
Dy-153	3.05E+07	9.53E+00
Dy-154	2.96E+02	3.82E+05
Dy-155	5.06E+07	2.50E+01
Dy-157	1.03E+08	4.17E+01
Dy-159	2.17E+07	3.81E+03
Dy-165	1.27E+08	1.57E+01
Dy-165m	3.82E+09	4.21E+00
Dy-166	4.26E+06	1.84E+01
Dy-167	1.13E+08	6.20E-01
Dy-168	1.56E+08	1.21E+00
Er-154	1.21E+09	3.68E+00
Er-156	2.80E+08	4.53E+00
Er-159	5.35E+07	1.63E+00

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Er-161	4.49E+07	7.47E+00
Er-163	1.80E+09	1.17E+02
Er-165	7.22E+08	3.94E+02
Er-167m	6.71E+08	2.26E-02
Er-169	8.11E+06	9.76E+01
Er-171	2.97E+07	1.22E+01
Er-172	6.91E+06	1.87E+01
Er-173	7.25E+07	9.56E-02
Es-249	2.68E+07	3.63E+00
Es-250	1.18E+07	1.98E+00
Es-250m	4.87E+06	8.63E-01
Es-251	3.84E+06	1.01E+01
Es-253	3.00E+03	1.19E-01
Es-254	9.43E+02	5.06E-01
Es-254m	1.72E+04	5.50E-02
Es-255	1.64E+03	1.27E-01
Es-256	1.78E+05	6.16E-03
Eu-142	4.68E+07	1.38E-03
Eu-142m	1.71E+07	1.58E-02
Eu-143	5.14E+07	1.01E-01
Eu-144	5.22E+07	6.79E-03
Eu-145	1.06E+07	6.97E+01
Eu-146	6.94E+06	3.57E+01
Eu-147	6.93E+06	1.87E+02
Eu-148	2.78E+06	1.72E+02
Eu-149	2.73E+07	2.90E+03
Eu-150l	1.52E+05	2.19E+03
Eu-150s	4.12E+07	2.49E+01
Eu-152	1.92E+05	1.09E+03
Eu-152ml	3.09E+07	1.40E+01
Eu-152ms	4.51E+08	3.50E+01
Eu-154	1.52E+05	5.78E+02
Eu-154m	7.23E+08	2.72E+01
Eu-155	1.17E+06	2.52E+03
Eu-156	2.25E+06	4.08E+01
Eu-157	2.57E+07	1.95E+01
Eu-158	3.95E+07	1.52E+00
Eu-159	1.19E+08	1.82E+00

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
F-17	5.88E+04	5.71E-06
F-18	3.94E+04	4.14E-04
Fe-52	1.10E+07	1.51E+00
Fe-53	5.05E+07	1.21E-01
Fe-53m	1.88E+07	1.34E-02
Fe-55	1.05E+07	4.37E+03
Fe-59	1.94E+06	3.90E+01
Fe-60	2.90E+04	4.85E+05
Fe-61	4.05E+07	7.84E-02
Fe-62	1.16E+08	4.35E-02
Fm-251	3.72E+06	1.58E+00
Fm-252	2.53E+04	4.63E-02
Fm-253	2.03E+04	1.18E-01
Fm-254	1.33E+05	3.49E-02
Fm-255	3.00E+04	4.91E-02
Fm-256	2.83E+04	6.07E-03
Fm-257	1.14E+03	2.26E-01
Fr-212	1.14E+06	2.56E-02
Fr-219	1.63E+10	6.64E-03
Fr-220	5.49E+09	2.94E+00
Fr-221	1.85E+09	1.04E+01
Fr-222	5.79E+05	9.85E-03
Fr-223	9.04E+06	2.34E-01
Fr-224	1.03E+08	4.09E-01
Fr-227	1.35E+08	4.03E-01
Ga-64	1.65E+07	1.47E-02
Ga-65	4.35E+07	2.28E-01
Ga-66	9.80E+06	1.94E+00
Ga-67	3.10E+07	5.18E+01
Ga-68	4.35E+07	1.07E+00
Ga-70	4.66E+08	3.67E+00
Ga-72	8.56E+06	2.77E+00
Ga-73	4.40E+07	5.02E+00
Ga-74	1.74E+07	5.57E-02
Gd-142	5.65E+07	4.99E-02
Gd-143m	2.77E+07	3.86E-02
Gd-144	6.36E+07	2.18E-01
Gd-145	2.22E+07	3.92E-01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Gd-145m	8.78E+07	9.58E-02
Gd-146	1.26E+06	6.81E+01
Gd-147	1.37E+07	2.44E+01
Gd-148	3.12E+02	1.20E+01
Gd-149	1.03E+07	1.10E+02
Gd-150	3.17E+02	2.38E+05
Gd-151	9.36E+06	1.30E+03
Gd-152	4.27E+02	1.96E+13
Gd-153	3.84E+06	1.09E+03
Gd-159	2.93E+07	2.76E+01
Gd-162	1.45E+08	1.05E+00
Ge-66	4.30E+07	2.05E+00
Ge-67	3.51E+07	2.34E-01
Ge-68	5.79E+05	8.68E+01
Ge-69	1.94E+07	1.67E+01
Ge-71	7.37E+08	4.72E+03
Ge-75	1.98E+08	6.52E+00
Ge-77	1.53E+07	4.25E+00
Ge-78	6.00E+07	2.16E+00
H-3	3.12E+04	3.25E+00
Hf-167	9.90E+07	1.80E-01
Hf-169	9.72E+07	2.83E-01
Hf-170	2.05E+07	1.78E+01
Hf-172	2.53E+05	2.28E+02
Hf-173	3.76E+07	4.98E+01
Hf-174	2.53E+02	2.47E+14
Hf-175	6.48E+06	6.08E+02
Hf-177m	1.99E+07	9.61E-01
Hf-178m	3.11E+04	4.81E+02
Hf-179m	2.07E+06	7.10E+01
Hf-180m	2.98E+07	9.41E+00
Hf-181	1.60E+06	9.38E+01
Hf-182	2.62E+04	1.20E+08
Hf-182m	4.53E+07	2.70E+00
Hf-183	4.89E+07	3.04E+00
Hf-184	2.23E+07	5.38E+00
Hg-190	7.61E+06	1.54E-01
Hg-191m	1.48E+06	7.62E-02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Hg-192	7.28E+05	2.16E-01
Hg-193	7.20E+05	1.55E-01
Hg-193m	2.49E+05	1.70E-01
Hg-194	2.03E+04	2.86E+03
Hg-195	5.68E+05	3.50E-01
Hg-195m	9.85E+04	2.55E-01
Hg-197	1.84E+05	7.41E-01
Hg-197m	1.40E+05	2.09E-01
Hg-199m	3.95E+06	1.78E-01
Hg-203	1.15E+05	8.35E+00
Hg-205	4.37E+08	2.48E+00
Hg-206	4.86E+07	4.34E-01
Hg-207	2.11E+06	6.74E-03
Ho-150	3.10E+07	3.16E-02
Ho-153	5.86E+07	9.58E-02
Ho-153m	5.73E+07	4.33E-01
Ho-154	2.93E+07	2.82E-01
Ho-154m	2.48E+07	6.29E-02
Ho-155	1.10E+08	4.35E+00
Ho-156	2.26E+07	1.05E+00
Ho-157	1.14E+08	1.19E+00
Ho-158	1.04E+09	9.87E+00
Ho-159	1.50E+08	4.18E+00
Ho-160	3.30E+07	7.19E-01
Ho-161	7.25E+08	9.30E+01
Ho-162	3.26E+08	4.21E+00
Ho-162m	7.86E+07	4.60E+00
Ho-163	2.88E+07	5.99E+07
Ho-164	7.29E+08	1.84E+01
Ho-164m	5.08E+08	1.66E+01
Ho-166	1.24E+07	1.76E+01
Ho-166m	6.74E+04	3.76E+04
Ho-167	6.60E+07	1.09E+01
Ho-168	6.66E+07	1.78E-01
Ho-168m	1.80E+10	3.54E+01
Ho-170	3.45E+07	8.61E-02
I-118	3.35E+04	2.88E-04
I-118m	3.16E+04	1.68E-04

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
I-119	9.09E+04	1.10E-03
I-120	2.27E+04	1.17E-03
I-120m	1.66E+04	5.62E-04
I-121	1.12E+05	9.20E-03
I-122	1.19E+05	2.78E-04
I-123	6.99E+04	3.62E-02
I-124	1.33E+03	5.29E-03
I-125	1.16E+03	6.66E-02
I-126	6.22E+02	7.81E-03
I-128	2.09E+05	3.56E-03
I-129	1.69E+02	9.56E+05
I-130	7.33E+03	3.76E-03
I-130m	1.11E+06	6.77E-03
I-131	8.09E+02	6.52E-03
I-132	2.51E+04	2.43E-03
I-132m	5.13E+04	3.01E-03
I-133	3.97E+03	3.50E-03
I-134	3.00E+04	1.12E-03
I-134m	4.54E+05	1.16E-03
I-135	1.40E+04	3.98E-03
In-103	2.08E+07	1.14E-02
In-105	3.01E+07	8.52E-02
In-106	1.66E+07	5.79E-02
In-106m	2.00E+07	5.86E-02
In-107	3.30E+07	6.07E-01
In-108	1.35E+07	4.50E-01
In-108m	1.80E+07	4.09E-01
In-109	5.86E+07	8.56E+00
In-109m	9.86E+07	7.66E-02
In-110l	1.41E+07	2.41E+00
In-110s	2.94E+07	1.19E+00
In-111	2.84E+07	6.82E+01
In-111m	1.29E+08	5.85E-01
In-112	1.79E+08	1.54E+00
In-112m	2.80E+08	3.43E+00
In-113m	1.44E+08	8.60E+00
In-114	1.94E+10	1.41E+01
In-114m	8.71E+05	3.76E+01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
In-115	2.08E+04	3.41E+16
In-115m	9.99E+07	1.64E+01
In-116m	1.93E+07	6.44E-01
In-117	6.32E+07	1.72E+00
In-117m	9.59E+07	6.94E+00
In-118	4.73E+08	2.47E-02
In-118m	2.06E+07	5.65E-02
In-119	7.23E+07	1.10E-01
In-119m	4.30E+08	4.90E+00
In-121	6.20E+07	1.53E-02
In-121m	6.89E+08	1.72E+00
Ir-180	3.73E+07	5.36E-02
Ir-182	3.70E+07	5.37E-01
Ir-183	3.83E+07	2.16E+00
Ir-184	2.02E+07	3.58E+00
Ir-185	2.91E+07	2.41E+01
Ir-186l	1.44E+07	1.35E+01
Ir-186s	4.42E+07	4.59E+00
Ir-187	6.27E+07	3.93E+01
Ir-188	1.23E+07	3.06E+01
Ir-189	1.33E+07	2.56E+02
Ir-190	3.11E+06	5.48E+01
Ir-190ms	8.11E+08	5.90E+01
Ir-190ml	2.66E+07	5.00E+00
Ir-191m	8.95E+08	7.48E-02
Ir-192	1.21E+06	1.31E+02
Ir-192ms	1.01E+12	1.49E+03
Ir-192ml	2.08E+05	2.69E+04
Ir-193m	6.24E+06	9.71E+01
Ir-194	1.41E+07	1.68E+01
Ir-194m	6.08E+05	1.54E+02
Ir-195	1.04E+08	1.62E+01
Ir-195m	3.56E+07	8.41E+00
Ir-196	2.33E+08	2.10E-01
Ir-196m	1.85E+07	1.62E+00
K-38	3.30E+04	5.08E-05
K-40	7.63E+03	1.09E+09
K-42	9.90E+04	1.64E-02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
K-43	5.79E+04	1.79E-02
K-44	4.30E+04	2.23E-04
K-45	5.32E+04	2.54E-04
K-46	3.68E+04	1.57E-05
Kr-74	4.83E+04	2.19E-04
Kr-75	4.62E+04	7.90E-05
Kr-76	1.33E+05	4.77E-02
Kr-77	5.56E+04	1.70E-03
Kr-79	2.23E+05	1.97E-01
Kr-81	1.01E+07	4.81E+08
Kr-81m	4.40E+05	4.10E-05
Kr-83m	1.80E+09	8.72E+01
Kr-85	2.27E+07	5.78E+04
Kr-85m	3.61E+05	4.39E-02
Kr-87	6.56E+04	2.31E-03
Kr-88	2.65E+04	2.11E-03
Kr-89	2.83E+04	4.21E-05
La-128	2.08E+07	7.33E-02
La-129	5.87E+07	4.67E-01
La-130	2.62E+07	1.58E-01
La-131	6.92E+07	2.84E+00
La-132	1.76E+07	3.56E+00
La-132m	7.14E+07	1.22E+00
La-133	2.03E+08	3.37E+01
La-134	8.07E+07	3.83E-01
La-135	4.84E+08	4.06E+02
La-136	1.51E+08	1.08E+00
La-137	9.32E+05	2.14E+07
La-138	5.40E+04	2.81E+12
La-140	5.59E+06	1.00E+01
La-141	5.16E+07	9.12E+00
La-142	1.56E+07	1.09E+00
La-143	2.22E+08	2.40E+00
Lu-165	4.86E+07	4.58E-01
Lu-167	2.86E+07	1.31E+00
Lu-169	1.52E+07	2.79E+01
Lu-169m	1.07E+14	2.57E+05
Lu-170	7.77E+06	2.02E+01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Lu-171	8.29E+06	8.93E+01
Lu-171m	2.74E+11	3.28E+02
Lu-172	4.32E+06	3.81E+01
Lu-172m	6.93E+13	2.34E+05
Lu-173	3.36E+06	2.22E+03
Lu-174	1.92E+06	3.10E+03
Lu-174m	1.93E+06	3.65E+02
Lu-176	1.16E+05	2.05E+12
Lu-176m	6.66E+07	1.38E+01
Lu-177	6.73E+06	6.12E+01
Lu-177m	5.02E+05	1.10E+02
Lu-178	1.72E+08	4.61E+00
Lu-178m	4.27E+07	9.17E-01
Lu-179	6.51E+07	1.71E+01
Lu-180	3.81E+07	2.08E-01
Lu-181	1.05E+08	3.53E-01
Md-257	3.24E+05	1.38E-01
Md-258	1.37E+03	1.49E-01
Mg-27	6.50E+07	8.82E-02
Mg-28	5.78E+06	1.08E+00
Mn-50m	1.24E+07	5.76E-03
Mn-51	4.38E+07	5.49E-01
Mn-52	4.23E+06	9.41E+00
Mn-52m	2.08E+07	1.22E-01
Mn-53	1.50E+08	8.23E+10
Mn-54	5.00E+06	6.45E+02
Mn-56	2.14E+07	9.87E-01
Mn-57	5.10E+08	2.20E-01
Mn-58m	2.35E+07	7.87E-03
Mo-101	3.49E+07	2.74E-01
Mo-102	2.45E+08	1.50E+00
Mo-89	4.74E+07	4.73E-02
Mo-90	1.70E+07	2.76E+00
Mo-91	5.07E+07	3.80E-01
Mo-91m	4.19E+07	2.18E-02
Mo-93	3.53E+06	3.21E+06
Mo-93m	1.59E+07	3.24E+00
Mo-99	8.01E+06	1.67E+01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
N-13	5.52E+04	2.95E-06
N-16	1.04E+04	1.06E-07
Na-22	9.99E+03	1.60E+00
Na-24	1.76E+04	2.02E-03
Nb-87	4.88E+07	8.46E-02
Nb-88	1.28E+07	8.55E-02
Nb-88m	1.42E+07	5.15E-02
Nb-89l	2.46E+07	1.42E+00
Nb-89s	2.32E+07	7.26E-01
Nb-90	6.18E+06	2.59E+00
Nb-91	4.12E+06	7.12E+05
Nb-91m	1.77E+06	7.51E+01
Nb-92	2.83E+05	2.53E+09
Nb-92m	1.24E+07	8.88E+01
Nb-93m	4.50E+06	1.59E+04
Nb-94	1.65E+05	8.78E+05
Nb-94m	1.26E+10	3.93E+01
Nb-95	4.24E+06	1.08E+02
Nb-95m	9.12E+06	2.39E+01
Nb-96	7.93E+06	5.66E+00
Nb-97	5.78E+07	2.15E+00
Nb-97m	7.61E+07	3.92E-02
Nb-98	1.93E+07	5.16E-01
Nb-99	3.25E+08	4.27E-02
Nb-99m	7.00E+07	9.58E-02
Nd-134	1.16E+08	7.05E-01
Nd-135	4.04E+07	3.59E-01
Nd-136	8.80E+07	3.22E+00
Nd-137	4.18E+07	1.17E+00
Nd-138	3.19E+07	7.09E+00
Nd-139	1.21E+08	2.66E+00
Nd-139m	2.14E+07	5.22E+00
Nd-140	6.09E+06	2.20E+01
Nd-141	5.94E+08	6.66E+01
Nd-141m	7.30E+07	5.69E-02
Nd-144	4.03E+02	3.72E+14
Nd-147	3.35E+06	4.14E+01
Nd-149	5.66E+07	4.65E+00

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Nd-151	5.36E+07	5.35E-01
Nd-152	1.63E+08	1.50E+00
Ne-19	5.49E+04	1.59E-06
Ne-24	1.09E+05	4.70E-05
Ni-56	5.58E+06	1.46E+01
Ni-57	9.53E+06	6.25E+00
Ni-59	9.77E+06	1.21E+08
Ni-63	4.05E+06	6.85E+04
Ni-65	1.83E+07	9.54E-01
Ni-66	4.50E+06	5.17E+00
Np-231	4.50E+06	2.70E-01
Np-232	2.76E+07	5.00E-01
Np-233	6.12E+08	2.75E+01
Np-234	1.06E+07	8.33E+01
Np-235	1.29E+07	9.17E+03
Np-236l	1.01E+03	7.70E+04
Np-236s	9.00E+05	1.53E+00
Np-237	1.62E+02	2.30E+05
Np-238	2.26E+06	8.74E+00
Np-239	7.93E+06	3.42E+01
Np-240	2.90E+07	2.41E+00
Np-240m	1.67E+08	1.58E+00
Np-241	4.16E+08	7.42E+00
Np-242	2.03E+08	5.76E-01
Np-242m	6.50E+07	4.60E-01
O-14	1.66E+04	1.45E-06
O-15	5.50E+04	8.95E-06
O-19	5.88E+04	2.66E-06
Os-180	3.70E+08	7.80E+00
Os-181	3.33E+07	3.37E+00
Os-182	1.84E+07	2.35E+01
Os-183	2.70E+07	2.05E+01
Os-183m	2.59E+07	1.50E+01
Os-185	4.76E+06	6.34E+02
Os-186	1.80E+03	1.87E+15
Os-189m	1.53E+09	5.53E+02
Os-190m	3.56E+07	3.56E-01
Os-191	4.25E+06	9.56E+01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Os-191m	5.04E+07	4.00E+01
Os-193	1.53E+07	2.83E+01
Os-194	9.54E+04	3.11E+02
Os-196	1.05E+08	3.81E+00
P-30	1.09E+05	4.36E-05
P-32	4.77E+03	1.67E-02
P-33	1.08E+04	6.93E-02
Pa-227	1.01E+05	4.69E-03
Pa-228	1.08E+05	1.73E-01
Pa-229	1.04E+06	2.74E+00
Pa-230	1.07E+04	3.27E-01
Pa-231	5.79E+01	1.23E+03
Pa-232	8.00E+05	1.86E+00
Pa-233	2.06E+06	9.95E+01
Pa-234	1.19E+07	5.96E+00
Pa-234m	3.76E+09	5.47E+00
Pa-235	3.90E+08	1.19E+01
Pa-236	6.20E+07	7.08E-01
Pa-237	9.58E+07	1.05E+00
Pb-194	4.95E+07	6.12E-01
Pb-195m	3.15E+07	5.16E-01
Pb-196	8.73E+07	3.37E+00
Pb-197	3.79E+07	3.17E-01
Pb-197m	3.82E+07	1.72E+00
Pb-198	6.18E+07	9.37E+00
Pb-199	3.16E+07	3.01E+00
Pb-200	2.15E+07	2.95E+01
Pb-201	3.54E+07	2.14E+01
Pb-201m	1.66E+08	1.80E-01
Pb-202	6.76E+05	1.15E+08
Pb-202m	2.03E+07	4.74E+00
Pb-203	3.08E+07	1.04E+02
Pb-204m	2.54E+07	1.85E+00
Pb-205	9.54E+06	7.82E+10
Pb-209	1.33E+08	2.88E+01
Pb-210	1.45E+03	1.90E+01
Pb-211	6.75E+05	2.74E-02
Pb-212	4.27E+04	3.07E-02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Pb-214	5.39E+05	1.64E-02
Pd-100	9.39E+06	2.61E+01
Pd-101	7.51E+07	2.00E+01
Pd-103	1.80E+07	2.41E+02
Pd-107	1.37E+07	2.67E+10
Pd-109	2.19E+07	1.02E+01
Pd-109m	5.89E+08	1.60E+00
Pd-111	2.02E+08	2.79E+00
Pd-112	6.14E+06	4.61E+00
Pd-114	1.81E+09	2.66E+00
Pd-96	4.15E+07	4.31E-02
Pd-97	2.41E+07	3.86E-02
Pd-98	9.40E+07	8.66E-01
Pd-99	4.07E+07	4.58E-01
Pm-136	2.16E+07	2.79E-02
Pm-137m	3.37E+07	5.90E-02
Pm-139	6.30E+07	1.93E-01
Pm-140	5.48E+07	6.26E-03
Pm-140m	1.94E+07	8.61E-02
Pm-141	6.59E+07	1.03E+00
Pm-142	6.40E+07	3.26E-02
Pm-143	5.25E+06	1.52E+03
Pm-144	9.62E+05	3.85E+02
Pm-145	2.25E+06	1.62E+04
Pm-146	3.84E+05	8.67E+02
Pm-147	1.62E+06	1.75E+03
Pm-148	3.55E+06	2.16E+01
Pm-148m	1.35E+06	6.33E+01
Pm-149	1.11E+07	2.80E+01
Pm-150	2.35E+07	3.01E+00
Pm-151	1.60E+07	2.19E+01
Pm-152	1.86E+08	6.20E-01
Pm-152m	3.82E+07	2.32E-01
Pm-153	7.95E+08	3.39E+00
Pm-154	3.10E+07	4.38E-02
Pm-154m	3.18E+07	6.98E-02
Po-203	2.90E+06	1.15E-01
Po-204	1.32E+06	3.03E-01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Po-205	2.68E+06	3.15E-01
Po-206	1.14E+04	1.58E-01
Po-207	2.92E+06	1.13E+00
Po-208	1.09E+02	1.84E-01
Po-209	7.95E+01	4.74E+00
Po-210	1.89E+02	4.20E-02
Po-211	7.09E+08	6.85E-03
Po-212m	6.77E+07	5.74E-02
Po-213	1.58E+11	1.25E-05
Po-214	6.62E+10	2.06E-04
Po-215	3.21E+10	1.09E-03
Po-216	3.26E+11	9.36E-01
Po-218	6.03E+11	2.13E+03
Pr-134	1.77E+07	1.39E-01
Pr-134m	2.24E+07	2.71E-01
Pr-135	5.74E+07	9.89E-01
Pr-136	2.51E+07	2.38E-01
Pr-137	8.83E+07	4.93E+00
Pr-138	6.89E+07	7.33E-02
Pr-138m	1.86E+07	1.71E+00
Pr-139	2.28E+08	4.56E+01
Pr-140	1.11E+08	2.79E-01
Pr-142	1.45E+07	1.26E+01
Pr-142m	1.16E+09	1.28E+01
Pr-143	3.38E+06	5.01E+01
Pr-144	3.40E+08	4.50E+00
Pr-144m	9.69E+09	5.34E+01
Pr-145	4.71E+07	1.30E+01
Pr-146	4.42E+07	8.29E-01
Pr-147	5.69E+07	6.05E-01
Pr-148	5.60E+07	1.01E-01
Pr-148m	6.18E+07	9.78E-02
Pt-184	6.69E+07	1.13E+00
Pt-186	5.84E+07	6.93E+00
Pt-187	4.98E+07	6.99E+00
Pt-188	1.82E+07	2.67E+02
Pt-189	9.84E+07	6.45E+01
Pt-190	1.45E+03	5.02E+11

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Pt-191	5.40E+07	2.21E+02
Pt-193	3.86E+08	1.04E+07
Pt-193m	6.69E+07	4.28E+02
Pt-195m	4.30E+07	2.58E+02
Pt-197	9.21E+07	1.06E+02
Pt-197m	2.35E+08	2.33E+01
Pt-199	1.97E+08	6.42E+00
Pt-200	3.56E+07	2.84E+01
Pt-202	3.10E+06	8.80E+00
Pu-232	3.13E+05	1.30E-02
Pu-234	3.38E+05	2.22E-01
Pu-235	6.11E+08	1.93E+01
Pu-236	2.03E+02	3.82E-01
Pu-237	2.05E+07	1.68E+03
Pu-238	7.37E+01	4.31E+00
Pu-239	6.76E+01	1.09E+03
Pu-240	6.76E+01	2.97E+02
Pu-241	3.53E+03	3.42E+01
Pu-242	7.37E+01	1.88E+04
Pu-243	9.10E+07	3.50E+01
Pu-244	7.37E+01	4.16E+06
Pu-245	1.66E+07	1.36E+01
Pu-246	1.01E+06	2.07E+01
Ra-219	3.67E+08	7.12E-05
Ra-220	1.31E+10	4.56E-03
Ra-221	1.84E+09	1.01E+00
Ra-222	6.16E+09	4.60E+00
Ra-223	9.32E+02	1.82E-02
Ra-224	2.38E+03	1.50E-02
Ra-225	1.05E+03	2.69E-02
Ra-226	8.53E+02	8.63E+02
Ra-227	1.68E+07	8.57E-01
Ra-228	5.07E+02	1.86E+00
Ra-230	5.59E+07	6.36E+00
Rb-77	3.81E+07	5.77E-02
Rb-78	1.25E+07	9.17E-02
Rb-78m	1.78E+07	4.23E-02
Rb-79	3.84E+07	3.69E-01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Rb-80	4.45E+07	1.07E-02
Rb-81	6.60E+07	7.81E+00
Rb-81m	1.07E+09	1.48E+01
Rb-82	5.10E+07	2.89E-02
Rb-82m	1.50E+07	2.44E+00
Rb-83	1.06E+07	5.83E+02
Rb-84	7.15E+06	1.51E+02
Rb-84m	1.34E+08	1.21E+00
Rb-86	8.59E+06	1.05E+02
Rb-86m	1.11E+08	5.15E-02
Rb-87	1.62E+07	1.85E+14
Rb-88	6.94E+07	5.78E-01
Rb-89	2.44E+07	1.76E-01
Rb-90	2.50E+07	3.15E-02
Rb-90m	1.66E+07	3.41E-02
Re-177	7.89E+07	1.04E+00
Re-178	4.12E+07	5.15E-01
Re-179	5.06E+07	9.39E-01
Re-180	4.73E+07	1.10E-01
Re-181	2.26E+07	2.60E+01
Re-182l	5.50E+06	2.04E+01
Re-182s	2.17E+07	1.60E+01
Re-183	2.05E+06	2.01E+02
Re-184	4.00E+06	2.14E+02
Re-184m	1.24E+06	2.88E+02
Re-186	7.35E+06	3.95E+01
Re-186m	6.76E+05	7.03E+07
Re-187	1.29E+09	3.37E+16
Re-188	1.48E+07	1.51E+01
Re-188m	3.68E+08	6.83E+00
Re-189	1.84E+07	2.70E+01
Re-190	4.47E+07	1.40E-01
Re-190m	2.20E+07	4.28E+00
Rh-100	1.05E+07	6.96E+00
Rh-100m	1.33E+09	3.25E+00
Rh-101	1.49E+06	1.35E+03
Rh-101m	3.21E+07	1.08E+02
Rh-102	4.68E+05	3.87E+02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Rh-102m	1.13E+06	1.83E+02
Rh-103m	2.97E+09	9.13E+01
Rh-104	1.93E+09	7.52E-01
Rh-104m	2.96E+09	7.09E+00
Rh-105	2.25E+07	2.66E+01
Rh-106	2.60E+08	7.29E-02
Rh-106m	1.50E+07	1.11E+00
Rh-107	1.31E+08	1.61E+00
Rh-108	1.68E+08	2.70E-02
Rh-109	1.96E+08	1.51E-01
Rh-94	1.49E+07	8.78E-03
Rh-95	2.23E+07	5.66E-02
Rh-95m	6.30E+07	6.23E-02
Rh-96	1.49E+07	7.54E-02
Rh-96m	4.48E+07	3.45E-02
Rh-97	3.58E+07	5.67E-01
Rh-97m	2.31E+07	5.50E-01
Rh-98	3.24E+07	1.47E-01
Rh-99	8.49E+06	1.03E+02
Rh-99m	5.85E+07	8.67E+00
Rn-207	6.13E+04	6.24E-04
Rn-209	4.94E+04	1.57E-03
Rn-210	2.13E+05	3.42E-02
Rn-211	3.14E+04	3.08E-02
Rn-212	1.96E+05	5.28E-03
Rn-215	1.42E+05	6.24E-12
Rn-216	1.53E+05	1.32E-10
Rn-217	1.59E+05	1.65E-09
Rn-218	7.40E+07	5.01E-05
Rn-219	1.01E+06	7.75E-05
Rn-220	1.46E+08	1.58E-01
Rn-222	1.42E+08	9.20E+02
Rn-223	1.73E+05	4.99E-03
Ru-103	2.64E+05	8.18E+00
Ru-105	2.76E+06	4.10E-01
Ru-106	1.23E+04	3.67E+00
Ru-107	1.60E+07	3.41E-02
Ru-108	9.26E+07	2.42E-01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Ru-92	2.86E+06	5.11E-03
Ru-94	6.13E+06	1.59E-01
Ru-95	3.63E+06	1.81E-01
Ru-97	5.31E+06	1.14E+01
S-35	8.53E+03	2.00E-01
S-37	3.51E+04	3.49E-05
S-38	2.67E+04	9.19E-04
Sb-111	4.00E+07	2.95E-02
Sb-113	4.73E+07	1.90E-01
Sb-114	2.13E+07	4.50E-02
Sb-115	5.65E+07	1.10E+00
Sb-116	2.41E+07	2.34E-01
Sb-116m	1.58E+07	5.86E-01
Sb-117	1.98E+08	2.07E+01
Sb-118	7.40E+07	1.67E-01
Sb-118m	1.62E+07	3.04E+00
Sb-119	2.21E+08	3.20E+02
Sb-120s	1.14E+08	1.15E+00
Sb-120l	5.53E+06	2.93E+01
Sb-122	6.97E+06	1.76E+01
Sb-122m	1.53E+09	4.15E+00
Sb-124	9.14E+05	5.22E+01
Sb-124ms	1.59E+08	1.62E-01
Sb-124ml	1.37E+09	1.83E+01
Sb-125	6.72E+05	6.51E+02
Sb-126	2.25E+06	2.68E+01
Sb-126m	3.31E+07	4.21E-01
Sb-127	4.05E+06	1.52E+01
Sb-128l	9.29E+06	3.42E+00
Sb-128s	2.65E+07	1.88E-01
Sb-129	1.75E+07	3.10E+00
Sb-130	1.52E+07	4.20E-01
Sb-130m	2.15E+07	9.34E-02
Sb-131	2.49E+07	3.99E-01
Sb-133	2.03E+07	3.59E-02
Sc-42m	1.37E+07	3.15E-03
Sc-43	3.03E+07	1.62E+00
Sc-44	1.64E+07	9.02E-01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Sc-44m	5.63E+06	4.63E+00
Sc-46	1.14E+06	3.37E+01
Sc-47	1.09E+07	1.31E+01
Sc-48	5.05E+06	3.38E+00
Sc-49	2.00E+08	2.99E+00
Sc-50	1.76E+07	7.97E-03
Se-70	3.72E+06	5.67E-02
Se-71	3.65E+06	6.53E-03
Se-72	1.95E+05	9.01E-01
Se-73	2.22E+06	3.70E-01
Se-73m	1.42E+07	2.15E-01
Se-75	5.98E+05	4.11E+01
Se-77m	6.71E+07	7.98E-03
Se-79	1.19E+05	1.71E+06
Se-79m	7.51E+08	1.24E+00
Se-81	4.89E+07	3.90E-01
Se-81m	1.53E+07	3.78E-01
Se-83	2.04E+06	2.03E-02
Se-83m	5.65E+06	2.91E-03
Se-84	1.42E+07	1.97E-02
Si-31	1.02E+08	2.65E+00
Si-32	7.37E+04	2.97E+03
Sm-139	4.07E+07	7.73E-02
Sm-140	7.04E+07	7.77E-01
Sm-141	3.67E+07	2.80E-01
Sm-141m	2.51E+07	4.25E-01
Sm-142	9.84E+07	5.39E+00
Sm-143	1.15E+08	7.62E-01
Sm-143m	8.69E+07	7.27E-02
Sm-145	5.05E+06	1.91E+03
Sm-146	7.37E+02	3.10E+07
Sm-147	8.45E+02	3.68E+10
Sm-148	3.86E+02	1.12E+15
Sm-151	2.03E+06	7.70E+04
Sm-153	1.27E+07	2.90E+01
Sm-155	2.62E+08	4.77E+00
Sm-156	3.43E+07	1.60E+01
Sm-157	1.42E+08	9.48E-01

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Sn-106	5.01E+07	5.41E-02
Sn-108	7.89E+07	4.66E-01
Sn-109	2.46E+07	2.57E-01
Sn-110	4.03E+07	5.66E+00
Sn-111	9.37E+07	1.95E+00
Sn-113	3.00E+06	2.99E+02
Sn-113m	1.48E+09	1.90E+01
Sn-117m	3.35E+06	4.08E+01
Sn-119m	3.69E+06	9.83E+02
Sn-121	3.53E+07	3.68E+01
Sn-121m	1.80E+06	3.35E+04
Sn-123	1.00E+06	1.22E+02
Sn-123m	1.74E+08	4.55E+00
Sn-125	2.58E+06	2.38E+01
Sn-125m	1.69E+08	1.07E+00
Sn-126	2.90E+05	1.02E+07
Sn-127	1.94E+07	1.65E+00
Sn-127m	1.01E+08	2.82E-01
Sn-128	4.46E+07	1.79E+00
Sn-129	5.68E+07	8.68E-02
Sn-130	6.50E+07	1.67E-01
Sn-130m	6.44E+07	7.56E-02
Sr-79	5.01E+07	4.74E-02
Sr-80	5.79E+07	2.46E+00
Sr-81	3.42E+07	3.75E-01
Sr-82	7.37E+05	1.16E+01
Sr-83	1.78E+07	1.53E+01
Sr-85	9.19E+06	3.87E+02
Sr-85m	2.26E+08	7.11E+00
Sr-87m	1.22E+08	9.47E+00
Sr-89	1.03E+06	3.53E+01
Sr-90	5.07E+04	3.71E+02
Sr-91	1.58E+07	4.35E+00
Sr-92	1.87E+07	1.49E+00
Sr-93	2.53E+07	9.27E-02
Sr-94	3.91E+07	2.45E-02
Ta-170	5.54E+07	3.38E-01
Ta-172	3.09E+07	1.04E+00

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Ta-173	4.21E+07	8.48E+00
Ta-174	6.14E+07	4.09E+00
Ta-175	3.04E+07	1.78E+01
Ta-176	1.54E+07	6.98E+00
Ta-177	6.90E+07	2.20E+02
Ta-178s	5.86E+08	5.17E+00
Ta-178l	3.85E+07	4.81E+00
Ta-179	1.44E+07	1.31E+04
Ta-180	3.11E+05	1.57E+15
Ta-180m	1.65E+08	7.68E+01
Ta-182	7.96E+05	1.27E+02
Ta-182m	1.49E+08	2.29E+00
Ta-183	3.79E+06	2.71E+01
Ta-184	1.22E+07	6.24E+00
Ta-185	1.09E+08	5.27E+00
Ta-186	3.32E+07	3.45E-01
Tb-146	1.55E+07	4.62E-03
Tb-147	2.62E+07	2.03E+00
Tb-147m	2.97E+07	4.34E-02
Tb-148	1.95E+07	9.20E-01
Tb-148m	1.90E+07	3.29E-02
Tb-149	1.58E+06	3.11E-01
Tb-149m	4.36E+07	1.44E-01
Tb-150	2.27E+07	3.55E+00
Tb-150m	2.41E+07	1.12E-01
Tb-151	2.28E+07	1.93E+01
Tb-151m	8.45E+08	2.82E-01
Tb-152	1.37E+07	1.16E+01
Tb-152m	8.24E+07	2.80E-01
Tb-153	3.69E+07	1.01E+02
Tb-154	1.12E+07	1.18E+01
Tb-155	3.43E+07	2.16E+02
Tb-156	5.52E+06	3.52E+01
Tb-156ml	3.82E+07	4.64E+01
Tb-156ms	8.42E+07	2.09E+01
Tb-157	6.76E+06	4.45E+05
Tb-158	1.76E+05	1.17E+04
Tb-160	1.13E+06	1.00E+02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Tb-161	6.22E+06	5.30E+01
Tb-162	5.36E+07	3.51E-01
Tb-163	6.46E+07	1.09E+00
Tb-164	2.37E+07	6.20E-02
Tb-165	6.69E+07	1.24E-01
Tc-101	1.34E+08	1.02E+00
Tc-102	4.62E+08	2.20E-02
Tc-102m	2.29E+07	5.40E-02
Tc-104	2.44E+07	2.46E-01
Tc-105	7.17E+07	3.04E-01
Tc-91	2.25E+07	3.42E-02
Tc-91m	4.10E+07	6.53E-02
Tc-92	1.51E+07	3.14E-02
Tc-93	3.16E+07	2.58E+00
Tc-93m	6.29E+07	1.35E+00
Tc-94	1.56E+07	2.28E+00
Tc-94m	2.52E+07	6.55E-01
Tc-95	3.60E+07	2.18E+01
Tc-95m	6.25E+06	2.77E+02
Tc-96	7.61E+06	2.39E+01
Tc-96m	5.70E+08	1.50E+01
Tc-97	4.50E+06	3.17E+09
Tc-97m	1.98E+06	1.28E+02
Tc-98	1.79E+05	2.06E+08
Tc-99	6.24E+05	3.68E+07
Tc-99m	2.15E+08	4.09E+01
Te-113	2.57E+06	2.63E-03
Te-114	3.76E+06	3.46E-02
Te-115	2.57E+06	9.12E-03
Te-115m	2.22E+06	9.07E-03
Te-116	6.94E+06	6.39E-01
Te-117	3.16E+06	1.22E-01
Te-118	2.75E+05	1.49E+00
Te-119	3.45E+06	2.10E+00
Te-119m	8.62E+05	3.69E+00
Te-121	1.37E+06	2.16E+01
Te-121m	1.42E+05	2.02E+01
Te-123	6.76E+04	2.32E+14

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Te-123m	1.58E+05	1.78E+01
Te-125m	1.93E+05	1.07E+01
Te-127	5.76E+06	2.18E+00
Te-127m	8.27E+04	8.76E+00
Te-129	1.72E+07	8.19E-01
Te-129m	1.03E+05	3.40E+00
Te-131	6.28E+06	1.09E-01
Te-131m	3.11E+05	3.89E-01
Te-132	1.58E+05	5.20E-01
Te-133	4.18E+06	3.68E-02
Te-133m	1.44E+06	5.65E-02
Te-134	3.84E+06	1.14E-01
Th-223	9.72E+08	1.15E-02
Th-224	2.77E+09	5.78E-02
Th-226	1.33E+05	4.94E-03
Th-227	8.11E+02	2.64E-02
Th-228	2.03E+02	2.47E-01
Th-229	3.38E+01	1.59E+02
Th-230	8.11E+01	4.02E+03
Th-231	2.45E+07	4.60E+01
Th-232	7.37E+01	6.72E+08
Th-233	3.05E+08	8.43E+00
Th-234	1.05E+06	4.55E+01
Th-235	9.22E+08	8.19E+00
Th-236	1.12E+08	5.29E+00
Ti-44	6.76E+04	3.93E+02
Ti-45	3.71E+07	1.64E+00
Ti-51	1.58E+08	2.47E-01
Ti-52	4.70E+08	2.21E-01
Tl-190	4.55E+07	1.20E-01
Tl-190m	2.43E+07	9.10E-02
Tl-194	7.03E+07	2.39E+00
Tl-194m	2.30E+07	7.79E-01
Tl-195	3.95E+07	2.85E+00
Tl-196	2.61E+07	3.00E+00
Tl-197	1.13E+08	2.01E+01
Tl-198	2.23E+07	7.48E+00
Tl-198m	3.90E+07	4.61E+00

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Tl-199	1.53E+08	7.22E+01
Tl-200	2.51E+07	4.19E+01
Tl-201	1.47E+08	6.86E+02
Tl-202	3.17E+07	6.01E+02
Tl-204	2.08E+07	4.48E+04
Tl-206	4.02E+10	1.85E+02
Tl-206m	2.48E+07	1.02E-01
Tl-207	1.67E+10	8.76E+01
Tl-208	1.53E+07	5.19E-02
Tl-209	2.65E+07	6.48E-02
Tl-210	2.05E+07	2.97E-02
Tm-161	3.91E+07	1.01E+00
Tm-162	2.83E+07	5.29E-01
Tm-163	3.58E+07	3.37E+00
Tm-164	7.57E+07	1.32E-01
Tm-165	2.34E+07	3.71E+01
Tm-166	1.80E+07	7.34E+00
Tm-167	7.25E+06	8.57E+01
Tm-168	1.41E+06	1.68E+02
Tm-170	1.16E+06	1.94E+02
Tm-171	5.79E+06	5.32E+03
Tm-172	6.92E+06	2.41E+01
Tm-173	3.44E+07	1.57E+01
Tm-174	3.36E+07	1.68E-01
Tm-175	4.72E+07	6.67E-01
Tm-176	2.88E+07	4.98E-02
U-227	5.57E+08	7.40E-01
U-228	1.70E+10	1.88E+02
U-230	5.07E+02	1.86E-02
U-231	1.53E+07	1.14E+02
U-232	2.19E+02	1.02E+01
U-233	8.45E+02	8.73E+04
U-234	8.63E+02	1.38E+05
U-235	9.54E+02	4.41E+08
U-235m	8.84E+12	2.87E+05
U-236	9.32E+02	1.44E+07
U-237	4.23E+06	5.18E+01
U-238	1.01E+03	3.02E+09

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
U-239	2.66E+08	7.95E+00
U-240	1.40E+07	1.51E+01
U-242	2.06E+08	4.45E+00
V-47	4.69E+07	3.82E-01
V-48	2.86E+06	1.71E+01
V-49	2.38E+08	2.95E+04
V-50	1.21E+05	2.53E+18
V-52	3.83E+07	3.96E-02
V-53	5.48E+07	2.49E-02
W-176	1.31E+08	1.69E+01
W-177	5.34E+07	6.79E+00
W-178	1.10E+08	3.27E+03
W-179	1.26E+09	4.51E+01
W-179m	1.36E+09	8.27E+00
W-181	2.60E+08	4.36E+04
W-185	6.76E+07	7.19E+03
W-185m	2.90E+09	4.55E+00
W-187	3.14E+07	4.47E+01
W-188	1.42E+07	1.42E+03
W-190	7.90E+07	2.39E+00
Xe-120	1.39E+05	3.55E-03
Xe-121	2.96E+04	7.63E-04
Xe-122	1.10E+06	8.59E-01
Xe-123	8.92E+04	7.28E-03
Xe-125	2.27E+05	1.54E-01
Xe-127	2.16E+05	7.65E+00
Xe-127m	4.11E+05	3.20E-04
Xe-129m	2.55E+06	2.01E+01
Xe-131m	6.95E+06	8.29E+01
Xe-133	1.73E+06	9.25E+00
Xe-133m	1.97E+06	4.39E+00
Xe-135	2.27E+05	8.89E-02
Xe-135m	1.32E+05	1.45E-03
Xe-137	2.60E+05	7.22E-04
Xe-138	4.68E+04	4.87E-04
Y-81	5.05E+07	2.55E-02
Y-83	4.39E+07	1.37E-01
Y-83m	7.17E+07	9.01E-02

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Y-84m	1.29E+07	2.28E-01
Y-85	3.10E+07	2.25E+00
Y-85m	2.08E+07	2.74E+00
Y-86	8.05E+06	3.25E+00
Y-86m	1.36E+08	2.97E+00
Y-87	1.78E+07	3.97E+01
Y-87m	3.93E+07	1.46E+01
Y-88	1.69E+06	1.21E+02
Y-89m	6.50E+07	8.02E-03
Y-90	5.40E+06	9.92E+00
Y-90m	4.26E+07	3.90E+00
Y-91	9.11E+05	3.71E+01
Y-91m	9.27E+07	2.23E+00
Y-92	3.70E+07	3.84E+00
Y-93	1.87E+07	5.59E+00
Y-94	4.12E+07	3.93E-01
Y-95	5.08E+07	2.74E-01
Yb-162	2.62E+08	4.26E+00
Yb-163	7.45E+07	7.13E-01
Yb-164	1.40E+08	9.25E+00
Yb-165	1.97E+08	1.71E+00
Yb-166	1.04E+07	3.13E+01
Yb-167	2.05E+08	3.18E+00
Yb-169	2.67E+06	1.11E+02
Yb-175	1.10E+07	6.19E+01
Yb-177	8.39E+07	9.00E+00
Yb-178	1.01E+08	7.10E+00
Yb-179	6.14E+07	4.68E-01
Zn-60	3.91E+07	2.97E-02
Zn-61	3.74E+07	1.80E-02
Zn-62	1.32E+07	2.42E+00
Zn-63	4.12E+07	5.26E-01
Zn-65	3.55E+06	4.30E+02
Zn-69	2.89E+08	6.04E+00
Zn-69m	2.46E+07	7.44E+00
Zn-71	1.78E+08	1.64E-01
Zn-71m	2.11E+07	1.87E+00
Zn-72	6.14E+06	6.55E+00

Table A.2 HC-2 TQs Using Maximum Inhalation DCs (continued)		
MASTER ISOTOPE LIST	**Activity (Ci)**	**Mass (g)**
Zr-85	4.01E+07	1.42E-01
Zr-86	1.73E+07	7.83E+00
Zr-87	3.46E+07	1.61E+00
Zr-88	2.22E+06	1.25E+02
Zr-89	1.13E+07	2.50E+01
Zr-89m	9.38E+07	1.85E-01
Zr-93	3.24E+05	1.29E+08
Zr-95	1.35E+06	6.28E+01
Zr-97	8.56E+06	4.47E+00

APPENDIX B. CALCULATION OF HAZARD CATEGORY 2 THRESHOLD QUANTITIES USING RECOMMENDED DOSE COEFFICIENTS

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APPENDIX B. CALCULATION OF HAZARD CATEGORY 2 THRESHOLD QUANTITIES USING RECOMMENDED DOSE COEFFICIENTS

This appendix contains the following tables:

- Table B.1: Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs
- Table B.2: HC-2 TQs Using Recommended Inhalation DCs

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Ac-223	Ac-223	223.019	Actinium	1.00E-03	ICRP-38	2.20E+00	m	1.32E+02	3.83E+08	--	--	--	--	FGR-12	2.07E-16
Ac-224	Ac-224	224.022	Actinium	1.00E-03	ICRP-38	2.90E+00	h	1.04E+04	4.82E+06	ICRP-72	1.30E-07	S	Max	FGR-12	9.00E-15
Ac-225	Ac-225	225.023	Actinium	1.00E-03	ICRP-38	1.00E+01	d	8.64E+05	5.80E+04	ICRP-72	8.50E-06	S	Max	FGR-12	7.21E-16
Ac-226	Ac-226	226.026	Actinium	1.00E-03	ICRP-38	2.90E+01	h	1.04E+05	4.78E+05	ICRP-72	1.30E-06	S	Max	FGR-12	6.03E-15
Ac-227	Ac-227	227.028	Actinium	1.00E-03	ICRP-38	2.18E+01	y	6.87E+08	7.23E+01	ICRP-72	5.50E-04	F	Max	FGR-12	5.82E-18
Ac-228	Ac-228	228.031	Actinium	1.00E-03	ICRP-38	6.13E+00	h	2.21E+04	2.24E+06	ICRP-72	2.50E-08	F	Max	FGR-12	4.78E-14
Ac-229	Ac-229	229.033	Actinium	1.00E-03	JAERI	6.27E+01	m	3.76E+03	1.31E+07	JAERI	3.50E-11	M	Max	--	--
Ac-230	Ac-230	230.036	Actinium	1.00E-03	ICRP-107	1.22E+02	s	1.22E+02	4.02E+08	--	--	--	--	DOE-STD-1196	2.66E-14
Ac-231	Ac-231	231.038	Actinium	1.00E-03	ICRP-107	7.50E+00	m	4.50E+02	1.09E+08	--	--	--	--	DOE-STD-1196	1.84E-14
Ac-232	Ac-232	232.042	Actinium	1.00E-03	ICRP-107	1.19E+02	s	1.19E+02	4.09E+08	--	--	--	--	DOE-STD-1196	5.65E-14
Ac-233	Ac-233	233.044	Actinium	1.00E-03	ICRP-107	1.45E+02	s	1.45E+02	3.34E+08	--	--	--	--	DOE-STD-1196	2.29E-14
Ag-100m	Ag-100	99.916	Silver	1.00E-03	ICRP-107	2.24E+00	m	1.34E+02	8.40E+08	--	--	--	--	DOE-STD-1196	1.33E-13
Ag-101	Ag-101	100.913	Silver	1.00E-03	ICRP-107	1.11E+01	m	6.66E+02	1.68E+08	DOE-STD-1196	1.60E-11	M	Rec	DOE-STD-1196	7.19E-14
Ag-102	Ag-102	101.912	Silver	1.00E-03	ICRP-38	1.29E+01	m	7.74E+02	1.43E+08	ICRP-72	1.70E-11	M	Rec	FGR-12	1.67E-13
Ag-102m	Ag-102	101.912	Silver	1.00E-03	ICRP-107	7.70E+00	m	4.62E+02	2.40E+08	--	--	--	--	DOE-STD-1196	9.72E-14
Ag-103	Ag-103	102.909	Silver	1.00E-03	ICRP-38	6.57E+01	m	3.94E+03	2.78E+07	ICRP-72	2.60E-11	M	Rec	FGR-12	3.68E-14
Ag-104	Ag-104	103.909	Silver	1.00E-03	ICRP-38	6.92E+01	m	4.15E+03	2.61E+07	ICRP-72	3.60E-11	M	Rec	FGR-12	1.32E-13
Ag-104m	Ag-104	103.909	Silver	1.00E-03	ICRP-38	3.35E+01	m	2.01E+03	5.40E+07	ICRP-72	2.50E-11	M	Rec	FGR-12	5.82E-14
Ag-105	Ag-105	104.907	Silver	1.00E-03	ICRP-38	4.10E+01	d	3.54E+06	3.04E+04	ICRP-72	7.30E-10	M	Rec	FGR-12	2.45E-14
Ag-105m	Ag-105	104.907	Silver	1.00E-03	ICRP-107	7.23E+00	m	4.34E+02	2.48E+08	--	--	--	--	DOE-STD-1196	4.42E-17
Ag-106	Ag-106	105.907	Silver	1.00E-03	ICRP-38	2.40E+01	m	1.44E+03	7.41E+07	ICRP-72	1.50E-11	M	Rec	FGR-12	3.39E-14
Ag-106m	Ag-106	105.907	Silver	1.00E-03	ICRP-38	8.41E+00	d	7.27E+05	1.47E+05	ICRP-72	1.10E-09	M	Rec	FGR-12	1.38E-13
Ag-108	Ag-108	107.906	Silver	1.00E-03	ICRP-38	2.37E+00	m	1.42E+02	7.35E+08	--	--	--	--	FGR-12	9.28E-16
Ag-108m	Ag-108	107.906	Silver	1.00E-03	ICRP-38	1.27E+02	y	4.01E+09	2.61E+01	ICRP-72	7.40E-09	M	Rec	FGR-12	7.80E-14
Ag-109m	Ag-109	108.905	Silver	1.00E-03	ICRP-38	3.96E+01	s	3.96E+01	2.62E+09	--	--	--	--	FGR-12	1.92E-16
Ag-110	Ag-110	109.906	Silver	1.00E-03	ICRP-38	2.46E+01	s	2.46E+01	4.17E+09	--	--	--	--	FGR-12	1.78E-15
Ag-110m	Ag-110	109.906	Silver	1.00E-03	ICRP-38	2.50E+02	d	2.16E+07	4.75E+03	ICRP-72	7.60E-09	M	Rec	FGR-12	1.36E-13
Ag-111	Ag-111	110.905	Silver	1.00E-03	ICRP-38	7.45E+00	d	6.44E+05	1.58E+05	ICRP-72	1.50E-09	M	Rec	FGR-12	1.29E-15
Ag-111m	Ag-111	110.905	Silver	1.00E-03	ICRP-107	6.48E+01	s	6.48E+01	1.57E+09	--	--	--	--	DOE-STD-1196	1.68E-16
Ag-112	Ag-112	111.907	Silver	1.00E-03	ICRP-38	3.12E+00	h	1.12E+04	8.98E+06	ICRP-72	1.60E-10	M	Rec	FGR-12	3.34E-14
Ag-113	Ag-113	112.907	Silver	1.00E-03	ICRP-107	5.37E+00	h	1.93E+04	5.17E+06	DOE-STD-1196	1.83E-10	M	Rec	DOE-STD-1196	3.83E-15
Ag-113m	Ag-113	112.907	Silver	1.00E-03	ICRP-107	6.87E+01	s	6.87E+01	1.45E+09	--	--	--	--	DOE-STD-1196	9.55E-15
Ag-114	Ag-114	113.909	Silver	1.00E-03	ICRP-107	4.60E+00	s	4.60E+00	2.15E+10	--	--	--	--	DOE-STD-1196	1.46E-14
Ag-115	Ag-115	114.909	Silver	1.00E-03	ICRP-38	2.00E+01	m	1.20E+03	8.18E+07	ICRP-72	2.70E-11	M	Rec	FGR-12	3.61E-14
Ag-116	Ag-116	115.911	Silver	1.00E-03	ICRP-107	2.68E+00	m	1.61E+02	6.05E+08	--	--	--	--	DOE-STD-1196	1.07E-13
Ag-117	Ag-117	116.912	Silver	1.00E-03	ICRP-107	7.36E+01	s	7.36E+01	1.31E+09	--	--	--	--	DOE-STD-1196	6.50E-14
Ag-99	Ag-99	98.918	Silver	1.00E-03	ICRP-107	1.24E+02	s	1.24E+02	9.20E+08	--	--	--	--	DOE-STD-1196	1.08E-13
Al-26	Al-26	25.987	Aluminum	1.00E-03	ICRP-38	7.16E+05	y	2.26E+13	1.92E-02	ICRP-72	2.00E-08	M	Max	FGR-12	1.36E-13
Al-28	Al-28	27.982	Aluminum	1.00E-03	ICRP-38	2.24E+00	m	1.34E+02	3.00E+09	--	--	--	--	FGR-12	9.28E-14
Al-29	Al-29	28.980	Aluminum	1.00E-03	ICRP-107	6.56E+00	m	3.94E+02	9.89E+08	--	--	--	--	DOE-STD-1196	6.71E-14
Am-237	Am-237	237.050	Americium	1.00E-03	ICRP-38	7.30E+01	m	4.38E+03	1.09E+07	ICRP-72	2.50E-11	M	Rec	FGR-12	1.70E-14
Am-238	Am-238	238.052	Americium	1.00E-03	ICRP-38	9.80E+01	m	5.88E+03	8.06E+06	ICRP-72	9.00E-11	M	Rec	FGR-12	4.33E-14
Am-239	Am-239	239.053	Americium	1.00E-03	ICRP-38	1.19E+01	h	4.28E+04	1.10E+06	ICRP-72	2.20E-10	M	Rec	FGR-12	1.04E-14
Am-240	Am-240	240.055	Americium	1.00E-03	ICRP-38	5.08E+01	h	1.83E+05	2.57E+05	ICRP-72	4.30E-10	M	Rec	FGR-12	5.00E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Am-241	Am-241	241.057	Americium	1.00E-03	ICRP-38	4.32E+02	y	1.36E+10	3.43E+00	ICRP-72	4.20E-05	M	Rec	FGR-12	8.18E-16
Am-242	Am-242	242.060	Americium	1.00E-03	ICRP-38	1.60E+01	h	5.77E+04	8.08E+05	ICRP-72	1.70E-08	M	Rec	FGR-12	6.15E-16
Am-242m	Am-242	242.060	Americium	1.00E-03	ICRP-38	1.52E+02	y	4.80E+09	9.72E+00	ICRP-72	3.70E-05	M	Rec	FGR-12	3.17E-17
Am-243	Am-243	243.061	Americium	1.00E-03	ICRP-38	7.38E+03	y	2.33E+11	1.99E-01	ICRP-72	4.10E-05	M	Rec	FGR-12	2.18E-15
Am-244	Am-244	244.064	Americium	1.00E-03	ICRP-38	1.01E+01	h	3.64E+04	1.27E+06	ICRP-72	2.00E-09	M	Rec	FGR-12	3.85E-14
Am-244m	Am-244	244.064	Americium	1.00E-03	ICRP-38	2.60E+01	m	1.56E+03	2.96E+07	ICRP-72	8.40E-11	M	Rec	FGR-12	6.13E-17
Am-245	Am-245	245.066	Americium	1.00E-03	ICRP-38	2.05E+00	h	7.38E+03	6.24E+06	ICRP-72	5.30E-11	M	Rec	FGR-12	1.46E-15
Am-246	Am-246	246.070	Americium	1.00E-03	ICRP-38	3.90E+01	m	2.34E+03	1.96E+07	ICRP-72	6.60E-11	M	Rec	FGR-12	3.28E-14
Am-246m	Am-246	246.070	Americium	1.00E-03	ICRP-38	2.50E+01	m	1.50E+03	3.06E+07	ICRP-72	2.20E-11	M	Rec	FGR-12	5.03E-14
Am-247	Am-247	247.072	Americium	1.00E-03	ICRP-107	2.30E+01	m	1.38E+03	3.31E+07	DOE-STD-1196	3.02E-11	M	Rec	DOE-STD-1196	5.85E-15
Ar-37	Ar-37	36.967	Argon	1.00E+00	ICRP-38	3.50E+01	d	3.03E+06	1.01E+05	--	--	--	--	FGR-12	1.27E-19
Ar-39	Ar-39	38.964	Argon	1.00E+00	ICRP-38	2.69E+02	y	8.49E+09	3.41E+01	--	--	--	--	FGR-12	9.10E-18
Ar-41	Ar-41	40.965	Argon	1.00E+00	ICRP-38	1.83E+00	h	6.58E+03	4.19E+07	--	--	--	--	FGR-12	6.50E-14
Ar-42	Ar-42	41.963	Argon	1.00E+00	ICRP-107	3.29E+01	y	1.04E+09	2.59E+02	--	--	--	--	DOE-STD-1196	1.26E-16
Ar-43	Ar-43	42.966	Argon	1.00E+00	ICRP-107	5.37E+00	m	3.22E+02	8.15E+08	--	--	--	--	DOE-STD-1196	7.55E-14
Ar-44	Ar-44	43.965	Argon	1.00E+00	ICRP-107	1.19E+01	m	7.12E+02	3.60E+08	--	--	--	--	DOE-STD-1196	9.46E-14
As-68	As-68	67.937	Arsenic	1.00E-03	ICRP-107	1.52E+02	s	1.52E+02	1.10E+09	--	--	--	--	DOE-STD-1196	1.76E-13
As-69	As-69	68.932	Arsenic	1.00E-03	ICRP-38	1.52E+01	m	9.12E+02	1.79E+08	ICRP-72	2.10E-11	M	Max	FGR-12	4.89E-14
As-70	As-70	69.931	Arsenic	1.00E-03	ICRP-38	5.26E+01	m	3.16E+03	5.11E+07	ICRP-72	6.70E-11	M	Max	FGR-12	2.04E-13
As-71	As-71	70.927	Arsenic	1.00E-03	ICRP-38	6.48E+01	h	2.33E+05	6.82E+05	ICRP-72	4.00E-10	M	Max	FGR-12	2.74E-14
As-72	As-72	71.927	Arsenic	1.00E-03	ICRP-38	2.60E+01	h	9.36E+04	1.68E+06	ICRP-72	9.00E-10	M	Max	FGR-12	8.78E-14
As-73	As-73	72.924	Arsenic	1.00E-03	ICRP-38	8.03E+01	d	6.94E+06	2.23E+04	ICRP-72	1.00E-09	M	Max	FGR-12	1.90E-16
As-74	As-74	73.924	Arsenic	1.00E-03	ICRP-38	1.78E+01	d	1.53E+06	9.95E+04	ICRP-72	2.10E-09	M	Max	FGR-12	3.65E-14
As-76	As-76	75.922	Arsenic	1.00E-03	ICRP-38	2.63E+01	h	9.48E+04	1.57E+06	ICRP-72	7.40E-10	M	Max	FGR-12	2.13E-14
As-77	As-77	76.921	Arsenic	1.00E-03	ICRP-38	3.88E+01	h	1.40E+05	1.05E+06	ICRP-72	3.90E-10	M	Max	FGR-12	4.31E-16
As-78	As-78	77.922	Arsenic	1.00E-03	ICRP-38	9.07E+01	m	5.44E+03	2.66E+07	ICRP-72	8.90E-11	M	Max	FGR-12	6.32E-14
As-79	As-79	78.921	Arsenic	1.00E-03	ICRP-107	9.01E+00	m	5.41E+02	2.64E+08	--	--	--	--	DOE-STD-1196	2.25E-15
At-204	At-204	203.987	Astatine	1.00E-03	ICRP-107	9.20E+00	m	5.52E+02	1.00E+08	--	--	--	--	DOE-STD-1196	1.04E-13
At-205	At-205	204.986	Astatine	1.00E-03	ICRP-107	2.62E+01	m	1.57E+03	3.50E+07	DOE-STD-1196	7.83E-10	S	Max	DOE-STD-1196	5.22E-14
At-206	At-206	205.987	Astatine	1.00E-03	ICRP-107	3.06E+01	m	1.84E+03	2.98E+07	DOE-STD-1196	2.62E-10	S	Max	DOE-STD-1196	1.12E-13
At-207	At-207	206.986	Astatine	1.00E-03	ICRP-38	1.80E+00	h	6.48E+03	8.41E+06	ICRP-72	2.30E-09	M	Max	FGR-12	6.52E-14
At-208	At-208	207.987	Astatine	1.00E-03	ICRP-107	1.63E+00	h	5.87E+03	9.24E+06	DOE-STD-1196	6.56E-10	S	Max	DOE-STD-1196	1.40E-13
At-209	At-209	208.986	Astatine	1.00E-03	ICRP-107	5.41E+00	h	1.95E+04	2.77E+06	DOE-STD-1196	3.04E-09	S	Max	DOE-STD-1196	1.03E-13
At-210	At-210	209.987	Astatine	1.00E-03	ICRP-107	8.10E+00	h	2.92E+04	1.84E+06	DOE-STD-1196	1.17E-08	S	Max	DOE-STD-1196	1.40E-13
At-211	At-211	210.987	Astatine	1.00E-03	ICRP-38	7.21E+00	h	2.60E+04	2.06E+06	ICRP-72	1.10E-07	M	Max	FGR-12	1.59E-15
At-215	At-215	214.999	Astatine	1.00E-03	ICRP-38	1.00E-01	ms	1.00E-04	5.25E+14	--	--	--	--	FGR-12	9.22E-18
At-216	At-216	216.002	Astatine	1.00E-03	ICRP-38	3.00E-01	ms	3.00E-04	1.74E+14	--	--	--	--	FGR-12	6.24E-17
At-217	At-217	217.005	Astatine	1.00E-03	ICRP-38	3.23E-02	s	3.23E-02	1.61E+12	--	--	--	--	FGR-12	1.48E-17
At-218	At-218	218.009	Astatine	1.00E-03	ICRP-38	2.00E+00	s	2.00E+00	2.59E+10	--	--	--	--	FGR-12	1.19E-16
At-219	At-219	219.011	Astatine	1.00E-03	ICRP-107	5.60E+01	s	5.60E+01	9.20E+08	--	--	--	--	--	--
At-220	At-220	220.015	Astatine	1.00E-03	ICRP-107	3.71E+00	m	2.23E+02	2.30E+08	--	--	--	--	DOE-STD-1196	2.09E-14
Au-186	Au-186	185.966	Gold	1.00E-03	ICRP-107	1.07E+01	m	6.42E+02	9.45E+07	DOE-STD-1196	2.43E-11	S	Max	DOE-STD-1196	6.87E-14
Au-187	Au-187	186.965	Gold	1.00E-03	ICRP-107	8.40E+00	m	5.04E+02	1.20E+08	--	--	--	--	DOE-STD-1196	4.96E-14
Au-188	Au-188	187.965	Gold	1.00E-03	JAERI	8.84E+00	m	5.30E+02	1.13E+08	--	--	--	--	--	--
Au-189m	Au-189	188.964	Gold	1.00E-03	JAERI	4.59E+00	m	2.75E+02	2.17E+08	--	--	--	--	--	--
Au-190	Au-190	189.965	Gold	1.00E-03	ICRP-107	4.28E+01	m	2.57E+03	2.31E+07	DOE-STD-1196	2.90E-11	S	Max	DOE-STD-1196	1.16E-13

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Au-191	Au-191	190.964	Gold	1.00E-03	ICRP-107	3.18E+00	h	1.14E+04	5.16E+06	DOE-STD-1196	7.56E-11	S	Max	DOE-STD-1196	2.55E-14
Au-192	Au-192	191.965	Gold	1.00E-03	ICRP-107	4.94E+00	h	1.78E+04	3.30E+06	DOE-STD-1196	1.15E-10	S	Max	DOE-STD-1196	9.29E-14
Au-193	Au-193	192.964	Gold	1.00E-03	ICRP-38	1.77E+01	h	6.35E+04	9.20E+05	ICRP-72	1.20E-10	S	Max	FGR-12	6.83E-15
Au-193m	Au-193	192.964	Gold	1.00E-03	ICRP-107	3.90E+00	s	3.90E+00	1.50E+10	--	--	--	--	DOE-STD-1196	8.37E-15
Au-194	Au-194	193.965	Gold	1.00E-03	ICRP-38	3.95E+01	h	1.42E+05	4.09E+05	ICRP-72	2.40E-10	S	Max	FGR-12	5.29E-14
Au-195	Au-195	194.965	Gold	1.00E-03	ICRP-38	1.83E+02	d	1.58E+07	3.66E+03	ICRP-72	1.70E-09	S	Max	FGR-12	3.21E-15
Au-195m	Au-195	194.965	Gold	1.00E-03	ICRP-38	3.05E+01	s	3.05E+01	1.90E+09	--	--	--	--	FGR-12	9.37E-15
Au-196	Au-196	195.967	Gold	1.00E-03	ICRP-107	6.18E+00	d	5.34E+05	1.08E+05	DOE-STD-1196	3.78E-10	M	Max	DOE-STD-1196	2.02E-14
Au-196m	Au-196	195.967	Gold	1.00E-03	ICRP-107	9.60E+00	h	3.46E+04	1.67E+06	DOE-STD-1196	5.00E-10	S	Max	DOE-STD-1196	9.70E-15
Au-198	Au-198	197.968	Gold	1.00E-03	ICRP-38	2.70E+00	d	2.33E+05	2.45E+05	ICRP-72	8.60E-10	S	Max	FGR-12	1.94E-14
Au-198m	Au-198	197.968	Gold	1.00E-03	ICRP-38	2.30E+00	d	1.99E+05	2.87E+05	ICRP-72	2.00E-09	S	Max	FGR-12	2.66E-14
Au-199	Au-199	198.969	Gold	1.00E-03	ICRP-38	3.14E+00	d	2.71E+05	2.09E+05	ICRP-72	7.90E-10	S	Max	FGR-12	4.08E-15
Au-200	Au-200	199.971	Gold	1.00E-03	ICRP-38	4.84E+01	m	2.90E+03	1.94E+07	ICRP-72	3.50E-11	S	Max	FGR-12	1.37E-14
Au-200m	Au-200	199.971	Gold	1.00E-03	ICRP-38	1.87E+01	h	6.73E+04	8.38E+05	ICRP-72	7.20E-10	S	Max	FGR-12	1.01E-13
Au-201	Au-201	200.972	Gold	1.00E-03	ICRP-38	2.64E+01	m	1.58E+03	3.54E+07	ICRP-72	1.70E-11	M	Max	FGR-12	2.57E-15
Au-202	Au-202	201.974	Gold	1.00E-03	ICRP-107	2.88E+01	s	2.88E+01	1.94E+09	--	--	--	--	DOE-STD-1196	8.90E-15
Ba-124	Ba-124	123.915	Barium	1.00E-03	ICRP-107	1.10E+01	m	6.60E+02	1.38E+08	DOE-STD-1196	2.63E-11	M	Rec	DOE-STD-1196	2.51E-14
Ba-126	Ba-126	125.911	Barium	1.00E-03	ICRP-38	9.65E+01	m	5.79E+03	1.55E+07	ICRP-72	1.00E-10	M	Rec	FGR-12	7.03E-15
Ba-127	Ba-127	126.911	Barium	1.00E-03	ICRP-107	1.27E+01	m	7.62E+02	1.17E+08	DOE-STD-1196	1.30E-11	M	Rec	DOE-STD-1196	3.28E-14
Ba-128	Ba-128	127.908	Barium	1.00E-03	ICRP-38	2.43E+00	d	2.10E+05	4.20E+05	ICRP-72	1.30E-09	M	Rec	FGR-12	2.86E-15
Ba-129	Ba-129	128.909	Barium	1.00E-03	ICRP-107	2.23E+00	h	8.03E+03	1.09E+07	DOE-STD-1196	3.31E-11	M	Rec	DOE-STD-1196	1.44E-14
Ba-129m	Ba-129	128.909	Barium	1.00E-03	ICRP-107	2.16E+00	h	7.78E+03	1.13E+07	DOE-STD-1196	5.44E-11	M	Rec	DOE-STD-1196	7.20E-14
Ba-131	Ba-131	130.907	Barium	1.00E-03	ICRP-38	1.18E+01	d	1.02E+06	8.45E+04	ICRP-72	7.60E-10	M	Rec	FGR-12	2.10E-14
Ba-131m	Ba-131	130.907	Barium	1.00E-03	ICRP-38	1.46E+01	m	8.76E+02	9.84E+07	ICRP-72	7.40E-12	M	Rec	FGR-12	3.04E-15
Ba-133	Ba-133	132.906	Barium	1.00E-03	ICRP-38	1.07E+01	y	3.39E+08	2.50E+02	ICRP-72	3.10E-09	M	Rec	FGR-12	1.78E-14
Ba-133m	Ba-133	132.906	Barium	1.00E-03	ICRP-38	3.89E+01	h	1.40E+05	6.06E+05	ICRP-72	4.20E-10	M	Rec	FGR-12	2.62E-15
Ba-135m	Ba-135	134.906	Barium	1.00E-03	ICRP-38	2.87E+01	h	1.03E+05	8.09E+05	ICRP-72	3.30E-10	M	Rec	FGR-12	2.32E-15
Ba-137m	Ba-137	136.906	Barium	1.00E-03	ICRP-38	2.55E+00	m	1.53E+02	5.38E+08	--	--	--	--	FGR-12	2.88E-14
Ba-139	Ba-139	138.909	Barium	1.00E-03	ICRP-38	8.27E+01	m	4.96E+03	1.64E+07	ICRP-72	5.60E-11	M	Rec	FGR-12	2.17E-15
Ba-140	Ba-140	139.911	Barium	1.00E-03	ICRP-38	1.27E+01	d	1.10E+06	7.33E+04	ICRP-72	5.10E-09	M	Rec	FGR-12	8.58E-15
Ba-141	Ba-141	140.914	Barium	1.00E-03	ICRP-38	1.83E+01	m	1.10E+03	7.30E+07	ICRP-72	3.20E-11	M	Rec	FGR-12	4.16E-14
Ba-142	Ba-142	141.916	Barium	1.00E-03	ICRP-38	1.06E+01	m	6.36E+02	1.25E+08	ICRP-72	2.10E-11	M	Rec	FGR-12	5.15E-14
Be-10	Be-10	10.014	Beryllium	1.00E-03	ICRP-38	1.60E+06	y	5.05E+13	2.23E-02	ICRP-72	3.50E-08	S	Max	FGR-12	1.12E-17
Be-7	Be-7	7.017	Beryllium	1.00E-03	ICRP-38	5.33E+01	d	4.61E+06	3.49E+05	ICRP-72	5.50E-11	S	Max	FGR-12	2.36E-15
Bi-197	Bi-197	196.979	Bismuth	1.00E-03	ICRP-107	9.30E+00	m	5.58E+02	1.03E+08	--	--	--	--	DOE-STD-1196	7.85E-14
Bi-200	Bi-200	199.978	Bismuth	1.00E-03	ICRP-38	3.64E+01	m	2.18E+03	2.58E+07	ICRP-72	3.30E-11	M	Max	FGR-12	1.16E-13
Bi-201	Bi-201	200.977	Bismuth	1.00E-03	ICRP-38	1.08E+02	m	6.48E+03	8.66E+06	ICRP-72	6.60E-11	M	Max	FGR-12	6.51E-14
Bi-202	Bi-202	201.978	Bismuth	1.00E-03	ICRP-38	1.67E+00	h	6.01E+03	9.29E+06	ICRP-72	5.50E-11	M	Max	FGR-12	1.33E-13
Bi-203	Bi-203	202.977	Bismuth	1.00E-03	ICRP-38	1.18E+01	h	4.23E+04	1.31E+06	ICRP-72	2.60E-10	M	Max	FGR-12	1.20E-13
Bi-204	Bi-204	203.978	Bismuth	1.00E-03	ICRP-38	1.12E+01	h	4.04E+04	1.37E+06	DOE-STD-1196	3.81E-10	S	Max	DOE-STD-1196	1.35E-13
Bi-205	Bi-205	204.977	Bismuth	1.00E-03	ICRP-38	1.53E+01	d	1.32E+06	4.16E+04	ICRP-72	9.30E-10	M	Max	FGR-12	8.49E-14
Bi-206	Bi-206	205.978	Bismuth	1.00E-03	ICRP-38	6.24E+00	d	5.39E+05	1.02E+05	ICRP-72	1.70E-09	M	Max	FGR-12	1.61E-13
Bi-207	Bi-207	206.978	Bismuth	1.00E-03	ICRP-38	3.80E+01	y	1.20E+09	4.55E+01	ICRP-72	5.60E-09	M	Max	FGR-12	7.54E-14
Bi-208	Bi-208	207.980	Bismuth	1.00E-03	ICRP-107	3.68E+05	y	1.16E+13	4.67E-03	DOE-STD-1196	3.83E-08	S	Max	DOE-STD-1196	1.35E-13
Bi-210	Bi-210	209.984	Bismuth	1.00E-03	ICRP-38	5.01E+00	d	4.33E+05	1.24E+05	ICRP-72	9.30E-08	M	Max	FGR-12	3.29E-17
Bi-210m	Bi-210	209.984	Bismuth	1.00E-03	ICRP-38	3.00E+06	y	9.47E+13	5.67E-04	ICRP-72	3.40E-06	M	Max	FGR-12	1.22E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Bi-211	Bi-211	210.987	Bismuth	1.00E-03	ICRP-38	2.14E+00	m	1.28E+02	4.16E+08	--	--	--	--	FGR-12	2.22E-15
Bi-212	Bi-212	211.991	Bismuth	1.00E-03	ICRP-38	6.06E+01	m	3.63E+03	1.46E+07	ICRP-72	3.10E-08	M	Max	FGR-12	9.24E-15
Bi-212n	Bi-212	211.991	Bismuth	1.00E-03	ICRP-107	7.00E+00	m	4.20E+02	1.27E+08	--	--	--	--	DOE-STD-1196	3.89E-16
Bi-213	Bi-213	212.994	Bismuth	1.00E-03	ICRP-38	4.57E+01	m	2.74E+03	1.93E+07	ICRP-72	3.00E-08	M	Max	FGR-12	6.39E-15
Bi-214	Bi-214	213.999	Bismuth	1.00E-03	ICRP-38	1.99E+01	m	1.19E+03	4.42E+07	ICRP-72	1.40E-08	M	Max	FGR-12	7.65E-14
Bi-215	Bi-215	215.002	Bismuth	1.00E-03	ICRP-107	7.60E+00	m	4.56E+02	1.15E+08	--	--	--	--	DOE-STD-1196	1.18E-14
Bi-216	Bi-216	216.006	Bismuth	1.00E-03	ICRP-107	2.17E+00	m	1.30E+02	4.01E+08	--	--	--	--	DOE-STD-1196	3.41E-14
Bk-244	Bk-244	244.065	Berkelium	1.00E-03	JAERI	4.35E+00	h	1.57E+04	2.95E+06	JAERI	1.00E-09	M	Max	--	--
Bk-245	Bk-245	245.066	Berkelium	1.00E-03	ICRP-38	4.94E+00	d	4.27E+05	1.08E+05	ICRP-72	2.10E-09	M	Max	FGR-12	1.04E-14
Bk-246	Bk-246	246.069	Berkelium	1.00E-03	ICRP-38	1.83E+00	d	1.58E+05	2.90E+05	ICRP-72	3.30E-10	M	Max	FGR-12	4.59E-14
Bk-247	Bk-247	247.070	Berkelium	1.00E-03	ICRP-38	1.38E+03	y	4.35E+10	1.05E+00	ICRP-72	6.90E-05	M	Max	FGR-12	4.71E-15
Bk-248m	Bk-248	248.073	Berkelium	1.00E-03	ICRP-107	2.37E+01	h	8.53E+04	5.33E+05	DOE-STD-1196	2.81E-08	F	Max	DOE-STD-1196	2.28E-15
Bk-249	Bk-249	249.075	Berkelium	1.00E-03	ICRP-38	3.20E+02	d	2.76E+07	1.64E+03	ICRP-72	1.60E-07	M	Max	FGR-12	8.21E-20
Bk-250	Bk-250	250.078	Berkelium	1.00E-03	ICRP-38	3.22E+00	h	1.16E+04	3.89E+06	ICRP-72	1.00E-09	M	Max	FGR-12	4.38E-14
Bk-251	Bk-251	251.081	Berkelium	1.00E-03	ICRP-107	5.56E+01	m	3.34E+03	1.35E+07	DOE-STD-1196	5.09E-11	M	Max	DOE-STD-1196	3.56E-15
Br-72	Br-72	71.937	Bromine	5.00E-01	ICRP-107	7.86E+01	s	7.86E+01	2.00E+09	--	--	--	--	DOE-STD-1196	1.41E-13
Br-73	Br-73	72.932	Bromine	5.00E-01	ICRP-107	3.40E+00	m	2.04E+02	7.58E+08	--	--	--	--	DOE-STD-1196	6.52E-14
Br-74	Br-74	73.930	Bromine	5.00E-01	ICRP-38	2.53E+01	m	1.52E+03	1.01E+08	ICRP-72	3.80E-11	M	Max	FGR-12	2.38E-13
Br-74m	Br-74	73.930	Bromine	5.00E-01	ICRP-38	4.15E+01	m	2.49E+03	6.13E+07	ICRP-72	6.20E-11	M	Max	FGR-12	2.08E-13
Br-75	Br-75	74.926	Bromine	5.00E-01	ICRP-38	9.80E+01	m	5.88E+03	2.56E+07	ICRP-72	5.30E-11	M	Max	FGR-12	5.84E-14
Br-76	Br-76	75.925	Bromine	5.00E-01	ICRP-38	1.62E+01	h	5.83E+04	2.55E+06	ICRP-72	4.10E-10	M	Max	FGR-12	1.34E-13
Br-76m	Br-76	75.925	Bromine	5.00E-01	ICRP-107	1.31E+00	s	1.31E+00	1.13E+11	--	--	--	--	DOE-STD-1196	9.66E-16
Br-77	Br-77	76.921	Bromine	5.00E-01	ICRP-38	5.60E+01	h	2.02E+05	7.27E+05	ICRP-72	8.40E-11	M	Max	FGR-12	1.51E-14
Br-77m	Br-77	76.921	Bromine	5.00E-01	ICRP-107	4.28E+00	m	2.57E+02	5.71E+08	--	--	--	--	DOE-STD-1196	5.96E-16
Br-78	Br-78	77.921	Bromine	5.00E-01	ICRP-107	6.46E+00	m	3.88E+02	3.74E+08	--	--	--	--	DOE-STD-1196	4.69E-14
Br-80	Br-80	79.919	Bromine	5.00E-01	ICRP-38	1.74E+01	m	1.04E+03	1.35E+08	ICRP-72	9.40E-12	M	Max	FGR-12	3.85E-15
Br-80m	Br-80	79.919	Bromine	5.00E-01	ICRP-38	4.42E+00	h	1.59E+04	8.87E+06	ICRP-72	7.60E-11	M	Max	FGR-12	3.11E-16
Br-82	Br-82	81.917	Bromine	5.00E-01	ICRP-38	3.53E+01	h	1.27E+05	1.08E+06	ICRP-72	6.30E-10	M	Max	FGR-12	1.30E-13
Br-82m	Br-82	81.917	Bromine	5.00E-01	ICRP-107	6.13E+00	m	3.68E+02	3.74E+08	--	--	--	--	DOE-STD-1196	1.59E-16
Br-83	Br-83	82.915	Bromine	5.00E-01	ICRP-38	2.39E+00	h	8.60E+03	1.58E+07	ICRP-72	4.80E-11	M	Max	FGR-12	3.82E-16
Br-84	Br-84	83.916	Bromine	5.00E-01	ICRP-38	3.18E+01	m	1.91E+03	7.05E+07	ICRP-72	3.70E-11	M	Max	FGR-12	9.41E-14
Br-84m	Br-84	83.916	Bromine	5.00E-01	ICRP-107	6.00E+00	m	3.60E+02	3.73E+08	--	--	--	--	DOE-STD-1196	1.31E-13
Br-85	Br-85	84.916	Bromine	5.00E-01	ICRP-107	2.90E+00	m	1.74E+02	7.64E+08	--	--	--	--	DOE-STD-1196	3.98E-15
C-10	C-10	10.017	Carbon	1.00E-02	ICRP-107	1.93E+01	s	1.93E+01	5.85E+10	--	--	--	--	DOE-STD-1196	7.90E-14
C-11	C-11	11.011	Carbon	1.00E-02	ICRP-38	2.04E+01	m	1.22E+03	8.38E+08	ICRP-72	1.80E-11	M	Rec	FGR-12	4.89E-14
C-14	C-14	14.003	Carbon	1.00E-02	ICRP-38	5.73E+03	y	1.81E+11	4.46E+00	ICRP-72	2.00E-09	M	Rec	FGR-12	2.24E-19
Ca-41	Ca-41	40.962	Calcium	1.00E-03	ICRP-38	1.40E+05	y	4.42E+12	6.23E-02	ICRP-72	9.50E-11	M	Rec	--	--
Ca-45	Ca-45	44.956	Calcium	1.00E-03	ICRP-38	1.63E+02	d	1.41E+07	1.78E+04	ICRP-72	2.70E-09	M	Rec	FGR-12	8.63E-19
Ca-47	Ca-47	46.955	Calcium	1.00E-03	ICRP-38	4.53E+00	d	3.91E+05	6.14E+05	ICRP-72	1.90E-09	M	Rec	FGR-12	5.36E-14
Ca-49	Ca-49	48.956	Calcium	1.00E-03	ICRP-38	8.72E+00	m	5.23E+02	4.41E+08	--	--	--	--	FGR-12	1.73E-13
Cd-101	Cd-101	100.919	Cadmium	1.00E-03	ICRP-107	1.36E+00	m	8.16E+01	1.37E+09	--	--	--	--	DOE-STD-1196	1.17E-13
Cd-102	Cd-102	101.914	Cadmium	1.00E-03	ICRP-107	5.50E+00	m	3.30E+02	3.35E+08	--	--	--	--	DOE-STD-1196	3.73E-14
Cd-103	Cd-103	102.913	Cadmium	1.00E-03	ICRP-107	7.30E+00	m	4.38E+02	2.50E+08	--	--	--	--	DOE-STD-1196	1.00E-13
Cd-104	Cd-104	103.910	Cadmium	1.00E-03	ICRP-38	5.77E+01	m	3.46E+03	3.14E+07	ICRP-72	3.50E-11	S	Max	FGR-12	1.14E-14
Cd-105	Cd-105	104.909	Cadmium	1.00E-03	ICRP-107	5.55E+01	m	3.33E+03	3.23E+07	DOE-STD-1196	2.86E-11	S	Max	DOE-STD-1196	6.13E-14
Cd-107	Cd-107	106.907	Cadmium	1.00E-03	ICRP-38	6.49E+00	h	2.34E+04	4.52E+06	ICRP-72	8.30E-11	M	Max	FGR-12	6.02E-16

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Cd-109	Cd-109	108.905	Cadmium	1.00E-03	ICRP-38	4.64E+02	d	4.01E+07	2.58E+03	ICRP-72	8.10E-09	F	Max	FGR-12	2.94E-16
Cd-111m	Cd-111	110.904	Cadmium	1.00E-03	ICRP-107	4.85E+01	m	2.91E+03	3.50E+07	DOE-STD-1196	2.66E-11	S	Max	DOE-STD-1196	1.20E-14
Cd-113	Cd-113	112.904	Cadmium	1.00E-03	ICRP-38	9.30E+15	y	2.93E+23	3.40E-13	ICRP-72	1.20E-07	F	Max	FGR-12	1.45E-18
Cd-113m	Cd-113	112.904	Cadmium	1.00E-03	ICRP-38	1.36E+01	y	4.29E+08	2.33E+02	ICRP-72	1.10E-07	F	Max	FGR-12	6.94E-18
Cd-115	Cd-115	114.905	Cadmium	1.00E-03	ICRP-38	5.35E+01	h	1.92E+05	5.10E+05	ICRP-72	1.10E-09	S	Max	FGR-12	1.12E-14
Cd-115m	Cd-115	114.905	Cadmium	1.00E-03	ICRP-38	4.46E+01	d	3.85E+06	2.55E+04	ICRP-72	7.70E-09	S	Max	FGR-12	1.17E-15
Cd-117	Cd-117	116.907	Cadmium	1.00E-03	ICRP-38	2.49E+00	h	8.96E+03	1.08E+07	ICRP-72	1.70E-10	S	Max	FGR-12	5.45E-14
Cd-117m	Cd-117	116.907	Cadmium	1.00E-03	ICRP-38	3.36E+00	h	1.21E+04	7.98E+06	ICRP-72	2.10E-10	S	Max	FGR-12	1.05E-13
Cd-118	Cd-118	117.907	Cadmium	1.00E-03	ICRP-107	5.03E+01	m	3.02E+03	3.17E+07	DOE-STD-1196	9.60E-11	S	Max	DOE-STD-1196	7.25E-17
Cd-119	Cd-119	118.910	Cadmium	1.00E-03	ICRP-107	2.69E+00	m	1.61E+02	5.88E+08	--	--	--	--	DOE-STD-1196	7.96E-14
Cd-119m	Cd-119	118.910	Cadmium	1.00E-03	ICRP-107	2.20E+00	m	1.32E+02	7.19E+08	--	--	--	--	DOE-STD-1196	1.11E-13
Ce-130	Ce-130	129.915	Cerium	1.00E-03	ICRP-107	2.29E+01	m	1.37E+03	6.32E+07	DOE-STD-1196	4.09E-11	M	Rec	DOE-STD-1196	2.14E-14
Ce-131	Ce-131	130.914	Cerium	1.00E-03	ICRP-107	1.02E+01	m	6.12E+02	1.41E+08	DOE-STD-1196	1.62E-11	M	Rec	DOE-STD-1196	7.43E-14
Ce-131m	Ce-131	130.914	Cerium	1.00E-03	JAERI	5.00E+00	m	3.00E+02	2.87E+08	--	--	--	--	--	--
Ce-132	Ce-132	131.911	Cerium	1.00E-03	ICRP-107	3.51E+00	h	1.26E+04	6.77E+06	DOE-STD-1196	1.65E-10	M	Rec	DOE-STD-1196	1.09E-14
Ce-133	Ce-133	132.912	Cerium	1.00E-03	ICRP-107	9.70E+01	m	5.82E+03	1.46E+07	DOE-STD-1196	5.90E-11	M	Rec	DOE-STD-1196	2.28E-14
Ce-133m	Ce-133	132.912	Cerium	1.00E-03	ICRP-107	4.90E+00	h	1.76E+04	4.81E+06	DOE-STD-1196	1.38E-10	M	Rec	DOE-STD-1196	7.95E-14
Ce-134	Ce-134	133.909	Cerium	1.00E-03	ICRP-38	7.20E+01	h	2.59E+05	3.25E+05	ICRP-72	1.30E-09	M	Rec	FGR-12	4.71E-16
Ce-135	Ce-135	134.909	Cerium	1.00E-03	ICRP-38	1.76E+01	h	6.34E+04	1.32E+06	ICRP-72	4.80E-10	M	Rec	FGR-12	8.54E-14
Ce-137	Ce-137	136.908	Cerium	1.00E-03	ICRP-38	9.00E+00	h	3.24E+04	2.54E+06	ICRP-72	9.80E-12	M	Rec	FGR-12	8.81E-16
Ce-137m	Ce-137	136.908	Cerium	1.00E-03	ICRP-38	3.44E+01	h	1.24E+05	6.65E+05	ICRP-72	4.10E-10	M	Rec	FGR-12	1.96E-15
Ce-139	Ce-139	138.907	Cerium	1.00E-03	ICRP-38	1.38E+02	d	1.19E+07	6.83E+03	ICRP-72	1.70E-09	M	Rec	FGR-12	6.73E-15
Ce-141	Ce-141	140.908	Cerium	1.00E-03	ICRP-38	3.25E+01	d	2.81E+06	2.85E+04	ICRP-72	3.20E-09	M	Rec	FGR-12	3.43E-15
Ce-143	Ce-143	142.912	Cerium	1.00E-03	ICRP-38	3.30E+01	h	1.19E+05	6.64E+05	ICRP-72	7.50E-10	M	Rec	FGR-12	1.29E-14
Ce-144	Ce-144	143.914	Cerium	1.00E-03	ICRP-38	2.84E+02	d	2.46E+07	3.19E+03	ICRP-72	3.60E-08	M	Rec	FGR-12	8.53E-16
Ce-145	Ce-145	144.917	Cerium	1.00E-03	ICRP-107	3.01E+00	m	1.81E+02	4.31E+08	--	--	--	--	DOE-STD-1196	3.64E-14
Ce-146	Ce-146	145.919	Cerium	1.00E-03	JAERI	1.35E+01	m	8.11E+02	9.53E+07	JAERI	2.50E-11	M	Rec	--	--
Cf-244	Cf-244	244.066	Californium	1.00E-03	ICRP-38	1.94E+01	m	1.16E+03	3.97E+07	ICRP-72	1.40E-08	M	Max	FGR-12	6.91E-18
Cf-246	Cf-246	246.069	Californium	1.00E-03	ICRP-38	3.57E+01	h	1.29E+05	3.57E+05	ICRP-72	4.50E-07	M	Max	FGR-12	5.48E-18
Cf-247	Cf-247	247.071	Californium	1.00E-03	ICRP-107	3.11E+00	h	1.12E+04	4.08E+06	DOE-STD-1196	5.22E-11	F	Max	DOE-STD-1196	3.58E-15
Cf-248	Cf-248	248.072	Californium	1.00E-03	ICRP-38	3.34E+02	d	2.88E+07	1.58E+03	ICRP-72	8.80E-06	M	Max	FGR-12	4.73E-18
Cf-249	Cf-249	249.075	Californium	1.00E-03	ICRP-38	3.51E+02	y	1.11E+10	4.09E+00	ICRP-72	7.00E-05	M	Max	FGR-12	1.58E-14
Cf-250	Cf-250	250.076	Californium	1.00E-03	ICRP-38	1.31E+01	y	4.13E+08	1.09E+02	ICRP-72	3.40E-05	M	Max	FGR-12	4.50E-18
Cf-251	Cf-251	251.080	Californium	1.00E-03	ICRP-38	8.98E+02	y	2.83E+10	1.59E+00	ICRP-72	7.10E-05	M	Max	FGR-12	5.58E-15
Cf-252	Cf-252	252.082	Californium	1.00E-03	ICRP-38	2.64E+00	y	8.32E+07	5.38E+02	ICRP-72	2.00E-05	M	Max	FGR-12	5.06E-18
Cf-253	Cf-253	253.085	Californium	1.00E-03	ICRP-38	1.78E+01	d	1.54E+06	2.90E+04	ICRP-72	1.30E-06	M	Max	FGR-12	1.08E-18
Cf-254	Cf-254	254.087	Californium	1.00E-03	ICRP-38	6.05E+01	d	5.23E+06	8.49E+03	ICRP-72	4.10E-05	M	Max	FGR-12	1.47E-20
Cf-255	Cf-255	255.091	Californium	1.00E-03	ICRP-107	8.50E+01	m	5.10E+03	8.67E+06	DOE-STD-1196	7.35E-09	S	Max	DOE-STD-1196	1.16E-16
Cf-256	Cf-256	256.093	Californium	1.00E-03	JAERI	1.23E+01	m	7.38E+02	5.97E+07	JAERI	1.90E-06	M	Max	--	--
Cl-34	Cl-34	33.974	Chlorine	1.00E+00	ICRP-107	1.53E+00	s	1.53E+00	2.18E+11	--	--	--	--	DOE-STD-1196	4.77E-14
Cl-34m	Cl-34	33.974	Chlorine	1.00E+00	ICRP-107	3.20E+01	m	1.92E+03	1.73E+08	DOE-STD-1196	5.50E-11	S	Max	DOE-STD-1196	1.03E-13
Cl-36	Cl-36	35.968	Chlorine	1.00E+00	ICRP-38	3.01E+05	y	9.50E+12	3.30E-02	ICRP-72	7.30E-09	M	Max	FGR-12	2.23E-17
Cl-38	Cl-38	37.968	Chlorine	1.00E+00	ICRP-38	3.72E+01	m	2.23E+03	1.33E+08	ICRP-72	4.50E-11	M	Max	FGR-12	7.87E-14
Cl-39	Cl-39	38.968	Chlorine	1.00E+00	ICRP-38	5.56E+01	m	3.34E+03	8.68E+07	ICRP-72	4.60E-11	M	Max	FGR-12	7.29E-14
Cl-40	Cl-40	39.970	Chlorine	1.00E+00	ICRP-107	1.35E+00	m	8.10E+01	3.48E+09	--	--	--	--	DOE-STD-1196	2.09E-13
Cm-238	Cm-238	238.053	Curium	1.00E-03	ICRP-38	2.40E+00	h	8.64E+03	5.49E+06	ICRP-72	4.50E-09	M	Rec	FGR-12	3.25E-15

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Cm-239	Cm-239	239.055	Curium	1.00E-03	ICRP-107	2.90E+00	h	1.04E+04	4.52E+06	DOE-STD-1196	7.59E-11	M	Rec	DOE-STD-1196	1.05E-14
Cm-240	Cm-240	240.056	Curium	1.00E-03	ICRP-38	2.70E+01	d	2.33E+06	2.01E+04	ICRP-72	3.20E-06	M	Rec	FGR-12	6.00E-18
Cm-241	Cm-241	241.058	Curium	1.00E-03	ICRP-38	3.28E+01	d	2.83E+06	1.65E+04	ICRP-72	3.70E-08	M	Rec	FGR-12	2.31E-14
Cm-242	Cm-242	242.059	Curium	1.00E-03	ICRP-38	1.63E+02	d	1.41E+07	3.31E+03	ICRP-72	5.20E-06	M	Rec	FGR-12	5.69E-18
Cm-243	Cm-243	243.061	Curium	1.00E-03	ICRP-38	2.85E+01	y	8.99E+08	5.16E+01	ICRP-72	3.10E-05	M	Rec	FGR-12	5.88E-15
Cm-244	Cm-244	244.063	Curium	1.00E-03	ICRP-38	1.81E+01	y	5.72E+08	8.09E+01	ICRP-72	2.70E-05	M	Rec	FGR-12	4.91E-18
Cm-245	Cm-245	245.065	Curium	1.00E-03	ICRP-38	8.50E+03	y	2.68E+11	1.72E-01	ICRP-72	4.20E-05	M	Rec	FGR-12	3.96E-15
Cm-246	Cm-246	246.067	Curium	1.00E-03	ICRP-38	4.73E+03	y	1.49E+11	3.07E-01	ICRP-72	4.20E-05	M	Rec	FGR-12	4.46E-18
Cm-247	Cm-247	247.070	Curium	1.00E-03	ICRP-38	1.56E+07	y	4.92E+14	9.28E-05	ICRP-72	3.90E-05	M	Rec	FGR-12	1.50E-14
Cm-248	Cm-248	248.072	Curium	1.00E-03	ICRP-38	3.39E+05	y	1.07E+13	4.25E-03	ICRP-72	1.50E-04	M	Rec	FGR-12	3.39E-18
Cm-249	Cm-249	249.076	Curium	1.00E-03	ICRP-38	6.42E+01	m	3.85E+03	1.18E+07	ICRP-72	3.30E-11	M	Rec	FGR-12	9.36E-16
Cm-250	Cm-250	250.078	Curium	1.00E-03	ICRP-38	6.90E+03	y	2.18E+11	2.07E-01	ICRP-72	8.40E-04	M	Rec	DOE-STD-1196	6.52E-13
Cm-251	Cm-251	251.082	Curium	1.00E-03	ICRP-107	1.68E+01	m	1.01E+03	4.46E+07	DOE-STD-1196	2.74E-11	M	Rec	DOE-STD-1196	5.20E-15
Co-54m	Co-54	53.948	Cobalt	1.00E-03	ICRP-107	1.48E+00	m	8.88E+01	2.35E+09	--	--	--	--	DOE-STD-1196	1.85E-13
Co-55	Co-55	54.942	Cobalt	1.00E-03	ICRP-38	1.75E+01	h	6.31E+04	3.25E+06	ICRP-72	5.00E-10	M	Rec	FGR-12	9.78E-14
Co-56	Co-56	55.940	Cobalt	1.00E-03	ICRP-38	7.88E+01	d	6.80E+06	2.96E+04	ICRP-72	4.80E-09	M	Rec	FGR-12	1.83E-13
Co-57	Co-57	56.936	Cobalt	1.00E-03	ICRP-38	2.71E+02	d	2.34E+07	8.47E+03	ICRP-72	5.50E-10	M	Rec	FGR-12	5.61E-15
Co-58	Co-58	57.936	Cobalt	1.00E-03	ICRP-38	7.08E+01	d	6.12E+06	3.18E+04	ICRP-72	1.60E-09	M	Rec	FGR-12	4.76E-14
Co-58m	Co-58	57.936	Cobalt	1.00E-03	ICRP-38	9.15E+00	h	3.29E+04	5.91E+06	ICRP-72	1.30E-11	M	Rec	FGR-12	8.77E-20
Co-60	Co-60	59.934	Cobalt	1.00E-03	ICRP-38	5.27E+00	y	1.66E+08	1.13E+03	ICRP-72	1.00E-08	M	Rec	FGR-12	1.26E-13
Co-60m	Co-60	59.934	Cobalt	1.00E-03	ICRP-38	1.05E+01	m	6.28E+02	3.00E+08	ICRP-72	1.20E-12	M	Rec	FGR-12	2.17E-16
Co-61	Co-61	60.932	Cobalt	1.00E-03	ICRP-38	1.65E+00	h	5.94E+03	3.12E+07	ICRP-72	4.70E-11	M	Rec	FGR-12	3.94E-15
Co-62	Co-62	61.934	Cobalt	1.00E-03	ICRP-107	1.50E+00	m	9.00E+01	2.02E+09	--	--	--	--	DOE-STD-1196	7.92E-14
Co-62m	Co-62	61.934	Cobalt	1.00E-03	ICRP-38	1.39E+01	m	8.35E+02	2.18E+08	ICRP-72	2.00E-11	M	Rec	FGR-12	1.37E-13
Cr-48	Cr-48	47.954	Chromium	1.00E-03	ICRP-38	2.30E+01	h	8.27E+04	2.85E+06	ICRP-72	2.20E-10	S	Max	FGR-12	2.06E-14
Cr-49	Cr-49	48.951	Chromium	1.00E-03	ICRP-38	4.21E+01	m	2.53E+03	9.13E+07	ICRP-72	3.50E-11	S	Max	FGR-12	5.03E-14
Cr-51	Cr-51	50.945	Chromium	1.00E-03	ICRP-38	2.77E+01	d	2.39E+06	9.25E+04	ICRP-72	3.70E-11	S	Max	FGR-12	1.51E-15
Cr-55	Cr-55	54.941	Chromium	1.00E-03	ICRP-107	3.50E+00	m	2.10E+02	9.79E+08	--	--	--	--	DOE-STD-1196	1.00E-15
Cr-56	Cr-56	55.941	Chromium	1.00E-03	ICRP-107	5.94E+00	m	3.56E+02	5.66E+08	--	--	--	--	DOE-STD-1196	3.47E-15
Cs-121	Cs-121	120.917	Cesium	1.00E-02	ICRP-107	1.55E+02	s	1.55E+02	6.02E+08	--	--	--	--	DOE-STD-1196	5.41E-14
Cs-121m	Cs-121	120.917	Cesium	1.00E-02	ICRP-107	1.22E+02	s	1.22E+02	7.65E+08	--	--	--	--	DOE-STD-1196	5.38E-14
Cs-123	Cs-123	122.913	Cesium	1.00E-02	ICRP-107	5.88E+00	m	3.53E+02	2.60E+08	--	--	--	--	DOE-STD-1196	4.89E-14
Cs-124	Cs-124	123.912	Cesium	1.00E-02	ICRP-107	3.08E+01	s	3.08E+01	2.96E+09	--	--	--	--	DOE-STD-1196	5.43E-14
Cs-125	Cs-125	124.910	Cesium	1.00E-02	ICRP-38	4.50E+01	m	2.70E+03	3.35E+07	ICRP-72	1.20E-11	F	Rec	FGR-12	3.22E-14
Cs-126	Cs-126	125.909	Cesium	1.00E-02	ICRP-38	1.64E+00	m	9.84E+01	9.11E+08	--	--	--	--	FGR-12	5.24E-14
Cs-127	Cs-127	126.907	Cesium	1.00E-02	ICRP-38	6.25E+00	h	2.25E+04	3.95E+06	ICRP-72	2.00E-11	F	Rec	FGR-12	1.93E-14
Cs-128	Cs-128	127.908	Cesium	1.00E-02	ICRP-38	3.90E+00	m	2.34E+02	3.77E+08	--	--	--	--	FGR-12	4.32E-14
Cs-129	Cs-129	128.906	Cesium	1.00E-02	ICRP-38	3.21E+01	h	1.15E+05	7.58E+05	ICRP-72	4.20E-11	F	Rec	FGR-12	1.24E-14
Cs-130	Cs-130	129.907	Cesium	1.00E-02	ICRP-38	2.99E+01	m	1.79E+03	4.84E+07	ICRP-72	7.80E-12	F	Rec	FGR-12	2.45E-14
Cs-130m	Cs-130	129.907	Cesium	1.00E-02	ICRP-107	3.46E+00	m	2.08E+02	4.18E+08	--	--	--	--	DOE-STD-1196	2.01E-15
Cs-131	Cs-131	130.905	Cesium	1.00E-02	ICRP-38	9.69E+00	d	8.37E+05	1.03E+05	ICRP-72	2.70E-11	F	Rec	FGR-12	3.28E-16
Cs-132	Cs-132	131.906	Cesium	1.00E-02	ICRP-38	6.48E+00	d	5.59E+05	1.53E+05	ICRP-72	2.30E-10	F	Rec	FGR-12	3.34E-14
Cs-134	Cs-134	133.907	Cesium	1.00E-02	ICRP-38	2.06E+00	y	6.51E+07	1.29E+03	ICRP-72	6.60E-09	F	Rec	FGR-12	7.57E-14
Cs-134m	Cs-134	133.907	Cesium	1.00E-02	ICRP-38	2.90E+00	h	1.04E+04	8.07E+06	ICRP-72	1.40E-11	F	Rec	FGR-12	9.05E-16
Cs-135	Cs-135	134.906	Cesium	1.00E-02	ICRP-38	2.30E+06	y	7.26E+13	1.15E-03	ICRP-72	6.90E-10	F	Rec	FGR-12	5.65E-19
Cs-135m	Cs-135	134.906	Cesium	1.00E-02	ICRP-38	5.30E+01	m	3.18E+03	2.63E+07	ICRP-72	1.20E-11	F	Rec	FGR-12	7.76E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Cs-136	Cs-136	135.907	Cesium	1.00E-02	ICRP-38	1.31E+01	d	1.13E+06	7.33E+04	ICRP-72	1.20E-09	F	Rec	FGR-12	1.06E-13
Cs-137	Cs-137	136.907	Cesium	1.00E-02	ICRP-38	3.00E+01	y	9.47E+08	8.70E+01	ICRP-72	4.60E-09	F	Rec	FGR-12	7.74E-18
Cs-138	Cs-138	137.911	Cesium	1.00E-02	ICRP-38	3.22E+01	m	1.93E+03	4.23E+07	ICRP-72	2.40E-11	F	Rec	FGR-12	1.21E-13
Cs-138m	Cs-138	137.911	Cesium	1.00E-02	ICRP-107	2.91E+00	m	1.75E+02	4.69E+08	--	--	--	--	DOE-STD-1196	1.92E-14
Cs-139	Cs-139	138.913	Cesium	1.00E-02	ICRP-107	9.27E+00	m	5.56E+02	1.46E+08	--	--	--	--	DOE-STD-1196	1.66E-14
Cs-140	Cs-140	139.917	Cesium	1.00E-02	ICRP-107	6.37E+01	s	6.37E+01	1.27E+09	--	--	--	--	DOE-STD-1196	8.89E-14
Cu-57	Cu-57	56.949	Copper	1.00E-03	ICRP-38	2.33E+02	ms	2.33E-01	8.50E+11	--	--	--	--	DOE-STD-1196	5.65E-14
Cu-59	Cu-59	58.939	Copper	1.00E-03	ICRP-107	8.15E+01	s	8.15E+01	2.35E+09	--	--	--	--	DOE-STD-1196	6.68E-14
Cu-60	Cu-60	59.937	Copper	1.00E-03	ICRP-38	2.32E+01	m	1.39E+03	1.35E+08	ICRP-72	3.40E-11	S	Max	FGR-12	1.98E-13
Cu-61	Cu-61	60.933	Copper	1.00E-03	ICRP-38	3.41E+00	h	1.23E+04	1.51E+07	ICRP-72	7.80E-11	S	Max	FGR-12	3.99E-14
Cu-62	Cu-62	61.933	Copper	1.00E-03	ICRP-38	9.74E+00	m	5.84E+02	3.12E+08	--	--	--	--	FGR-12	4.86E-14
Cu-64	Cu-64	63.930	Copper	1.00E-03	ICRP-38	1.27E+01	h	4.57E+04	3.86E+06	ICRP-72	1.20E-10	S	Max	FGR-12	9.10E-15
Cu-66	Cu-66	65.929	Copper	1.00E-03	ICRP-38	5.10E+00	m	3.06E+02	5.59E+08	--	--	--	--	FGR-12	4.46E-15
Cu-67	Cu-67	66.928	Copper	1.00E-03	ICRP-38	6.19E+01	h	2.23E+05	7.57E+05	ICRP-72	6.10E-10	S	Max	FGR-12	5.41E-15
Cu-69	Cu-69	68.929	Copper	1.00E-03	ICRP-107	2.85E+00	m	1.71E+02	9.57E+08	--	--	--	--	DOE-STD-1196	2.53E-14
Dy-148	Dy-148	147.927	Dysprosium	1.00E-03	ICRP-107	3.30E+00	m	1.98E+02	3.85E+08	--	--	--	--	DOE-STD-1196	3.15E-14
Dy-149	Dy-149	148.927	Dysprosium	1.00E-03	ICRP-107	4.20E+00	m	2.52E+02	3.01E+08	--	--	--	--	DOE-STD-1196	7.52E-14
Dy-150	Dy-150	149.926	Dysprosium	1.00E-03	ICRP-107	7.17E+00	m	4.30E+02	1.75E+08	--	--	--	--	DOE-STD-1196	1.18E-14
Dy-151	Dy-151	150.926	Dysprosium	1.00E-03	ICRP-107	1.79E+01	m	1.07E+03	6.96E+07	DOE-STD-1196	1.51E-10	S	Max	DOE-STD-1196	6.28E-14
Dy-152	Dy-152	151.925	Dysprosium	1.00E-03	ICRP-107	2.38E+00	h	8.57E+03	8.67E+06	DOE-STD-1196	7.46E-11	S	Max	DOE-STD-1196	1.18E-14
Dy-153	Dy-153	152.926	Dysprosium	1.00E-03	ICRP-107	6.40E+00	h	2.30E+04	3.20E+06	DOE-STD-1196	1.51E-10	S	Max	DOE-STD-1196	3.82E-14
Dy-154	Dy-154	153.924	Dysprosium	1.00E-03	ICRP-107	3.00E+06	y	9.47E+13	7.74E-04	DOE-STD-1196	2.74E-05	F	Max	--	--
Dy-155	Dy-155	154.926	Dysprosium	1.00E-03	ICRP-38	1.00E+01	h	3.60E+04	2.02E+06	ICRP-72	7.70E-11	M	Max	FGR-12	2.77E-14
Dy-157	Dy-157	156.925	Dysprosium	1.00E-03	ICRP-38	8.10E+00	h	2.92E+04	2.47E+06	ICRP-72	3.00E-11	M	Max	FGR-12	1.63E-14
Dy-159	Dy-159	158.926	Dysprosium	1.00E-03	ICRP-38	1.44E+02	d	1.25E+07	5.69E+03	ICRP-72	3.70E-10	M	Max	FGR-12	1.25E-15
Dy-165	Dy-165	164.932	Dysprosium	1.00E-03	ICRP-38	2.33E+00	h	8.40E+03	8.14E+06	ICRP-72	6.00E-11	M	Max	FGR-12	1.20E-15
Dy-165m	Dy-165	164.932	Dysprosium	1.00E-03	ICRP-107	1.26E+00	m	7.54E+01	9.07E+08	--	--	--	--	DOE-STD-1196	7.08E-16
Dy-166	Dy-166	165.933	Dysprosium	1.00E-03	ICRP-38	8.16E+01	h	2.94E+05	2.31E+05	ICRP-72	1.90E-09	M	Max	FGR-12	1.40E-15
Dy-167	Dy-167	166.936	Dysprosium	1.00E-03	ICRP-107	6.20E+00	m	3.72E+02	1.82E+08	--	--	--	--	DOE-STD-1196	2.40E-14
Dy-168	Dy-168	167.937	Dysprosium	1.00E-03	ICRP-107	8.70E+00	m	5.22E+02	1.29E+08	--	--	--	--	DOE-STD-1196	1.73E-14
Er-154	Er-154	153.933	Erbium	1.00E-03	ICRP-107	3.73E+00	m	2.24E+02	3.27E+08	--	--	--	--	DOE-STD-1196	2.24E-15
Er-155	Er-155	154.933	Erbium	1.00E-03	JAERI	5.30E+00	m	3.18E+02	2.29E+08	--	--	--	--	--	--
Er-156	Er-156	155.931	Erbium	1.00E-03	ICRP-107	1.95E+01	m	1.17E+03	6.18E+07	DOE-STD-1196	2.38E-11	S	Max	DOE-STD-1196	1.72E-15
Er-159	Er-159	158.931	Erbium	1.00E-03	ICRP-107	3.60E+01	m	2.16E+03	3.29E+07	DOE-STD-1196	2.07E-11	S	Max	DOE-STD-1196	4.36E-14
Er-161	Er-161	160.930	Erbium	1.00E-03	ICRP-38	3.24E+00	h	1.17E+04	6.01E+06	ICRP-72	4.80E-11	M	Max	FGR-12	4.42E-14
Er-163	Er-163	162.930	Erbium	1.00E-03	ICRP-107	7.50E+01	m	4.50E+03	1.54E+07	DOE-STD-1196	1.56E-12	S	Max	DOE-STD-1196	9.82E-16
Er-165	Er-165	164.931	Erbium	1.00E-03	ICRP-38	1.04E+01	h	3.73E+04	1.83E+06	ICRP-72	7.90E-12	M	Max	FGR-12	1.11E-15
Er-167m	Er-167	166.932	Erbium	1.00E-03	ICRP-38	2.28E+00	s	2.28E+00	2.96E+10	--	--	--	--	DOE-STD-1196	4.03E-15
Er-169	Er-169	168.935	Erbium	1.00E-03	ICRP-38	9.30E+00	d	8.04E+05	8.31E+04	ICRP-72	1.00E-09	M	Max	FGR-12	1.74E-18
Er-171	Er-171	170.938	Erbium	1.00E-03	ICRP-38	7.52E+00	h	2.71E+04	2.44E+06	ICRP-72	2.20E-10	M	Max	FGR-12	1.78E-14
Er-172	Er-172	171.939	Erbium	1.00E-03	ICRP-38	4.93E+01	h	1.77E+05	3.70E+05	ICRP-72	1.10E-09	M	Max	FGR-12	2.47E-14
Er-173	Er-173	172.942	Erbium	1.00E-03	ICRP-107	1.43E+00	m	8.60E+01	7.58E+08	--	--	--	--	DOE-STD-1196	3.73E-14
Es-249	Es-249	249.076	Einsteinium	1.00E-03	ICRP-107	1.02E+02	m	6.13E+03	7.39E+06	DOE-STD-1196	2.49E-10	M	Max	DOE-STD-1196	1.77E-14
Es-250	Es-250	250.079	Einsteinium	1.00E-03	ICRP-38	2.10E+00	h	7.56E+03	5.97E+06	ICRP-72	6.30E-10	M	Max	FGR-12	1.90E-14
Es-250m	Es-250	250.079	Einsteinium	1.00E-03	ICRP-107	2.22E+00	h	7.99E+03	5.64E+06	DOE-STD-1196	1.59E-09	F	Max	DOE-STD-1196	2.49E-14
Es-251	Es-251	251.080	Einsteinium	1.00E-03	ICRP-38	3.30E+01	h	1.19E+05	3.78E+05	ICRP-72	2.10E-09	M	Max	FGR-12	4.13E-15

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Es-253	Es-253	253.085	Einsteinium	1.00E-03	ICRP-38	2.05E+01	d	1.77E+06	2.52E+04	ICRP-72	2.70E-06	M	Max	FGR-12	1.83E-17
Es-254	Es-254	254.088	Einsteinium	1.00E-03	ICRP-38	2.76E+02	d	2.38E+07	1.86E+03	ICRP-72	8.60E-06	M	Max	FGR-12	1.93E-16
Es-254m	Es-254	254.088	Einsteinium	1.00E-03	ICRP-38	3.93E+01	h	1.41E+05	3.14E+05	ICRP-72	4.70E-07	M	Max	FGR-12	2.25E-14
Es-255	Es-255	255.090	Einsteinium	1.00E-03	ICRP-107	3.98E+01	d	3.44E+06	1.29E+04	DOE-STD-1196	4.95E-06	S	Max	DOE-STD-1196	4.95E-17
Es-256	Es-256	256.094	Einsteinium	1.00E-03	ICRP-107	2.54E+01	m	1.52E+03	2.89E+07	DOE-STD-1196	4.55E-08	S	Max	DOE-STD-1196	4.33E-16
Eu-142	Eu-142	141.923	Europium	1.00E-03	ICRP-107	2.34E+00	s	2.34E+00	3.40E+10	--	--	--	--	DOE-STD-1196	5.78E-14
Eu-142m	Eu-142	141.923	Europium	1.00E-03	ICRP-107	1.22E+00	m	7.34E+01	1.08E+09	--	--	--	--	DOE-STD-1196	1.58E-13
Eu-143	Eu-143	142.920	Europium	1.00E-03	ICRP-107	2.59E+00	m	1.55E+02	5.08E+08	--	--	--	--	DOE-STD-1196	5.26E-14
Eu-144	Eu-144	143.919	Europium	1.00E-03	ICRP-107	1.02E+01	s	1.02E+01	7.69E+09	--	--	--	--	DOE-STD-1196	5.18E-14
Eu-145	Eu-145	144.916	Europium	1.00E-03	ICRP-38	5.94E+00	d	5.13E+05	1.52E+05	ICRP-72	5.50E-10	M	Max	FGR-12	7.22E-14
Eu-146	Eu-146	145.917	Europium	1.00E-03	ICRP-38	4.61E+00	d	3.98E+05	1.94E+05	ICRP-72	8.00E-10	M	Max	FGR-12	1.23E-13
Eu-147	Eu-147	146.917	Europium	1.00E-03	ICRP-38	2.40E+01	d	2.07E+06	3.70E+04	ICRP-72	1.10E-09	M	Max	FGR-12	2.32E-14
Eu-148	Eu-148	147.918	Europium	1.00E-03	ICRP-38	5.45E+01	d	4.71E+06	1.62E+04	ICRP-72	2.60E-09	M	Max	FGR-12	1.06E-13
Eu-149	Eu-149	148.918	Europium	1.00E-03	ICRP-38	9.31E+01	d	8.04E+06	9.42E+03	ICRP-72	2.90E-10	M	Max	FGR-12	2.25E-15
Eu-150l	Eu-150	149.920	Europium	1.00E-03	ICRP-38	3.42E+01	y	1.08E+09	6.97E+01	ICRP-72	5.30E-08	M	Max	FGR-12	7.17E-14
Eu-150s	Eu-150	149.920	Europium	1.00E-03	ICRP-38	1.26E+01	h	4.54E+04	1.66E+06	ICRP-72	1.90E-10	M	Max	FGR-12	2.21E-15
Eu-152	Eu-152	151.922	Europium	1.00E-03	ICRP-38	1.33E+01	y	4.21E+08	1.77E+02	ICRP-72	4.20E-08	M	Max	FGR-12	5.65E-14
Eu-152ml	Eu-152	151.922	Europium	1.00E-03	ICRP-38	9.32E+00	h	3.36E+04	2.21E+06	ICRP-72	2.20E-10	M	Max	FGR-12	1.42E-14
Eu-152ms	Eu-152	151.922	Europium	1.00E-03	ICRP-107	9.60E+01	m	5.76E+03	1.29E+07	DOE-STD-1196	1.01E-11	M	Max	DOE-STD-1196	2.63E-15
Eu-154	Eu-154	153.923	Europium	1.00E-03	ICRP-38	8.80E+00	y	2.78E+08	2.64E+02	ICRP-72	5.30E-08	M	Max	FGR-12	6.14E-14
Eu-154m	Eu-154	153.923	Europium	1.00E-03	ICRP-107	4.60E+01	m	2.76E+03	2.66E+07	DOE-STD-1196	4.76E-12	S	Max	DOE-STD-1196	2.15E-15
Eu-155	Eu-155	154.923	Europium	1.00E-03	ICRP-38	4.96E+00	y	1.57E+08	4.65E+02	ICRP-72	6.90E-09	M	Max	FGR-12	2.49E-15
Eu-156	Eu-156	155.925	Europium	1.00E-03	ICRP-38	1.52E+01	d	1.31E+06	5.51E+04	ICRP-72	3.40E-09	M	Max	FGR-12	6.75E-14
Eu-157	Eu-157	156.925	Europium	1.00E-03	ICRP-38	1.52E+01	h	5.45E+04	1.32E+06	ICRP-72	2.80E-10	M	Max	FGR-12	1.17E-14
Eu-158	Eu-158	157.928	Europium	1.00E-03	ICRP-38	4.59E+01	m	2.75E+03	2.59E+07	ICRP-72	4.70E-11	M	Max	FGR-12	5.27E-14
Eu-159	Eu-159	158.929	Europium	1.00E-03	ICRP-107	1.81E+01	m	1.09E+03	6.54E+07	DOE-STD-1196	2.85E-11	S	Max	DOE-STD-1196	1.32E-14
F-17	F-17	17.002	Fluorine	1.00E+00	ICRP-107	6.45E+01	s	6.45E+01	1.03E+10	--	--	--	--	DOE-STD-1196	4.60E-14
F-18	F-18	18.001	Fluorine	1.00E+00	ICRP-38	1.10E+02	m	6.59E+03	9.52E+07	ICRP-72	5.90E-11	S	Max	FGR-12	4.90E-14
Fe-52	Fe-52	51.948	Iron	1.00E-03	ICRP-38	8.28E+00	h	2.98E+04	7.29E+06	ICRP-72	6.00E-10	M	Rec	FGR-12	3.54E-14
Fe-53	Fe-53	52.945	Iron	1.00E-03	ICRP-107	8.51E+00	m	5.11E+02	4.17E+08	--	--	--	--	DOE-STD-1196	5.35E-14
Fe-53m	Fe-53	52.945	Iron	1.00E-03	ICRP-107	2.53E+00	m	1.52E+02	1.41E+09	--	--	--	--	DOE-STD-1196	1.44E-13
Fe-55	Fe-55	54.938	Iron	1.00E-03	ICRP-38	2.70E+00	y	8.52E+07	2.41E+03	ICRP-72	3.80E-10	M	Rec	DOE-STD-1196	6.69E-24
Fe-59	Fe-59	58.935	Iron	1.00E-03	ICRP-38	4.45E+01	d	3.85E+06	4.98E+04	ICRP-72	3.70E-09	M	Rec	FGR-12	5.97E-14
Fe-60	Fe-60	59.934	Iron	1.00E-03	ICRP-38	1.00E+05	y	3.16E+12	5.96E-02	ICRP-72	1.40E-07	M	Rec	FGR-12	1.95E-19
Fe-61	Fe-61	60.937	Iron	1.00E-03	ICRP-107	5.98E+00	m	3.59E+02	5.16E+08	--	--	--	--	DOE-STD-1196	6.68E-14
Fe-62	Fe-62	61.937	Iron	1.00E-03	ICRP-107	6.80E+01	s	6.80E+01	2.68E+09	--	--	--	--	DOE-STD-1196	2.32E-14
Fm-251	Fm-251	251.082	Fermium	1.00E-03	ICRP-107	5.30E+00	h	1.91E+04	2.35E+06	DOE-STD-1196	2.16E-09	S	Max	DOE-STD-1196	6.35E-15
Fm-252	Fm-252	252.082	Fermium	1.00E-03	ICRP-38	2.27E+01	h	8.17E+04	5.48E+05	ICRP-72	3.20E-07	M	Max	FGR-12	5.03E-18
Fm-253	Fm-253	253.085	Fermium	1.00E-03	ICRP-38	3.00E+00	d	2.59E+05	1.72E+05	ICRP-72	4.00E-07	M	Max	FGR-12	3.53E-15
Fm-254	Fm-254	254.087	Fermium	1.00E-03	ICRP-38	3.24E+00	h	1.17E+04	3.81E+06	ICRP-72	6.10E-08	M	Max	FGR-12	6.57E-18
Fm-255	Fm-255	255.090	Fermium	1.00E-03	ICRP-38	2.01E+01	h	7.23E+04	6.12E+05	ICRP-72	2.70E-07	M	Max	FGR-12	1.10E-16
Fm-256	Fm-256	256.092	Fermium	1.00E-03	ICRP-107	1.58E+02	m	9.46E+03	4.66E+06	DOE-STD-1196	2.85E-07	S	Max	DOE-STD-1196	6.07E-13
Fm-257	Fm-257	257.095	Fermium	1.00E-03	ICRP-38	1.01E+02	d	8.68E+06	5.05E+03	ICRP-72	7.10E-06	M	Max	FGR-12	4.66E-15
Fr-212	Fr-212	211.996	Francium	1.00E-03	ICRP-107	2.00E+01	m	1.20E+03	4.43E+07	DOE-STD-1196	6.98E-09	S	Max	DOE-STD-1196	5.26E-14
Fr-219	Fr-219	219.009	Francium	1.00E-03	ICRP-38	2.10E+01	ms	2.10E-02	2.45E+12	--	--	--	--	FGR-12	1.66E-16
Fr-220	Fr-220	220.012	Francium	1.00E-03	ICRP-38	2.74E+01	s	2.74E+01	1.87E+09	--	--	--	--	FGR-12	4.92E-16

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Fr-221	Fr-221	221.014	Francium	1.00E-03	ICRP-38	4.80E+00	m	2.88E+02	1.77E+08	--	--	--	--	FGR-12	1.46E-15
Fr-222	Fr-222	222.018	Francium	1.00E-03	ICRP-38	1.44E+01	m	8.64E+02	5.88E+07	ICRP-72	1.40E-08	F	Max	FGR-12	1.17E-16
Fr-223	Fr-223	223.020	Francium	1.00E-03	ICRP-38	2.18E+01	m	1.31E+03	3.87E+07	ICRP-72	8.90E-10	F	Max	FGR-12	2.29E-15
Fr-224	Fr-224	224.023	Francium	1.00E-03	ICRP-107	3.33E+00	m	2.00E+02	2.52E+08	--	--	--	--	DOE-STD-1196	2.62E-14
Fr-227	Fr-227	227.032	Francium	1.00E-03	ICRP-107	2.47E+00	m	1.48E+02	3.35E+08	--	--	--	--	DOE-STD-1196	2.00E-14
Ga-64	Ga-64	63.937	Gallium	1.00E-03	ICRP-107	2.63E+00	m	1.58E+02	1.12E+09	--	--	--	--	DOE-STD-1196	1.64E-13
Ga-65	Ga-65	64.933	Gallium	1.00E-03	ICRP-38	1.52E+01	m	9.12E+02	1.91E+08	ICRP-72	1.70E-11	M	Max	FGR-12	5.65E-14
Ga-66	Ga-66	65.932	Gallium	1.00E-03	ICRP-38	9.40E+00	h	3.38E+04	5.06E+06	ICRP-72	4.40E-10	M	Max	FGR-12	1.29E-13
Ga-67	Ga-67	66.928	Gallium	1.00E-03	ICRP-38	7.83E+01	h	2.82E+05	5.98E+05	ICRP-72	2.40E-10	M	Max	FGR-12	7.20E-15
Ga-68	Ga-68	67.928	Gallium	1.00E-03	ICRP-38	6.80E+01	m	4.08E+03	4.07E+07	ICRP-72	4.90E-11	M	Max	FGR-12	4.58E-14
Ga-70	Ga-70	69.926	Gallium	1.00E-03	ICRP-38	2.12E+01	m	1.27E+03	1.27E+08	ICRP-72	1.60E-11	M	Max	FGR-12	4.62E-16
Ga-72	Ga-72	71.926	Gallium	1.00E-03	ICRP-38	1.41E+01	h	5.08E+04	3.09E+06	ICRP-72	5.30E-10	M	Max	FGR-12	1.39E-13
Ga-73	Ga-73	72.925	Gallium	1.00E-03	ICRP-38	4.91E+00	h	1.77E+04	8.75E+06	ICRP-72	1.40E-10	M	Max	FGR-12	1.48E-14
Ga-74	Ga-74	73.927	Gallium	1.00E-03	ICRP-107	8.12E+00	m	4.87E+02	3.13E+08	--	--	--	--	DOE-STD-1196	1.55E-13
Gd-142	Gd-142	141.928	Gadolinium	1.00E-03	ICRP-107	7.02E+01	s	7.02E+01	1.13E+09	--	--	--	--	DOE-STD-1196	4.78E-14
Gd-143m	Gd-143	142.927	Gadolinium	1.00E-03	ICRP-107	1.10E+02	s	1.10E+02	7.18E+08	--	--	--	--	DOE-STD-1196	9.77E-14
Gd-144	Gd-144	143.923	Gadolinium	1.00E-03	ICRP-107	4.47E+00	m	2.68E+02	2.92E+08	--	--	--	--	DOE-STD-1196	4.25E-14
Gd-145	Gd-145	144.922	Gadolinium	1.00E-03	ICRP-38	2.29E+01	m	1.37E+03	5.67E+07	ICRP-72	2.00E-11	M	Max	FGR-12	1.15E-13
Gd-145m	Gd-145	144.922	Gadolinium	1.00E-03	ICRP-107	8.50E+01	s	8.50E+01	9.16E+08	--	--	--	--	DOE-STD-1196	3.08E-14
Gd-146	Gd-146	145.918	Gadolinium	1.00E-03	ICRP-38	4.83E+01	d	4.17E+06	1.85E+04	ICRP-72	6.40E-09	M	Max	FGR-12	9.95E-15
Gd-147	Gd-147	146.919	Gadolinium	1.00E-03	ICRP-38	3.81E+01	h	1.37E+05	5.60E+05	ICRP-72	4.00E-10	M	Max	FGR-12	6.45E-14
Gd-148	Gd-148	147.918	Gadolinium	1.00E-03	ICRP-38	9.30E+01	y	2.93E+09	2.60E+01	ICRP-72	2.60E-05	F	Max	--	--
Gd-149	Gd-149	148.919	Gadolinium	1.00E-03	ICRP-38	9.40E+00	d	8.12E+05	9.33E+04	ICRP-72	7.30E-10	M	Max	FGR-12	1.92E-14
Gd-150	Gd-150	149.919	Gadolinium	1.00E-03	ICRP-107	1.79E+06	y	5.65E+13	1.33E-03	DOE-STD-1196	2.56E-05	F	Max	--	--
Gd-151	Gd-151	150.920	Gadolinium	1.00E-03	ICRP-38	1.20E+02	d	1.04E+07	7.21E+03	ICRP-72	8.60E-10	M	Max	FGR-12	2.20E-15
Gd-152	Gd-152	151.920	Gadolinium	1.00E-03	ICRP-38	1.08E+14	y	3.41E+21	2.18E-11	ICRP-72	1.90E-05	F	Max	--	--
Gd-153	Gd-153	152.922	Gadolinium	1.00E-03	ICRP-38	2.42E+02	d	2.09E+07	3.53E+03	ICRP-72	2.10E-09	F	Max	FGR-12	3.71E-15
Gd-159	Gd-159	158.926	Gadolinium	1.00E-03	ICRP-38	1.86E+01	h	6.68E+04	1.06E+06	ICRP-72	2.70E-10	M	Max	FGR-12	2.21E-15
Gd-162	Gd-162	161.931	Gadolinium	1.00E-03	ICRP-107	8.40E+00	m	5.04E+02	1.38E+08	--	--	--	--	DOE-STD-1196	1.86E-14
Ge-66	Ge-66	65.934	Germanium	1.00E-03	ICRP-38	2.27E+00	h	8.17E+03	2.09E+07	ICRP-72	9.10E-11	M	Max	FGR-12	3.25E-14
Ge-67	Ge-67	66.933	Germanium	1.00E-03	ICRP-38	1.87E+01	m	1.12E+03	1.50E+08	ICRP-72	2.50E-11	M	Max	FGR-12	6.86E-14
Ge-68	Ge-68	67.928	Germanium	1.00E-03	ICRP-38	2.88E+02	d	2.49E+07	6.67E+03	ICRP-72	1.40E-08	M	Max	FGR-12	7.37E-20
Ge-69	Ge-69	68.928	Germanium	1.00E-03	ICRP-38	3.91E+01	h	1.41E+05	1.16E+06	ICRP-72	2.90E-10	M	Max	FGR-12	4.27E-14
Ge-71	Ge-71	70.925	Germanium	1.00E-03	ICRP-38	1.18E+01	d	1.02E+06	1.56E+05	ICRP-72	1.10E-11	M	Max	FGR-12	7.47E-20
Ge-75	Ge-75	74.923	Germanium	1.00E-03	ICRP-38	8.28E+01	m	4.97E+03	3.03E+07	ICRP-72	3.60E-11	M	Max	FGR-12	1.68E-15
Ge-77	Ge-77	76.924	Germanium	1.00E-03	ICRP-38	1.13E+01	h	4.07E+04	3.61E+06	ICRP-72	3.70E-10	M	Max	FGR-12	5.32E-14
Ge-78	Ge-78	77.923	Germanium	1.00E-03	ICRP-38	8.70E+01	m	5.22E+03	2.77E+07	ICRP-72	9.50E-11	M	Max	FGR-12	1.34E-14
H-3	H-3	3.016	Hydrogen	1.00E+00	ICRP-38	1.24E+01	y	3.90E+08	9.60E+03	ICRP-72	4.50E-11	M	Rec	FGR-12	3.31E-19
Hf-167	Hf-167	166.943	Hafnium	1.00E-03	ICRP-107	2.05E+00	m	1.23E+02	5.49E+08	--	--	--	--	DOE-STD-1196	2.73E-14
Hf-169	Hf-169	168.941	Hafnium	1.00E-03	ICRP-107	3.24E+00	m	1.94E+02	3.44E+08	--	--	--	--	DOE-STD-1196	2.78E-14
Hf-170	Hf-170	169.940	Hafnium	1.00E-03	ICRP-38	1.60E+01	h	5.76E+04	1.15E+06	ICRP-72	3.20E-10	M	Max	FGR-12	2.52E-14
Hf-172	Hf-172	171.939	Hafnium	1.00E-03	ICRP-38	1.87E+00	y	5.90E+07	1.11E+03	ICRP-72	3.20E-08	F	Max	FGR-12	4.06E-15
Hf-173	Hf-173	172.941	Hafnium	1.00E-03	ICRP-38	2.40E+01	h	8.64E+04	7.55E+05	ICRP-72	1.60E-10	M	Max	FGR-12	1.85E-14
Hf-174	Hf-174	173.940	Hafnium	1.00E-03	ICRP-107	2.00E+15	y	6.31E+22	1.03E-12	DOE-STD-1196	3.20E-05	F	Max	--	--
Hf-175	Hf-175	174.942	Hafnium	1.00E-03	ICRP-38	7.00E+01	d	6.05E+06	1.07E+04	ICRP-72	1.20E-09	M	Max	FGR-12	1.69E-14
Hf-177m	Hf-177	176.943	Hafnium	1.00E-03	ICRP-38	5.14E+01	m	3.08E+03	2.07E+07	ICRP-72	9.00E-11	M	Max	FGR-12	1.06E-13

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Hf-178m	Hf-178	177.944	Hafnium	1.00E-03	ICRP-38	3.10E+01	y	9.78E+08	6.48E+01	ICRP-72	2.60E-07	F	Max	FGR-12	1.12E-13
Hf-179m	Hf-179	178.946	Hafnium	1.00E-03	ICRP-38	2.51E+01	d	2.17E+06	2.91E+04	ICRP-72	3.80E-09	M	Max	FGR-12	4.21E-14
Hf-180m	Hf-180	179.947	Hafnium	1.00E-03	ICRP-38	5.50E+00	h	1.98E+04	3.17E+06	ICRP-72	1.30E-10	M	Max	FGR-12	4.74E-14
Hf-181	Hf-181	180.949	Hafnium	1.00E-03	ICRP-38	4.24E+01	d	3.66E+06	1.70E+04	ICRP-72	5.00E-09	M	Max	FGR-12	2.62E-14
Hf-182	Hf-182	181.951	Hafnium	1.00E-03	ICRP-38	9.00E+06	y	2.84E+14	2.18E-04	ICRP-72	3.10E-07	F	Max	FGR-12	1.14E-14
Hf-182m	Hf-182	181.951	Hafnium	1.00E-03	ICRP-38	6.15E+01	m	3.69E+03	1.68E+07	ICRP-72	4.60E-11	M	Max	FGR-12	4.43E-14
Hf-183	Hf-183	182.954	Hafnium	1.00E-03	ICRP-38	6.40E+01	m	3.84E+03	1.61E+07	ICRP-72	5.70E-11	M	Max	FGR-12	3.63E-14
Hf-184	Hf-184	183.955	Hafnium	1.00E-03	ICRP-38	4.12E+00	h	1.48E+04	4.13E+06	ICRP-72	3.30E-10	M	Max	FGR-12	1.14E-14
Hg-187	Hg-187	186.970	Mercury	1.00E-02	JAERI	2.20E+00	m	1.32E+02	4.57E+08	--	--	--	--	--	--
Hg-187m	Hg-187	186.970	Mercury	1.00E-02	JAERI	2.40E+00	m	1.44E+02	4.19E+08	--	--	--	--	--	--
Hg-188	Hg-188	187.968	Mercury	1.00E-02	JAERI	3.25E+00	m	1.95E+02	3.08E+08	--	--	--	--	--	--
Hg-190	Hg-190	189.966	Mercury	1.00E-02	ICRP-107	2.00E+01	m	1.20E+03	4.95E+07	DOE-STD-1196	8.33E-11	V	Max	DOE-STD-1196	7.74E-15
Hg-191m	Hg-191	190.967	Mercury	1.00E-02	ICRP-107	5.08E+01	m	3.05E+03	1.94E+07	DOE-STD-1196	3.47E-10	V	Max	DOE-STD-1196	6.73E-14
Hg-192	Hg-192	191.966	Mercury	1.00E-02	ICRP-107	4.85E+00	h	1.75E+04	3.37E+06	DOE-STD-1196	1.08E-09	V	Max	DOE-STD-1196	1.10E-14
Hg-193	Hg-193	192.967	Mercury	1.00E-02	ICRP-38	3.50E+00	h	1.26E+04	4.64E+06	ICRP-72	1.10E-09	M	Max	FGR-12	8.69E-15
Hg-193m	Hg-193	192.967	Mercury	1.00E-02	ICRP-38	1.11E+01	h	4.00E+04	1.46E+06	ICRP-72	3.10E-09	M	Max	FGR-12	5.05E-14
Hg-194	Hg-194	193.965	Mercury	1.00E-02	ICRP-38	2.60E+02	y	8.20E+09	7.09E+00	ICRP-72	4.00E-08	F	Max	FGR-12	6.92E-19
Hg-195	Hg-195	194.967	Mercury	1.00E-02	ICRP-38	9.90E+00	h	3.56E+04	1.62E+06	ICRP-72	1.40E-09	M	Max	FGR-12	9.20E-15
Hg-195m	Hg-195	194.967	Mercury	1.00E-02	ICRP-38	4.16E+01	h	1.50E+05	3.86E+05	ICRP-72	8.20E-09	M	Max	FGR-12	9.63E-15
Hg-197	Hg-197	196.967	Mercury	1.00E-02	ICRP-38	6.41E+01	h	2.31E+05	2.48E+05	ICRP-72	4.40E-09	M	Max	FGR-12	2.66E-15
Hg-197m	Hg-197	196.967	Mercury	1.00E-02	ICRP-38	2.38E+01	h	8.57E+04	6.68E+05	ICRP-72	5.80E-09	M	Max	FGR-12	4.05E-15
Hg-199m	Hg-199	198.968	Mercury	1.00E-02	ICRP-38	4.26E+01	m	2.56E+03	2.22E+07	ICRP-72	1.80E-10	M	Max	FGR-12	8.36E-15
Hg-203	Hg-203	202.973	Mercury	1.00E-02	ICRP-38	4.66E+01	d	4.03E+06	1.38E+04	ICRP-72	7.00E-09	M	Max	FGR-12	1.13E-14
Hg-205	Hg-205	204.976	Mercury	1.00E-02	ICRP-107	5.20E+00	m	3.12E+02	1.76E+08	--	--	--	--	DOE-STD-1196	6.19E-16
Hg-206	Hg-206	205.978	Mercury	1.00E-02	ICRP-38	8.15E+00	m	4.89E+02	1.12E+08	--	--	--	--	DOE-STD-1196	5.56E-15
Hg-207	Hg-207	206.982	Mercury	1.00E-02	ICRP-107	2.90E+00	m	1.74E+02	3.13E+08	--	--	--	--	DOE-STD-1196	1.28E-13
Ho-150	Ho-150	149.933	Holmium	1.00E-03	ICRP-107	7.68E+01	s	7.68E+01	9.80E+08	--	--	--	--	DOE-STD-1196	8.73E-14
Ho-152	Ho-152	151.932	Holmium	1.00E-03	JAERI	2.70E+00	m	1.62E+02	4.59E+08	--	--	--	--	--	--
Ho-153	Ho-153	152.930	Holmium	1.00E-03	ICRP-107	2.01E+00	m	1.21E+02	6.12E+08	--	--	--	--	DOE-STD-1196	4.61E-14
Ho-153m	Ho-153	152.930	Holmium	1.00E-03	ICRP-107	9.30E+00	m	5.58E+02	1.32E+08	--	--	--	--	DOE-STD-1196	4.72E-14
Ho-154	Ho-154	153.931	Holmium	1.00E-03	ICRP-107	1.18E+01	m	7.06E+02	1.04E+08	DOE-STD-1196	1.82E-11	S	Max	DOE-STD-1196	8.63E-14
Ho-154m	Ho-154	153.931	Holmium	1.00E-03	ICRP-107	3.10E+00	m	1.86E+02	3.94E+08	--	--	--	--	DOE-STD-1196	1.09E-13
Ho-155	Ho-155	154.929	Holmium	1.00E-03	ICRP-38	4.80E+01	m	2.88E+03	2.53E+07	ICRP-72	2.00E-11	M	Max	FGR-12	1.79E-14
Ho-156	Ho-156	155.930	Holmium	1.00E-03	ICRP-107	5.60E+01	m	3.36E+03	2.15E+07	DOE-STD-1196	6.56E-11	S	Max	DOE-STD-1196	9.78E-14
Ho-157	Ho-157	156.928	Holmium	1.00E-03	ICRP-38	1.26E+01	m	7.56E+02	9.51E+07	ICRP-72	4.20E-12	M	Max	FGR-12	2.24E-14
Ho-158	Ho-158	157.929	Holmium	1.00E-03	JAERI	1.13E+01	m	6.78E+02	1.05E+08	JAERI	7.80E-12	M	Max	--	--
Ho-159	Ho-159	158.928	Holmium	1.00E-03	ICRP-38	3.30E+01	m	1.98E+03	3.59E+07	ICRP-72	6.10E-12	M	Max	FGR-12	1.60E-14
Ho-160	Ho-160	159.929	Holmium	1.00E-03	ICRP-107	2.56E+01	m	1.54E+03	4.59E+07	DOE-STD-1196	1.63E-11	S	Max	DOE-STD-1196	7.64E-14
Ho-161	Ho-161	160.928	Holmium	1.00E-03	ICRP-38	2.50E+00	h	9.00E+03	7.79E+06	ICRP-72	6.00E-12	M	Max	FGR-12	1.73E-15
Ho-162	Ho-162	161.929	Holmium	1.00E-03	ICRP-38	1.50E+01	m	9.00E+02	7.74E+07	ICRP-72	2.80E-12	M	Max	FGR-12	7.35E-15
Ho-162m	Ho-162	161.929	Holmium	1.00E-03	ICRP-38	6.80E+01	m	4.08E+03	1.71E+07	ICRP-72	2.10E-11	M	Max	FGR-12	2.74E-14
Ho-163	Ho-163	162.929	Holmium	1.00E-03	ICRP-107	4.57E+03	y	1.44E+11	4.80E-01	DOE-STD-1196	2.82E-10	F	Max	--	--
Ho-164	Ho-164	163.930	Holmium	1.00E-03	ICRP-38	2.90E+01	m	1.74E+03	3.96E+07	ICRP-72	8.40E-12	M	Max	FGR-12	9.05E-16
Ho-164m	Ho-164	163.930	Holmium	1.00E-03	ICRP-38	3.75E+01	m	2.25E+03	3.06E+07	ICRP-72	1.20E-11	M	Max	FGR-12	1.32E-15
Ho-166	Ho-166	165.932	Holmium	1.00E-03	ICRP-38	2.68E+01	h	9.65E+04	7.05E+05	ICRP-72	6.50E-10	M	Max	FGR-12	1.42E-15
Ho-166m	Ho-166	165.932	Holmium	1.00E-03	ICRP-38	1.20E+03	y	3.79E+10	1.80E+00	ICRP-72	1.20E-07	M	Max	FGR-12	8.45E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Ho-167	Ho-167	166.933	Holmium	1.00E-03	ICRP-38	3.10E+00	h	1.12E+04	6.06E+06	ICRP-72	7.10E-11	M	Max	FGR-12	1.73E-14
Ho-168	Ho-168	167.936	Holmium	1.00E-03	ICRP-107	2.99E+00	m	1.79E+02	3.74E+08	--	--	--	--	DOE-STD-1196	4.06E-14
Ho-168m	Ho-168	167.936	Holmium	1.00E-03	ICRP-107	1.32E+02	s	1.32E+02	5.09E+08	--	--	--	--	DOE-STD-1196	1.50E-16
Ho-170	Ho-170	169.940	Holmium	1.00E-03	ICRP-107	2.76E+00	m	1.66E+02	4.01E+08	--	--	--	--	DOE-STD-1196	7.83E-14
I-118	I-118	117.913	Iodine	5.00E-01	ICRP-107	1.37E+01	m	8.22E+02	1.16E+08	DOE-STD-1196	6.86E-11	F	Rec	DOE-STD-1196	9.38E-14
I-118m	I-118	117.913	Iodine	5.00E-01	ICRP-107	8.50E+00	m	5.10E+02	1.88E+08	--	--	--	--	DOE-STD-1196	1.71E-13
I-119	I-119	118.910	Iodine	5.00E-01	ICRP-107	1.91E+01	m	1.15E+03	8.28E+07	DOE-STD-1196	1.85E-11	F	Rec	DOE-STD-1196	4.06E-14
I-120	I-120	119.910	Iodine	5.00E-01	ICRP-38	8.10E+01	m	4.86E+03	1.94E+07	ICRP-72	1.00E-10	F	Rec	FGR-12	1.38E-13
I-120m	I-120	119.910	Iodine	5.00E-01	ICRP-38	5.30E+01	m	3.18E+03	2.96E+07	ICRP-72	8.20E-11	F	Rec	FGR-12	2.65E-13
I-121	I-121	120.907	Iodine	5.00E-01	ICRP-38	2.12E+00	h	7.63E+03	1.22E+07	ICRP-72	2.70E-11	F	Rec	FGR-12	1.94E-14
I-122	I-122	121.908	Iodine	5.00E-01	ICRP-38	3.62E+00	m	2.17E+02	4.26E+08	--	--	--	--	FGR-12	4.56E-14
I-123	I-123	122.906	Iodine	5.00E-01	ICRP-38	1.32E+01	h	4.75E+04	1.93E+06	ICRP-72	7.40E-11	F	Rec	FGR-12	7.28E-15
I-124	I-124	123.906	Iodine	5.00E-01	ICRP-38	4.18E+00	d	3.61E+05	2.52E+05	ICRP-72	4.40E-09	F	Rec	FGR-12	5.38E-14
I-125	I-125	124.905	Iodine	5.00E-01	ICRP-38	6.01E+01	d	5.20E+06	1.74E+04	ICRP-72	5.10E-09	F	Rec	FGR-12	5.22E-16
I-126	I-126	125.906	Iodine	5.00E-01	ICRP-38	1.30E+01	d	1.12E+06	7.97E+04	ICRP-72	9.80E-09	F	Rec	FGR-12	2.15E-14
I-128	I-128	127.906	Iodine	5.00E-01	ICRP-38	2.50E+01	m	1.50E+03	5.88E+07	ICRP-72	1.30E-11	F	Rec	FGR-12	4.16E-15
I-129	I-129	128.905	Iodine	5.00E-01	ICRP-38	1.57E+07	y	4.95E+14	1.77E-04	ICRP-72	3.60E-08	F	Rec	FGR-12	3.80E-16
I-130	I-130	129.907	Iodine	5.00E-01	ICRP-38	1.24E+01	h	4.45E+04	1.95E+06	ICRP-72	6.70E-10	F	Rec	FGR-12	1.04E-13
I-130m	I-130	129.907	Iodine	5.00E-01	ICRP-107	8.84E+00	m	5.30E+02	1.64E+08	--	--	--	--	DOE-STD-1196	4.88E-15
I-131	I-131	130.906	Iodine	5.00E-01	ICRP-38	8.04E+00	d	6.95E+05	1.24E+05	ICRP-72	7.40E-09	F	Rec	FGR-12	1.82E-14
I-132	I-132	131.908	Iodine	5.00E-01	ICRP-38	2.30E+00	h	8.28E+03	1.03E+07	ICRP-72	9.40E-11	F	Rec	FGR-12	1.12E-13
I-132m	I-132	131.908	Iodine	5.00E-01	ICRP-38	8.36E+01	m	5.02E+03	1.71E+07	ICRP-72	7.90E-11	F	Rec	FGR-12	1.53E-14
I-133	I-133	132.908	Iodine	5.00E-01	ICRP-38	2.08E+01	h	7.49E+04	1.13E+06	ICRP-72	1.50E-09	F	Rec	FGR-12	2.94E-14
I-134	I-134	133.910	Iodine	5.00E-01	ICRP-38	5.26E+01	m	3.16E+03	2.67E+07	ICRP-72	4.50E-11	F	Rec	FGR-12	1.30E-13
I-134m	I-134	133.910	Iodine	5.00E-01	ICRP-107	3.60E+00	m	2.16E+02	3.90E+08	--	--	--	--	DOE-STD-1196	1.19E-14
I-135	I-135	134.910	Iodine	5.00E-01	ICRP-38	6.61E+00	h	2.38E+04	3.51E+06	ICRP-72	3.20E-10	F	Rec	FGR-12	7.98E-14
In-103	In-103	102.920	Indium	1.00E-03	ICRP-107	6.00E+01	s	6.00E+01	1.83E+09	--	--	--	--	DOE-STD-1196	1.30E-13
In-105	In-105	104.915	Indium	1.00E-03	ICRP-107	5.07E+00	m	3.04E+02	3.53E+08	--	--	--	--	DOE-STD-1196	8.97E-14
In-106	In-106	105.913	Indium	1.00E-03	ICRP-107	6.20E+00	m	3.72E+02	2.86E+08	--	--	--	--	DOE-STD-1196	1.63E-13
In-106m	In-106	105.913	Indium	1.00E-03	ICRP-107	5.20E+00	m	3.12E+02	3.41E+08	--	--	--	--	DOE-STD-1196	1.35E-13
In-107	In-107	106.910	Indium	1.00E-03	ICRP-107	3.24E+01	m	1.94E+03	5.43E+07	DOE-STD-1196	3.06E-11	S	Max	DOE-STD-1196	7.18E-14
In-108	In-108	107.910	Indium	1.00E-03	ICRP-107	5.80E+01	m	3.48E+03	3.00E+07	DOE-STD-1196	5.71E-11	S	Max	DOE-STD-1196	1.81E-13
In-108m	In-108	107.910	Indium	1.00E-03	ICRP-107	3.96E+01	m	2.38E+03	4.40E+07	DOE-STD-1196	4.53E-11	S	Max	DOE-STD-1196	1.35E-13
In-109	In-109	108.907	Indium	1.00E-03	ICRP-38	4.20E+00	h	1.51E+04	6.85E+06	ICRP-72	4.20E-11	M	Max	FGR-12	3.21E-14
In-109m	In-109	108.907	Indium	1.00E-03	ICRP-107	1.34E+00	m	8.04E+01	1.29E+09	--	--	--	--	DOE-STD-1196	2.74E-14
In-110l	In-110	109.907	Indium	1.00E-03	ICRP-38	4.90E+00	h	1.76E+04	5.82E+06	ICRP-72	1.30E-10	M	Max	FGR-12	1.49E-13
In-110s	In-110	109.907	Indium	1.00E-03	ICRP-38	6.91E+01	m	4.15E+03	2.48E+07	ICRP-72	4.70E-11	M	Max	FGR-12	7.62E-14
In-111	In-111	110.905	Indium	1.00E-03	ICRP-38	2.83E+00	d	2.45E+05	4.16E+05	ICRP-72	2.30E-10	M	Max	FGR-12	1.86E-14
In-111m	In-111	110.905	Indium	1.00E-03	ICRP-38	7.70E+00	m	4.62E+02	2.20E+08	--	--	--	--	DOE-STD-1196	2.10E-14
In-112	In-112	111.906	Indium	1.00E-03	ICRP-38	1.44E+01	m	8.64E+02	1.17E+08	ICRP-72	7.40E-12	M	Max	FGR-12	1.26E-14
In-112m	In-112	111.906	Indium	1.00E-03	ICRP-107	2.06E+01	m	1.23E+03	8.17E+07	DOE-STD-1196	2.60E-11	S	Max	DOE-STD-1196	9.86E-16
In-113m	In-113	112.904	Indium	1.00E-03	ICRP-38	1.66E+00	h	5.97E+03	1.67E+07	ICRP-72	2.00E-11	M	Max	FGR-12	1.21E-14
In-114	In-114	113.905	Indium	1.00E-03	ICRP-38	7.19E+01	s	7.19E+01	1.38E+09	--	--	--	--	FGR-12	1.39E-16
In-114m	In-114	113.905	Indium	1.00E-03	ICRP-38	4.95E+01	d	4.28E+06	2.32E+04	ICRP-72	9.30E-09	F	Max	FGR-12	4.18E-15
In-115	In-115	114.904	Indium	1.00E-03	ICRP-38	5.10E+15	y	1.61E+23	6.10E-13	ICRP-72	3.90E-07	F	Max	FGR-12	4.50E-18
In-115m	In-115	114.904	Indium	1.00E-03	ICRP-38	4.49E+00	h	1.61E+04	6.08E+06	ICRP-72	5.90E-11	M	Max	FGR-12	7.39E-15

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
In-116m	In-116	115.905	Indium	1.00E-03	ICRP-38	5.42E+01	m	3.25E+03	3.00E+07	ICRP-72	4.50E-11	M	Max	FGR-12	1.25E-13
In-117	In-117	116.905	Indium	1.00E-03	ICRP-38	4.38E+01	m	2.63E+03	3.67E+07	ICRP-72	2.90E-11	M	Max	FGR-12	3.31E-14
In-117m	In-117	116.905	Indium	1.00E-03	ICRP-38	1.17E+02	m	6.99E+03	1.38E+07	ICRP-72	7.20E-11	M	Max	FGR-12	4.19E-15
In-118	In-118	117.906	Indium	1.00E-03	ICRP-107	5.00E+00	s	5.00E+00	1.91E+10	--	--	--	--	DOE-STD-1196	5.72E-15
In-118m	In-118	117.906	Indium	1.00E-03	ICRP-107	4.36E+00	m	2.62E+02	3.65E+08	--	--	--	--	DOE-STD-1196	1.31E-13
In-119	In-119	118.906	Indium	1.00E-03	ICRP-38	2.40E+00	m	1.44E+02	6.59E+08	--	--	--	--	FGR-12	3.74E-14
In-119m	In-119	118.906	Indium	1.00E-03	ICRP-38	1.80E+01	m	1.08E+03	8.78E+07	ICRP-72	1.70E-11	M	Max	FGR-12	6.14E-16
In-121	In-121	120.908	Indium	1.00E-03	ICRP-107	2.31E+01	s	2.31E+01	4.04E+09	--	--	--	--	DOE-STD-1196	4.36E-14
In-121m	In-121	120.908	Indium	1.00E-03	ICRP-107	3.88E+00	m	2.33E+02	4.01E+08	--	--	--	--	DOE-STD-1196	3.92E-15
Ir-179	Ir-179	178.959	Iridium	1.00E-03	JAERI	1.32E+00	m	7.90E+01	7.98E+08	--	--	--	--	--	--
Ir-180	Ir-180	179.959	Iridium	1.00E-03	ICRP-107	1.50E+00	m	9.00E+01	6.97E+08	--	--	--	--	DOE-STD-1196	7.24E-14
Ir-181	Ir-181	180.958	Iridium	1.00E-03	JAERI	4.90E+00	m	2.94E+02	2.12E+08	--	--	--	--	--	--
Ir-182	Ir-182	181.958	Iridium	1.00E-03	ICRP-38	1.50E+01	m	9.00E+02	6.89E+07	ICRP-72	2.40E-11	S	Max	FGR-12	6.50E-14
Ir-183	Ir-183	182.957	Iridium	1.00E-03	ICRP-107	5.80E+01	m	3.48E+03	1.77E+07	DOE-STD-1196	4.71E-11	S	Max	DOE-STD-1196	5.48E-14
Ir-184	Ir-184	183.957	Iridium	1.00E-03	ICRP-38	3.02E+00	h	1.09E+04	5.64E+06	ICRP-72	1.20E-10	S	Max	FGR-12	9.38E-14
Ir-185	Ir-185	184.957	Iridium	1.00E-03	ICRP-38	1.40E+01	h	5.04E+04	1.21E+06	ICRP-72	1.90E-10	S	Max	FGR-12	2.94E-14
Ir-186l	Ir-186	185.958	Iridium	1.00E-03	ICRP-38	1.58E+01	h	5.69E+04	1.07E+06	ICRP-72	3.20E-10	S	Max	FGR-12	8.06E-14
Ir-186s	Ir-186	185.958	Iridium	1.00E-03	ICRP-38	1.75E+00	h	6.30E+03	9.63E+06	ICRP-72	4.40E-11	S	Max	FGR-12	4.65E-14
Ir-187	Ir-187	186.958	Iridium	1.00E-03	ICRP-38	1.05E+01	h	3.78E+04	1.60E+06	ICRP-72	7.90E-11	S	Max	FGR-12	1.68E-14
Ir-188	Ir-188	187.959	Iridium	1.00E-03	ICRP-38	4.15E+01	h	1.49E+05	4.02E+05	ICRP-72	4.20E-10	S	Max	FGR-12	8.01E-14
Ir-189	Ir-189	188.959	Iridium	1.00E-03	ICRP-38	1.33E+01	d	1.15E+06	5.20E+04	ICRP-72	6.00E-10	S	Max	FGR-12	3.21E-15
Ir-190	Ir-190	189.961	Iridium	1.00E-03	ICRP-38	1.21E+01	d	1.05E+06	5.68E+04	ICRP-72	2.40E-09	S	Max	FGR-12	6.86E-14
Ir-190ms	Ir-190	189.961	Iridium	1.00E-03	ICRP-38	1.20E+00	h	4.32E+03	1.37E+07	ICRP-72	1.00E-11	S	Max	FGR-12	1.27E-19
Ir-190ml	Ir-190	189.961	Iridium	1.00E-03	ICRP-38	3.10E+00	h	1.12E+04	5.32E+06	ICRP-72	8.30E-11	S	Max	FGR-12	7.39E-14
Ir-191m	Ir-191	190.961	Iridium	1.00E-03	ICRP-38	4.94E+00	s	4.94E+00	1.20E+10	--	--	--	--	FGR-12	3.02E-15
Ir-192	Ir-192	191.963	Iridium	1.00E-03	ICRP-38	7.40E+01	d	6.40E+06	9.19E+03	ICRP-72	6.60E-09	S	Max	FGR-12	3.91E-14
Ir-192ms	Ir-192	191.963	Iridium	1.00E-03	ICRP-107	1.45E+00	m	8.70E+01	6.76E+08	--	--	--	--	DOE-STD-1196	2.68E-18
Ir-192ml	Ir-192	191.963	Iridium	1.00E-03	ICRP-38	2.41E+02	y	7.61E+09	7.73E+00	ICRP-72	3.90E-08	S	Max	FGR-12	7.63E-15
Ir-193m	Ir-193	192.963	Iridium	1.00E-03	ICRP-107	1.05E+01	d	9.10E+05	6.43E+04	ICRP-72	1.30E-09	S	Max	DOE-STD-1196	1.04E-17
Ir-194	Ir-194	193.965	Iridium	1.00E-03	ICRP-38	1.92E+01	h	6.89E+04	8.44E+05	ICRP-72	5.60E-10	S	Max	FGR-12	4.54E-15
Ir-194m	Ir-194	193.965	Iridium	1.00E-03	ICRP-38	1.71E+02	d	1.48E+07	3.94E+03	ICRP-72	1.30E-08	S	Max	FGR-12	1.12E-13
Ir-195	Ir-195	194.966	Iridium	1.00E-03	ICRP-38	2.50E+00	h	9.00E+03	6.43E+06	ICRP-72	7.10E-11	S	Max	FGR-12	2.32E-15
Ir-195m	Ir-195	194.966	Iridium	1.00E-03	ICRP-38	3.80E+00	h	1.37E+04	4.23E+06	ICRP-72	1.70E-10	S	Max	FGR-12	1.93E-14
Ir-196	Ir-196	195.968	Iridium	1.00E-03	ICRP-107	5.20E+01	s	5.20E+01	1.11E+09	--	--	--	--	DOE-STD-1196	1.16E-14
Ir-196m	Ir-196	195.968	Iridium	1.00E-03	ICRP-107	1.40E+00	h	5.04E+03	1.14E+07	DOE-STD-1196	1.08E-10	S	Max	DOE-STD-1196	1.10E-13
K-38	K-38	37.969	Potassium	5.00E-01	ICRP-38	7.64E+00	m	4.58E+02	6.49E+08	--	--	--	--	FGR-12	1.64E-13
K-40	K-40	39.964	Potassium	5.00E-01	ICRP-38	1.28E+09	y	4.04E+16	6.99E-06	ICRP-72	2.10E-09	F	Max	FGR-12	8.05E-15
K-42	K-42	41.962	Potassium	5.00E-01	ICRP-38	1.24E+01	h	4.45E+04	6.04E+06	ICRP-72	1.20E-10	F	Max	FGR-12	1.46E-14
K-43	K-43	42.961	Potassium	5.00E-01	ICRP-38	2.26E+01	h	8.14E+04	3.23E+06	ICRP-72	1.40E-10	F	Max	FGR-12	4.67E-14
K-44	K-44	43.962	Potassium	5.00E-01	ICRP-38	2.21E+01	m	1.33E+03	1.93E+08	ICRP-72	2.00E-11	F	Max	FGR-12	1.19E-13
K-45	K-45	44.961	Potassium	5.00E-01	ICRP-38	2.00E+01	m	1.20E+03	2.09E+08	ICRP-72	1.50E-11	F	Max	FGR-12	9.67E-14
K-46	K-46	45.962	Potassium	5.00E-01	ICRP-107	1.05E+02	s	1.05E+02	2.34E+09	--	--	--	--	DOE-STD-1196	1.47E-13
Kr-74	Kr-74	73.933	Krypton	1.00E+00	ICRP-38	1.15E+01	m	6.90E+02	2.21E+08	--	--	--	--	FGR-12	5.59E-14
Kr-75	Kr-75	74.931	Krypton	1.00E+00	ICRP-107	4.29E+00	m	2.57E+02	5.85E+08	--	--	--	--	DOE-STD-1196	5.85E-14
Kr-76	Kr-76	75.926	Krypton	1.00E+00	ICRP-38	1.48E+01	h	5.33E+04	2.79E+06	--	--	--	--	FGR-12	2.03E-14
Kr-77	Kr-77	76.925	Krypton	1.00E+00	ICRP-38	7.47E+01	m	4.48E+03	3.27E+07	--	--	--	--	FGR-12	4.86E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Kr-79	Kr-79	78.920	Krypton	1.00E+00	ICRP-38	3.50E+01	h	1.26E+05	1.13E+06	--	--	--	--	FGR-12	1.21E-14
Kr-81	Kr-81	80.917	Krypton	1.00E+00	ICRP-38	2.10E+05	y	6.63E+12	2.10E-02	--	--	--	--	FGR-12	2.67E-16
Kr-81m	Kr-81	80.917	Krypton	1.00E+00	ICRP-38	1.30E+01	s	1.30E+01	1.07E+10	--	--	--	--	FGR-12	6.14E-15
Kr-83m	Kr-83	82.914	Krypton	1.00E+00	ICRP-38	1.83E+00	h	6.59E+03	2.07E+07	--	--	--	--	FGR-12	1.50E-18
Kr-85	Kr-85	84.913	Krypton	1.00E+00	ICRP-38	1.07E+01	y	3.38E+08	3.93E+02	--	--	--	--	FGR-12	1.19E-16
Kr-85m	Kr-85	84.913	Krypton	1.00E+00	ICRP-38	4.48E+00	h	1.61E+04	8.24E+06	--	--	--	--	FGR-12	7.48E-15
Kr-87	Kr-87	86.913	Krypton	1.00E+00	ICRP-38	7.63E+01	m	4.58E+03	2.84E+07	--	--	--	--	FGR-12	4.12E-14
Kr-88	Kr-88	87.914	Krypton	1.00E+00	ICRP-38	2.84E+00	h	1.02E+04	1.26E+07	--	--	--	--	FGR-12	1.02E-13
Kr-89	Kr-89	88.918	Krypton	1.00E+00	ICRP-107	3.15E+00	m	1.89E+02	6.71E+08	--	--	--	--	DOE-STD-1196	9.56E-14
La-128	La-128	127.916	Lanthanum	1.00E-03	ICRP-107	5.18E+00	m	3.11E+02	2.84E+08	--	--	--	--	DOE-STD-1196	1.30E-13
La-129	La-129	128.913	Lanthanum	1.00E-03	ICRP-107	1.16E+01	m	6.96E+02	1.26E+08	DOE-STD-1196	1.48E-11	S	Max	DOE-STD-1196	4.11E-14
La-130	La-130	129.912	Lanthanum	1.00E-03	ICRP-107	8.70E+00	m	5.22E+02	1.66E+08	--	--	--	--	DOE-STD-1196	1.03E-13
La-131	La-131	130.910	Lanthanum	1.00E-03	ICRP-38	5.90E+01	m	3.54E+03	2.43E+07	ICRP-72	2.30E-11	M	Max	FGR-12	3.14E-14
La-132	La-132	131.910	Lanthanum	1.00E-03	ICRP-38	4.80E+00	h	1.73E+04	4.95E+06	ICRP-72	1.60E-10	M	Max	FGR-12	1.00E-13
La-132m	La-132	131.910	Lanthanum	1.00E-03	ICRP-107	2.43E+01	m	1.46E+03	5.87E+07	DOE-STD-1196	2.51E-11	S	Max	DOE-STD-1196	2.95E-14
La-133	La-133	132.908	Lanthanum	1.00E-03	ICRP-107	3.91E+00	h	1.41E+04	6.03E+06	DOE-STD-1196	2.08E-11	S	Max	DOE-STD-1196	6.39E-15
La-134	La-134	133.909	Lanthanum	1.00E-03	ICRP-38	6.67E+00	m	4.00E+02	2.11E+08	--	--	--	--	FGR-12	3.35E-14
La-135	La-135	134.907	Lanthanum	1.00E-03	ICRP-38	1.95E+01	h	7.02E+04	1.19E+06	ICRP-72	1.40E-11	M	Max	FGR-12	9.21E-16
La-136	La-136	135.908	Lanthanum	1.00E-03	ICRP-107	9.87E+00	m	5.92E+02	1.40E+08	--	--	--	--	DOE-STD-1196	1.79E-14
La-137	La-137	136.906	Lanthanum	1.00E-03	ICRP-38	6.00E+04	y	1.89E+12	4.35E-02	ICRP-72	8.70E-09	F	Max	FGR-12	4.06E-16
La-138	La-138	137.907	Lanthanum	1.00E-03	ICRP-38	1.35E+11	y	4.26E+18	1.92E-08	ICRP-72	1.50E-07	F	Max	FGR-12	6.20E-14
La-140	La-140	139.909	Lanthanum	1.00E-03	ICRP-38	4.03E+01	h	1.45E+05	5.56E+05	ICRP-72	1.10E-09	M	Max	FGR-12	1.17E-13
La-141	La-141	140.911	Lanthanum	1.00E-03	ICRP-38	3.93E+00	h	1.41E+04	5.66E+06	ICRP-72	1.50E-10	M	Max	FGR-12	2.39E-15
La-142	La-142	141.914	Lanthanum	1.00E-03	ICRP-38	9.25E+01	m	5.55E+03	1.43E+07	ICRP-72	8.90E-11	M	Max	FGR-12	1.44E-13
La-143	La-143	142.916	Lanthanum	1.00E-03	ICRP-38	1.42E+01	m	8.54E+02	9.25E+07	ICRP-72	2.10E-11	M	Max	FGR-12	5.18E-15
Lu-164	Lu-164	163.941	Lutetium	1.00E-03	JAERI	3.14E+00	m	1.88E+02	3.65E+08	--	--	--	--	--	--
Lu-165	Lu-165	164.939	Lutetium	1.00E-03	ICRP-107	1.07E+01	m	6.44E+02	1.06E+08	DOE-STD-1196	1.63E-11	S	Max	DOE-STD-1196	5.02E-14
Lu-166	Lu-166	165.940	Lutetium	1.00E-03	JAERI	2.65E+00	m	1.59E+02	4.28E+08	--	--	--	--	--	--
Lu-166m	Lu-166	165.940	Lutetium	1.00E-03	JAERI	1.41E+00	m	8.46E+01	8.04E+08	--	--	--	--	--	--
Lu-167	Lu-167	166.938	Lutetium	1.00E-03	ICRP-107	5.15E+01	m	3.09E+03	2.19E+07	DOE-STD-1196	4.56E-11	S	Max	DOE-STD-1196	7.94E-14
Lu-168m	Lu-168	167.939	Lutetium	1.00E-03	JAERI	6.70E+00	m	4.02E+02	1.67E+08	--	--	--	--	--	--
Lu-169	Lu-169	168.938	Lutetium	1.00E-03	ICRP-38	3.41E+01	h	1.23E+05	5.45E+05	ICRP-72	3.80E-10	S	Max	FGR-12	5.09E-14
Lu-169m	Lu-169	168.938	Lutetium	1.00E-03	ICRP-107	1.60E+02	s	1.60E+02	4.17E+08	--	--	--	--	DOE-STD-1196	2.52E-20
Lu-170	Lu-170	169.938	Lutetium	1.00E-03	ICRP-38	2.00E+00	d	1.73E+05	3.84E+05	ICRP-72	6.60E-10	S	Max	FGR-12	1.28E-13
Lu-171	Lu-171	170.938	Lutetium	1.00E-03	ICRP-38	8.22E+00	d	7.10E+05	9.29E+04	ICRP-72	8.80E-10	S	Max	FGR-12	3.25E-14
Lu-171m	Lu-171	170.938	Lutetium	1.00E-03	ICRP-107	7.90E+01	s	7.90E+01	8.35E+08	--	--	--	--	DOE-STD-1196	9.86E-18
Lu-172	Lu-172	171.939	Lutetium	1.00E-03	ICRP-38	6.70E+00	d	5.79E+05	1.13E+05	ICRP-72	1.60E-09	S	Max	FGR-12	9.25E-14
Lu-172m	Lu-172	171.939	Lutetium	1.00E-03	ICRP-107	3.70E+00	m	2.22E+02	2.96E+08	--	--	--	--	DOE-STD-1196	3.90E-20
Lu-173	Lu-173	172.939	Lutetium	1.00E-03	ICRP-38	1.37E+00	y	4.32E+07	1.51E+03	ICRP-72	2.40E-09	S	Max	FGR-12	5.10E-15
Lu-174	Lu-174	173.940	Lutetium	1.00E-03	ICRP-38	3.31E+00	y	1.04E+08	6.21E+02	ICRP-72	4.20E-09	M	Max	FGR-12	5.46E-15
Lu-174m	Lu-174	173.940	Lutetium	1.00E-03	ICRP-38	1.42E+02	d	1.23E+07	5.29E+03	ICRP-72	4.20E-09	S	Max	FGR-12	2.18E-15
Lu-176	Lu-176	175.943	Lutetium	1.00E-03	ICRP-38	3.60E+10	y	1.14E+18	5.64E-08	ICRP-72	7.00E-08	M	Max	FGR-12	2.32E-14
Lu-176m	Lu-176	175.943	Lutetium	1.00E-03	ICRP-38	3.68E+00	h	1.32E+04	4.84E+06	ICRP-72	1.20E-10	S	Max	FGR-12	5.87E-16
Lu-177	Lu-177	176.944	Lutetium	1.00E-03	ICRP-38	6.71E+00	d	5.80E+05	1.10E+05	ICRP-72	1.20E-09	S	Max	FGR-12	1.62E-15
Lu-177m	Lu-177	176.944	Lutetium	1.00E-03	ICRP-38	1.61E+02	d	1.39E+07	4.59E+03	ICRP-72	1.60E-08	S	Max	FGR-12	4.67E-14
Lu-178	Lu-178	177.946	Lutetium	1.00E-03	ICRP-38	2.84E+01	m	1.70E+03	3.72E+07	ICRP-72	2.60E-11	S	Max	FGR-12	7.09E-15

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Lu-178m	Lu-178	177.946	Lutetium	1.00E-03	ICRP-38	2.27E+01	m	1.36E+03	4.65E+07	ICRP-72	3.30E-11	S	Max	FGR-12	5.23E-14
Lu-179	Lu-179	178.947	Lutetium	1.00E-03	ICRP-38	4.59E+00	h	1.65E+04	3.82E+06	ICRP-72	1.20E-10	S	Max	FGR-12	1.52E-15
Lu-180	Lu-180	179.950	Lutetium	1.00E-03	ICRP-107	5.70E+00	m	3.42E+02	1.83E+08	--	--	--	--	DOE-STD-1196	7.09E-14
Lu-181	Lu-181	180.952	Lutetium	1.00E-03	ICRP-107	3.50E+00	m	2.10E+02	2.97E+08	--	--	--	--	DOE-STD-1196	2.58E-14
Md-257	Md-257	257.096	Mendelevium	1.00E-03	ICRP-38	5.20E+00	h	1.87E+04	2.34E+06	ICRP-72	2.50E-08	M	Max	FGR-12	5.03E-15
Md-258	Md-258	258.098	Mendelevium	1.00E-03	ICRP-38	5.50E+01	d	4.75E+06	9.20E+03	ICRP-72	5.90E-06	M	Max	FGR-12	5.08E-17
Mg-27	Mg-27	26.984	Magnesium	1.00E-03	ICRP-107	9.46E+00	m	5.67E+02	7.37E+08	--	--	--	--	DOE-STD-1196	4.16E-14
Mg-28	Mg-28	27.984	Magnesium	1.00E-03	ICRP-38	2.09E+01	h	7.53E+04	5.36E+06	ICRP-72	1.20E-09	M	Max	FGR-12	6.79E-14
Mn-50m	Mn-50	49.954	Manganese	1.00E-03	ICRP-107	1.75E+00	m	1.05E+02	2.15E+09	--	--	--	--	DOE-STD-1196	2.18E-13
Mn-51	Mn-51	50.948	Manganese	1.00E-03	ICRP-38	4.62E+01	m	2.77E+03	7.99E+07	ICRP-72	4.10E-11	M	Max	FGR-12	4.80E-14
Mn-52	Mn-52	51.946	Manganese	1.00E-03	ICRP-38	5.59E+00	d	4.83E+05	4.50E+05	ICRP-72	1.40E-09	M	Max	FGR-12	1.72E-13
Mn-52m	Mn-52	51.946	Manganese	1.00E-03	ICRP-38	2.11E+01	m	1.27E+03	1.72E+08	ICRP-72	2.90E-11	M	Max	FGR-12	1.20E-13
Mn-53	Mn-53	52.941	Manganese	1.00E-03	ICRP-38	3.70E+06	y	1.17E+14	1.83E-03	ICRP-72	5.40E-11	M	Max	--	--
Mn-54	Mn-54	53.940	Manganese	1.00E-03	ICRP-38	3.13E+02	d	2.70E+07	7.75E+03	ICRP-72	1.50E-09	M	Max	FGR-12	4.09E-14
Mn-56	Mn-56	55.939	Manganese	1.00E-03	ICRP-38	2.58E+00	h	9.28E+03	2.17E+07	ICRP-72	1.20E-10	M	Max	FGR-12	8.61E-14
Mn-57	Mn-57	56.938	Manganese	1.00E-03	ICRP-107	8.54E+01	s	8.54E+01	2.32E+09	--	--	--	--	DOE-STD-1196	5.30E-15
Mn-58m	Mn-58	57.940	Manganese	1.00E-03	ICRP-107	6.52E+01	s	6.52E+01	2.99E+09	--	--	--	--	DOE-STD-1196	1.15E-13
Mo-101	Mo-101	100.910	Molybdenum	1.00E-03	ICRP-38	1.46E+01	m	8.77E+02	1.27E+08	ICRP-72	2.50E-11	M	Rec	FGR-12	6.87E-14
Mo-102	Mo-102	101.910	Molybdenum	1.00E-03	ICRP-107	1.13E+01	m	6.78E+02	1.63E+08	DOE-STD-1196	2.89E-11	M	Rec	DOE-STD-1196	1.02E-15
Mo-89	Mo-89	88.919	Molybdenum	1.00E-03	ICRP-107	2.11E+00	m	1.27E+02	1.00E+09	--	--	--	--	DOE-STD-1196	5.70E-14
Mo-90	Mo-90	89.914	Molybdenum	1.00E-03	ICRP-38	5.67E+00	h	2.04E+04	6.15E+06	ICRP-72	3.40E-10	M	Rec	FGR-12	3.93E-14
Mo-91	Mo-91	90.912	Molybdenum	1.00E-03	ICRP-107	1.55E+01	m	9.29E+02	1.34E+08	DOE-STD-1196	2.39E-11	M	Rec	DOE-STD-1196	4.50E-14
Mo-91m	Mo-91	90.912	Molybdenum	1.00E-03	ICRP-107	6.46E+01	s	6.46E+01	1.92E+09	--	--	--	--	DOE-STD-1196	6.45E-14
Mo-93	Mo-93	92.907	Molybdenum	1.00E-03	ICRP-38	3.50E+03	y	1.10E+11	1.10E+00	ICRP-72	5.90E-10	M	Rec	FGR-12	2.52E-17
Mo-93m	Mo-93	92.907	Molybdenum	1.00E-03	ICRP-38	6.85E+00	h	2.47E+04	4.92E+06	ICRP-72	1.60E-10	M	Rec	FGR-12	1.13E-13
Mo-99	Mo-99	98.908	Molybdenum	1.00E-03	ICRP-38	6.60E+01	h	2.38E+05	4.80E+05	ICRP-72	8.90E-10	M	Rec	FGR-12	7.28E-15
N-13	N-1	1.009	Nitrogen	1.00E+00	ICRP-38	9.97E+00	m	5.98E+02	1.87E+10	--	--	--	--	FGR-12	4.90E-14
N-16	N-16	16.006	Nitrogen	1.00E+00	ICRP-107	7.13E+00	s	7.13E+00	9.89E+10	--	--	--	--	DOE-STD-1196	2.59E-13
Na-22	Na-22	21.994	Sodium	5.00E-01	ICRP-38	2.60E+00	y	8.21E+07	6.25E+03	ICRP-72	1.30E-09	F	Max	FGR-12	1.08E-13
Na-24	Na-24	23.991	Sodium	5.00E-01	ICRP-38	1.50E+01	h	5.40E+04	8.71E+06	ICRP-72	2.70E-10	F	Max	FGR-12	2.18E-13
Nb-87	Nb-87	86.921	Niobium	1.00E-03	ICRP-107	3.75E+00	m	2.25E+02	5.77E+08	--	--	--	--	DOE-STD-1196	5.54E-14
Nb-88	Nb-88	87.918	Niobium	1.00E-03	ICRP-38	1.43E+01	m	8.58E+02	1.50E+08	ICRP-72	2.70E-11	M	Rec	FGR-12	2.02E-13
Nb-88m	Nb-88	87.918	Niobium	1.00E-03	ICRP-107	7.78E+00	m	4.67E+02	2.75E+08	--	--	--	--	DOE-STD-1196	1.91E-13
Nb-89l	Nb-89	88.913	Niobium	1.00E-03	ICRP-38	1.22E+02	m	7.32E+03	1.73E+07	ICRP-72	1.10E-10	M	Rec	FGR-12	6.98E-14
Nb-89s	Nb-89	88.913	Niobium	1.00E-03	ICRP-38	6.60E+01	m	3.96E+03	3.20E+07	ICRP-72	6.80E-11	M	Rec	FGR-12	9.26E-14
Nb-90	Nb-90	89.911	Niobium	1.00E-03	ICRP-38	1.46E+01	h	5.26E+04	2.39E+06	ICRP-72	6.30E-10	M	Rec	FGR-12	2.17E-13
Nb-91	Nb-91	90.907	Niobium	1.00E-03	ICRP-107	6.80E+02	y	2.15E+10	5.78E+00	DOE-STD-1196	3.03E-10	M	Rec	DOE-STD-1196	8.45E-17
Nb-91m	Nb-91	90.907	Niobium	1.00E-03	ICRP-107	6.09E+01	d	5.26E+06	2.36E+04	DOE-STD-1196	3.65E-09	M	Rec	DOE-STD-1196	1.20E-15
Nb-92	Nb-92	91.907	Niobium	1.00E-03	ICRP-107	3.47E+07	y	1.10E+15	1.12E-04	DOE-STD-1196	5.46E-09	M	Rec	DOE-STD-1196	6.83E-14
Nb-92m	Nb-92	91.907	Niobium	1.00E-03	ICRP-107	1.02E+01	d	8.77E+05	1.40E+05	DOE-STD-1196	5.00E-10	M	Rec	DOE-STD-1196	4.44E-14
Nb-93m	Nb-93	92.906	Niobium	1.00E-03	ICRP-38	1.36E+01	y	4.29E+08	2.83E+02	ICRP-72	5.10E-10	M	Rec	FGR-12	4.44E-18
Nb-94	Nb-94	93.907	Niobium	1.00E-03	ICRP-38	2.03E+04	y	6.41E+11	1.88E-01	ICRP-72	1.10E-08	M	Rec	FGR-12	7.70E-14
Nb-94m	Nb-94	93.907	Niobium	1.00E-03	ICRP-107	6.26E+00	m	3.76E+02	3.20E+08	--	--	--	--	DOE-STD-1196	2.15E-16
Nb-95	Nb-95	94.907	Niobium	1.00E-03	ICRP-38	3.52E+01	d	3.04E+06	3.91E+04	ICRP-72	1.50E-09	M	Rec	FGR-12	3.74E-14
Nb-95m	Nb-95	94.907	Niobium	1.00E-03	ICRP-38	8.66E+01	h	3.12E+05	3.81E+05	ICRP-72	7.90E-10	M	Rec	FGR-12	2.93E-15
Nb-96	Nb-96	95.908	Niobium	1.00E-03	ICRP-38	2.34E+01	h	8.41E+04	1.40E+06	ICRP-72	6.30E-10	M	Rec	FGR-12	1.21E-13

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Nb-97	Nb-97	96.908	Niobium	1.00E-03	ICRP-38	7.21E+01	m	4.33E+03	2.69E+07	ICRP-72	4.30E-11	M	Rec	FGR-12	3.18E-14
Nb-97m	Nb-97	96.908	Niobium	1.00E-03	ICRP-38	6.00E+01	s	6.00E+01	1.94E+09	--	--	--	--	FGR-12	3.55E-14
Nb-98	Nb-98	97.910	Niobium	1.00E-03	ICRP-38	5.15E+01	m	3.09E+03	3.73E+07	ICRP-72	5.60E-11	M	Rec	FGR-12	1.21E-13
Nb-99	Nb-99	98.912	Niobium	1.00E-03	ICRP-107	1.50E+01	s	1.50E+01	7.60E+09	--	--	--	--	DOE-STD-1196	8.32E-15
Nb-99m	Nb-99	98.912	Niobium	1.00E-03	ICRP-107	2.60E+00	m	1.56E+02	7.31E+08	--	--	--	--	DOE-STD-1196	3.86E-14
Nd-134	Nd-134	133.919	Neodymium	1.00E-03	ICRP-107	8.50E+00	m	5.10E+02	1.65E+08	--	--	--	--	DOE-STD-1196	2.32E-14
Nd-135	Nd-135	134.918	Neodymium	1.00E-03	ICRP-107	1.24E+01	m	7.44E+02	1.12E+08	DOE-STD-1196	3.18E-11	S	Max	DOE-STD-1196	5.63E-14
Nd-136	Nd-136	135.915	Neodymium	1.00E-03	ICRP-38	5.07E+01	m	3.04E+03	2.73E+07	ICRP-72	5.40E-11	S	Max	FGR-12	1.27E-14
Nd-137	Nd-137	136.915	Neodymium	1.00E-03	ICRP-107	3.85E+01	m	2.31E+03	3.57E+07	DOE-STD-1196	3.39E-11	S	Max	DOE-STD-1196	5.33E-14
Nd-138	Nd-138	137.912	Neodymium	1.00E-03	ICRP-38	5.04E+00	h	1.81E+04	4.51E+06	ICRP-72	2.50E-10	S	Max	FGR-12	1.27E-15
Nd-139	Nd-139	138.912	Neodymium	1.00E-03	ICRP-38	2.97E+01	m	1.78E+03	4.56E+07	ICRP-72	1.00E-11	S	Max	FGR-12	1.90E-14
Nd-139m	Nd-139	138.912	Neodymium	1.00E-03	ICRP-38	5.50E+00	h	1.98E+04	4.10E+06	ICRP-72	1.50E-10	M	Max	FGR-12	7.63E-14
Nd-140	Nd-140	139.910	Neodymium	1.00E-03	ICRP-107	3.37E+00	d	2.91E+05	2.77E+05	DOE-STD-1196	1.33E-09	S	Max	DOE-STD-1196	4.44E-16
Nd-141	Nd-141	140.910	Neodymium	1.00E-03	ICRP-38	2.49E+00	h	8.96E+03	8.93E+06	ICRP-72	5.00E-12	S	Max	FGR-12	2.88E-15
Nd-141m	Nd-141	140.910	Neodymium	1.00E-03	ICRP-38	6.24E+01	s	6.24E+01	1.28E+09	--	--	--	--	FGR-12	3.70E-14
Nd-144	Nd-144	143.910	Neodymium	1.00E-03	ICRP-107	2.29E+15	y	7.23E+22	1.08E-12	DOE-STD-1196	2.01E-05	F	Max	--	--
Nd-147	Nd-147	146.916	Neodymium	1.00E-03	ICRP-38	1.10E+01	d	9.49E+05	8.09E+04	ICRP-72	2.40E-09	S	Max	FGR-12	6.19E-15
Nd-149	Nd-149	148.920	Neodymium	1.00E-03	ICRP-38	1.73E+00	h	6.23E+03	1.22E+07	ICRP-72	8.90E-11	S	Max	FGR-12	1.81E-14
Nd-151	Nd-151	150.924	Neodymium	1.00E-03	ICRP-38	1.24E+01	m	7.46E+02	1.00E+08	ICRP-72	1.70E-11	M	Max	FGR-12	4.48E-14
Nd-152	Nd-152	151.925	Neodymium	1.00E-03	ICRP-107	1.14E+01	m	6.84E+02	1.09E+08	DOE-STD-1196	2.80E-11	S	Max	DOE-STD-1196	7.29E-15
Ne-19	Ne-19	19.002	Neon	1.00E+00	ICRP-38	1.72E+01	s	1.72E+01	3.45E+10	--	--	--	--	FGR-12	4.92E-14
Ne-24	Ne-24	23.994	Neon	1.00E+00	ICRP-107	3.38E+00	m	2.03E+02	2.32E+09	--	--	--	--	DOE-STD-1196	2.48E-14
Ni-56	Ni-56	55.942	Nickel	1.00E-03	ICRP-38	6.10E+00	d	5.27E+05	3.83E+05	ICRP-72	8.70E-10	M	Rec	FGR-12	8.41E-14
Ni-57	Ni-57	56.940	Nickel	1.00E-03	ICRP-38	3.61E+01	h	1.30E+05	1.53E+06	ICRP-72	5.00E-10	M	Rec	FGR-12	9.69E-14
Ni-59	Ni-59	58.934	Nickel	1.00E-03	ICRP-38	7.50E+04	y	2.37E+12	8.09E-02	ICRP-72	1.30E-10	M	Rec	DOE-STD-1196	6.92E-19
Ni-63	Ni-63	62.930	Nickel	1.00E-03	ICRP-38	9.60E+01	y	3.03E+09	5.92E+01	ICRP-72	4.80E-10	M	Rec	--	--
Ni-65	Ni-65	64.930	Nickel	1.00E-03	ICRP-38	2.52E+00	h	9.07E+03	1.92E+07	ICRP-72	8.50E-11	M	Rec	FGR-12	2.79E-14
Ni-66	Ni-66	65.929	Nickel	1.00E-03	ICRP-38	5.46E+01	h	1.97E+05	8.71E+05	ICRP-72	1.60E-09	M	Rec	FGR-12	6.16E-19
Np-231	Np-231	231.038	Neptunium	1.00E-03	JAERI	4.88E+01	m	2.93E+03	1.67E+07	JAERI	1.70E-09	M	Rec	--	--
Np-232	Np-232	232.040	Neptunium	1.00E-03	ICRP-38	1.47E+01	m	8.82E+02	5.51E+07	ICRP-72	5.00E-11	M	Rec	FGR-12	5.80E-14
Np-233	Np-233	233.041	Neptunium	1.00E-03	ICRP-38	3.62E+01	m	2.17E+03	2.23E+07	ICRP-72	1.60E-12	M	Rec	FGR-12	3.85E-15
Np-234	Np-234	234.043	Neptunium	1.00E-03	ICRP-38	4.40E+00	d	3.80E+05	1.27E+05	ICRP-72	5.30E-10	M	Rec	FGR-12	7.26E-14
Np-235	Np-235	235.044	Neptunium	1.00E-03	ICRP-38	3.96E+02	d	3.42E+07	1.40E+03	ICRP-72	4.20E-10	M	Rec	FGR-12	5.10E-17
Np-236l	Np-236	236.047	Neptunium	1.00E-03	ICRP-38	1.15E+05	y	3.63E+12	1.32E-02	ICRP-72	3.20E-06	M	Rec	FGR-12	5.36E-15
Np-236s	Np-236	236.047	Neptunium	1.00E-03	ICRP-38	2.25E+01	h	8.10E+04	5.90E+05	ICRP-72	5.30E-09	M	Rec	FGR-12	2.14E-15
Np-237	Np-237	237.048	Neptunium	1.00E-03	ICRP-38	2.14E+06	y	6.75E+13	7.05E-04	ICRP-72	2.30E-05	M	Rec	FGR-12	1.03E-15
Np-238	Np-238	238.051	Neptunium	1.00E-03	ICRP-38	2.12E+00	d	1.83E+05	2.59E+05	ICRP-72	2.10E-09	M	Rec	FGR-12	2.72E-14
Np-239	Np-239	239.053	Neptunium	1.00E-03	ICRP-38	2.36E+00	d	2.03E+05	2.32E+05	ICRP-72	9.30E-10	M	Rec	FGR-12	7.69E-15
Np-240	Np-240	240.056	Neptunium	1.00E-03	ICRP-38	6.50E+01	m	3.90E+03	1.20E+07	ICRP-72	8.50E-11	M	Rec	FGR-12	6.31E-14
Np-240m	Np-240	240.056	Neptunium	1.00E-03	ICRP-38	7.40E+00	m	4.44E+02	1.06E+08	--	--	--	--	FGR-12	1.62E-14
Np-241	Np-241	241.058	Neptunium	1.00E-03	ICRP-107	1.39E+01	m	8.34E+02	5.61E+07	DOE-STD-1196	1.40E-11	M	Rec	DOE-STD-1196	1.79E-15
Np-242	Np-242	242.062	Neptunium	1.00E-03	ICRP-107	2.20E+00	m	1.32E+02	3.53E+08	--	--	--	--	DOE-STD-1196	1.33E-14
Np-242m	Np-242	242.062	Neptunium	1.00E-03	ICRP-107	5.50E+00	m	3.30E+02	1.41E+08	--	--	--	--	DOE-STD-1196	4.16E-14
O-14	O-14	14.009	Oxygen	1.00E+00	ICRP-38	7.06E+01	s	7.06E+01	1.14E+10	--	--	--	--	DOE-STD-1196	1.63E-13
O-15	O-15	15.003	Oxygen	1.00E+00	ICRP-38	1.22E+02	s	1.22E+02	6.15E+09	--	--	--	--	FGR-12	4.91E-14
O-19	O-19	19.004	Oxygen	1.00E+00	ICRP-38	2.69E+01	s	2.69E+01	2.21E+10	--	--	--	--	DOE-STD-1196	4.60E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Os-177	Os-177	176.955	Osmium	1.00E-03	JAERI	2.80E+00	m	1.68E+02	3.79E+08	--	--	--	--	--	--
Os-179	Os-179	178.954	Osmium	1.00E-03	JAERI	6.50E+00	m	3.90E+02	1.62E+08	--	--	--	--	--	--
Os-180	Os-180	179.952	Osmium	1.00E-03	ICRP-38	2.20E+01	m	1.32E+03	4.75E+07	ICRP-72	1.50E-11	S	Max	FGR-12	2.30E-15
Os-181	Os-181	180.953	Osmium	1.00E-03	ICRP-38	1.05E+02	m	6.30E+03	9.90E+06	ICRP-72	6.50E-11	S	Max	FGR-12	5.94E-14
Os-182	Os-182	181.952	Osmium	1.00E-03	ICRP-38	2.20E+01	h	7.92E+04	7.83E+05	ICRP-72	3.80E-10	S	Max	FGR-12	2.01E-14
Os-183	Os-183	182.953	Osmium	1.00E-03	ICRP-107	1.30E+01	h	4.68E+04	1.32E+06	DOE-STD-1196	2.20E-10	S	Max	DOE-STD-1196	2.66E-14
Os-183m	Os-183	182.953	Osmium	1.00E-03	ICRP-107	9.90E+00	h	3.56E+04	1.73E+06	DOE-STD-1196	1.74E-10	S	Max	DOE-STD-1196	4.63E-14
Os-185	Os-185	184.954	Osmium	1.00E-03	ICRP-38	9.40E+01	d	8.12E+06	7.51E+03	ICRP-72	1.60E-09	S	Max	FGR-12	3.43E-14
Os-186	Os-186	185.954	Osmium	1.00E-03	ICRP-107	2.00E+15	y	6.31E+22	9.61E-13	DOE-STD-1196	4.51E-06	S	Max	--	--
Os-189m	Os-189	188.958	Osmium	1.00E-03	ICRP-38	6.00E+00	h	2.16E+04	2.76E+06	ICRP-72	5.30E-12	S	Max	FGR-12	1.06E-19
Os-190m	Os-190	189.958	Osmium	1.00E-03	ICRP-38	9.90E+00	m	5.94E+02	1.00E+08	--	--	--	--	FGR-12	7.60E-14
Os-191	Os-191	190.961	Osmium	1.00E-03	ICRP-38	1.54E+01	d	1.33E+06	4.44E+04	ICRP-72	1.90E-09	S	Max	FGR-12	3.21E-15
Os-191m	Os-191	190.961	Osmium	1.00E-03	ICRP-38	1.30E+01	h	4.69E+04	1.26E+06	ICRP-72	1.60E-10	S	Max	FGR-12	2.75E-16
Os-193	Os-193	192.964	Osmium	1.00E-03	ICRP-38	3.00E+01	h	1.08E+05	5.41E+05	ICRP-72	5.20E-10	S	Max	FGR-12	3.40E-15
Os-194	Os-194	193.965	Osmium	1.00E-03	ICRP-38	6.00E+00	y	1.89E+08	3.07E+02	ICRP-72	8.50E-08	S	Max	FGR-12	2.75E-17
Os-196	Os-196	195.970	Osmium	1.00E-03	ICRP-107	3.49E+01	m	2.09E+03	2.75E+07	DOE-STD-1196	6.64E-11	S	Max	DOE-STD-1196	3.64E-15
P-30	P-30	29.978	Phosphorus	5.00E-01	ICRP-38	2.50E+00	m	1.50E+02	2.51E+09	--	--	--	--	FGR-12	4.94E-14
P-32	P-32	31.974	Phosphorus	5.00E-01	ICRP-38	1.43E+01	d	1.23E+06	2.86E+05	ICRP-72	3.40E-09	M	Max	FGR-12	9.90E-17
P-33	P-33	32.972	Phosphorus	5.00E-01	ICRP-38	2.54E+01	d	2.19E+06	1.56E+05	ICRP-72	1.50E-09	M	Max	FGR-12	8.23E-19
Pa-227	Pa-227	227.029	Protactinium	1.00E-03	ICRP-38	3.83E+01	m	2.30E+03	2.16E+07	ICRP-72	8.00E-08	S	Max	FGR-12	8.54E-16
Pa-228	Pa-228	228.031	Protactinium	1.00E-03	ICRP-38	2.20E+01	h	7.92E+04	6.25E+05	ICRP-72	7.50E-08	S	Max	FGR-12	5.54E-14
Pa-229	Pa-229	229.032	Protactinium	1.00E-03	ICRP-107	1.50E+00	d	1.30E+05	3.80E+05	DOE-STD-1196	7.78E-09	S	Max	DOE-STD-1196	2.33E-15
Pa-230	Pa-230	230.035	Protactinium	1.00E-03	ICRP-38	1.74E+01	d	1.50E+06	3.26E+04	ICRP-72	7.60E-07	S	Max	FGR-12	3.13E-14
Pa-231	Pa-231	231.036	Protactinium	1.00E-03	ICRP-38	3.28E+04	y	1.03E+12	4.72E-02	ICRP-72	1.40E-04	M	Max	FGR-12	1.72E-15
Pa-232	Pa-232	232.039	Protactinium	1.00E-03	ICRP-38	1.31E+00	d	1.13E+05	4.30E+05	ICRP-72	1.00E-08	M	Max	FGR-12	4.56E-14
Pa-233	Pa-233	233.040	Protactinium	1.00E-03	ICRP-38	2.70E+01	d	2.33E+06	2.08E+04	ICRP-72	3.90E-09	S	Max	FGR-12	9.35E-15
Pa-234	Pa-234	234.043	Protactinium	1.00E-03	ICRP-38	6.70E+00	h	2.41E+04	2.00E+06	ICRP-72	4.00E-10	S	Max	FGR-12	9.34E-14
Pa-234m	Pa-234	234.043	Protactinium	1.00E-03	ICRP-38	1.17E+00	m	7.02E+01	6.87E+08	--	--	--	--	FGR-12	7.19E-16
Pa-235	Pa-235	235.045	Protactinium	1.00E-03	ICRP-107	2.45E+01	m	1.47E+03	3.27E+07	DOE-STD-1196	1.98E-11	S	Max	DOE-STD-1196	3.35E-16
Pa-236	Pa-236	236.049	Protactinium	1.00E-03	ICRP-107	9.10E+00	m	5.46E+02	8.75E+07	--	--	--	--	DOE-STD-1196	4.36E-14
Pa-237	Pa-237	237.051	Protactinium	1.00E-03	ICRP-107	8.70E+00	m	5.22E+02	9.12E+07	--	--	--	--	DOE-STD-1196	2.82E-14
Pb-194	Pb-194	193.974	Lead	1.00E-03	ICRP-107	1.20E+01	m	7.20E+02	8.08E+07	DOE-STD-1196	1.51E-11	M	Rec	DOE-STD-1196	4.94E-14
Pb-195m	Pb-195	194.975	Lead	1.00E-03	ICRP-38	1.58E+01	m	9.48E+02	6.10E+07	ICRP-72	2.50E-11	M	Rec	FGR-12	7.68E-14
Pb-196	Pb-196	195.973	Lead	1.00E-03	ICRP-107	3.70E+01	m	2.22E+03	2.59E+07	DOE-STD-1196	2.88E-11	M	Rec	DOE-STD-1196	2.10E-14
Pb-197	Pb-197	196.973	Lead	1.00E-03	ICRP-107	8.00E+00	m	4.80E+02	1.19E+08	--	--	--	--	DOE-STD-1196	7.14E-14
Pb-197m	Pb-197	196.973	Lead	1.00E-03	ICRP-107	4.30E+01	m	2.58E+03	2.22E+07	DOE-STD-1196	5.27E-11	M	Rec	DOE-STD-1196	5.22E-14
Pb-198	Pb-198	197.972	Lead	1.00E-03	ICRP-38	2.40E+00	h	8.64E+03	6.60E+06	ICRP-72	6.60E-11	M	Rec	FGR-12	2.04E-14
Pb-199	Pb-199	198.973	Lead	1.00E-03	ICRP-38	9.00E+01	m	5.40E+03	1.05E+07	ICRP-72	3.60E-11	M	Rec	FGR-12	7.31E-14
Pb-200	Pb-200	199.972	Lead	1.00E-03	ICRP-38	2.15E+01	h	7.74E+04	7.29E+05	ICRP-72	3.30E-10	M	Rec	FGR-12	9.20E-15
Pb-201	Pb-201	200.973	Lead	1.00E-03	ICRP-38	9.40E+00	h	3.38E+04	1.66E+06	ICRP-72	1.10E-10	M	Rec	FGR-12	3.63E-14
Pb-201m	Pb-201	200.973	Lead	1.00E-03	ICRP-107	6.10E+01	s	6.10E+01	9.20E+08	--	--	--	--	DOE-STD-1196	1.63E-14
Pb-202	Pb-202	201.972	Lead	1.00E-03	ICRP-38	3.00E+05	y	9.47E+12	5.90E-03	ICRP-72	6.30E-09	M	Rec	FGR-12	4.52E-19
Pb-202m	Pb-202	201.972	Lead	1.00E-03	ICRP-38	3.62E+00	h	1.30E+04	4.29E+06	ICRP-72	9.50E-11	M	Rec	FGR-12	9.96E-14
Pb-203	Pb-203	202.973	Lead	1.00E-03	ICRP-38	5.21E+01	h	1.87E+05	2.97E+05	ICRP-72	2.00E-10	M	Rec	FGR-12	1.44E-14
Pb-204m	Pb-204	203.973	Lead	1.00E-03	ICRP-38	6.72E+01	m	4.03E+03	1.37E+07	DOE-STD-1196	3.44E-11	M	Rec	DOE-STD-1196	9.45E-14
Pb-205	Pb-205	204.974	Lead	1.00E-03	ICRP-38	1.43E+07	y	4.51E+14	1.22E-04	ICRP-72	2.50E-10	M	Rec	FGR-12	5.06E-19

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Pb-209	Pb-209	208.981	Lead	1.00E-03	ICRP-38	3.25E+00	h	1.17E+04	4.61E+06	ICRP-72	5.60E-11	M	Rec	FGR-12	8.12E-18
Pb-210	Pb-210	209.984	Lead	1.00E-03	ICRP-38	2.23E+01	y	7.04E+08	7.63E+01	ICRP-72	1.10E-06	M	Rec	FGR-12	5.64E-17
Pb-211	Pb-211	210.989	Lead	1.00E-03	ICRP-38	3.61E+01	m	2.17E+03	2.47E+07	ICRP-72	1.10E-08	M	Rec	FGR-12	2.49E-15
Pb-212	Pb-212	211.992	Lead	1.00E-03	ICRP-38	1.06E+01	h	3.83E+04	1.39E+06	ICRP-72	1.70E-07	M	Rec	FGR-12	6.87E-15
Pb-214	Pb-214	214.000	Lead	1.00E-03	ICRP-38	2.68E+01	m	1.61E+03	3.28E+07	ICRP-72	1.40E-08	M	Rec	FGR-12	1.18E-14
Pd-100	Pd-100	99.909	Palladium	1.00E-03	ICRP-38	3.63E+00	d	3.14E+05	3.60E+05	ICRP-72	8.50E-10	S	Max	FGR-12	4.65E-15
Pd-101	Pd-101	100.908	Palladium	1.00E-03	ICRP-38	8.27E+00	h	2.98E+04	3.76E+06	ICRP-72	6.20E-11	S	Max	FGR-12	1.53E-14
Pd-103	Pd-103	102.906	Palladium	1.00E-03	ICRP-38	1.70E+01	d	1.47E+06	7.48E+04	ICRP-72	4.50E-10	S	Max	FGR-12	7.68E-17
Pd-107	Pd-107	106.905	Palladium	1.00E-03	ICRP-38	6.50E+06	y	2.05E+14	5.14E-04	ICRP-72	5.90E-10	S	Max	--	--
Pd-109	Pd-109	108.906	Palladium	1.00E-03	ICRP-38	1.34E+01	h	4.83E+04	2.14E+06	ICRP-72	3.70E-10	S	Max	FGR-12	2.51E-16
Pd-109m	Pd-109	108.906	Palladium	1.00E-03	ICRP-107	4.69E+00	m	2.81E+02	3.68E+08	--	--	--	--	DOE-STD-1196	4.59E-15
Pd-111	Pd-111	110.908	Palladium	1.00E-03	ICRP-107	2.34E+01	m	1.40E+03	7.24E+07	DOE-STD-1196	3.14E-11	S	Max	DOE-STD-1196	2.89E-15
Pd-112	Pd-112	111.907	Palladium	1.00E-03	ICRP-107	2.10E+01	h	7.57E+04	1.33E+06	DOE-STD-1196	1.32E-09	S	Max	DOE-STD-1196	2.68E-17
Pd-114	Pd-114	113.910	Palladium	1.00E-03	ICRP-107	2.42E+00	m	1.45E+02	6.82E+08	--	--	--	--	DOE-STD-1196	1.49E-15
Pd-96	Pd-96	95.918	Palladium	1.00E-03	ICRP-107	1.22E+02	s	1.22E+02	9.64E+08	--	--	--	--	DOE-STD-1196	6.51E-14
Pd-97	Pd-97	96.916	Palladium	1.00E-03	ICRP-107	3.10E+00	m	1.86E+02	6.26E+08	--	--	--	--	DOE-STD-1196	1.12E-13
Pd-98	Pd-98	97.913	Palladium	1.00E-03	ICRP-107	1.77E+01	m	1.06E+03	1.08E+08	DOE-STD-1196	3.35E-11	S	Max	DOE-STD-1196	1.76E-14
Pd-99	Pd-99	98.912	Palladium	1.00E-03	ICRP-107	2.14E+01	m	1.28E+03	8.88E+07	DOE-STD-1196	2.28E-11	S	Max	DOE-STD-1196	5.88E-14
Pm-136	Pm-136	135.924	Promethium	1.00E-03	ICRP-107	1.07E+02	s	1.07E+02	7.76E+08	--	--	--	--	DOE-STD-1196	1.25E-13
Pm-137m	Pm-137	136.920	Promethium	1.00E-03	ICRP-107	2.40E+00	m	1.44E+02	5.72E+08	--	--	--	--	DOE-STD-1196	8.01E-14
Pm-138	Pm-138	137.920	Promethium	1.00E-03	JAERI	3.24E+00	m	1.94E+02	4.21E+08	--	--	--	--	--	--
Pm-139	Pm-139	138.917	Promethium	1.00E-03	ICRP-107	4.15E+00	m	2.49E+02	3.26E+08	--	--	--	--	DOE-STD-1196	4.29E-14
Pm-140	Pm-140	139.916	Promethium	1.00E-03	ICRP-107	9.20E+00	s	9.20E+00	8.76E+09	--	--	--	--	DOE-STD-1196	4.93E-14
Pm-140m	Pm-140	139.916	Promethium	1.00E-03	ICRP-107	5.95E+00	m	3.57E+02	2.26E+08	--	--	--	--	DOE-STD-1196	1.39E-13
Pm-141	Pm-141	140.914	Promethium	1.00E-03	ICRP-38	2.09E+01	m	1.25E+03	6.38E+07	ICRP-72	1.50E-11	S	Max	FGR-12	3.60E-14
Pm-142	Pm-142	141.913	Promethium	1.00E-03	ICRP-38	4.05E+01	s	4.05E+01	1.96E+09	--	--	--	--	FGR-12	4.22E-14
Pm-143	Pm-143	142.911	Promethium	1.00E-03	ICRP-38	2.65E+02	d	2.29E+07	3.45E+03	ICRP-72	1.50E-09	M	Max	FGR-12	1.46E-14
Pm-144	Pm-144	143.913	Promethium	1.00E-03	ICRP-38	3.63E+02	d	3.14E+07	2.50E+03	ICRP-72	8.20E-09	M	Max	FGR-12	7.48E-14
Pm-145	Pm-145	144.913	Promethium	1.00E-03	ICRP-38	1.77E+01	y	5.59E+08	1.39E+02	ICRP-72	3.60E-09	M	Max	FGR-12	7.09E-16
Pm-146	Pm-146	145.915	Promethium	1.00E-03	ICRP-38	2.02E+03	d	1.75E+08	4.43E+02	ICRP-72	2.10E-08	M	Max	FGR-12	3.59E-14
Pm-147	Pm-147	146.915	Promethium	1.00E-03	ICRP-38	2.62E+00	y	8.28E+07	9.28E+02	ICRP-72	5.00E-09	M	Max	FGR-12	6.93E-19
Pm-148	Pm-148	147.917	Promethium	1.00E-03	ICRP-38	5.37E+00	d	4.64E+05	1.64E+05	ICRP-72	2.20E-09	S	Max	FGR-12	2.89E-14
Pm-148m	Pm-148	147.917	Promethium	1.00E-03	ICRP-38	4.13E+01	d	3.57E+06	2.14E+04	ICRP-72	5.70E-09	S	Max	FGR-12	9.68E-14
Pm-149	Pm-149	148.918	Promethium	1.00E-03	ICRP-38	5.31E+01	h	1.91E+05	3.96E+05	ICRP-72	7.30E-10	S	Max	FGR-12	5.41E-16
Pm-150	Pm-150	149.921	Promethium	1.00E-03	ICRP-38	2.68E+00	h	9.65E+03	7.80E+06	ICRP-72	1.30E-10	S	Max	FGR-12	7.17E-14
Pm-151	Pm-151	150.921	Promethium	1.00E-03	ICRP-38	2.84E+01	h	1.02E+05	7.31E+05	ICRP-72	4.60E-10	S	Max	FGR-12	1.51E-14
Pm-152	Pm-152	151.924	Promethium	1.00E-03	ICRP-107	4.12E+00	m	2.47E+02	3.00E+08	--	--	--	--	DOE-STD-1196	1.45E-14
Pm-152m	Pm-152	151.924	Promethium	1.00E-03	ICRP-107	7.52E+00	m	4.51E+02	1.65E+08	--	--	--	--	DOE-STD-1196	7.07E-14
Pm-153	Pm-153	152.924	Promethium	1.00E-03	ICRP-107	5.25E+00	m	3.15E+02	2.34E+08	--	--	--	--	DOE-STD-1196	3.40E-15
Pm-154	Pm-154	153.926	Promethium	1.00E-03	ICRP-107	1.73E+00	m	1.04E+02	7.06E+08	--	--	--	--	DOE-STD-1196	8.73E-14
Pm-154m	Pm-154	153.926	Promethium	1.00E-03	ICRP-107	2.68E+00	m	1.61E+02	4.56E+08	--	--	--	--	DOE-STD-1196	8.50E-14
Po-203	Po-203	202.981	Polonium	1.00E-02	ICRP-38	3.67E+01	m	2.20E+03	2.52E+07	ICRP-72	3.50E-11	M	Rec	FGR-12	8.12E-14
Po-204	Po-204	203.980	Polonium	1.00E-02	ICRP-107	3.53E+00	h	1.27E+04	4.35E+06	DOE-STD-1196	4.24E-10	M	Rec	DOE-STD-1196	5.16E-14
Po-205	Po-205	204.981	Polonium	1.00E-02	ICRP-38	1.80E+00	h	6.48E+03	8.49E+06	ICRP-72	6.50E-11	M	Rec	FGR-12	7.80E-14
Po-206	Po-206	205.980	Polonium	1.00E-02	ICRP-107	8.80E+00	d	7.60E+05	7.20E+04	DOE-STD-1196	6.27E-08	M	Rec	DOE-STD-1196	5.33E-14
Po-207	Po-207	206.982	Polonium	1.00E-02	ICRP-38	3.50E+02	m	2.10E+04	2.60E+06	ICRP-72	7.80E-11	M	Rec	FGR-12	6.51E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Po-208	Po-208	207.981	Polonium	1.00E-02	ICRP-107	2.90E+00	y	9.15E+07	5.93E+02	DOE-STD-1196	4.16E-06	M	Rec	DOE-STD-1196	9.36E-19
Po-209	Po-209	208.982	Polonium	1.00E-02	ICRP-38	1.02E+02	y	3.22E+09	1.68E+01	DOE-STD-1196	4.02E-06	M	Rec	DOE-STD-1196	2.76E-16
Po-210	Po-210	209.983	Polonium	1.00E-02	ICRP-38	1.38E+02	d	1.20E+07	4.49E+03	ICRP-72	3.30E-06	M	Rec	FGR-12	4.16E-19
Po-211	Po-211	210.987	Polonium	1.00E-02	ICRP-38	5.16E-01	s	5.16E-01	1.04E+11	--	--	--	--	FGR-12	3.81E-16
Po-212	Po-212	211.989	Polonium	1.00E-02	ICRP-38	3.05E-01	us	3.05E-07	1.74E+17	--	--	--	--	--	--
Po-212m	Po-212	211.989	Polonium	1.00E-02	ICRP-107	4.51E+01	s	4.51E+01	1.18E+09	--	--	--	--	DOE-STD-1196	3.99E-15
Po-213	Po-213	212.993	Polonium	1.00E-02	ICRP-38	4.20E+00	us	4.20E-06	1.26E+16	--	--	--	--	DOE-STD-1196	1.71E-18
Po-214	Po-214	213.995	Polonium	1.00E-02	ICRP-38	1.64E+02	us	1.64E-04	3.21E+14	--	--	--	--	FGR-12	4.08E-18
Po-215	Po-215	214.999	Polonium	1.00E-02	ICRP-38	1.78E-03	s	1.78E-03	2.95E+13	--	--	--	--	FGR-12	8.43E-18
Po-216	Po-216	216.002	Polonium	1.00E-02	ICRP-38	1.50E-01	s	1.50E-01	3.48E+11	--	--	--	--	FGR-12	8.29E-19
Po-218	Po-218	218.009	Polonium	1.00E-02	ICRP-38	3.05E+00	m	1.83E+02	2.83E+08	--	--	--	--	FGR-12	4.48E-19
Pr-134	Pr-134	133.916	Praseodymium	1.00E-03	ICRP-107	1.10E+01	m	6.60E+02	1.28E+08	DOE-STD-1196	2.52E-11	S	Max	DOE-STD-1196	1.44E-13
Pr-134m	Pr-134	133.916	Praseodymium	1.00E-03	ICRP-107	1.70E+01	m	1.02E+03	8.26E+07	DOE-STD-1196	3.83E-11	S	Max	DOE-STD-1196	1.08E-13
Pr-135	Pr-135	134.913	Praseodymium	1.00E-03	ICRP-107	2.40E+01	m	1.44E+03	5.81E+07	DOE-STD-1196	2.45E-11	S	Max	DOE-STD-1196	3.89E-14
Pr-136	Pr-136	135.913	Praseodymium	1.00E-03	ICRP-38	1.31E+01	m	7.86E+02	1.06E+08	ICRP-72	1.40E-11	S	Max	FGR-12	1.03E-13
Pr-137	Pr-137	136.911	Praseodymium	1.00E-03	ICRP-38	7.66E+01	m	4.60E+03	1.79E+07	ICRP-72	2.10E-11	S	Max	FGR-12	2.36E-14
Pr-138	Pr-138	137.911	Praseodymium	1.00E-03	ICRP-38	1.45E+00	m	8.70E+01	9.40E+08	--	--	--	--	FGR-12	3.92E-14
Pr-138m	Pr-138	137.911	Praseodymium	1.00E-03	ICRP-38	2.10E+00	h	7.56E+03	1.08E+07	ICRP-72	7.40E-11	S	Max	FGR-12	1.21E-13
Pr-139	Pr-139	138.909	Praseodymium	1.00E-03	ICRP-38	4.51E+00	h	1.62E+04	5.00E+06	ICRP-72	2.00E-11	S	Max	FGR-12	5.17E-15
Pr-140	Pr-140	139.909	Praseodymium	1.00E-03	ICRP-107	3.39E+00	m	2.03E+02	3.96E+08	--	--	--	--	DOE-STD-1196	2.44E-14
Pr-142	Pr-142	141.910	Praseodymium	1.00E-03	ICRP-38	1.91E+01	h	6.89E+04	1.15E+06	ICRP-72	5.50E-10	S	Max	FGR-12	3.15E-15
Pr-142m	Pr-142	141.910	Praseodymium	1.00E-03	ICRP-38	1.46E+01	m	8.76E+02	9.08E+07	ICRP-72	7.00E-12	S	Max	--	--
Pr-143	Pr-143	142.911	Praseodymium	1.00E-03	ICRP-38	1.36E+01	d	1.17E+06	6.74E+04	ICRP-72	2.40E-09	S	Max	FGR-12	2.10E-17
Pr-144	Pr-144	143.913	Praseodymium	1.00E-03	ICRP-38	1.73E+01	m	1.04E+03	7.56E+07	ICRP-72	1.80E-11	M	Max	FGR-12	1.95E-15
Pr-144m	Pr-144	143.913	Praseodymium	1.00E-03	ICRP-38	7.20E+00	m	4.32E+02	1.81E+08	--	--	--	--	FGR-12	2.79E-16
Pr-145	Pr-145	144.915	Praseodymium	1.00E-03	ICRP-38	5.98E+00	h	2.15E+04	3.62E+06	ICRP-72	1.70E-10	S	Max	FGR-12	7.36E-16
Pr-146	Pr-146	145.918	Praseodymium	1.00E-03	ICRP-107	2.42E+01	m	1.45E+03	5.34E+07	DOE-STD-1196	3.58E-11	S	Max	DOE-STD-1196	4.92E-14
Pr-147	Pr-147	146.919	Praseodymium	1.00E-03	ICRP-38	1.36E+01	m	8.16E+02	9.41E+07	ICRP-72	1.80E-11	M	Max	FGR-12	4.15E-14
Pr-148	Pr-148	147.922	Praseodymium	1.00E-03	ICRP-107	2.29E+00	m	1.37E+02	5.55E+08	--	--	--	--	DOE-STD-1196	4.83E-14
Pr-148m	Pr-148	147.922	Praseodymium	1.00E-03	ICRP-107	2.01E+00	m	1.21E+02	6.32E+08	--	--	--	--	DOE-STD-1196	4.37E-14
Pt-183	Pt-183	182.962	Platinum	1.00E-03	JAERI	6.50E+00	m	3.90E+02	1.58E+08	--	--	--	--	--	--
Pt-184	Pt-184	183.960	Platinum	1.00E-03	ICRP-107	1.73E+01	m	1.04E+03	5.91E+07	DOE-STD-1196	3.06E-11	S	Max	DOE-STD-1196	3.02E-14
Pt-186	Pt-186	185.959	Platinum	1.00E-03	ICRP-38	2.00E+00	h	7.20E+03	8.43E+06	ICRP-72	3.30E-11	F	Max	FGR-12	3.53E-14
Pt-187	Pt-187	186.961	Platinum	1.00E-03	ICRP-107	2.35E+00	h	8.46E+03	7.13E+06	DOE-STD-1196	8.29E-11	S	Max	DOE-STD-1196	2.66E-14
Pt-188	Pt-188	187.959	Platinum	1.00E-03	ICRP-38	1.02E+01	d	8.81E+05	6.81E+04	ICRP-72	4.20E-10	F	Max	FGR-12	8.86E-15
Pt-189	Pt-189	188.961	Platinum	1.00E-03	ICRP-38	1.09E+01	h	3.91E+04	1.53E+06	ICRP-72	3.80E-11	F	Max	FGR-12	1.48E-14
Pt-190	Pt-190	189.960	Platinum	1.00E-03	ICRP-107	6.50E+11	y	2.05E+19	2.90E-09	DOE-STD-1196	5.58E-06	S	Max	--	--
Pt-191	Pt-191	190.962	Platinum	1.00E-03	ICRP-38	2.80E+00	d	2.42E+05	2.44E+05	ICRP-72	1.10E-10	F	Max	FGR-12	1.34E-14
Pt-193	Pt-193	192.963	Platinum	1.00E-03	ICRP-38	5.00E+01	y	1.58E+09	3.71E+01	ICRP-72	2.10E-11	F	Max	FGR-12	3.98E-19
Pt-193m	Pt-193	192.963	Platinum	1.00E-03	ICRP-38	4.33E+00	d	3.74E+05	1.56E+05	ICRP-72	1.20E-10	F	Max	FGR-12	4.15E-16
Pt-195m	Pt-195	194.965	Platinum	1.00E-03	ICRP-38	4.02E+00	d	3.47E+05	1.67E+05	ICRP-72	1.80E-10	F	Max	FGR-12	2.84E-15
Pt-197	Pt-197	196.967	Platinum	1.00E-03	ICRP-38	1.83E+01	h	6.59E+04	8.69E+05	ICRP-72	8.50E-11	F	Max	FGR-12	1.01E-15
Pt-197m	Pt-197	196.967	Platinum	1.00E-03	ICRP-38	9.44E+01	m	5.66E+03	1.01E+07	ICRP-72	2.40E-11	F	Max	FGR-12	3.49E-15
Pt-199	Pt-199	198.971	Platinum	1.00E-03	ICRP-38	3.08E+01	m	1.85E+03	3.07E+07	ICRP-72	1.20E-11	F	Max	FGR-12	9.73E-15
Pt-200	Pt-200	199.971	Platinum	1.00E-03	ICRP-38	1.25E+01	h	4.50E+04	1.25E+06	ICRP-72	2.20E-10	F	Max	FGR-12	2.55E-15
Pt-202	Pt-202	201.976	Platinum	1.00E-03	ICRP-107	4.40E+01	h	1.58E+05	3.53E+05	DOE-STD-1196	2.61E-09	S	Max	DOE-STD-1196	5.03E-16

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Pu-232	Pu-232	232.041	Plutonium	1.00E-03	ICRP-107	3.37E+01	m	2.02E+03	2.40E+07	DOE-STD-1196	2.44E-08	M	Rec	DOE-STD-1196	2.31E-15
Pu-234	Pu-234	234.043	Plutonium	1.00E-03	ICRP-38	8.80E+00	h	3.17E+04	1.52E+06	ICRP-72	2.10E-08	M	Rec	FGR-12	2.85E-15
Pu-235	Pu-235	235.045	Plutonium	1.00E-03	ICRP-38	2.53E+01	m	1.52E+03	3.16E+07	ICRP-72	1.40E-12	M	Rec	FGR-12	3.92E-15
Pu-236	Pu-236	236.046	Plutonium	1.00E-03	ICRP-38	2.85E+00	y	9.00E+07	5.31E+02	ICRP-72	2.00E-05	M	Rec	FGR-12	6.35E-18
Pu-237	Pu-237	237.048	Plutonium	1.00E-03	ICRP-38	4.53E+01	d	3.91E+06	1.22E+04	ICRP-72	3.50E-10	M	Rec	FGR-12	2.02E-15
Pu-238	Pu-238	238.050	Plutonium	1.00E-03	ICRP-38	8.77E+01	y	2.77E+09	1.71E+01	ICRP-72	4.60E-05	M	Rec	FGR-12	4.88E-18
Pu-239	Pu-239	239.052	Plutonium	1.00E-03	ICRP-38	2.41E+04	y	7.59E+11	6.21E-02	ICRP-72	5.00E-05	M	Rec	FGR-12	4.24E-18
Pu-240	Pu-240	240.054	Plutonium	1.00E-03	ICRP-38	6.54E+03	y	2.06E+11	2.28E-01	ICRP-72	5.00E-05	M	Rec	FGR-12	4.75E-18
Pu-241	Pu-241	241.057	Plutonium	1.00E-03	ICRP-38	1.44E+01	y	4.54E+08	1.03E+02	ICRP-72	9.00E-07	M	Rec	FGR-12	7.25E-20
Pu-242	Pu-242	242.059	Plutonium	1.00E-03	ICRP-38	3.76E+05	y	1.19E+13	3.92E-03	ICRP-72	4.80E-05	M	Rec	FGR-12	4.01E-18
Pu-243	Pu-243	243.062	Plutonium	1.00E-03	ICRP-38	4.96E+00	h	1.78E+04	2.60E+06	ICRP-72	8.30E-11	M	Rec	FGR-12	1.03E-15
Pu-244	Pu-244	244.064	Plutonium	1.00E-03	ICRP-38	8.26E+07	y	2.61E+15	1.77E-05	ICRP-72	4.70E-05	M	Rec	FGR-12	2.97E-18
Pu-245	Pu-245	245.068	Plutonium	1.00E-03	ICRP-38	1.05E+01	h	3.78E+04	1.22E+06	ICRP-72	4.00E-10	M	Rec	FGR-12	1.99E-14
Pu-246	Pu-246	246.070	Plutonium	1.00E-03	ICRP-38	1.09E+01	d	9.37E+05	4.89E+04	ICRP-72	7.40E-09	M	Rec	FGR-12	6.01E-15
Ra-219	Ra-219	219.010	Radium	1.00E-03	ICRP-107	1.00E+01	ms	1.00E-02	5.15E+12	--	--	--	--	DOE-STD-1196	7.37E-15
Ra-220	Ra-220	220.011	Radium	1.00E-03	ICRP-107	1.79E-02	s	1.79E-02	2.86E+12	--	--	--	--	DOE-STD-1196	2.07E-16
Ra-221	Ra-221	221.014	Radium	1.00E-03	ICRP-107	2.80E+01	s	2.80E+01	1.82E+09	--	--	--	--	DOE-STD-1196	1.47E-15
Ra-222	Ra-222	222.015	Radium	1.00E-03	ICRP-38	3.80E+01	s	3.80E+01	1.34E+09	--	--	--	--	FGR-12	4.39E-16
Ra-223	Ra-223	223.019	Radium	1.00E-03	ICRP-38	1.14E+01	d	9.88E+05	5.12E+04	ICRP-72	7.40E-06	M	Rec	FGR-12	6.09E-15
Ra-224	Ra-224	224.020	Radium	1.00E-03	ICRP-38	3.66E+00	d	3.16E+05	1.59E+05	ICRP-72	3.00E-06	M	Rec	FGR-12	4.71E-16
Ra-225	Ra-225	225.024	Radium	1.00E-03	ICRP-38	1.48E+01	d	1.28E+06	3.92E+04	ICRP-72	6.30E-06	M	Rec	FGR-12	2.79E-16
Ra-226	Ra-226	226.025	Radium	1.00E-03	ICRP-38	1.60E+03	y	5.05E+10	9.89E-01	ICRP-72	3.50E-06	M	Rec	FGR-12	3.15E-16
Ra-227	Ra-227	227.029	Radium	1.00E-03	ICRP-38	4.22E+01	m	2.53E+03	1.96E+07	ICRP-72	2.80E-10	M	Rec	FGR-12	7.41E-15
Ra-228	Ra-228	228.031	Radium	1.00E-03	ICRP-38	5.75E+00	y	1.81E+08	2.73E+02	ICRP-72	2.60E-06	M	Rec	DOE-STD-1196	2.89E-18
Ra-230	Ra-230	230.037	Radium	1.00E-03	ICRP-107	9.30E+01	m	5.58E+03	8.79E+06	DOE-STD-1196	1.29E-10	M	Rec	DOE-STD-1196	3.33E-15
Rb-77	Rb-77	76.930	Rubidium	1.00E-03	ICRP-38	3.70E+00	m	2.22E+02	6.61E+08	--	--	--	--	DOE-STD-1196	7.09E-14
Rb-78	Rb-78	77.928	Rubidium	1.00E-03	ICRP-107	1.77E+01	m	1.06E+03	1.37E+08	DOE-STD-1196	3.55E-11	S	Max	DOE-STD-1196	2.04E-13
Rb-78m	Rb-78	77.928	Rubidium	1.00E-03	ICRP-107	5.74E+00	m	3.44E+02	4.20E+08	--	--	--	--	DOE-STD-1196	1.52E-13
Rb-79	Rb-79	78.924	Rubidium	1.00E-03	ICRP-38	2.29E+01	m	1.37E+03	1.04E+08	ICRP-72	1.60E-11	F	Max	FGR-12	6.51E-14
Rb-80	Rb-80	79.923	Rubidium	1.00E-03	ICRP-38	3.40E+01	s	3.40E+01	4.15E+09	--	--	--	--	FGR-12	6.07E-14
Rb-81	Rb-81	80.919	Rubidium	1.00E-03	ICRP-38	4.58E+00	h	1.65E+04	8.46E+06	ICRP-72	3.40E-11	F	Max	FGR-12	2.96E-14
Rb-81m	Rb-81	80.919	Rubidium	1.00E-03	ICRP-38	3.20E+01	m	1.92E+03	7.26E+07	ICRP-72	7.00E-12	F	Max	FGR-12	1.88E-16
Rb-82	Rb-82	81.918	Rubidium	1.00E-03	ICRP-38	1.30E+00	m	7.80E+01	1.77E+09	--	--	--	--	FGR-12	5.30E-14
Rb-82m	Rb-82	81.918	Rubidium	1.00E-03	ICRP-38	6.20E+00	h	2.23E+04	6.17E+06	ICRP-72	1.10E-10	F	Max	FGR-12	1.43E-13
Rb-83	Rb-83	82.915	Rubidium	1.00E-03	ICRP-38	8.62E+01	d	7.45E+06	1.83E+04	ICRP-72	6.90E-10	F	Max	FGR-12	2.39E-14
Rb-84	Rb-84	83.914	Rubidium	1.00E-03	ICRP-38	3.28E+01	d	2.83E+06	4.75E+04	ICRP-72	1.00E-09	F	Max	FGR-12	4.47E-14
Rb-84m	Rb-84	83.914	Rubidium	1.00E-03	ICRP-107	2.03E+01	m	1.22E+03	1.11E+08	DOE-STD-1196	1.01E-11	S	Max	DOE-STD-1196	1.68E-14
Rb-86	Rb-86	85.911	Rubidium	1.00E-03	ICRP-38	1.87E+01	d	1.61E+06	8.14E+04	ICRP-72	9.30E-10	F	Max	FGR-12	4.81E-15
Rb-86m	Rb-86	85.911	Rubidium	1.00E-03	ICRP-107	1.02E+00	m	6.10E+01	2.15E+09	--	--	--	--	DOE-STD-1196	2.44E-14
Rb-87	Rb-87	86.909	Rubidium	1.00E-03	ICRP-38	4.70E+10	y	1.48E+18	8.75E-08	ICRP-72	5.00E-10	F	Max	FGR-12	1.82E-18
Rb-88	Rb-88	87.911	Rubidium	1.00E-03	ICRP-38	1.78E+01	m	1.07E+03	1.20E+08	ICRP-72	1.60E-11	F	Max	FGR-12	3.36E-14
Rb-89	Rb-89	88.912	Rubidium	1.00E-03	ICRP-38	1.52E+01	m	9.12E+02	1.39E+08	ICRP-72	1.40E-11	F	Max	FGR-12	1.06E-13
Rb-90	Rb-90	89.915	Rubidium	1.00E-03	ICRP-107	1.58E+02	s	1.58E+02	7.94E+08	--	--	--	--	DOE-STD-1196	1.08E-13
Rb-90m	Rb-90	89.915	Rubidium	1.00E-03	ICRP-107	2.58E+02	s	2.58E+02	4.86E+08	--	--	--	--	DOE-STD-1196	1.63E-13
Re-177	Re-177	176.950	Rhenium	1.00E-03	ICRP-38	1.40E+01	m	8.40E+02	7.59E+07	ICRP-72	1.40E-11	M	Max	FGR-12	2.96E-14
Re-178	Re-178	177.951	Rhenium	1.00E-03	ICRP-38	1.32E+01	m	7.92E+02	8.00E+07	ICRP-72	1.40E-11	M	Max	FGR-12	6.09E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Re-179	Re-179	178.950	Rhenium	1.00E-03	ICRP-107	1.95E+01	m	1.17E+03	5.39E+07	DOE-STD-1196	1.32E-11	S	Max	DOE-STD-1196	4.90E-14
Re-180	Re-180	179.951	Rhenium	1.00E-03	ICRP-38	2.43E+00	m	1.46E+02	4.30E+08	--	--	--	--	FGR-12	5.72E-14
Re-181	Re-181	180.950	Rhenium	1.00E-03	ICRP-38	2.00E+01	h	7.20E+04	8.66E+05	ICRP-72	2.50E-10	M	Max	FGR-12	3.65E-14
Re-182l	Re-182	181.951	Rhenium	1.00E-03	ICRP-38	6.40E+01	h	2.30E+05	2.69E+05	ICRP-72	1.20E-09	M	Max	FGR-12	9.16E-14
Re-182s	Re-182	181.951	Rhenium	1.00E-03	ICRP-38	1.27E+01	h	4.57E+04	1.36E+06	ICRP-72	2.00E-10	M	Max	FGR-12	5.78E-14
Re-183	Re-183	182.951	Rhenium	1.00E-03	ICRP-107	7.00E+01	d	6.05E+06	1.02E+04	DOE-STD-1196	3.94E-09	S	Max	DOE-STD-1196	5.53E-15
Re-184	Re-184	183.953	Rhenium	1.00E-03	ICRP-38	3.80E+01	d	3.28E+06	1.87E+04	ICRP-72	1.90E-09	M	Max	FGR-12	4.29E-14
Re-184m	Re-184	183.953	Rhenium	1.00E-03	ICRP-38	1.65E+02	d	1.43E+07	4.30E+03	ICRP-72	6.50E-09	M	Max	FGR-12	1.82E-14
Re-186	Re-186	185.955	Rhenium	1.00E-03	ICRP-38	9.06E+01	h	3.26E+05	1.86E+05	ICRP-72	1.10E-09	M	Max	FGR-12	9.19E-16
Re-186m	Re-186	185.955	Rhenium	1.00E-03	ICRP-38	2.00E+05	y	6.31E+12	9.61E-03	ICRP-72	1.20E-08	M	Max	FGR-12	5.00E-16
Re-187	Re-187	186.956	Rhenium	1.00E-03	ICRP-38	5.00E+10	y	1.58E+18	3.82E-08	ICRP-72	6.30E-12	M	Max	--	--
Re-188	Re-188	187.958	Rhenium	1.00E-03	ICRP-38	1.70E+01	h	6.11E+04	9.82E+05	ICRP-72	5.40E-10	M	Max	FGR-12	2.87E-15
Re-188m	Re-188	187.958	Rhenium	1.00E-03	ICRP-38	1.86E+01	m	1.12E+03	5.38E+07	ICRP-72	1.30E-11	M	Max	FGR-12	3.02E-15
Re-189	Re-189	188.959	Rhenium	1.00E-03	ICRP-38	2.43E+01	h	8.75E+04	6.82E+05	ICRP-72	4.30E-10	M	Max	FGR-12	3.22E-15
Re-190	Re-190	189.962	Rhenium	1.00E-03	ICRP-107	3.10E+00	m	1.86E+02	3.19E+08	--	--	--	--	DOE-STD-1196	6.04E-14
Re-190m	Re-190	189.962	Rhenium	1.00E-03	ICRP-107	3.20E+00	h	1.15E+04	5.16E+06	DOE-STD-1196	2.44E-10	S	Max	DOE-STD-1196	4.13E-14
Rh-100	Rh-100	99.908	Rhodium	1.00E-03	ICRP-38	2.08E+01	h	7.49E+04	1.51E+06	ICRP-72	3.50E-10	S	Max	FGR-12	1.41E-13
Rh-100m	Rh-100	99.908	Rhodium	1.00E-03	ICRP-107	4.60E+00	m	2.76E+02	4.09E+08	--	--	--	--	DOE-STD-1196	2.03E-15
Rh-101	Rh-101	100.906	Rhodium	1.00E-03	ICRP-38	3.20E+00	y	1.01E+08	1.11E+03	ICRP-72	5.40E-09	S	Max	FGR-12	1.21E-14
Rh-101m	Rh-101	100.906	Rhodium	1.00E-03	ICRP-38	4.34E+00	d	3.75E+05	2.98E+05	ICRP-72	2.10E-10	S	Max	FGR-12	1.41E-14
Rh-102	Rh-102	101.907	Rhodium	1.00E-03	ICRP-38	2.90E+00	y	9.15E+07	1.21E+03	ICRP-72	1.70E-08	S	Max	FGR-12	1.04E-13
Rh-102m	Rh-102	101.907	Rhodium	1.00E-03	ICRP-38	2.07E+02	d	1.79E+07	6.19E+03	ICRP-72	7.10E-09	S	Max	FGR-12	2.31E-14
Rh-103m	Rh-103	102.905	Rhodium	1.00E-03	ICRP-38	5.61E+01	m	3.37E+03	3.26E+07	ICRP-72	2.70E-12	S	Max	FGR-12	8.80E-18
Rh-104	Rh-104	103.907	Rhodium	1.00E-03	ICRP-107	4.23E+01	s	4.23E+01	2.57E+09	--	--	--	--	DOE-STD-1196	1.40E-15
Rh-104m	Rh-104	103.907	Rhodium	1.00E-03	ICRP-107	4.34E+00	m	2.60E+02	4.17E+08	--	--	--	--	DOE-STD-1196	9.14E-16
Rh-105	Rh-105	104.906	Rhodium	1.00E-03	ICRP-38	3.54E+01	h	1.27E+05	8.45E+05	ICRP-72	3.50E-10	S	Max	FGR-12	3.72E-15
Rh-106	Rh-106	105.907	Rhodium	1.00E-03	ICRP-38	2.99E+01	s	2.99E+01	3.56E+09	--	--	--	--	FGR-12	1.04E-14
Rh-106m	Rh-106	105.907	Rhodium	1.00E-03	ICRP-38	1.32E+02	m	7.92E+03	1.34E+07	ICRP-72	1.10E-10	M	Max	FGR-12	1.44E-13
Rh-107	Rh-107	106.907	Rhodium	1.00E-03	ICRP-38	2.17E+01	m	1.30E+03	8.10E+07	ICRP-72	1.70E-11	S	Max	FGR-12	1.50E-14
Rh-108	Rh-108	107.909	Rhodium	1.00E-03	ICRP-107	1.68E+01	s	1.68E+01	6.22E+09	--	--	--	--	DOE-STD-1196	1.61E-14
Rh-109	Rh-109	108.909	Rhodium	1.00E-03	ICRP-107	8.00E+01	s	8.00E+01	1.29E+09	--	--	--	--	DOE-STD-1196	1.38E-14
Rh-94	Rh-94	93.922	Rhodium	1.00E-03	ICRP-107	7.06E+01	s	7.06E+01	1.70E+09	--	--	--	--	DOE-STD-1196	1.81E-13
Rh-95	Rh-95	94.916	Rhodium	1.00E-03	ICRP-107	5.02E+00	m	3.01E+02	3.95E+08	--	--	--	--	DOE-STD-1196	1.21E-13
Rh-95m	Rh-95	94.916	Rhodium	1.00E-03	ICRP-107	1.96E+00	m	1.18E+02	1.01E+09	--	--	--	--	DOE-STD-1196	4.29E-14
Rh-96	Rh-96	95.914	Rhodium	1.00E-03	ICRP-107	9.90E+00	m	5.94E+02	1.98E+08	--	--	--	--	DOE-STD-1196	1.81E-13
Rh-96m	Rh-96	95.914	Rhodium	1.00E-03	ICRP-107	1.51E+00	m	9.06E+01	1.30E+09	--	--	--	--	DOE-STD-1196	6.03E-14
Rh-97	Rh-97	96.911	Rhodium	1.00E-03	ICRP-107	3.07E+01	m	1.84E+03	6.32E+07	DOE-STD-1196	2.84E-11	S	Max	DOE-STD-1196	6.60E-14
Rh-97m	Rh-97	96.911	Rhodium	1.00E-03	ICRP-107	4.62E+01	m	2.77E+03	4.20E+07	DOE-STD-1196	3.30E-11	S	Max	DOE-STD-1196	1.06E-13
Rh-98	Rh-98	97.911	Rhodium	1.00E-03	ICRP-107	8.70E+00	m	5.22E+02	2.21E+08	--	--	--	--	DOE-STD-1196	8.34E-14
Rh-99	Rh-99	98.908	Rhodium	1.00E-03	ICRP-38	1.60E+01	d	1.38E+06	8.25E+04	ICRP-72	8.70E-10	S	Max	FGR-12	2.85E-14
Rh-99m	Rh-99	98.908	Rhodium	1.00E-03	ICRP-38	4.70E+00	h	1.69E+04	6.74E+06	ICRP-72	4.00E-11	S	Max	FGR-12	3.29E-14
Rn-207	Rn-207	206.991	Radon	1.00E+00	ICRP-107	9.25E+00	m	5.55E+02	9.82E+07	--	--	--	--	DOE-STD-1196	4.41E-14
Rn-209	Rn-209	208.990	Radon	1.00E+00	ICRP-107	2.85E+01	m	1.71E+03	3.16E+07	--	--	--	--	DOE-STD-1196	5.47E-14
Rn-210	Rn-210	209.990	Radon	1.00E+00	ICRP-107	2.40E+00	h	8.64E+03	6.22E+06	--	--	--	--	DOE-STD-1196	1.27E-14
Rn-211	Rn-211	210.991	Radon	1.00E+00	ICRP-107	1.46E+01	h	5.26E+04	1.02E+06	--	--	--	--	DOE-STD-1196	8.62E-14
Rn-212	Rn-212	211.991	Radon	1.00E+00	ICRP-107	2.39E+01	m	1.43E+03	3.71E+07	--	--	--	--	DOE-STD-1196	1.38E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Rn-215	Rn-215	214.999	Radon	1.00E+00	ICRP-107	2.30E+00	us	2.30E-06	2.28E+16	--	--	--	--	DOE-STD-1196	1.90E-14
Rn-216	Rn-216	216.000	Radon	1.00E+00	ICRP-107	4.50E-05	s	4.50E-05	1.16E+15	--	--	--	--	DOE-STD-1196	1.77E-14
Rn-217	Rn-217	217.004	Radon	1.00E+00	ICRP-107	5.40E-04	s	5.40E-04	9.63E+13	--	--	--	--	DOE-STD-1196	1.70E-14
Rn-218	Rn-218	218.006	Radon	1.00E+00	ICRP-38	3.50E+01	ms	3.50E-02	1.48E+12	--	--	--	--	FGR-12	3.65E-17
Rn-219	Rn-219	219.009	Radon	1.00E+00	ICRP-38	3.96E+00	s	3.96E+00	1.30E+10	--	--	--	--	FGR-12	2.68E-15
Rn-220	Rn-220	220.011	Radon	1.00E+00	ICRP-38	5.56E+01	s	5.56E+01	9.22E+08	--	--	--	--	FGR-12	1.85E-17
Rn-222	Rn-222	222.018	Radon	1.00E+00	ICRP-38	3.82E+00	d	3.30E+05	1.54E+05	--	--	--	--	FGR-12	1.91E-17
Rn-223	Rn-223	223.022	Radon	1.00E+00	ICRP-107	2.43E+01	m	1.46E+03	3.47E+07	--	--	--	--	DOE-STD-1196	1.56E-14
Ru-103	Ru-103	102.906	Ruthenium	1.00E-02	ICRP-38	3.93E+01	d	3.39E+06	3.23E+04	ICRP-72	2.40E-09	M	Rec	FGR-12	2.25E-14
Ru-105	Ru-105	104.908	Ruthenium	1.00E-02	ICRP-38	4.44E+00	h	1.60E+04	6.73E+06	ICRP-72	1.70E-10	M	Rec	FGR-12	3.81E-14
Ru-106	Ru-106	105.907	Ruthenium	1.00E-02	ICRP-38	3.68E+02	d	3.18E+07	3.35E+03	ICRP-72	2.80E-08	M	Rec	--	--
Ru-107	Ru-107	106.910	Ruthenium	1.00E-02	ICRP-107	3.75E+00	m	2.25E+02	4.69E+08	--	--	--	--	DOE-STD-1196	1.69E-14
Ru-108	Ru-108	107.910	Ruthenium	1.00E-02	ICRP-107	4.55E+00	m	2.73E+02	3.83E+08	--	--	--	--	DOE-STD-1196	2.92E-15
Ru-92	Ru-92	91.920	Ruthenium	1.00E-02	ICRP-107	3.65E+00	m	2.19E+02	5.60E+08	--	--	--	--	DOE-STD-1196	9.44E-14
Ru-94	Ru-94	93.911	Ruthenium	1.00E-02	ICRP-38	5.18E+01	m	3.11E+03	3.87E+07	ICRP-72	4.20E-11	M	Rec	FGR-12	2.54E-14
Ru-95	Ru-95	94.910	Ruthenium	1.00E-02	ICRP-107	1.64E+00	h	5.91E+03	2.01E+07	DOE-STD-1196	4.29E-11	M	Rec	DOE-STD-1196	5.68E-14
Ru-97	Ru-97	96.908	Ruthenium	1.00E-02	ICRP-38	2.90E+00	d	2.51E+05	4.65E+05	ICRP-72	1.00E-10	M	Rec	FGR-12	1.09E-14
S-35	S-35	34.969	Sulfur	5.00E-01	ICRP-38	8.74E+01	d	7.55E+06	4.27E+04	ICRP-72	1.40E-09	M	Rec	FGR-12	2.43E-19
S-37	S-37	36.971	Sulfur	5.00E-01	ICRP-107	5.05E+00	m	3.03E+02	1.01E+09	--	--	--	--	DOE-STD-1196	1.54E-13
S-38	S-38	37.971	Sulfur	5.00E-01	ICRP-107	1.70E+02	m	1.02E+04	2.91E+07	DOE-STD-1196	3.33E-10	M	Rec	DOE-STD-1196	8.47E-14
Sb-111	Sb-111	110.913	Antimony	1.00E-03	ICRP-107	7.50E+01	s	7.50E+01	1.36E+09	--	--	--	--	DOE-STD-1196	6.76E-14
Sb-113	Sb-113	112.909	Antimony	1.00E-03	ICRP-107	6.67E+00	m	4.00E+02	2.50E+08	--	--	--	--	DOE-STD-1196	5.71E-14
Sb-114	Sb-114	113.909	Antimony	1.00E-03	ICRP-107	3.49E+00	m	2.09E+02	4.73E+08	--	--	--	--	DOE-STD-1196	1.27E-13
Sb-115	Sb-115	114.907	Antimony	1.00E-03	ICRP-38	3.18E+01	m	1.91E+03	5.15E+07	ICRP-72	1.30E-11	M	Rec	FGR-12	4.32E-14
Sb-116	Sb-116	115.907	Antimony	1.00E-03	ICRP-38	1.58E+01	m	9.48E+02	1.03E+08	ICRP-72	1.30E-11	M	Rec	FGR-12	1.08E-13
Sb-116m	Sb-116	115.907	Antimony	1.00E-03	ICRP-38	6.03E+01	m	3.62E+03	2.69E+07	ICRP-72	4.70E-11	M	Rec	FGR-12	1.55E-13
Sb-117	Sb-117	116.905	Antimony	1.00E-03	ICRP-38	2.80E+00	h	1.01E+04	9.57E+06	ICRP-72	1.60E-11	M	Rec	FGR-12	7.97E-15
Sb-118	Sb-118	117.906	Antimony	1.00E-03	ICRP-38	3.60E+00	m	2.16E+02	4.43E+08	--	--	--	--	DOE-STD-1196	3.65E-14
Sb-118m	Sb-118	117.906	Antimony	1.00E-03	ICRP-38	5.00E+00	h	1.80E+04	5.32E+06	ICRP-72	1.20E-10	M	Rec	FGR-12	1.27E-13
Sb-119	Sb-119	118.904	Antimony	1.00E-03	ICRP-38	3.81E+01	h	1.37E+05	6.92E+05	ICRP-72	3.50E-11	M	Rec	FGR-12	2.16E-16
Sb-120s	Sb-120	119.905	Antimony	1.00E-03	ICRP-38	1.59E+01	m	9.53E+02	9.87E+07	ICRP-72	7.00E-12	M	Rec	FGR-12	2.13E-14
Sb-120l	Sb-120	119.905	Antimony	1.00E-03	ICRP-38	5.76E+00	d	4.98E+05	1.89E+05	ICRP-72	1.00E-09	M	Rec	FGR-12	1.22E-13
Sb-122	Sb-122	121.905	Antimony	1.00E-03	ICRP-38	2.70E+00	d	2.33E+05	3.97E+05	ICRP-72	1.00E-09	M	Rec	FGR-12	2.13E-14
Sb-122m	Sb-122	121.905	Antimony	1.00E-03	ICRP-107	4.19E+00	m	2.51E+02	3.68E+08	--	--	--	--	DOE-STD-1196	1.77E-15
Sb-124	Sb-124	123.906	Antimony	1.00E-03	ICRP-38	6.02E+01	d	5.20E+06	1.75E+04	ICRP-72	6.40E-09	M	Rec	FGR-12	9.15E-14
Sb-124ms	Sb-124	123.906	Antimony	1.00E-03	ICRP-38	9.30E+01	s	9.30E+01	9.79E+08	--	--	--	--	FGR-12	1.70E-14
Sb-124ml	Sb-124	123.906	Antimony	1.00E-03	ICRP-38	2.02E+01	m	1.21E+03	7.51E+07	ICRP-72	5.40E-12	M	Rec	FGR-12	6.75E-19
Sb-125	Sb-125	124.905	Antimony	1.00E-03	ICRP-38	2.77E+00	y	8.74E+07	1.03E+03	ICRP-72	4.80E-09	M	Rec	FGR-12	2.02E-14
Sb-126	Sb-126	125.907	Antimony	1.00E-03	ICRP-38	1.24E+01	d	1.07E+06	8.36E+04	ICRP-72	2.80E-09	M	Rec	FGR-12	1.37E-13
Sb-126m	Sb-126	125.907	Antimony	1.00E-03	ICRP-38	1.90E+01	m	1.14E+03	7.86E+07	ICRP-72	1.90E-11	M	Rec	FGR-12	7.50E-14
Sb-127	Sb-127	126.907	Antimony	1.00E-03	ICRP-38	3.85E+00	d	3.33E+05	2.67E+05	ICRP-72	1.70E-09	M	Rec	FGR-12	3.33E-14
Sb-128l	Sb-128	127.909	Antimony	1.00E-03	ICRP-38	9.01E+00	h	3.24E+04	2.72E+06	ICRP-72	4.00E-10	M	Rec	FGR-12	1.51E-13
Sb-128s	Sb-128	127.909	Antimony	1.00E-03	ICRP-38	1.04E+01	m	6.24E+02	1.41E+08	ICRP-72	1.40E-11	M	Rec	FGR-12	9.69E-14
Sb-129	Sb-129	128.909	Antimony	1.00E-03	ICRP-38	4.32E+00	h	1.56E+04	5.63E+06	ICRP-72	2.30E-10	M	Rec	FGR-12	7.14E-14
Sb-130	Sb-130	129.912	Antimony	1.00E-03	ICRP-38	4.00E+01	m	2.40E+03	3.62E+07	ICRP-72	5.10E-11	M	Rec	FGR-12	1.60E-13
Sb-130m	Sb-130	129.912	Antimony	1.00E-03	ICRP-107	6.30E+00	m	3.78E+02	2.30E+08	--	--	--	--	DOE-STD-1196	1.26E-13

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Sb-131	Sb-131	130.912	Antimony	1.00E-03	ICRP-38	2.30E+01	m	1.38E+03	6.24E+07	ICRP-72	4.40E-11	M	Rec	FGR-12	9.37E-14
Sb-133	Sb-133	132.915	Antimony	1.00E-03	ICRP-107	2.50E+00	m	1.50E+02	5.66E+08	--	--	--	--	DOE-STD-1196	1.33E-13
Sc-42m	Sc-42	41.966	Scandium	1.00E-03	ICRP-107	6.20E+01	s	6.20E+01	4.34E+09	--	--	--	--	DOE-STD-1196	1.98E-13
Sc-43	Sc-43	42.961	Scandium	1.00E-03	ICRP-38	3.89E+00	h	1.40E+04	1.87E+07	ICRP-72	1.10E-10	S	Max	FGR-12	5.26E-14
Sc-44	Sc-44	43.959	Scandium	1.00E-03	ICRP-38	3.93E+00	h	1.41E+04	1.82E+07	ICRP-72	1.80E-10	S	Max	FGR-12	1.05E-13
Sc-44m	Sc-44	43.959	Scandium	1.00E-03	ICRP-38	5.86E+01	h	2.11E+05	1.22E+06	ICRP-72	1.40E-09	S	Max	FGR-12	1.35E-14
Sc-46	Sc-46	45.955	Scandium	1.00E-03	ICRP-38	8.38E+01	d	7.24E+06	3.39E+04	ICRP-72	6.80E-09	S	Max	FGR-12	9.98E-14
Sc-47	Sc-47	46.952	Scandium	1.00E-03	ICRP-38	3.35E+00	d	2.90E+05	8.30E+05	ICRP-72	7.30E-10	S	Max	FGR-12	5.14E-15
Sc-48	Sc-48	47.952	Scandium	1.00E-03	ICRP-38	4.37E+01	h	1.57E+05	1.50E+06	ICRP-72	1.10E-09	S	Max	FGR-12	1.68E-13
Sc-49	Sc-49	48.950	Scandium	1.00E-03	ICRP-38	5.74E+01	m	3.44E+03	6.69E+07	ICRP-72	4.00E-11	S	Max	FGR-12	1.93E-16
Sc-50	Sc-50	49.952	Scandium	1.00E-03	ICRP-107	1.03E+02	s	1.03E+02	2.20E+09	--	--	--	--	DOE-STD-1196	1.54E-13
Se-70	Se-70	69.934	Selenium	1.00E-02	ICRP-38	4.10E+01	m	2.46E+03	6.56E+07	ICRP-72	4.20E-11	F	Rec	FGR-12	4.73E-14
Se-71	Se-71	70.932	Selenium	1.00E-02	ICRP-107	4.74E+00	m	2.84E+02	5.59E+08	--	--	--	--	DOE-STD-1196	7.40E-14
Se-72	Se-72	71.927	Selenium	1.00E-02	ICRP-38	8.40E+00	d	7.26E+05	2.16E+05	DOE-STD-1196	2.84E-09	F	Rec	DOE-STD-1196	6.10E-16
Se-73	Se-73	72.927	Selenium	1.00E-02	ICRP-38	7.15E+00	h	2.57E+04	6.01E+06	ICRP-72	8.00E-11	F	Rec	FGR-12	5.16E-14
Se-73m	Se-73	72.927	Selenium	1.00E-02	ICRP-38	3.90E+01	m	2.34E+03	6.61E+07	ICRP-72	9.20E-12	F	Rec	FGR-12	1.17E-14
Se-75	Se-75	74.923	Selenium	1.00E-02	ICRP-38	1.20E+02	d	1.04E+07	1.45E+04	ICRP-72	1.00E-09	F	Rec	FGR-12	1.85E-14
Se-77m	Se-77	76.920	Selenium	1.00E-02	ICRP-38	1.75E+01	s	1.75E+01	8.40E+09	--	--	--	--	FGR-12	4.03E-15
Se-79	Se-79	78.918	Selenium	1.00E-02	ICRP-38	6.50E+04	y	2.05E+12	6.97E-02	ICRP-72	1.10E-09	F	Rec	FGR-12	3.03E-19
Se-79m	Se-79	78.918	Selenium	1.00E-02	ICRP-107	3.92E+00	m	2.35E+02	6.08E+08	--	--	--	--	DOE-STD-1196	3.60E-16
Se-81	Se-81	80.918	Selenium	1.00E-02	ICRP-38	1.85E+01	m	1.11E+03	1.26E+08	ICRP-72	8.00E-12	F	Rec	FGR-12	5.24E-16
Se-81m	Se-81	80.918	Selenium	1.00E-02	ICRP-38	5.73E+01	m	3.44E+03	4.06E+07	ICRP-72	1.60E-11	F	Rec	FGR-12	6.18E-16
Se-83	Se-83	82.919	Selenium	1.00E-02	ICRP-38	2.25E+01	m	1.35E+03	1.01E+08	ICRP-72	1.80E-11	F	Rec	FGR-12	1.21E-13
Se-83m	Se-83	82.919	Selenium	1.00E-02	ICRP-107	7.01E+01	s	7.01E+01	1.94E+09	--	--	--	--	DOE-STD-1196	4.78E-14
Se-84	Se-84	83.918	Selenium	1.00E-02	ICRP-107	3.10E+00	m	1.86E+02	7.23E+08	--	--	--	--	DOE-STD-1196	1.90E-14
Si-31	Si-31	30.975	Silicon	1.00E-03	ICRP-38	1.57E+02	m	9.44E+03	3.86E+07	ICRP-72	7.90E-11	S	Max	FGR-12	1.17E-16
Si-32	Si-32	31.974	Silicon	1.00E-03	ICRP-38	4.50E+02	y	1.42E+10	2.48E+01	ICRP-72	1.10E-07	S	Max	FGR-12	5.24E-19
Sm-139	Sm-139	138.922	Samarium	1.00E-03	ICRP-107	2.57E+00	m	1.54E+02	5.27E+08	--	--	--	--	DOE-STD-1196	6.64E-14
Sm-140	Sm-140	139.919	Samarium	1.00E-03	ICRP-107	1.48E+01	m	8.89E+02	9.07E+07	DOE-STD-1196	3.92E-11	S	Max	DOE-STD-1196	2.53E-14
Sm-141	Sm-141	140.918	Samarium	1.00E-03	ICRP-38	1.02E+01	m	6.12E+02	1.31E+08	ICRP-72	1.50E-11	M	Max	FGR-12	6.87E-14
Sm-141m	Sm-141	140.918	Samarium	1.00E-03	ICRP-38	2.26E+01	m	1.36E+03	5.90E+07	ICRP-72	3.20E-11	M	Max	FGR-12	9.71E-14
Sm-142	Sm-142	141.915	Samarium	1.00E-03	ICRP-38	7.25E+01	m	4.35E+03	1.83E+07	ICRP-72	7.10E-11	M	Max	FGR-12	3.79E-15
Sm-143	Sm-143	142.915	Samarium	1.00E-03	ICRP-107	8.75E+00	m	5.25E+02	1.50E+08	--	--	--	--	DOE-STD-1196	2.36E-14
Sm-143m	Sm-143	142.915	Samarium	1.00E-03	ICRP-107	6.60E+01	s	6.60E+01	1.20E+09	--	--	--	--	DOE-STD-1196	3.11E-14
Sm-145	Sm-145	144.913	Samarium	1.00E-03	ICRP-38	3.40E+02	d	2.94E+07	2.65E+03	ICRP-72	1.60E-09	M	Max	FGR-12	1.61E-15
Sm-146	Sm-146	145.913	Samarium	1.00E-03	ICRP-38	1.03E+08	y	3.25E+15	2.38E-05	ICRP-72	1.10E-05	M	Max	--	--
Sm-147	Sm-147	146.915	Samarium	1.00E-03	ICRP-38	1.06E+11	y	3.35E+18	2.30E-08	ICRP-72	9.60E-06	M	Max	--	--
Sm-148	Sm-148	147.915	Samarium	1.00E-03	ICRP-107	7.00E+15	y	2.21E+23	3.45E-13	DOE-STD-1196	2.10E-05	F	Max	--	--
Sm-151	Sm-151	150.920	Samarium	1.00E-03	ICRP-38	9.00E+01	y	2.84E+09	2.63E+01	ICRP-72	4.00E-09	M	Max	FGR-12	3.61E-20
Sm-153	Sm-153	152.922	Samarium	1.00E-03	ICRP-38	4.67E+01	h	1.68E+05	4.39E+05	ICRP-72	6.30E-10	M	Max	FGR-12	2.28E-15
Sm-155	Sm-155	154.925	Samarium	1.00E-03	ICRP-38	2.21E+01	m	1.33E+03	5.49E+07	ICRP-72	1.70E-11	M	Max	FGR-12	4.65E-15
Sm-156	Sm-156	155.926	Samarium	1.00E-03	ICRP-38	9.40E+00	h	3.38E+04	2.14E+06	ICRP-72	2.20E-10	M	Max	FGR-12	5.43E-15
Sm-157	Sm-157	156.928	Samarium	1.00E-03	ICRP-107	8.03E+00	m	4.82E+02	1.49E+08	--	--	--	--	DOE-STD-1196	1.91E-14
Sn-106	Sn-106	105.917	Tin	1.00E-03	ICRP-107	1.92E+00	m	1.15E+02	9.25E+08	--	--	--	--	DOE-STD-1196	5.40E-14
Sn-108	Sn-108	107.912	Tin	1.00E-03	ICRP-107	1.03E+01	m	6.18E+02	1.69E+08	DOE-STD-1196	1.40E-11	S	Max	DOE-STD-1196	2.96E-14
Sn-109	Sn-109	108.911	Tin	1.00E-03	ICRP-107	1.80E+01	m	1.08E+03	9.59E+07	DOE-STD-1196	1.44E-11	S	Max	DOE-STD-1196	1.05E-13

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Sn-110	Sn-110	109.908	Tin	1.00E-03	ICRP-38	4.00E+00	h	1.44E+04	7.13E+06	ICRP-72	1.60E-10	M	Max	FGR-12	1.37E-14
Sn-111	Sn-111	110.908	Tin	1.00E-03	ICRP-38	3.53E+01	m	2.12E+03	4.80E+07	ICRP-72	1.30E-11	M	Max	FGR-12	2.45E-14
Sn-113	Sn-113	112.905	Tin	1.00E-03	ICRP-38	1.15E+02	d	9.94E+06	1.00E+04	ICRP-72	2.70E-09	M	Max	FGR-12	3.82E-16
Sn-113m	Sn-113	112.905	Tin	1.00E-03	ICRP-107	2.14E+01	m	1.28E+03	7.78E+07	DOE-STD-1196	5.19E-12	S	Max	DOE-STD-1196	1.02E-16
Sn-117m	Sn-117	116.903	Tin	1.00E-03	ICRP-38	1.36E+01	d	1.18E+06	8.21E+04	ICRP-72	2.40E-09	M	Max	FGR-12	6.82E-15
Sn-119m	Sn-119	118.903	Tin	1.00E-03	ICRP-38	2.93E+02	d	2.53E+07	3.75E+03	ICRP-72	2.20E-09	M	Max	FGR-12	1.01E-16
Sn-121	Sn-121	120.904	Tin	1.00E-03	ICRP-38	2.71E+01	h	9.74E+04	9.58E+05	ICRP-72	2.30E-10	M	Max	FGR-12	2.37E-18
Sn-121m	Sn-121	120.904	Tin	1.00E-03	ICRP-38	5.50E+01	y	1.74E+09	5.38E+01	ICRP-72	4.50E-09	M	Max	FGR-12	6.02E-17
Sn-123	Sn-123	122.906	Tin	1.00E-03	ICRP-38	1.29E+02	d	1.12E+07	8.22E+03	ICRP-72	8.10E-09	M	Max	FGR-12	4.03E-16
Sn-123m	Sn-123	122.906	Tin	1.00E-03	ICRP-38	4.01E+01	m	2.40E+03	3.82E+07	ICRP-72	2.70E-11	M	Max	FGR-12	6.55E-15
Sn-125	Sn-125	124.908	Tin	1.00E-03	ICRP-38	9.64E+00	d	8.33E+05	1.08E+05	ICRP-72	3.10E-09	M	Max	FGR-12	1.58E-14
Sn-125m	Sn-125	124.908	Tin	1.00E-03	ICRP-107	9.52E+00	m	5.71E+02	1.58E+08	--	--	--	--	DOE-STD-1196	1.60E-14
Sn-126	Sn-126	125.908	Tin	1.00E-03	ICRP-38	1.00E+05	y	3.16E+12	2.84E-02	ICRP-72	2.80E-08	M	Max	FGR-12	2.11E-15
Sn-127	Sn-127	126.910	Tin	1.00E-03	ICRP-38	2.10E+00	h	7.56E+03	1.18E+07	ICRP-72	1.30E-10	M	Max	FGR-12	9.59E-14
Sn-127m	Sn-127	126.910	Tin	1.00E-03	ICRP-107	4.13E+00	m	2.48E+02	3.59E+08	--	--	--	--	DOE-STD-1196	2.67E-14
Sn-128	Sn-128	127.911	Tin	1.00E-03	ICRP-38	5.91E+01	m	3.55E+03	2.49E+07	ICRP-72	9.20E-11	M	Max	FGR-12	3.00E-14
Sn-129	Sn-129	128.913	Tin	1.00E-03	ICRP-107	2.23E+00	m	1.34E+02	6.54E+08	--	--	--	--	DOE-STD-1196	4.76E-14
Sn-130	Sn-130	129.914	Tin	1.00E-03	ICRP-107	3.72E+00	m	2.23E+02	3.89E+08	--	--	--	--	DOE-STD-1196	4.16E-14
Sn-130m	Sn-130	129.914	Tin	1.00E-03	ICRP-107	1.70E+00	m	1.02E+02	8.51E+08	--	--	--	--	DOE-STD-1196	4.20E-14
Sr-79	Sr-79	78.930	Strontium	1.00E-03	ICRP-107	2.25E+00	m	1.35E+02	1.06E+09	--	--	--	--	DOE-STD-1196	5.39E-14
Sr-80	Sr-80	79.925	Strontium	1.00E-03	ICRP-38	1.00E+02	m	6.00E+03	2.35E+07	ICRP-72	1.30E-10	M	Rec	FGR-12	6.53E-18
Sr-81	Sr-81	80.923	Strontium	1.00E-03	ICRP-38	2.55E+01	m	1.53E+03	9.11E+07	ICRP-72	3.50E-11	M	Rec	FGR-12	6.68E-14
Sr-82	Sr-82	81.918	Strontium	1.00E-03	ICRP-38	2.50E+01	d	2.16E+06	6.38E+04	ICRP-72	8.90E-09	M	Rec	FGR-12	6.43E-18
Sr-83	Sr-83	82.918	Strontium	1.00E-03	ICRP-38	3.24E+01	h	1.17E+05	1.17E+06	ICRP-72	3.10E-10	M	Rec	FGR-12	3.86E-14
Sr-85	Sr-85	84.913	Strontium	1.00E-03	ICRP-38	6.48E+01	d	5.60E+06	2.37E+04	ICRP-72	6.40E-10	M	Rec	FGR-12	2.42E-14
Sr-85m	Sr-85	84.913	Strontium	1.00E-03	ICRP-38	6.95E+01	m	4.17E+03	3.19E+07	ICRP-72	4.10E-12	M	Rec	FGR-12	1.05E-14
Sr-87m	Sr-87	86.909	Strontium	1.00E-03	ICRP-38	2.81E+00	h	1.01E+04	1.29E+07	ICRP-72	2.00E-11	M	Rec	FGR-12	1.52E-14
Sr-89	Sr-89	88.907	Strontium	1.00E-03	ICRP-38	5.05E+01	d	4.36E+06	2.91E+04	ICRP-72	6.10E-09	M	Rec	FGR-12	7.73E-17
Sr-90	Sr-90	89.908	Strontium	1.00E-03	ICRP-38	2.91E+01	y	9.19E+08	1.37E+02	ICRP-72	3.60E-08	M	Rec	FGR-12	7.53E-18
Sr-91	Sr-91	90.910	Strontium	1.00E-03	ICRP-38	9.50E+00	h	3.42E+04	3.63E+06	ICRP-72	3.70E-10	M	Rec	FGR-12	3.45E-14
Sr-92	Sr-92	91.911	Strontium	1.00E-03	ICRP-38	2.71E+00	h	9.76E+03	1.26E+07	ICRP-72	2.10E-10	M	Rec	FGR-12	6.79E-14
Sr-93	Sr-93	92.914	Strontium	1.00E-03	ICRP-107	7.42E+00	m	4.45E+02	2.73E+08	--	--	--	--	DOE-STD-1196	1.07E-13
Sr-94	Sr-94	93.915	Strontium	1.00E-03	ICRP-107	7.53E+01	s	7.53E+01	1.60E+09	--	--	--	--	DOE-STD-1196	6.92E-14
Ta-170	Ta-170	169.946	Tantalum	1.00E-03	ICRP-107	6.76E+00	m	4.06E+02	1.64E+08	--	--	--	--	DOE-STD-1196	4.88E-14
Ta-172	Ta-172	171.945	Tantalum	1.00E-03	ICRP-38	3.68E+01	m	2.21E+03	2.97E+07	ICRP-72	3.50E-11	S	Max	FGR-12	7.59E-14
Ta-173	Ta-173	172.944	Tantalum	1.00E-03	ICRP-38	3.65E+00	h	1.31E+04	4.96E+06	ICRP-72	1.10E-10	M	Max	FGR-12	2.75E-14
Ta-174	Ta-174	173.944	Tantalum	1.00E-03	ICRP-38	1.20E+00	h	4.32E+03	1.50E+07	ICRP-72	4.30E-11	S	Max	FGR-12	2.97E-14
Ta-175	Ta-175	174.944	Tantalum	1.00E-03	ICRP-38	1.05E+01	h	3.78E+04	1.71E+06	ICRP-72	1.30E-10	S	Max	FGR-12	4.55E-14
Ta-176	Ta-176	175.945	Tantalum	1.00E-03	ICRP-38	8.08E+00	h	2.91E+04	2.20E+06	ICRP-72	2.00E-10	S	Max	FGR-12	1.09E-13
Ta-177	Ta-177	176.944	Tantalum	1.00E-03	ICRP-38	5.66E+01	h	2.04E+05	3.13E+05	ICRP-72	1.10E-10	S	Max	FGR-12	2.53E-15
Ta-178s	Ta-178	177.946	Tantalum	1.00E-03	ICRP-38	9.31E+00	m	5.59E+02	1.13E+08	--	--	--	--	FGR-12	4.61E-15
Ta-178l	Ta-178	177.946	Tantalum	1.00E-03	ICRP-38	2.20E+00	h	7.92E+03	8.00E+06	ICRP-72	6.80E-11	S	Max	FGR-12	4.75E-14
Ta-179	Ta-179	178.946	Tantalum	1.00E-03	ICRP-38	6.65E+02	d	5.74E+07	1.10E+03	ICRP-72	5.60E-10	S	Max	FGR-12	1.09E-15
Ta-180	Ta-180	179.947	Tantalum	1.00E-03	ICRP-38	1.00E+13	y	3.16E+20	1.99E-10	ICRP-72	2.60E-08	S	Max	FGR-12	2.59E-14
Ta-180m	Ta-180	179.947	Tantalum	1.00E-03	ICRP-38	8.10E+00	h	2.92E+04	2.15E+06	ICRP-72	4.40E-11	M	Max	FGR-12	1.71E-15
Ta-182	Ta-182	181.950	Tantalum	1.00E-03	ICRP-38	1.15E+02	d	9.94E+06	6.24E+03	ICRP-72	1.00E-08	S	Max	FGR-12	6.40E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Ta-182m	Ta-182	181.950	Tantalum	1.00E-03	ICRP-38	1.58E+01	m	9.50E+02	6.52E+07	ICRP-72	2.10E-11	S	Max	FGR-12	1.11E-14
Ta-183	Ta-183	182.951	Tantalum	1.00E-03	ICRP-38	5.10E+00	d	4.41E+05	1.40E+05	ICRP-72	2.10E-09	S	Max	FGR-12	1.31E-14
Ta-184	Ta-184	183.954	Tantalum	1.00E-03	ICRP-38	8.70E+00	h	3.13E+04	1.96E+06	ICRP-72	4.30E-10	S	Max	FGR-12	7.80E-14
Ta-185	Ta-185	184.956	Tantalum	1.00E-03	ICRP-38	4.90E+01	m	2.94E+03	2.07E+07	ICRP-72	4.80E-11	S	Max	FGR-12	8.73E-15
Ta-186	Ta-186	185.959	Tantalum	1.00E-03	ICRP-38	1.05E+01	m	6.30E+02	9.63E+07	ICRP-72	1.80E-11	S	Max	FGR-12	7.53E-14
Tb-146	Tb-146	145.927	Terbium	1.00E-03	ICRP-107	2.30E+01	s	2.30E+01	3.36E+09	--	--	--	--	DOE-STD-1196	1.74E-13
Tb-147	Tb-147	146.924	Terbium	1.00E-03	ICRP-38	1.65E+00	h	5.94E+03	1.29E+07	ICRP-72	7.60E-11	M	Max	FGR-12	7.78E-14
Tb-147m	Tb-147	146.924	Terbium	1.00E-03	ICRP-107	1.87E+00	m	1.12E+02	6.84E+08	--	--	--	--	DOE-STD-1196	9.11E-14
Tb-148	Tb-148	147.924	Terbium	1.00E-03	ICRP-107	6.00E+01	m	3.60E+03	2.12E+07	DOE-STD-1196	8.28E-11	M	Max	DOE-STD-1196	1.11E-13
Tb-148m	Tb-148	147.924	Terbium	1.00E-03	ICRP-107	2.20E+00	m	1.32E+02	5.78E+08	--	--	--	--	DOE-STD-1196	1.42E-13
Tb-149	Tb-149	148.923	Terbium	1.00E-03	ICRP-38	4.15E+00	h	1.49E+04	5.07E+06	ICRP-72	4.90E-09	M	Max	FGR-12	8.02E-14
Tb-149m	Tb-149	148.923	Terbium	1.00E-03	ICRP-107	4.16E+00	m	2.50E+02	3.03E+08	--	--	--	--	DOE-STD-1196	6.20E-14
Tb-150	Tb-150	149.924	Terbium	1.00E-03	ICRP-38	3.27E+00	h	1.18E+04	6.39E+06	ICRP-72	1.10E-10	M	Max	FGR-12	8.26E-14
Tb-150m	Tb-150	149.924	Terbium	1.00E-03	ICRP-107	5.80E+00	m	3.48E+02	2.16E+08	--	--	--	--	DOE-STD-1196	1.12E-13
Tb-151	Tb-151	150.923	Terbium	1.00E-03	ICRP-38	1.76E+01	h	6.34E+04	1.18E+06	ICRP-72	2.30E-10	M	Max	FGR-12	4.20E-14
Tb-151m	Tb-151	150.923	Terbium	1.00E-03	ICRP-107	2.50E+01	s	2.50E+01	2.99E+09	--	--	--	--	DOE-STD-1196	3.20E-15
Tb-152	Tb-152	151.924	Terbium	1.00E-03	ICRP-107	1.75E+01	h	6.30E+04	1.18E+06	DOE-STD-1196	3.82E-10	S	Max	DOE-STD-1196	6.98E-14
Tb-152m	Tb-152	151.924	Terbium	1.00E-03	ICRP-107	4.20E+00	m	2.52E+02	2.95E+08	--	--	--	--	DOE-STD-1196	3.28E-14
Tb-153	Tb-153	152.923	Terbium	1.00E-03	ICRP-38	2.34E+00	d	2.02E+05	3.65E+05	ICRP-72	1.90E-10	M	Max	FGR-12	9.89E-15
Tb-154	Tb-154	153.925	Terbium	1.00E-03	ICRP-38	2.14E+01	h	7.70E+04	9.51E+05	ICRP-72	3.60E-10	M	Max	FGR-12	1.21E-13
Tb-155	Tb-155	154.924	Terbium	1.00E-03	ICRP-38	5.32E+00	d	4.60E+05	1.58E+05	ICRP-72	2.20E-10	M	Max	FGR-12	5.56E-15
Tb-156	Tb-156	155.925	Terbium	1.00E-03	ICRP-38	5.34E+00	d	4.61E+05	1.57E+05	ICRP-72	1.20E-09	M	Max	FGR-12	8.94E-14
Tb-156ml	Tb-156	155.925	Terbium	1.00E-03	ICRP-38	2.44E+01	h	8.78E+04	8.24E+05	ICRP-72	2.10E-10	M	Max	FGR-12	7.75E-16
Tb-156ms	Tb-156	155.925	Terbium	1.00E-03	ICRP-38	5.00E+00	h	1.80E+04	4.02E+06	ICRP-72	9.60E-11	M	Max	FGR-12	1.16E-16
Tb-157	Tb-157	156.924	Terbium	1.00E-03	ICRP-38	1.50E+02	y	4.73E+09	1.52E+01	ICRP-72	1.20E-09	M	Max	FGR-12	6.78E-17
Tb-158	Tb-158	157.925	Terbium	1.00E-03	ICRP-38	1.50E+02	y	4.73E+09	1.51E+01	ICRP-72	4.60E-08	M	Max	FGR-12	3.84E-14
Tb-160	Tb-160	159.927	Terbium	1.00E-03	ICRP-38	7.23E+01	d	6.25E+06	1.13E+04	ICRP-72	7.00E-09	M	Max	FGR-12	5.54E-14
Tb-161	Tb-161	160.928	Terbium	1.00E-03	ICRP-38	6.91E+00	d	5.97E+05	1.17E+05	ICRP-72	1.30E-09	M	Max	FGR-12	1.02E-15
Tb-162	Tb-162	161.929	Terbium	1.00E-03	ICRP-107	7.60E+00	m	4.56E+02	1.53E+08	--	--	--	--	DOE-STD-1196	5.04E-14
Tb-163	Tb-163	162.931	Terbium	1.00E-03	ICRP-107	1.95E+01	m	1.17E+03	5.92E+07	DOE-STD-1196	2.03E-11	S	Max	DOE-STD-1196	3.51E-14
Tb-164	Tb-164	163.933	Terbium	1.00E-03	ICRP-107	3.00E+00	m	1.80E+02	3.82E+08	--	--	--	--	DOE-STD-1196	1.14E-13
Tb-165	Tb-165	164.935	Terbium	1.00E-03	ICRP-107	2.11E+00	m	1.27E+02	5.40E+08	--	--	--	--	DOE-STD-1196	4.04E-14
Tc-101	Tc-101	100.907	Technetium	1.00E-03	ICRP-38	1.42E+01	m	8.52E+02	1.31E+08	ICRP-72	1.20E-11	M	Rec	FGR-12	1.61E-14
Tc-102	Tc-102	101.909	Technetium	1.00E-03	ICRP-107	5.28E+00	s	5.28E+00	2.10E+10	--	--	--	--	DOE-STD-1196	5.85E-15
Tc-102m	Tc-102	101.909	Technetium	1.00E-03	ICRP-107	4.35E+00	m	2.61E+02	4.24E+08	--	--	--	--	DOE-STD-1196	1.18E-13
Tc-104	Tc-104	103.911	Technetium	1.00E-03	ICRP-38	1.82E+01	m	1.09E+03	9.94E+07	ICRP-72	2.80E-11	M	Rec	FGR-12	1.01E-13
Tc-105	Tc-105	104.912	Technetium	1.00E-03	ICRP-107	7.60E+00	m	4.56E+02	2.36E+08	--	--	--	--	DOE-STD-1196	3.77E-14
Tc-91	Tc-91	90.918	Technetium	1.00E-03	ICRP-107	3.14E+00	m	1.88E+02	6.59E+08	--	--	--	--	DOE-STD-1196	1.20E-13
Tc-91m	Tc-91	90.918	Technetium	1.00E-03	ICRP-107	3.30E+00	m	1.98E+02	6.27E+08	--	--	--	--	DOE-STD-1196	6.60E-14
Tc-92	Tc-92	91.915	Technetium	1.00E-03	ICRP-107	4.25E+00	m	2.55E+02	4.81E+08	--	--	--	--	DOE-STD-1196	1.79E-13
Tc-93	Tc-93	92.910	Technetium	1.00E-03	ICRP-38	2.75E+00	h	9.90E+03	1.23E+07	ICRP-72	3.50E-11	M	Rec	FGR-12	7.38E-14
Tc-93m	Tc-93	92.910	Technetium	1.00E-03	ICRP-38	4.35E+01	m	2.61E+03	4.65E+07	ICRP-72	1.70E-11	M	Rec	FGR-12	3.73E-14
Tc-94	Tc-94	93.910	Technetium	1.00E-03	ICRP-38	2.93E+02	m	1.76E+04	6.83E+06	ICRP-72	1.20E-10	M	Rec	FGR-12	1.30E-13
Tc-94m	Tc-94	93.910	Technetium	1.00E-03	ICRP-38	5.20E+01	m	3.12E+03	3.85E+07	ICRP-72	4.50E-11	M	Rec	FGR-12	9.18E-14
Tc-95	Tc-95	94.908	Technetium	1.00E-03	ICRP-38	2.00E+01	h	7.20E+04	1.65E+06	ICRP-72	1.00E-10	M	Rec	FGR-12	3.84E-14
Tc-95m	Tc-95	94.908	Technetium	1.00E-03	ICRP-38	6.10E+01	d	5.27E+06	2.26E+04	ICRP-72	8.80E-10	M	Rec	FGR-12	3.23E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Tc-96	Tc-96	95.908	Technetium	1.00E-03	ICRP-38	4.28E+00	d	3.70E+05	3.18E+05	ICRP-72	6.80E-10	M	Rec	FGR-12	1.22E-13
Tc-96m	Tc-96	95.908	Technetium	1.00E-03	ICRP-38	5.15E+01	m	3.09E+03	3.81E+07	ICRP-72	7.40E-12	M	Rec	FGR-12	2.24E-15
Tc-97	Tc-97	96.906	Technetium	1.00E-03	ICRP-38	2.60E+06	y	8.20E+13	1.42E-03	ICRP-72	2.20E-10	M	Rec	FGR-12	3.33E-17
Tc-97m	Tc-97	96.906	Technetium	1.00E-03	ICRP-38	8.70E+01	d	7.52E+06	1.55E+04	ICRP-72	3.20E-09	M	Rec	FGR-12	4.64E-17
Tc-98	Tc-98	97.907	Technetium	1.00E-03	ICRP-38	4.20E+06	y	1.33E+14	8.69E-04	ICRP-72	8.30E-09	M	Rec	FGR-12	6.86E-14
Tc-99	Tc-99	98.906	Technetium	1.00E-03	ICRP-38	2.13E+05	y	6.72E+12	1.70E-02	ICRP-72	4.00E-09	M	Rec	FGR-12	1.62E-18
Tc-99m	Tc-99	98.906	Technetium	1.00E-03	ICRP-38	6.02E+00	h	2.17E+04	5.26E+06	ICRP-72	1.90E-11	M	Rec	FGR-12	5.89E-15
Te-113	Te-113	112.916	Tellurium	1.00E-02	ICRP-107	1.70E+00	m	1.02E+02	9.80E+08	--	--	--	--	DOE-STD-1196	1.05E-13
Te-114	Te-114	113.912	Tellurium	1.00E-02	ICRP-107	1.52E+01	m	9.12E+02	1.09E+08	DOE-STD-1196	3.34E-11	M	Rec	DOE-STD-1196	5.92E-14
Te-115	Te-115	114.912	Tellurium	1.00E-02	ICRP-107	5.80E+00	m	3.48E+02	2.82E+08	--	--	--	--	DOE-STD-1196	1.05E-13
Te-115m	Te-115	114.912	Tellurium	1.00E-02	ICRP-107	6.70E+00	m	4.02E+02	2.44E+08	--	--	--	--	DOE-STD-1196	1.22E-13
Te-116	Te-116	115.908	Tellurium	1.00E-02	ICRP-38	2.49E+00	h	8.96E+03	1.09E+07	ICRP-72	1.00E-10	M	Rec	FGR-12	2.29E-15
Te-117	Te-117	116.909	Tellurium	1.00E-02	ICRP-107	6.20E+01	m	3.72E+03	2.59E+07	DOE-STD-1196	3.76E-11	M	Rec	DOE-STD-1196	7.25E-14
Te-118	Te-118	117.906	Tellurium	1.00E-02	ICRP-107	6.00E+00	d	5.18E+05	1.85E+05	DOE-STD-1196	2.68E-09	M	Rec	DOE-STD-1196	1.51E-16
Te-119	Te-119	118.906	Tellurium	1.00E-02	ICRP-107	1.61E+01	h	5.78E+04	1.64E+06	DOE-STD-1196	1.26E-10	M	Rec	DOE-STD-1196	3.43E-14
Te-119m	Te-119	118.906	Tellurium	1.00E-02	ICRP-107	4.70E+00	d	4.06E+05	2.34E+05	DOE-STD-1196	6.12E-10	M	Rec	DOE-STD-1196	6.97E-14
Te-121	Te-121	120.905	Tellurium	1.00E-02	ICRP-38	1.70E+01	d	1.47E+06	6.35E+04	ICRP-72	3.80E-10	M	Rec	FGR-12	2.70E-14
Te-121m	Te-121	120.905	Tellurium	1.00E-02	ICRP-38	1.54E+02	d	1.33E+07	7.01E+03	ICRP-72	4.20E-09	M	Rec	FGR-12	9.90E-15
Te-123	Te-123	122.904	Tellurium	1.00E-02	ICRP-38	1.00E+13	y	3.16E+20	2.91E-10	ICRP-72	1.90E-09	M	Rec	FGR-12	2.15E-16
Te-123m	Te-123	122.904	Tellurium	1.00E-02	ICRP-38	1.20E+02	d	1.03E+07	8.88E+03	ICRP-72	4.00E-09	M	Rec	FGR-12	6.51E-15
Te-125m	Te-125	124.904	Tellurium	1.00E-02	ICRP-38	5.80E+01	d	5.01E+06	1.80E+04	ICRP-72	3.40E-09	M	Rec	FGR-12	4.53E-16
Te-127	Te-127	126.905	Tellurium	1.00E-02	ICRP-38	9.35E+00	h	3.37E+04	2.64E+06	ICRP-72	1.30E-10	M	Rec	FGR-12	2.42E-16
Te-127m	Te-127	126.905	Tellurium	1.00E-02	ICRP-38	1.09E+02	d	9.42E+06	9.44E+03	ICRP-72	7.40E-09	M	Rec	FGR-12	1.47E-16
Te-129	Te-129	128.907	Tellurium	1.00E-02	ICRP-38	6.96E+01	m	4.18E+03	2.10E+07	ICRP-72	3.70E-11	M	Rec	FGR-12	2.75E-15
Te-129m	Te-129	128.907	Tellurium	1.00E-02	ICRP-38	3.36E+01	d	2.90E+06	3.01E+04	ICRP-72	6.60E-09	M	Rec	FGR-12	1.55E-15
Te-131	Te-131	130.909	Tellurium	1.00E-02	ICRP-38	2.50E+01	m	1.50E+03	5.75E+07	ICRP-72	2.80E-11	M	Rec	FGR-12	2.04E-14
Te-131m	Te-131	130.909	Tellurium	1.00E-02	ICRP-38	3.00E+01	h	1.08E+05	7.98E+05	ICRP-72	9.40E-10	M	Rec	FGR-12	7.01E-14
Te-132	Te-132	131.909	Tellurium	1.00E-02	ICRP-38	7.82E+01	h	2.82E+05	3.04E+05	ICRP-72	2.00E-09	M	Rec	FGR-12	1.03E-14
Te-133	Te-133	132.911	Tellurium	1.00E-02	ICRP-38	1.25E+01	m	7.47E+02	1.14E+08	ICRP-72	2.00E-11	M	Rec	FGR-12	4.60E-14
Te-133m	Te-133	132.911	Tellurium	1.00E-02	ICRP-38	5.54E+01	m	3.32E+03	2.55E+07	ICRP-72	8.70E-11	M	Rec	FGR-12	1.14E-13
Te-134	Te-134	133.911	Tellurium	1.00E-02	ICRP-38	4.18E+01	m	2.51E+03	3.36E+07	ICRP-72	6.60E-11	M	Rec	FGR-12	4.24E-14
Th-223	Th-223	223.021	Thorium	1.00E-03	ICRP-107	6.00E-01	s	6.00E-01	8.43E+10	--	--	--	--	DOE-STD-1196	2.78E-15
Th-224	Th-224	224.021	Thorium	1.00E-03	ICRP-107	1.05E+00	s	1.05E+00	4.80E+10	--	--	--	--	DOE-STD-1196	9.75E-16
Th-226	Th-226	226.025	Thorium	1.00E-03	ICRP-38	3.09E+01	m	1.85E+03	2.69E+07	ICRP-72	6.10E-08	S	Rec	FGR-12	3.59E-16
Th-227	Th-227	227.028	Thorium	1.00E-03	ICRP-38	1.87E+01	d	1.62E+06	3.07E+04	ICRP-72	1.00E-05	S	Rec	FGR-12	4.88E-15
Th-228	Th-228	228.029	Thorium	1.00E-03	ICRP-38	1.91E+00	y	6.04E+07	8.19E+02	ICRP-72	4.00E-05	S	Rec	FGR-12	9.20E-17
Th-229	Th-229	229.032	Thorium	1.00E-03	ICRP-38	7.34E+03	y	2.32E+11	2.13E-01	ICRP-72	7.10E-05	S	Rec	FGR-12	3.83E-15
Th-230	Th-230	230.033	Thorium	1.00E-03	ICRP-38	7.70E+04	y	2.43E+12	2.02E-02	ICRP-72	1.40E-05	S	Rec	FGR-12	1.74E-17
Th-231	Th-231	231.036	Thorium	1.00E-03	ICRP-38	2.55E+01	h	9.19E+04	5.31E+05	ICRP-72	3.30E-10	S	Rec	FGR-12	5.22E-16
Th-232	Th-232	232.038	Thorium	1.00E-03	ICRP-38	1.41E+10	y	4.43E+17	1.10E-07	ICRP-72	2.50E-05	S	Rec	FGR-12	8.72E-18
Th-233	Th-233	233.042	Thorium	1.00E-03	ICRP-107	2.23E+01	m	1.34E+03	3.62E+07	DOE-STD-1196	2.12E-11	S	Rec	DOE-STD-1196	1.79E-15
Th-234	Th-234	234.044	Thorium	1.00E-03	ICRP-38	2.41E+01	d	2.08E+06	2.31E+04	ICRP-72	7.70E-09	S	Rec	FGR-12	3.38E-16
Th-235	Th-235	235.047	Thorium	1.00E-03	ICRP-107	7.10E+00	m	4.26E+02	1.13E+08	--	--	--	--	DOE-STD-1196	2.93E-15
Th-236	Th-236	236.050	Thorium	1.00E-03	ICRP-107	3.75E+01	m	2.25E+03	2.12E+07	DOE-STD-1196	6.71E-11	S	Rec	DOE-STD-1196	1.68E-15
Ti-44	Ti-44	43.960	Titanium	1.00E-03	ICRP-38	4.73E+01	y	1.49E+09	1.72E+02	ICRP-72	1.20E-07	S	Max	FGR-12	5.53E-15
Ti-45	Ti-45	44.958	Titanium	1.00E-03	ICRP-38	3.08E+00	h	1.11E+04	2.26E+07	ICRP-72	9.30E-11	S	Max	FGR-12	4.18E-14

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Ti-51	Ti-51	50.947	Titanium	1.00E-03	ICRP-107	5.76E+00	m	3.46E+02	6.41E+08	--	--	--	--	DOE-STD-1196	1.71E-14
Ti-52	Ti-52	51.947	Titanium	1.00E-03	ICRP-107	1.70E+00	m	1.02E+02	2.13E+09	--	--	--	--	DOE-STD-1196	5.75E-15
Tl-190	Tl-190	189.974	Thallium	1.00E-03	ICRP-107	2.60E+00	m	1.56E+02	3.81E+08	--	--	--	--	DOE-STD-1196	5.94E-14
Tl-190m	Tl-190	189.974	Thallium	1.00E-03	ICRP-107	3.70E+00	m	2.22E+02	2.67E+08	--	--	--	--	DOE-STD-1196	1.11E-13
Tl-194	Tl-194	193.971	Thallium	1.00E-03	ICRP-38	3.30E+01	m	1.98E+03	2.94E+07	ICRP-72	4.40E-12	F	Max	FGR-12	3.70E-14
Tl-194m	Tl-194	193.971	Thallium	1.00E-03	ICRP-38	3.28E+01	m	1.97E+03	2.96E+07	ICRP-72	1.90E-11	F	Max	FGR-12	1.11E-13
Tl-195	Tl-195	194.970	Thallium	1.00E-03	ICRP-38	1.16E+00	h	4.18E+03	1.39E+07	ICRP-72	1.50E-11	F	Max	FGR-12	6.34E-14
Tl-196	Tl-196	195.970	Thallium	1.00E-03	ICRP-107	1.84E+00	h	6.62E+03	8.69E+06	DOE-STD-1196	4.70E-11	S	Max	DOE-STD-1196	8.80E-14
Tl-197	Tl-197	196.970	Thallium	1.00E-03	ICRP-38	2.84E+00	h	1.02E+04	5.60E+06	ICRP-72	1.40E-11	F	Max	FGR-12	1.93E-14
Tl-198	Tl-198	197.970	Thallium	1.00E-03	ICRP-38	5.30E+00	h	1.91E+04	2.99E+06	ICRP-72	6.00E-11	F	Max	FGR-12	1.01E-13
Tl-198m	Tl-198	197.970	Thallium	1.00E-03	ICRP-38	1.87E+00	h	6.73E+03	8.46E+06	ICRP-72	3.70E-11	F	Max	FGR-12	5.69E-14
Tl-199	Tl-199	198.970	Thallium	1.00E-03	ICRP-38	7.42E+00	h	2.67E+04	2.12E+06	ICRP-72	1.90E-11	F	Max	FGR-12	1.13E-14
Tl-200	Tl-200	199.971	Thallium	1.00E-03	ICRP-38	2.61E+01	h	9.40E+04	6.00E+05	ICRP-72	1.30E-10	F	Max	FGR-12	6.42E-14
Tl-201	Tl-201	200.971	Thallium	1.00E-03	ICRP-38	3.04E+00	d	2.63E+05	2.13E+05	ICRP-72	4.40E-11	F	Max	FGR-12	3.78E-15
Tl-202	Tl-202	201.972	Thallium	1.00E-03	ICRP-38	1.22E+01	d	1.06E+06	5.29E+04	ICRP-72	1.90E-10	F	Max	FGR-12	2.18E-14
Tl-204	Tl-204	203.974	Thallium	1.00E-03	ICRP-38	3.78E+00	y	1.19E+08	4.64E+02	ICRP-72	3.90E-10	F	Max	FGR-12	5.59E-17
Tl-206	Tl-206	205.976	Thallium	1.00E-03	ICRP-38	4.20E+00	m	2.52E+02	2.17E+08	--	--	--	--	FGR-12	6.73E-17
Tl-206m	Tl-206	205.976	Thallium	1.00E-03	ICRP-107	3.74E+00	m	2.24E+02	2.44E+08	--	--	--	--	DOE-STD-1196	1.09E-13
Tl-207	Tl-207	206.977	Thallium	1.00E-03	ICRP-38	4.77E+00	m	2.86E+02	1.90E+08	--	--	--	--	FGR-12	1.62E-16
Tl-208	Tl-208	207.982	Thallium	1.00E-03	ICRP-38	3.07E+00	m	1.84E+02	2.94E+08	--	--	--	--	FGR-12	1.77E-13
Tl-209	Tl-209	208.985	Thallium	1.00E-03	ICRP-38	2.20E+00	m	1.32E+02	4.09E+08	--	--	--	--	FGR-12	1.02E-13
Tl-210	Tl-210	209.990	Thallium	1.00E-03	ICRP-38	1.30E+00	m	7.80E+01	6.89E+08	--	--	--	--	DOE-STD-1196	1.32E-13
Tm-159	Tm-159	158.935	Thulium	1.00E-03	JAERI	9.13E+00	m	5.48E+02	1.30E+08	--	--	--	--	--	--
Tm-161	Tm-161	160.934	Thulium	1.00E-03	ICRP-107	3.02E+01	m	1.81E+03	3.87E+07	DOE-STD-1196	3.06E-11	S	Max	DOE-STD-1196	5.89E-14
Tm-162	Tm-162	161.934	Thulium	1.00E-03	ICRP-38	2.17E+01	m	1.30E+03	5.35E+07	ICRP-72	1.60E-11	M	Max	FGR-12	9.01E-14
Tm-163	Tm-163	162.933	Thulium	1.00E-03	ICRP-107	1.81E+00	h	6.52E+03	1.06E+07	DOE-STD-1196	4.53E-11	S	Max	DOE-STD-1196	6.03E-14
Tm-164	Tm-164	163.934	Thulium	1.00E-03	ICRP-107	2.00E+00	m	1.20E+02	5.73E+08	--	--	--	--	DOE-STD-1196	3.57E-14
Tm-165	Tm-165	164.932	Thulium	1.00E-03	ICRP-107	3.01E+01	h	1.08E+05	6.32E+05	DOE-STD-1196	2.74E-10	S	Max	DOE-STD-1196	2.40E-14
Tm-166	Tm-166	165.934	Thulium	1.00E-03	ICRP-38	7.70E+00	h	2.77E+04	2.45E+06	ICRP-72	1.70E-10	M	Max	FGR-12	9.35E-14
Tm-167	Tm-167	166.933	Thulium	1.00E-03	ICRP-38	9.24E+00	d	7.98E+05	8.47E+04	ICRP-72	1.10E-09	M	Max	FGR-12	6.06E-15
Tm-168	Tm-168	167.934	Thulium	1.00E-03	ICRP-107	9.31E+01	d	8.04E+06	8.35E+03	DOE-STD-1196	5.60E-09	S	Max	DOE-STD-1196	5.51E-14
Tm-170	Tm-170	169.936	Thulium	1.00E-03	ICRP-38	1.29E+02	d	1.11E+07	5.97E+03	ICRP-72	7.00E-09	M	Max	FGR-12	2.23E-16
Tm-171	Tm-171	170.936	Thulium	1.00E-03	ICRP-38	1.92E+00	y	6.06E+07	1.09E+03	ICRP-72	1.40E-09	M	Max	FGR-12	2.15E-17
Tm-172	Tm-172	171.938	Thulium	1.00E-03	ICRP-38	6.36E+01	h	2.29E+05	2.87E+05	ICRP-72	1.10E-09	M	Max	FGR-12	2.41E-14
Tm-173	Tm-173	172.940	Thulium	1.00E-03	ICRP-38	8.24E+00	h	2.97E+04	2.20E+06	ICRP-72	1.80E-10	M	Max	FGR-12	1.85E-14
Tm-174	Tm-174	173.942	Thulium	1.00E-03	ICRP-107	5.40E+00	m	3.24E+02	2.00E+08	--	--	--	--	DOE-STD-1196	8.05E-14
Tm-175	Tm-175	174.944	Thulium	1.00E-03	ICRP-38	1.52E+01	m	9.12E+02	7.07E+07	ICRP-72	1.80E-11	M	Max	FGR-12	5.13E-14
Tm-176	Tm-176	175.947	Thulium	1.00E-03	ICRP-107	1.85E+00	m	1.11E+02	5.78E+08	--	--	--	--	DOE-STD-1196	9.39E-14
U-227	U-227	227.031	Uranium	1.00E-03	ICRP-107	1.10E+00	m	6.60E+01	7.53E+08	--	--	--	--	DOE-STD-1196	4.85E-15
U-228	U-228	228.031	Uranium	1.00E-03	ICRP-107	9.10E+00	m	5.46E+02	9.06E+07	--	--	--	--	DOE-STD-1196	1.59E-16
U-230	U-230	230.034	Uranium	1.00E-03	ICRP-38	2.08E+01	d	1.80E+06	2.73E+04	ICRP-72	1.30E-05	M	Rec	FGR-12	5.23E-17
U-231	U-231	231.036	Uranium	1.00E-03	ICRP-38	4.20E+00	d	3.63E+05	1.35E+05	ICRP-72	4.70E-10	M	Rec	FGR-12	2.95E-15
U-232	U-232	232.037	Uranium	1.00E-03	ICRP-38	7.20E+01	y	2.27E+09	2.14E+01	ICRP-72	7.80E-06	M	Rec	FGR-12	1.42E-17
U-233	U-233	233.040	Uranium	1.00E-03	ICRP-38	1.59E+05	y	5.00E+12	9.68E-03	ICRP-72	3.60E-06	M	Rec	FGR-12	1.63E-17
U-234	U-234	234.041	Uranium	1.00E-03	ICRP-38	2.45E+05	y	7.72E+12	6.25E-03	ICRP-72	3.50E-06	M	Rec	FGR-12	7.63E-18
U-235	U-235	235.044	Uranium	1.00E-03	ICRP-38	7.04E+08	y	2.22E+16	2.16E-06	ICRP-72	3.10E-06	M	Rec	FGR-12	7.20E-15

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
U-235m	U-235	235.044	Uranium	1.00E-03	ICRP-107	2.60E+01	m	1.56E+03	3.08E+07	DOE-STD-1196	9.01E-16	M	Rec	--	--
U-236	U-236	236.046	Uranium	1.00E-03	ICRP-38	2.34E+07	y	7.39E+14	6.47E-05	ICRP-72	3.20E-06	M	Rec	FGR-12	5.01E-18
U-237	U-237	237.049	Uranium	1.00E-03	ICRP-38	6.75E+00	d	5.83E+05	8.16E+04	ICRP-72	1.70E-09	M	Rec	FGR-12	5.97E-15
U-238	U-238	238.051	Uranium	1.00E-03	ICRP-38	4.47E+09	y	1.41E+17	3.36E-07	ICRP-72	2.90E-06	M	Rec	FGR-12	3.41E-18
U-239	U-239	239.054	Uranium	1.00E-03	ICRP-38	2.35E+01	m	1.41E+03	3.34E+07	ICRP-72	2.20E-11	M	Rec	FGR-12	2.17E-15
U-240	U-240	240.057	Uranium	1.00E-03	ICRP-38	1.41E+01	h	5.08E+04	9.26E+05	ICRP-72	5.30E-10	M	Rec	FGR-12	3.93E-17
U-242	U-242	242.063	Uranium	1.00E-03	ICRP-107	1.68E+01	m	1.01E+03	4.62E+07	DOE-STD-1196	3.21E-11	M	Rec	DOE-STD-1196	1.96E-15
V-47	V-47	46.955	Vanadium	1.00E-03	ICRP-38	3.26E+01	m	1.96E+03	1.23E+08	ICRP-72	2.90E-11	M	Max	FGR-12	4.79E-14
V-48	V-48	47.952	Vanadium	1.00E-03	ICRP-38	1.62E+01	d	1.40E+06	1.68E+05	ICRP-72	2.40E-09	M	Max	FGR-12	1.45E-13
V-49	V-49	48.949	Vanadium	1.00E-03	ICRP-38	3.30E+02	d	2.85E+07	8.08E+03	ICRP-72	3.40E-11	M	Max	--	--
V-50	V-50	49.947	Vanadium	1.00E-03	ICRP-107	1.50E+17	y	4.73E+24	4.77E-14	DOE-STD-1196	6.69E-08	F	Max	DOE-STD-1196	6.87E-14
V-52	V-52	51.945	Vanadium	1.00E-03	ICRP-107	3.74E+00	m	2.25E+02	9.67E+08	--	--	--	--	DOE-STD-1196	7.05E-14
V-53	V-53	52.944	Vanadium	1.00E-03	ICRP-107	1.61E+00	m	9.66E+01	2.21E+09	--	--	--	--	DOE-STD-1196	4.93E-14
W-176	W-176	175.946	Tungsten	1.00E-03	ICRP-38	2.30E+00	h	8.28E+03	7.74E+06	ICRP-72	4.10E-11	F	Max	FGR-12	7.02E-15
W-177	W-177	176.947	Tungsten	1.00E-03	ICRP-38	1.35E+02	m	8.10E+03	7.87E+06	ICRP-72	2.40E-11	F	Max	FGR-12	4.26E-14
W-178	W-178	177.946	Tungsten	1.00E-03	ICRP-38	2.17E+01	d	1.87E+06	3.38E+04	ICRP-72	7.20E-11	F	Max	FGR-12	4.62E-16
W-179	W-179	178.947	Tungsten	1.00E-03	ICRP-38	3.75E+01	m	2.25E+03	2.80E+07	ICRP-72	9.20E-13	F	Max	FGR-12	1.83E-15
W-179m	W-179	178.947	Tungsten	1.00E-03	ICRP-107	6.40E+00	m	3.84E+02	1.64E+08	--	--	--	--	DOE-STD-1196	1.99E-15
W-181	W-181	180.948	Tungsten	1.00E-03	ICRP-38	1.21E+02	d	1.05E+07	5.95E+03	ICRP-72	2.70E-11	F	Max	FGR-12	1.40E-15
W-185	W-185	184.953	Tungsten	1.00E-03	ICRP-38	7.51E+01	d	6.49E+06	9.40E+03	ICRP-72	1.20E-10	F	Max	FGR-12	5.37E-18
W-185m	W-185	184.953	Tungsten	1.00E-03	ICRP-107	1.60E+00	m	9.58E+01	6.37E+08	--	--	--	--	DOE-STD-1196	9.33E-16
W-187	W-187	186.957	Tungsten	1.00E-03	ICRP-38	2.39E+01	h	8.60E+04	7.01E+05	ICRP-72	1.90E-10	F	Max	FGR-12	2.28E-14
W-188	W-188	187.958	Tungsten	1.00E-03	ICRP-38	6.94E+01	d	6.00E+06	1.00E+04	ICRP-72	5.70E-10	F	Max	FGR-12	9.04E-17
W-190	W-190	189.963	Tungsten	1.00E-03	ICRP-107	3.00E+01	m	1.80E+03	3.30E+07	DOE-STD-1196	8.54E-11	S	Max	DOE-STD-1196	5.75E-15
Xe-120	Xe-120	119.912	Xenon	1.00E+00	ICRP-38	4.00E+01	m	2.40E+03	3.92E+07	--	--	--	--	FGR-12	1.94E-14
Xe-121	Xe-121	120.911	Xenon	1.00E+00	ICRP-38	4.01E+01	m	2.41E+03	3.88E+07	--	--	--	--	FGR-12	9.14E-14
Xe-122	Xe-122	121.908	Xenon	1.00E+00	ICRP-38	2.01E+01	h	7.24E+04	1.28E+06	--	--	--	--	FGR-12	2.46E-15
Xe-123	Xe-123	122.908	Xenon	1.00E+00	ICRP-38	2.08E+00	h	7.49E+03	1.23E+07	--	--	--	--	FGR-12	3.03E-14
Xe-125	Xe-125	124.906	Xenon	1.00E+00	ICRP-38	1.70E+01	h	6.12E+04	1.48E+06	--	--	--	--	FGR-12	1.19E-14
Xe-127	Xe-127	126.905	Xenon	1.00E+00	ICRP-38	3.64E+01	d	3.15E+06	2.83E+04	--	--	--	--	FGR-12	1.25E-14
Xe-127m	Xe-127	126.905	Xenon	1.00E+00	ICRP-107	6.92E+01	s	6.92E+01	1.28E+09	--	--	--	--	DOE-STD-1196	6.57E-15
Xe-129m	Xe-129	128.905	Xenon	1.00E+00	ICRP-38	8.00E+00	d	6.91E+05	1.27E+05	--	--	--	--	FGR-12	1.06E-15
Xe-131m	Xe-131	130.905	Xenon	1.00E+00	ICRP-38	1.19E+01	d	1.03E+06	8.38E+04	--	--	--	--	FGR-12	3.89E-16
Xe-133	Xe-133	132.906	Xenon	1.00E+00	ICRP-38	5.25E+00	d	4.53E+05	1.87E+05	--	--	--	--	FGR-12	1.56E-15
Xe-133m	Xe-133	132.906	Xenon	1.00E+00	ICRP-38	2.19E+00	d	1.89E+05	4.49E+05	--	--	--	--	FGR-12	1.37E-15
Xe-135	Xe-135	134.907	Xenon	1.00E+00	ICRP-38	9.09E+00	h	3.27E+04	2.56E+06	--	--	--	--	FGR-12	1.19E-14
Xe-135m	Xe-135	134.907	Xenon	1.00E+00	ICRP-38	1.53E+01	m	9.17E+02	9.12E+07	--	--	--	--	FGR-12	2.04E-14
Xe-137	Xe-137	136.912	Xenon	1.00E+00	ICRP-107	3.82E+00	m	2.29E+02	3.60E+08	--	--	--	--	DOE-STD-1196	1.04E-14
Xe-138	Xe-138	137.914	Xenon	1.00E+00	ICRP-38	1.42E+01	m	8.50E+02	9.62E+07	--	--	--	--	FGR-12	5.77E-14
Y-81	Y-81	80.929	Yttrium	1.00E-03	ICRP-107	7.04E+01	s	7.04E+01	1.98E+09	--	--	--	--	DOE-STD-1196	5.35E-14
Y-83	Y-83	82.922	Yttrium	1.00E-03	ICRP-107	7.08E+00	m	4.25E+02	3.20E+08	--	--	--	--	DOE-STD-1196	6.16E-14
Y-83m	Y-83	82.922	Yttrium	1.00E-03	ICRP-107	2.85E+00	m	1.71E+02	7.96E+08	--	--	--	--	DOE-STD-1196	3.77E-14
Y-84m	Y-84	83.921	Yttrium	1.00E-03	ICRP-107	3.95E+01	m	2.37E+03	5.67E+07	DOE-STD-1196	7.50E-11	S	Max	DOE-STD-1196	1.84E-13
Y-85	Y-85	84.916	Yttrium	1.00E-03	ICRP-107	2.68E+00	h	9.65E+03	1.38E+07	DOE-STD-1196	1.16E-10	S	Max	DOE-STD-1196	4.85E-14
Y-85m	Y-85	84.916	Yttrium	1.00E-03	ICRP-107	4.86E+00	h	1.75E+04	7.59E+06	DOE-STD-1196	2.04E-10	S	Max	DOE-STD-1196	6.18E-14
Y-86	Y-86	85.915	Yttrium	1.00E-03	ICRP-38	1.47E+01	h	5.31E+04	2.47E+06	ICRP-72	4.70E-10	S	Max	FGR-12	1.79E-13

Table B.1 Radionuclide Specific Input Data Used For the Calculation of HC-2 TQs Using Recommended DCs (continued)															
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	RF per DOE-STD-1027	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-2 Inhalation DC (Sv/Bq)	Lung Absorption Class/Type		Immersion DC Reference	HC-2 Immersion DC (Sv/s per Bq/m^3)
Y-86m	Y-86	85.915	Yttrium	1.00E-03	ICRP-38	4.80E+01	m	2.88E+03	4.56E+07	ICRP-72	2.80E-11	S	Max	FGR-12	1.06E-14
Y-87	Y-87	86.911	Yttrium	1.00E-03	ICRP-38	8.03E+01	h	2.89E+05	4.49E+05	ICRP-72	3.90E-10	S	Max	FGR-12	2.15E-14
Y-87m	Y-87	86.911	Yttrium	1.00E-03	ICRP-107	1.34E+01	h	4.81E+04	2.70E+06	DOE-STD-1196	1.66E-10	S	Max	DOE-STD-1196	1.35E-14
Y-88	Y-88	87.910	Yttrium	1.00E-03	ICRP-38	1.07E+02	d	9.21E+06	1.39E+04	ICRP-72	4.40E-09	S	Max	FGR-12	1.37E-13
Y-89m	Y-89	88.906	Yttrium	1.00E-03	ICRP-107	1.57E+01	s	1.57E+01	8.10E+09	--	--	--	--	DOE-STD-1196	4.16E-14
Y-90	Y-90	89.907	Yttrium	1.00E-03	ICRP-38	6.40E+01	h	2.30E+05	5.45E+05	ICRP-72	1.50E-09	S	Max	FGR-12	1.90E-16
Y-90m	Y-90	89.907	Yttrium	1.00E-03	ICRP-38	3.19E+00	h	1.15E+04	1.09E+07	ICRP-72	1.00E-10	S	Max	FGR-12	3.01E-14
Y-91	Y-91	90.907	Yttrium	1.00E-03	ICRP-38	5.85E+01	d	5.06E+06	2.45E+04	ICRP-72	8.90E-09	S	Max	FGR-12	2.60E-16
Y-91m	Y-91	90.907	Yttrium	1.00E-03	ICRP-38	4.97E+01	m	2.98E+03	4.16E+07	ICRP-72	1.10E-11	S	Max	FGR-12	2.55E-14
Y-92	Y-92	91.909	Yttrium	1.00E-03	ICRP-38	3.54E+00	h	1.27E+04	9.63E+06	ICRP-72	1.80E-10	S	Max	FGR-12	1.30E-14
Y-93	Y-93	92.910	Yttrium	1.00E-03	ICRP-38	1.01E+01	h	3.64E+04	3.34E+06	ICRP-72	4.20E-10	S	Max	FGR-12	4.80E-15
Y-94	Y-94	93.912	Yttrium	1.00E-03	ICRP-38	1.91E+01	m	1.15E+03	1.05E+08	ICRP-72	2.80E-11	S	Max	FGR-12	5.62E-14
Y-95	Y-95	94.913	Yttrium	1.00E-03	ICRP-38	1.07E+01	m	6.42E+02	1.85E+08	ICRP-72	1.60E-11	S	Max	FGR-12	4.79E-14
Yb-162	Yb-162	161.936	Ytterbium	1.00E-03	ICRP-38	1.89E+01	m	1.13E+03	6.14E+07	ICRP-72	1.40E-11	S	Max	FGR-12	5.66E-15
Yb-163	Yb-163	162.936	Ytterbium	1.00E-03	ICRP-107	1.11E+01	m	6.63E+02	1.04E+08	DOE-STD-1196	1.02E-11	S	Max	DOE-STD-1196	3.29E-14
Yb-164	Yb-164	163.934	Ytterbium	1.00E-03	ICRP-107	7.58E+01	m	4.55E+03	1.51E+07	DOE-STD-1196	5.31E-11	S	Max	DOE-STD-1196	1.61E-15
Yb-165	Yb-165	164.935	Ytterbium	1.00E-03	ICRP-107	9.90E+00	m	5.94E+02	1.15E+08	--	--	--	--	DOE-STD-1196	1.37E-14
Yb-166	Yb-166	165.934	Ytterbium	1.00E-03	ICRP-38	5.67E+01	h	2.04E+05	3.33E+05	ICRP-72	7.70E-10	S	Max	FGR-12	2.86E-15
Yb-167	Yb-167	166.935	Ytterbium	1.00E-03	ICRP-38	1.75E+01	m	1.05E+03	6.44E+07	ICRP-72	6.90E-12	S	Max	FGR-12	1.09E-14
Yb-169	Yb-169	168.935	Ytterbium	1.00E-03	ICRP-38	3.20E+01	d	2.77E+06	2.41E+04	ICRP-72	3.00E-09	S	Max	FGR-12	1.29E-14
Yb-175	Yb-175	174.941	Ytterbium	1.00E-03	ICRP-38	4.19E+00	d	3.62E+05	1.78E+05	ICRP-72	7.30E-10	S	Max	FGR-12	1.87E-15
Yb-177	Yb-177	176.945	Ytterbium	1.00E-03	ICRP-38	1.90E+00	h	6.84E+03	9.32E+06	ICRP-72	6.90E-11	S	Max	FGR-12	9.23E-15
Yb-178	Yb-178	177.947	Ytterbium	1.00E-03	ICRP-38	7.40E+01	m	4.44E+03	1.43E+07	ICRP-72	7.50E-11	S	Max	FGR-12	1.67E-15
Yb-179	Yb-179	178.950	Ytterbium	1.00E-03	ICRP-107	8.00E+00	m	4.80E+02	1.31E+08	--	--	--	--	DOE-STD-1196	4.40E-14
Zn-60	Zn-60	59.942	Zinc	1.00E-03	ICRP-107	2.38E+00	m	1.43E+02	1.32E+09	--	--	--	--	DOE-STD-1196	6.91E-14
Zn-61	Zn-61	60.940	Zinc	1.00E-03	ICRP-107	8.91E+01	s	8.91E+01	2.08E+09	--	--	--	--	DOE-STD-1196	7.23E-14
Zn-62	Zn-62	61.934	Zinc	1.00E-03	ICRP-38	9.26E+00	h	3.33E+04	5.46E+06	ICRP-72	5.00E-10	M	Rec	FGR-12	2.07E-14
Zn-63	Zn-63	62.933	Zinc	1.00E-03	ICRP-38	3.81E+01	m	2.29E+03	7.84E+07	ICRP-72	3.50E-11	M	Rec	FGR-12	5.32E-14
Zn-65	Zn-65	64.929	Zinc	1.00E-03	ICRP-38	2.44E+02	d	2.11E+07	8.25E+03	ICRP-72	1.60E-09	M	Rec	FGR-12	2.90E-14
Zn-69	Zn-69	68.927	Zinc	1.00E-03	ICRP-38	5.70E+01	m	3.42E+03	4.79E+07	ICRP-72	2.60E-11	M	Rec	FGR-12	2.16E-17
Zn-69m	Zn-69	68.927	Zinc	1.00E-03	ICRP-38	1.38E+01	h	4.95E+04	3.30E+06	ICRP-72	2.40E-10	M	Rec	FGR-12	1.99E-14
Zn-71	Zn-71	70.928	Zinc	1.00E-03	ICRP-107	2.45E+00	m	1.47E+02	1.08E+09	--	--	--	--	DOE-STD-1196	1.52E-14
Zn-71m	Zn-71	70.928	Zinc	1.00E-03	ICRP-38	3.92E+00	h	1.41E+04	1.13E+07	ICRP-72	1.50E-10	M	Rec	FGR-12	7.50E-14
Zn-72	Zn-72	71.927	Zinc	1.00E-03	ICRP-38	4.65E+01	h	1.67E+05	9.37E+05	ICRP-72	1.20E-09	M	Rec	FGR-12	6.90E-15
Zr-85	Zr-85	84.921	Zirconium	1.00E-03	ICRP-107	7.86E+00	m	4.72E+02	2.82E+08	--	--	--	--	DOE-STD-1196	6.74E-14
Zr-86	Zr-86	85.916	Zirconium	1.00E-03	ICRP-38	1.65E+01	h	5.94E+04	2.21E+06	ICRP-72	4.20E-10	M	Rec	FGR-12	1.28E-14
Zr-87	Zr-87	86.915	Zirconium	1.00E-03	ICRP-107	1.68E+00	h	6.05E+03	2.15E+07	DOE-STD-1196	1.02E-10	M	Rec	DOE-STD-1196	4.22E-14
Zr-88	Zr-88	87.910	Zirconium	1.00E-03	ICRP-38	8.34E+01	d	7.21E+06	1.78E+04	ICRP-72	2.60E-09	M	Rec	FGR-12	1.88E-14
Zr-89	Zr-89	88.909	Zirconium	1.00E-03	ICRP-38	7.84E+01	h	2.82E+05	4.49E+05	ICRP-72	5.20E-10	M	Rec	FGR-12	5.68E-14
Zr-89m	Zr-89	88.909	Zirconium	1.00E-03	ICRP-107	4.16E+00	m	2.50E+02	5.08E+08	--	--	--	--	DOE-STD-1196	2.88E-14
Zr-93	Zr-93	92.906	Zirconium	1.00E-03	ICRP-38	1.53E+06	y	4.83E+13	2.51E-03	ICRP-72	1.00E-08	M	Rec	DOE-STD-1196	6.45E-22
Zr-95	Zr-95	94.908	Zirconium	1.00E-03	ICRP-38	6.40E+01	d	5.53E+06	2.15E+04	ICRP-72	4.80E-09	M	Rec	FGR-12	3.60E-14
Zr-97	Zr-97	96.911	Zirconium	1.00E-03	ICRP-38	1.69E+01	h	6.08E+04	1.91E+06	ICRP-72	9.20E-10	M	Rec	FGR-12	9.02E-15

Table B.2 HC-2 TQs Using Recommended Inhalation DCs				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Ac-223			1.31E+10	3.41E+01
Ac-224			6.24E+04	1.29E-02
Ac-225	9.54E+02	1.64E-02	9.54E+02	1.64E-02
Ac-226			6.24E+03	1.30E-02
Ac-227	1.47E+01	2.04E-01	1.47E+01	2.04E-01
Ac-228			3.22E+05	1.44E-01
Ac-229			2.32E+08	1.77E+01
Ac-230			1.02E+08	2.53E-01
Ac-231			1.47E+08	1.35E+00
Ac-232			4.78E+07	1.17E-01
Ac-233			1.18E+08	3.54E-01
Ag-100m			2.03E+07	2.42E-02
Ag-101			3.50E+07	2.08E-01
Ag-102			1.57E+07	1.09E-01
Ag-102m			2.78E+07	1.16E-01
Ag-103			5.94E+07	2.14E+00
Ag-104			1.88E+07	7.18E-01
Ag-104m			4.06E+07	7.52E-01
Ag-105			1.01E+07	3.32E+02
Ag-105m			6.11E+10	2.47E+02
Ag-106			6.95E+07	9.38E-01
Ag-106m			5.36E+06	3.65E+01
Ag-108			2.91E+09	3.96E+00
Ag-108m			1.06E+06	4.07E+04
Ag-109m			1.41E+10	5.38E+00
Ag-110			1.52E+09	3.64E-01
Ag-110m	1.01E+06	2.13E+02	1.01E+06	2.13E+02
Ag-111			5.39E+06	3.41E+01
Ag-111m			1.61E+10	1.02E+01
Ag-112			3.12E+07	3.47E+00
Ag-113			4.17E+07	8.07E+00
Ag-113m			2.83E+08	1.95E-01
Ag-114			1.85E+08	8.60E-03
Ag-115			5.99E+07	7.32E-01
Ag-116			2.53E+07	4.17E-02
Ag-117			4.16E+07	3.17E-02
Ag-99			2.50E+07	2.72E-02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Al-26			3.97E+05	2.07E+07
Al-28			2.91E+07	9.71E-03
Al-29			4.03E+07	4.07E-02
Am-237			1.07E+08	9.82E+00
Am-238			3.69E+07	4.57E+00
Am-239			3.23E+07	2.93E+01
Am-240			1.40E+07	5.44E+01
Am-241	1.93E+02	5.63E+01	1.93E+02	5.63E+01
Am-242			4.77E+05	5.90E-01
Am-242m	2.19E+02	2.09E+01	2.19E+02	2.26E+01
Am-243	1.98E+02	9.90E+02	1.98E+02	9.92E+02
Am-244			3.83E+06	3.01E+00
Am-244m			9.63E+07	3.25E+00
Am-245			1.41E+08	2.27E+01
Am-246			4.93E+07	2.52E+00
Am-246m			4.69E+07	1.53E+00
Am-247			1.70E+08	5.13E+00
Ar-37			2.13E+10	2.11E+05
Ar-39			2.97E+08	8.71E+06
Ar-41			4.16E+04	9.93E-04
Ar-42			2.15E+07	8.28E+04
Ar-43			3.58E+04	4.39E-05
Ar-44			2.86E+04	7.93E-05
As-68			1.54E+07	1.40E-02
As-69			4.83E+07	2.69E-01
As-70			1.19E+07	2.34E-01
As-71			1.68E+07	2.47E+01
As-72			6.97E+06	4.16E+00
As-73			8.10E+06	3.63E+02
As-74			3.67E+06	3.69E+01
As-76			1.01E+07	6.43E+00
As-77			2.07E+07	1.97E+01
As-78			2.91E+07	1.09E+00
As-79			1.20E+09	4.54E+00
At-204			2.60E+07	2.59E-01
At-205			8.63E+06	2.46E-01
At-206			1.36E+07	4.55E-01
At-207			3.25E+06	3.86E-01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
At-208			7.54E+06	8.15E-01
At-209			2.42E+06	8.73E-01
At-210			6.69E+05	3.63E-01
At-211			7.37E+04	3.58E-02
At-215			2.93E+11	5.59E-04
At-216			4.33E+10	2.49E-04
At-217			1.83E+11	1.13E-01
At-218			2.27E+10	8.78E-01
At-220			1.29E+08	5.61E-01
Au-186			3.52E+07	3.72E-01
Au-187			5.45E+07	4.55E-01
Au-190			2.15E+07	9.30E-01
Au-191			5.33E+07	1.03E+01
Au-192			2.06E+07	6.23E+00
Au-193			5.77E+07	6.27E+01
Au-193m			3.23E+08	2.15E-02
Au-194			2.03E+07	4.97E+01
Au-195			4.74E+06	1.30E+03
Au-195m			2.88E+08	1.52E-01
Au-196			1.85E+07	1.72E+02
Au-196m			1.53E+07	9.20E+00
Au-198	8.83E+06	3.61E+01	8.83E+06	3.61E+01
Au-198m			3.90E+06	1.36E+01
Au-199			1.01E+07	4.83E+01
Au-200			1.07E+08	5.48E+00
Au-200m			7.93E+06	9.46E+00
Au-201			3.28E+08	9.26E+00
Au-202			3.04E+08	1.57E-01
Ba-124			7.98E+07	5.79E-01
Ba-126			6.70E+07	4.33E+00
Ba-127			7.28E+07	6.24E-01
Ba-128			6.20E+06	1.47E+01
Ba-129			1.06E+08	9.75E+00
Ba-129m			3.00E+07	2.66E+00
Ba-131			9.85E+06	1.17E+02
Ba-131m			4.91E+08	4.99E+00
Ba-133	2.57E+06	1.01E+04	2.57E+06	1.03E+04
Ba-133m			1.90E+07	3.13E+01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Ba-135m			2.41E+07	2.97E+01
Ba-137m			9.38E+07	1.74E-01
Ba-139			1.30E+08	7.92E+00
Ba-140	1.58E+06	2.16E+01	1.58E+06	2.16E+01
Ba-141			5.17E+07	7.08E-01
Ba-142			4.62E+07	3.70E-01
Be-10			2.32E+05	1.04E+07
Be-7			1.31E+08	3.74E+02
Bi-197			3.44E+07	3.35E-01
Bi-200			2.13E+07	8.24E-01
Bi-201			3.10E+07	3.58E+00
Bi-202			1.79E+07	1.92E+00
Bi-203			1.31E+07	9.96E+00
Bi-204			1.03E+07	7.53E+00
Bi-205			6.84E+06	1.64E+02
Bi-206			3.71E+06	3.66E+01
Bi-207	1.39E+06	3.06E+04	1.39E+06	3.06E+04
Bi-208			2.09E+05	4.48E+07
Bi-210	8.72E+04	7.01E-01	8.72E+04	7.03E-01
Bi-210m			2.38E+03	4.20E+06
Bi-211			1.22E+09	2.92E+00
Bi-212			2.61E+05	1.78E-02
Bi-212n			6.95E+09	5.48E+01
Bi-213			2.70E+05	1.40E-02
Bi-214			5.70E+05	1.29E-02
Bi-215			2.29E+08	1.99E+00
Bi-216			7.93E+07	1.98E-01
Bk-244			8.11E+06	2.75E+00
Bk-245			3.80E+06	3.53E+01
Bk-246			1.73E+07	5.98E+01
Bk-247			1.18E+02	1.12E+02
Bk-248m			2.88E+05	5.41E-01
Bk-249			5.07E+04	3.09E+01
Bk-250			7.17E+06	1.84E+00
Bk-251			1.32E+08	9.78E+00
Br-72			3.83E+04	1.92E-05
Br-73			8.29E+04	1.09E-04
Br-74			2.16E+04	2.15E-04

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Br-74m			2.36E+04	3.86E-04
Br-75			7.11E+04	2.78E-03
Br-76			2.00E+04	7.84E-03
Br-76m			5.60E+06	4.93E-05
Br-77			1.25E+05	1.72E-01
Br-77m			9.07E+06	1.59E-02
Br-78			1.15E+05	3.09E-04
Br-80			7.74E+05	5.72E-03
Br-80m			2.11E+05	2.38E-02
Br-82			1.59E+04	1.47E-02
Br-82m			3.40E+07	9.08E-02
Br-83			3.30E+05	2.09E-02
Br-84			5.08E+04	7.21E-04
Br-84m			4.13E+04	1.10E-04
Br-85			1.36E+06	1.78E-03
C-10			3.42E+06	5.85E-05
C-11			4.92E+06	5.88E-03
C-14	4.05E+05	9.07E+04	4.05E+05	9.10E+04
Ca-41			8.53E+07	1.37E+09
Ca-45	3.00E+06	1.68E+02	3.00E+06	1.69E+02
Ca-47	3.93E+06	6.42E+00	3.93E+06	6.41E+00
Ca-49			1.56E+07	3.55E-02
Cd-101			2.31E+07	1.69E-02
Cd-102			7.25E+07	2.16E-01
Cd-103			2.70E+07	1.08E-01
Cd-104			1.17E+08	3.74E+00
Cd-105			3.82E+07	1.18E+00
Cd-107			9.56E+07	2.12E+01
Cd-109	1.00E+06	3.86E+02	1.00E+06	3.87E+02
Cd-111m			1.30E+08	3.71E+00
Cd-113	6.76E+04	1.92E+17	6.76E+04	1.98E+17
Cd-113m			7.37E+04	3.17E+02
Cd-115			7.15E+06	1.40E+01
Cd-115m			1.05E+06	4.13E+01
Cd-117			2.43E+07	2.26E+00
Cd-117m			1.54E+07	1.94E+00
Cd-118			8.43E+07	2.66E+00
Cd-119			3.40E+07	5.78E-02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Cd-119m			2.43E+07	3.39E-02
Ce-130			7.71E+07	1.22E+00
Ce-131			3.39E+07	2.41E-01
Ce-132			4.10E+07	6.06E+00
Ce-133			6.36E+07	4.36E+00
Ce-133m			2.15E+07	4.48E+00
Ce-134			6.23E+06	1.92E+01
Ce-135			1.10E+07	8.34E+00
Ce-137			6.52E+08	2.56E+02
Ce-137m			1.95E+07	2.93E+01
Ce-139			4.71E+06	6.90E+02
Ce-141	2.53E+06	8.86E+01	2.53E+06	8.86E+01
Ce-143			1.03E+07	1.55E+01
Ce-144	2.25E+05	7.06E+01	2.25E+05	7.06E+01
Ce-145			7.43E+07	1.72E-01
Ce-146			3.24E+08	3.40E+00
Cf-244			5.79E+05	1.46E-02
Cf-246			1.80E+04	5.05E-02
Cf-247			1.29E+08	3.16E+01
Cf-248			9.21E+02	5.84E-01
Cf-249			1.16E+02	2.83E+01
Cf-250			2.38E+02	2.18E+00
Cf-251			1.14E+02	7.20E+01
Cf-252	4.05E+02	7.56E-01	4.05E+02	7.54E-01
Cf-253			6.24E+03	2.15E-01
Cf-254			1.98E+02	2.33E-02
Cf-255			1.10E+06	1.27E-01
Cf-256			4.27E+03	7.15E-05
Cl-34			5.67E+04	2.60E-07
Cl-34m			2.23E+04	1.29E-04
Cl-36	1.11E+03	3.36E+04	1.11E+03	3.36E+04
Cl-38			2.88E+04	2.17E-04
Cl-39			3.06E+04	3.53E-04
Cl-40			1.29E+04	3.71E-06
Cm-238			1.80E+06	3.28E-01
Cm-239			7.55E+07	1.67E+01
Cm-240			2.53E+03	1.26E-01
Cm-241			2.19E+05	1.32E+01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Cm-242	1.56E+03	4.71E-01	1.56E+03	4.71E-01
Cm-243			2.62E+02	5.07E+00
Cm-244			3.00E+02	3.71E+00
Cm-245	1.93E+02	1.12E+03	1.93E+02	1.12E+03
Cm-246			1.93E+02	6.29E+02
Cm-247			2.08E+02	2.24E+06
Cm-248			5.41E+01	1.27E+04
Cm-249			2.26E+08	1.92E+01
Cm-250			9.65E+00	4.66E+01
Cm-251			1.89E+08	4.23E+00
Co-54m			1.46E+07	6.20E-03
Co-55			1.02E+07	3.14E+00
Co-56			1.52E+06	5.11E+01
Co-57			1.43E+07	1.69E+03
Co-58			4.65E+06	1.46E+02
Co-58m			6.24E+08	1.06E+02
Co-60	7.81E+05	6.90E+02	7.81E+05	6.90E+02
Co-60m			4.38E+09	1.46E+01
Co-61			1.38E+08	4.42E+00
Co-62			3.41E+07	1.69E-02
Co-62m			1.88E+07	8.62E-02
Cr-48			2.88E+07	1.01E+01
Cr-49			4.36E+07	4.78E-01
Cr-51	1.95E+08	2.11E+03	1.95E+08	2.11E+03
Cr-55			2.70E+09	2.76E+00
Cr-56			7.79E+08	1.38E+00
Cs-121			5.00E+06	8.30E-03
Cs-121m			5.02E+06	6.57E-03
Cs-123			5.53E+06	2.12E-02
Cs-124			4.98E+06	1.68E-03
Cs-125			7.47E+06	2.23E-01
Cs-126			5.16E+06	5.66E-03
Cs-127			1.04E+07	2.63E+00
Cs-128			6.26E+06	1.66E-02
Cs-129			1.02E+07	1.35E+01
Cs-130			9.97E+06	2.06E-01
Cs-130m			1.34E+08	3.21E-01
Cs-131			2.90E+07	2.81E+02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Cs-132			2.46E+06	1.61E+01
Cs-134	1.19E+05	9.18E+01	1.19E+05	9.17E+01
Cs-134m			4.85E+07	6.01E+00
Cs-135			1.18E+06	1.02E+09
Cs-135m			3.31E+06	1.26E-01
Cs-136			5.34E+05	7.28E+00
Cs-137	1.76E+05	2.03E+03	1.76E+05	2.03E+03
Cs-138			2.10E+06	4.95E-02
Cs-138m			1.41E+07	3.00E-02
Cs-139			1.63E+07	1.12E-01
Cs-140			3.04E+06	2.40E-03
Cu-57			4.78E+07	5.63E-05
Cu-59			4.05E+07	1.72E-02
Cu-60			1.29E+07	9.55E-02
Cu-61			4.10E+07	2.72E+00
Cu-62			5.56E+07	1.78E-01
Cu-64			5.50E+07	1.43E+01
Cu-66			6.06E+08	1.08E+00
Cu-67			1.29E+07	1.71E+01
Cu-69			1.07E+08	1.12E-01
Dy-148			8.58E+07	2.23E-01
Dy-149			3.59E+07	1.20E-01
Dy-150			2.29E+08	1.31E+00
Dy-151			2.39E+07	3.43E-01
Dy-152			7.37E+07	8.50E+00
Dy-153			3.05E+07	9.53E+00
Dy-154			2.96E+02	3.82E+05
Dy-155			5.06E+07	2.50E+01
Dy-157			1.03E+08	4.17E+01
Dy-159			2.17E+07	3.81E+03
Dy-165			1.27E+08	1.57E+01
Dy-165m			3.82E+09	4.21E+00
Dy-166			4.26E+06	1.84E+01
Dy-167			1.13E+08	6.20E-01
Dy-168			1.56E+08	1.21E+00
Er-154			1.21E+09	3.68E+00
Er-156			2.80E+08	4.53E+00
Er-159			5.35E+07	1.63E+00

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Er-161			4.49E+07	7.47E+00
Er-163			1.80E+09	1.17E+02
Er-165			7.22E+08	3.94E+02
Er-167m			6.71E+08	2.26E-02
Er-169			8.11E+06	9.76E+01
Er-171			2.97E+07	1.22E+01
Er-172			6.91E+06	1.87E+01
Er-173			7.25E+07	9.56E-02
Es-249			2.68E+07	3.63E+00
Es-250			1.18E+07	1.98E+00
Es-250m			4.87E+06	8.63E-01
Es-251			3.84E+06	1.01E+01
Es-253			3.00E+03	1.19E-01
Es-254			9.43E+02	5.06E-01
Es-254m			1.72E+04	5.50E-02
Es-255			1.64E+03	1.27E-01
Es-256			1.78E+05	6.16E-03
Eu-142			4.68E+07	1.38E-03
Eu-142m			1.71E+07	1.58E-02
Eu-143			5.14E+07	1.01E-01
Eu-144			5.22E+07	6.79E-03
Eu-145			1.06E+07	6.97E+01
Eu-146			6.94E+06	3.57E+01
Eu-147			6.93E+06	1.87E+02
Eu-148			2.78E+06	1.72E+02
Eu-149			2.73E+07	2.90E+03
Eu-150l			1.52E+05	2.19E+03
Eu-150s			4.12E+07	2.49E+01
Eu-152	1.92E+05	1.11E+03	1.92E+05	1.09E+03
Eu-152ml			3.09E+07	1.40E+01
Eu-152ms			4.51E+08	3.50E+01
Eu-154	1.52E+05	5.64E+02	1.52E+05	5.78E+02
Eu-154m			7.23E+08	2.72E+01
Eu-155	1.17E+06	2.41E+03	1.17E+06	2.52E+03
Eu-156			2.25E+06	4.08E+01
Eu-157			2.57E+07	1.95E+01
Eu-158			3.95E+07	1.52E+00
Eu-159			1.19E+08	1.82E+00

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
F-17			5.88E+04	5.71E-06
F-18			3.94E+04	4.14E-04
Fe-52			1.15E+07	1.57E+00
Fe-53			5.05E+07	1.21E-01
Fe-53m			1.88E+07	1.34E-02
Fe-55	2.13E+07	8.95E+03	2.13E+07	8.85E+03
Fe-59	2.09E+06	4.20E+01	2.09E+06	4.20E+01
Fe-60			5.79E+04	9.71E+05
Fe-61			4.05E+07	7.84E-02
Fe-62			1.16E+08	4.35E-02
Fm-251			3.72E+06	1.58E+00
Fm-252			2.53E+04	4.63E-02
Fm-253			2.03E+04	1.18E-01
Fm-254			1.33E+05	3.49E-02
Fm-255			3.00E+04	4.91E-02
Fm-256			2.83E+04	6.07E-03
Fm-257			1.14E+03	2.26E-01
Fr-212			1.14E+06	2.56E-02
Fr-219			1.63E+10	6.64E-03
Fr-220			5.49E+09	2.94E+00
Fr-221			1.85E+09	1.04E+01
Fr-222			5.79E+05	9.85E-03
Fr-223			9.04E+06	2.34E-01
Fr-224			1.03E+08	4.09E-01
Fr-227			1.35E+08	4.03E-01
Ga-64			1.65E+07	1.47E-02
Ga-65			4.35E+07	2.28E-01
Ga-66			9.80E+06	1.94E+00
Ga-67			3.10E+07	5.18E+01
Ga-68			4.35E+07	1.07E+00
Ga-70			4.66E+08	3.67E+00
Ga-72			8.56E+06	2.77E+00
Ga-73			4.40E+07	5.02E+00
Ga-74			1.74E+07	5.57E-02
Gd-142			5.65E+07	4.99E-02
Gd-143m			2.77E+07	3.86E-02
Gd-144			6.36E+07	2.18E-01
Gd-145			2.22E+07	3.92E-01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Gd-145m			8.78E+07	9.58E-02
Gd-146			1.26E+06	6.81E+01
Gd-147			1.37E+07	2.44E+01
Gd-148			3.12E+02	1.20E+01
Gd-149			1.03E+07	1.10E+02
Gd-150			3.17E+02	2.38E+05
Gd-151			9.36E+06	1.30E+03
Gd-152			4.27E+02	1.96E+13
Gd-153	3.84E+06	1.09E+03	3.84E+06	1.09E+03
Gd-159			2.93E+07	2.76E+01
Gd-162			1.45E+08	1.05E+00
Ge-66			4.30E+07	2.05E+00
Ge-67			3.51E+07	2.34E-01
Ge-68	5.79E+05	8.16E+01	5.79E+05	8.68E+01
Ge-69			1.94E+07	1.67E+01
Ge-71			7.37E+08	4.72E+03
Ge-75			1.98E+08	6.52E+00
Ge-77			1.53E+07	4.25E+00
Ge-78			6.00E+07	2.16E+00
H-3	3.00E+05	3.00E+01	1.80E+05	1.88E+01
Hf-167			9.90E+07	1.80E-01
Hf-169			9.72E+07	2.83E-01
Hf-170			2.05E+07	1.78E+01
Hf-172			2.53E+05	2.28E+02
Hf-173			3.76E+07	4.98E+01
Hf-174			2.53E+02	2.47E+14
Hf-175			6.48E+06	6.08E+02
Hf-177m			1.99E+07	9.61E-01
Hf-178m			3.11E+04	4.81E+02
Hf-179m			2.07E+06	7.10E+01
Hf-180m			2.98E+07	9.41E+00
Hf-181	1.60E+06	9.38E+01	1.60E+06	9.38E+01
Hf-182			2.62E+04	1.20E+08
Hf-182m			4.53E+07	2.70E+00
Hf-183			4.89E+07	3.04E+00
Hf-184			2.23E+07	5.38E+00
Hg-190			7.61E+06	1.54E-01
Hg-191m			1.48E+06	7.62E-02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Hg-192			7.28E+05	2.16E-01
Hg-193			7.20E+05	1.55E-01
Hg-193m			2.49E+05	1.70E-01
Hg-194			2.03E+04	2.86E+03
Hg-195			5.68E+05	3.50E-01
Hg-195m			9.85E+04	2.55E-01
Hg-197			1.84E+05	7.41E-01
Hg-197m			1.40E+05	2.09E-01
Hg-199m			3.95E+06	1.78E-01
Hg-203	3.33E+05	2.41E+01	1.15E+05	8.35E+00
Hg-205			4.37E+08	2.48E+00
Hg-206			4.86E+07	4.34E-01
Hg-207			2.11E+06	6.74E-03
Ho-150			3.10E+07	3.16E-02
Ho-153			5.86E+07	9.58E-02
Ho-153m			5.73E+07	4.33E-01
Ho-154			2.93E+07	2.82E-01
Ho-154m			2.48E+07	6.29E-02
Ho-155			1.10E+08	4.35E+00
Ho-156			2.26E+07	1.05E+00
Ho-157			1.14E+08	1.19E+00
Ho-158			1.04E+09	9.87E+00
Ho-159			1.50E+08	4.18E+00
Ho-160			3.30E+07	7.19E-01
Ho-161			7.25E+08	9.30E+01
Ho-162			3.26E+08	4.21E+00
Ho-162m			7.86E+07	4.60E+00
Ho-163			2.88E+07	5.99E+07
Ho-164			7.29E+08	1.84E+01
Ho-164m			5.08E+08	1.66E+01
Ho-166			1.24E+07	1.76E+01
Ho-166m	6.74E+04	3.75E+04	6.74E+04	3.76E+04
Ho-167			6.60E+07	1.09E+01
Ho-168			6.66E+07	1.78E-01
Ho-168m			1.80E+10	3.54E+01
Ho-170			3.45E+07	8.61E-02
I-118			4.63E+04	3.98E-04
I-118m			3.16E+04	1.68E-04

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
I-119			1.16E+05	1.40E-03
I-120			3.15E+04	1.63E-03
I-120m			1.85E+04	6.25E-04
I-121			1.90E+05	1.56E-02
I-122			1.19E+05	2.78E-04
I-123			1.69E+05	8.76E-02
I-124			3.56E+03	1.41E-02
I-125	3.18E+03	1.81E-01	3.18E+03	1.83E-01
I-126			1.64E+03	2.06E-02
I-128			6.36E+05	1.08E-02
I-129			4.50E+02	2.55E+06
I-130			1.65E+04	8.46E-03
I-130m			1.11E+06	6.77E-03
I-131	2.18E+03	1.75E-02	2.18E+03	1.75E-02
I-132			3.77E+04	3.65E-03
I-132m			1.30E+05	7.61E-03
I-133			1.02E+04	9.01E-03
I-134			3.73E+04	1.40E-03
I-134m			4.54E+05	1.16E-03
I-135			2.90E+04	8.25E-03
In-103			2.08E+07	1.14E-02
In-105			3.01E+07	8.52E-02
In-106			1.66E+07	5.79E-02
In-106m			2.00E+07	5.86E-02
In-107			3.30E+07	6.07E-01
In-108			1.35E+07	4.50E-01
In-108m			1.80E+07	4.09E-01
In-109			5.86E+07	8.56E+00
In-109m			9.86E+07	7.66E-02
In-110l			1.41E+07	2.41E+00
In-110s			2.94E+07	1.19E+00
In-111			2.84E+07	6.82E+01
In-111m			1.29E+08	5.85E-01
In-112			1.79E+08	1.54E+00
In-112m			2.80E+08	3.43E+00
In-113m			1.44E+08	8.60E+00
In-114			1.94E+10	1.41E+01
In-114m	8.71E+05	3.76E+01	8.71E+05	3.76E+01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
In-115			2.08E+04	3.41E+16
In-115m			9.99E+07	1.64E+01
In-116m			1.93E+07	6.44E-01
In-117			6.32E+07	1.72E+00
In-117m			9.59E+07	6.94E+00
In-118			4.73E+08	2.47E-02
In-118m			2.06E+07	5.65E-02
In-119			7.23E+07	1.10E-01
In-119m			4.30E+08	4.90E+00
In-121			6.20E+07	1.53E-02
In-121m			6.89E+08	1.72E+00
Ir-180			3.73E+07	5.36E-02
Ir-182			3.70E+07	5.37E-01
Ir-183			3.83E+07	2.16E+00
Ir-184			2.02E+07	3.58E+00
Ir-185			2.91E+07	2.41E+01
Ir-186l			1.44E+07	1.35E+01
Ir-186s			4.42E+07	4.59E+00
Ir-187			6.27E+07	3.93E+01
Ir-188			1.23E+07	3.06E+01
Ir-189			1.33E+07	2.56E+02
Ir-190			3.11E+06	5.48E+01
Ir-190ms			8.11E+08	5.90E+01
Ir-190ml			2.66E+07	5.00E+00
Ir-191m			8.95E+08	7.48E-02
Ir-192	1.21E+06	1.31E+02	1.21E+06	1.31E+02
Ir-192ms			1.01E+12	1.49E+03
Ir-192ml			2.08E+05	2.69E+04
Ir-193m			6.24E+06	9.71E+01
Ir-194			1.41E+07	1.68E+01
Ir-194m			6.08E+05	1.54E+02
Ir-195			1.04E+08	1.62E+01
Ir-195m			3.56E+07	8.41E+00
Ir-196			2.33E+08	2.10E-01
Ir-196m			1.85E+07	1.62E+00
K-38			3.30E+04	5.08E-05
K-40	7.63E+03	1.10E+09	7.63E+03	1.09E+09
K-42			9.90E+04	1.64E-02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
K-43			5.79E+04	1.79E-02
K-44			4.30E+04	2.23E-04
K-45			5.32E+04	2.54E-04
K-46			3.68E+04	1.57E-05
Kr-74			4.83E+04	2.19E-04
Kr-75			4.62E+04	7.90E-05
Kr-76			1.33E+05	4.77E-02
Kr-77			5.56E+04	1.70E-03
Kr-79			2.23E+05	1.97E-01
Kr-81			1.01E+07	4.81E+08
Kr-81m			4.40E+05	4.10E-05
Kr-83m			1.80E+09	8.72E+01
Kr-85	1.06E+07	2.70E+04	2.27E+07	5.78E+04
Kr-85m			3.61E+05	4.39E-02
Kr-87			6.56E+04	2.31E-03
Kr-88			2.65E+04	2.11E-03
Kr-89			2.83E+04	4.21E-05
La-128			2.08E+07	7.33E-02
La-129			5.87E+07	4.67E-01
La-130			2.62E+07	1.58E-01
La-131			6.92E+07	2.84E+00
La-132			1.76E+07	3.56E+00
La-132m			7.14E+07	1.22E+00
La-133			2.03E+08	3.37E+01
La-134			8.07E+07	3.83E-01
La-135			4.84E+08	4.06E+02
La-136			1.51E+08	1.08E+00
La-137			9.32E+05	2.14E+07
La-138			5.40E+04	2.81E+12
La-140			5.59E+06	1.00E+01
La-141			5.16E+07	9.12E+00
La-142			1.56E+07	1.09E+00
La-143			2.22E+08	2.40E+00
Lu-165			4.86E+07	4.58E-01
Lu-167			2.86E+07	1.31E+00
Lu-169			1.52E+07	2.79E+01
Lu-169m			1.07E+14	2.57E+05
Lu-170			7.77E+06	2.02E+01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Lu-171			8.29E+06	8.93E+01
Lu-171m			2.74E+11	3.28E+02
Lu-172			4.32E+06	3.81E+01
Lu-172m			6.93E+13	2.34E+05
Lu-173			3.36E+06	2.22E+03
Lu-174			1.92E+06	3.10E+03
Lu-174m			1.93E+06	3.65E+02
Lu-176			1.16E+05	2.05E+12
Lu-176m			6.66E+07	1.38E+01
Lu-177			6.73E+06	6.12E+01
Lu-177m			5.02E+05	1.10E+02
Lu-178			1.72E+08	4.61E+00
Lu-178m			4.27E+07	9.17E-01
Lu-179			6.51E+07	1.71E+01
Lu-180			3.81E+07	2.08E-01
Lu-181			1.05E+08	3.53E-01
Md-257			3.24E+05	1.38E-01
Md-258			1.37E+03	1.49E-01
Mg-27			6.50E+07	8.82E-02
Mg-28			5.78E+06	1.08E+00
Mn-50m			1.24E+07	5.76E-03
Mn-51			4.38E+07	5.49E-01
Mn-52	4.23E+06	9.41E+00	4.23E+06	9.41E+00
Mn-52m			2.08E+07	1.22E-01
Mn-53			1.50E+08	8.23E+10
Mn-54			5.00E+06	6.45E+02
Mn-56			2.14E+07	9.87E-01
Mn-57			5.10E+08	2.20E-01
Mn-58m			2.35E+07	7.87E-03
Mo-101			3.51E+07	2.75E-01
Mo-102			2.54E+08	1.55E+00
Mo-89			4.74E+07	4.73E-02
Mo-90			1.77E+07	2.88E+00
Mo-91			5.10E+07	3.82E-01
Mo-91m			4.19E+07	2.18E-02
Mo-93			1.37E+07	1.25E+07
Mo-93m			1.62E+07	3.30E+00
Mo-99	8.89E+06	1.85E+01	8.89E+06	1.85E+01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
N-13			5.52E+04	2.95E-06
N-16			1.04E+04	1.06E-07
Na-22	9.99E+03	1.60E+00	9.99E+03	1.60E+00
Na-24			1.76E+04	2.02E-03
Nb-87			4.88E+07	8.46E-02
Nb-88			1.28E+07	8.56E-02
Nb-88m			1.42E+07	5.15E-02
Nb-89l			2.54E+07	1.46E+00
Nb-89s			2.34E+07	7.32E-01
Nb-90			6.33E+06	2.65E+00
Nb-91			2.67E+07	4.62E+06
Nb-91m			2.22E+06	9.40E+01
Nb-92			1.43E+06	1.28E+10
Nb-92m			1.28E+07	9.15E+01
Nb-93m			1.59E+07	5.62E+04
Nb-94	7.22E+05	3.79E+06	7.22E+05	3.85E+06
Nb-94m			1.26E+10	3.93E+01
Nb-95			5.03E+06	1.28E+02
Nb-95m			1.02E+07	2.66E+01
Nb-96			8.17E+06	5.84E+00
Nb-97			5.86E+07	2.18E+00
Nb-97m			7.61E+07	3.92E-02
Nb-98			1.94E+07	5.19E-01
Nb-99			3.25E+08	4.27E-02
Nb-99m			7.00E+07	9.58E-02
Nd-134			1.16E+08	7.05E-01
Nd-135			4.04E+07	3.59E-01
Nd-136			8.80E+07	3.22E+00
Nd-137			4.18E+07	1.17E+00
Nd-138			3.19E+07	7.09E+00
Nd-139			1.21E+08	2.66E+00
Nd-139m			2.14E+07	5.22E+00
Nd-140			6.09E+06	2.20E+01
Nd-141			5.94E+08	6.66E+01
Nd-141m			7.30E+07	5.69E-02
Nd-144			4.03E+02	3.72E+14
Nd-147			3.35E+06	4.14E+01
Nd-149			5.66E+07	4.65E+00

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Nd-151			5.36E+07	5.35E-01
Nd-152			1.63E+08	1.50E+00
Ne-19			5.49E+04	1.59E-06
Ne-24			1.09E+05	4.70E-05
Ni-56			7.22E+06	1.89E+01
Ni-57			1.03E+07	6.72E+00
Ni-59			6.24E+07	7.71E+08
Ni-63	1.69E+07	2.97E+05	1.69E+07	2.85E+05
Ni-65			4.81E+07	2.51E+00
Ni-66			5.07E+06	5.82E+00
Np-231			4.77E+06	2.86E-01
Np-232			3.62E+07	6.57E-01
Np-233			6.17E+08	2.77E+01
Np-234			1.08E+07	8.55E+01
Np-235			1.93E+07	1.38E+04
Np-236l			2.53E+03	1.92E+05
Np-236s			1.53E+06	2.59E+00
Np-237	3.53E+02	5.00E+05	3.53E+02	5.00E+05
Np-238	3.72E+06	1.43E+01	3.72E+06	1.43E+01
Np-239			8.51E+06	3.67E+01
Np-240			2.96E+07	2.45E+00
Np-240m			1.67E+08	1.58E+00
Np-241			4.19E+08	7.46E+00
Np-242			2.03E+08	5.76E-01
Np-242m			6.50E+07	4.60E-01
O-14			1.66E+04	1.45E-06
O-15			5.50E+04	8.95E-06
O-19			5.88E+04	2.66E-06
Os-180			3.70E+08	7.80E+00
Os-181			3.33E+07	3.37E+00
Os-182			1.84E+07	2.35E+01
Os-183			2.70E+07	2.05E+01
Os-183m			2.59E+07	1.50E+01
Os-185			4.76E+06	6.34E+02
Os-186			1.80E+03	1.87E+15
Os-189m			1.53E+09	5.53E+02
Os-190m			3.56E+07	3.56E-01
Os-191			4.25E+06	9.56E+01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Os-191m			5.04E+07	4.00E+01
Os-193			1.53E+07	2.83E+01
Os-194			9.54E+04	3.11E+02
Os-196			1.05E+08	3.81E+00
P-30			1.09E+05	4.36E-05
P-32	4.77E+03	1.67E-02	4.77E+03	1.67E-02
P-33	1.08E+04	6.91E-02	1.08E+04	6.93E-02
Pa-227			1.01E+05	4.69E-03
Pa-228			1.08E+05	1.73E-01
Pa-229			1.04E+06	2.74E+00
Pa-230			1.07E+04	3.27E-01
Pa-231			5.79E+01	1.23E+03
Pa-232			8.00E+05	1.86E+00
Pa-233			2.06E+06	9.95E+01
Pa-234			1.19E+07	5.96E+00
Pa-234m			3.76E+09	5.47E+00
Pa-235			3.90E+08	1.19E+01
Pa-236			6.20E+07	7.08E-01
Pa-237			9.58E+07	1.05E+00
Pb-194			4.97E+07	6.15E-01
Pb-195m			3.17E+07	5.20E-01
Pb-196			8.83E+07	3.41E+00
Pb-197			3.79E+07	3.17E-01
Pb-197m			3.87E+07	1.75E+00
Pb-198			6.37E+07	9.66E+00
Pb-199			3.18E+07	3.02E+00
Pb-200			2.27E+07	3.11E+01
Pb-201			3.70E+07	2.23E+01
Pb-201m			1.66E+08	1.80E-01
Pb-202			1.29E+06	2.18E+08
Pb-202m			2.06E+07	4.80E+00
Pb-203			3.33E+07	1.12E+02
Pb-204m			2.55E+07	1.86E+00
Pb-205			3.24E+07	2.66E+11
Pb-209			1.45E+08	3.14E+01
Pb-210	7.37E+03	9.78E+01	7.37E+03	9.66E+01
Pb-211			7.37E+05	2.98E-02
Pb-212			4.77E+04	3.43E-02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Pb-214			5.78E+05	1.76E-02
Pd-100			9.39E+06	2.61E+01
Pd-101			7.51E+07	2.00E+01
Pd-103			1.80E+07	2.41E+02
Pd-107			1.37E+07	2.67E+10
Pd-109			2.19E+07	1.02E+01
Pd-109m			5.89E+08	1.60E+00
Pd-111			2.02E+08	2.79E+00
Pd-112			6.14E+06	4.61E+00
Pd-114			1.81E+09	2.66E+00
Pd-96			4.15E+07	4.31E-02
Pd-97			2.41E+07	3.86E-02
Pd-98			9.40E+07	8.66E-01
Pd-99			4.07E+07	4.58E-01
Pm-136			2.16E+07	2.79E-02
Pm-137m			3.37E+07	5.90E-02
Pm-139			6.30E+07	1.93E-01
Pm-140			5.48E+07	6.26E-03
Pm-140m			1.94E+07	8.61E-02
Pm-141			6.59E+07	1.03E+00
Pm-142			6.40E+07	3.26E-02
Pm-143			5.25E+06	1.52E+03
Pm-144			9.62E+05	3.85E+02
Pm-145	2.25E+06	1.61E+04	2.25E+06	1.62E+04
Pm-146			3.84E+05	8.67E+02
Pm-147	1.62E+06	1.75E+03	1.62E+06	1.75E+03
Pm-148			3.55E+06	2.16E+01
Pm-148m			1.35E+06	6.33E+01
Pm-149			1.11E+07	2.80E+01
Pm-150			2.35E+07	3.01E+00
Pm-151			1.60E+07	2.19E+01
Pm-152			1.86E+08	6.20E-01
Pm-152m			3.82E+07	2.32E-01
Pm-153			7.95E+08	3.39E+00
Pm-154			3.10E+07	4.38E-02
Pm-154m			3.18E+07	6.98E-02
Po-203			2.91E+06	1.15E-01
Po-204			1.40E+06	3.22E-01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Po-205			2.71E+06	3.19E-01
Po-206			1.29E+04	1.79E-01
Po-207			2.97E+06	1.14E+00
Po-208			1.95E+02	3.29E-01
Po-209			2.02E+02	1.20E+01
Po-210	2.46E+02	5.47E-02	2.46E+02	5.47E-02
Po-211			7.09E+08	6.85E-03
Po-212m			6.77E+07	5.74E-02
Po-213			1.58E+11	1.25E-05
Po-214			6.62E+10	2.06E-04
Po-215			3.21E+10	1.09E-03
Po-216			3.26E+11	9.36E-01
Po-218			6.03E+11	2.13E+03
Pr-134			1.77E+07	1.39E-01
Pr-134m			2.24E+07	2.71E-01
Pr-135			5.74E+07	9.89E-01
Pr-136			2.51E+07	2.38E-01
Pr-137			8.83E+07	4.93E+00
Pr-138			6.89E+07	7.33E-02
Pr-138m			1.86E+07	1.71E+00
Pr-139			2.28E+08	4.56E+01
Pr-140			1.11E+08	2.79E-01
Pr-142			1.45E+07	1.26E+01
Pr-142m			1.16E+09	1.28E+01
Pr-143			3.38E+06	5.01E+01
Pr-144			3.40E+08	4.50E+00
Pr-144m			9.69E+09	5.34E+01
Pr-145			4.71E+07	1.30E+01
Pr-146			4.42E+07	8.29E-01
Pr-147			5.69E+07	6.05E-01
Pr-148			5.60E+07	1.01E-01
Pr-148m			6.18E+07	9.78E-02
Pt-184			6.69E+07	1.13E+00
Pt-186			5.84E+07	6.93E+00
Pt-187			4.98E+07	6.99E+00
Pt-188			1.82E+07	2.67E+02
Pt-189			9.84E+07	6.45E+01
Pt-190			1.45E+03	5.02E+11

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Pt-191			5.40E+07	2.21E+02
Pt-193			3.86E+08	1.04E+07
Pt-193m			6.69E+07	4.28E+02
Pt-195m			4.30E+07	2.58E+02
Pt-197			9.21E+07	1.06E+02
Pt-197m			2.35E+08	2.33E+01
Pt-199			1.97E+08	6.42E+00
Pt-200			3.56E+07	2.84E+01
Pt-202			3.10E+06	8.80E+00
Pu-232			3.32E+05	1.38E-02
Pu-234			3.86E+05	2.54E-01
Pu-235			6.16E+08	1.95E+01
Pu-236			4.05E+02	7.63E-01
Pu-237			2.28E+07	1.87E+03
Pu-238	1.76E+02	1.03E+01	1.76E+02	1.03E+01
Pu-239	1.62E+02	2.61E+03	1.62E+02	2.61E+03
Pu-240	1.62E+02	7.14E+02	1.62E+02	7.12E+02
Pu-241	9.01E+03	8.74E+01	9.01E+03	8.75E+01
Pu-242	1.69E+02	4.29E+04	1.69E+02	4.30E+04
Pu-243			9.42E+07	3.62E+01
Pu-244			1.73E+02	9.73E+06
Pu-245			1.76E+07	1.45E+01
Pu-246			1.09E+06	2.23E+01
Ra-219			3.67E+08	7.12E-05
Ra-220			1.31E+10	4.56E-03
Ra-221			1.84E+09	1.01E+00
Ra-222			6.16E+09	4.60E+00
Ra-223	1.10E+03	2.14E-02	1.10E+03	2.14E-02
Ra-224	2.70E+03	1.70E-02	2.70E+03	1.70E-02
Ra-225	1.29E+03	3.30E-02	1.29E+03	3.28E-02
Ra-226			2.32E+03	2.34E+03
Ra-227			2.68E+07	1.37E+00
Ra-228			3.12E+03	1.14E+01
Ra-230			5.83E+07	6.64E+00
Rb-77			3.81E+07	5.77E-02
Rb-78			1.25E+07	9.17E-02
Rb-78m			1.78E+07	4.23E-02
Rb-79			3.84E+07	3.69E-01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Rb-80			4.45E+07	1.07E-02
Rb-81			6.60E+07	7.81E+00
Rb-81m			1.07E+09	1.48E+01
Rb-82			5.10E+07	2.89E-02
Rb-82m			1.50E+07	2.44E+00
Rb-83			1.06E+07	5.83E+02
Rb-84			7.15E+06	1.51E+02
Rb-84m			1.34E+08	1.21E+00
Rb-86			8.59E+06	1.05E+02
Rb-86m			1.11E+08	5.15E-02
Rb-87			1.62E+07	1.85E+14
Rb-88			6.94E+07	5.78E-01
Rb-89			2.44E+07	1.76E-01
Rb-90			2.50E+07	3.15E-02
Rb-90m			1.66E+07	3.41E-02
Re-177			7.89E+07	1.04E+00
Re-178			4.12E+07	5.15E-01
Re-179			5.06E+07	9.39E-01
Re-180			4.73E+07	1.10E-01
Re-181			2.26E+07	2.60E+01
Re-182l			5.50E+06	2.04E+01
Re-182s			2.17E+07	1.60E+01
Re-183			2.05E+06	2.01E+02
Re-184			4.00E+06	2.14E+02
Re-184m			1.24E+06	2.88E+02
Re-186			7.35E+06	3.95E+01
Re-186m			6.76E+05	7.03E+07
Re-187			1.29E+09	3.37E+16
Re-188			1.48E+07	1.51E+01
Re-188m			3.68E+08	6.83E+00
Re-189			1.84E+07	2.70E+01
Re-190			4.47E+07	1.40E-01
Re-190m			2.20E+07	4.28E+00
Rh-100			1.05E+07	6.96E+00
Rh-100m			1.33E+09	3.25E+00
Rh-101			1.49E+06	1.35E+03
Rh-101m			3.21E+07	1.08E+02
Rh-102			4.68E+05	3.87E+02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Rh-102m			1.13E+06	1.83E+02
Rh-103m			2.97E+09	9.13E+01
Rh-104			1.93E+09	7.52E-01
Rh-104m			2.96E+09	7.09E+00
Rh-105			2.25E+07	2.66E+01
Rh-106			2.60E+08	7.29E-02
Rh-106m			1.50E+07	1.11E+00
Rh-107			1.31E+08	1.61E+00
Rh-108			1.68E+08	2.70E-02
Rh-109			1.96E+08	1.51E-01
Rh-94			1.49E+07	8.78E-03
Rh-95			2.23E+07	5.66E-02
Rh-95m			6.30E+07	6.23E-02
Rh-96			1.49E+07	7.54E-02
Rh-96m			4.48E+07	3.45E-02
Rh-97			3.58E+07	5.67E-01
Rh-97m			2.31E+07	5.50E-01
Rh-98			3.24E+07	1.47E-01
Rh-99			8.49E+06	1.03E+02
Rh-99m			5.85E+07	8.67E+00
Rn-207			6.13E+04	6.24E-04
Rn-209			4.94E+04	1.57E-03
Rn-210			2.13E+05	3.42E-02
Rn-211			3.14E+04	3.08E-02
Rn-212			1.96E+05	5.28E-03
Rn-215			1.42E+05	6.24E-12
Rn-216			1.53E+05	1.32E-10
Rn-217			1.59E+05	1.65E-09
Rn-218			7.40E+07	5.01E-05
Rn-219			1.01E+06	7.75E-05
Rn-220			1.46E+08	1.58E-01
Rn-222	1.60E+08	1.10E+03	1.42E+08	9.20E+02
Rn-223			1.73E+05	4.99E-03
Ru-103			3.29E+05	1.02E+01
Ru-105			2.85E+06	4.24E-01
Ru-106	2.90E+04	8.74E+00	2.90E+04	8.65E+00
Ru-107			1.60E+07	3.41E-02
Ru-108			9.26E+07	2.42E-01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Ru-92			2.86E+06	5.11E-03
Ru-94			6.86E+06	1.77E-01
Ru-95			3.80E+06	1.89E-01
Ru-97			6.11E+06	1.32E+01
S-35	1.16E+04	2.70E-01	1.16E+04	2.71E-01
S-37			3.51E+04	3.49E-05
S-38			2.76E+04	9.50E-04
Sb-111			4.00E+07	2.95E-02
Sb-113			4.73E+07	1.90E-01
Sb-114			2.13E+07	4.50E-02
Sb-115			5.69E+07	1.10E+00
Sb-116			2.41E+07	2.34E-01
Sb-116m			1.58E+07	5.89E-01
Sb-117			2.03E+08	2.12E+01
Sb-118			7.40E+07	1.67E-01
Sb-118m			1.62E+07	3.04E+00
Sb-119			2.27E+08	3.29E+02
Sb-120s			1.14E+08	1.16E+00
Sb-120l			5.94E+06	3.14E+01
Sb-122			7.62E+06	1.92E+01
Sb-122m			1.53E+09	4.15E+00
Sb-124	1.21E+06	6.94E+01	1.21E+06	6.94E+01
Sb-124ms			1.59E+08	1.62E-01
Sb-124ml			1.50E+09	2.00E+01
Sb-125			1.67E+06	1.61E+03
Sb-126	2.53E+06	3.02E+01	2.53E+06	3.02E+01
Sb-126m			3.32E+07	4.23E-01
Sb-127			4.50E+06	1.69E+01
Sb-128l			9.51E+06	3.50E+00
Sb-128s			2.66E+07	1.88E-01
Sb-129			1.83E+07	3.24E+00
Sb-130			1.53E+07	4.22E-01
Sb-130m			2.15E+07	9.34E-02
Sb-131			2.49E+07	3.99E-01
Sb-133			2.03E+07	3.59E-02
Sc-42m			1.37E+07	3.15E-03
Sc-43			3.03E+07	1.62E+00
Sc-44			1.64E+07	9.02E-01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Sc-44m			5.63E+06	4.63E+00
Sc-46	1.14E+06	3.37E+01	1.14E+06	3.37E+01
Sc-47			1.09E+07	1.31E+01
Sc-48			5.05E+06	3.38E+00
Sc-49			2.00E+08	2.99E+00
Sc-50			1.76E+07	7.97E-03
Se-70			4.41E+06	6.72E-02
Se-71			3.65E+06	6.53E-03
Se-72			2.85E+05	1.32E+00
Se-73			3.45E+06	5.75E-01
Se-73m			1.83E+07	2.77E-01
Se-75	7.68E+05	5.28E+01	7.68E+05	5.28E+01
Se-77m			6.71E+07	7.98E-03
Se-79			7.37E+05	1.06E+07
Se-79m			7.51E+08	1.24E+00
Se-81			8.47E+07	6.74E-01
Se-81m			4.54E+07	1.12E+00
Se-83			2.13E+06	2.11E-02
Se-83m			5.65E+06	2.91E-03
Se-84			1.42E+07	1.97E-02
Si-31			1.02E+08	2.65E+00
Si-32			7.37E+04	2.97E+03
Sm-139			4.07E+07	7.73E-02
Sm-140			7.04E+07	7.77E-01
Sm-141			3.67E+07	2.80E-01
Sm-141m			2.51E+07	4.25E-01
Sm-142			9.84E+07	5.39E+00
Sm-143			1.15E+08	7.62E-01
Sm-143m			8.69E+07	7.27E-02
Sm-145			5.05E+06	1.91E+03
Sm-146			7.37E+02	3.10E+07
Sm-147			8.45E+02	3.68E+10
Sm-148			3.86E+02	1.12E+15
Sm-151	2.03E+06	7.70E+04	2.03E+06	7.70E+04
Sm-153			1.27E+07	2.90E+01
Sm-155			2.62E+08	4.77E+00
Sm-156			3.43E+07	1.60E+01
Sm-157			1.42E+08	9.48E-01

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Sn-106			5.01E+07	5.41E-02
Sn-108			7.89E+07	4.66E-01
Sn-109			2.46E+07	2.57E-01
Sn-110			4.03E+07	5.66E+00
Sn-111			9.37E+07	1.95E+00
Sn-113	3.00E+06	2.99E+02	3.00E+06	2.99E+02
Sn-113m			1.48E+09	1.90E+01
Sn-117m			3.35E+06	4.08E+01
Sn-119m			3.69E+06	9.83E+02
Sn-121			3.53E+07	3.68E+01
Sn-121m			1.80E+06	3.35E+04
Sn-123	1.00E+06	1.22E+02	1.00E+06	1.22E+02
Sn-123m			1.74E+08	4.55E+00
Sn-125			2.58E+06	2.38E+01
Sn-125m			1.69E+08	1.07E+00
Sn-126	2.90E+05	1.02E+07	2.90E+05	1.02E+07
Sn-127			1.94E+07	1.65E+00
Sn-127m			1.01E+08	2.82E-01
Sn-128			4.46E+07	1.79E+00
Sn-129			5.68E+07	8.68E-02
Sn-130			6.50E+07	1.67E-01
Sn-130m			6.44E+07	7.56E-02
Sr-79			5.01E+07	4.74E-02
Sr-80			6.24E+07	2.65E+00
Sr-81			3.44E+07	3.78E-01
Sr-82			9.11E+05	1.43E+01
Sr-83			1.90E+07	1.63E+01
Sr-85			1.14E+07	4.80E+02
Sr-85m			2.28E+08	7.15E+00
Sr-87m			1.24E+08	9.62E+00
Sr-89	1.33E+06	4.57E+01	1.33E+06	4.57E+01
Sr-90	2.25E+05	1.63E+03	2.25E+05	1.65E+03
Sr-91			1.71E+07	4.72E+00
Sr-92			1.96E+07	1.56E+00
Sr-93			2.53E+07	9.27E-02
Sr-94			3.91E+07	2.45E-02
Ta-170			5.54E+07	3.38E-01
Ta-172			3.09E+07	1.04E+00

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Ta-173			4.21E+07	8.48E+00
Ta-174			6.14E+07	4.09E+00
Ta-175			3.04E+07	1.78E+01
Ta-176			1.54E+07	6.98E+00
Ta-177			6.90E+07	2.20E+02
Ta-178s			5.86E+08	5.17E+00
Ta-178l			3.85E+07	4.81E+00
Ta-179			1.44E+07	1.31E+04
Ta-180			3.11E+05	1.57E+15
Ta-180m			1.65E+08	7.68E+01
Ta-182			7.96E+05	1.27E+02
Ta-182m			1.49E+08	2.29E+00
Ta-183			3.79E+06	2.71E+01
Ta-184			1.22E+07	6.24E+00
Ta-185			1.09E+08	5.27E+00
Ta-186			3.32E+07	3.45E-01
Tb-146			1.55E+07	4.62E-03
Tb-147			2.62E+07	2.03E+00
Tb-147m			2.97E+07	4.34E-02
Tb-148			1.95E+07	9.20E-01
Tb-148m			1.90E+07	3.29E-02
Tb-149			1.58E+06	3.11E-01
Tb-149m			4.36E+07	1.44E-01
Tb-150			2.27E+07	3.55E+00
Tb-150m			2.41E+07	1.12E-01
Tb-151			2.28E+07	1.93E+01
Tb-151m			8.45E+08	2.82E-01
Tb-152			1.37E+07	1.16E+01
Tb-152m			8.24E+07	2.80E-01
Tb-153			3.69E+07	1.01E+02
Tb-154			1.12E+07	1.18E+01
Tb-155			3.43E+07	2.16E+02
Tb-156			5.52E+06	3.52E+01
Tb-156ml			3.82E+07	4.64E+01
Tb-156ms			8.42E+07	2.09E+01
Tb-157			6.76E+06	4.45E+05
Tb-158			1.76E+05	1.17E+04
Tb-160	1.13E+06	1.00E+02	1.13E+06	1.00E+02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Tb-161			6.22E+06	5.30E+01
Tb-162			5.36E+07	3.51E-01
Tb-163			6.46E+07	1.09E+00
Tb-164			2.37E+07	6.20E-02
Tb-165			6.69E+07	1.24E-01
Tc-101			1.34E+08	1.02E+00
Tc-102			4.62E+08	2.20E-02
Tc-102m			2.29E+07	5.40E-02
Tc-104			2.45E+07	2.46E-01
Tc-105			7.17E+07	3.04E-01
Tc-91			2.25E+07	3.42E-02
Tc-91m			4.10E+07	6.53E-02
Tc-92			1.51E+07	3.14E-02
Tc-93			3.16E+07	2.58E+00
Tc-93m			6.29E+07	1.35E+00
Tc-94			1.59E+07	2.33E+00
Tc-94m			2.53E+07	6.57E-01
Tc-95			3.77E+07	2.28E+01
Tc-95m			8.30E+06	3.68E+02
Tc-96			7.75E+06	2.44E+01
Tc-96m			5.74E+08	1.51E+01
Tc-97			3.68E+07	2.60E+10
Tc-97m			2.53E+06	1.64E+02
Tc-98			9.53E+05	1.10E+09
Tc-99	2.03E+06	1.19E+08	2.03E+06	1.19E+08
Tc-99m			2.21E+08	4.20E+01
Te-113			2.57E+06	2.63E-03
Te-114			3.84E+06	3.54E-02
Te-115			2.57E+06	9.12E-03
Te-115m			2.22E+06	9.07E-03
Te-116			7.59E+06	6.99E-01
Te-117			3.18E+06	1.23E-01
Te-118			3.02E+05	1.64E+00
Te-119			3.54E+06	2.16E+00
Te-119m			9.87E+05	4.23E+00
Te-121			1.76E+06	2.77E+01
Te-121m			1.92E+05	2.73E+01
Te-123			4.27E+05	1.47E+15

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Te-123m			2.02E+05	2.27E+01
Te-125m			2.38E+05	1.32E+01
Te-127			6.20E+06	2.35E+00
Te-127m	1.10E+05	1.16E+01	1.10E+05	1.16E+01
Te-129			1.79E+07	8.55E-01
Te-129m	1.23E+05	4.07E+00	1.23E+05	4.07E+00
Te-131			9.09E+06	1.58E-01
Te-131m			7.05E+05	8.83E-01
Te-132			3.99E+05	1.31E+00
Te-133			5.13E+06	4.52E-02
Te-133m			1.89E+06	7.40E-02
Te-134			4.20E+06	1.25E-01
Th-223			9.72E+08	1.15E-02
Th-224			2.77E+09	5.78E-02
Th-226			1.33E+05	4.94E-03
Th-227			8.11E+02	2.64E-02
Th-228	2.03E+02	2.47E-01	2.03E+02	2.47E-01
Th-229			1.14E+02	5.37E+02
Th-230	5.79E+02	2.81E+04	5.79E+02	2.87E+04
Th-231			2.45E+07	4.60E+01
Th-232	3.24E+02	2.96E+09	3.24E+02	2.96E+09
Th-233			3.05E+08	8.43E+00
Th-234			1.05E+06	4.55E+01
Th-235			9.22E+08	8.19E+00
Th-236			1.12E+08	5.29E+00
Ti-44	6.76E+04	3.93E+02	6.76E+04	3.93E+02
Ti-45			3.71E+07	1.64E+00
Ti-51			1.58E+08	2.47E-01
Ti-52			4.70E+08	2.21E-01
Tl-190			4.55E+07	1.20E-01
Tl-190m			2.43E+07	9.10E-02
Tl-194			7.03E+07	2.39E+00
Tl-194m			2.30E+07	7.79E-01
Tl-195			3.95E+07	2.85E+00
Tl-196			2.61E+07	3.00E+00
Tl-197			1.13E+08	2.01E+01
Tl-198			2.23E+07	7.48E+00
Tl-198m			3.90E+07	4.61E+00

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Tl-199			1.53E+08	7.22E+01
Tl-200			2.51E+07	4.19E+01
Tl-201			1.47E+08	6.86E+02
Tl-202			3.17E+07	6.01E+02
Tl-204			2.08E+07	4.48E+04
Tl-206			4.02E+10	1.85E+02
Tl-206m			2.48E+07	1.02E-01
Tl-207			1.67E+10	8.76E+01
Tl-208			1.53E+07	5.19E-02
Tl-209			2.65E+07	6.48E-02
Tl-210			2.05E+07	2.97E-02
Tm-161			3.91E+07	1.01E+00
Tm-162			2.83E+07	5.29E-01
Tm-163			3.58E+07	3.37E+00
Tm-164			7.57E+07	1.32E-01
Tm-165			2.34E+07	3.71E+01
Tm-166			1.80E+07	7.34E+00
Tm-167			7.25E+06	8.57E+01
Tm-168			1.41E+06	1.68E+02
Tm-170	1.16E+06	1.94E+02	1.16E+06	1.94E+02
Tm-171			5.79E+06	5.32E+03
Tm-172			6.92E+06	2.41E+01
Tm-173			3.44E+07	1.57E+01
Tm-174			3.36E+07	1.68E-01
Tm-175			4.72E+07	6.67E-01
Tm-176			2.88E+07	4.98E-02
U-227			5.57E+08	7.40E-01
U-228			1.70E+10	1.88E+02
U-230			6.24E+02	2.29E-02
U-231			1.69E+07	1.26E+02
U-232	1.04E+03	4.71E+01	1.04E+03	4.86E+01
U-233	2.25E+03	2.34E+05	2.25E+03	2.33E+05
U-234	2.32E+03	3.73E+05	2.32E+03	3.71E+05
U-235	2.62E+03	1.21E+09	2.62E+03	1.21E+09
U-235m			9.00E+12	2.92E+05
U-236	2.53E+03	3.92E+07	2.53E+03	3.92E+07
U-237			4.72E+06	5.78E+01
U-238	2.80E+03	8.32E+09	2.80E+03	8.32E+09

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
U-239			2.84E+08	8.51E+00
U-240			1.53E+07	1.65E+01
U-242			2.13E+08	4.62E+00
V-47			4.69E+07	3.82E-01
V-48	2.86E+06	1.68E+01	2.86E+06	1.71E+01
V-49			2.38E+08	2.95E+04
V-50			1.21E+05	2.53E+18
V-52			3.83E+07	3.96E-02
V-53			5.48E+07	2.49E-02
W-176			1.31E+08	1.69E+01
W-177			5.34E+07	6.79E+00
W-178			1.10E+08	3.27E+03
W-179			1.26E+09	4.51E+01
W-179m			1.36E+09	8.27E+00
W-181			2.60E+08	4.36E+04
W-185			6.76E+07	7.19E+03
W-185m			2.90E+09	4.55E+00
W-187			3.14E+07	4.47E+01
W-188			1.42E+07	1.42E+03
W-190			7.90E+07	2.39E+00
Xe-120			1.39E+05	3.55E-03
Xe-121			2.96E+04	7.63E-04
Xe-122			1.10E+06	8.59E-01
Xe-123			8.92E+04	7.28E-03
Xe-125			2.27E+05	1.54E-01
Xe-127			2.16E+05	7.65E+00
Xe-127m			4.11E+05	3.20E-04
Xe-129m			2.55E+06	2.01E+01
Xe-131m			6.95E+06	8.29E+01
Xe-133	1.95E+06	1.04E+01	1.73E+06	9.25E+00
Xe-133m			1.97E+06	4.39E+00
Xe-135			2.27E+05	8.89E-02
Xe-135m			1.32E+05	1.45E-03
Xe-137			2.60E+05	7.22E-04
Xe-138			4.68E+04	4.87E-04
Y-81			5.05E+07	2.55E-02
Y-83			4.39E+07	1.37E-01
Y-83m			7.17E+07	9.01E-02

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	NNSA SD 1027		Final Threshold Quantity	
	Act (Ci)	Mass (g)	Act (Ci)	Mass (g)
Y-84m			1.29E+07	2.28E-01
Y-85			3.10E+07	2.25E+00
Y-85m			2.08E+07	2.74E+00
Y-86			8.05E+06	3.25E+00
Y-86m			1.36E+08	2.97E+00
Y-87			1.78E+07	3.97E+01
Y-87m			3.93E+07	1.46E+01
Y-88			1.69E+06	1.21E+02
Y-89m			6.50E+07	8.02E-03
Y-90			5.40E+06	9.92E+00
Y-90m			4.26E+07	3.90E+00
Y-91	9.11E+05	3.71E+01	9.11E+05	3.71E+01
Y-91m			9.27E+07	2.23E+00
Y-92			3.70E+07	3.84E+00
Y-93			1.87E+07	5.59E+00
Y-94			4.12E+07	3.93E-01
Y-95			5.08E+07	2.74E-01
Yb-162			2.62E+08	4.26E+00
Yb-163			7.45E+07	7.13E-01
Yb-164			1.40E+08	9.25E+00
Yb-165			1.97E+08	1.71E+00
Yb-166			1.04E+07	3.13E+01
Yb-167			2.05E+08	3.18E+00
Yb-169			2.67E+06	1.11E+02
Yb-175			1.10E+07	6.19E+01
Yb-177			8.39E+07	9.00E+00
Yb-178			1.01E+08	7.10E+00
Yb-179			6.14E+07	4.68E-01
Zn-60			3.91E+07	2.97E-02
Zn-61			3.74E+07	1.80E-02
Zn-62			1.44E+07	2.64E+00
Zn-63			4.17E+07	5.31E-01
Zn-65	4.81E+06	5.83E+02	4.81E+06	5.83E+02
Zn-69			3.11E+08	6.50E+00
Zn-69m			2.71E+07	8.19E+00
Zn-71			1.78E+08	1.64E-01
Zn-71m			2.16E+07	1.92E+00
Zn-72			6.64E+06	7.09E+00

Table B.2 HC-2 TQs Using Recommended Inhalation DCs (continued)				
MASTER ISOTOPE LIST	**NNSA SD 1027**		**Final Threshold Quantity**	
	Act (Ci)	**Mass (g)**	**Act (Ci)**	**Mass (g)**
Zr-85			4.01E+07	1.42E-01
Zr-86			1.77E+07	8.00E+00
Zr-87			3.55E+07	1.65E+00
Zr-88			3.05E+06	1.71E+02
Zr-89			1.17E+07	2.61E+01
Zr-89m			9.38E+07	1.85E-01
Zr-93	8.11E+05	3.16E+08	8.11E+05	3.22E+08
Zr-95	1.65E+06	7.69E+01	1.65E+06	7.68E+01
Zr-97			8.56E+06	4.47E+00

APPENDIX C. CALCULATION OF HAZARD CATEGORY 3 THRESHOLD QUANTITIES

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APPENDIX C. CALCULATION OF HAZARD CATEGORY 3 THRESHOLD QUANTITIES

This appendix contains the following tables:

- Table C.1: Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs
- Table C.2: Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Ac-223	Ac-223	223.019	Actinium	0.001	0.0035	1000	ICRP-38	2.20E+00	m	1.32E+02	3.83E+08	--	--	--	--	--	--	--
Ac-224	Ac-224	224.022	Actinium	0.001	0.0035	1000	ICRP-38	2.90E+00	h	1.04E+04	4.82E+06	ICRP-68	1.2E-07	S	ICRP-68	7.0E-10	--	--
Ac-225	Ac-225	225.023	Actinium	0.001	0.0035	1000	ICRP-38	1.00E+01	d	8.64E+05	5.80E+04	ICRP-68	7.9E-06	S	ICRP-68	2.4E-08	--	--
Ac-226	Ac-226	226.026	Actinium	0.001	0.0035	1000	ICRP-38	2.90E+01	h	1.04E+05	4.78E+05	ICRP-68	1.2E-06	S	ICRP-68	1.0E-08	--	--
Ac-227	Ac-227	227.028	Actinium	0.001	0.0035	1000	ICRP-38	2.18E+01	y	6.87E+08	7.23E+01	ICRP-68	6.3E-04	F	ICRP-68	1.1E-06	--	--
Ac-228	Ac-228	228.031	Actinium	0.001	0.0035	1000	ICRP-38	6.13E+00	h	2.21E+04	2.24E+06	ICRP-68	2.9E-08	F	ICRP-68	4.3E-10	--	--
Ac-229	Ac-229	229.033	Actinium	0.001	0.0035	1000	JAERI	6.27E+01	m	3.76E+03	1.31E+07	JAERI	5.4E-11	S	JAERI	4.4E-11	--	--
Ac-230	Ac-230	230.036	Actinium	0.001	0.0035	1000	ICRP-107	1.22E+02	s	1.22E+02	4.02E+08	--	--	--	--	--	--	--
Ac-231	Ac-231	231.038	Actinium	0.001	0.0035	1000	ICRP-107	7.50E+00	m	4.50E+02	1.09E+08	--	--	--	--	--	--	--
Ac-232	Ac-232	232.042	Actinium	0.001	0.0035	1000	ICRP-107	1.19E+02	s	1.19E+02	4.09E+08	--	--	--	--	--	--	--
Ac-233	Ac-233	233.044	Actinium	0.001	0.0035	1000	ICRP-107	1.45E+02	s	1.45E+02	3.34E+08	--	--	--	--	--	--	--
Ag-100m	Ag-100	99.916	Silver	0.01	0.4	50-100	ICRP-107	2.24E+00	m	1.34E+02	8.40E+08	--	--	--	--	--	--	--
Ag-101	Ag-101	100.913	Silver	0.01	0.4	50-100	ICRP-107	1.11E+01	m	6.66E+02	1.68E+08	JAERI	2.4E-11	M	JAERI	3.2E-11	--	--
Ag-102	Ag-102	101.912	Silver	0.01	0.4	50-100	ICRP-38	1.29E+01	m	7.74E+02	1.43E+08	ICRP-68	3.2E-11	M	ICRP-68	4.0E-11	--	--
Ag-102m	Ag-102	101.912	Silver	0.01	0.4	50-100	ICRP-107	7.70E+00	m	4.62E+02	2.40E+08	--	--	--	--	--	--	--
Ag-103	Ag-103	102.909	Silver	0.01	0.4	50-100	ICRP-38	6.57E+01	m	3.94E+03	2.78E+07	ICRP-68	4.5E-11	S	ICRP-68	4.3E-11	--	--
Ag-104	Ag-104	103.909	Silver	0.01	0.4	50-100	ICRP-38	6.92E+01	m	4.15E+03	2.61E+07	ICRP-68	7.1E-11	S	ICRP-68	6.0E-11	--	--
Ag-104m	Ag-104	103.909	Silver	0.01	0.4	50-100	ICRP-38	3.35E+01	m	2.01E+03	5.40E+07	ICRP-68	4.5E-11	S	ICRP-68	5.4E-11	--	--
Ag-105	Ag-105	104.907	Silver	0.01	0.4	50-100	ICRP-38	4.10E+01	d	3.54E+06	3.04E+04	ICRP-68	8.0E-10	F	ICRP-68	4.7E-10	--	--
Ag-105m	Ag-105	104.907	Silver	0.01	0.4	50-100	ICRP-107	7.23E+00	m	4.34E+02	2.48E+08	--	--	--	--	--	--	--
Ag-106	Ag-106	105.907	Silver	0.01	0.4	50-100	ICRP-38	2.40E+01	m	1.44E+03	7.41E+07	ICRP-68	2.7E-11	S	ICRP-68	3.2E-11	--	--
Ag-106m	Ag-106	105.907	Silver	0.01	0.4	50-100	ICRP-38	8.41E+00	d	7.27E+05	1.47E+05	ICRP-68	1.6E-09	F	ICRP-68	1.5E-09	--	--
Ag-108	Ag-108	107.906	Silver	0.01	0.4	50-100	ICRP-38	2.37E+00	m	1.42E+02	7.35E+08	--	--	--	--	--	--	--
Ag-108m	Ag-108	107.906	Silver	0.01	0.4	50-100	ICRP-38	1.27E+02	y	4.01E+09	2.61E+01	ICRP-68	3.5E-08	S	ICRP-68	2.3E-09	--	--
Ag-109m	Ag-109	108.905	Silver	0.01	0.4	50-100	ICRP-38	3.96E+01	s	3.96E+01	2.62E+09	--	--	--	--	--	--	--
Ag-110	Ag-110	109.906	Silver	0.01	0.4	50-100	ICRP-38	2.46E+01	s	2.46E+01	4.17E+09	--	--	--	--	--	--	--
Ag-110m	Ag-110	109.906	Silver	0.01	0.4	50-100	ICRP-38	2.50E+02	d	2.16E+07	4.75E+03	ICRP-68	1.2E-08	S	ICRP-68	2.8E-09	--	--
Ag-111	Ag-111	110.905	Silver	0.01	0.4	50-100	ICRP-38	7.45E+00	d	6.44E+05	1.58E+05	ICRP-68	1.7E-09	S	ICRP-68	1.3E-09	--	--
Ag-111m	Ag-111	110.905	Silver	0.01	0.4	50-100	ICRP-107	6.48E+01	s	6.48E+01	1.57E+09	--	--	--	--	--	--	--
Ag-112	Ag-112	111.907	Silver	0.01	0.4	50-100	ICRP-38	3.12E+00	h	1.12E+04	8.98E+06	ICRP-68	2.6E-10	S	ICRP-68	4.3E-10	--	--
Ag-113	Ag-113	112.907	Silver	0.01	0.4	50-100	ICRP-107	5.37E+00	h	1.93E+04	5.17E+06	JAERI	2.5E-10	S	JAERI	4.1E-10	--	--
Ag-113m	Ag-113	112.907	Silver	0.01	0.4	50-100	ICRP-107	6.87E+01	s	6.87E+01	1.45E+09	--	--	--	--	--	--	--
Ag-114	Ag-114	113.909	Silver	0.01	0.4	50-100	ICRP-107	4.60E+00	s	4.60E+00	2.15E+10	--	--	--	--	--	--	--
Ag-115	Ag-115	114.909	Silver	0.01	0.4	50-100	ICRP-38	2.00E+01	m	1.20E+03	8.18E+07	ICRP-68	4.4E-11	S	ICRP-68	6.0E-11	--	--
Ag-116	Ag-116	115.911	Silver	0.01	0.4	50-100	ICRP-107	2.68E+00	m	1.61E+02	6.05E+08	--	--	--	--	--	--	--
Ag-117	Ag-117	116.912	Silver	0.01	0.4	50-100	ICRP-107	7.36E+01	s	7.36E+01	1.31E+09	--	--	--	--	--	--	--
Ag-99	Ag-99	98.918	Silver	0.01	0.4	50-100	ICRP-107	1.24E+02	s	1.24E+02	9.20E+08	--	--	--	--	--	--	--
Al-26	Al-26	25.987	Aluminum	0.01	0.004	0	ICRP-38	7.16E+05	y	2.26E+13	1.92E-02	ICRP-68	1.8E-08	M	ICRP-68	3.5E-09	--	--
Al-28	Al-28	27.982	Aluminum	0.01	0.004	0	ICRP-38	2.24E+00	m	1.34E+02	3.00E+09	--	--	--	--	--	--	--
Al-29	Al-29	28.980	Aluminum	0.01	0.004	0	ICRP-107	6.56E+00	m	3.94E+02	9.89E+08	--	--	--	--	--	--	--
Am-237	Am-237	237.050	Americium	0.001	0.0055	1000	ICRP-38	7.30E+01	m	4.38E+03	1.09E+07	ICRP-68	3.6E-11	M	ICRP-68	1.8E-11	--	--
Am-238	Am-238	238.052	Americium	0.001	0.0055	1000	ICRP-38	9.80E+01	m	5.88E+03	8.06E+06	ICRP-68	8.5E-11	M	ICRP-68	3.2E-11	--	--
Am-239	Am-239	239.053	Americium	0.001	0.0055	1000	ICRP-38	1.19E+01	h	4.28E+04	1.10E+06	ICRP-68	2.9E-10	M	ICRP-68	2.4E-10	--	--
Am-240	Am-240	240.055	Americium	0.001	0.0055	1000	ICRP-38	5.08E+01	h	1.83E+05	2.57E+05	ICRP-68	5.9E-10	M	ICRP-68	5.8E-10	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																	
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Am-241	Am-241	241.057	Americium	0.001	0.0055	1000	ICRP-38	4.32E+02	y	1.36E+10	3.43E+00	ICRP-68	3.9E-05	M	ICRP-68	2.0E-07	--	--
Am-242	Am-242	242.060	Americium	0.001	0.0055	1000	ICRP-38	1.60E+01	h	5.77E+04	8.08E+05	ICRP-68	1.6E-08	M	ICRP-68	3.0E-10	--	--
Am-242m	Am-242	242.060	Americium	0.001	0.0055	1000	ICRP-38	1.52E+02	y	4.80E+09	9.72E+00	ICRP-68	3.5E-05	M	ICRP-68	1.9E-07	--	--
Am-243	Am-243	243.061	Americium	0.001	0.0055	1000	ICRP-38	7.38E+03	y	2.33E+11	1.99E-01	ICRP-68	3.9E-05	M	ICRP-68	2.0E-07	--	--
Am-244	Am-244	244.064	Americium	0.001	0.0055	1000	ICRP-38	1.01E+01	h	3.64E+04	1.27E+06	ICRP-68	1.9E-09	M	ICRP-68	4.6E-10	--	--
Am-244m	Am-244	244.064	Americium	0.001	0.0055	1000	ICRP-38	2.60E+01	m	1.56E+03	2.96E+07	ICRP-68	7.9E-11	M	ICRP-68	2.9E-11	--	--
Am-245	Am-245	245.066	Americium	0.001	0.0055	1000	ICRP-38	2.05E+00	h	7.38E+03	6.24E+06	ICRP-68	7.6E-11	M	ICRP-68	6.2E-11	--	--
Am-246	Am-246	246.070	Americium	0.001	0.0055	1000	ICRP-38	3.90E+01	m	2.34E+03	1.96E+07	ICRP-68	1.1E-10	M	ICRP-68	5.8E-11	--	--
Am-246m	Am-246	246.070	Americium	0.001	0.0055	1000	ICRP-38	2.50E+01	m	1.50E+03	3.06E+07	ICRP-68	3.8E-11	M	ICRP-68	3.4E-11	--	--
Am-247	Am-247	247.072	Americium	0.001	0.0055	1000	ICRP-107	2.30E+01	m	1.38E+03	3.31E+07	JAERI	4.4E-11	M	JAERI	3.1E-11	--	--
Ar-37	Ar-37	36.967	Argon	1	0	0	ICRP-38	3.50E+01	d	3.03E+06	1.01E+05	--	--	--	--	--	ICRP-68	4.10E-15
Ar-39	Ar-39	38.964	Argon	1	0	0	ICRP-38	2.69E+02	y	8.49E+09	3.41E+01	--	--	--	--	--	ICRP-68	1.10E-11
Ar-41	Ar-41	40.965	Argon	1	0	0	ICRP-38	1.83E+00	h	6.58E+03	4.19E+07	--	--	--	--	--	ICRP-68	5.30E-09
Ar-42	Ar-42	41.963	Argon	1	0	0	ICRP-107	3.29E+01	y	1.04E+09	2.59E+02	--	--	--	--	--	JAERI	1.30E-11
Ar-43	Ar-43	42.966	Argon	1	0	0	ICRP-107	5.37E+00	m	3.22E+02	8.15E+08	--	--	--	--	--	--	--
Ar-44	Ar-44	43.965	Argon	1	0	0	ICRP-107	1.19E+01	m	7.12E+02	3.60E+08	--	--	--	--	--	JAERI	8.10E-09
As-68	As-68	67.937	Arsenic	0.01	0.04	0	ICRP-107	1.52E+02	s	1.52E+02	1.10E+09	--	--	--	--	--	--	--
As-69	As-69	68.932	Arsenic	0.01	0.04	0	ICRP-38	1.52E+01	m	9.12E+02	1.79E+08	ICRP-68	3.5E-11	M	ICRP-68	5.7E-11	--	--
As-70	As-70	69.931	Arsenic	0.01	0.04	0	ICRP-38	5.26E+01	m	3.16E+03	5.11E+07	ICRP-68	1.2E-10	M	ICRP-68	1.3E-10	--	--
As-71	As-71	70.927	Arsenic	0.01	0.04	0	ICRP-38	6.48E+01	h	2.33E+05	6.82E+05	ICRP-68	5.0E-10	M	ICRP-68	4.6E-10	--	--
As-72	As-72	71.927	Arsenic	0.01	0.04	0	ICRP-38	2.60E+01	h	9.36E+04	1.68E+06	ICRP-68	1.3E-09	M	ICRP-68	1.8E-09	--	--
As-73	As-73	72.924	Arsenic	0.01	0.04	0	ICRP-38	8.03E+01	d	6.94E+06	2.23E+04	ICRP-68	9.3E-10	M	ICRP-68	2.6E-10	--	--
As-74	As-74	73.924	Arsenic	0.01	0.04	0	ICRP-38	1.78E+01	d	1.53E+06	9.95E+04	ICRP-68	2.1E-09	M	ICRP-68	1.3E-09	--	--
As-76	As-76	75.922	Arsenic	0.01	0.04	0	ICRP-38	2.63E+01	h	9.48E+04	1.57E+06	ICRP-68	9.2E-10	M	ICRP-68	1.6E-09	--	--
As-77	As-77	76.921	Arsenic	0.01	0.04	0	ICRP-38	3.88E+01	h	1.40E+05	1.05E+06	ICRP-68	4.2E-10	M	ICRP-68	4.0E-10	--	--
As-78	As-78	77.922	Arsenic	0.01	0.04	0	ICRP-38	9.07E+01	m	5.44E+03	2.66E+07	ICRP-68	1.4E-10	M	ICRP-68	2.1E-10	--	--
As-79	As-79	78.921	Arsenic	0.01	0.04	0	ICRP-107	9.01E+00	m	5.41E+02	2.64E+08	--	--	--	--	--	--	--
At-204	At-204	203.987	Astatine	0.001	1	0	ICRP-107	9.20E+00	m	5.52E+02	1.00E+08	--	--	--	--	--	--	--
At-205	At-205	204.986	Astatine	0.001	1	0	ICRP-107	2.62E+01	m	1.57E+03	3.50E+07	JAERI	6.7E-10	M	JAERI	7.7E-11	--	--
At-206	At-206	205.987	Astatine	0.001	1	0	ICRP-107	3.06E+01	m	1.84E+03	2.98E+07	--	--	--	--	--	--	--
At-207	At-207	206.986	Astatine	0.001	1	0	ICRP-38	1.80E+00	h	6.48E+03	8.41E+06	ICRP-68	2.1E-09	M	ICRP-68	2.3E-10	--	--
At-208	At-208	207.987	Astatine	0.001	1	0	ICRP-107	1.63E+00	h	5.87E+03	9.24E+06	JAERI	3.8E-10	M	JAERI	9.4E-11	--	--
At-209	At-209	208.986	Astatine	0.001	1	0	ICRP-107	5.41E+00	h	1.95E+04	2.77E+06	JAERI	2.8E-09	M	JAERI	1.9E-09	--	--
At-210	At-210	209.987	Astatine	0.001	1	0	ICRP-107	8.10E+00	h	2.92E+04	1.84E+06	JAERI	9.8E-09	M	JAERI	9.8E-09	--	--
At-211	At-211	210.987	Astatine	0.001	1	0	ICRP-38	7.21E+00	h	2.60E+04	2.06E+06	ICRP-68	1.1E-07	M	ICRP-68	1.1E-08	--	--
At-215	At-215	214.999	Astatine	0.001	1	0	ICRP-38	1.00E-01	ms	1.00E-04	5.25E+14	--	--	--	--	--	--	--
At-216	At-216	216.002	Astatine	0.001	1	0	ICRP-38	3.00E-01	ms	3.00E-04	1.74E+14	--	--	--	--	--	--	--
At-217	At-217	217.005	Astatine	0.001	1	0	ICRP-38	3.23E-02	s	3.23E-02	1.61E+12	--	--	--	--	--	--	--
At-218	At-218	218.009	Astatine	0.001	1	0	ICRP-38	2.00E+00	s	2.00E+00	2.59E+10	--	--	--	--	--	--	--
At-219	At-219	219.011	Astatine	0.001	1	0	ICRP-107	5.60E+01	s	5.60E+01	9.20E+08	--	--	--	--	--	--	--
At-220	At-220	220.015	Astatine	0.001	1	0	ICRP-107	3.71E+00	m	2.23E+02	2.30E+08	--	--	--	--	--	--	--
Au-186	Au-186	185.966	Gold	0.01	0.4	0	ICRP-107	1.07E+01	m	6.42E+02	9.45E+07	JAERI	3.5E-11	S	JAERI	4.6E-11	--	--
Au-187	Au-187	186.965	Gold	0.01	0.4	0	ICRP-107	8.40E+00	m	5.04E+02	1.20E+08	--	--	--	--	--	--	--
Au-188	Au-188	187.965	Gold	0.01	0.4	0	JAERI	8.84E+00	m	5.30E+02	1.13E+08	--	--	--	--	--	--	--
Au-189m	Au-189	188.964	Gold	0.01	0.4	0	JAERI	4.59E+00	m	2.75E+02	2.17E+08	--	--	--	--	--	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Au-190	Au-190	189.965	Gold	0.01	0.4	0	ICRP-107	4.28E+01	m	2.57E+03	2.31E+07	JAERI	4.6E-11	S	JAERI	4.7E-11	--	--
Au-191	Au-191	190.964	Gold	0.01	0.4	0	ICRP-107	3.18E+00	h	1.14E+04	5.16E+06	JAERI	9.7E-11	S	JAERI	7.7E-11	--	--
Au-192	Au-192	191.965	Gold	0.01	0.4	0	ICRP-107	4.94E+00	h	1.78E+04	3.30E+06	JAERI	1.7E-10	M	JAERI	1.8E-10	--	--
Au-193	Au-193	192.964	Gold	0.01	0.4	0	ICRP-38	1.77E+01	h	6.35E+04	9.20E+05	ICRP-68	1.6E-10	S	ICRP-68	1.3E-10	--	--
Au-193m	Au-193	192.964	Gold	0.01	0.4	0	ICRP-107	3.90E+00	s	3.90E+00	1.50E+10	--	--	--	--	--	--	--
Au-194	Au-194	193.965	Gold	0.01	0.4	0	ICRP-38	3.95E+01	h	1.42E+05	4.09E+05	ICRP-68	3.8E-10	S	ICRP-68	4.2E-10	--	--
Au-195	Au-195	194.965	Gold	0.01	0.4	0	ICRP-38	1.83E+02	d	1.58E+07	3.66E+03	ICRP-68	1.6E-09	S	ICRP-68	2.5E-10	--	--
Au-195m	Au-195	194.965	Gold	0.01	0.4	0	ICRP-38	3.05E+01	s	3.05E+01	1.90E+09	--	--	--	--	--	--	--
Au-196	Au-196	195.967	Gold	0.01	0.4	0	ICRP-107	6.18E+00	d	5.34E+05	1.08E+05	JAERI	7.3E-10	S	JAERI	5.3E-10	--	--
Au-196m	Au-196	195.967	Gold	0.01	0.4	0	ICRP-107	9.60E+00	h	3.46E+04	1.67E+06	JAERI	6.1E-10	S	JAERI	4.1E-10	--	--
Au-198	Au-198	197.968	Gold	0.01	0.4	0	ICRP-38	2.70E+00	d	2.33E+05	2.45E+05	ICRP-68	1.1E-09	S	ICRP-68	1.0E-09	--	--
Au-198m	Au-198	197.968	Gold	0.01	0.4	0	ICRP-38	2.30E+00	d	1.99E+05	2.87E+05	ICRP-68	2.0E-09	M	ICRP-68	1.3E-09	--	--
Au-199	Au-199	198.969	Gold	0.01	0.4	0	ICRP-38	3.14E+00	d	2.71E+05	2.09E+05	ICRP-68	7.6E-10	S	ICRP-68	4.4E-10	--	--
Au-200	Au-200	199.971	Gold	0.01	0.4	0	ICRP-38	4.84E+01	m	2.90E+03	1.94E+07	ICRP-68	5.6E-11	S	ICRP-68	6.8E-11	--	--
Au-200m	Au-200	199.971	Gold	0.01	0.4	0	ICRP-38	1.87E+01	h	6.73E+04	8.38E+05	ICRP-68	1.0E-09	S	ICRP-68	1.1E-09	--	--
Au-201	Au-201	200.972	Gold	0.01	0.4	0	ICRP-38	2.64E+01	m	1.58E+03	3.54E+07	ICRP-68	2.9E-11	S	ICRP-68	2.4E-11	--	--
Au-202	Au-202	201.974	Gold	0.01	0.4	0	ICRP-107	2.88E+01	s	2.88E+01	1.94E+09	--	--	--	--	--	--	--
Ba-124	Ba-124	123.915	Barium	0.01	0.15	100	ICRP-107	1.10E+01	m	6.60E+02	1.38E+08	JAERI	2.8E-11	F	JAERI	6.9E-11	--	--
Ba-126	Ba-126	125.911	Barium	0.01	0.15	100	ICRP-38	9.65E+01	m	5.79E+03	1.55E+07	ICRP-68	1.2E-10	F	ICRP-68	2.6E-10	--	--
Ba-127	Ba-127	126.911	Barium	0.01	0.15	100	ICRP-107	1.27E+01	m	7.62E+02	1.17E+08	JAERI	1.4E-11	F	JAERI	2.5E-11	--	--
Ba-128	Ba-128	127.908	Barium	0.01	0.15	100	ICRP-38	2.43E+00	d	2.10E+05	4.20E+05	ICRP-68	1.3E-09	F	ICRP-68	2.7E-09	--	--
Ba-129	Ba-129	128.909	Barium	0.01	0.15	100	ICRP-107	2.23E+00	h	8.03E+03	1.09E+07	JAERI	3.6E-11	F	JAERI	5.2E-11	--	--
Ba-129m	Ba-129	128.909	Barium	0.01	0.15	100	ICRP-107	2.16E+00	h	7.78E+03	1.13E+07	JAERI	7.6E-11	F	JAERI	7.8E-11	--	--
Ba-131	Ba-131	130.907	Barium	0.01	0.15	100	ICRP-38	1.18E+01	d	1.02E+06	8.45E+04	ICRP-68	3.5E-10	F	ICRP-68	4.5E-10	--	--
Ba-131m	Ba-131	130.907	Barium	0.01	0.15	100	ICRP-38	1.46E+01	m	8.76E+02	9.84E+07	ICRP-68	6.4E-12	F	ICRP-68	4.9E-12	--	--
Ba-133	Ba-133	132.906	Barium	0.01	0.15	100	ICRP-38	1.07E+01	y	3.39E+08	2.50E+02	ICRP-68	1.8E-09	F	ICRP-68	1.0E-09	--	--
Ba-133m	Ba-133	132.906	Barium	0.01	0.15	100	ICRP-38	3.89E+01	h	1.40E+05	6.06E+05	ICRP-68	2.8E-10	F	ICRP-68	5.5E-10	--	--
Ba-135m	Ba-135	134.906	Barium	0.01	0.15	100	ICRP-38	2.87E+01	h	1.03E+05	8.09E+05	ICRP-68	2.3E-10	F	ICRP-68	4.5E-10	--	--
Ba-137m	Ba-137	136.906	Barium	0.01	0.15	100	ICRP-38	2.55E+00	m	1.53E+02	5.38E+08	--	--	--	--	--	--	--
Ba-139	Ba-139	138.909	Barium	0.01	0.15	100	ICRP-38	8.27E+01	m	4.96E+03	1.64E+07	ICRP-68	5.5E-11	F	ICRP-68	1.2E-10	--	--
Ba-140	Ba-140	139.911	Barium	0.01	0.15	100	ICRP-38	1.27E+01	d	1.10E+06	7.33E+04	ICRP-68	1.6E-09	F	ICRP-68	2.5E-09	--	--
Ba-141	Ba-141	140.914	Barium	0.01	0.15	100	ICRP-38	1.83E+01	m	1.10E+03	7.30E+07	ICRP-68	3.5E-11	F	ICRP-68	7.0E-11	--	--
Ba-142	Ba-142	141.916	Barium	0.01	0.15	100	ICRP-38	1.06E+01	m	6.36E+02	1.25E+08	ICRP-68	2.7E-11	F	ICRP-68	3.5E-11	--	--
Be-10	Be-10	10.014	Beryllium	0.01	0.01	75	ICRP-38	1.60E+06	y	5.05E+13	2.23E-02	ICRP-68	3.2E-08	S	ICRP-68	1.1E-09	--	--
Be-7	Be-7	7.017	Beryllium	0.01	0.01	75	ICRP-38	5.33E+01	d	4.61E+06	3.49E+05	ICRP-68	5.2E-11	S	ICRP-68	2.8E-11	--	--
Bi-197	Bi-197	196.979	Bismuth	0.01	0.035	10	ICRP-107	9.30E+00	m	5.58E+02	1.03E+08	--	--	--	--	--	--	--
Bi-200	Bi-200	199.978	Bismuth	0.01	0.035	10	ICRP-38	3.64E+01	m	2.18E+03	2.58E+07	ICRP-68	5.6E-11	M	ICRP-68	5.1E-11	--	--
Bi-201	Bi-201	200.977	Bismuth	0.01	0.035	10	ICRP-38	1.08E+02	m	6.48E+03	8.66E+06	ICRP-68	1.1E-10	M	ICRP-68	1.2E-10	--	--
Bi-202	Bi-202	201.978	Bismuth	0.01	0.035	10	ICRP-38	1.67E+00	h	6.01E+03	9.29E+06	ICRP-68	1.0E-10	M	ICRP-68	8.9E-11	--	--
Bi-203	Bi-203	202.977	Bismuth	0.01	0.035	10	ICRP-38	1.18E+01	h	4.23E+04	1.31E+06	ICRP-68	4.5E-10	M	ICRP-68	4.8E-10	--	--
Bi-204	Bi-204	203.978	Bismuth	0.01	0.035	10	ICRP-38	1.12E+01	h	4.04E+04	1.37E+06	JAERI	5.8E-10	M	JAERI	6.1E-10	--	--
Bi-205	Bi-205	204.977	Bismuth	0.01	0.035	10	ICRP-38	1.53E+01	d	1.32E+06	4.16E+04	ICRP-68	1.0E-09	M	ICRP-68	9.0E-10	--	--
Bi-206	Bi-206	205.978	Bismuth	0.01	0.035	10	ICRP-38	6.24E+00	d	5.39E+05	1.02E+05	ICRP-68	2.1E-09	M	ICRP-68	1.9E-09	--	--
Bi-207	Bi-207	206.978	Bismuth	0.01	0.035	10	ICRP-38	3.80E+01	y	1.20E+09	4.55E+01	ICRP-68	5.2E-09	M	ICRP-68	1.3E-09	--	--
Bi-208	Bi-208	207.980	Bismuth	0.01	0.035	10	ICRP-107	3.68E+05	y	1.16E+13	4.67E-03	JAERI	4.4E-09	M	JAERI	1.2E-09	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Bi-210	Bi-210	209.984	Bismuth	0.01	0.035	10	ICRP-38	5.01E+00	d	4.33E+05	1.24E+05	ICRP-68	8.4E-08	M	ICRP-68	1.3E-09	--	--
Bi-210m	Bi-210	209.984	Bismuth	0.01	0.035	10	ICRP-38	3.00E+06	y	9.47E+13	5.67E-04	ICRP-68	3.1E-06	M	ICRP-68	1.5E-08	--	--
Bi-211	Bi-211	210.987	Bismuth	0.01	0.035	10	ICRP-38	2.14E+00	m	1.28E+02	4.16E+08	--	--	--	--	--	--	--
Bi-212	Bi-212	211.991	Bismuth	0.01	0.035	10	ICRP-38	6.06E+01	m	3.63E+03	1.46E+07	ICRP-68	3.9E-08	M	ICRP-68	2.6E-10	--	--
Bi-212n	Bi-212	211.991	Bismuth	0.01	0.035	10	ICRP-107	7.00E+00	m	4.20E+02	1.27E+08	--	--	--	--	--	--	--
Bi-213	Bi-213	212.994	Bismuth	0.01	0.035	10	ICRP-38	4.57E+01	m	2.74E+03	1.93E+07	ICRP-68	4.1E-08	M	ICRP-68	2.0E-10	--	--
Bi-214	Bi-214	213.999	Bismuth	0.01	0.035	10	ICRP-38	1.99E+01	m	1.19E+03	4.42E+07	ICRP-68	2.1E-08	M	ICRP-68	1.1E-10	--	--
Bi-215	Bi-215	215.002	Bismuth	0.01	0.035	10	ICRP-107	7.60E+00	m	4.56E+02	1.15E+08	--	--	--	--	--	--	--
Bi-216	Bi-216	216.006	Bismuth	0.01	0.035	10	ICRP-107	2.17E+00	m	1.30E+02	4.01E+08	--	--	--	--	--	--	--
Bk-244	Bk-244	244.065	Berkelium	0.001	0.001	700	JAERI	4.35E+00	h	1.57E+04	2.95E+06	JAERI	1.0E-09	M	JAERI	6.9E-10	--	--
Bk-245	Bk-245	245.066	Berkelium	0.001	0.001	700	ICRP-38	4.94E+00	d	4.27E+05	1.08E+05	ICRP-68	2.0E-09	M	ICRP-68	5.7E-10	--	--
Bk-246	Bk-246	246.069	Berkelium	0.001	0.001	700	ICRP-38	1.83E+00	d	1.58E+05	2.90E+05	ICRP-68	4.6E-10	M	ICRP-68	4.8E-10	--	--
Bk-247	Bk-247	247.070	Berkelium	0.001	0.001	700	ICRP-38	1.38E+03	y	4.35E+10	1.05E+00	ICRP-68	6.5E-05	M	ICRP-68	3.5E-07	--	--
Bk-248m	Bk-248	248.073	Berkelium	0.001	0.001	700	ICRP-107	2.37E+01	h	8.53E+04	5.33E+05	JAERI	1.5E-08	M	JAERI	3.3E-09	--	--
Bk-249	Bk-249	249.075	Berkelium	0.01	0.001	700	ICRP-38	3.20E+02	d	2.76E+07	1.64E+03	ICRP-68	1.5E-07	M	ICRP-68	9.7E-10	--	--
Bk-250	Bk-250	250.078	Berkelium	0.01	0.001	700	ICRP-38	3.22E+00	h	1.16E+04	3.89E+06	ICRP-68	9.6E-10	M	ICRP-68	1.4E-10	--	--
Bk-251	Bk-251	251.081	Berkelium	0.001	0.001	700	ICRP-107	5.56E+01	m	3.34E+03	1.35E+07	JAERI	6.4E-11	M	JAERI	4.4E-11	--	--
Br-72	Br-72	71.937	Bromine	0.01	1.5	0	ICRP-107	7.86E+01	s	7.86E+01	2.00E+09	--	--	--	--	--	--	--
Br-73	Br-73	72.932	Bromine	0.01	1.5	0	ICRP-107	3.40E+00	m	2.04E+02	7.58E+08	--	--	--	--	--	--	--
Br-74	Br-74	73.930	Bromine	0.01	1.5	0	ICRP-38	2.53E+01	m	1.52E+03	1.01E+08	ICRP-68	6.8E-11	M	ICRP-68	8.4E-11	--	--
Br-74m	Br-74	73.930	Bromine	0.01	1.5	0	ICRP-38	4.15E+01	m	2.49E+03	6.13E+07	ICRP-68	1.1E-10	M	ICRP-68	1.4E-10	--	--
Br-75	Br-75	74.926	Bromine	0.01	1.5	0	ICRP-38	9.80E+01	m	5.88E+03	2.56E+07	ICRP-68	8.5E-11	M	ICRP-68	7.9E-11	--	--
Br-76	Br-76	75.925	Bromine	0.01	1.5	0	ICRP-38	1.62E+01	h	5.83E+04	2.55E+06	ICRP-68	5.8E-10	M	ICRP-68	4.6E-10	--	--
Br-76m	Br-76	75.925	Bromine	0.01	1.5	0	ICRP-107	1.31E+00	s	1.31E+00	1.13E+11	--	--	--	--	--	--	--
Br-77	Br-77	76.921	Bromine	0.01	1.5	0	ICRP-38	5.60E+01	h	2.02E+05	7.27E+05	ICRP-68	1.3E-10	M	ICRP-68	9.6E-11	--	--
Br-77m	Br-77	76.921	Bromine	0.01	1.5	0	ICRP-107	4.28E+00	m	2.57E+02	5.71E+08	--	--	--	--	--	--	--
Br-78	Br-78	77.921	Bromine	0.01	1.5	0	ICRP-107	6.46E+00	m	3.88E+02	3.74E+08	--	--	--	--	--	--	--
Br-80	Br-80	79.919	Bromine	0.01	1.5	0	ICRP-38	1.74E+01	m	1.04E+03	1.35E+08	ICRP-68	1.7E-11	M	ICRP-68	3.1E-11	--	--
Br-80m	Br-80	79.919	Bromine	0.01	1.5	0	ICRP-38	4.42E+00	h	1.59E+04	8.87E+06	ICRP-68	1.0E-10	M	ICRP-68	1.1E-10	--	--
Br-82	Br-82	81.917	Bromine	0.01	1.5	0	ICRP-38	3.53E+01	h	1.27E+05	1.08E+06	ICRP-68	8.8E-10	M	ICRP-68	5.4E-10	--	--
Br-82m	Br-82	81.917	Bromine	0.01	1.5	0	ICRP-107	6.13E+00	m	3.68E+02	3.74E+08	--	--	--	--	--	--	--
Br-83	Br-83	82.915	Bromine	0.01	1.5	0	ICRP-38	2.39E+00	h	8.60E+03	1.58E+07	ICRP-68	6.7E-11	M	ICRP-68	4.3E-11	--	--
Br-84	Br-84	83.916	Bromine	0.01	1.5	0	ICRP-38	3.18E+01	m	1.91E+03	7.05E+07	ICRP-68	6.2E-11	M	ICRP-68	8.8E-11	--	--
Br-84m	Br-84	83.916	Bromine	0.01	1.5	0	ICRP-107	6.00E+00	m	3.60E+02	3.73E+08	--	--	--	--	--	--	--
Br-85	Br-85	84.916	Bromine	0.01	1.5	0	ICRP-107	2.90E+00	m	1.74E+02	7.64E+08	--	--	--	--	--	--	--
C-10	C-10	10.017	Carbon	0.5	--	0	ICRP-107	1.93E+01	s	1.93E+01	5.85E+10	--	--	--	--	--	--	--
C-11	C-11	11.011	Carbon	0.5	--	0	ICRP-38	2.04E+01	m	1.22E+03	8.38E+08	ICRP-68	3.2E-12	Organic gasses/ vapours	ICRP-68	2.4E-11	--	--
C-14	C-14	14.003	Carbon	0.5	--	0	ICRP-38	5.73E+03	y	1.81E+11	4.46E+00	ICRP-68	5.8E-10	Organic gasses/ vapours	ICRP-68	5.8E-10	--	--
Ca-41	Ca-41	40.962	Calcium	0.01	3.5	15	ICRP-38	1.40E+05	y	4.42E+12	6.23E-02	ICRP-68	1.9E-10	M	ICRP-68	2.9E-10	--	--
Ca-45	Ca-45	44.956	Calcium	0.01	3.5	15	ICRP-38	1.63E+02	d	1.41E+07	1.78E+04	ICRP-68	2.7E-09	M	ICRP-68	7.6E-10	--	--
Ca-47	Ca-47	46.955	Calcium	0.01	3.5	15	ICRP-38	4.53E+00	d	3.91E+05	6.14E+05	ICRP-68	2.1E-09	M	ICRP-68	1.6E-09	--	--
Ca-49	Ca-49	48.956	Calcium	0.01	3.5	15	ICRP-38	8.72E+00	m	5.23E+02	4.41E+08	--	--	--	--	--	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Cd-101	Cd-101	100.919	Cadmium	0.01	0.55	50-100	ICRP-107	1.36E+00	m	8.16E+01	1.37E+09	--	--	--	--	--	--	--
Cd-102	Cd-102	101.914	Cadmium	0.01	0.55	50-100	ICRP-107	5.50E+00	m	3.30E+02	3.35E+08	--	--	--	--	--	--	--
Cd-103	Cd-103	102.913	Cadmium	0.01	0.55	50-100	ICRP-107	7.30E+00	m	4.38E+02	2.50E+08	--	--	--	--	--	--	--
Cd-104	Cd-104	103.910	Cadmium	0.01	0.55	50-100	ICRP-38	5.77E+01	m	3.46E+03	3.14E+07	ICRP-68	6.3E-11	S	ICRP-68	5.8E-11	--	--
Cd-105	Cd-105	104.909	Cadmium	0.01	0.55	50-100	ICRP-107	5.55E+01	m	3.33E+03	3.23E+07	JAERI	4.2E-11	S	JAERI	4.4E-11	--	--
Cd-107	Cd-107	106.907	Cadmium	0.01	0.55	50-100	ICRP-38	6.49E+00	h	2.34E+04	4.52E+06	ICRP-68	1.1E-10	S	ICRP-68	6.2E-11	--	--
Cd-109	Cd-109	108.905	Cadmium	0.01	0.55	50-100	ICRP-38	4.64E+02	d	4.01E+07	2.58E+03	ICRP-68	9.6E-09	F	ICRP-68	2.0E-09	--	--
Cd-111m	Cd-111	110.904	Cadmium	0.01	0.55	50-100	ICRP-107	4.85E+01	m	2.91E+03	3.50E+07	JAERI	3.8E-11	S	JAERI	1.4E-11	--	--
Cd-113	Cd-113	112.904	Cadmium	0.01	0.55	50-100	ICRP-38	9.30E+15	y	2.93E+23	3.40E-13	ICRP-68	1.4E-07	F	ICRP-68	2.5E-08	--	--
Cd-113m	Cd-113	112.904	Cadmium	0.01	0.55	50-100	ICRP-38	1.36E+01	y	4.29E+08	2.33E+02	ICRP-68	1.3E-07	F	ICRP-68	2.3E-08	--	--
Cd-115	Cd-115	114.905	Cadmium	0.01	0.55	50-100	ICRP-38	5.35E+01	h	1.92E+05	5.10E+05	ICRP-68	1.3E-09	S	ICRP-68	1.4E-09	--	--
Cd-115m	Cd-115	114.905	Cadmium	0.01	0.55	50-100	ICRP-38	4.46E+01	d	3.85E+06	2.55E+04	ICRP-68	7.3E-09	S	ICRP-68	3.3E-09	--	--
Cd-117	Cd-117	116.907	Cadmium	0.01	0.55	50-100	ICRP-38	2.49E+00	h	8.96E+03	1.08E+07	ICRP-68	2.5E-10	S	ICRP-68	2.8E-10	--	--
Cd-117m	Cd-117	116.907	Cadmium	0.01	0.55	50-100	ICRP-38	3.36E+00	h	1.21E+04	7.98E+06	ICRP-68	3.2E-10	S	ICRP-68	2.8E-10	--	--
Cd-118	Cd-118	117.907	Cadmium	0.01	0.55	50-100	ICRP-107	5.03E+01	m	3.02E+03	3.17E+07	JAERI	1.2E-10	M	JAERI	1.9E-10	--	--
Cd-119	Cd-119	118.910	Cadmium	0.01	0.55	50-100	ICRP-107	2.69E+00	m	1.61E+02	5.88E+08	--	--	--	--	--	--	--
Cd-119m	Cd-119	118.910	Cadmium	0.01	0.55	50-100	ICRP-107	2.20E+00	m	1.32E+02	7.19E+08	--	--	--	--	--	--	--
Ce-130	Ce-130	129.915	Cerium	0.01	0.01	2000	ICRP-107	2.29E+01	m	1.37E+03	6.32E+07	JAERI	6.1E-11	S	JAERI	7.2E-11	--	--
Ce-131	Ce-131	130.914	Cerium	0.01	0.01	2000	ICRP-107	1.02E+01	m	6.12E+02	1.41E+08	JAERI	2.4E-11	M	JAERI	2.8E-11	--	--
Ce-131m	Ce-131	130.914	Cerium	0.01	0.01	2000	JAERI	5.00E+00	m	3.00E+02	2.87E+08	--	--	--	--	--	--	--
Ce-132	Ce-132	131.911	Cerium	0.01	0.01	2000	ICRP-107	3.51E+00	h	1.26E+04	6.77E+06	JAERI	2.3E-10	M	JAERI	3.4E-10	--	--
Ce-133	Ce-133	132.912	Cerium	0.01	0.01	2000	ICRP-107	9.70E+01	m	5.82E+03	1.46E+07	JAERI	7.9E-11	S	JAERI	9.1E-11	--	--
Ce-133m	Ce-133	132.912	Cerium	0.01	0.01	2000	ICRP-107	4.90E+00	h	1.76E+04	4.81E+06	JAERI	2.2E-10	S	JAERI	2.3E-10	--	--
Ce-134	Ce-134	133.909	Cerium	0.01	0.01	2000	ICRP-38	7.20E+01	h	2.59E+05	3.25E+05	ICRP-68	1.6E-09	S	ICRP-68	2.5E-09	--	--
Ce-135	Ce-135	134.909	Cerium	0.01	0.01	2000	ICRP-38	1.76E+01	h	6.34E+04	1.32E+06	ICRP-68	7.6E-10	S	ICRP-68	7.9E-10	--	--
Ce-137	Ce-137	136.908	Cerium	0.01	0.01	2000	ICRP-38	9.00E+00	h	3.24E+04	2.54E+06	ICRP-68	1.9E-11	S	ICRP-68	2.5E-11	--	--
Ce-137m	Ce-137	136.908	Cerium	0.01	0.01	2000	ICRP-38	3.44E+01	h	1.24E+05	6.65E+05	ICRP-68	5.9E-10	S	ICRP-68	5.4E-10	--	--
Ce-139	Ce-139	138.907	Cerium	0.01	0.01	2000	ICRP-38	1.38E+02	d	1.19E+07	6.83E+03	ICRP-68	1.8E-09	S	ICRP-68	2.6E-10	--	--
Ce-141	Ce-141	140.908	Cerium	0.01	0.01	2000	ICRP-38	3.25E+01	d	2.81E+06	2.85E+04	ICRP-68	3.6E-09	S	ICRP-68	7.1E-10	--	--
Ce-143	Ce-143	142.912	Cerium	0.01	0.01	2000	ICRP-38	3.30E+01	h	1.19E+05	6.64E+05	ICRP-68	1.0E-09	S	ICRP-68	1.1E-09	--	--
Ce-144	Ce-144	143.914	Cerium	0.01	0.01	2000	ICRP-38	2.84E+02	d	2.46E+07	3.19E+03	ICRP-68	4.9E-08	S	ICRP-68	5.2E-09	--	--
Ce-145	Ce-145	144.917	Cerium	0.01	0.01	2000	ICRP-107	3.01E+00	m	1.81E+02	4.31E+08	--	--	--	--	--	--	--
Ce-146	Ce-146	145.919	Cerium	0.01	0.01	2000	JAERI	1.35E+01	m	8.11E+02	9.53E+07	JAERI	4.4E-11	S	JAERI	4.7E-11	--	--
Cf-244	Cf-244	244.066	Californium	0.001	0.001	0	ICRP-38	1.94E+01	m	1.16E+03	3.97E+07	ICRP-68	1.8E-08	M	ICRP-68	7.0E-11	--	--
Cf-246	Cf-246	246.069	Californium	0.001	0.001	0	ICRP-38	3.57E+01	h	1.29E+05	3.57E+05	ICRP-68	4.2E-07	M	ICRP-68	3.3E-09	--	--
Cf-247	Cf-247	247.071	Californium	0.001	0.001	0	ICRP-107	3.11E+00	h	1.12E+04	4.08E+06	JAERI	4.9E-11	M	JAERI	2.9E-11	--	--
Cf-248	Cf-248	248.072	Californium	0.001	0.001	0	ICRP-38	3.34E+02	d	2.88E+07	1.58E+03	ICRP-68	8.2E-06	M	ICRP-68	2.8E-08	--	--
Cf-249	Cf-249	249.075	Californium	0.001	0.001	0	ICRP-38	3.51E+02	y	1.11E+10	4.09E+00	ICRP-68	6.6E-05	M	ICRP-68	3.5E-07	--	--
Cf-250	Cf-250	250.076	Californium	0.001	0.001	0	ICRP-38	1.31E+01	y	4.13E+08	1.09E+02	ICRP-68	3.2E-05	M	ICRP-68	1.6E-07	--	--
Cf-251	Cf-251	251.080	Californium	0.001	0.001	0	ICRP-38	8.98E+02	y	2.83E+10	1.59E+00	ICRP-68	6.7E-05	M	ICRP-68	3.6E-07	--	--
Cf-252	Cf-252	252.082	Californium	0.001	0.001	0	ICRP-38	2.64E+00	y	8.32E+07	5.38E+02	ICRP-68	1.8E-05	M	ICRP-68	9.0E-08	--	--
Cf-253	Cf-253	253.085	Californium	0.001	0.001	0	ICRP-38	1.78E+01	d	1.54E+06	2.90E+04	ICRP-68	1.2E-06	M	ICRP-68	1.4E-09	--	--
Cf-254	Cf-254	254.087	Californium	0.001	0.001	0	ICRP-38	6.05E+01	d	5.23E+06	8.49E+03	ICRP-68	3.7E-05	M	ICRP-68	4.0E-07	--	--
Cf-255	Cf-255	255.091	Californium	0.001	0.001	0	ICRP-107	8.50E+01	m	5.10E+03	8.67E+06	JAERI	5.4E-09	M	JAERI	4.0E-11	--	--
Cf-256	Cf-256	256.093	Californium	0.001	0.001	0	JAERI	1.23E+01	m	7.38E+02	5.97E+07	JAERI	4.0E-06	M	JAERI	3.3E-09	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Cl-34	Cl-34	33.974	Chlorine	0.01	70	0	ICRP-107	1.53E+00	s	1.53E+00	2.18E+11	--	--	--	--	--	--	--
Cl-34m	Cl-34	33.974	Chlorine	0.01	70	0	ICRP-107	3.20E+01	m	1.92E+03	1.73E+08	JAERI	7.5E-11	M	JAERI	1.0E-10	--	--
Cl-36	Cl-36	35.968	Chlorine	0.01	70	0	ICRP-38	3.01E+05	y	9.50E+12	3.30E-02	ICRP-68	6.9E-09	M	ICRP-68	9.3E-10	--	--
Cl-38	Cl-38	37.968	Chlorine	0.01	70	0	ICRP-38	3.72E+01	m	2.23E+03	1.33E+08	ICRP-68	7.3E-11	M	ICRP-68	1.2E-10	--	--
Cl-39	Cl-39	38.968	Chlorine	0.01	70	0	ICRP-38	5.56E+01	m	3.34E+03	8.68E+07	ICRP-68	7.6E-11	M	ICRP-68	8.5E-11	--	--
Cl-40	Cl-40	39.970	Chlorine	0.01	70	0	ICRP-107	1.35E+00	m	8.10E+01	3.48E+09	--	--	--	--	--	--	--
Cm-238	Cm-238	238.053	Curium	0.001	0.00085	500	ICRP-38	2.40E+00	h	8.64E+03	5.49E+06	ICRP-68	4.8E-09	M	ICRP-68	8.0E-11	--	--
Cm-239	Cm-239	239.055	Curium	0.001	0.00085	500	ICRP-107	2.90E+00	h	1.04E+04	4.52E+06	JAERI	8.8E-11	M	JAERI	8.2E-11	--	--
Cm-240	Cm-240	240.056	Curium	0.001	0.00085	500	ICRP-38	2.70E+01	d	2.33E+06	2.01E+04	ICRP-68	2.9E-06	M	ICRP-68	7.6E-09	--	--
Cm-241	Cm-241	241.058	Curium	0.001	0.00085	500	ICRP-38	3.28E+01	d	2.83E+06	1.65E+04	ICRP-68	3.4E-08	M	ICRP-68	9.1E-10	--	--
Cm-242	Cm-242	242.059	Curium	0.001	0.00085	500	ICRP-38	1.63E+02	d	1.41E+07	3.31E+03	ICRP-68	4.8E-06	M	ICRP-68	1.2E-08	--	--
Cm-243	Cm-243	243.061	Curium	0.001	0.00085	500	ICRP-38	2.85E+01	y	8.99E+08	5.16E+01	ICRP-68	2.9E-05	M	ICRP-68	1.5E-07	--	--
Cm-244	Cm-244	244.063	Curium	0.001	0.00085	500	ICRP-38	1.81E+01	y	5.72E+08	8.09E+01	ICRP-68	2.5E-05	M	ICRP-68	1.2E-07	--	--
Cm-245	Cm-245	245.065	Curium	0.001	0.00085	500	ICRP-38	8.50E+03	y	2.68E+11	1.72E-01	ICRP-68	4.0E-05	M	ICRP-68	2.1E-07	--	--
Cm-246	Cm-246	246.067	Curium	0.001	0.00085	500	ICRP-38	4.73E+03	y	1.49E+11	3.07E-01	ICRP-68	4.0E-05	M	ICRP-68	2.1E-07	--	--
Cm-247	Cm-247	247.070	Curium	0.001	0.00085	500	ICRP-38	1.56E+07	y	4.92E+14	9.28E-05	ICRP-68	3.6E-05	M	ICRP-68	1.9E-07	--	--
Cm-248	Cm-248	248.072	Curium	0.001	0.00085	500	ICRP-38	3.39E+05	y	1.07E+13	4.25E-03	ICRP-68	1.4E-04	M	ICRP-68	7.7E-07	--	--
Cm-249	Cm-249	249.076	Curium	0.001	0.00085	500	ICRP-38	6.42E+01	m	3.85E+03	1.18E+07	ICRP-68	5.1E-11	M	ICRP-68	3.1E-11	--	--
Cm-250	Cm-250	250.078	Curium	0.001	0.00085	500	ICRP-38	6.90E+03	y	2.18E+11	2.07E-01	ICRP-68	7.9E-04	M	ICRP-68	4.4E-06	--	--
Cm-251	Cm-251	251.082	Curium	0.001	0.00085	500	ICRP-107	1.68E+01	m	1.01E+03	4.46E+07	--	--	--	--	--	--	--
Co-54m	Co-54	53.948	Cobalt	0.001	0.02	2000	ICRP-107	1.48E+00	m	8.88E+01	2.35E+09	--	--	--	--	--	--	--
Co-55	Co-55	54.942	Cobalt	0.001	0.02	2000	ICRP-38	1.75E+01	h	6.31E+04	3.25E+06	ICRP-68	8.3E-10	S	ICRP-68	1.1E-09	--	--
Co-56	Co-56	55.940	Cobalt	0.001	0.02	2000	ICRP-38	7.88E+01	d	6.80E+06	2.96E+04	ICRP-68	6.3E-09	S	ICRP-68	2.5E-09	--	--
Co-57	Co-57	56.936	Cobalt	0.001	0.02	2000	ICRP-38	2.71E+02	d	2.34E+07	8.47E+03	ICRP-68	9.4E-10	S	ICRP-68	2.1E-10	--	--
Co-58	Co-58	57.936	Cobalt	0.001	0.02	2000	ICRP-38	7.08E+01	d	6.12E+06	3.18E+04	ICRP-68	2.0E-09	S	ICRP-68	7.4E-10	--	--
Co-58m	Co-58	57.936	Cobalt	0.001	0.02	2000	ICRP-38	9.15E+00	h	3.29E+04	5.91E+06	ICRP-68	1.7E-11	S	ICRP-68	2.4E-11	--	--
Co-60	Co-60	59.934	Cobalt	0.001	0.02	2000	ICRP-38	5.27E+00	y	1.66E+08	1.13E+03	ICRP-68	2.9E-08	S	ICRP-68	3.4E-09	--	--
Co-60m	Co-60	59.934	Cobalt	0.001	0.02	2000	ICRP-38	1.05E+01	m	6.28E+02	3.00E+08	ICRP-68	1.3E-12	S	ICRP-68	1.7E-12	--	--
Co-61	Co-61	60.932	Cobalt	0.001	0.02	2000	ICRP-38	1.65E+00	h	5.94E+03	3.12E+07	ICRP-68	7.5E-11	S	ICRP-68	7.4E-11	--	--
Co-62	Co-62	61.934	Cobalt	0.001	0.02	2000	ICRP-107	1.50E+00	m	9.00E+01	2.02E+09	--	--	--	--	--	--	--
Co-62m	Co-62	61.934	Cobalt	0.001	0.02	2000	ICRP-38	1.39E+01	m	8.35E+02	2.18E+08	ICRP-68	3.7E-11	S	ICRP-68	4.7E-11	--	--
Cr-48	Cr-48	47.954	Chromium	0.01	0.0075	0	ICRP-38	2.30E+01	h	8.27E+04	2.85E+06	ICRP-68	2.5E-10	S	ICRP-68	2.0E-10	--	--
Cr-49	Cr-49	48.951	Chromium	0.01	0.0075	0	ICRP-38	4.21E+01	m	2.53E+03	9.13E+07	ICRP-68	5.9E-11	S	ICRP-68	6.1E-11	--	--
Cr-51	Cr-51	50.945	Chromium	0.01	0.0075	0	ICRP-38	2.77E+01	d	2.39E+06	9.25E+04	ICRP-68	3.6E-11	S	ICRP-68	3.8E-11	--	--
Cr-55	Cr-55	54.941	Chromium	0.01	0.0075	0	ICRP-107	3.50E+00	m	2.10E+02	9.79E+08	--	--	--	--	--	--	--
Cr-56	Cr-56	55.941	Chromium	0.01	0.0075	0	ICRP-107	5.94E+00	m	3.56E+02	5.66E+08	--	--	--	--	--	--	--
Cs-121	Cs-121	120.917	Cesium	0.01	0.08	2000	ICRP-107	1.55E+02	s	1.55E+02	6.02E+08	--	--	--	--	--	--	--
Cs-121m	Cs-121	120.917	Cesium	0.01	0.08	2000	ICRP-107	1.22E+02	s	1.22E+02	7.65E+08	--	--	--	--	--	--	--
Cs-123	Cs-123	122.913	Cesium	0.01	0.08	2000	ICRP-107	5.88E+00	m	3.53E+02	2.60E+08	--	--	--	--	--	--	--
Cs-124	Cs-124	123.912	Cesium	0.01	0.08	2000	ICRP-107	3.08E+01	s	3.08E+01	2.96E+09	--	--	--	--	--	--	--
Cs-125	Cs-125	124.910	Cesium	0.01	0.08	2000	ICRP-38	4.50E+01	m	2.70E+03	3.35E+07	ICRP-68	2.3E-11	F	ICRP-68	3.5E-11	--	--
Cs-126	Cs-126	125.909	Cesium	0.01	0.08	2000	ICRP-38	1.64E+00	m	9.84E+01	9.11E+08	--	--	--	--	--	--	--
Cs-127	Cs-127	126.907	Cesium	0.01	0.08	2000	ICRP-38	6.25E+00	h	2.25E+04	3.95E+06	ICRP-68	4.0E-11	F	ICRP-68	2.4E-11	--	--
Cs-128	Cs-128	127.908	Cesium	0.01	0.08	2000	ICRP-38	3.90E+00	m	2.34E+02	3.77E+08	--	--	--	--	--	--	--
Cs-129	Cs-129	128.906	Cesium	0.01	0.08	2000	ICRP-38	3.21E+01	h	1.15E+05	7.58E+05	ICRP-68	8.1E-11	F	ICRP-68	6.0E-11	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Cs-130	Cs-130	129.907	Cesium	0.01	0.08	2000	ICRP-38	2.99E+01	m	1.79E+03	4.84E+07	ICRP-68	1.5E-11	F	ICRP-68	2.8E-11	--	--
Cs-130m	Cs-130	129.907	Cesium	0.01	0.08	2000	ICRP-107	3.46E+00	m	2.08E+02	4.18E+08	--	--	--	--	--	--	--
Cs-131	Cs-131	130.905	Cesium	0.01	0.08	2000	ICRP-38	9.69E+00	d	8.37E+05	1.03E+05	ICRP-68	4.5E-11	F	ICRP-68	5.8E-11	--	--
Cs-132	Cs-132	131.906	Cesium	0.01	0.08	2000	ICRP-38	6.48E+00	d	5.59E+05	1.53E+05	ICRP-68	3.8E-10	F	ICRP-68	5.0E-10	--	--
Cs-134	Cs-134	133.907	Cesium	0.01	0.08	2000	ICRP-38	2.06E+00	y	6.51E+07	1.29E+03	ICRP-68	9.6E-09	F	ICRP-68	1.9E-08	--	--
Cs-134m	Cs-134	133.907	Cesium	0.01	0.08	2000	ICRP-38	2.90E+00	h	1.04E+04	8.07E+06	ICRP-68	2.6E-11	F	ICRP-68	2.0E-11	--	--
Cs-135	Cs-135	134.906	Cesium	0.01	0.08	2000	ICRP-38	2.30E+06	y	7.26E+13	1.15E-03	ICRP-68	9.9E-10	F	ICRP-68	2.0E-09	--	--
Cs-135m	Cs-135	134.906	Cesium	0.01	0.08	2000	ICRP-38	5.30E+01	m	3.18E+03	2.63E+07	ICRP-68	2.4E-11	F	ICRP-68	1.9E-11	--	--
Cs-136	Cs-136	135.907	Cesium	0.01	0.08	2000	ICRP-38	1.31E+01	d	1.13E+06	7.33E+04	ICRP-68	1.9E-09	F	ICRP-68	3.0E-09	--	--
Cs-137	Cs-137	136.907	Cesium	0.01	0.08	2000	ICRP-38	3.00E+01	y	9.47E+08	8.70E+01	ICRP-68	6.7E-09	F	ICRP-68	1.3E-08	--	--
Cs-138	Cs-138	137.911	Cesium	0.01	0.08	2000	ICRP-38	3.22E+01	m	1.93E+03	4.23E+07	ICRP-68	4.6E-11	F	ICRP-68	9.2E-11	--	--
Cs-138m	Cs-138	137.911	Cesium	0.01	0.08	2000	ICRP-107	2.91E+00	m	1.75E+02	4.69E+08	--	--	--	--	--	--	--
Cs-139	Cs-139	138.913	Cesium	0.01	0.08	2000	ICRP-107	9.27E+00	m	5.56E+02	1.46E+08	--	--	--	--	--	--	--
Cs-140	Cs-140	139.917	Cesium	0.01	0.08	2000	ICRP-107	6.37E+01	s	6.37E+01	1.27E+09	--	--	--	--	--	--	--
Cu-57	Cu-57	56.949	Copper	0.01	0.4	0	ICRP-38	2.33E+02	ms	2.33E-01	8.50E+11	--	--	--	--	--	--	--
Cu-59	Cu-59	58.939	Copper	0.01	0.4	0	ICRP-107	8.15E+01	s	8.15E+01	2.35E+09	--	--	--	--	--	--	--
Cu-60	Cu-60	59.937	Copper	0.01	0.4	0	ICRP-38	2.32E+01	m	1.39E+03	1.35E+08	ICRP-68	6.2E-11	S	ICRP-68	7.0E-11	--	--
Cu-61	Cu-61	60.933	Copper	0.01	0.4	0	ICRP-38	3.41E+00	h	1.23E+04	1.51E+07	ICRP-68	1.2E-10	M	ICRP-68	1.2E-10	--	--
Cu-62	Cu-62	61.933	Copper	0.01	0.4	0	ICRP-38	9.74E+00	m	5.84E+02	3.12E+08	--	--	--	--	--	--	--
Cu-64	Cu-64	63.930	Copper	0.01	0.4	0	ICRP-38	1.27E+01	h	4.57E+04	3.86E+06	ICRP-68	1.5E-10	M	ICRP-68	1.2E-10	--	--
Cu-66	Cu-66	65.929	Copper	0.01	0.4	0	ICRP-38	5.10E+00	m	3.06E+02	5.59E+08	--	--	--	--	--	--	--
Cu-67	Cu-67	66.928	Copper	0.01	0.4	0	ICRP-38	6.19E+01	h	2.23E+05	7.57E+05	ICRP-68	5.8E-10	S	ICRP-68	3.4E-10	--	--
Cu-69	Cu-69	68.929	Copper	0.01	0.4	0	ICRP-107	2.85E+00	m	1.71E+02	9.57E+08	--	--	--	--	--	--	--
Dy-148	Dy-148	147.927	Dysprosium	0.01	0.01	0	ICRP-107	3.30E+00	m	1.98E+02	3.85E+08	--	--	--	--	--	--	--
Dy-149	Dy-149	148.927	Dysprosium	0.01	0.01	0	ICRP-107	4.20E+00	m	2.52E+02	3.01E+08	--	--	--	--	--	--	--
Dy-150	Dy-150	149.926	Dysprosium	0.01	0.01	0	ICRP-107	7.17E+00	m	4.30E+02	1.75E+08	--	--	--	--	--	--	--
Dy-151	Dy-151	150.926	Dysprosium	0.01	0.01	0	ICRP-107	1.79E+01	m	1.07E+03	6.96E+07	JAERI	1.2E-10	M	JAERI	2.0E-11	--	--
Dy-152	Dy-152	151.925	Dysprosium	0.01	0.01	0	ICRP-107	2.38E+00	h	8.57E+03	8.67E+06	JAERI	8.8E-11	M	JAERI	1.1E-10	--	--
Dy-153	Dy-153	152.926	Dysprosium	0.01	0.01	0	ICRP-107	6.40E+00	h	2.30E+04	3.20E+06	JAERI	1.8E-10	M	JAERI	1.9E-10	--	--
Dy-154	Dy-154	153.924	Dysprosium	0.01	0.01	0	ICRP-107	3.00E+06	y	9.47E+13	7.74E-04	JAERI	1.1E-05	M	JAERI	5.6E-08	--	--
Dy-155	Dy-155	154.926	Dysprosium	0.01	0.01	0	ICRP-38	1.00E+01	h	3.60E+04	2.02E+06	ICRP-68	1.2E-10	M	ICRP-68	1.3E-10	--	--
Dy-157	Dy-157	156.925	Dysprosium	0.01	0.01	0	ICRP-38	8.10E+00	h	2.92E+04	2.47E+06	ICRP-68	5.5E-11	M	ICRP-68	6.1E-11	--	--
Dy-159	Dy-159	158.926	Dysprosium	0.01	0.01	0	ICRP-38	1.44E+02	d	1.25E+07	5.69E+03	ICRP-68	3.5E-10	M	ICRP-68	1.0E-10	--	--
Dy-165	Dy-165	164.932	Dysprosium	0.01	0.01	0	ICRP-38	2.33E+00	h	8.40E+03	8.14E+06	ICRP-68	8.7E-11	M	ICRP-68	1.1E-10	--	--
Dy-165m	Dy-165	164.932	Dysprosium	0.01	0.01	0	ICRP-107	1.26E+00	m	7.54E+01	9.07E+08	--	--	--	--	--	--	--
Dy-166	Dy-166	165.933	Dysprosium	0.01	0.01	0	ICRP-38	8.16E+01	h	2.94E+05	2.31E+05	ICRP-68	1.8E-09	M	ICRP-68	1.6E-09	--	--
Dy-167	Dy-167	166.936	Dysprosium	0.01	0.01	0	ICRP-107	6.20E+00	m	3.72E+02	1.82E+08	--	--	--	--	--	--	--
Dy-168	Dy-168	167.937	Dysprosium	0.01	0.01	0	ICRP-107	8.70E+00	m	5.22E+02	1.29E+08	--	--	--	--	--	--	--
Er-154	Er-154	153.933	Erbium	0.01	0.01	0	ICRP-107	3.73E+00	m	2.24E+02	3.27E+08	--	--	--	--	--	--	--
Er-155	Er-155	154.933	Erbium	0.01	0.01	0	JAERI	5.30E+00	m	3.18E+02	2.29E+08	--	--	--	--	--	--	--
Er-156	Er-156	155.931	Erbium	0.01	0.01	0	ICRP-107	1.95E+01	m	1.17E+03	6.18E+07	JAERI	3.0E-11	M	JAERI	3.8E-11	--	--
Er-159	Er-159	158.931	Erbium	0.01	0.01	0	ICRP-107	3.60E+01	m	2.16E+03	3.29E+07	JAERI	3.0E-11	M	JAERI	2.4E-11	--	--
Er-161	Er-161	160.930	Erbium	0.01	0.01	0	ICRP-38	3.24E+00	h	1.17E+04	6.01E+06	ICRP-68	8.5E-11	M	ICRP-68	8.0E-11	--	--
Er-163	Er-163	162.930	Erbium	0.01	0.01	0	ICRP-107	7.50E+01	m	4.50E+03	1.54E+07	JAERI	2.2E-12	M	JAERI	2.7E-12	--	--
Er-165	Er-165	164.931	Erbium	0.01	0.01	0	ICRP-38	1.04E+01	h	3.73E+04	1.83E+06	ICRP-68	1.4E-11	M	ICRP-68	1.9E-11	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Er-167m	Er-167	166.932	Erbium	0.01	0.01	0	ICRP-38	2.28E+00	s	2.28E+00	2.96E+10	--	--	--	--	--	--	--
Er-169	Er-169	168.935	Erbium	0.01	0.01	0	ICRP-38	9.30E+00	d	8.04E+05	8.31E+04	ICRP-68	9.8E-10	M	ICRP-68	3.7E-10	--	--
Er-171	Er-171	170.938	Erbium	0.01	0.01	0	ICRP-38	7.52E+00	h	2.71E+04	2.44E+06	ICRP-68	3.0E-10	M	ICRP-68	3.6E-10	--	--
Er-172	Er-172	171.939	Erbium	0.01	0.01	0	ICRP-38	4.93E+01	h	1.77E+05	3.70E+05	ICRP-68	1.2E-09	M	ICRP-68	1.0E-09	--	--
Er-173	Er-173	172.942	Erbium	0.01	0.01	0	ICRP-107	1.43E+00	m	8.60E+01	7.58E+08	--	--	--	--	--	--	--
Es-249	Es-249	249.076	Einsteinium	0.001	0.001	0	ICRP-107	1.02E+02	m	6.13E+03	7.39E+06	JAERI	2.7E-10	M	JAERI	2.2E-11	--	--
Es-250	Es-250	250.079	Einsteinium	0.001	0.001	0	ICRP-38	2.10E+00	h	7.56E+03	5.97E+06	ICRP-68	5.9E-10	M	ICRP-68	2.1E-11	--	--
Es-250m	Es-250	250.079	Einsteinium	0.001	0.001	0	ICRP-107	2.22E+00	h	7.99E+03	5.64E+06	--	--	--	--	--	--	--
Es-251	Es-251	251.080	Einsteinium	0.001	0.001	0	ICRP-38	3.30E+01	h	1.19E+05	3.78E+05	ICRP-68	2.0E-09	M	ICRP-68	1.7E-10	--	--
Es-253	Es-253	253.085	Einsteinium	0.001	0.001	0	ICRP-38	2.05E+01	d	1.77E+06	2.52E+04	ICRP-68	2.5E-06	M	ICRP-68	6.1E-09	--	--
Es-254	Es-254	254.088	Einsteinium	0.001	0.001	0	ICRP-38	2.76E+02	d	2.38E+07	1.86E+03	ICRP-68	8.0E-06	M	ICRP-68	2.8E-08	--	--
Es-254m	Es-254	254.088	Einsteinium	0.01	0.001	0	ICRP-38	3.93E+01	h	1.41E+05	3.14E+05	ICRP-68	4.4E-07	M	ICRP-68	4.2E-09	--	--
Es-255	Es-255	255.090	Einsteinium	0.001	0.001	0	ICRP-107	3.98E+01	d	3.44E+06	1.29E+04	JAERI	3.6E-06	M	JAERI	6.0E-09	--	--
Es-256	Es-256	256.094	Einsteinium	0.001	0.001	0	ICRP-107	2.54E+01	m	1.52E+03	2.89E+07	JAERI	3.4E-07	M	JAERI	4.1E-09	--	--
Eu-142	Eu-142	141.923	Europium	0.01	0.01	500	ICRP-107	2.34E+00	s	2.34E+00	3.40E+10	--	--	--	--	--	--	--
Eu-142m	Eu-142	141.923	Europium	0.01	0.01	500	ICRP-107	1.22E+00	m	7.34E+01	1.08E+09	--	--	--	--	--	--	--
Eu-143	Eu-143	142.920	Europium	0.01	0.01	500	ICRP-107	2.59E+00	m	1.55E+02	5.08E+08	--	--	--	--	--	--	--
Eu-144	Eu-144	143.919	Europium	0.01	0.01	500	ICRP-107	1.02E+01	s	1.02E+01	7.69E+09	--	--	--	--	--	--	--
Eu-145	Eu-145	144.916	Europium	0.01	0.01	500	ICRP-38	5.94E+00	d	5.13E+05	1.52E+05	ICRP-68	7.3E-10	M	ICRP-68	7.5E-10	--	--
Eu-146	Eu-146	145.917	Europium	0.01	0.01	500	ICRP-38	4.61E+00	d	3.98E+05	1.94E+05	ICRP-68	1.2E-09	M	ICRP-68	1.3E-09	--	--
Eu-147	Eu-147	146.917	Europium	0.01	0.01	500	ICRP-38	2.40E+01	d	2.07E+06	3.70E+04	ICRP-68	1.0E-09	M	ICRP-68	4.4E-10	--	--
Eu-148	Eu-148	147.918	Europium	0.01	0.01	500	ICRP-38	5.45E+01	d	4.71E+06	1.62E+04	ICRP-68	2.7E-09	M	ICRP-68	1.3E-09	--	--
Eu-149	Eu-149	148.918	Europium	0.01	0.01	500	ICRP-38	9.31E+01	d	8.04E+06	9.42E+03	ICRP-68	2.7E-10	M	ICRP-68	1.0E-10	--	--
Eu-150l	Eu-150	149.920	Europium	0.01	0.01	500	ICRP-38	3.42E+01	y	1.08E+09	6.97E+01	ICRP-68	5.0E-08	M	ICRP-68	1.3E-09	--	--
Eu-150s	Eu-150	149.920	Europium	0.01	0.01	500	ICRP-38	1.26E+01	h	4.54E+04	1.66E+06	ICRP-68	2.8E-10	M	ICRP-68	3.8E-10	--	--
Eu-152	Eu-152	151.922	Europium	0.01	0.01	500	ICRP-38	1.33E+01	y	4.21E+08	1.77E+02	ICRP-68	3.9E-08	M	ICRP-68	1.4E-09	--	--
Eu-152ml	Eu-152	151.922	Europium	0.01	0.01	500	ICRP-38	9.32E+00	h	3.36E+04	2.21E+06	ICRP-68	3.2E-10	M	ICRP-68	5.0E-10	--	--
Eu-152ms	Eu-152	151.922	Europium	0.01	0.01	500	ICRP-107	9.60E+01	m	5.76E+03	1.29E+07	JAERI	1.1E-11	M	JAERI	1.4E-11	--	--
Eu-154	Eu-154	153.923	Europium	0.01	0.01	500	ICRP-38	8.80E+00	y	2.78E+08	2.64E+02	ICRP-68	5.0E-08	M	ICRP-68	2.0E-09	--	--
Eu-154m	Eu-154	153.923	Europium	0.01	0.01	500	ICRP-107	4.60E+01	m	2.76E+03	2.66E+07	JAERI	5.8E-12	M	JAERI	9.1E-12	--	--
Eu-155	Eu-155	154.923	Europium	0.01	0.01	500	ICRP-38	4.96E+00	y	1.57E+08	4.65E+02	ICRP-68	6.5E-09	M	ICRP-68	3.2E-10	--	--
Eu-156	Eu-156	155.925	Europium	0.01	0.01	500	ICRP-38	1.52E+01	d	1.31E+06	5.51E+04	ICRP-68	3.3E-09	M	ICRP-68	2.2E-09	--	--
Eu-157	Eu-157	156.925	Europium	0.01	0.01	500	ICRP-38	1.52E+01	h	5.45E+04	1.32E+06	ICRP-68	4.4E-10	M	ICRP-68	6.0E-10	--	--
Eu-158	Eu-158	157.928	Europium	0.01	0.01	500	ICRP-38	4.59E+01	m	2.75E+03	2.59E+07	ICRP-68	7.5E-11	M	ICRP-68	9.4E-11	--	--
Eu-159	Eu-159	158.929	Europium	0.01	0.01	500	ICRP-107	1.81E+01	m	1.09E+03	6.54E+07	JAERI	3.6E-11	M	JAERI	4.9E-11	--	--
F-17	F-17	17.002	Fluorine	0.01	0.06	0	ICRP-107	6.45E+01	s	6.45E+01	1.03E+10	--	--	--	--	--	--	--
F-18	F-18	18.001	Fluorine	0.01	0.06	0	ICRP-38	1.10E+02	m	6.59E+03	9.52E+07	ICRP-68	9.3E-11	S	ICRP-68	4.9E-11	--	--
Fe-52	Fe-52	51.948	Iron	0.01	0.004	150	ICRP-38	8.28E+00	h	2.98E+04	7.29E+06	ICRP-68	9.5E-10	M	ICRP-68	1.4E-09	--	--
Fe-53	Fe-53	52.945	Iron	0.01	0.004	150	ICRP-107	8.51E+00	m	5.11E+02	4.17E+08	--	--	--	--	--	--	--
Fe-53m	Fe-53	52.945	Iron	0.01	0.004	150	ICRP-107	2.53E+00	m	1.52E+02	1.41E+09	--	--	--	--	--	--	--
Fe-55	Fe-55	54.938	Iron	0.01	0.004	150	ICRP-38	2.70E+00	y	8.52E+07	2.41E+03	ICRP-68	9.2E-10	F	ICRP-68	3.3E-10	--	--
Fe-59	Fe-59	58.935	Iron	0.01	0.004	150	ICRP-38	4.45E+01	d	3.85E+06	4.98E+04	ICRP-68	3.5E-09	M	ICRP-68	1.8E-09	--	--
Fe-60	Fe-60	59.934	Iron	0.01	0.004	150	ICRP-38	1.00E+05	y	3.16E+12	5.96E-02	ICRP-68	3.3E-07	F	ICRP-68	1.1E-07	--	--
Fe-61	Fe-61	60.937	Iron	0.01	0.004	150	ICRP-107	5.98E+00	m	3.59E+02	5.16E+08	--	--	--	--	--	--	--
Fe-62	Fe-62	61.937	Iron	0.01	0.004	150	ICRP-107	6.80E+01	s	6.80E+01	2.68E+09	--	--	--	--	--	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																	
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Fm-251	Fm-251	251.082	Fermium	0.001	0.001	0	ICRP-107	5.30E+00	h	1.91E+04	2.35E+06	JAERI	1.8E-09	M	JAERI	7.2E-11	--	--
Fm-252	Fm-252	252.082	Fermium	0.001	0.001	0	ICRP-38	2.27E+01	h	8.17E+04	5.48E+05	ICRP-68	3.0E-07	M	ICRP-68	2.7E-09	--	--
Fm-253	Fm-253	253.085	Fermium	0.001	0.001	0	ICRP-38	3.00E+00	d	2.59E+05	1.72E+05	ICRP-68	3.7E-07	M	ICRP-68	9.1E-10	--	--
Fm-254	Fm-254	254.087	Fermium	0.001	0.001	0	ICRP-38	3.24E+00	h	1.17E+04	3.81E+06	ICRP-68	7.7E-08	M	ICRP-68	4.4E-10	--	--
Fm-255	Fm-255	255.090	Fermium	0.001	0.001	0	ICRP-38	2.01E+01	h	7.23E+04	6.12E+05	ICRP-68	2.6E-07	M	ICRP-68	2.5E-09	--	--
Fm-256	Fm-256	256.092	Fermium	0.001	0.001	0	ICRP-107	1.58E+02	m	9.46E+03	4.66E+06	JAERI	7.0E-06	M	JAERI	2.6E-08	--	--
Fm-257	Fm-257	257.095	Fermium	0.001	0.001	0	ICRP-38	1.01E+02	d	8.68E+06	5.05E+03	ICRP-68	6.6E-06	M	ICRP-68	1.5E-08	--	--
Fr-212	Fr-212	211.996	Francium	0.01	0.03	200	ICRP-107	2.00E+01	m	1.20E+03	4.43E+07	JAERI	2.8E-09	F	JAERI	7.1E-10	--	--
Fr-219	Fr-219	219.009	Francium	0.01	0.03	200	ICRP-38	2.10E+01	ms	2.10E-02	2.45E+12	--	--	--	--	--	--	--
Fr-220	Fr-220	220.012	Francium	0.01	0.03	200	ICRP-38	2.74E+01	s	2.74E+01	1.87E+09	--	--	--	--	--	--	--
Fr-221	Fr-221	221.014	Francium	0.01	0.03	200	ICRP-38	4.80E+00	m	2.88E+02	1.77E+08	--	--	--	--	--	--	--
Fr-222	Fr-222	222.018	Francium	0.01	0.03	200	ICRP-38	1.44E+01	m	8.64E+02	5.88E+07	ICRP-68	2.1E-08	F	ICRP-68	7.1E-10	--	--
Fr-223	Fr-223	223.020	Francium	0.01	0.03	200	ICRP-38	2.18E+01	m	1.31E+03	3.87E+07	ICRP-68	1.3E-09	F	ICRP-68	2.3E-09	--	--
Fr-224	Fr-224	224.023	Francium	0.01	0.03	200	ICRP-107	3.33E+00	m	2.00E+02	2.52E+08	--	--	--	--	--	--	--
Fr-227	Fr-227	227.032	Francium	0.01	0.03	200	ICRP-107	2.47E+00	m	1.48E+02	3.35E+08	--	--	--	--	--	--	--
Ga-64	Ga-64	63.937	Gallium	0.01	0.004	0	ICRP-107	2.63E+00	m	1.58E+02	1.12E+09	--	--	--	--	--	--	--
Ga-65	Ga-65	64.933	Gallium	0.01	0.004	0	ICRP-38	1.52E+01	m	9.12E+02	1.91E+08	ICRP-68	2.9E-11	M	ICRP-68	3.7E-11	--	--
Ga-66	Ga-66	65.932	Gallium	0.01	0.004	0	ICRP-38	9.40E+00	h	3.38E+04	5.06E+06	ICRP-68	7.1E-10	M	ICRP-68	1.2E-09	--	--
Ga-67	Ga-67	66.928	Gallium	0.01	0.004	0	ICRP-38	7.83E+01	h	2.82E+05	5.98E+05	ICRP-68	2.8E-10	M	ICRP-68	1.9E-10	--	--
Ga-68	Ga-68	67.928	Gallium	0.01	0.004	0	ICRP-38	6.80E+01	m	4.08E+03	4.07E+07	ICRP-68	8.1E-11	M	ICRP-68	1.0E-10	--	--
Ga-70	Ga-70	69.926	Gallium	0.01	0.004	0	ICRP-38	2.12E+01	m	1.27E+03	1.27E+08	ICRP-68	2.6E-11	M	ICRP-68	3.1E-11	--	--
Ga-72	Ga-72	71.926	Gallium	0.01	0.004	0	ICRP-38	1.41E+01	h	5.08E+04	3.09E+06	ICRP-68	8.4E-10	M	ICRP-68	1.1E-09	--	--
Ga-73	Ga-73	72.925	Gallium	0.01	0.004	0	ICRP-38	4.91E+00	h	1.77E+04	8.75E+06	ICRP-68	2.0E-10	M	ICRP-68	2.6E-10	--	--
Ga-74	Ga-74	73.927	Gallium	0.01	0.004	0	ICRP-107	8.12E+00	m	4.87E+02	3.13E+08	--	--	--	--	--	--	--
Gd-142	Gd-142	141.928	Gadolinium	0.01	0.01	500-1000	ICRP-107	7.02E+01	s	7.02E+01	1.13E+09	--	--	--	--	--	--	--
Gd-143m	Gd-143	142.927	Gadolinium	0.01	0.01	500-1000	ICRP-107	1.10E+02	s	1.10E+02	7.18E+08	--	--	--	--	--	--	--
Gd-144	Gd-144	143.923	Gadolinium	0.01	0.01	500-1000	ICRP-107	4.47E+00	m	2.68E+02	2.92E+08	--	--	--	--	--	--	--
Gd-145	Gd-145	144.922	Gadolinium	0.01	0.01	500-1000	ICRP-38	2.29E+01	m	1.37E+03	5.67E+07	ICRP-68	3.5E-11	M	ICRP-68	4.4E-11	--	--
Gd-145m	Gd-145	144.922	Gadolinium	0.01	0.01	500-1000	ICRP-107	8.50E+01	s	8.50E+01	9.16E+08	--	--	--	--	--	--	--
Gd-146	Gd-146	145.918	Gadolinium	0.01	0.01	500-1000	ICRP-38	4.83E+01	d	4.17E+06	1.85E+04	ICRP-68	6.0E-09	M	ICRP-68	9.6E-10	--	--
Gd-147	Gd-147	146.919	Gadolinium	0.01	0.01	500-1000	ICRP-38	3.81E+01	h	1.37E+05	5.60E+05	ICRP-68	5.9E-10	M	ICRP-68	6.1E-10	--	--
Gd-148	Gd-148	147.918	Gadolinium	0.01	0.01	500-1000	ICRP-38	9.30E+01	y	2.93E+09	2.60E+01	ICRP-68	3.0E-05	F	ICRP-68	5.5E-08	--	--
Gd-149	Gd-149	148.919	Gadolinium	0.01	0.01	500-1000	ICRP-38	9.40E+00	d	8.12E+05	9.33E+04	ICRP-68	7.9E-10	M	ICRP-68	4.5E-10	--	--
Gd-150	Gd-150	149.919	Gadolinium	0.01	0.01	500-1000	ICRP-107	1.79E+06	y	5.65E+13	1.33E-03	JAERI	2.8E-05	F	JAERI	5.2E-08	--	--
Gd-151	Gd-151	150.920	Gadolinium	0.01	0.01	500-1000	ICRP-38	1.20E+02	d	1.04E+07	7.21E+03	ICRP-68	9.3E-10	F	ICRP-68	2.0E-10	--	--
Gd-152	Gd-152	151.920	Gadolinium	0.01	0.01	500-1000	ICRP-38	1.08E+14	y	3.41E+21	2.18E-11	ICRP-68	2.2E-05	F	ICRP-68	4.1E-08	--	--
Gd-153	Gd-153	152.922	Gadolinium	0.01	0.01	500-1000	ICRP-38	2.42E+02	d	2.09E+07	3.53E+03	ICRP-68	2.5E-09	F	ICRP-68	2.7E-10	--	--
Gd-159	Gd-159	158.926	Gadolinium	0.01	0.01	500-1000	ICRP-38	1.86E+01	h	6.68E+04	1.06E+06	ICRP-68	3.9E-10	M	ICRP-68	4.9E-10	--	--
Gd-162	Gd-162	161.931	Gadolinium	0.01	0.01	500-1000	ICRP-107	8.40E+00	m	5.04E+02	1.38E+08	--	--	--	--	--	--	--
Ge-66	Ge-66	65.934	Germanium	0.01	0.4	0	ICRP-38	2.27E+00	h	8.17E+03	2.09E+07	ICRP-68	1.3E-10	M	ICRP-68	1.0E-10	--	--
Ge-67	Ge-67	66.933	Germanium	0.01	0.4	0	ICRP-38	1.87E+01	m	1.12E+03	1.50E+08	ICRP-68	4.2E-11	M	ICRP-68	6.5E-11	--	--
Ge-68	Ge-68	67.928	Germanium	0.01	0.4	0	ICRP-38	2.88E+02	d	2.49E+07	6.67E+03	ICRP-68	1.3E-08	M	ICRP-68	1.3E-09	--	--
Ge-69	Ge-69	68.928	Germanium	0.01	0.4	0	ICRP-38	3.91E+01	h	1.41E+05	1.16E+06	ICRP-68	3.7E-10	M	ICRP-68	2.4E-10	--	--
Ge-71	Ge-71	70.925	Germanium	0.01	0.4	0	ICRP-38	1.18E+01	d	1.02E+06	1.56E+05	ICRP-68	1.1E-11	M	ICRP-68	1.2E-11	--	--
Ge-75	Ge-75	74.923	Germanium	0.01	0.4	0	ICRP-38	8.28E+01	m	4.97E+03	3.03E+07	ICRP-68	5.4E-11	M	ICRP-68	4.6E-11	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Ge-77	Ge-77	76.924	Germanium	0.01	0.4	0	ICRP-38	1.13E+01	h	4.07E+04	3.61E+06	ICRP-68	4.5E-10	M	ICRP-68	3.3E-10	--	--
Ge-78	Ge-78	77.923	Germanium	0.01	0.4	0	ICRP-38	8.70E+01	m	5.22E+03	2.77E+07	ICRP-68	1.4E-10	M	ICRP-68	1.2E-10	--	--
H-3	H-3	3.016	Hydrogen	0.5	--	0	ICRP-38	1.24E+01	y	3.90E+08	9.60E+03	ICRP-68	4.1E-11	OBT	ICRP-68	4.2E-11	--	--
Hf-167	Hf-167	166.943	Hafnium	0.01	0.0035	0	ICRP-107	2.05E+00	m	1.23E+02	5.49E+08	--	--	--	--	--	--	--
Hf-169	Hf-169	168.941	Hafnium	0.01	0.0035	0	ICRP-107	3.24E+00	m	1.94E+02	3.44E+08	--	--	--	--	--	--	--
Hf-170	Hf-170	169.940	Hafnium	0.01	0.0035	0	ICRP-38	1.60E+01	h	5.76E+04	1.15E+06	ICRP-68	4.3E-10	M	ICRP-68	4.8E-10	--	--
Hf-172	Hf-172	171.939	Hafnium	0.01	0.0035	0	ICRP-38	1.87E+00	y	5.90E+07	1.11E+03	ICRP-68	3.7E-08	F	ICRP-68	1.0E-09	--	--
Hf-173	Hf-173	172.941	Hafnium	0.01	0.0035	0	ICRP-38	2.40E+01	h	8.64E+04	7.55E+05	ICRP-68	2.2E-10	M	ICRP-68	2.3E-10	--	--
Hf-174	Hf-174	173.940	Hafnium	0.01	0.0035	0	ICRP-107	2.00E+15	y	6.31E+22	1.03E-12	JAERI	3.6E-05	F	JAERI	2.5E-07	--	--
Hf-175	Hf-175	174.942	Hafnium	0.01	0.0035	0	ICRP-38	7.00E+01	d	6.05E+06	1.07E+04	ICRP-68	1.1E-09	M	ICRP-68	4.1E-10	--	--
Hf-177m	Hf-177	176.943	Hafnium	0.01	0.0035	0	ICRP-38	5.14E+01	m	3.08E+03	2.07E+07	ICRP-68	1.5E-10	M	ICRP-68	8.1E-11	--	--
Hf-178m	Hf-178	177.944	Hafnium	0.01	0.0035	0	ICRP-38	3.10E+01	y	9.78E+08	6.48E+01	ICRP-68	3.1E-07	F	ICRP-68	4.7E-09	--	--
Hf-179m	Hf-179	178.946	Hafnium	0.01	0.0035	0	ICRP-38	2.51E+01	d	2.17E+06	2.91E+04	ICRP-68	3.6E-09	M	ICRP-68	1.2E-09	--	--
Hf-180m	Hf-180	179.947	Hafnium	0.01	0.0035	0	ICRP-38	5.50E+00	h	1.98E+04	3.17E+06	ICRP-68	2.0E-10	M	ICRP-68	1.7E-10	--	--
Hf-181	Hf-181	180.949	Hafnium	0.01	0.0035	0	ICRP-38	4.24E+01	d	3.66E+06	1.70E+04	ICRP-68	4.7E-09	M	ICRP-68	1.1E-09	--	--
Hf-182	Hf-182	181.951	Hafnium	0.01	0.0035	0	ICRP-38	9.00E+06	y	2.84E+14	2.18E-04	ICRP-68	3.6E-07	F	ICRP-68	3.0E-09	--	--
Hf-182m	Hf-182	181.951	Hafnium	0.01	0.0035	0	ICRP-38	6.15E+01	m	3.69E+03	1.68E+07	ICRP-68	7.1E-11	M	ICRP-68	4.2E-11	--	--
Hf-183	Hf-183	182.954	Hafnium	0.01	0.0035	0	ICRP-38	6.40E+01	m	3.84E+03	1.61E+07	ICRP-68	8.3E-11	M	ICRP-68	7.3E-11	--	--
Hf-184	Hf-184	183.955	Hafnium	0.01	0.0035	0	ICRP-38	4.12E+00	h	1.48E+04	4.13E+06	ICRP-68	4.5E-10	M	ICRP-68	5.2E-10	--	--
Hg-187	Hg-187	186.970	Mercury	0.01	0.9	0	JAERI	2.20E+00	m	1.32E+02	4.57E+08	--	--	--	--	--	--	--
Hg-187m	Hg-187	186.970	Mercury	0.01	0.9	0	JAERI	2.40E+00	m	1.44E+02	4.19E+08	--	--	--	--	--	--	--
Hg-188	Hg-188	187.968	Mercury	0.01	0.9	0	JAERI	3.25E+00	m	1.95E+02	3.08E+08	--	--	--	--	--	--	--
Hg-190	Hg-190	189.966	Mercury	0.01	0.9	0	ICRP-107	2.00E+01	m	1.20E+03	4.95E+07	JAERI	9.6E-11	Vap	JAERI	2.5E-11	--	--
Hg-191m	Hg-191	190.967	Mercury	0.01	0.9	0	ICRP-107	5.08E+01	m	3.05E+03	1.94E+07	JAERI	3.2E-10	Vap	JAERI	5.5E-11	--	--
Hg-192	Hg-192	191.966	Mercury	0.01	0.9	0	ICRP-107	4.85E+00	h	1.75E+04	3.37E+06	JAERI	1.0E-09	Vap	JAERI	2.3E-10	--	--
Hg-193	Hg-193	192.967	Mercury	0.01	0.9	0	ICRP-38	3.50E+00	h	1.26E+04	4.64E+06	ICRP-68	1.1E-09	0	ICRP-68	8.2E-11	--	--
Hg-193m	Hg-193	192.967	Mercury	0.01	0.9	0	ICRP-38	1.11E+01	h	4.00E+04	1.46E+06	ICRP-68	3.1E-09	0	ICRP-68	4.0E-10	--	--
Hg-194	Hg-194	193.965	Mercury	0.01	0.9	0	ICRP-38	2.60E+02	y	8.20E+09	7.09E+00	ICRP-68	4.0E-08	0	ICRP-68	5.1E-08	--	--
Hg-195	Hg-195	194.967	Mercury	0.01	0.9	0	ICRP-38	9.90E+00	h	3.56E+04	1.62E+06	ICRP-68	1.4E-09	0	ICRP-68	9.7E-11	--	--
Hg-195m	Hg-195	194.967	Mercury	0.01	0.9	0	ICRP-38	4.16E+01	h	1.50E+05	3.86E+05	ICRP-68	8.2E-09	0	ICRP-68	5.6E-10	--	--
Hg-197	Hg-197	196.967	Mercury	0.01	0.9	0	ICRP-38	6.41E+01	h	2.31E+05	2.48E+05	ICRP-68	4.4E-09	0	ICRP-68	2.3E-10	--	--
Hg-197m	Hg-197	196.967	Mercury	0.01	0.9	0	ICRP-38	2.38E+01	h	8.57E+04	6.68E+05	ICRP-68	5.8E-09	0	ICRP-68	4.7E-10	--	--
Hg-199m	Hg-199	198.968	Mercury	0.01	0.9	0	ICRP-38	4.26E+01	m	2.56E+03	2.22E+07	ICRP-68	1.8E-10	0	ICRP-68	3.1E-11	--	--
Hg-203	Hg-203	202.973	Mercury	0.01	0.9	0	ICRP-38	4.66E+01	d	4.03E+06	1.38E+04	ICRP-68	7.0E-09	0	ICRP-68	1.9E-09	--	--
Hg-205	Hg-205	204.976	Mercury	0.01	0.9	0	ICRP-107	5.20E+00	m	3.12E+02	1.76E+08	--	--	--	--	--	--	--
Hg-206	Hg-206	205.978	Mercury	0.01	0.9	0	ICRP-38	8.15E+00	m	4.89E+02	1.12E+08	--	--	--	--	--	--	--
Hg-207	Hg-207	206.982	Mercury	0.01	0.9	0	ICRP-107	2.90E+00	m	1.74E+02	3.13E+08	--	--	--	--	--	--	--
Ho-150	Ho-150	149.933	Holmium	0.01	0.01	600	ICRP-107	7.68E+01	s	7.68E+01	9.80E+08	--	--	--	--	--	--	--
Ho-152	Ho-152	151.932	Holmium	0.01	0.01	600	JAERI	2.70E+00	m	1.62E+02	4.59E+08	--	--	--	--	--	--	--
Ho-153	Ho-153	152.930	Holmium	0.01	0.01	600	ICRP-107	2.01E+00	m	1.21E+02	6.12E+08	--	--	--	--	--	--	--
Ho-153m	Ho-153	152.930	Holmium	0.01	0.01	600	ICRP-107	9.30E+00	m	5.58E+02	1.32E+08	--	--	--	--	--	--	--
Ho-154	Ho-154	153.931	Holmium	0.01	0.01	600	ICRP-107	1.18E+01	m	7.06E+02	1.04E+08	JAERI	2.7E-11	M	JAERI	4.1E-11	--	--
Ho-154m	Ho-154	153.931	Holmium	0.01	0.01	600	ICRP-107	3.10E+00	m	1.86E+02	3.94E+08	--	--	--	--	--	--	--
Ho-155	Ho-155	154.929	Holmium	0.01	0.01	600	ICRP-38	4.80E+01	m	2.88E+03	2.53E+07	ICRP-68	3.2E-11	M	ICRP-68	3.7E-11	--	--
Ho-156	Ho-156	155.930	Holmium	0.01	0.01	600	ICRP-107	5.60E+01	m	3.36E+03	2.15E+07	JAERI	9.1E-11	M	JAERI	9.0E-12	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Ho-157	Ho-157	156.928	Holmium	0.01	0.01	600	ICRP-38	1.26E+01	m	7.56E+02	9.51E+07	ICRP-68	7.6E-12	M	ICRP-68	6.5E-12	--	--
Ho-158	Ho-158	157.929	Holmium	0.01	0.01	600	JAERI	1.13E+01	m	6.78E+02	1.05E+08	JAERI	1.4E-11	M	JAERI	8.9E-12	--	--
Ho-159	Ho-159	158.928	Holmium	0.01	0.01	600	ICRP-38	3.30E+01	m	1.98E+03	3.59E+07	ICRP-68	1.0E-11	M	ICRP-68	7.9E-12	--	--
Ho-160	Ho-160	159.929	Holmium	0.01	0.01	600	ICRP-107	2.56E+01	m	1.54E+03	4.59E+07	JAERI	2.4E-11	M	JAERI	1.7E-11	--	--
Ho-161	Ho-161	160.928	Holmium	0.01	0.01	600	ICRP-38	2.50E+00	h	9.00E+03	7.79E+06	ICRP-68	1.0E-11	M	ICRP-68	1.3E-11	--	--
Ho-162	Ho-162	161.929	Holmium	0.01	0.01	600	ICRP-38	1.50E+01	m	9.00E+02	7.74E+07	ICRP-68	4.5E-12	M	ICRP-68	3.3E-12	--	--
Ho-162m	Ho-162	161.929	Holmium	0.01	0.01	600	ICRP-38	6.80E+01	m	4.08E+03	1.71E+07	ICRP-68	3.3E-11	M	ICRP-68	2.6E-11	--	--
Ho-163	Ho-163	162.929	Holmium	0.01	0.01	600	ICRP-107	4.57E+03	y	1.44E+11	4.80E-01	JAERI	2.4E-10	M	JAERI	6.8E-12	--	--
Ho-164	Ho-164	163.930	Holmium	0.01	0.01	600	ICRP-38	2.90E+01	m	1.74E+03	3.96E+07	ICRP-68	1.3E-11	M	ICRP-68	9.5E-12	--	--
Ho-164m	Ho-164	163.930	Holmium	0.01	0.01	600	ICRP-38	3.75E+01	m	2.25E+03	3.06E+07	ICRP-68	1.6E-11	M	ICRP-68	1.6E-11	--	--
Ho-166	Ho-166	165.932	Holmium	0.01	0.01	600	ICRP-38	2.68E+01	h	9.65E+04	7.05E+05	ICRP-68	8.3E-10	M	ICRP-68	1.4E-09	--	--
Ho-166m	Ho-166	165.932	Holmium	0.01	0.01	600	ICRP-38	1.20E+03	y	3.79E+10	1.80E+00	ICRP-68	1.1E-07	M	ICRP-68	2.0E-09	--	--
Ho-167	Ho-167	166.933	Holmium	0.01	0.01	600	ICRP-38	3.10E+00	h	1.12E+04	6.06E+06	ICRP-68	1.0E-10	M	ICRP-68	8.3E-11	--	--
Ho-168	Ho-168	167.936	Holmium	0.01	0.01	600	ICRP-107	2.99E+00	m	1.79E+02	3.74E+08	--	--	--	--	--	--	--
Ho-168m	Ho-168	167.936	Holmium	0.01	0.01	600	ICRP-107	1.32E+02	s	1.32E+02	5.09E+08	--	--	--	--	--	--	--
Ho-170	Ho-170	169.940	Holmium	0.01	0.01	600	ICRP-107	2.76E+00	m	1.66E+02	4.01E+08	--	--	--	--	--	--	--
I-118	I-118	117.913	Iodine	0.5	0.15	3	ICRP-107	1.37E+01	m	8.22E+02	1.16E+08	JAERI	1.7E-10	Vap	JAERI	2.0E-10	--	--
I-118m	I-118	117.913	Iodine	0.5	0.15	3	ICRP-107	8.50E+00	m	5.10E+02	1.88E+08	--	--	--	--	--	--	--
I-119	I-119	118.910	Iodine	0.5	0.15	3	ICRP-107	1.91E+01	m	1.15E+03	8.28E+07	JAERI	5.6E-11	Vap	JAERI	4.6E-11	--	--
I-120	I-120	119.910	Iodine	0.5	0.15	3	ICRP-38	8.10E+01	m	4.86E+03	1.94E+07	ICRP-68	3.0E-10	I2	ICRP-68	3.4E-10	--	--
I-120m	I-120	119.910	Iodine	0.5	0.15	3	ICRP-38	5.30E+01	m	3.18E+03	2.96E+07	ICRP-68	1.8E-10	I2	ICRP-68	2.1E-10	--	--
I-121	I-121	120.907	Iodine	0.5	0.15	3	ICRP-38	2.12E+00	h	7.63E+03	1.22E+07	ICRP-68	8.6E-11	I2	ICRP-68	8.2E-11	--	--
I-122	I-122	121.908	Iodine	0.5	0.15	3	ICRP-38	3.62E+00	m	2.17E+02	4.26E+08	--	--	--	--	--	--	--
I-123	I-123	122.906	Iodine	0.5	0.15	3	ICRP-38	1.32E+01	h	4.75E+04	1.93E+06	ICRP-68	2.1E-10	I2	ICRP-68	2.1E-10	--	--
I-124	I-124	123.906	Iodine	0.5	0.15	3	ICRP-38	4.18E+00	d	3.61E+05	2.52E+05	ICRP-68	1.2E-08	I2	ICRP-68	1.3E-08	--	--
I-125	I-125	124.905	Iodine	0.5	0.15	3	ICRP-38	6.01E+01	d	5.20E+06	1.74E+04	ICRP-68	1.4E-08	I2	ICRP-68	1.5E-08	--	--
I-126	I-126	125.906	Iodine	0.5	0.15	3	ICRP-38	1.30E+01	d	1.12E+06	7.97E+04	ICRP-68	2.6E-08	I2	ICRP-68	2.9E-08	--	--
I-128	I-128	127.906	Iodine	0.5	0.15	3	ICRP-38	2.50E+01	m	1.50E+03	5.88E+07	ICRP-68	6.5E-11	I2	ICRP-68	4.6E-11	--	--
I-129	I-129	128.905	Iodine	0.5	0.15	3	ICRP-38	1.57E+07	y	4.95E+14	1.77E-04	ICRP-68	9.6E-08	I2	ICRP-68	1.1E-07	--	--
I-130	I-130	129.907	Iodine	0.5	0.15	3	ICRP-38	1.24E+01	h	4.45E+04	1.95E+06	ICRP-68	1.9E-09	I2	ICRP-68	2.0E-09	--	--
I-130m	I-130	129.907	Iodine	0.5	0.15	3	ICRP-107	8.84E+00	m	5.30E+02	1.64E+08	--	--	--	--	--	--	--
I-131	I-131	130.906	Iodine	0.5	0.15	3	ICRP-38	8.04E+00	d	6.95E+05	1.24E+05	ICRP-68	2.0E-08	I2	ICRP-68	2.2E-08	--	--
I-132	I-132	131.908	Iodine	0.5	0.15	3	ICRP-38	2.30E+00	h	8.28E+03	1.03E+07	ICRP-68	3.1E-10	I2	ICRP-68	2.9E-10	--	--
I-132m	I-132	131.908	Iodine	0.5	0.15	3	ICRP-38	8.36E+01	m	5.02E+03	1.71E+07	ICRP-68	2.7E-10	I2	ICRP-68	2.2E-10	--	--
I-133	I-133	132.908	Iodine	0.5	0.15	3	ICRP-38	2.08E+01	h	7.49E+04	1.13E+06	ICRP-68	4.0E-09	I2	ICRP-68	4.3E-09	--	--
I-134	I-134	133.910	Iodine	0.5	0.15	3	ICRP-38	5.26E+01	m	3.16E+03	2.67E+07	ICRP-68	1.5E-10	I2	ICRP-68	1.1E-10	--	--
I-134m	I-134	133.910	Iodine	0.5	0.15	3	ICRP-107	3.60E+00	m	2.16E+02	3.90E+08	--	--	--	--	--	--	--
I-135	I-135	134.910	Iodine	0.5	0.15	3	ICRP-38	6.61E+00	h	2.38E+04	3.51E+06	ICRP-68	9.2E-10	I2	ICRP-68	9.3E-10	--	--
In-103	In-103	102.920	Indium	0.01	0.004	0	ICRP-107	6.00E+01	s	6.00E+01	1.83E+09	--	--	--	--	--	--	--
In-105	In-105	104.915	Indium	0.01	0.004	0	ICRP-107	5.07E+00	m	3.04E+02	3.53E+08	--	--	--	--	--	--	--
In-106	In-106	105.913	Indium	0.01	0.004	0	ICRP-107	6.20E+00	m	3.72E+02	2.86E+08	--	--	--	--	--	--	--
In-106m	In-106	105.913	Indium	0.01	0.004	0	ICRP-107	5.20E+00	m	3.12E+02	3.41E+08	--	--	--	--	--	--	--
In-107	In-107	106.910	Indium	0.01	0.004	0	ICRP-107	3.24E+01	m	1.94E+03	5.43E+07	JAERI	4.1E-11	M	JAERI	4.1E-11	--	--
In-108	In-108	107.910	Indium	0.01	0.004	0	ICRP-107	5.80E+01	m	3.48E+03	3.00E+07	JAERI	9.2E-11	M	JAERI	8.3E-11	--	--
In-108m	In-108	107.910	Indium	0.01	0.004	0	ICRP-107	3.96E+01	m	2.38E+03	4.40E+07	JAERI	6.5E-11	M	JAERI	8.5E-11	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
In-109	In-109	108.907	Indium	0.01	0.004	0	ICRP-38	4.20E+00	h	1.51E+04	6.85E+06	ICRP-68	7.3E-11	M	ICRP-68	6.6E-11	--	--
In-109m	In-109	108.907	Indium	0.01	0.004	0	ICRP-107	1.34E+00	m	8.04E+01	1.29E+09	--	--	--	--	--	--	--
In-110l	In-110	109.907	Indium	0.01	0.004	0	ICRP-38	4.90E+00	h	1.76E+04	5.82E+06	ICRP-68	2.5E-10	M	ICRP-68	2.4E-10	--	--
In-110s	In-110	109.907	Indium	0.01	0.004	0	ICRP-38	6.91E+01	m	4.15E+03	2.48E+07	ICRP-68	8.1E-11	M	ICRP-68	1.0E-10	--	--
In-111	In-111	110.905	Indium	0.01	0.004	0	ICRP-38	2.83E+00	d	2.45E+05	4.16E+05	ICRP-68	3.1E-10	M	ICRP-68	2.9E-10	--	--
In-111m	In-111	110.905	Indium	0.01	0.004	0	ICRP-38	7.70E+00	m	4.62E+02	2.20E+08	--	--	--	--	--	--	--
In-112	In-112	111.906	Indium	0.01	0.004	0	ICRP-38	1.44E+01	m	8.64E+02	1.17E+08	ICRP-68	1.3E-11	M	ICRP-68	1.0E-11	--	--
In-112m	In-112	111.906	Indium	0.01	0.004	0	ICRP-107	2.06E+01	m	1.23E+03	8.17E+07	JAERI	3.6E-11	M	JAERI	1.7E-11	--	--
In-113m	In-113	112.904	Indium	0.01	0.004	0	ICRP-38	1.66E+00	h	5.97E+03	1.67E+07	ICRP-68	3.2E-11	M	ICRP-68	2.8E-11	--	--
In-114	In-114	113.905	Indium	0.01	0.004	0	ICRP-38	7.19E+01	s	7.19E+01	1.38E+09	--	--	--	--	--	--	--
In-114m	In-114	113.905	Indium	0.01	0.004	0	ICRP-38	4.95E+01	d	4.28E+06	2.32E+04	ICRP-68	1.1E-08	F	ICRP-68	4.1E-09	--	--
In-115	In-115	114.904	Indium	0.01	0.004	0	ICRP-38	5.10E+15	y	1.61E+23	6.10E-13	ICRP-68	4.5E-07	F	ICRP-68	3.2E-08	--	--
In-115m	In-115	114.904	Indium	0.01	0.004	0	ICRP-38	4.49E+00	h	1.61E+04	6.08E+06	ICRP-68	8.7E-11	M	ICRP-68	8.6E-11	--	--
In-116m	In-116	115.905	Indium	0.01	0.004	0	ICRP-38	5.42E+01	m	3.25E+03	3.00E+07	ICRP-68	8.0E-11	M	ICRP-68	6.4E-11	--	--
In-117	In-117	116.905	Indium	0.01	0.004	0	ICRP-38	4.38E+01	m	2.63E+03	3.67E+07	ICRP-68	4.8E-11	M	ICRP-68	3.1E-11	--	--
In-117m	In-117	116.905	Indium	0.01	0.004	0	ICRP-38	1.17E+02	m	6.99E+03	1.38E+07	ICRP-68	1.1E-10	M	ICRP-68	1.2E-10	--	--
In-118	In-118	117.906	Indium	0.01	0.004	0	ICRP-107	5.00E+00	s	5.00E+00	1.91E+10	--	--	--	--	--	--	--
In-118m	In-118	117.906	Indium	0.01	0.004	0	ICRP-107	4.36E+00	m	2.62E+02	3.65E+08	--	--	--	--	--	--	--
In-119	In-119	118.906	Indium	0.01	0.004	0	ICRP-38	2.40E+00	m	1.44E+02	6.59E+08	--	--	--	--	--	--	--
In-119m	In-119	118.906	Indium	0.01	0.004	0	ICRP-38	1.80E+01	m	1.08E+03	8.78E+07	ICRP-68	2.9E-11	M	ICRP-68	4.7E-11	--	--
In-121	In-121	120.908	Indium	0.01	0.004	0	ICRP-107	2.31E+01	s	2.31E+01	4.04E+09	--	--	--	--	--	--	--
In-121m	In-121	120.908	Indium	0.01	0.004	0	ICRP-107	3.88E+00	m	2.33E+02	4.01E+08	--	--	--	--	--	--	--
Ir-179	Ir-179	178.959	Iridium	0.001	0.055	0	JAERI	1.32E+00	m	7.90E+01	7.98E+08	--	--	--	--	--	--	--
Ir-180	Ir-180	179.959	Iridium	0.001	0.055	0	ICRP-107	1.50E+00	m	9.00E+01	6.97E+08	--	--	--	--	--	--	--
Ir-181	Ir-181	180.958	Iridium	0.001	0.055	0	JAERI	4.90E+00	m	2.94E+02	2.12E+08	--	--	--	--	--	--	--
Ir-182	Ir-182	181.958	Iridium	0.001	0.055	0	ICRP-38	1.50E+01	m	9.00E+02	6.89E+07	ICRP-68	4.0E-11	S	ICRP-68	4.8E-11	--	--
Ir-183	Ir-183	182.957	Iridium	0.001	0.055	0	ICRP-107	5.80E+01	m	3.48E+03	1.77E+07	JAERI	6.4E-11	S	JAERI	5.5E-11	--	--
Ir-184	Ir-184	183.957	Iridium	0.001	0.055	0	ICRP-38	3.02E+00	h	1.09E+04	5.64E+06	ICRP-68	1.9E-10	S	ICRP-68	1.7E-10	--	--
Ir-185	Ir-185	184.957	Iridium	0.001	0.055	0	ICRP-38	1.40E+01	h	5.04E+04	1.21E+06	ICRP-68	2.6E-10	S	ICRP-68	2.6E-10	--	--
Ir-186l	Ir-186	185.958	Iridium	0.001	0.055	0	ICRP-38	1.58E+01	h	5.69E+04	1.07E+06	ICRP-68	5.0E-10	S	ICRP-68	4.9E-10	--	--
Ir-186s	Ir-186	185.958	Iridium	0.001	0.055	0	ICRP-38	1.75E+00	h	6.30E+03	9.63E+06	ICRP-68	7.1E-11	S	ICRP-68	6.1E-11	--	--
Ir-187	Ir-187	186.958	Iridium	0.001	0.055	0	ICRP-38	1.05E+01	h	3.78E+04	1.60E+06	ICRP-68	1.2E-10	S	ICRP-68	1.2E-10	--	--
Ir-188	Ir-188	187.959	Iridium	0.001	0.055	0	ICRP-38	4.15E+01	h	1.49E+05	4.02E+05	ICRP-68	6.2E-10	S	ICRP-68	6.3E-10	--	--
Ir-189	Ir-189	188.959	Iridium	0.001	0.055	0	ICRP-38	1.33E+01	d	1.15E+06	5.20E+04	ICRP-68	5.5E-10	S	ICRP-68	2.4E-10	--	--
Ir-190	Ir-190	189.961	Iridium	0.001	0.055	0	ICRP-38	1.21E+01	d	1.05E+06	5.68E+04	ICRP-68	2.5E-09	S	ICRP-68	1.2E-09	--	--
Ir-190ms	Ir-190	189.961	Iridium	0.001	0.055	0	ICRP-38	1.20E+00	h	4.32E+03	1.37E+07	ICRP-68	1.1E-11	S	ICRP-68	8.0E-12	--	--
Ir-190ml	Ir-190	189.961	Iridium	0.001	0.055	0	ICRP-38	3.10E+00	h	1.12E+04	5.32E+06	ICRP-68	1.4E-10	M	ICRP-68	1.2E-10	--	--
Ir-191m	Ir-191	190.961	Iridium	0.001	0.055	0	ICRP-38	4.94E+00	s	4.94E+00	1.20E+10	--	--	--	--	--	--	--
Ir-192	Ir-192	191.963	Iridium	0.001	0.055	0	ICRP-38	7.40E+01	d	6.40E+06	9.19E+03	ICRP-68	6.2E-09	S	ICRP-68	1.4E-09	--	--
Ir-192ms	Ir-192	191.963	Iridium	0.001	0.055	0	ICRP-107	1.45E+00	m	8.70E+01	6.76E+08	--	--	--	--	--	--	--
Ir-192ml	Ir-192	191.963	Iridium	0.001	0.055	0	ICRP-38	2.41E+02	y	7.61E+09	7.73E+00	ICRP-68	3.6E-08	S	ICRP-68	3.1E-10	--	--
Ir-193m	Ir-193	192.963	Iridium	0.001	0.055	0	ICRP-107	1.05E+01	d	9.10E+05	6.43E+04	ICRP-68	1.2E-09	S	ICRP-68	2.7E-10	--	--
Ir-194	Ir-194	193.965	Iridium	0.001	0.055	0	ICRP-38	1.92E+01	h	6.89E+04	8.44E+05	ICRP-68	7.5E-10	S	ICRP-68	1.3E-09	--	--
Ir-194m	Ir-194	193.965	Iridium	0.001	0.055	0	ICRP-38	1.71E+02	d	1.48E+07	3.94E+03	ICRP-68	1.2E-08	S	ICRP-68	2.1E-09	--	--
Ir-195	Ir-195	194.966	Iridium	0.001	0.055	0	ICRP-38	2.50E+00	h	9.00E+03	6.43E+06	ICRP-68	1.0E-10	S	ICRP-68	1.0E-10	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Ir-195m	Ir-195	194.966	Iridium	0.001	0.055	0	ICRP-38	3.80E+00	h	1.37E+04	4.23E+06	ICRP-68	2.4E-10	S	ICRP-68	2.1E-10	--	--
Ir-196	Ir-196	195.968	Iridium	0.001	0.055	0	ICRP-107	5.20E+01	s	5.20E+01	1.11E+09	--	--	--	--	--	--	--
Ir-196m	Ir-196	195.968	Iridium	0.001	0.055	0	ICRP-107	1.40E+00	h	5.04E+03	1.14E+07	JAERI	1.6E-10	S	JAERI	1.3E-10	--	--
K-38	K-38	37.969	Potassium	0.01	1	35	ICRP-38	7.64E+00	m	4.58E+02	6.49E+08	--	--	--	--	--	--	--
K-40	K-40	39.964	Potassium	0.01	1	35	ICRP-38	1.28E+09	y	4.04E+16	6.99E-06	ICRP-68	3.0E-09	F	ICRP-68	6.2E-09	--	--
K-42	K-42	41.962	Potassium	0.01	1	35	ICRP-38	1.24E+01	h	4.45E+04	6.04E+06	ICRP-68	2.0E-10	F	ICRP-68	4.3E-10	--	--
K-43	K-43	42.961	Potassium	0.01	1	35	ICRP-38	2.26E+01	h	8.14E+04	3.23E+06	ICRP-68	2.6E-10	F	ICRP-68	2.5E-10	--	--
K-44	K-44	43.962	Potassium	0.01	1	35	ICRP-38	2.21E+01	m	1.33E+03	1.93E+08	ICRP-68	3.7E-11	F	ICRP-68	8.4E-11	--	--
K-45	K-45	44.961	Potassium	0.01	1	35	ICRP-38	2.00E+01	m	1.20E+03	2.09E+08	ICRP-68	2.8E-11	F	ICRP-68	5.4E-11	--	--
K-46	K-46	45.962	Potassium	0.01	1	35	ICRP-107	1.05E+02	s	1.05E+02	2.34E+09	--	--	--	--	--	--	--
Kr-74	Kr-74	73.933	Krypton	1	0	0	ICRP-38	1.15E+01	m	6.90E+02	2.21E+08	--	--	--	--	--	ICRP-68	4.50E-09
Kr-75	Kr-75	74.931	Krypton	1	0	0	ICRP-107	4.29E+00	m	2.57E+02	5.85E+08	--	--	--	--	--	JAERI	5.10E-09
Kr-76	Kr-76	75.926	Krypton	1	0	0	ICRP-38	1.48E+01	h	5.33E+04	2.79E+06	--	--	--	--	--	ICRP-68	1.60E-09
Kr-77	Kr-77	76.925	Krypton	1	0	0	ICRP-38	7.47E+01	m	4.48E+03	3.27E+07	--	--	--	--	--	ICRP-68	3.90E-09
Kr-79	Kr-79	78.920	Krypton	1	0	0	ICRP-38	3.50E+01	h	1.26E+05	1.13E+06	--	--	--	--	--	ICRP-68	9.70E-10
Kr-81	Kr-81	80.917	Krypton	1	0	0	ICRP-38	2.10E+05	y	6.63E+12	2.10E-02	--	--	--	--	--	ICRP-68	2.10E-11
Kr-81m	Kr-81	80.917	Krypton	1	0	0	ICRP-38	1.30E+01	s	1.30E+01	1.07E+10	--	--	--	--	--	ICRP-68	4.80E-10
Kr-83m	Kr-83	82.914	Krypton	1	0	0	ICRP-38	1.83E+00	h	6.59E+03	2.07E+07	--	--	--	--	--	ICRP-68	2.10E-13
Kr-85	Kr-85	84.913	Krypton	1	0	0	ICRP-38	1.07E+01	y	3.38E+08	3.93E+02	--	--	--	--	--	ICRP-68	2.20E-11
Kr-85m	Kr-85	84.913	Krypton	1	0	0	ICRP-38	4.48E+00	h	1.61E+04	8.24E+06	--	--	--	--	--	ICRP-68	5.90E-10
Kr-87	Kr-87	86.913	Krypton	1	0	0	ICRP-38	7.63E+01	m	4.58E+03	2.84E+07	--	--	--	--	--	ICRP-68	3.40E-09
Kr-88	Kr-88	87.914	Krypton	1	0	0	ICRP-38	2.84E+00	h	1.02E+04	1.26E+07	--	--	--	--	--	ICRP-68	8.40E-09
Kr-89	Kr-89	88.918	Krypton	1	0	0	ICRP-107	3.15E+00	m	1.89E+02	6.71E+08	--	--	--	--	--	JAERI	8.30E-09
La-128	La-128	127.916	Lanthanum	0.01	0.01	0	ICRP-107	5.18E+00	m	3.11E+02	2.84E+08	--	--	--	--	--	--	--
La-129	La-129	128.913	Lanthanum	0.01	0.01	0	ICRP-107	1.16E+01	m	6.96E+02	1.26E+08	JAERI	2.1E-11	M	JAERI	2.7E-11	--	--
La-130	La-130	129.912	Lanthanum	0.01	0.01	0	ICRP-107	8.70E+00	m	5.22E+02	1.66E+08	--	--	--	--	--	--	--
La-131	La-131	130.910	Lanthanum	0.01	0.01	0	ICRP-38	5.90E+01	m	3.54E+03	2.43E+07	ICRP-68	3.6E-11	M	ICRP-68	3.5E-11	--	--
La-132	La-132	131.910	Lanthanum	0.01	0.01	0	ICRP-38	4.80E+00	h	1.73E+04	4.95E+06	ICRP-68	2.8E-10	M	ICRP-68	3.9E-10	--	--
La-132m	La-132	131.910	Lanthanum	0.01	0.01	0	ICRP-107	2.43E+01	m	1.46E+03	5.87E+07	JAERI	3.4E-11	M	JAERI	3.8E-11	--	--
La-133	La-133	132.908	Lanthanum	0.01	0.01	0	ICRP-107	3.91E+00	h	1.41E+04	6.03E+06	JAERI	3.7E-11	M	JAERI	4.6E-11	--	--
La-134	La-134	133.909	Lanthanum	0.01	0.01	0	ICRP-38	6.67E+00	m	4.00E+02	2.11E+08	--	--	--	--	--	--	--
La-135	La-135	134.907	Lanthanum	0.01	0.01	0	ICRP-38	1.95E+01	h	7.02E+04	1.19E+06	ICRP-68	2.5E-11	M	ICRP-68	3.0E-11	--	--
La-136	La-136	135.908	Lanthanum	0.01	0.01	0	ICRP-107	9.87E+00	m	5.92E+02	1.40E+08	--	--	--	--	--	--	--
La-137	La-137	136.906	Lanthanum	0.01	0.01	0	ICRP-38	6.00E+04	y	1.89E+12	4.35E-02	ICRP-68	1.0E-08	F	ICRP-68	8.1E-11	--	--
La-138	La-138	137.907	Lanthanum	0.01	0.01	0	ICRP-38	1.35E+11	y	4.26E+18	1.92E-08	ICRP-68	1.8E-07	F	ICRP-68	1.1E-09	--	--
La-140	La-140	139.909	Lanthanum	0.01	0.01	0	ICRP-38	4.03E+01	h	1.45E+05	5.56E+05	ICRP-68	1.5E-09	M	ICRP-68	2.0E-09	--	--
La-141	La-141	140.911	Lanthanum	0.01	0.01	0	ICRP-38	3.93E+00	h	1.41E+04	5.66E+06	ICRP-68	2.2E-10	M	ICRP-68	3.6E-10	--	--
La-142	La-142	141.914	Lanthanum	0.01	0.01	0	ICRP-38	9.25E+01	m	5.55E+03	1.43E+07	ICRP-68	1.5E-10	M	ICRP-68	1.8E-10	--	--
La-143	La-143	142.916	Lanthanum	0.01	0.01	0	ICRP-38	1.42E+01	m	8.54E+02	9.25E+07	ICRP-68	3.3E-11	M	ICRP-68	5.6E-11	--	--
Lu-164	Lu-164	163.941	Lutetium	0.01	0.01	0	JAERI	3.14E+00	m	1.88E+02	3.65E+08	--	--	--	--	--	--	--
Lu-165	Lu-165	164.939	Lutetium	0.01	0.01	0	ICRP-107	1.07E+01	m	6.44E+02	1.06E+08	JAERI	2.3E-11	S	JAERI	2.3E-11	--	--
Lu-166	Lu-166	165.940	Lutetium	0.01	0.01	0	JAERI	2.65E+00	m	1.59E+02	4.28E+08	--	--	--	--	--	--	--
Lu-166m	Lu-166	165.940	Lutetium	0.01	0.01	0	JAERI	1.41E+00	m	8.46E+01	8.04E+08	--	--	--	--	--	--	--
Lu-167	Lu-167	166.938	Lutetium	0.01	0.01	0	ICRP-107	5.15E+01	m	3.09E+03	2.19E+07	JAERI	6.0E-11	S	JAERI	5.0E-11	--	--
Lu-168m	Lu-168	167.939	Lutetium	0.01	0.01	0	JAERI	6.70E+00	m	4.02E+02	1.67E+08	--	--	--	--	--	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Lu-169	Lu-169	168.938	Lutetium	0.01	0.01	0	ICRP-38	3.41E+01	h	1.23E+05	5.45E+05	ICRP-68	4.9E-10	S	ICRP-68	4.6E-10	--	--
Lu-169m	Lu-169	168.938	Lutetium	0.01	0.01	0	ICRP-107	1.60E+02	s	1.60E+02	4.17E+08	--	--	--	--	--	--	--
Lu-170	Lu-170	169.938	Lutetium	0.01	0.01	0	ICRP-38	2.00E+00	d	1.73E+05	3.84E+05	ICRP-68	9.5E-10	S	ICRP-68	9.9E-10	--	--
Lu-171	Lu-171	170.938	Lutetium	0.01	0.01	0	ICRP-38	8.22E+00	d	7.10E+05	9.29E+04	ICRP-68	9.3E-10	S	ICRP-68	6.7E-10	--	--
Lu-171m	Lu-171	170.938	Lutetium	0.01	0.01	0	ICRP-107	7.90E+01	s	7.90E+01	8.35E+08	--	--	--	--	--	--	--
Lu-172	Lu-172	171.939	Lutetium	0.01	0.01	0	ICRP-38	6.70E+00	d	5.79E+05	1.13E+05	ICRP-68	1.8E-09	S	ICRP-68	1.3E-09	--	--
Lu-172m	Lu-172	171.939	Lutetium	0.01	0.01	0	ICRP-107	3.70E+00	m	2.22E+02	2.96E+08	--	--	--	--	--	--	--
Lu-173	Lu-173	172.939	Lutetium	0.01	0.01	0	ICRP-38	1.37E+00	y	4.32E+07	1.51E+03	ICRP-68	2.3E-09	S	ICRP-68	2.6E-10	--	--
Lu-174	Lu-174	173.940	Lutetium	0.01	0.01	0	ICRP-38	3.31E+00	y	1.04E+08	6.21E+02	ICRP-68	4.0E-09	M	ICRP-68	2.7E-10	--	--
Lu-174m	Lu-174	173.940	Lutetium	0.01	0.01	0	ICRP-38	1.42E+02	d	1.23E+07	5.29E+03	ICRP-68	3.8E-09	S	ICRP-68	5.3E-10	--	--
Lu-176	Lu-176	175.943	Lutetium	0.01	0.01	0	ICRP-38	3.60E+10	y	1.14E+18	5.64E-08	ICRP-68	6.6E-08	M	ICRP-68	1.8E-09	--	--
Lu-176m	Lu-176	175.943	Lutetium	0.01	0.01	0	ICRP-38	3.68E+00	h	1.32E+04	4.84E+06	ICRP-68	1.6E-10	S	ICRP-68	1.7E-10	--	--
Lu-177	Lu-177	176.944	Lutetium	0.01	0.01	0	ICRP-38	6.71E+00	d	5.80E+05	1.10E+05	ICRP-68	1.1E-09	S	ICRP-68	5.3E-10	--	--
Lu-177m	Lu-177	176.944	Lutetium	0.01	0.01	0	ICRP-38	1.61E+02	d	1.39E+07	4.59E+03	ICRP-68	1.5E-08	S	ICRP-68	1.7E-09	--	--
Lu-178	Lu-178	177.946	Lutetium	0.01	0.01	0	ICRP-38	2.84E+01	m	1.70E+03	3.72E+07	ICRP-68	4.1E-11	S	ICRP-68	4.7E-11	--	--
Lu-178m	Lu-178	177.946	Lutetium	0.01	0.01	0	ICRP-38	2.27E+01	m	1.36E+03	4.65E+07	ICRP-68	5.6E-11	S	ICRP-68	3.8E-11	--	--
Lu-179	Lu-179	178.947	Lutetium	0.01	0.01	0	ICRP-38	4.59E+00	h	1.65E+04	3.82E+06	ICRP-68	1.6E-10	M	ICRP-68	2.1E-10	--	--
Lu-180	Lu-180	179.950	Lutetium	0.01	0.01	0	ICRP-107	5.70E+00	m	3.42E+02	1.83E+08	--	--	--	--	--	--	--
Lu-181	Lu-181	180.952	Lutetium	0.01	0.01	0	ICRP-107	3.50E+00	m	2.10E+02	2.97E+08	--	--	--	--	--	--	--
Md-257	Md-257	257.096	Mendelevium	0.001	0.001	0	ICRP-38	5.20E+00	h	1.87E+04	2.34E+06	ICRP-68	2.3E-08	M	ICRP-68	1.2E-10	--	--
Md-258	Md-258	258.098	Mendelevium	0.001	0.001	0	ICRP-38	5.50E+01	d	4.75E+06	9.20E+03	ICRP-68	5.5E-06	M	ICRP-68	1.3E-08	--	--
Mg-27	Mg-27	26.984	Magnesium	0.01	1	0	ICRP-107	9.46E+00	m	5.67E+02	7.37E+08	--	--	--	--	--	--	--
Mg-28	Mg-28	27.984	Magnesium	0.01	1	0	ICRP-38	2.09E+01	h	7.53E+04	5.36E+06	ICRP-68	1.7E-09	M	ICRP-68	2.2E-09	--	--
Mn-50m	Mn-50	49.954	Manganese	0.01	0.25	0	ICRP-107	1.75E+00	m	1.05E+02	2.15E+09	--	--	--	--	--	--	--
Mn-51	Mn-51	50.948	Manganese	0.01	0.25	0	ICRP-38	4.62E+01	m	2.77E+03	7.99E+07	ICRP-68	6.8E-11	M	ICRP-68	9.3E-11	--	--
Mn-52	Mn-52	51.946	Manganese	0.01	0.25	0	ICRP-38	5.59E+00	d	4.83E+05	4.50E+05	ICRP-68	1.8E-09	M	ICRP-68	1.8E-09	--	--
Mn-52m	Mn-52	51.946	Manganese	0.01	0.25	0	ICRP-38	2.11E+01	m	1.27E+03	1.72E+08	ICRP-68	5.0E-11	M	ICRP-68	6.9E-11	--	--
Mn-53	Mn-53	52.941	Manganese	0.01	0.25	0	ICRP-38	3.70E+06	y	1.17E+14	1.83E-03	ICRP-68	5.2E-11	M	ICRP-68	3.0E-11	--	--
Mn-54	Mn-54	53.940	Manganese	0.01	0.25	0	ICRP-38	3.13E+02	d	2.70E+07	7.75E+03	ICRP-68	1.5E-09	M	ICRP-68	7.1E-10	--	--
Mn-56	Mn-56	55.939	Manganese	0.01	0.25	0	ICRP-38	2.58E+00	h	9.28E+03	2.17E+07	ICRP-68	2.0E-10	M	ICRP-68	2.5E-10	--	--
Mn-57	Mn-57	56.938	Manganese	0.01	0.25	0	ICRP-107	8.54E+01	s	8.54E+01	2.32E+09	--	--	--	--	--	--	--
Mn-58m	Mn-58	57.940	Manganese	0.01	0.25	0	ICRP-107	6.52E+01	s	6.52E+01	2.99E+09	--	--	--	--	--	--	--
Mo-101	Mo-101	100.910	Molybdenum	0.01	0.25	5	ICRP-38	1.46E+01	m	8.77E+02	1.27E+08	ICRP-68	4.5E-11	S	ICRP-68	4.2E-11	--	--
Mo-102	Mo-102	101.910	Molybdenum	0.01	0.25	5	ICRP-107	1.13E+01	m	6.78E+02	1.63E+08	JAERI	4.2E-11	S	JAERI	6.9E-11	--	--
Mo-89	Mo-89	88.919	Molybdenum	0.01	0.25	5	ICRP-107	2.11E+00	m	1.27E+02	1.00E+09	--	--	--	--	--	--	--
Mo-90	Mo-90	89.914	Molybdenum	0.01	0.25	5	ICRP-38	5.67E+00	h	2.04E+04	6.15E+06	ICRP-68	5.6E-10	S	ICRP-68	6.2E-10	--	--
Mo-91	Mo-91	90.912	Molybdenum	0.01	0.25	5	ICRP-107	1.55E+01	m	9.29E+02	1.34E+08	JAERI	3.5E-11	S	JAERI	6.1E-11	--	--
Mo-91m	Mo-91	90.912	Molybdenum	0.01	0.25	5	ICRP-107	6.46E+01	s	6.46E+01	1.92E+09	--	--	--	--	--	--	--
Mo-93	Mo-93	92.907	Molybdenum	0.01	0.25	5	ICRP-38	3.50E+03	y	1.10E+11	1.10E+00	ICRP-68	2.2E-09	S	ICRP-68	2.6E-09	--	--
Mo-93m	Mo-93	92.907	Molybdenum	0.01	0.25	5	ICRP-38	6.85E+00	h	2.47E+04	4.92E+06	ICRP-68	3.0E-10	S	ICRP-68	2.8E-10	--	--
Mo-99	Mo-99	98.908	Molybdenum	0.01	0.25	5	ICRP-38	6.60E+01	h	2.38E+05	4.80E+05	ICRP-68	1.1E-09	S	ICRP-68	1.2E-09	--	--
N-13	N-13	13.006	Nitrogen	--	--	--	ICRP-38	9.97E+00	m	5.98E+02	1.45E+09	--	--	--	--	--	JAERI	4.00E-09
N-16	N-16	16.006	Nitrogen	--	--	--	ICRP-107	7.13E+00	s	7.13E+00	9.89E+10	--	--	--	--	--	--	--
Na-22	Na-22	21.994	Sodium	0.01	0.075	10	ICRP-38	2.60E+00	y	8.21E+07	6.25E+03	ICRP-68	2.0E-09	F	ICRP-68	3.2E-09	--	--
Na-24	Na-24	23.991	Sodium	0.01	0.075	10	ICRP-38	1.50E+01	h	5.40E+04	8.71E+06	ICRP-68	5.3E-10	F	ICRP-68	4.3E-10	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Nb-87	Nb-87	86.921	Niobium	0.01	0.02	2000	ICRP-107	3.75E+00	m	2.25E+02	5.77E+08	--	--	--	--	--	--	--
Nb-88	Nb-88	87.918	Niobium	0.01	0.02	2000	ICRP-38	1.43E+01	m	8.58E+02	1.50E+08	ICRP-68	5.0E-11	S	ICRP-68	6.3E-11	--	--
Nb-88m	Nb-88	87.918	Niobium	0.01	0.02	2000	ICRP-107	7.78E+00	m	4.67E+02	2.75E+08	--	--	--	--	--	--	--
Nb-89l	Nb-89	88.913	Niobium	0.01	0.02	2000	ICRP-38	1.22E+02	m	7.32E+03	1.73E+07	ICRP-68	1.9E-10	S	ICRP-68	3.0E-10	--	--
Nb-89s	Nb-89	88.913	Niobium	0.01	0.02	2000	ICRP-38	6.60E+01	m	3.96E+03	3.20E+07	ICRP-68	1.2E-10	S	ICRP-68	1.4E-10	--	--
Nb-90	Nb-90	89.911	Niobium	0.01	0.02	2000	ICRP-38	1.46E+01	h	5.26E+04	2.39E+06	ICRP-68	1.1E-09	S	ICRP-68	1.2E-09	--	--
Nb-91	Nb-91	90.907	Niobium	0.01	0.02	2000	ICRP-107	6.80E+02	y	2.15E+10	5.78E+00	JAERI	1.7E-09	S	JAERI	4.6E-11	--	--
Nb-91m	Nb-91	90.907	Niobium	0.01	0.02	2000	ICRP-107	6.09E+01	d	5.26E+06	2.36E+04	JAERI	3.9E-09	S	JAERI	4.1E-10	--	--
Nb-92	Nb-92	91.907	Niobium	0.01	0.02	2000	ICRP-107	3.47E+07	y	1.10E+15	1.12E-04	JAERI	2.5E-08	S	JAERI	1.0E-09	--	--
Nb-92m	Nb-92	91.907	Niobium	0.01	0.02	2000	ICRP-107	1.02E+01	d	8.77E+05	1.40E+05	JAERI	5.4E-10	M	JAERI	5.0E-10	--	--
Nb-93m	Nb-93	92.906	Niobium	0.01	0.02	2000	ICRP-38	1.36E+01	y	4.29E+08	2.83E+02	ICRP-68	1.6E-09	S	ICRP-68	1.2E-10	--	--
Nb-94	Nb-94	93.907	Niobium	0.01	0.02	2000	ICRP-38	2.03E+04	y	6.41E+11	1.88E-01	ICRP-68	4.5E-08	S	ICRP-68	1.7E-09	--	--
Nb-94m	Nb-94	93.907	Niobium	0.01	0.02	2000	ICRP-107	6.26E+00	m	3.76E+02	3.20E+08	--	--	--	--	--	--	--
Nb-95	Nb-95	94.907	Niobium	0.01	0.02	2000	ICRP-38	3.52E+01	d	3.04E+06	3.91E+04	ICRP-68	1.6E-09	S	ICRP-68	5.8E-10	--	--
Nb-95m	Nb-95	94.907	Niobium	0.01	0.02	2000	ICRP-38	8.66E+01	h	3.12E+05	3.81E+05	ICRP-68	8.5E-10	S	ICRP-68	5.6E-10	--	--
Nb-96	Nb-96	95.908	Niobium	0.01	0.02	2000	ICRP-38	2.34E+01	h	8.41E+04	1.40E+06	ICRP-68	1.0E-09	S	ICRP-68	1.1E-09	--	--
Nb-97	Nb-97	96.908	Niobium	0.01	0.02	2000	ICRP-38	7.21E+01	m	4.33E+03	2.69E+07	ICRP-68	7.2E-11	S	ICRP-68	6.8E-11	--	--
Nb-97m	Nb-97	96.908	Niobium	0.01	0.02	2000	ICRP-38	6.00E+01	s	6.00E+01	1.94E+09	--	--	--	--	--	--	--
Nb-98	Nb-98	97.910	Niobium	0.01	0.02	2000	ICRP-38	5.15E+01	m	3.09E+03	3.73E+07	ICRP-68	9.9E-11	S	ICRP-68	1.1E-10	--	--
Nb-99	Nb-99	98.912	Niobium	0.01	0.02	2000	ICRP-107	1.50E+01	s	1.50E+01	7.60E+09	--	--	--	--	--	--	--
Nb-99m	Nb-99	98.912	Niobium	0.01	0.02	2000	ICRP-107	2.60E+00	m	1.56E+02	7.31E+08	--	--	--	--	--	--	--
Nd-134	Nd-134	133.919	Neodymium	0.01	0.01	500	ICRP-107	8.50E+00	m	5.10E+02	1.65E+08	--	--	--	--	--	--	--
Nd-135	Nd-135	134.918	Neodymium	0.01	0.01	500	ICRP-107	1.24E+01	m	7.44E+02	1.12E+08	JAERI	4.5E-11	S	JAERI	6.0E-11	--	--
Nd-136	Nd-136	135.915	Neodymium	0.01	0.01	500	ICRP-38	5.07E+01	m	3.04E+03	2.73E+07	ICRP-68	8.9E-11	S	ICRP-68	9.9E-11	--	--
Nd-137	Nd-137	136.915	Neodymium	0.01	0.01	500	ICRP-107	3.85E+01	m	2.31E+03	3.57E+07	JAERI	5.0E-11	S	JAERI	5.9E-11	--	--
Nd-138	Nd-138	137.912	Neodymium	0.01	0.01	500	ICRP-38	5.04E+00	h	1.81E+04	4.51E+06	ICRP-68	3.8E-10	S	ICRP-68	6.4E-10	--	--
Nd-139	Nd-139	138.912	Neodymium	0.01	0.01	500	ICRP-38	2.97E+01	m	1.78E+03	4.56E+07	ICRP-68	1.7E-11	M	ICRP-68	2.0E-11	--	--
Nd-139m	Nd-139	138.912	Neodymium	0.01	0.01	500	ICRP-38	5.50E+00	h	1.98E+04	4.10E+06	ICRP-68	2.5E-10	M	ICRP-68	2.5E-10	--	--
Nd-140	Nd-140	139.910	Neodymium	0.01	0.01	500	ICRP-107	3.37E+00	d	2.91E+05	2.77E+05	JAERI	1.3E-09	M	JAERI	2.0E-09	--	--
Nd-141	Nd-141	140.910	Neodymium	0.01	0.01	500	ICRP-38	2.49E+00	h	8.96E+03	8.93E+06	ICRP-68	8.8E-12	S	ICRP-68	8.3E-12	--	--
Nd-141m	Nd-141	140.910	Neodymium	0.01	0.01	500	ICRP-38	6.24E+01	s	6.24E+01	1.28E+09	--	--	--	--	--	--	--
Nd-144	Nd-144	143.910	Neodymium	0.01	0.01	500	ICRP-107	2.29E+15	y	7.23E+22	1.08E-12	JAERI	7.4E-06	M	JAERI	4.1E-08	--	--
Nd-147	Nd-147	146.916	Neodymium	0.01	0.01	500	ICRP-38	1.10E+01	d	9.49E+05	8.09E+04	ICRP-68	2.3E-09	S	ICRP-68	1.1E-09	--	--
Nd-149	Nd-149	148.920	Neodymium	0.01	0.01	500	ICRP-38	1.73E+00	h	6.23E+03	1.22E+07	ICRP-68	1.3E-10	S	ICRP-68	1.2E-10	--	--
Nd-151	Nd-151	150.924	Neodymium	0.01	0.01	500	ICRP-38	1.24E+01	m	7.46E+02	1.00E+08	ICRP-68	2.9E-11	S	ICRP-68	3.0E-11	--	--
Nd-152	Nd-152	151.925	Neodymium	0.01	0.01	500	ICRP-107	1.14E+01	m	6.84E+02	1.09E+08	JAERI	4.0E-11	S	JAERI	4.9E-11	--	--
Ne-19	Ne-19	19.002	Neon	--	--	--	ICRP-38	1.72E+01	s	1.72E+01	3.45E+10	--	--	--	--	--	--	--
Ne-24	Ne-24	23.994	Neon	--	--	--	ICRP-107	3.38E+00	m	2.03E+02	2.32E+09	--	--	--	--	--	--	--
Ni-56	Ni-56	55.942	Nickel	0.01	0.06	100	ICRP-38	6.10E+00	d	5.27E+05	3.83E+05	ICRP-68	1.2E-09	0	ICRP-68	8.6E-10	--	--
Ni-57	Ni-57	56.940	Nickel	0.01	0.06	100	ICRP-38	3.61E+01	h	1.30E+05	1.53E+06	ICRP-68	7.6E-10	M	ICRP-68	8.7E-10	--	--
Ni-59	Ni-59	58.934	Nickel	0.01	0.06	100	ICRP-38	7.50E+04	y	2.37E+12	8.09E-02	ICRP-68	8.3E-10	0	ICRP-68	6.3E-11	--	--
Ni-63	Ni-63	62.930	Nickel	0.01	0.06	100	ICRP-38	9.60E+01	y	3.03E+09	5.92E+01	ICRP-68	2.0E-09	0	ICRP-68	1.5E-10	--	--
Ni-65	Ni-65	64.930	Nickel	0.01	0.06	100	ICRP-38	2.52E+00	h	9.07E+03	1.92E+07	ICRP-68	3.6E-10	0	ICRP-68	1.8E-10	--	--
Ni-66	Ni-66	65.929	Nickel	0.01	0.06	100	ICRP-38	5.46E+01	h	1.97E+05	8.71E+05	ICRP-68	1.9E-09	M	ICRP-68	3.0E-09	--	--
Np-231	Np-231	231.038	Neptunium	0.001	0.1	10	JAERI	4.88E+01	m	2.93E+03	1.67E+07	JAERI	1.7E-09	M	JAERI	2.9E-11	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																	
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Np-232	Np-232	232.040	Neptunium	0.001	0.1	10	ICRP-38	1.47E+01	m	8.82E+02	5.51E+07	ICRP-68	4.7E-11	M	ICRP-68	9.7E-12	--	--
Np-233	Np-233	233.041	Neptunium	0.001	0.1	10	ICRP-38	3.62E+01	m	2.17E+03	2.23E+07	ICRP-68	3.0E-12	M	ICRP-68	2.2E-12	--	--
Np-234	Np-234	234.043	Neptunium	0.001	0.1	10	ICRP-38	4.40E+00	d	3.80E+05	1.27E+05	ICRP-68	7.3E-10	M	ICRP-68	8.1E-10	--	--
Np-235	Np-235	235.044	Neptunium	0.001	0.1	10	ICRP-38	3.96E+02	d	3.42E+07	1.40E+03	ICRP-68	4.0E-10	M	ICRP-68	5.3E-11	--	--
Np-236l	Np-236	236.047	Neptunium	0.001	0.1	10	ICRP-38	1.15E+05	y	3.63E+12	1.32E-02	ICRP-68	3.0E-06	M	ICRP-68	1.7E-08	--	--
Np-236s	Np-236	236.047	Neptunium	0.001	0.1	10	ICRP-38	2.25E+01	h	8.10E+04	5.90E+05	ICRP-68	5.0E-09	M	ICRP-68	1.9E-10	--	--
Np-237	Np-237	237.048	Neptunium	0.001	0.1	10	ICRP-38	2.14E+06	y	6.75E+13	7.05E-04	ICRP-68	2.1E-05	M	ICRP-68	1.1E-07	--	--
Np-238	Np-238	238.051	Neptunium	0.001	0.1	10	ICRP-38	2.12E+00	d	1.83E+05	2.59E+05	ICRP-68	2.0E-09	M	ICRP-68	9.1E-10	--	--
Np-239	Np-239	239.053	Neptunium	0.001	0.1	10	ICRP-38	2.36E+00	d	2.03E+05	2.32E+05	ICRP-68	1.1E-09	M	ICRP-68	8.0E-10	--	--
Np-240	Np-240	240.056	Neptunium	0.001	0.1	10	ICRP-38	6.50E+01	m	3.90E+03	1.20E+07	ICRP-68	1.3E-10	M	ICRP-68	8.2E-11	--	--
Np-240m	Np-240	240.056	Neptunium	0.001	0.1	10	ICRP-38	7.40E+00	m	4.44E+02	1.06E+08	--	--	--	--	--	--	--
Np-241	Np-241	241.058	Neptunium	0.001	0.1	10	ICRP-107	1.39E+01	m	8.34E+02	5.61E+07	JAERI	2.2E-11	M	JAERI	1.8E-11	--	--
Np-242	Np-242	242.062	Neptunium	0.001	0.1	10	ICRP-107	2.20E+00	m	1.32E+02	3.53E+08	--	--	--	--	--	--	--
Np-242m	Np-242	242.062	Neptunium	0.001	0.1	10	ICRP-107	5.50E+00	m	3.30E+02	1.41E+08	--	--	--	--	--	--	--
O-14	O-14	14.009	Oxygen	--	--	--	ICRP-38	7.06E+01	s	7.06E+01	1.14E+10	--	--	--	--	--	JAERI	1.40E-08
O-15	O-15	15.003	Oxygen	--	--	--	ICRP-38	1.22E+02	s	1.22E+02	6.15E+09	--	--	--	--	--	JAERI	4.00E-09
O-19	O-19	19.004	Oxygen	--	--	--	ICRP-38	2.69E+01	s	2.69E+01	2.21E+10	--	--	--	--	--	--	--
Os-177	Os-177	176.955	Osmium	0.01	0.015	0	JAERI	2.80E+00	m	1.68E+02	3.79E+08	--	--	--	--	--	--	--
Os-179	Os-179	178.954	Osmium	0.01	0.015	0	JAERI	6.50E+00	m	3.90E+02	1.62E+08	--	--	--	--	--	--	--
Os-180	Os-180	179.952	Osmium	0.01	0.015	0	ICRP-38	2.20E+01	m	1.32E+03	4.75E+07	ICRP-68	2.5E-11	S	ICRP-68	1.7E-11	--	--
Os-181	Os-181	180.953	Osmium	0.01	0.015	0	ICRP-38	1.05E+02	m	6.30E+03	9.90E+06	ICRP-68	1.0E-10	S	ICRP-68	8.9E-11	--	--
Os-182	Os-182	181.952	Osmium	0.01	0.015	0	ICRP-38	2.20E+01	h	7.92E+04	7.83E+05	ICRP-68	5.2E-10	S	ICRP-68	5.6E-10	--	--
Os-183	Os-183	182.953	Osmium	0.01	0.015	0	ICRP-107	1.30E+01	h	4.68E+04	1.32E+06	JAERI	2.5E-10	S	JAERI	2.3E-10	--	--
Os-183m	Os-183	182.953	Osmium	0.01	0.015	0	ICRP-107	9.90E+00	h	3.56E+04	1.73E+06	JAERI	2.2E-10	M	JAERI	2.1E-10	--	--
Os-185	Os-185	184.954	Osmium	0.01	0.015	0	ICRP-38	9.40E+01	d	8.12E+06	7.51E+03	ICRP-68	1.5E-09	S	ICRP-68	5.1E-10	--	--
Os-186	Os-186	185.954	Osmium	0.01	0.015	0	ICRP-107	2.00E+15	y	6.31E+22	9.61E-13	JAERI	3.8E-06	S	JAERI	3.2E-08	--	--
Os-189m	Os-189	188.958	Osmium	0.01	0.015	0	ICRP-38	6.00E+00	h	2.16E+04	2.76E+06	ICRP-68	7.9E-12	S	ICRP-68	1.8E-11	--	--
Os-190m	Os-190	189.958	Osmium	0.01	0.015	0	ICRP-38	9.90E+00	m	5.94E+02	1.00E+08	--	--	--	--	--	--	--
Os-191	Os-191	190.961	Osmium	0.01	0.015	0	ICRP-38	1.54E+01	d	1.33E+06	4.44E+04	ICRP-68	1.8E-09	S	ICRP-68	5.7E-10	--	--
Os-191m	Os-191	190.961	Osmium	0.01	0.015	0	ICRP-38	1.30E+01	h	4.69E+04	1.26E+06	ICRP-68	1.5E-10	S	ICRP-68	9.6E-11	--	--
Os-193	Os-193	192.964	Osmium	0.01	0.015	0	ICRP-38	3.00E+01	h	1.08E+05	5.41E+05	ICRP-68	6.8E-10	S	ICRP-68	8.1E-10	--	--
Os-194	Os-194	193.965	Osmium	0.01	0.015	0	ICRP-38	6.00E+00	y	1.89E+08	3.07E+02	ICRP-68	7.9E-08	S	ICRP-68	2.4E-09	--	--
Os-196	Os-196	195.970	Osmium	0.01	0.015	0	ICRP-107	3.49E+01	m	2.09E+03	2.75E+07	JAERI	9.1E-11	S	JAERI	1.2E-10	--	--
P-30	P-30	29.978	Phosphorus	0.5	3.5	0	ICRP-38	2.50E+00	m	1.50E+02	2.51E+09	--	--	--	--	--	--	--
P-32	P-32	31.974	Phosphorus	0.5	3.5	0	ICRP-38	1.43E+01	d	1.23E+06	2.86E+05	ICRP-68	3.2E-09	M	ICRP-68	2.4E-09	--	--
P-33	P-33	32.972	Phosphorus	0.5	3.5	0	ICRP-38	2.54E+01	d	2.19E+06	1.56E+05	ICRP-68	1.4E-09	M	ICRP-68	2.4E-10	--	--
Pa-227	Pa-227	227.029	Protactinium	0.001	0.0025	4000	ICRP-38	3.83E+01	m	2.30E+03	2.16E+07	ICRP-68	9.7E-08	S	ICRP-68	4.5E-10	--	--
Pa-228	Pa-228	228.031	Protactinium	0.001	0.0025	4000	ICRP-38	2.20E+01	h	7.92E+04	6.25E+05	ICRP-68	6.9E-08	S	ICRP-68	7.8E-10	--	--
Pa-229	Pa-229	229.032	Protactinium	0.001	0.0025	4000	ICRP-107	1.50E+00	d	1.30E+05	3.80E+05	JAERI	6.7E-09	S	JAERI	2.2E-10	--	--
Pa-230	Pa-230	230.035	Protactinium	0.001	0.0025	4000	ICRP-38	1.74E+01	d	1.50E+06	3.26E+04	ICRP-68	7.1E-07	S	ICRP-68	9.2E-10	--	--
Pa-231	Pa-231	231.036	Protactinium	0.001	0.0025	4000	ICRP-38	3.28E+04	y	1.03E+12	4.72E-02	ICRP-68	1.3E-04	M	ICRP-68	7.1E-07	--	--
Pa-232	Pa-232	232.039	Protactinium	0.001	0.0025	4000	ICRP-38	1.31E+00	d	1.13E+05	4.30E+05	ICRP-68	9.5E-09	M	ICRP-68	7.2E-10	--	--
Pa-233	Pa-233	233.040	Protactinium	0.001	0.0025	4000	ICRP-38	2.70E+01	d	2.33E+06	2.08E+04	ICRP-68	3.7E-09	S	ICRP-68	8.7E-10	--	--
Pa-234	Pa-234	234.043	Protactinium	0.001	0.0025	4000	ICRP-38	6.70E+00	h	2.41E+04	2.00E+06	ICRP-68	5.8E-10	S	ICRP-68	5.1E-10	--	--
Pa-234m	Pa-234	234.043	Protactinium	0.001	0.0025	4000	ICRP-38	1.17E+00	m	7.02E+01	6.87E+08	--	--	--	--	--	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Pa-235	Pa-235	235.045	Protactinium	0.001	0.0025	4000	ICRP-107	2.45E+01	m	1.47E+03	3.27E+07	--	--	--	--	--	--	--
Pa-236	Pa-236	236.049	Protactinium	0.001	0.0025	4000	ICRP-107	9.10E+00	m	5.46E+02	8.75E+07	--	--	--	--	--	--	--
Pa-237	Pa-237	237.051	Protactinium	0.001	0.0025	4000	ICRP-107	8.70E+00	m	5.22E+02	9.12E+07	--	--	--	--	--	--	--
Pb-194	Pb-194	193.974	Lead	0.01	0.045	4000	ICRP-107	1.20E+01	m	7.20E+02	8.08E+07	JAERI	1.5E-11	F	JAERI	2.0E-11	--	--
Pb-195m	Pb-195	194.975	Lead	0.01	0.045	4000	ICRP-38	1.58E+01	m	9.48E+02	6.10E+07	ICRP-68	3.0E-11	F	ICRP-68	2.9E-11	--	--
Pb-196	Pb-196	195.973	Lead	0.01	0.045	4000	ICRP-107	3.70E+01	m	2.22E+03	2.59E+07	JAERI	3.1E-11	F	JAERI	2.8E-11	--	--
Pb-197	Pb-197	196.973	Lead	0.01	0.045	4000	ICRP-107	8.00E+00	m	4.80E+02	1.19E+08	--	--	--	--	--	--	--
Pb-197m	Pb-197	196.973	Lead	0.01	0.045	4000	ICRP-107	4.30E+01	m	2.58E+03	2.22E+07	JAERI	4.6E-11	F	JAERI	4.5E-11	--	--
Pb-198	Pb-198	197.972	Lead	0.01	0.045	4000	ICRP-38	2.40E+00	h	8.64E+03	6.60E+06	ICRP-68	8.7E-11	F	ICRP-68	1.0E-10	--	--
Pb-199	Pb-199	198.973	Lead	0.01	0.045	4000	ICRP-38	9.00E+01	m	5.40E+03	1.05E+07	ICRP-68	4.8E-11	F	ICRP-68	5.4E-11	--	--
Pb-200	Pb-200	199.972	Lead	0.01	0.045	4000	ICRP-38	2.15E+01	h	7.74E+04	7.29E+05	ICRP-68	2.6E-10	F	ICRP-68	4.0E-10	--	--
Pb-201	Pb-201	200.973	Lead	0.01	0.045	4000	ICRP-38	9.40E+00	h	3.38E+04	1.66E+06	ICRP-68	1.2E-10	F	ICRP-68	1.6E-10	--	--
Pb-201m	Pb-201	200.973	Lead	0.01	0.045	4000	ICRP-107	6.10E+01	s	6.10E+01	9.20E+08	--	--	--	--	--	--	--
Pb-202	Pb-202	201.972	Lead	0.01	0.045	4000	ICRP-38	3.00E+05	y	9.47E+12	5.90E-03	ICRP-68	1.4E-08	F	ICRP-68	8.7E-09	--	--
Pb-202m	Pb-202	201.972	Lead	0.01	0.045	4000	ICRP-38	3.62E+00	h	1.30E+04	4.29E+06	ICRP-68	1.2E-10	F	ICRP-68	1.3E-10	--	--
Pb-203	Pb-203	202.973	Lead	0.01	0.045	4000	ICRP-38	5.21E+01	h	1.87E+05	2.97E+05	ICRP-68	1.6E-10	F	ICRP-68	2.4E-10	--	--
Pb-204m	Pb-204	203.973	Lead	0.01	0.045	4000	ICRP-38	6.72E+01	m	4.03E+03	1.37E+07	JAERI	4.4E-11	F	JAERI	5.0E-11	--	--
Pb-205	Pb-205	204.974	Lead	0.01	0.045	4000	ICRP-38	1.43E+07	y	4.51E+14	1.22E-04	ICRP-68	4.1E-10	F	ICRP-68	2.8E-10	--	--
Pb-209	Pb-209	208.981	Lead	0.01	0.045	4000	ICRP-38	3.25E+00	h	1.17E+04	4.61E+06	ICRP-68	3.2E-11	F	ICRP-68	5.7E-11	--	--
Pb-210	Pb-210	209.984	Lead	0.01	0.045	4000	ICRP-38	2.23E+01	y	7.04E+08	7.63E+01	ICRP-68	1.1E-06	F	ICRP-68	6.8E-07	--	--
Pb-211	Pb-211	210.989	Lead	0.01	0.045	4000	ICRP-38	3.61E+01	m	2.17E+03	2.47E+07	ICRP-68	5.6E-09	F	ICRP-68	1.8E-10	--	--
Pb-212	Pb-212	211.992	Lead	0.01	0.045	4000	ICRP-38	1.06E+01	h	3.83E+04	1.39E+06	ICRP-68	3.3E-08	F	ICRP-68	5.9E-09	--	--
Pb-214	Pb-214	214.000	Lead	0.01	0.045	4000	ICRP-38	2.68E+01	m	1.61E+03	3.28E+07	ICRP-68	4.8E-09	F	ICRP-68	1.4E-10	--	--
Pd-100	Pd-100	99.909	Palladium	0.01	0.15	50-100	ICRP-38	3.63E+00	d	3.14E+05	3.60E+05	ICRP-68	9.7E-10	S	ICRP-68	9.4E-10	--	--
Pd-101	Pd-101	100.908	Palladium	0.01	0.15	50-100	ICRP-38	8.27E+00	h	2.98E+04	3.76E+06	ICRP-68	1.0E-10	S	ICRP-68	9.4E-11	--	--
Pd-103	Pd-103	102.906	Palladium	0.01	0.15	50-100	ICRP-38	1.70E+01	d	1.47E+06	7.48E+04	ICRP-68	4.0E-10	S	ICRP-68	1.9E-10	--	--
Pd-107	Pd-107	106.905	Palladium	0.01	0.15	50-100	ICRP-38	6.50E+06	y	2.05E+14	5.14E-04	ICRP-68	5.5E-10	S	ICRP-68	3.7E-11	--	--
Pd-109	Pd-109	108.906	Palladium	0.01	0.15	50-100	ICRP-38	1.34E+01	h	4.83E+04	2.14E+06	ICRP-68	5.0E-10	S	ICRP-68	5.5E-10	--	--
Pd-109m	Pd-109	108.906	Palladium	0.01	0.15	50-100	ICRP-107	4.69E+00	m	2.81E+02	3.68E+08	--	--	--	--	--	--	--
Pd-111	Pd-111	110.908	Palladium	0.01	0.15	50-100	ICRP-107	2.34E+01	m	1.40E+03	7.24E+07	JAERI	3.9E-11	S	JAERI	5.0E-11	--	--
Pd-112	Pd-112	111.907	Palladium	0.01	0.15	50-100	ICRP-107	2.10E+01	h	7.57E+04	1.33E+06	JAERI	1.5E-09	S	JAERI	2.6E-09	--	--
Pd-114	Pd-114	113.910	Palladium	0.01	0.15	50-100	ICRP-107	2.42E+00	m	1.45E+02	6.82E+08	--	--	--	--	--	--	--
Pd-96	Pd-96	95.918	Palladium	0.01	0.15	50-100	ICRP-107	1.22E+02	s	1.22E+02	9.64E+08	--	--	--	--	--	--	--
Pd-97	Pd-97	96.916	Palladium	0.01	0.15	50-100	ICRP-107	3.10E+00	m	1.86E+02	6.26E+08	--	--	--	--	--	--	--
Pd-98	Pd-98	97.913	Palladium	0.01	0.15	50-100	ICRP-107	1.77E+01	m	1.06E+03	1.08E+08	JAERI	4.7E-11	S	JAERI	6.3E-11	--	--
Pd-99	Pd-99	98.912	Palladium	0.01	0.15	50-100	ICRP-107	2.14E+01	m	1.28E+03	8.88E+07	JAERI	3.4E-11	S	JAERI	3.6E-11	--	--
Pm-136	Pm-136	135.924	Promethium	0.01	0.01	1000-10000	ICRP-107	1.07E+02	s	1.07E+02	7.76E+08	--	--	--	--	--	--	--
Pm-137m	Pm-137	136.920	Promethium	0.01	0.01	1000-10000	ICRP-107	2.40E+00	m	1.44E+02	5.72E+08	--	--	--	--	--	--	--
Pm-138	Pm-138	137.920	Promethium	0.01	0.01	1000-10000	JAERI	3.24E+00	m	1.94E+02	4.21E+08	--	--	--	--	--	--	--
Pm-139	Pm-139	138.917	Promethium	0.01	0.01	1000-10000	ICRP-107	4.15E+00	m	2.49E+02	3.26E+08	--	--	--	--	--	--	--
Pm-140	Pm-140	139.916	Promethium	0.01	0.01	1000-10000	ICRP-107	9.20E+00	s	9.20E+00	8.76E+09	--	--	--	--	--	--	--
Pm-140m	Pm-140	139.916	Promethium	0.01	0.01	1000-10000	ICRP-107	5.95E+00	m	3.57E+02	2.26E+08	--	--	--	--	--	--	--
Pm-141	Pm-141	140.914	Promethium	0.01	0.01	1000-10000	ICRP-38	2.09E+01	m	1.25E+03	6.38E+07	ICRP-68	2.5E-11	S	ICRP-68	3.6E-11	--	--
Pm-142	Pm-142	141.913	Promethium	0.01	0.01	1000-10000	ICRP-38	4.05E+01	s	4.05E+01	1.96E+09	--	--	--	--	--	--	--
Pm-143	Pm-143	142.911	Promethium	0.01	0.01	1000-10000	ICRP-38	2.65E+02	d	2.29E+07	3.45E+03	ICRP-68	1.4E-09	M	ICRP-68	2.3E-10	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Pm-144	Pm-144	143.913	Promethium	0.01	0.01	1000-10000	ICRP-38	3.63E+02	d	3.14E+07	2.50E+03	ICRP-68	7.8E-09	M	ICRP-68	9.7E-10	--	--
Pm-145	Pm-145	144.913	Promethium	0.01	0.01	1000-10000	ICRP-38	1.77E+01	y	5.59E+08	1.39E+02	ICRP-68	3.4E-09	M	ICRP-68	1.1E-10	--	--
Pm-146	Pm-146	145.915	Promethium	0.01	0.01	1000-10000	ICRP-38	2.02E+03	d	1.75E+08	4.43E+02	ICRP-68	1.9E-08	M	ICRP-68	9.0E-10	--	--
Pm-147	Pm-147	146.915	Promethium	0.01	0.01	1000-10000	ICRP-38	2.62E+00	y	8.28E+07	9.28E+02	ICRP-68	4.7E-09	M	ICRP-68	2.6E-10	--	--
Pm-148	Pm-148	147.917	Promethium	0.01	0.01	1000-10000	ICRP-38	5.37E+00	d	4.64E+05	1.64E+05	ICRP-68	2.2E-09	S	ICRP-68	2.7E-09	--	--
Pm-148m	Pm-148	147.917	Promethium	0.01	0.01	1000-10000	ICRP-38	4.13E+01	d	3.57E+06	2.14E+04	ICRP-68	5.4E-09	S	ICRP-68	1.8E-09	--	--
Pm-149	Pm-149	148.918	Promethium	0.01	0.01	1000-10000	ICRP-38	5.31E+01	h	1.91E+05	3.96E+05	ICRP-68	8.2E-10	S	ICRP-68	9.9E-10	--	--
Pm-150	Pm-150	149.921	Promethium	0.01	0.01	1000-10000	ICRP-38	2.68E+00	h	9.65E+03	7.80E+06	ICRP-68	2.1E-10	S	ICRP-68	2.6E-10	--	--
Pm-151	Pm-151	150.921	Promethium	0.01	0.01	1000-10000	ICRP-38	2.84E+01	h	1.02E+05	7.31E+05	ICRP-68	6.4E-10	S	ICRP-68	7.3E-10	--	--
Pm-152	Pm-152	151.924	Promethium	0.01	0.01	1000-10000	ICRP-107	4.12E+00	m	2.47E+02	3.00E+08	--	--	--	--	--	--	--
Pm-152m	Pm-152	151.924	Promethium	0.01	0.01	1000-10000	ICRP-107	7.52E+00	m	4.51E+02	1.65E+08	--	--	--	--	--	--	--
Pm-153	Pm-153	152.924	Promethium	0.01	0.01	1000-10000	ICRP-107	5.25E+00	m	3.15E+02	2.34E+08	--	--	--	--	--	--	--
Pm-154	Pm-154	153.926	Promethium	0.01	0.01	1000-10000	ICRP-107	1.73E+00	m	1.04E+02	7.06E+08	--	--	--	--	--	--	--
Pm-154m	Pm-154	153.926	Promethium	0.01	0.01	1000-10000	ICRP-107	2.68E+00	m	1.61E+02	4.56E+08	--	--	--	--	--	--	--
Po-203	Po-203	202.981	Polonium	0.01	0.0025	25	ICRP-38	3.67E+01	m	2.20E+03	2.52E+07	ICRP-68	6.1E-11	M	ICRP-68	5.2E-11	--	--
Po-204	Po-204	203.980	Polonium	0.01	0.0025	25	ICRP-107	3.53E+00	h	1.27E+04	4.35E+06	JAERI	3.8E-10	M	JAERI	3.1E-10	--	--
Po-205	Po-205	204.981	Polonium	0.01	0.0025	25	ICRP-38	1.80E+00	h	6.48E+03	8.49E+06	ICRP-68	8.9E-11	M	ICRP-68	5.9E-11	--	--
Po-206	Po-206	205.980	Polonium	0.01	0.0025	25	ICRP-107	8.80E+00	d	7.60E+05	7.20E+04	JAERI	5.2E-08	M	JAERI	4.6E-09	--	--
Po-207	Po-207	206.982	Polonium	0.01	0.0025	25	ICRP-38	3.50E+02	m	2.10E+04	2.60E+06	ICRP-68	1.5E-10	M	ICRP-68	1.4E-10	--	--
Po-208	Po-208	207.981	Polonium	0.01	0.0025	25	ICRP-107	2.90E+00	y	9.15E+07	5.93E+02	JAERI	3.5E-06	M	JAERI	3.1E-07	--	--
Po-209	Po-209	208.982	Polonium	0.01	0.0025	25	ICRP-38	1.02E+02	y	3.22E+09	1.68E+01	JAERI	3.4E-06	M	JAERI	3.0E-07	--	--
Po-210	Po-210	209.983	Polonium	0.01	0.0025	25	ICRP-38	1.38E+02	d	1.20E+07	4.49E+03	ICRP-68	3.0E-06	M	ICRP-68	2.4E-07	--	--
Po-211	Po-211	210.987	Polonium	0.01	0.0025	25	ICRP-38	5.16E-01	s	5.16E-01	1.04E+11	--	--	--	--	--	--	--
Po-212	Po-212	211.989	Polonium	0.01	0.0025	25	ICRP-38	3.05E-01	us	3.05E-07	1.74E+17	--	--	--	--	--	--	--
Po-212m	Po-212	211.989	Polonium	0.01	0.0025	25	ICRP-107	4.51E+01	s	4.51E+01	1.18E+09	--	--	--	--	--	--	--
Po-213	Po-213	212.993	Polonium	0.01	0.0025	25	ICRP-38	4.20E+00	us	4.20E-06	1.26E+16	--	--	--	--	--	--	--
Po-214	Po-214	213.995	Polonium	0.01	0.0025	25	ICRP-38	1.64E+02	us	1.64E-04	3.21E+14	--	--	--	--	--	--	--
Po-215	Po-215	214.999	Polonium	0.01	0.0025	25	ICRP-38	1.78E-03	s	1.78E-03	2.95E+13	--	--	--	--	--	--	--
Po-216	Po-216	216.002	Polonium	0.01	0.0025	25	ICRP-38	1.50E-01	s	1.50E-01	3.48E+11	--	--	--	--	--	--	--
Po-218	Po-218	218.009	Polonium	0.01	0.0025	25	ICRP-38	3.05E+00	m	1.83E+02	2.83E+08	--	--	--	--	--	--	--
Pr-134	Pr-134	133.916	Praseodymium	0.01	0.01	500-1000	ICRP-107	1.10E+01	m	6.60E+02	1.28E+08	JAERI	5.0E-11	S	JAERI	8.1E-11	--	--
Pr-134m	Pr-134	133.916	Praseodymium	0.01	0.01	500-1000	ICRP-107	1.70E+01	m	1.02E+03	8.26E+07	JAERI	3.4E-11	S	JAERI	4.6E-11	--	--
Pr-135	Pr-135	134.913	Praseodymium	0.01	0.01	500-1000	ICRP-107	2.40E+01	m	1.44E+03	5.81E+07	JAERI	3.6E-11	S	JAERI	4.6E-11	--	--
Pr-136	Pr-136	135.913	Praseodymium	0.01	0.01	500-1000	ICRP-38	1.31E+01	m	7.86E+02	1.06E+08	ICRP-68	2.5E-11	S	ICRP-68	3.3E-11	--	--
Pr-137	Pr-137	136.911	Praseodymium	0.01	0.01	500-1000	ICRP-38	7.66E+01	m	4.60E+03	1.79E+07	ICRP-68	3.5E-11	S	ICRP-68	4.0E-11	--	--
Pr-138	Pr-138	137.911	Praseodymium	0.01	0.01	500-1000	ICRP-38	1.45E+00	m	8.70E+01	9.40E+08	--	--	--	--	--	--	--
Pr-138m	Pr-138	137.911	Praseodymium	0.01	0.01	500-1000	ICRP-38	2.10E+00	h	7.56E+03	1.08E+07	ICRP-68	1.3E-10	M	ICRP-68	1.3E-10	--	--
Pr-139	Pr-139	138.909	Praseodymium	0.01	0.01	500-1000	ICRP-38	4.51E+00	h	1.62E+04	5.00E+06	ICRP-68	3.0E-11	S	ICRP-68	3.1E-11	--	--
Pr-140	Pr-140	139.909	Praseodymium	0.01	0.01	500-1000	ICRP-107	3.39E+00	m	2.03E+02	3.96E+08	--	--	--	--	--	--	--
Pr-142	Pr-142	141.910	Praseodymium	0.01	0.01	500-1000	ICRP-38	1.91E+01	h	6.89E+04	1.15E+06	ICRP-68	7.4E-10	S	ICRP-68	1.3E-09	--	--
Pr-142m	Pr-142	141.910	Praseodymium	0.01	0.01	500-1000	ICRP-38	1.46E+01	m	8.76E+02	9.08E+07	ICRP-68	9.4E-12	S	ICRP-68	1.7E-11	--	--
Pr-143	Pr-143	142.911	Praseodymium	0.01	0.01	500-1000	ICRP-38	1.36E+01	d	1.17E+06	6.74E+04	ICRP-68	2.3E-09	S	ICRP-68	1.2E-09	--	--
Pr-144	Pr-144	143.913	Praseodymium	0.01	0.01	500-1000	ICRP-38	1.73E+01	m	1.04E+03	7.56E+07	ICRP-68	3.0E-11	S	ICRP-68	5.0E-11	--	--
Pr-144m	Pr-144	143.913	Praseodymium	0.01	0.01	500-1000	ICRP-38	7.20E+00	m	4.32E+02	1.81E+08	--	--	--	--	--	--	--
Pr-145	Pr-145	144.915	Praseodymium	0.01	0.01	500-1000	ICRP-38	5.98E+00	h	2.15E+04	3.62E+06	ICRP-68	2.6E-10	S	ICRP-68	3.9E-10	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Pr-146	Pr-146	145.918	Praseodymium	0.01	0.01	500-1000	ICRP-107	2.42E+01	m	1.45E+03	5.34E+07	JAERI	4.9E-11	S	JAERI	7.8E-11	--	--
Pr-147	Pr-147	146.919	Praseodymium	0.01	0.01	500-1000	ICRP-38	1.36E+01	m	8.16E+02	9.41E+07	ICRP-68	3.0E-11	S	ICRP-68	3.3E-11	--	--
Pr-148	Pr-148	147.922	Praseodymium	0.01	0.01	500-1000	ICRP-107	2.29E+00	m	1.37E+02	5.55E+08	--	--	--	--	--	--	--
Pr-148m	Pr-148	147.922	Praseodymium	0.01	0.01	500-1000	ICRP-107	2.01E+00	m	1.21E+02	6.32E+08	--	--	--	--	--	--	--
Pt-183	Pt-183	182.962	Platinum	0.01	0.095	0	JAERI	6.50E+00	m	3.90E+02	1.58E+08	--	--	--	--	--	--	--
Pt-184	Pt-184	183.960	Platinum	0.01	0.095	0	ICRP-107	1.73E+01	m	1.04E+03	5.91E+07	JAERI	2.6E-11	F	JAERI	3.0E-11	--	--
Pt-186	Pt-186	185.959	Platinum	0.01	0.095	0	ICRP-38	2.00E+00	h	7.20E+03	8.43E+06	ICRP-68	6.6E-11	F	ICRP-68	9.3E-11	--	--
Pt-187	Pt-187	186.961	Platinum	0.01	0.095	0	ICRP-107	2.35E+00	h	8.46E+03	7.13E+06	JAERI	6.0E-11	F	JAERI	8.8E-11	--	--
Pt-188	Pt-188	187.959	Platinum	0.01	0.095	0	ICRP-38	1.02E+01	d	8.81E+05	6.81E+04	ICRP-68	6.3E-10	F	ICRP-68	7.6E-10	--	--
Pt-189	Pt-189	188.961	Platinum	0.01	0.095	0	ICRP-38	1.09E+01	h	3.91E+04	1.53E+06	ICRP-68	7.3E-11	F	ICRP-68	1.2E-10	--	--
Pt-190	Pt-190	189.960	Platinum	0.01	0.095	0	ICRP-107	6.50E+11	y	2.05E+19	2.90E-09	JAERI	1.3E-07	F	JAERI	6.8E-09	--	--
Pt-191	Pt-191	190.962	Platinum	0.01	0.095	0	ICRP-38	2.80E+00	d	2.42E+05	2.44E+05	ICRP-68	1.9E-10	F	ICRP-68	3.4E-10	--	--
Pt-193	Pt-193	192.963	Platinum	0.01	0.095	0	ICRP-38	5.00E+01	y	1.58E+09	3.71E+01	ICRP-68	2.7E-11	F	ICRP-68	3.1E-11	--	--
Pt-193m	Pt-193	192.963	Platinum	0.01	0.095	0	ICRP-38	4.33E+00	d	3.74E+05	1.56E+05	ICRP-68	2.1E-10	F	ICRP-68	4.5E-10	--	--
Pt-195m	Pt-195	194.965	Platinum	0.01	0.095	0	ICRP-38	4.02E+00	d	3.47E+05	1.67E+05	ICRP-68	3.1E-10	F	ICRP-68	6.3E-10	--	--
Pt-197	Pt-197	196.967	Platinum	0.01	0.095	0	ICRP-38	1.83E+01	h	6.59E+04	8.69E+05	ICRP-68	1.6E-10	F	ICRP-68	4.0E-10	--	--
Pt-197m	Pt-197	196.967	Platinum	0.01	0.095	0	ICRP-38	9.44E+01	m	5.66E+03	1.01E+07	ICRP-68	4.3E-11	F	ICRP-68	8.4E-11	--	--
Pt-199	Pt-199	198.971	Platinum	0.01	0.095	0	ICRP-38	3.08E+01	m	1.85E+03	3.07E+07	ICRP-68	2.2E-11	F	ICRP-68	3.9E-11	--	--
Pt-200	Pt-200	199.971	Platinum	0.01	0.095	0	ICRP-38	1.25E+01	h	4.50E+04	1.25E+06	ICRP-68	4.0E-10	F	ICRP-68	1.2E-09	--	--
Pt-202	Pt-202	201.976	Platinum	0.01	0.095	0	ICRP-107	4.40E+01	h	1.58E+05	3.53E+05	JAERI	1.4E-09	F	JAERI	4.5E-09	--	--
Pu-232	Pu-232	232.041	Plutonium	0.001	0.00045	100-10000	ICRP-107	3.37E+01	m	2.02E+03	2.40E+07	JAERI	2.5E-08	S	JAERI	2.9E-10	--	--
Pu-234	Pu-234	234.043	Plutonium	0.001	0.00045	100-10000	ICRP-38	8.80E+00	h	3.17E+04	1.52E+06	ICRP-68	2.2E-08	S	ICRP-68	1.6E-10	--	--
Pu-235	Pu-235	235.045	Plutonium	0.001	0.00045	100-10000	ICRP-38	2.53E+01	m	1.52E+03	3.16E+07	ICRP-68	2.6E-12	S	ICRP-68	2.1E-12	--	--
Pu-236	Pu-236	236.046	Plutonium	0.001	0.00045	100-10000	ICRP-38	2.85E+00	y	9.00E+07	5.31E+02	ICRP-68	1.8E-05	M	ICRP-68	8.6E-08	--	--
Pu-237	Pu-237	237.048	Plutonium	0.001	0.00045	100-10000	ICRP-38	4.53E+01	d	3.91E+06	1.22E+04	ICRP-68	3.6E-10	S	ICRP-68	1.0E-10	--	--
Pu-238	Pu-238	238.050	Plutonium	0.001	0.00045	100-10000	ICRP-38	8.77E+01	y	2.77E+09	1.71E+01	ICRP-68	4.3E-05	M	ICRP-68	2.3E-07	--	--
Pu-239	Pu-239	239.052	Plutonium	0.001	0.00045	100-10000	ICRP-38	2.41E+04	y	7.59E+11	6.21E-02	ICRP-68	4.7E-05	M	ICRP-68	2.5E-07	--	--
Pu-240	Pu-240	240.054	Plutonium	0.001	0.00045	100-10000	ICRP-38	6.54E+03	y	2.06E+11	2.28E-01	ICRP-68	4.7E-05	M	ICRP-68	2.5E-07	--	--
Pu-241	Pu-241	241.057	Plutonium	0.001	0.00045	100-10000	ICRP-38	1.44E+01	y	4.54E+08	1.03E+02	ICRP-68	8.5E-07	M	ICRP-68	4.7E-09	--	--
Pu-242	Pu-242	242.059	Plutonium	0.001	0.00045	100-10000	ICRP-38	3.76E+05	y	1.19E+13	3.92E-03	ICRP-68	4.4E-05	M	ICRP-68	2.4E-07	--	--
Pu-243	Pu-243	243.062	Plutonium	0.001	0.00045	100-10000	ICRP-38	4.96E+00	h	1.78E+04	2.60E+06	ICRP-68	1.1E-10	M	ICRP-68	8.5E-11	--	--
Pu-244	Pu-244	244.064	Plutonium	0.001	0.00045	100-10000	ICRP-38	8.26E+07	y	2.61E+15	1.77E-05	ICRP-68	4.4E-05	M	ICRP-68	2.4E-07	--	--
Pu-245	Pu-245	245.068	Plutonium	0.001	0.00045	100-10000	ICRP-38	1.05E+01	h	3.78E+04	1.22E+06	ICRP-68	6.5E-10	S	ICRP-68	7.2E-10	--	--
Pu-246	Pu-246	246.070	Plutonium	0.001	0.00045	100-10000	ICRP-38	1.09E+01	d	9.37E+05	4.89E+04	ICRP-68	7.6E-09	S	ICRP-68	3.3E-09	--	--
Ra-219	Ra-219	219.010	Radium	0.001	0.015	100-10000	ICRP-107	1.00E+01	ms	1.00E-02	5.15E+12	--	--	--	--	--	--	--
Ra-220	Ra-220	220.011	Radium	0.001	0.015	100-10000	ICRP-107	1.79E-02	s	1.79E-02	2.86E+12	--	--	--	--	--	--	--
Ra-221	Ra-221	221.014	Radium	0.001	0.015	100-10000	ICRP-107	2.80E+01	s	2.80E+01	1.82E+09	--	--	--	--	--	--	--
Ra-222	Ra-222	222.015	Radium	0.001	0.015	100-10000	ICRP-38	3.80E+01	s	3.80E+01	1.34E+09	--	--	--	--	--	--	--
Ra-223	Ra-223	223.019	Radium	0.001	0.015	100-10000	ICRP-38	1.14E+01	d	9.88E+05	5.12E+04	ICRP-68	6.9E-06	M	ICRP-68	1.0E-07	--	--
Ra-224	Ra-224	224.020	Radium	0.001	0.015	100-10000	ICRP-38	3.66E+00	d	3.16E+05	1.59E+05	ICRP-68	2.9E-06	M	ICRP-68	6.5E-08	--	--
Ra-225	Ra-225	225.024	Radium	0.001	0.015	100-10000	ICRP-38	1.48E+01	d	1.28E+06	3.92E+04	ICRP-68	5.8E-06	M	ICRP-68	9.5E-08	--	--
Ra-226	Ra-226	226.025	Radium	0.001	0.015	100-10000	ICRP-38	1.60E+03	y	5.05E+10	9.89E-01	ICRP-68	3.2E-06	M	ICRP-68	2.8E-07	--	--
Ra-227	Ra-227	227.029	Radium	0.001	0.015	100-10000	ICRP-38	4.22E+01	m	2.53E+03	1.96E+07	ICRP-68	2.8E-10	M	ICRP-68	8.4E-11	--	--
Ra-228	Ra-228	228.031	Radium	0.001	0.015	100-10000	ICRP-38	5.75E+00	y	1.81E+08	2.73E+02	ICRP-68	2.6E-06	M	ICRP-68	6.7E-07	--	--
Ra-230	Ra-230	230.037	Radium	0.001	0.015	100-10000	ICRP-107	9.30E+01	m	5.58E+03	8.79E+06	JAERI	1.7E-10	M	JAERI	1.9E-10	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Rb-77	Rb-77	76.930	Rubidium	0.01	0.15	500	ICRP-38	3.70E+00	m	2.22E+02	6.61E+08	--	--	--	--	--	--	--
Rb-78	Rb-78	77.928	Rubidium	0.01	0.15	500	ICRP-107	1.77E+01	m	1.06E+03	1.37E+08	JAERI	3.7E-11	F	JAERI	7.0E-11	--	--
Rb-78m	Rb-78	77.928	Rubidium	0.01	0.15	500	ICRP-107	5.74E+00	m	3.44E+02	4.20E+08	--	--	--	--	--	--	--
Rb-79	Rb-79	78.924	Rubidium	0.01	0.15	500	ICRP-38	2.29E+01	m	1.37E+03	1.04E+08	ICRP-68	3.0E-11	F	ICRP-68	5.0E-11	--	--
Rb-80	Rb-80	79.923	Rubidium	0.01	0.15	500	ICRP-38	3.40E+01	s	3.40E+01	4.15E+09	--	--	--	--	--	--	--
Rb-81	Rb-81	80.919	Rubidium	0.01	0.15	500	ICRP-38	4.58E+00	h	1.65E+04	8.46E+06	ICRP-68	6.8E-11	F	ICRP-68	5.4E-11	--	--
Rb-81m	Rb-81	80.919	Rubidium	0.01	0.15	500	ICRP-38	3.20E+01	m	1.92E+03	7.26E+07	ICRP-68	1.3E-11	F	ICRP-68	9.7E-12	--	--
Rb-82	Rb-82	81.918	Rubidium	0.01	0.15	500	ICRP-38	1.30E+00	m	7.80E+01	1.77E+09	--	--	--	--	--	--	--
Rb-82m	Rb-82	81.918	Rubidium	0.01	0.15	500	ICRP-38	6.20E+00	h	2.23E+04	6.17E+06	ICRP-68	2.2E-10	F	ICRP-68	1.3E-10	--	--
Rb-83	Rb-83	82.915	Rubidium	0.01	0.15	500	ICRP-38	8.62E+01	d	7.45E+06	1.83E+04	ICRP-68	1.0E-09	F	ICRP-68	1.9E-09	--	--
Rb-84	Rb-84	83.914	Rubidium	0.01	0.15	500	ICRP-38	3.28E+01	d	2.83E+06	4.75E+04	ICRP-68	1.5E-09	F	ICRP-68	2.8E-09	--	--
Rb-84m	Rb-84	83.914	Rubidium	0.01	0.15	500	ICRP-107	2.03E+01	m	1.22E+03	1.11E+08	JAERI	8.9E-12	F	JAERI	7.1E-12	--	--
Rb-86	Rb-86	85.911	Rubidium	0.01	0.15	500	ICRP-38	1.87E+01	d	1.61E+06	8.14E+04	ICRP-68	1.3E-09	F	ICRP-68	2.8E-09	--	--
Rb-86m	Rb-86	85.911	Rubidium	0.01	0.15	500	ICRP-107	1.02E+00	m	6.10E+01	2.15E+09	--	--	--	--	--	--	--
Rb-87	Rb-87	86.909	Rubidium	0.01	0.15	500	ICRP-38	4.70E+10	y	1.48E+18	8.75E-08	ICRP-68	7.6E-10	F	ICRP-68	1.5E-09	--	--
Rb-88	Rb-88	87.911	Rubidium	0.01	0.15	500	ICRP-38	1.78E+01	m	1.07E+03	1.20E+08	ICRP-68	2.8E-11	F	ICRP-68	9.0E-11	--	--
Rb-89	Rb-89	88.912	Rubidium	0.01	0.15	500	ICRP-38	1.52E+01	m	9.12E+02	1.39E+08	ICRP-68	2.5E-11	F	ICRP-68	4.7E-11	--	--
Rb-90	Rb-90	89.915	Rubidium	0.01	0.15	500	ICRP-107	1.58E+02	s	1.58E+02	7.94E+08	--	--	--	--	--	--	--
Rb-90m	Rb-90	89.915	Rubidium	0.01	0.15	500	ICRP-107	2.58E+02	s	2.58E+02	4.86E+08	--	--	--	--	--	--	--
Re-177	Re-177	176.950	Rhenium	0.01	1.5	0	ICRP-38	1.40E+01	m	8.40E+02	7.59E+07	ICRP-68	2.2E-11	M	ICRP-68	2.2E-11	--	--
Re-178	Re-178	177.951	Rhenium	0.01	1.5	0	ICRP-38	1.32E+01	m	7.92E+02	8.00E+07	ICRP-68	2.4E-11	M	ICRP-68	2.5E-11	--	--
Re-179	Re-179	178.950	Rhenium	0.01	1.5	0	ICRP-107	1.95E+01	m	1.17E+03	5.39E+07	JAERI	2.1E-11	M	JAERI	1.6E-11	--	--
Re-180	Re-180	179.951	Rhenium	0.01	1.5	0	ICRP-38	2.43E+00	m	1.46E+02	4.30E+08	--	--	--	--	--	--	--
Re-181	Re-181	180.950	Rhenium	0.01	1.5	0	ICRP-38	2.00E+01	h	7.20E+04	8.66E+05	ICRP-68	3.7E-10	M	ICRP-68	4.2E-10	--	--
Re-182l	Re-182	181.951	Rhenium	0.01	1.5	0	ICRP-38	6.40E+01	h	2.30E+05	2.69E+05	ICRP-68	1.7E-09	M	ICRP-68	1.4E-09	--	--
Re-182s	Re-182	181.951	Rhenium	0.01	1.5	0	ICRP-38	1.27E+01	h	4.57E+04	1.36E+06	ICRP-68	3.0E-10	M	ICRP-68	2.7E-10	--	--
Re-183	Re-183	182.951	Rhenium	0.01	1.5	0	ICRP-107	7.00E+01	d	6.05E+06	1.02E+04	JAERI	2.6E-09	M	JAERI	9.5E-10	--	--
Re-184	Re-184	183.953	Rhenium	0.01	1.5	0	ICRP-38	3.80E+01	d	3.28E+06	1.87E+04	ICRP-68	1.8E-09	M	ICRP-68	1.0E-09	--	--
Re-184m	Re-184	183.953	Rhenium	0.01	1.5	0	ICRP-38	1.65E+02	d	1.43E+07	4.30E+03	ICRP-68	6.1E-09	M	ICRP-68	1.5E-09	--	--
Re-186	Re-186	185.955	Rhenium	0.01	1.5	0	ICRP-38	9.06E+01	h	3.26E+05	1.86E+05	ICRP-68	1.2E-09	M	ICRP-68	1.5E-09	--	--
Re-186m	Re-186	185.955	Rhenium	0.01	1.5	0	ICRP-38	2.00E+05	y	6.31E+12	9.61E-03	ICRP-68	1.1E-08	M	ICRP-68	2.2E-09	--	--
Re-187	Re-187	186.956	Rhenium	0.01	1.5	0	ICRP-38	5.00E+10	y	1.58E+18	3.82E-08	ICRP-68	6.0E-12	M	ICRP-68	5.1E-12	--	--
Re-188	Re-188	187.958	Rhenium	0.01	1.5	0	ICRP-38	1.70E+01	h	6.11E+04	9.82E+05	ICRP-68	7.4E-10	M	ICRP-68	1.4E-09	--	--
Re-188m	Re-188	187.958	Rhenium	0.01	1.5	0	ICRP-38	1.86E+01	m	1.12E+03	5.38E+07	ICRP-68	2.0E-11	M	ICRP-68	3.0E-11	--	--
Re-189	Re-189	188.959	Rhenium	0.01	1.5	0	ICRP-38	2.43E+01	h	8.75E+04	6.82E+05	ICRP-68	6.0E-10	M	ICRP-68	7.8E-10	--	--
Re-190	Re-190	189.962	Rhenium	0.01	1.5	0	ICRP-107	3.10E+00	m	1.86E+02	3.19E+08	--	--	--	--	--	--	--
Re-190m	Re-190	189.962	Rhenium	0.01	1.5	0	ICRP-107	3.20E+00	h	1.15E+04	5.16E+06	--	--	--	--	--	--	--
Rh-100	Rh-100	99.908	Rhodium	0.01	0.15	0	ICRP-38	2.08E+01	h	7.49E+04	1.51E+06	ICRP-68	6.3E-10	S	ICRP-68	7.1E-10	--	--
Rh-100m	Rh-100	99.908	Rhodium	0.01	0.15	0	ICRP-107	4.60E+00	m	2.76E+02	4.09E+08	--	--	--	--	--	--	--
Rh-101	Rh-101	100.906	Rhodium	0.01	0.15	0	ICRP-38	3.20E+00	y	1.01E+08	1.11E+03	ICRP-68	5.0E-09	S	ICRP-68	5.5E-10	--	--
Rh-101m	Rh-101	100.906	Rhodium	0.01	0.15	0	ICRP-38	4.34E+00	d	3.75E+05	2.98E+05	ICRP-68	2.7E-10	S	ICRP-68	2.2E-10	--	--
Rh-102	Rh-102	101.907	Rhodium	0.01	0.15	0	ICRP-38	2.90E+00	y	9.15E+07	1.21E+03	ICRP-68	1.6E-08	S	ICRP-68	2.6E-09	--	--
Rh-102m	Rh-102	101.907	Rhodium	0.01	0.15	0	ICRP-38	2.07E+02	d	1.79E+07	6.19E+03	ICRP-68	6.7E-09	S	ICRP-68	1.2E-09	--	--
Rh-103m	Rh-103	102.905	Rhodium	0.01	0.15	0	ICRP-38	5.61E+01	m	3.37E+03	3.26E+07	ICRP-68	2.5E-12	S	ICRP-68	3.8E-12	--	--
Rh-104	Rh-104	103.907	Rhodium	0.01	0.15	0	ICRP-107	4.23E+01	s	4.23E+01	2.57E+09	--	--	--	--	--	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Rh-104m	Rh-104	103.907	Rhodium	0.01	0.15	0	ICRP-107	4.34E+00	m	2.60E+02	4.17E+08	--	--	--	--	--	--	--
Rh-105	Rh-105	104.906	Rhodium	0.01	0.15	0	ICRP-38	3.54E+01	h	1.27E+05	8.45E+05	ICRP-68	4.4E-10	S	ICRP-68	3.7E-10	--	--
Rh-106	Rh-106	105.907	Rhodium	0.01	0.15	0	ICRP-38	2.99E+01	s	2.99E+01	3.56E+09	--	--	--	--	--	--	--
Rh-106m	Rh-106	105.907	Rhodium	0.01	0.15	0	ICRP-38	1.32E+02	m	7.92E+03	1.34E+07	ICRP-68	1.9E-10	S	ICRP-68	1.6E-10	--	--
Rh-107	Rh-107	106.907	Rhodium	0.01	0.15	0	ICRP-38	2.17E+01	m	1.30E+03	8.10E+07	ICRP-68	2.8E-11	S	ICRP-68	2.4E-11	--	--
Rh-108	Rh-108	107.909	Rhodium	0.01	0.15	0	ICRP-107	1.68E+01	s	1.68E+01	6.22E+09	--	--	--	--	--	--	--
Rh-109	Rh-109	108.909	Rhodium	0.01	0.15	0	ICRP-107	8.00E+01	s	8.00E+01	1.29E+09	--	--	--	--	--	--	--
Rh-94	Rh-94	93.922	Rhodium	0.01	0.15	0	ICRP-107	7.06E+01	s	7.06E+01	1.70E+09	--	--	--	--	--	--	--
Rh-95	Rh-95	94.916	Rhodium	0.01	0.15	0	ICRP-107	5.02E+00	m	3.01E+02	3.95E+08	--	--	--	--	--	--	--
Rh-95m	Rh-95	94.916	Rhodium	0.01	0.15	0	ICRP-107	1.96E+00	m	1.18E+02	1.01E+09	--	--	--	--	--	--	--
Rh-96	Rh-96	95.914	Rhodium	0.01	0.15	0	ICRP-107	9.90E+00	m	5.94E+02	1.98E+08	--	--	--	--	--	--	--
Rh-96m	Rh-96	95.914	Rhodium	0.01	0.15	0	ICRP-107	1.51E+00	m	9.06E+01	1.30E+09	--	--	--	--	--	--	--
Rh-97	Rh-97	96.911	Rhodium	0.01	0.15	0	ICRP-107	3.07E+01	m	1.84E+03	6.32E+07	JAERI	4.2E-11	S	JAERI	4.9E-11	--	--
Rh-97m	Rh-97	96.911	Rhodium	0.01	0.15	0	ICRP-107	4.62E+01	m	2.77E+03	4.20E+07	JAERI	5.0E-11	S	JAERI	4.8E-11	--	--
Rh-98	Rh-98	97.911	Rhodium	0.01	0.15	0	ICRP-107	8.70E+00	m	5.22E+02	2.21E+08	--	--	--	--	--	--	--
Rh-99	Rh-99	98.908	Rhodium	0.01	0.15	0	ICRP-38	1.60E+01	d	1.38E+06	8.25E+04	ICRP-68	8.9E-10	S	ICRP-68	5.1E-10	--	--
Rh-99m	Rh-99	98.908	Rhodium	0.01	0.15	0	ICRP-38	4.70E+00	h	1.69E+04	6.74E+06	ICRP-68	7.3E-11	S	ICRP-68	6.6E-11	--	--
Rn-207	Rn-207	206.991	Radon	1	0	0	ICRP-107	9.25E+00	m	5.55E+02	9.82E+07	--	--	--	--	--	--	--
Rn-209	Rn-209	208.990	Radon	1	0	0	ICRP-107	2.85E+01	m	1.71E+03	3.16E+07	--	--	--	--	--	--	--
Rn-210	Rn-210	209.990	Radon	1	0	0	ICRP-107	2.40E+00	h	8.64E+03	6.22E+06	--	--	--	--	--	--	--
Rn-211	Rn-211	210.991	Radon	1	0	0	ICRP-107	1.46E+01	h	5.26E+04	1.02E+06	--	--	--	--	--	--	--
Rn-212	Rn-212	211.991	Radon	1	0	0	ICRP-107	2.39E+01	m	1.43E+03	3.71E+07	--	--	--	--	--	--	--
Rn-215	Rn-215	214.999	Radon	1	0	0	ICRP-107	2.30E+00	us	2.30E-06	2.28E+16	--	--	--	--	--	--	--
Rn-216	Rn-216	216.000	Radon	1	0	0	ICRP-107	4.50E-05	s	4.50E-05	1.16E+15	--	--	--	--	--	--	--
Rn-217	Rn-217	217.004	Radon	1	0	0	ICRP-107	5.40E-04	s	5.40E-04	9.63E+13	--	--	--	--	--	--	--
Rn-218	Rn-218	218.006	Radon	1	0	0	ICRP-38	3.50E+01	ms	3.50E-02	1.48E+12	--	--	--	--	--	--	--
Rn-219	Rn-219	219.009	Radon	1	0	0	ICRP-38	3.96E+00	s	3.96E+00	1.30E+10	--	--	--	--	--	--	--
Rn-220	Rn-220	220.011	Radon	1	0	0	ICRP-38	5.56E+01	s	5.56E+01	9.22E+08	--	--	--	--	--	--	--
Rn-222	Rn-222	222.018	Radon	1	0	0	ICRP-38	3.82E+00	d	3.30E+05	1.54E+05	--	--	--	--	--	--	--
Rn-223	Rn-223	223.022	Radon	1	0	0	ICRP-107	2.43E+01	m	1.46E+03	3.47E+07	--	--	--	--	--	--	--
Ru-103	Ru-103	102.906	Ruthenium	0.01	0.075	0-500	ICRP-38	3.93E+01	d	3.39E+06	3.23E+04	ICRP-68	2.8E-09	S	ICRP-68	7.3E-10	--	--
Ru-105	Ru-105	104.908	Ruthenium	0.01	0.075	0-500	ICRP-38	4.44E+00	h	1.60E+04	6.73E+06	ICRP-68	2.5E-10	S	ICRP-68	2.6E-10	--	--
Ru-106	Ru-106	105.907	Ruthenium	0.01	0.075	0-500	ICRP-38	3.68E+02	d	3.18E+07	3.35E+03	ICRP-68	6.2E-08	S	ICRP-68	7.0E-09	--	--
Ru-107	Ru-107	106.910	Ruthenium	0.01	0.075	0-500	ICRP-107	3.75E+00	m	2.25E+02	4.69E+08	--	--	--	--	--	--	--
Ru-108	Ru-108	107.910	Ruthenium	0.01	0.075	0-500	ICRP-107	4.55E+00	m	2.73E+02	3.83E+08	--	--	--	--	--	--	--
Ru-92	Ru-92	91.920	Ruthenium	0.01	0.075	0-500	ICRP-107	3.65E+00	m	2.19E+02	5.60E+08	--	--	--	--	--	--	--
Ru-94	Ru-94	93.911	Ruthenium	0.01	0.075	0-500	ICRP-38	5.18E+01	m	3.11E+03	3.87E+07	ICRP-68	7.4E-11	S	ICRP-68	9.4E-11	--	--
Ru-95	Ru-95	94.910	Ruthenium	0.01	0.075	0-500	ICRP-107	1.64E+00	h	5.91E+03	2.01E+07	JAERI	6.7E-11	S	JAERI	6.3E-11	--	--
Ru-97	Ru-97	96.908	Ruthenium	0.01	0.075	0-500	ICRP-38	2.90E+00	d	2.51E+05	4.65E+05	ICRP-68	1.6E-10	M	ICRP-68	1.5E-10	--	--
S-35	S-35	34.969	Sulfur	0.5	1.5	0	ICRP-38	8.74E+01	d	7.55E+06	4.27E+04	ICRP-68	1.3E-09	M	ICRP-68	7.7E-10	--	--
S-37	S-37	36.971	Sulfur	0.5	1.5	0	ICRP-107	5.05E+00	m	3.03E+02	1.01E+09	--	--	--	--	--	--	--
S-38	S-38	37.971	Sulfur	0.5	1.5	0	ICRP-107	1.70E+02	m	1.02E+04	2.91E+07	JAERI	3.6E-10	M	JAERI	6.4E-10	--	--
Sb-111	Sb-111	110.913	Antimony	0.01	0.2	1	ICRP-107	7.50E+01	s	7.50E+01	1.36E+09	--	--	--	--	--	--	--
Sb-113	Sb-113	112.909	Antimony	0.01	0.2	1	ICRP-107	6.67E+00	m	4.00E+02	2.50E+08	--	--	--	--	--	--	--
Sb-114	Sb-114	113.909	Antimony	0.01	0.2	1	ICRP-107	3.49E+00	m	2.09E+02	4.73E+08	--	--	--	--	--	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Sb-115	Sb-115	114.907	Antimony	0.01	0.2	1	ICRP-38	3.18E+01	m	1.91E+03	5.15E+07	ICRP-68	2.3E-11	M	ICRP-68	2.4E-11	--	--
Sb-116	Sb-116	115.907	Antimony	0.01	0.2	1	ICRP-38	1.58E+01	m	9.48E+02	1.03E+08	ICRP-68	2.3E-11	M	ICRP-68	2.6E-11	--	--
Sb-116m	Sb-116	115.907	Antimony	0.01	0.2	1	ICRP-38	6.03E+01	m	3.62E+03	2.69E+07	ICRP-68	8.5E-11	M	ICRP-68	6.7E-11	--	--
Sb-117	Sb-117	116.905	Antimony	0.01	0.2	1	ICRP-38	2.80E+00	h	1.01E+04	9.57E+06	ICRP-68	2.7E-11	M	ICRP-68	1.8E-11	--	--
Sb-118	Sb-118	117.906	Antimony	0.01	0.2	1	ICRP-38	3.60E+00	m	2.16E+02	4.43E+08	--	--	--	--	--	--	--
Sb-118m	Sb-118	117.906	Antimony	0.01	0.2	1	ICRP-38	5.00E+00	h	1.80E+04	5.32E+06	ICRP-68	2.3E-10	M	ICRP-68	2.1E-10	--	--
Sb-119	Sb-119	118.904	Antimony	0.01	0.2	1	ICRP-38	3.81E+01	h	1.37E+05	6.92E+05	ICRP-68	5.9E-11	M	ICRP-68	8.1E-11	--	--
Sb-120s	Sb-120	119.905	Antimony	0.01	0.2	1	ICRP-38	1.59E+01	m	9.53E+02	9.87E+07	ICRP-68	1.2E-11	M	ICRP-68	1.4E-11	--	--
Sb-120l	Sb-120	119.905	Antimony	0.01	0.2	1	ICRP-38	5.76E+00	d	4.98E+05	1.89E+05	ICRP-68	1.3E-09	M	ICRP-68	1.2E-09	--	--
Sb-122	Sb-122	121.905	Antimony	0.01	0.2	1	ICRP-38	2.70E+00	d	2.33E+05	3.97E+05	ICRP-68	1.2E-09	M	ICRP-68	1.7E-09	--	--
Sb-122m	Sb-122	121.905	Antimony	0.01	0.2	1	ICRP-107	4.19E+00	m	2.51E+02	3.68E+08	--	--	--	--	--	--	--
Sb-124	Sb-124	123.906	Antimony	0.01	0.2	1	ICRP-38	6.02E+01	d	5.20E+06	1.75E+04	ICRP-68	6.1E-09	M	ICRP-68	2.5E-09	--	--
Sb-124ms	Sb-124	123.906	Antimony	0.01	0.2	1	ICRP-38	9.30E+01	s	9.30E+01	9.79E+08	--	--	--	--	--	--	--
Sb-124ml	Sb-124	123.906	Antimony	0.01	0.2	1	ICRP-38	2.02E+01	m	1.21E+03	7.51E+07	ICRP-68	8.3E-12	M	ICRP-68	8.0E-12	--	--
Sb-125	Sb-125	124.905	Antimony	0.01	0.2	1	ICRP-38	2.77E+00	y	8.74E+07	1.03E+03	ICRP-68	4.5E-09	M	ICRP-68	1.1E-09	--	--
Sb-126	Sb-126	125.907	Antimony	0.01	0.2	1	ICRP-38	1.24E+01	d	1.07E+06	8.36E+04	ICRP-68	3.2E-09	M	ICRP-68	2.4E-09	--	--
Sb-126m	Sb-126	125.907	Antimony	0.01	0.2	1	ICRP-38	1.90E+01	m	1.14E+03	7.86E+07	ICRP-68	3.3E-11	M	ICRP-68	3.6E-11	--	--
Sb-127	Sb-127	126.907	Antimony	0.01	0.2	1	ICRP-38	3.85E+00	d	3.33E+05	2.67E+05	ICRP-68	1.7E-09	M	ICRP-68	1.7E-09	--	--
Sb-128l	Sb-128	127.909	Antimony	0.01	0.2	1	ICRP-38	9.01E+00	h	3.24E+04	2.72E+06	ICRP-68	6.7E-10	M	ICRP-68	7.6E-10	--	--
Sb-128s	Sb-128	127.909	Antimony	0.01	0.2	1	ICRP-38	1.04E+01	m	6.24E+02	1.41E+08	ICRP-68	2.6E-11	M	ICRP-68	3.3E-11	--	--
Sb-129	Sb-129	128.909	Antimony	0.01	0.2	1	ICRP-38	4.32E+00	h	1.56E+04	5.63E+06	ICRP-68	3.5E-10	M	ICRP-68	4.2E-10	--	--
Sb-130	Sb-130	129.912	Antimony	0.01	0.2	1	ICRP-38	4.00E+01	m	2.40E+03	3.62E+07	ICRP-68	9.1E-11	M	ICRP-68	9.1E-11	--	--
Sb-130m	Sb-130	129.912	Antimony	0.01	0.2	1	ICRP-107	6.30E+00	m	3.78E+02	2.30E+08	--	--	--	--	--	--	--
Sb-131	Sb-131	130.912	Antimony	0.01	0.2	1	ICRP-38	2.30E+01	m	1.38E+03	6.24E+07	ICRP-68	8.3E-11	M	ICRP-68	1.0E-10	--	--
Sb-133	Sb-133	132.915	Antimony	0.01	0.2	1	ICRP-107	2.50E+00	m	1.50E+02	5.66E+08	--	--	--	--	--	--	--
Sc-42m	Sc-42	41.966	Scandium	0.01	0.006	0	ICRP-107	6.20E+01	s	6.20E+01	4.34E+09	--	--	--	--	--	--	--
Sc-43	Sc-43	42.961	Scandium	0.01	0.006	0	ICRP-38	3.89E+00	h	1.40E+04	1.87E+07	ICRP-68	1.8E-10	S	ICRP-68	1.9E-10	--	--
Sc-44	Sc-44	43.959	Scandium	0.01	0.006	0	ICRP-38	3.93E+00	h	1.41E+04	1.82E+07	ICRP-68	3.0E-10	S	ICRP-68	3.5E-10	--	--
Sc-44m	Sc-44	43.959	Scandium	0.01	0.006	0	ICRP-38	5.86E+01	h	2.11E+05	1.22E+06	ICRP-68	2.0E-09	S	ICRP-68	2.4E-09	--	--
Sc-46	Sc-46	45.955	Scandium	0.01	0.006	0	ICRP-38	8.38E+01	d	7.24E+06	3.39E+04	ICRP-68	6.4E-09	S	ICRP-68	1.5E-09	--	--
Sc-47	Sc-47	46.952	Scandium	0.01	0.006	0	ICRP-38	3.35E+00	d	2.90E+05	8.30E+05	ICRP-68	7.3E-10	S	ICRP-68	5.4E-10	--	--
Sc-48	Sc-48	47.952	Scandium	0.01	0.006	0	ICRP-38	4.37E+01	h	1.57E+05	1.50E+06	ICRP-68	1.6E-09	S	ICRP-68	1.7E-09	--	--
Sc-49	Sc-49	48.950	Scandium	0.01	0.006	0	ICRP-38	5.74E+01	m	3.44E+03	6.69E+07	ICRP-68	6.1E-11	S	ICRP-68	8.2E-11	--	--
Sc-50	Sc-50	49.952	Scandium	0.01	0.006	0	ICRP-107	1.03E+02	s	1.03E+02	2.20E+09	--	--	--	--	--	--	--
Se-70	Se-70	69.934	Selenium	0.01	0.025	10	ICRP-38	4.10E+01	m	2.46E+03	6.56E+07	ICRP-68	1.2E-10	M	ICRP-68	1.4E-10	--	--
Se-71	Se-71	70.932	Selenium	0.01	0.025	10	ICRP-107	4.74E+00	m	2.84E+02	5.59E+08	--	--	--	--	--	--	--
Se-72	Se-72	71.927	Selenium	0.01	0.025	10	ICRP-38	8.40E+00	d	7.26E+05	2.16E+05	JAERI	3.9E-09	M	JAERI	5.1E-09	--	--
Se-73	Se-73	72.927	Selenium	0.01	0.025	10	ICRP-38	7.15E+00	h	2.57E+04	6.01E+06	ICRP-68	2.4E-10	M	ICRP-68	3.9E-10	--	--
Se-73m	Se-73	72.927	Selenium	0.01	0.025	10	ICRP-38	3.90E+01	m	2.34E+03	6.61E+07	ICRP-68	2.7E-11	M	ICRP-68	4.1E-11	--	--
Se-75	Se-75	74.923	Selenium	0.01	0.025	10	ICRP-38	1.20E+02	d	1.04E+07	1.45E+04	ICRP-68	1.7E-09	M	ICRP-68	2.6E-09	--	--
Se-77m	Se-77	76.920	Selenium	0.01	0.025	10	ICRP-38	1.75E+01	s	1.75E+01	8.40E+09	--	--	--	--	--	--	--
Se-79	Se-79	78.918	Selenium	0.01	0.025	10	ICRP-38	6.50E+04	y	2.05E+12	6.97E-02	ICRP-68	3.1E-09	M	ICRP-68	2.9E-09	--	--
Se-79m	Se-79	78.918	Selenium	0.01	0.025	10	ICRP-107	3.92E+00	m	2.35E+02	6.08E+08	--	--	--	--	--	--	--
Se-81	Se-81	80.918	Selenium	0.01	0.025	10	ICRP-38	1.85E+01	m	1.11E+03	1.26E+08	ICRP-68	2.4E-11	M	ICRP-68	2.7E-11	--	--
Se-81m	Se-81	80.918	Selenium	0.01	0.025	10	ICRP-38	5.73E+01	m	3.44E+03	4.06E+07	ICRP-68	6.8E-11	M	ICRP-68	5.9E-11	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Se-83	Se-83	82.919	Selenium	0.01	0.025	10	ICRP-38	2.25E+01	m	1.35E+03	1.01E+08	ICRP-68	5.3E-11	M	ICRP-68	5.1E-11	--	--
Se-83m	Se-83	82.919	Selenium	0.01	0.025	10	ICRP-107	7.01E+01	s	7.01E+01	1.94E+09	--	--	--	--	--	--	--
Se-84	Se-84	83.918	Selenium	0.01	0.025	10	ICRP-107	3.10E+00	m	1.86E+02	7.23E+08	--	--	--	--	--	--	--
Si-31	Si-31	30.975	Silicon	0.01	0.35	0	ICRP-38	1.57E+02	m	9.44E+03	3.86E+07	ICRP-68	1.1E-10	M	ICRP-68	1.6E-10	--	--
Si-32	Si-32	31.974	Silicon	0.01	0.35	0	ICRP-38	4.50E+02	y	1.42E+10	2.48E+01	ICRP-68	1.1E-07	S	ICRP-68	5.6E-10	--	--
Sm-139	Sm-139	138.922	Samarium	0.01	0.01	500-1000	ICRP-107	2.57E+00	m	1.54E+02	5.27E+08	--	--	--	--	--	--	--
Sm-140	Sm-140	139.919	Samarium	0.01	0.01	500-1000	ICRP-107	1.48E+01	m	8.89E+02	9.07E+07	JAERI	5.2E-11	M	JAERI	9.8E-11	--	--
Sm-141	Sm-141	140.918	Samarium	0.01	0.01	500-1000	ICRP-38	1.02E+01	m	6.12E+02	1.31E+08	ICRP-68	2.7E-11	M	ICRP-68	3.9E-11	--	--
Sm-141m	Sm-141	140.918	Samarium	0.01	0.01	500-1000	ICRP-38	2.26E+01	m	1.36E+03	5.90E+07	ICRP-68	5.6E-11	M	ICRP-68	6.5E-11	--	--
Sm-142	Sm-142	141.915	Samarium	0.01	0.01	500-1000	ICRP-38	7.25E+01	m	4.35E+03	1.83E+07	ICRP-68	1.1E-10	M	ICRP-68	1.9E-10	--	--
Sm-143	Sm-143	142.915	Samarium	0.01	0.01	500-1000	ICRP-107	8.75E+00	m	5.25E+02	1.50E+08	--	--	--	--	--	--	--
Sm-143m	Sm-143	142.915	Samarium	0.01	0.01	500-1000	ICRP-107	6.60E+01	s	6.60E+01	1.20E+09	--	--	--	--	--	--	--
Sm-145	Sm-145	144.913	Samarium	0.01	0.01	500-1000	ICRP-38	3.40E+02	d	2.94E+07	2.65E+03	ICRP-68	1.5E-09	M	ICRP-68	2.1E-10	--	--
Sm-146	Sm-146	145.913	Samarium	0.01	0.01	500-1000	ICRP-38	1.03E+08	y	3.25E+15	2.38E-05	ICRP-68	9.9E-06	M	ICRP-68	5.4E-08	--	--
Sm-147	Sm-147	146.915	Samarium	0.01	0.01	500-1000	ICRP-38	1.06E+11	y	3.35E+18	2.30E-08	ICRP-68	8.9E-06	M	ICRP-68	4.9E-08	--	--
Sm-148	Sm-148	147.915	Samarium	0.01	0.01	500-1000	ICRP-107	7.00E+15	y	2.21E+23	3.45E-13	JAERI	7.7E-06	M	JAERI	4.3E-08	--	--
Sm-151	Sm-151	150.920	Samarium	0.01	0.01	500-1000	ICRP-38	9.00E+01	y	2.84E+09	2.63E+01	ICRP-68	3.7E-09	M	ICRP-68	9.8E-11	--	--
Sm-153	Sm-153	152.922	Samarium	0.01	0.01	500-1000	ICRP-38	4.67E+01	h	1.68E+05	4.39E+05	ICRP-68	6.8E-10	M	ICRP-68	7.4E-10	--	--
Sm-155	Sm-155	154.925	Samarium	0.01	0.01	500-1000	ICRP-38	2.21E+01	m	1.33E+03	5.49E+07	ICRP-68	2.8E-11	M	ICRP-68	2.9E-11	--	--
Sm-156	Sm-156	155.926	Samarium	0.01	0.01	500-1000	ICRP-38	9.40E+00	h	3.38E+04	2.14E+06	ICRP-68	2.8E-10	M	ICRP-68	2.5E-10	--	--
Sm-157	Sm-157	156.928	Samarium	0.01	0.01	500-1000	ICRP-107	8.03E+00	m	4.82E+02	1.49E+08	--	--	--	--	--	--	--
Sn-106	Sn-106	105.917	Tin	0.01	0.03	50-100	ICRP-107	1.92E+00	m	1.15E+02	9.25E+08	--	--	--	--	--	--	--
Sn-108	Sn-108	107.912	Tin	0.01	0.03	50-100	ICRP-107	1.03E+01	m	6.18E+02	1.69E+08	JAERI	2.0E-11	M	JAERI	2.3E-11	--	--
Sn-109	Sn-109	108.911	Tin	0.01	0.03	50-100	ICRP-107	1.80E+01	m	1.08E+03	9.59E+07	JAERI	2.2E-11	M	JAERI	1.9E-11	--	--
Sn-110	Sn-110	109.908	Tin	0.01	0.03	50-100	ICRP-38	4.00E+00	h	1.44E+04	7.13E+06	ICRP-68	2.6E-10	M	ICRP-68	3.5E-10	--	--
Sn-111	Sn-111	110.908	Tin	0.01	0.03	50-100	ICRP-38	3.53E+01	m	2.12E+03	4.80E+07	ICRP-68	2.2E-11	M	ICRP-68	2.3E-11	--	--
Sn-113	Sn-113	112.905	Tin	0.01	0.03	50-100	ICRP-38	1.15E+02	d	9.94E+06	1.00E+04	ICRP-68	2.5E-09	M	ICRP-68	7.3E-10	--	--
Sn-113m	Sn-113	112.905	Tin	0.01	0.03	50-100	ICRP-107	2.14E+01	m	1.28E+03	7.78E+07	JAERI	5.3E-12	M	JAERI	3.3E-12	--	--
Sn-117m	Sn-117	116.903	Tin	0.01	0.03	50-100	ICRP-38	1.36E+01	d	1.18E+06	8.21E+04	ICRP-68	2.3E-09	M	ICRP-68	7.1E-10	--	--
Sn-119m	Sn-119	118.903	Tin	0.01	0.03	50-100	ICRP-38	2.93E+02	d	2.53E+07	3.75E+03	ICRP-68	2.0E-09	M	ICRP-68	3.4E-10	--	--
Sn-121	Sn-121	120.904	Tin	0.01	0.03	50-100	ICRP-38	2.71E+01	h	9.74E+04	9.58E+05	ICRP-68	2.8E-10	M	ICRP-68	2.3E-10	--	--
Sn-121m	Sn-121	120.904	Tin	0.01	0.03	50-100	ICRP-38	5.50E+01	y	1.74E+09	5.38E+01	ICRP-68	4.2E-09	M	ICRP-68	3.8E-10	--	--
Sn-123	Sn-123	122.906	Tin	0.01	0.03	50-100	ICRP-38	1.29E+02	d	1.12E+07	8.22E+03	ICRP-68	7.7E-09	M	ICRP-68	2.1E-09	--	--
Sn-123m	Sn-123	122.906	Tin	0.01	0.03	50-100	ICRP-38	4.01E+01	m	2.40E+03	3.82E+07	ICRP-68	4.4E-11	M	ICRP-68	3.8E-11	--	--
Sn-125	Sn-125	124.908	Tin	0.01	0.03	50-100	ICRP-38	9.64E+00	d	8.33E+05	1.08E+05	ICRP-68	3.0E-09	M	ICRP-68	3.1E-09	--	--
Sn-125m	Sn-125	124.908	Tin	0.01	0.03	50-100	ICRP-107	9.52E+00	m	5.71E+02	1.58E+08	--	--	--	--	--	--	--
Sn-126	Sn-126	125.908	Tin	0.01	0.03	50-100	ICRP-38	1.00E+05	y	3.16E+12	2.84E-02	ICRP-68	2.7E-08	M	ICRP-68	4.7E-09	--	--
Sn-127	Sn-127	126.910	Tin	0.01	0.03	50-100	ICRP-38	2.10E+00	h	7.56E+03	1.18E+07	ICRP-68	2.0E-10	M	ICRP-68	2.0E-10	--	--
Sn-127m	Sn-127	126.910	Tin	0.01	0.03	50-100	ICRP-107	4.13E+00	m	2.48E+02	3.59E+08	--	--	--	--	--	--	--
Sn-128	Sn-128	127.911	Tin	0.01	0.03	50-100	ICRP-38	5.91E+01	m	3.55E+03	2.49E+07	ICRP-68	1.5E-10	M	ICRP-68	1.5E-10	--	--
Sn-129	Sn-129	128.913	Tin	0.01	0.03	50-100	ICRP-107	2.23E+00	m	1.34E+02	6.54E+08	--	--	--	--	--	--	--
Sn-130	Sn-130	129.914	Tin	0.01	0.03	50-100	ICRP-107	3.72E+00	m	2.23E+02	3.89E+08	--	--	--	--	--	--	--
Sn-130m	Sn-130	129.914	Tin	0.01	0.03	50-100	ICRP-107	1.70E+00	m	1.02E+02	8.51E+08	--	--	--	--	--	--	--
Sr-79	Sr-79	78.930	Strontium	0.01	2.5	100	ICRP-107	2.25E+00	m	1.35E+02	1.06E+09	--	--	--	--	--	--	--
Sr-80	Sr-80	79.925	Strontium	0.01	2.5	100	ICRP-38	1.00E+02	m	6.00E+03	2.35E+07	ICRP-68	2.1E-10	S	ICRP-68	3.5E-10	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Sr-81	Sr-81	80.923	Strontium	0.01	2.5	100	ICRP-38	2.55E+01	m	1.53E+03	9.11E+07	ICRP-68	6.1E-11	S	ICRP-68	7.8E-11	--	--
Sr-82	Sr-82	81.918	Strontium	0.01	2.5	100	ICRP-38	2.50E+01	d	2.16E+06	6.38E+04	ICRP-68	1.0E-08	S	ICRP-68	6.1E-09	--	--
Sr-83	Sr-83	82.918	Strontium	0.01	2.5	100	ICRP-38	3.24E+01	h	1.17E+05	1.17E+06	ICRP-68	4.9E-10	S	ICRP-68	5.8E-10	--	--
Sr-85	Sr-85	84.913	Strontium	0.01	2.5	100	ICRP-38	6.48E+01	d	5.60E+06	2.37E+04	ICRP-68	7.7E-10	S	ICRP-68	5.6E-10	--	--
Sr-85m	Sr-85	84.913	Strontium	0.01	2.5	100	ICRP-38	6.95E+01	m	4.17E+03	3.19E+07	ICRP-68	7.4E-12	S	ICRP-68	6.1E-12	--	--
Sr-87m	Sr-87	86.909	Strontium	0.01	2.5	100	ICRP-38	2.81E+00	h	1.01E+04	1.29E+07	ICRP-68	3.5E-11	S	ICRP-68	3.3E-11	--	--
Sr-89	Sr-89	88.907	Strontium	0.01	2.5	100	ICRP-38	5.05E+01	d	4.36E+06	2.91E+04	ICRP-68	7.5E-09	S	ICRP-68	2.6E-09	--	--
Sr-90	Sr-90	89.908	Strontium	0.01	2.5	100	ICRP-38	2.91E+01	y	9.19E+08	1.37E+02	ICRP-68	1.5E-07	S	ICRP-68	2.8E-08	--	--
Sr-91	Sr-91	90.910	Strontium	0.01	2.5	100	ICRP-38	9.50E+00	h	3.42E+04	3.63E+06	ICRP-68	5.7E-10	S	ICRP-68	7.6E-10	--	--
Sr-92	Sr-92	91.911	Strontium	0.01	2.5	100	ICRP-38	2.71E+00	h	9.76E+03	1.26E+07	ICRP-68	3.4E-10	S	ICRP-68	4.9E-10	--	--
Sr-93	Sr-93	92.914	Strontium	0.01	2.5	100	ICRP-107	7.42E+00	m	4.45E+02	2.73E+08	--	--	--	--	--	--	--
Sr-94	Sr-94	93.915	Strontium	0.01	2.5	100	ICRP-107	7.53E+01	s	7.53E+01	1.60E+09	--	--	--	--	--	--	--
Ta-170	Ta-170	169.946	Tantalum	0.001	0.01	0	ICRP-107	6.76E+00	m	4.06E+02	1.64E+08	--	--	--	--	--	--	--
Ta-172	Ta-172	171.945	Tantalum	0.001	0.01	0	ICRP-38	3.68E+01	m	2.21E+03	2.97E+07	ICRP-68	5.7E-11	S	ICRP-68	5.3E-11	--	--
Ta-173	Ta-173	172.944	Tantalum	0.001	0.01	0	ICRP-38	3.65E+00	h	1.31E+04	4.96E+06	ICRP-68	1.6E-10	M	ICRP-68	1.9E-10	--	--
Ta-174	Ta-174	173.944	Tantalum	0.001	0.01	0	ICRP-38	1.20E+00	h	4.32E+03	1.50E+07	ICRP-68	6.6E-11	S	ICRP-68	5.7E-11	--	--
Ta-175	Ta-175	174.944	Tantalum	0.001	0.01	0	ICRP-38	1.05E+01	h	3.78E+04	1.71E+06	ICRP-68	2.0E-10	M	ICRP-68	2.1E-10	--	--
Ta-176	Ta-176	175.945	Tantalum	0.001	0.01	0	ICRP-38	8.08E+00	h	2.91E+04	2.20E+06	ICRP-68	3.3E-10	S	ICRP-68	3.1E-10	--	--
Ta-177	Ta-177	176.944	Tantalum	0.001	0.01	0	ICRP-38	5.66E+01	h	2.04E+05	3.13E+05	ICRP-68	1.3E-10	S	ICRP-68	1.1E-10	--	--
Ta-178s	Ta-178	177.946	Tantalum	0.001	0.01	0	ICRP-38	9.31E+00	m	5.59E+02	1.13E+08	--	--	--	--	--	--	--
Ta-178l	Ta-178	177.946	Tantalum	0.001	0.01	0	ICRP-38	2.20E+00	h	7.92E+03	8.00E+06	ICRP-68	1.1E-10	S	ICRP-68	7.8E-11	--	--
Ta-179	Ta-179	178.946	Tantalum	0.001	0.01	0	ICRP-38	6.65E+02	d	5.74E+07	1.10E+03	ICRP-68	5.2E-10	S	ICRP-68	6.5E-11	--	--
Ta-180	Ta-180	179.947	Tantalum	0.001	0.01	0	ICRP-38	1.00E+13	y	3.16E+20	1.99E-10	ICRP-68	2.4E-08	S	ICRP-68	8.4E-10	--	--
Ta-180m	Ta-180	179.947	Tantalum	0.001	0.01	0	ICRP-38	8.10E+00	h	2.92E+04	2.15E+06	ICRP-68	6.2E-11	S	ICRP-68	5.4E-11	--	--
Ta-182	Ta-182	181.950	Tantalum	0.001	0.01	0	ICRP-38	1.15E+02	d	9.94E+06	6.24E+03	ICRP-68	9.7E-09	S	ICRP-68	1.5E-09	--	--
Ta-182m	Ta-182	181.950	Tantalum	0.001	0.01	0	ICRP-38	1.58E+01	m	9.50E+02	6.52E+07	ICRP-68	3.6E-11	S	ICRP-68	1.2E-11	--	--
Ta-183	Ta-183	182.951	Tantalum	0.001	0.01	0	ICRP-38	5.10E+00	d	4.41E+05	1.40E+05	ICRP-68	2.0E-09	S	ICRP-68	1.3E-09	--	--
Ta-184	Ta-184	183.954	Tantalum	0.001	0.01	0	ICRP-38	8.70E+00	h	3.13E+04	1.96E+06	ICRP-68	6.3E-10	S	ICRP-68	6.8E-10	--	--
Ta-185	Ta-185	184.956	Tantalum	0.001	0.01	0	ICRP-38	4.90E+01	m	2.94E+03	2.07E+07	ICRP-68	7.2E-11	S	ICRP-68	6.8E-11	--	--
Ta-186	Ta-186	185.959	Tantalum	0.001	0.01	0	ICRP-38	1.05E+01	m	6.30E+02	9.63E+07	ICRP-68	3.1E-11	S	ICRP-68	3.3E-11	--	--
Tb-146	Tb-146	145.927	Terbium	0.01	0.01	500-1000	ICRP-107	2.30E+01	s	2.30E+01	3.36E+09	--	--	--	--	--	--	--
Tb-147	Tb-147	146.924	Terbium	0.01	0.01	500-1000	ICRP-38	1.65E+00	h	5.94E+03	1.29E+07	ICRP-68	1.2E-10	M	ICRP-68	1.6E-10	--	--
Tb-147m	Tb-147	146.924	Terbium	0.01	0.01	500-1000	ICRP-107	1.87E+00	m	1.12E+02	6.84E+08	--	--	--	--	--	--	--
Tb-148	Tb-148	147.924	Terbium	0.01	0.01	500-1000	ICRP-107	6.00E+01	m	3.60E+03	2.12E+07	JAERI	1.0E-10	M	JAERI	1.3E-10	--	--
Tb-148m	Tb-148	147.924	Terbium	0.01	0.01	500-1000	ICRP-107	2.20E+00	m	1.32E+02	5.78E+08	--	--	--	--	--	--	--
Tb-149	Tb-149	148.923	Terbium	0.01	0.01	500-1000	ICRP-38	4.15E+00	h	1.49E+04	5.07E+06	ICRP-68	4.3E-09	M	ICRP-68	2.5E-10	--	--
Tb-149m	Tb-149	148.923	Terbium	0.01	0.01	500-1000	ICRP-107	4.16E+00	m	2.50E+02	3.03E+08	--	--	--	--	--	--	--
Tb-150	Tb-150	149.924	Terbium	0.01	0.01	500-1000	ICRP-38	3.27E+00	h	1.18E+04	6.39E+06	ICRP-68	1.8E-10	M	ICRP-68	2.5E-10	--	--
Tb-150m	Tb-150	149.924	Terbium	0.01	0.01	500-1000	ICRP-107	5.80E+00	m	3.48E+02	2.16E+08	--	--	--	--	--	--	--
Tb-151	Tb-151	150.923	Terbium	0.01	0.01	500-1000	ICRP-38	1.76E+01	h	6.34E+04	1.18E+06	ICRP-68	3.3E-10	M	ICRP-68	3.4E-10	--	--
Tb-151m	Tb-151	150.923	Terbium	0.01	0.01	500-1000	ICRP-107	2.50E+01	s	2.50E+01	2.99E+09	--	--	--	--	--	--	--
Tb-152	Tb-152	151.924	Terbium	0.01	0.01	500-1000	ICRP-107	1.75E+01	h	6.30E+04	1.18E+06	JAERI	5.0E-10	M	JAERI	7.1E-10	--	--
Tb-152m	Tb-152	151.924	Terbium	0.01	0.01	500-1000	ICRP-107	4.20E+00	m	2.52E+02	2.95E+08	--	--	--	--	--	--	--
Tb-153	Tb-153	152.923	Terbium	0.01	0.01	500-1000	ICRP-38	2.34E+00	d	2.02E+05	3.65E+05	ICRP-68	2.4E-10	M	ICRP-68	2.5E-10	--	--
Tb-154	Tb-154	153.925	Terbium	0.01	0.01	500-1000	ICRP-38	2.14E+01	h	7.70E+04	9.51E+05	ICRP-68	6.0E-10	M	ICRP-68	6.5E-10	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Tb-155	Tb-155	154.924	Terbium	0.01	0.01	500-1000	ICRP-38	5.32E+00	d	4.60E+05	1.58E+05	ICRP-68	2.5E-10	M	ICRP-68	2.1E-10	--	--
Tb-156	Tb-156	155.925	Terbium	0.01	0.01	500-1000	ICRP-38	5.34E+00	d	4.61E+05	1.57E+05	ICRP-68	1.4E-09	M	ICRP-68	1.2E-09	--	--
Tb-156ml	Tb-156	155.925	Terbium	0.01	0.01	500-1000	ICRP-38	2.44E+01	h	8.78E+04	8.24E+05	ICRP-68	2.3E-10	M	ICRP-68	1.7E-10	--	--
Tb-156ms	Tb-156	155.925	Terbium	0.01	0.01	500-1000	ICRP-38	5.00E+00	h	1.80E+04	4.02E+06	ICRP-68	1.3E-10	M	ICRP-68	8.1E-11	--	--
Tb-157	Tb-157	156.924	Terbium	0.01	0.01	500-1000	ICRP-38	1.50E+02	y	4.73E+09	1.52E+01	ICRP-68	1.1E-09	M	ICRP-68	3.4E-11	--	--
Tb-158	Tb-158	157.925	Terbium	0.01	0.01	500-1000	ICRP-38	1.50E+02	y	4.73E+09	1.51E+01	ICRP-68	4.3E-08	M	ICRP-68	1.1E-09	--	--
Tb-160	Tb-160	159.927	Terbium	0.01	0.01	500-1000	ICRP-38	7.23E+01	d	6.25E+06	1.13E+04	ICRP-68	6.6E-09	M	ICRP-68	1.6E-09	--	--
Tb-161	Tb-161	160.928	Terbium	0.01	0.01	500-1000	ICRP-38	6.91E+00	d	5.97E+05	1.17E+05	ICRP-68	1.2E-09	M	ICRP-68	7.2E-10	--	--
Tb-162	Tb-162	161.929	Terbium	0.01	0.01	500-1000	ICRP-107	7.60E+00	m	4.56E+02	1.53E+08	--	--	--	--	--	--	--
Tb-163	Tb-163	162.931	Terbium	0.01	0.01	500-1000	ICRP-107	1.95E+01	m	1.17E+03	5.92E+07	JAERI	2.9E-11	M	JAERI	2.2E-11	--	--
Tb-164	Tb-164	163.933	Terbium	0.01	0.01	500-1000	ICRP-107	3.00E+00	m	1.80E+02	3.82E+08	--	--	--	--	--	--	--
Tb-165	Tb-165	164.935	Terbium	0.01	0.01	500-1000	ICRP-107	2.11E+00	m	1.27E+02	5.40E+08	--	--	--	--	--	--	--
Tc-101	Tc-101	100.907	Technetium	0.01	9.5	0	ICRP-38	1.42E+01	m	8.52E+02	1.31E+08	ICRP-68	2.1E-11	M	ICRP-68	1.9E-11	--	--
Tc-102	Tc-102	101.909	Technetium	0.01	9.5	0	ICRP-107	5.28E+00	s	5.28E+00	2.10E+10	--	--	--	--	--	--	--
Tc-102m	Tc-102	101.909	Technetium	0.01	9.5	0	ICRP-107	4.35E+00	m	2.61E+02	4.24E+08	--	--	--	--	--	--	--
Tc-104	Tc-104	103.911	Technetium	0.01	9.5	0	ICRP-38	1.82E+01	m	1.09E+03	9.94E+07	ICRP-68	4.8E-11	M	ICRP-68	8.1E-11	--	--
Tc-105	Tc-105	104.912	Technetium	0.01	9.5	0	ICRP-107	7.60E+00	m	4.56E+02	2.36E+08	--	--	--	--	--	--	--
Tc-91	Tc-91	90.918	Technetium	0.01	9.5	0	ICRP-107	3.14E+00	m	1.88E+02	6.59E+08	--	--	--	--	--	--	--
Tc-91m	Tc-91	90.918	Technetium	0.01	9.5	0	ICRP-107	3.30E+00	m	1.98E+02	6.27E+08	--	--	--	--	--	--	--
Tc-92	Tc-92	91.915	Technetium	0.01	9.5	0	ICRP-107	4.25E+00	m	2.55E+02	4.81E+08	--	--	--	--	--	--	--
Tc-93	Tc-93	92.910	Technetium	0.01	9.5	0	ICRP-38	2.75E+00	h	9.90E+03	1.23E+07	ICRP-68	6.5E-11	M	ICRP-68	4.9E-11	--	--
Tc-93m	Tc-93	92.910	Technetium	0.01	9.5	0	ICRP-38	4.35E+01	m	2.61E+03	4.65E+07	ICRP-68	3.1E-11	M	ICRP-68	2.4E-11	--	--
Tc-94	Tc-94	93.910	Technetium	0.01	9.5	0	ICRP-38	2.93E+02	m	1.76E+04	6.83E+06	ICRP-68	2.2E-10	M	ICRP-68	1.8E-10	--	--
Tc-94m	Tc-94	93.910	Technetium	0.01	9.5	0	ICRP-38	5.20E+01	m	3.12E+03	3.85E+07	ICRP-68	8.0E-11	M	ICRP-68	1.1E-10	--	--
Tc-95	Tc-95	94.908	Technetium	0.01	9.5	0	ICRP-38	2.00E+01	h	7.20E+04	1.65E+06	ICRP-68	1.8E-10	F	ICRP-68	1.6E-10	--	--
Tc-95m	Tc-95	94.908	Technetium	0.01	9.5	0	ICRP-38	6.10E+01	d	5.27E+06	2.26E+04	ICRP-68	8.7E-10	M	ICRP-68	6.2E-10	--	--
Tc-96	Tc-96	95.908	Technetium	0.01	9.5	0	ICRP-38	4.28E+00	d	3.70E+05	3.18E+05	ICRP-68	1.0E-09	M	ICRP-68	1.1E-09	--	--
Tc-96m	Tc-96	95.908	Technetium	0.01	9.5	0	ICRP-38	5.15E+01	m	3.09E+03	3.81E+07	ICRP-68	1.1E-11	F	ICRP-68	1.3E-11	--	--
Tc-97	Tc-97	96.906	Technetium	0.01	9.5	0	ICRP-38	2.60E+06	y	8.20E+13	1.42E-03	ICRP-68	2.1E-10	M	ICRP-68	8.3E-11	--	--
Tc-97m	Tc-97	96.906	Technetium	0.01	9.5	0	ICRP-38	8.70E+01	d	7.52E+06	1.55E+04	ICRP-68	3.1E-09	M	ICRP-68	6.6E-10	--	--
Tc-98	Tc-98	97.907	Technetium	0.01	9.5	0	ICRP-38	4.20E+06	y	1.33E+14	8.69E-04	ICRP-68	8.1E-09	M	ICRP-68	2.3E-09	--	--
Tc-99	Tc-99	98.906	Technetium	0.01	9.5	0	ICRP-38	2.13E+05	y	6.72E+12	1.70E-02	ICRP-68	3.9E-09	M	ICRP-68	7.8E-10	--	--
Tc-99m	Tc-99	98.906	Technetium	0.01	9.5	0	ICRP-38	6.02E+00	h	2.17E+04	5.26E+06	ICRP-68	2.9E-11	M	ICRP-68	2.2E-11	--	--
Te-113	Te-113	112.916	Tellurium	0.01	0.025	50-100	ICRP-107	1.70E+00	m	1.02E+02	9.80E+08	--	--	--	--	--	--	--
Te-114	Te-114	113.912	Tellurium	0.01	0.025	50-100	ICRP-107	1.52E+01	m	9.12E+02	1.09E+08	--	--	--	--	--	--	--
Te-115	Te-115	114.912	Tellurium	0.01	0.025	50-100	ICRP-107	5.80E+00	m	3.48E+02	2.82E+08	--	--	--	--	--	--	--
Te-115m	Te-115	114.912	Tellurium	0.01	0.025	50-100	ICRP-107	6.70E+00	m	4.02E+02	2.44E+08	--	--	--	--	--	--	--
Te-116	Te-116	115.908	Tellurium	0.01	0.025	50-100	ICRP-38	2.49E+00	h	8.96E+03	1.09E+07	ICRP-68	1.7E-10	M	ICRP-68	1.7E-10	--	--
Te-117	Te-117	116.909	Tellurium	0.01	0.025	50-100	ICRP-107	6.20E+01	m	3.72E+03	2.59E+07	JAERI	5.5E-11	M	JAERI	5.4E-11	--	--
Te-118	Te-118	117.906	Tellurium	0.01	0.025	50-100	ICRP-107	6.00E+00	d	5.18E+05	1.85E+05	JAERI	2.3E-09	M	JAERI	3.0E-09	--	--
Te-119	Te-119	118.906	Tellurium	0.01	0.025	50-100	ICRP-107	1.61E+01	h	5.78E+04	1.64E+06	JAERI	1.8E-10	M	JAERI	1.8E-10	--	--
Te-119m	Te-119	118.906	Tellurium	0.01	0.025	50-100	ICRP-107	4.70E+00	d	4.06E+05	2.34E+05	JAERI	7.3E-10	M	JAERI	7.3E-10	--	--
Te-121	Te-121	120.905	Tellurium	0.01	0.025	50-100	ICRP-38	1.70E+01	d	1.47E+06	6.35E+04	ICRP-68	5.1E-10	0	ICRP-68	4.3E-10	--	--
Te-121m	Te-121	120.905	Tellurium	0.01	0.025	50-100	ICRP-38	1.54E+02	d	1.33E+07	7.01E+03	ICRP-68	5.5E-09	0	ICRP-68	2.3E-09	--	--
Te-123	Te-123	122.904	Tellurium	0.01	0.025	50-100	ICRP-38	1.00E+13	y	3.16E+20	2.91E-10	ICRP-68	1.2E-08	0	ICRP-68	4.4E-09	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Te-123m	Te-123	122.904	Tellurium	0.01	0.025	50-100	ICRP-38	1.20E+02	d	1.03E+07	8.88E+03	ICRP-68	3.9E-09	M	ICRP-68	1.4E-09	--	--
Te-125m	Te-125	124.904	Tellurium	0.01	0.025	50-100	ICRP-38	5.80E+01	d	5.01E+06	1.80E+04	ICRP-68	3.3E-09	M	ICRP-68	8.7E-10	--	--
Te-127	Te-127	126.905	Tellurium	0.01	0.025	50-100	ICRP-38	9.35E+00	h	3.37E+04	2.64E+06	ICRP-68	1.8E-10	M	ICRP-68	1.7E-10	--	--
Te-127m	Te-127	126.905	Tellurium	0.01	0.025	50-100	ICRP-38	1.09E+02	d	9.42E+06	9.44E+03	ICRP-68	7.2E-09	M	ICRP-68	2.3E-09	--	--
Te-129	Te-129	128.907	Tellurium	0.01	0.025	50-100	ICRP-38	6.96E+01	m	4.18E+03	2.10E+07	ICRP-68	5.7E-11	M	ICRP-68	6.3E-11	--	--
Te-129m	Te-129	128.907	Tellurium	0.01	0.025	50-100	ICRP-38	3.36E+01	d	2.90E+06	3.01E+04	ICRP-68	6.3E-09	M	ICRP-68	3.0E-09	--	--
Te-131	Te-131	130.909	Tellurium	0.01	0.025	50-100	ICRP-38	2.50E+01	m	1.50E+03	5.75E+07	ICRP-68	6.8E-11	0	ICRP-68	8.7E-11	--	--
Te-131m	Te-131	130.909	Tellurium	0.01	0.025	50-100	ICRP-38	3.00E+01	h	1.08E+05	7.98E+05	ICRP-68	2.4E-09	0	ICRP-68	1.9E-09	--	--
Te-132	Te-132	131.909	Tellurium	0.01	0.025	50-100	ICRP-38	7.82E+01	h	2.82E+05	3.04E+05	ICRP-68	5.1E-09	0	ICRP-68	3.7E-09	--	--
Te-133	Te-133	132.911	Tellurium	0.01	0.025	50-100	ICRP-38	1.25E+01	m	7.47E+02	1.14E+08	ICRP-68	5.6E-11	0	ICRP-68	7.2E-11	--	--
Te-133m	Te-133	132.911	Tellurium	0.01	0.025	50-100	ICRP-38	5.54E+01	m	3.32E+03	2.55E+07	ICRP-68	2.2E-10	0	ICRP-68	2.8E-10	--	--
Te-134	Te-134	133.911	Tellurium	0.01	0.025	50-100	ICRP-38	4.18E+01	m	2.51E+03	3.36E+07	ICRP-68	1.1E-10	M	ICRP-68	1.1E-10	--	--
Th-223	Th-223	223.021	Thorium	0.001	0.00085	1000-10000	ICRP-107	6.00E-01	s	6.00E-01	8.43E+10	--	--	--	--	--	--	--
Th-224	Th-224	224.021	Thorium	0.001	0.00085	1000-10000	ICRP-107	1.05E+00	s	1.05E+00	4.80E+10	--	--	--	--	--	--	--
Th-226	Th-226	226.025	Thorium	0.001	0.00085	1000-10000	ICRP-38	3.09E+01	m	1.85E+03	2.69E+07	ICRP-68	7.8E-08	S	ICRP-68	3.6E-10	--	--
Th-227	Th-227	227.028	Thorium	0.001	0.00085	1000-10000	ICRP-38	1.87E+01	d	1.62E+06	3.07E+04	ICRP-68	9.6E-06	S	ICRP-68	8.9E-09	--	--
Th-228	Th-228	228.029	Thorium	0.001	0.00085	1000-10000	ICRP-38	1.91E+00	y	6.04E+07	8.19E+02	ICRP-68	3.7E-05	S	ICRP-68	7.2E-08	--	--
Th-229	Th-229	229.032	Thorium	0.001	0.00085	1000-10000	ICRP-38	7.34E+03	y	2.32E+11	2.13E-01	ICRP-68	9.9E-05	M	ICRP-68	4.8E-07	--	--
Th-230	Th-230	230.033	Thorium	0.001	0.00085	1000-10000	ICRP-38	7.70E+04	y	2.43E+12	2.02E-02	ICRP-68	4.0E-05	M	ICRP-68	2.1E-07	--	--
Th-231	Th-231	231.036	Thorium	0.001	0.00085	1000-10000	ICRP-38	2.55E+01	h	9.19E+04	5.31E+05	ICRP-68	4.0E-10	S	ICRP-68	3.4E-10	--	--
Th-232	Th-232	232.038	Thorium	0.001	0.00085	1000-10000	ICRP-38	1.41E+10	y	4.43E+17	1.10E-07	ICRP-68	4.2E-05	M	ICRP-68	2.2E-07	--	--
Th-233	Th-233	233.042	Thorium	0.001	0.00085	1000-10000	ICRP-107	2.23E+01	m	1.34E+03	3.62E+07	JAERI	2.9E-11	S	JAERI	2.2E-11	--	--
Th-234	Th-234	234.044	Thorium	0.001	0.00085	1000-10000	ICRP-38	2.41E+01	d	2.08E+06	2.31E+04	ICRP-68	7.3E-09	S	ICRP-68	3.4E-09	--	--
Th-235	Th-235	235.047	Thorium	0.001	0.00085	1000-10000	ICRP-107	7.10E+00	m	4.26E+02	1.13E+08	--	--	--	--	--	--	--
Th-236	Th-236	236.050	Thorium	0.001	0.00085	1000-10000	ICRP-107	3.75E+01	m	2.25E+03	2.12E+07	--	--	--	--	--	--	--
Ti-44	Ti-44	43.960	Titanium	0.01	0.0055	0	ICRP-38	4.73E+01	y	1.49E+09	1.72E+02	ICRP-68	1.2E-07	S	ICRP-68	5.8E-09	--	--
Ti-45	Ti-45	44.958	Titanium	0.01	0.0055	0	ICRP-38	3.08E+00	h	1.11E+04	2.26E+07	ICRP-68	1.5E-10	S	ICRP-68	1.5E-10	--	--
Ti-51	Ti-51	50.947	Titanium	0.01	0.0055	0	ICRP-107	5.76E+00	m	3.46E+02	6.41E+08	--	--	--	--	--	--	--
Ti-52	Ti-52	51.947	Titanium	0.01	0.0055	0	ICRP-107	1.70E+00	m	1.02E+02	2.13E+09	--	--	--	--	--	--	--
Tl-190	Tl-190	189.974	Thallium	0.01	0.004	2	ICRP-107	2.60E+00	m	1.56E+02	3.81E+08	--	--	--	--	--	--	--
Tl-190m	Tl-190	189.974	Thallium	0.01	0.004	2	ICRP-107	3.70E+00	m	2.22E+02	2.67E+08	--	--	--	--	--	--	--
Tl-194	Tl-194	193.971	Thallium	0.01	0.004	2	ICRP-38	3.30E+01	m	1.98E+03	2.94E+07	ICRP-68	8.9E-12	F	ICRP-68	8.1E-12	--	--
Tl-194m	Tl-194	193.971	Thallium	0.01	0.004	2	ICRP-38	3.28E+01	m	1.97E+03	2.96E+07	ICRP-68	3.6E-11	F	ICRP-68	4.0E-11	--	--
Tl-195	Tl-195	194.970	Thallium	0.01	0.004	2	ICRP-38	1.16E+00	h	4.18E+03	1.39E+07	ICRP-68	3.0E-11	F	ICRP-68	2.7E-11	--	--
Tl-196	Tl-196	195.970	Thallium	0.01	0.004	2	ICRP-107	1.84E+00	h	6.62E+03	8.69E+06	JAERI	5.7E-11	F	JAERI	5.4E-11	--	--
Tl-197	Tl-197	196.970	Thallium	0.01	0.004	2	ICRP-38	2.84E+00	h	1.02E+04	5.60E+06	ICRP-68	2.7E-11	F	ICRP-68	2.3E-11	--	--
Tl-198	Tl-198	197.970	Thallium	0.01	0.004	2	ICRP-38	5.30E+00	h	1.91E+04	2.99E+06	ICRP-68	1.2E-10	F	ICRP-68	7.3E-11	--	--
Tl-198m	Tl-198	197.970	Thallium	0.01	0.004	2	ICRP-38	1.87E+00	h	6.73E+03	8.46E+06	ICRP-68	7.3E-11	F	ICRP-68	5.4E-11	--	--
Tl-199	Tl-199	198.970	Thallium	0.01	0.004	2	ICRP-38	7.42E+00	h	2.67E+04	2.12E+06	ICRP-68	3.7E-11	F	ICRP-68	2.6E-11	--	--
Tl-200	Tl-200	199.971	Thallium	0.01	0.004	2	ICRP-38	2.61E+01	h	9.40E+04	6.00E+05	ICRP-68	2.5E-10	F	ICRP-68	2.0E-10	--	--
Tl-201	Tl-201	200.971	Thallium	0.01	0.004	2	ICRP-38	3.04E+00	d	2.63E+05	2.13E+05	ICRP-68	7.6E-11	F	ICRP-68	9.5E-11	--	--
Tl-202	Tl-202	201.972	Thallium	0.01	0.004	2	ICRP-38	1.22E+01	d	1.06E+06	5.29E+04	ICRP-68	3.1E-10	F	ICRP-68	4.5E-10	--	--
Tl-204	Tl-204	203.974	Thallium	0.01	0.004	2	ICRP-38	3.78E+00	y	1.19E+08	4.64E+02	ICRP-68	6.2E-10	F	ICRP-68	1.3E-09	--	--
Tl-206	Tl-206	205.976	Thallium	0.01	0.004	2	ICRP-38	4.20E+00	m	2.52E+02	2.17E+08	--	--	--	--	--	--	--
Tl-206m	Tl-206	205.976	Thallium	0.01	0.004	2	ICRP-107	3.74E+00	m	2.24E+02	2.44E+08	--	--	--	--	--	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Tl-207	Tl-207	206.977	Thallium	0.01	0.004	2	ICRP-38	4.77E+00	m	2.86E+02	1.90E+08	--	--	--	--	--	--	--
Tl-208	Tl-208	207.982	Thallium	0.01	0.004	2	ICRP-38	3.07E+00	m	1.84E+02	2.94E+08	--	--	--	--	--	--	--
Tl-209	Tl-209	208.985	Thallium	0.01	0.004	2	ICRP-38	2.20E+00	m	1.32E+02	4.09E+08	--	--	--	--	--	--	--
Tl-210	Tl-210	209.990	Thallium	0.01	0.004	2	ICRP-38	1.30E+00	m	7.80E+01	6.89E+08	--	--	--	--	--	--	--
Tm-159	Tm-159	158.935	Thulium	0.01	0.01	0	JAERI	9.13E+00	m	5.48E+02	1.30E+08	--	--	--	--	--	--	--
Tm-161	Tm-161	160.934	Thulium	0.01	0.01	0	ICRP-107	3.02E+01	m	1.81E+03	3.87E+07	--	--	--	--	--	--	--
Tm-162	Tm-162	161.934	Thulium	0.01	0.01	0	ICRP-38	2.17E+01	m	1.30E+03	5.35E+07	ICRP-68	2.7E-11	M	ICRP-68	2.9E-11	--	--
Tm-163	Tm-163	162.933	Thulium	0.01	0.01	0	ICRP-107	1.81E+00	h	6.52E+03	1.06E+07	JAERI	6.3E-11	M	JAERI	5.6E-11	--	--
Tm-164	Tm-164	163.934	Thulium	0.01	0.01	0	ICRP-107	2.00E+00	m	1.20E+02	5.73E+08	--	--	--	--	--	--	--
Tm-165	Tm-165	164.932	Thulium	0.01	0.01	0	ICRP-107	3.01E+01	h	1.08E+05	6.32E+05	JAERI	3.1E-10	M	JAERI	3.6E-10	--	--
Tm-166	Tm-166	165.934	Thulium	0.01	0.01	0	ICRP-38	7.70E+00	h	2.77E+04	2.45E+06	ICRP-68	2.8E-10	M	ICRP-68	2.8E-10	--	--
Tm-167	Tm-167	166.933	Thulium	0.01	0.01	0	ICRP-38	9.24E+00	d	7.98E+05	8.47E+04	ICRP-68	1.1E-09	M	ICRP-68	5.6E-10	--	--
Tm-168	Tm-168	167.934	Thulium	0.01	0.01	0	ICRP-107	9.31E+01	d	8.04E+06	8.35E+03	JAERI	4.3E-09	M	JAERI	1.0E-09	--	--
Tm-170	Tm-170	169.936	Thulium	0.01	0.01	0	ICRP-38	1.29E+02	d	1.11E+07	5.97E+03	ICRP-68	6.6E-09	M	ICRP-68	1.3E-09	--	--
Tm-171	Tm-171	170.936	Thulium	0.01	0.01	0	ICRP-38	1.92E+00	y	6.06E+07	1.09E+03	ICRP-68	1.3E-09	M	ICRP-68	1.1E-10	--	--
Tm-172	Tm-172	171.938	Thulium	0.01	0.01	0	ICRP-38	6.36E+01	h	2.29E+05	2.87E+05	ICRP-68	1.4E-09	M	ICRP-68	1.7E-09	--	--
Tm-173	Tm-173	172.940	Thulium	0.01	0.01	0	ICRP-38	8.24E+00	h	2.97E+04	2.20E+06	ICRP-68	2.6E-10	M	ICRP-68	3.1E-10	--	--
Tm-174	Tm-174	173.942	Thulium	0.01	0.01	0	ICRP-107	5.40E+00	m	3.24E+02	2.00E+08	--	--	--	--	--	--	--
Tm-175	Tm-175	174.944	Thulium	0.01	0.01	0	ICRP-38	1.52E+01	m	9.12E+02	7.07E+07	ICRP-68	3.1E-11	M	ICRP-68	2.7E-11	--	--
Tm-176	Tm-176	175.947	Thulium	0.01	0.01	0	ICRP-107	1.85E+00	m	1.11E+02	5.78E+08	--	--	--	--	--	--	--
U-227	U-227	227.031	Uranium	0.001	0.0085	1-50	ICRP-107	1.10E+00	m	6.60E+01	7.53E+08	--	--	--	--	--	--	--
U-228	U-228	228.031	Uranium	0.001	0.0085	1-50	ICRP-107	9.10E+00	m	5.46E+02	9.06E+07	--	--	--	--	--	--	--
U-230	U-230	230.034	Uranium	0.001	0.0085	1-50	ICRP-38	2.08E+01	d	1.80E+06	2.73E+04	ICRP-68	1.5E-05	S	ICRP-68	5.5E-08	--	--
U-231	U-231	231.036	Uranium	0.001	0.0085	1-50	ICRP-38	4.20E+00	d	3.63E+05	1.35E+05	ICRP-68	4.9E-10	S	ICRP-68	2.8E-10	--	--
U-232	U-232	232.037	Uranium	0.001	0.0085	1-50	ICRP-38	7.20E+01	y	2.27E+09	2.14E+01	ICRP-68	3.5E-05	S	ICRP-68	3.3E-07	--	--
U-233	U-233	233.040	Uranium	0.001	0.0085	1-50	ICRP-38	1.59E+05	y	5.00E+12	9.68E-03	ICRP-68	8.7E-06	S	ICRP-68	5.0E-08	--	--
U-234	U-234	234.041	Uranium	0.001	0.0085	1-50	ICRP-38	2.45E+05	y	7.72E+12	6.25E-03	ICRP-68	8.5E-06	S	ICRP-68	4.9E-08	--	--
U-235	U-235	235.044	Uranium	0.001	0.0085	1-50	ICRP-38	7.04E+08	y	2.22E+16	2.16E-06	ICRP-68	7.7E-06	S	ICRP-68	4.6E-08	--	--
U-235m	U-235	235.044	Uranium	0.001	0.0085	1-50	ICRP-107	2.60E+01	m	1.56E+03	3.08E+07	--	--	--	--	--	--	--
U-236	U-236	236.046	Uranium	0.001	0.0085	1-50	ICRP-38	2.34E+07	y	7.39E+14	6.47E-05	ICRP-68	7.9E-06	S	ICRP-68	4.6E-08	--	--
U-237	U-237	237.049	Uranium	0.001	0.0085	1-50	ICRP-38	6.75E+00	d	5.83E+05	8.16E+04	ICRP-68	1.8E-09	S	ICRP-68	7.7E-10	--	--
U-238	U-238	238.051	Uranium	0.001	0.0085	1-50	ICRP-38	4.47E+09	y	1.41E+17	3.36E-07	ICRP-68	7.3E-06	S	ICRP-68	4.4E-08	--	--
U-239	U-239	239.054	Uranium	0.001	0.0085	1-50	ICRP-38	2.35E+01	m	1.41E+03	3.34E+07	ICRP-68	3.5E-11	S	ICRP-68	2.8E-11	--	--
U-240	U-240	240.057	Uranium	0.001	0.0085	1-50	ICRP-38	1.41E+01	h	5.08E+04	9.26E+05	ICRP-68	8.4E-10	S	ICRP-68	1.1E-09	--	--
U-242	U-242	242.063	Uranium	0.001	0.0085	1-50	ICRP-107	1.68E+01	m	1.01E+03	4.62E+07	--	--	--	--	--	--	--
V-47	V-47	46.955	Vanadium	0.01	0.0055	0	ICRP-38	3.26E+01	m	1.96E+03	1.23E+08	ICRP-68	5.0E-11	M	ICRP-68	6.3E-11	--	--
V-48	V-48	47.952	Vanadium	0.01	0.0055	0	ICRP-38	1.62E+01	d	1.40E+06	1.68E+05	ICRP-68	2.7E-09	M	ICRP-68	2.0E-09	--	--
V-49	V-49	48.949	Vanadium	0.01	0.0055	0	ICRP-38	3.30E+02	d	2.85E+07	8.08E+03	ICRP-68	3.2E-11	M	ICRP-68	1.8E-11	--	--
V-50	V-50	49.947	Vanadium	0.01	0.0055	0	ICRP-107	1.50E+17	y	4.73E+24	4.77E-14	JAERI	9.9E-08	F	JAERI	4.2E-09	--	--
V-52	V-52	51.945	Vanadium	0.01	0.0055	0	ICRP-107	3.74E+00	m	2.25E+02	9.67E+08	--	--	--	--	--	--	--
V-53	V-53	52.944	Vanadium	0.01	0.0055	0	ICRP-107	1.61E+00	m	9.66E+01	2.21E+09	--	--	--	--	--	--	--
W-176	W-176	175.946	Tungsten	0.01	0.045	0	ICRP-38	2.30E+00	h	8.28E+03	7.74E+06	ICRP-68	7.6E-11	F	ICRP-68	1.1E-10	--	--
W-177	W-177	176.947	Tungsten	0.01	0.045	0	ICRP-38	1.35E+02	m	8.10E+03	7.87E+06	ICRP-68	4.6E-11	F	ICRP-68	6.1E-11	--	--
W-178	W-178	177.946	Tungsten	0.01	0.045	0	ICRP-38	2.17E+01	d	1.87E+06	3.38E+04	ICRP-68	1.2E-10	F	ICRP-68	2.5E-10	--	--
W-179	W-179	178.947	Tungsten	0.01	0.045	0	ICRP-38	3.75E+01	m	2.25E+03	2.80E+07	ICRP-68	1.8E-12	F	ICRP-68	3.3E-12	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
W-179m	W-179	178.947	Tungsten	0.01	0.045	0	ICRP-107	6.40E+00	m	3.84E+02	1.64E+08	--	--	--	--	--	--	--
W-181	W-181	180.948	Tungsten	0.01	0.045	0	ICRP-38	1.21E+02	d	1.05E+07	5.95E+03	ICRP-68	4.3E-11	F	ICRP-68	8.2E-11	--	--
W-185	W-185	184.953	Tungsten	0.01	0.045	0	ICRP-38	7.51E+01	d	6.49E+06	9.40E+03	ICRP-68	2.2E-10	F	ICRP-68	5.0E-10	--	--
W-185m	W-185	184.953	Tungsten	0.01	0.045	0	ICRP-107	1.60E+00	m	9.58E+01	6.37E+08	--	--	--	--	--	--	--
W-187	W-187	186.957	Tungsten	0.01	0.045	0	ICRP-38	2.39E+01	h	8.60E+04	7.01E+05	ICRP-68	3.3E-10	F	ICRP-68	7.1E-10	--	--
W-188	W-188	187.958	Tungsten	0.01	0.045	0	ICRP-38	6.94E+01	d	6.00E+06	1.00E+04	ICRP-68	8.4E-10	F	ICRP-68	2.3E-09	--	--
W-190	W-190	189.963	Tungsten	0.01	0.045	0	ICRP-107	3.00E+01	m	1.80E+03	3.30E+07	JAERI	6.6E-11	F	JAERI	8.5E-11	--	--
Xe-120	Xe-120	119.912	Xenon	1	0	0	ICRP-38	4.00E+01	m	2.40E+03	3.92E+07	--	--	--	--	--	ICRP-68	1.50E-09
Xe-121	Xe-121	120.911	Xenon	1	0	0	ICRP-38	4.01E+01	m	2.41E+03	3.88E+07	--	--	--	--	--	ICRP-68	7.50E-09
Xe-122	Xe-122	121.908	Xenon	1	0	0	ICRP-38	2.01E+01	h	7.24E+04	1.28E+06	--	--	--	--	--	ICRP-68	1.90E-10
Xe-123	Xe-123	122.908	Xenon	1	0	0	ICRP-38	2.08E+00	h	7.49E+03	1.23E+07	--	--	--	--	--	ICRP-68	2.40E-09
Xe-125	Xe-125	124.906	Xenon	1	0	0	ICRP-38	1.70E+01	h	6.12E+04	1.48E+06	--	--	--	--	--	ICRP-68	9.30E-10
Xe-127	Xe-127	126.905	Xenon	1	0	0	ICRP-38	3.64E+01	d	3.15E+06	2.83E+04	--	--	--	--	--	ICRP-68	9.70E-10
Xe-127m	Xe-127	126.905	Xenon	1	0	0	ICRP-107	6.92E+01	s	6.92E+01	1.28E+09	--	--	--	--	--	JAERI	6.00E-10
Xe-129m	Xe-129	128.905	Xenon	1	0	0	ICRP-38	8.00E+00	d	6.91E+05	1.27E+05	--	--	--	--	--	ICRP-68	8.10E-11
Xe-131m	Xe-131	130.905	Xenon	1	0	0	ICRP-38	1.19E+01	d	1.03E+06	8.38E+04	--	--	--	--	--	ICRP-68	3.20E-11
Xe-133	Xe-133	132.906	Xenon	1	0	0	ICRP-38	5.25E+00	d	4.53E+05	1.87E+05	--	--	--	--	--	ICRP-68	1.20E-10
Xe-133m	Xe-133	132.906	Xenon	1	0	0	ICRP-38	2.19E+00	d	1.89E+05	4.49E+05	--	--	--	--	--	ICRP-68	1.10E-10
Xe-135	Xe-135	134.907	Xenon	1	0	0	ICRP-38	9.09E+00	h	3.27E+04	2.56E+06	--	--	--	--	--	ICRP-68	9.60E-10
Xe-135m	Xe-135	134.907	Xenon	1	0	0	ICRP-38	1.53E+01	m	9.17E+02	9.12E+07	--	--	--	--	--	ICRP-68	1.60E-09
Xe-137	Xe-137	136.912	Xenon	1	0	0	ICRP-107	3.82E+00	m	2.29E+02	3.60E+08	--	--	--	--	--	JAERI	9.40E-10
Xe-138	Xe-138	137.914	Xenon	1	0	0	ICRP-38	1.42E+01	m	8.50E+02	9.62E+07	--	--	--	--	--	ICRP-68	4.70E-09
Y-81	Y-81	80.929	Yttrium	0.01	0.015	500	ICRP-107	7.04E+01	s	7.04E+01	1.98E+09	--	--	--	--	--	--	--
Y-83	Y-83	82.922	Yttrium	0.01	0.015	500	ICRP-107	7.08E+00	m	4.25E+02	3.20E+08	--	--	--	--	--	--	--
Y-83m	Y-83	82.922	Yttrium	0.01	0.015	500	ICRP-107	2.85E+00	m	1.71E+02	7.96E+08	--	--	--	--	--	--	--
Y-84m	Y-84	83.921	Yttrium	0.01	0.015	500	ICRP-107	3.95E+01	m	2.37E+03	5.67E+07	JAERI	1.0E-10	M	JAERI	1.2E-10	--	--
Y-85	Y-85	84.916	Yttrium	0.01	0.015	500	ICRP-107	2.68E+00	h	9.65E+03	1.38E+07	JAERI	1.6E-10	S	JAERI	1.9E-10	--	--
Y-85m	Y-85	84.916	Yttrium	0.01	0.015	500	ICRP-107	4.86E+00	h	1.75E+04	7.59E+06	JAERI	2.7E-10	S	JAERI	3.8E-10	--	--
Y-86	Y-86	85.915	Yttrium	0.01	0.015	500	ICRP-38	1.47E+01	h	5.31E+04	2.47E+06	ICRP-68	8.1E-10	S	ICRP-68	9.6E-10	--	--
Y-86m	Y-86	85.915	Yttrium	0.01	0.015	500	ICRP-38	4.80E+01	m	2.88E+03	4.56E+07	ICRP-68	4.9E-11	S	ICRP-68	5.6E-11	--	--
Y-87	Y-87	86.911	Yttrium	0.01	0.015	500	ICRP-38	8.03E+01	h	2.89E+05	4.49E+05	ICRP-68	5.3E-10	S	ICRP-68	5.5E-10	--	--
Y-87m	Y-87	86.911	Yttrium	0.01	0.015	500	ICRP-107	1.34E+01	h	4.81E+04	2.70E+06	JAERI	2.0E-10	S	JAERI	2.2E-10	--	--
Y-88	Y-88	87.910	Yttrium	0.01	0.015	500	ICRP-38	1.07E+02	d	9.21E+06	1.39E+04	ICRP-68	4.1E-09	S	ICRP-68	1.3E-09	--	--
Y-89m	Y-89	88.906	Yttrium	0.01	0.015	500	ICRP-107	1.57E+01	s	1.57E+01	8.10E+09	--	--	--	--	--	--	--
Y-90	Y-90	89.907	Yttrium	0.01	0.015	500	ICRP-38	6.40E+01	h	2.30E+05	5.45E+05	ICRP-68	1.7E-09	S	ICRP-68	2.7E-09	--	--
Y-90m	Y-90	89.907	Yttrium	0.01	0.015	500	ICRP-38	3.19E+00	h	1.15E+04	1.09E+07	ICRP-68	1.3E-10	M	ICRP-68	1.7E-10	--	--
Y-91	Y-91	90.907	Yttrium	0.01	0.015	500	ICRP-38	5.85E+01	d	5.06E+06	2.45E+04	ICRP-68	8.4E-09	S	ICRP-68	2.4E-09	--	--
Y-91m	Y-91	90.907	Yttrium	0.01	0.015	500	ICRP-38	4.97E+01	m	2.98E+03	4.16E+07	ICRP-68	1.5E-11	S	ICRP-68	1.1E-11	--	--
Y-92	Y-92	91.909	Yttrium	0.01	0.015	500	ICRP-38	3.54E+00	h	1.27E+04	9.63E+06	ICRP-68	2.8E-10	S	ICRP-68	4.9E-10	--	--
Y-93	Y-93	92.910	Yttrium	0.01	0.015	500	ICRP-38	1.01E+01	h	3.64E+04	3.34E+06	ICRP-68	6.0E-10	S	ICRP-68	1.2E-09	--	--
Y-94	Y-94	93.912	Yttrium	0.01	0.015	500	ICRP-38	1.91E+01	m	1.15E+03	1.05E+08	ICRP-68	4.6E-11	S	ICRP-68	8.1E-11	--	--
Y-95	Y-95	94.913	Yttrium	0.01	0.015	500	ICRP-38	1.07E+01	m	6.42E+02	1.85E+08	ICRP-68	2.6E-11	S	ICRP-68	4.6E-11	--	--
Yb-162	Yb-162	161.936	Ytterbium	0.01	0.01	0	ICRP-38	1.89E+01	m	1.13E+03	6.14E+07	ICRP-68	2.3E-11	S	ICRP-68	2.3E-11	--	--
Yb-163	Yb-163	162.936	Ytterbium	0.01	0.01	0	ICRP-107	1.11E+01	m	6.63E+02	1.04E+08	JAERI	1.5E-11	S	JAERI	1.6E-11	--	--
Yb-164	Yb-164	163.934	Ytterbium	0.01	0.01	0	ICRP-107	7.58E+01	m	4.55E+03	1.51E+07	JAERI	6.7E-11	S	JAERI	9.1E-11	--	--

Table C.1 Radionuclide Specific Input Data Used For the Calculation of HC-3 TQs Using Maximum Reported DCs (continued)																		
MASTER ISOTOPE LIST	Atomic Mass Nuclide	Atomic Mass	Element	EPA RF	EPA Conc Factors (B_v)	EPA Sorption Coefficient (K_d)	Half-Life Reference	Half-Life (original units)		Half Life (s)	Sp. Act (Ci/g)	Inhalation DC Reference	HC-3 Bounding Inhalation DC (Sv/Bq)	Lung Absorption Class/Type	Ingestion DC Reference	HC-3 Bounding Ingestion DC (Sv/Bq)	Immersion DC Reference	HC-3 Immersion DC (Sv/d per Bq/m^3)
Yb-165	Yb-165	164.935	Ytterbium	0.01	0.01	0	ICRP-107	9.90E+00	m	5.94E+02	1.15E+08	--	--	--	--	--	--	--
Yb-166	Yb-166	165.934	Ytterbium	0.01	0.01	0	ICRP-38	5.67E+01	h	2.04E+05	3.33E+05	ICRP-68	9.5E-10	S	ICRP-68	9.5E-10	--	--
Yb-167	Yb-167	166.935	Ytterbium	0.01	0.01	0	ICRP-38	1.75E+01	m	1.05E+03	6.44E+07	ICRP-68	9.5E-12	S	ICRP-68	6.7E-12	--	--
Yb-169	Yb-169	168.935	Ytterbium	0.01	0.01	0	ICRP-38	3.20E+01	d	2.77E+06	2.41E+04	ICRP-68	2.8E-09	S	ICRP-68	7.1E-10	--	--
Yb-175	Yb-175	174.941	Ytterbium	0.01	0.01	0	ICRP-38	4.19E+00	d	3.62E+05	1.78E+05	ICRP-68	7.0E-10	S	ICRP-68	4.4E-10	--	--
Yb-177	Yb-177	176.945	Ytterbium	0.01	0.01	0	ICRP-38	1.90E+00	h	6.84E+03	9.32E+06	ICRP-68	9.4E-11	S	ICRP-68	9.7E-11	--	--
Yb-178	Yb-178	177.947	Ytterbium	0.01	0.01	0	ICRP-38	7.40E+01	m	4.44E+03	1.43E+07	ICRP-68	1.1E-10	S	ICRP-68	1.2E-10	--	--
Yb-179	Yb-179	178.950	Ytterbium	0.01	0.01	0	ICRP-107	8.00E+00	m	4.80E+02	1.31E+08	--	--	--	--	--	--	--
Zn-60	Zn-60	59.942	Zinc	0.01	1.5	0	ICRP-107	2.38E+00	m	1.43E+02	1.32E+09	--	--	--	--	--	--	--
Zn-61	Zn-61	60.940	Zinc	0.01	1.5	0	ICRP-107	8.91E+01	s	8.91E+01	2.08E+09	--	--	--	--	--	--	--
Zn-62	Zn-62	61.934	Zinc	0.01	1.5	0	ICRP-38	9.26E+00	h	3.33E+04	5.46E+06	ICRP-68	6.6E-10	S	ICRP-68	9.4E-10	--	--
Zn-63	Zn-63	62.933	Zinc	0.01	1.5	0	ICRP-38	3.81E+01	m	2.29E+03	7.84E+07	ICRP-68	6.1E-11	S	ICRP-68	7.9E-11	--	--
Zn-65	Zn-65	64.929	Zinc	0.01	1.5	0	ICRP-38	2.44E+02	d	2.11E+07	8.25E+03	ICRP-68	2.9E-09	S	ICRP-68	3.9E-09	--	--
Zn-69	Zn-69	68.927	Zinc	0.01	1.5	0	ICRP-38	5.70E+01	m	3.42E+03	4.79E+07	ICRP-68	4.3E-11	S	ICRP-68	3.1E-11	--	--
Zn-69m	Zn-69	68.927	Zinc	0.01	1.5	0	ICRP-38	1.38E+01	h	4.95E+04	3.30E+06	ICRP-68	3.3E-10	S	ICRP-68	3.3E-10	--	--
Zn-71	Zn-71	70.928	Zinc	0.01	1.5	0	ICRP-107	2.45E+00	m	1.47E+02	1.08E+09	--	--	--	--	--	--	--
Zn-71m	Zn-71	70.928	Zinc	0.01	1.5	0	ICRP-38	3.92E+00	h	1.41E+04	1.13E+07	ICRP-68	2.4E-10	S	ICRP-68	2.4E-10	--	--
Zn-72	Zn-72	71.927	Zinc	0.01	1.5	0	ICRP-38	4.65E+01	h	1.67E+05	9.37E+05	ICRP-68	1.5E-09	S	ICRP-68	1.4E-09	--	--
Zr-85	Zr-85	84.921	Zirconium	0.01	0.002	2000	ICRP-107	7.86E+00	m	4.72E+02	2.82E+08	--	--	--	--	--	--	--
Zr-86	Zr-86	85.916	Zirconium	0.01	0.002	2000	ICRP-38	1.65E+01	h	5.94E+04	2.21E+06	ICRP-68	7.0E-10	S	ICRP-68	8.6E-10	--	--
Zr-87	Zr-87	86.915	Zirconium	0.01	0.002	2000	ICRP-107	1.68E+00	h	6.05E+03	2.15E+07	JAERI	1.4E-10	M	JAERI	2.0E-10	--	--
Zr-88	Zr-88	87.910	Zirconium	0.01	0.002	2000	ICRP-38	8.34E+01	d	7.21E+06	1.78E+04	ICRP-68	4.1E-09	F	ICRP-68	3.3E-10	--	--
Zr-89	Zr-89	88.909	Zirconium	0.01	0.002	2000	ICRP-38	7.84E+01	h	2.82E+05	4.49E+05	ICRP-68	7.5E-10	S	ICRP-68	7.9E-10	--	--
Zr-89m	Zr-89	88.909	Zirconium	0.01	0.002	2000	ICRP-107	4.16E+00	m	2.50E+02	5.08E+08	--	--	--	--	--	--	--
Zr-93	Zr-93	92.906	Zirconium	0.01	0.002	2000	ICRP-38	1.53E+06	y	4.83E+13	2.51E-03	ICRP-68	2.9E-08	F	ICRP-68	2.8E-10	--	--
Zr-95	Zr-95	94.908	Zirconium	0.01	0.002	2000	ICRP-38	6.40E+01	d	5.53E+06	2.15E+04	ICRP-68	5.5E-09	S	ICRP-68	8.8E-10	--	--
Zr-97	Zr-97	96.911	Zirconium	0.01	0.002	2000	ICRP-38	1.69E+01	h	6.08E+04	1.91E+06	ICRP-68	1.4E-09	S	ICRP-68	2.1E-09	--	--

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**[††††††††]	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Ac-223				--	--	--	5.31E+07	--	5.31E+07	1.39E-01	3.83E+08	Direct
Ac-224				9.31E+02	--	1.28E+06	2.09E+04	--	9.31E+02	1.93E-04	4.82E+06	Inh.
Ac-225	1.43E+01	2.46E-04	i	1.41E+01	--	7.65E+02	4.17E+04	--	1.41E+01	2.44E-04	5.80E+04	Inh.
Ac-226				9.31E+01	--	9.62E+03	7.34E+03	--	9.31E+01	1.95E-04	4.78E+05	Inh.
Ac-227	1.78E-01	2.45E-03	i	1.77E-01	--	7.34E+00	3.63E+06	--	1.77E-01	2.45E-03	7.23E+01	Inh.
Ac-228				3.85E+03	--	9.92E+05	2.17E+03	--	2.17E+03	9.69E-04	2.24E+06	Direct
Ac-229				2.07E+06	--	5.60E+07	--	--	2.07E+06	1.58E-01	1.31E+07	Inh.
Ac-230				--	--	--	6.55E+05	--	6.55E+05	1.63E-03	4.02E+08	Direct
Ac-231				--	--	--	2.31E+05	--	2.31E+05	2.13E-03	1.09E+08	Direct
Ac-232				--	--	--	3.17E+05	--	3.17E+05	7.76E-04	4.09E+08	Direct
Ac-233				--	--	--	6.01E+05	--	6.01E+05	1.80E-03	3.34E+08	Direct
Ag-100m				--	--	--	1.15E+05	--	1.15E+05	1.36E-04	8.40E+08	Direct
Ag-101				4.65E+05	--	4.28E+07	4.16E+04	--	4.16E+04	2.48E-04	1.68E+08	Direct
Ag-102				3.49E+05	--	2.95E+07	1.68E+04	--	1.68E+04	1.17E-04	1.43E+08	Direct
Ag-102m				--	--	--	4.72E+04	--	4.72E+04	1.97E-04	2.40E+08	Direct
Ag-103				2.48E+05	--	5.40E+06	1.44E+04	--	1.44E+04	5.18E-04	2.78E+07	Direct
Ag-104				1.57E+05	--	3.67E+06	3.90E+03	--	3.90E+03	1.49E-04	2.61E+07	Direct
Ag-104m				2.48E+05	--	8.42E+06	1.84E+04	--	1.84E+04	3.41E-04	5.40E+07	Direct
Ag-105				1.40E+04	--	2.19E+03	1.39E+03	--	1.39E+03	4.59E-02	3.04E+04	Direct
Ag-105m				--	--	--	7.95E+07	--	7.95E+07	3.21E-01	2.48E+08	Direct
Ag-106				4.14E+05	--	1.99E+07	4.25E+04	--	4.25E+04	5.74E-04	7.41E+07	Direct
Ag-106m				6.98E+03	--	1.34E+03	2.68E+02	--	2.68E+02	1.83E-03	1.47E+05	Direct
Ag-108				--	--	--	1.72E+07	--	1.72E+07	2.34E-02	7.35E+08	Direct
Ag-108m				3.19E+02	--	3.46E+02	4.46E+02	--	3.19E+02	1.22E+01	2.61E+01	Inh.
Ag-109m				--	--	--	9.89E+07	--	9.89E+07	3.78E-02	2.62E+09	Direct
Ag-110				--	--	--	5.78E+07	--	5.78E+07	1.38E-02	4.17E+09	Direct
Ag-110m	2.63E+02	5.54E-02	de	9.31E+02	--	2.97E+02	2.64E+02	--	2.64E+02	5.56E-02	4.75E+03	Direct
Ag-111				6.57E+03	--	1.67E+03	2.89E+04	--	1.67E+03	1.06E-02	1.58E+05	Food

[††††††††] Per NNSA SD 1027, pg T1-4;

de – direct exposure from a point source
i – inhalation
ing – ingestion
sub – submersion in a radioactive cloud

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Ag-111m				--	--	--	8.54E+07	--	8.54E+07	5.44E-02	1.57E+09	Direct
Ag-112				4.30E+04	--	1.91E+05	5.92E+03	--	5.92E+03	6.59E-04	8.98E+06	Direct
Ag-113				4.47E+04	--	1.17E+05	3.27E+04	--	3.27E+04	6.33E-03	5.17E+06	Direct
Ag-113m				--	--	--	2.97E+06	--	2.97E+06	2.04E-03	1.45E+09	Direct
Ag-114				--	--	--	3.65E+07	--	3.65E+07	1.70E-03	2.15E+10	Direct
Ag-115				2.54E+05	--	1.27E+07	5.13E+04	--	5.13E+04	6.26E-04	8.18E+07	Direct
Ag-116				--	--	--	1.26E+05	--	1.26E+05	2.08E-04	6.05E+08	Direct
Ag-117				--	--	--	4.53E+05	--	4.53E+05	3.46E-04	1.31E+09	Direct
Ag-99				--	--	--	1.52E+05	--	1.52E+05	1.65E-04	9.20E+08	Direct
Al-26				6.20E+02	5.64E+02	2.30E+02	2.71E+02	--	2.30E+02	1.20E+04	1.92E-02	Food
Al-28				--	--	--	1.82E+05	--	1.82E+05	6.06E-05	3.00E+09	Direct
Al-29				--	--	--	8.01E+04	--	8.01E+04	8.10E-05	9.89E+08	Direct
Am-237				3.10E+06	--	1.18E+08	2.69E+04	--	2.69E+04	2.47E-03	1.09E+07	Direct
Am-238				1.31E+06	--	4.94E+07	8.30E+03	--	8.30E+03	1.03E-03	8.06E+06	Direct
Am-239				3.85E+05	--	9.31E+05	5.63E+03	--	5.63E+03	5.11E-03	1.10E+06	Direct
Am-240				1.89E+05	--	1.00E+05	8.28E+02	--	8.28E+02	3.22E-03	2.57E+05	Direct
Am-241	2.89E+00	8.42E-01	i	2.86E+00	--	4.03E+01	2.23E+04	--	2.86E+00	8.35E-01	3.43E+00	Inh.
Am-242				6.98E+03	--	5.60E+05	6.38E+04	--	6.98E+03	8.64E-03	8.08E+05	Inh.
Am-242m	3.22E+00	3.07E-01	i	3.19E+00	--	4.24E+01	1.42E+05	--	3.19E+00	3.28E-01	9.72E+00	Inh.
Am-243	2.89E+00	1.45E+01	i	2.86E+00	--	4.03E+01	1.30E+04	--	2.86E+00	1.44E+01	1.99E-01	Inh.
Am-244				5.88E+04	--	5.70E+05	1.83E+03	--	1.83E+03	1.44E-03	1.27E+06	Direct
Am-244m				1.41E+06	--	2.05E+08	1.86E+07	--	1.41E+06	4.77E-02	2.96E+07	Inh.
Am-245				1.47E+06	--	2.03E+07	1.82E+05	--	1.82E+05	2.92E-02	6.24E+06	Direct
Am-246				1.02E+06	--	6.83E+07	2.66E+04	--	2.66E+04	1.36E-03	1.96E+07	Direct
Am-246m				2.94E+06	--	1.82E+08	2.85E+04	--	2.85E+04	9.31E-04	3.06E+07	Direct
Am-247				2.54E+06	--	2.16E+08	2.34E+05	--	2.34E+05	7.06E-03	3.31E+07	Direct
Ar-37				--	--	--	--	7.84E+08	7.84E+08	7.78E+03	1.01E+05	Sub
Ar-39				--	--	--	--	2.92E+05	2.92E+05	8.57E+03	3.41E+01	Sub
Ar-41				--	--	--	--	6.07E+02	6.07E+02	1.45E-05	4.19E+07	Sub
Ar-42				--	--	--	--	2.47E+05	2.47E+05	9.55E+02	2.59E+02	Sub
Ar-43				--	--	--	8.79E+04	--	8.79E+04	1.08E-04	8.15E+08	Direct
Ar-44				--	--	--	--	3.97E+02	3.97E+02	1.10E-06	3.60E+08	Sub
As-68				--	--	--	7.73E+04	--	7.73E+04	7.05E-05	1.10E+09	Direct
As-69				3.19E+05	1.30E+180	1.78E+07	4.71E+04	--	4.71E+04	2.62E-04	1.79E+08	Direct
As-70				9.31E+04	2.24E+56	2.26E+06	3.36E+03	--	3.36E+03	6.58E-05	5.11E+07	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
As-71				2.23E+04	5.22E+04	1.03E+04	1.43E+03	--	1.43E+03	2.10E-03	6.82E+05	Direct
As-72				8.59E+03	3.06E+05	5.91E+03	5.48E+02	--	5.48E+02	3.27E-04	1.68E+06	Direct
As-73				1.20E+04	8.32E+03	3.56E+03	4.56E+04	--	3.56E+03	1.60E-01	2.23E+04	Food
As-74				5.32E+03	2.28E+03	1.06E+03	9.76E+02	--	9.76E+02	9.81E-03	9.95E+04	Direct
As-76				1.21E+04	3.25E+05	6.57E+03	2.28E+03	--	2.28E+03	1.45E-03	1.57E+06	Direct
As-77				2.66E+04	2.62E+05	1.84E+04	1.03E+05	--	1.84E+04	1.76E-02	1.05E+06	Food
As-78				7.98E+04	8.49E+34	8.12E+05	6.38E+03	--	6.38E+03	2.40E-04	2.66E+07	Direct
As-79				--	--	--	2.38E+06	--	2.38E+06	9.00E-03	2.64E+08	Direct
At-204				--	--	--	3.39E+04	--	3.39E+04	3.38E-04	1.00E+08	Direct
At-205				1.67E+05	1.57E+107	7.39E+07	2.42E+04	--	2.42E+04	6.90E-04	3.50E+07	Direct
At-206				--	--	--	9.55E+03	--	9.55E+03	3.20E-04	2.98E+07	Direct
At-207				5.32E+04	1.49E+30	6.03E+06	5.07E+03	--	5.07E+03	6.02E-04	8.41E+06	Direct
At-208				2.94E+05	1.39E+33	1.63E+07	2.44E+03	--	2.44E+03	2.64E-04	9.24E+06	Direct
At-209				3.99E+04	3.56E+12	2.45E+05	1.02E+03	--	1.02E+03	3.70E-04	2.77E+06	Direct
At-210				1.14E+04	9.46E+08	3.20E+04	5.77E+02	--	5.77E+02	3.13E-04	1.84E+06	Direct
At-211				1.02E+03	4.36E+09	3.20E+04	4.76E+04	--	1.02E+03	4.93E-04	2.06E+06	Inh.
At-215				--	--	--	4.35E+15	--	4.35E+15	8.29E+00	5.25E+14	Direct
At-216				--	--	--	9.66E+13	--	9.66E+13	5.55E-01	1.74E+14	Direct
At-217				--	--	--	4.49E+12	--	4.49E+12	2.79E+00	1.61E+12	Direct
At-218				--	--	--	3.24E+09	--	3.24E+09	1.25E-01	2.59E+10	Direct
At-219				--	--	--	--	--	--	--	9.20E+08	--
At-220				--	--	--	4.34E+05	--	4.34E+05	1.89E-03	2.30E+08	Direct
Au-186				3.19E+05	1.08E+253	3.09E+07	4.52E+04	--	4.52E+04	4.78E-04	9.45E+07	Direct
Au-187				--	--	--	8.10E+04	--	8.10E+04	6.76E-04	1.20E+08	Direct
Au-188				--	--	--	--	--	--	--	1.13E+08	--
Au-189m				--	--	--	--	--	--	--	2.17E+08	--
Au-190				2.43E+05	2.07E+68	7.57E+06	7.11E+03	--	7.11E+03	3.07E-04	2.31E+07	Direct
Au-191				1.15E+05	7.05E+19	1.04E+06	6.42E+03	--	6.42E+03	1.24E-03	5.16E+06	Direct
Au-192				6.57E+04	2.42E+14	2.89E+05	1.31E+03	--	1.31E+03	3.95E-04	3.30E+06	Direct
Au-193				6.98E+04	3.90E+07	1.16E+05	7.03E+03	--	7.03E+03	7.64E-03	9.20E+05	Direct
Au-193m				--	--	--	5.63E+07	--	5.63E+07	3.76E-03	1.50E+10	Direct
Au-194				2.94E+04	2.34E+05	1.71E+04	8.34E+02	--	8.34E+02	2.04E-03	4.09E+05	Direct
Au-195				6.98E+03	8.22E+03	3.39E+03	8.60E+03	--	3.39E+03	9.25E-01	3.66E+03	Food
Au-195m				--	--	--	7.08E+06	--	7.08E+06	3.73E-03	1.90E+09	Direct
Au-196				1.53E+04	1.17E+04	4.64E+03	1.62E+03	--	1.62E+03	1.50E-02	1.08E+05	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Au-196m				1.83E+04	2.73E+09	6.62E+04	6.18E+03	--	6.18E+03	3.71E-03	1.67E+06	Direct
Au-198	2.03E+03	8.30E-03	de	1.02E+04	2.41E+04	4.67E+03	2.03E+03	--	2.03E+03	8.31E-03	2.45E+05	Direct
Au-198m				5.58E+03	2.74E+04	4.11E+03	1.46E+03	--	1.46E+03	5.08E-03	2.87E+05	Direct
Au-199				1.47E+04	3.94E+04	9.36E+03	9.11E+03	--	9.11E+03	4.36E-02	2.09E+05	Direct
Au-200				1.99E+05	1.00E+61	4.63E+06	5.50E+04	--	5.50E+04	2.83E-03	1.94E+07	Direct
Au-200m				1.12E+04	3.15E+06	1.30E+04	5.25E+02	--	5.25E+02	6.27E-04	8.38E+05	Direct
Au-201				3.85E+05	8.71E+106	2.40E+07	5.14E+05	--	3.85E+05	1.09E-02	3.54E+07	Inh.
Au-202				--	--	--	8.77E+06	--	8.77E+06	4.52E-03	1.94E+09	Direct
Ba-124				3.99E+05	--	2.02E+07	1.15E+05	--	1.15E+05	8.34E-04	1.38E+08	Direct
Ba-126				9.31E+04	--	6.14E+05	4.60E+04	--	4.60E+04	2.98E-03	1.55E+07	Direct
Ba-127				7.98E+05	--	4.83E+07	7.83E+04	--	7.83E+04	6.72E-04	1.17E+08	Direct
Ba-128				8.59E+03	--	1.90E+03	1.10E+04	--	1.90E+03	4.53E-03	4.20E+05	Food
Ba-129				3.10E+05	--	2.22E+06	1.63E+04	--	1.63E+04	1.49E-03	1.09E+07	Direct
Ba-129m				1.47E+05	--	1.53E+06	3.53E+03	--	3.53E+03	3.14E-04	1.13E+07	Direct
Ba-131				3.19E+04	--	3.70E+03	1.63E+03	--	1.63E+03	1.93E-02	8.45E+04	Direct
Ba-131m				1.75E+06	--	2.15E+08	6.48E+05	--	6.48E+05	6.59E-03	9.84E+07	Direct
Ba-133	7.85E+02	3.07E+00	ing	6.20E+03	--	8.04E+02	1.81E+03	--	8.04E+02	3.21E+00	2.50E+02	Food
Ba-133m				3.99E+04	--	1.33E+04	1.34E+04	--	1.33E+04	2.20E-02	6.06E+05	Food
Ba-135m				4.86E+04	--	2.15E+04	1.59E+04	--	1.59E+04	1.97E-02	8.09E+05	Direct
Ba-137m				--	--	--	4.76E+05	--	4.76E+05	8.84E-04	5.38E+08	Direct
Ba-139				2.03E+05	--	1.55E+06	2.05E+05	--	2.03E+05	1.24E-02	1.64E+07	Inh.
Ba-140	6.44E+02	8.80E-03	ing	6.98E+03	--	6.40E+02	4.08E+03	--	6.40E+02	8.73E-03	7.33E+04	Food
Ba-141				3.19E+05	--	1.20E+07	4.69E+04	--	4.69E+04	6.43E-04	7.30E+07	Direct
Ba-142				4.14E+05	--	4.14E+07	6.53E+04	--	6.53E+04	5.22E-04	1.25E+08	Direct
Be-10				3.49E+02	--	7.32E+02	--	--	3.49E+02	1.56E+04	2.23E-02	Inh.
Be-7				2.15E+05	--	3.53E+04	1.48E+04	--	1.48E+04	4.25E-02	3.49E+05	Direct
Bi-197				--	--	--	4.59E+04	--	4.59E+04	4.47E-04	1.03E+08	Direct
Bi-200				1.99E+05	--	8.31E+06	8.32E+03	--	8.32E+03	3.22E-04	2.58E+07	Direct
Bi-201				1.02E+05	--	1.19E+06	5.01E+03	--	5.01E+03	5.79E-04	8.66E+06	Direct
Bi-202				1.12E+05	--	1.74E+06	2.67E+03	--	2.67E+03	2.87E-04	9.29E+06	Direct
Bi-203				2.48E+04	--	4.70E+04	5.69E+02	--	5.69E+02	4.33E-04	1.31E+06	Direct
Bi-204				1.93E+04	--	3.87E+04	4.54E+02	--	4.54E+02	3.32E-04	1.37E+06	Direct
Bi-205				1.12E+04	--	1.63E+03	4.39E+02	--	4.39E+02	1.06E-02	4.16E+04	Direct
Bi-206				5.32E+03	--	1.30E+03	2.34E+02	--	2.34E+02	2.30E-03	1.02E+05	Direct
Bi-207	4.71E+02	1.04E+01	de	2.15E+03	--	6.20E+02	4.71E+02	--	4.71E+02	1.04E+01	4.55E+01	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Bi-208				2.54E+03	--	6.71E+02	2.74E+02	--	2.74E+02	5.87E+04	4.67E-03	Direct
Bi-210	1.34E+02	1.08E-03	i	1.33E+02	--	2.23E+03	--	--	1.33E+02	1.07E-03	1.24E+05	Inh.
Bi-210m				3.60E+00	--	5.37E+01	2.83E+03	--	3.60E+00	6.35E+03	5.67E-04	Inh.
Bi-211				--	--	--	7.25E+06	--	7.25E+06	1.74E-02	4.16E+08	Direct
Bi-212				2.86E+02	--	9.81E+05	6.45E+04	--	2.86E+02	1.95E-05	1.46E+07	Inh.
Bi-212n				--	--	--	--	--	--	--	1.27E+08	--
Bi-213				2.72E+02	--	1.69E+06	1.19E+05	--	2.72E+02	1.41E-05	1.93E+07	Inh.
Bi-214				5.32E+02	--	7.04E+06	2.41E+04	--	5.32E+02	1.20E-05	4.42E+07	Inh.
Bi-215				--	--	--	3.76E+05	--	3.76E+05	3.27E-03	1.15E+08	Direct
Bi-216				--	--	--	4.52E+05	--	4.52E+05	1.13E-03	4.01E+08	Direct
Bk-244				1.12E+05	--	8.67E+05	--	--	1.12E+05	3.78E-02	2.95E+06	Inh.
Bk-245				5.58E+04	--	5.14E+04	3.32E+03	--	3.32E+03	3.08E-02	1.08E+05	Direct
Bk-246				2.43E+05	--	1.38E+05	9.17E+02	--	9.17E+02	3.16E-03	2.90E+05	Direct
Bk-247				1.72E+00	--	2.30E+01	6.89E+03	--	1.72E+00	1.64E+00	1.05E+00	Inh.
Bk-248m				7.45E+03	--	3.52E+04	1.81E+04	--	7.45E+03	1.40E-02	5.33E+05	Inh.
Bk-249				7.45E+01	--	8.62E+02	--	--	7.45E+01	4.54E-02	1.64E+03	Inh.
Bk-250				1.16E+04	--	5.75E+05	4.25E+03	--	4.25E+03	1.09E-03	3.89E+06	Direct
Bk-251				1.75E+06	--	6.32E+07	1.42E+05	--	1.42E+05	1.06E-02	1.35E+07	Direct
Br-72				--	--	--	1.87E+05	--	1.87E+05	9.36E-05	2.00E+09	Direct
Br-73				--	--	--	1.49E+05	--	1.49E+05	1.96E-04	7.58E+08	Direct
Br-74				1.64E+05	5.50E+110	6.90E+06	6.30E+03	--	6.30E+03	6.26E-05	1.01E+08	Direct
Br-74m				1.02E+05	5.98E+69	2.53E+06	4.28E+03	--	4.28E+03	6.98E-05	6.13E+07	Direct
Br-75				1.31E+05	1.45E+33	1.90E+06	6.08E+03	--	6.08E+03	2.38E-04	2.56E+07	Direct
Br-76				1.93E+04	2.00E+07	3.43E+04	4.41E+02	--	4.41E+02	1.73E-04	2.55E+06	Direct
Br-76m				--	--	--	7.67E+08	--	7.67E+08	6.76E-03	1.13E+11	Direct
Br-77				8.59E+04	3.58E+05	5.30E+04	2.62E+03	--	2.62E+03	3.60E-03	7.27E+05	Direct
Br-77m				--	--	--	8.61E+06	--	8.61E+06	1.51E-02	5.71E+08	Direct
Br-78				--	--	--	1.09E+05	--	1.09E+05	2.91E-04	3.74E+08	Direct
Br-80				6.57E+05	2.96E+158	2.72E+07	5.23E+05	--	5.23E+05	3.87E-03	1.35E+08	Direct
Br-80m				1.12E+05	4.88E+15	5.09E+05	1.17E+05	--	1.12E+05	1.26E-02	8.87E+06	Inh.
Br-82				1.27E+04	2.74E+05	1.42E+04	3.45E+02	--	3.45E+02	3.18E-04	1.08E+06	Direct
Br-82m				--	--	--	1.46E+07	--	1.46E+07	3.90E-02	3.74E+08	Direct
Br-83				1.67E+05	5.97E+24	2.39E+06	6.74E+05	--	1.67E+05	1.05E-02	1.58E+07	Inh.
Br-84				1.80E+05	2.51E+89	5.24E+06	1.27E+04	--	1.27E+04	1.81E-04	7.05E+07	Direct
Br-84m				--	--	--	4.36E+04	--	4.36E+04	1.17E-04	3.73E+08	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Br-85				--	--	--	3.78E+06	--	3.78E+06	4.96E-03	7.64E+08	Direct
C-10				--	--	--	1.29E+06	--	1.29E+06	2.21E-05	5.85E+10	Direct
C-11				6.98E+04	2.76E+136	--	3.49E+04	--	3.49E+04	4.16E-05	8.38E+08	Direct
C-14	3.88E+02	8.69E+01	i	3.85E+02	3.41E+03	--	--	--	3.85E+02	8.64E+01	4.46E+00	Inh.
Ca-41				5.88E+04	--	2.48E+03	1.81E+06	--	2.48E+03	3.97E+04	6.23E-02	Food
Ca-45	9.94E+02	5.57E-02	ing	4.14E+03	--	1.01E+03	--	--	1.01E+03	5.69E-02	1.78E+04	Food
Ca-47	7.37E+02	1.20E-03	de	5.32E+03	--	1.74E+03	7.37E+02	--	7.37E+02	1.20E-03	6.14E+05	Direct
Ca-49				--	--	--	2.63E+04	--	2.63E+04	5.96E-05	4.41E+08	Direct
Cd-101				--	--	--	2.14E+05	--	2.14E+05	1.56E-04	1.37E+09	Direct
Cd-102				--	--	--	1.57E+05	--	1.57E+05	4.69E-04	3.35E+08	Direct
Cd-103				--	--	--	4.75E+04	--	4.75E+04	1.90E-04	2.50E+08	Direct
Cd-104				1.77E+05	--	4.53E+06	4.86E+04	--	4.86E+04	1.55E-03	3.14E+07	Direct
Cd-105				2.66E+05	--	6.21E+06	1.00E+04	--	1.00E+04	3.11E-04	3.23E+07	Direct
Cd-107				1.02E+05	--	6.39E+05	5.93E+04	--	5.93E+04	1.31E-02	4.52E+06	Direct
Cd-109	3.96E+02	1.53E-01	ing	1.16E+03	--	4.05E+02	2.76E+04	--	4.05E+02	1.57E-01	2.58E+03	Food
Cd-111m				2.94E+05	--	2.23E+07	5.26E+04	--	5.26E+04	1.50E-03	3.50E+07	Direct
Cd-113	3.09E+01	8.77E+13	ing	7.98E+01	--	3.16E+01	--	--	3.16E+01	9.29E+13	3.40E-13	Food
Cd-113m				8.59E+01	--	3.45E+01	--	--	3.45E+01	1.48E-01	2.33E+02	Food
Cd-115				8.59E+03	--	3.90E+03	3.63E+03	--	3.63E+03	7.11E-03	5.10E+05	Direct
Cd-115m				1.53E+03	--	3.05E+02	3.34E+04	--	3.05E+02	1.20E-02	2.55E+04	Food
Cd-117				4.47E+04	--	3.64E+05	4.47E+03	--	4.47E+03	4.15E-04	1.08E+07	Direct
Cd-117m				3.49E+04	--	2.71E+05	1.77E+03	--	1.77E+03	2.22E-04	7.98E+06	Direct
Cd-118				9.31E+04	--	1.59E+06	--	--	9.31E+04	2.94E-03	3.17E+07	Inh.
Cd-119				--	--	--	1.64E+05	--	1.64E+05	2.80E-04	5.88E+08	Direct
Cd-119m				--	--	--	1.43E+05	--	1.43E+05	1.99E-04	7.19E+08	Direct
Ce-130				1.83E+05	--	9.36E+06	6.32E+04	--	6.32E+04	1.00E-03	6.32E+07	Direct
Ce-131				4.65E+05	--	5.40E+07	4.37E+04	--	4.37E+04	3.10E-04	1.41E+08	Direct
Ce-131m				--	--	--	--	--	--	--	2.87E+08	--
Ce-132				4.86E+04	--	2.17E+05	1.27E+04	--	1.27E+04	1.88E-03	6.77E+06	Direct
Ce-133				1.41E+05	--	1.75E+06	1.38E+04	--	1.38E+04	9.43E-04	1.46E+07	Direct
Ce-133m				5.08E+04	--	2.31E+05	1.47E+03	--	1.47E+03	3.05E-04	4.81E+06	Direct
Ce-134				6.98E+03	--	1.73E+03	3.10E+04	--	1.73E+03	5.33E-03	3.25E+05	Food
Ce-135				1.47E+04	--	1.94E+04	6.32E+02	--	6.32E+02	4.79E-04	1.32E+06	Direct
Ce-137				5.88E+05	--	1.17E+06	4.49E+04	--	4.49E+04	1.76E-02	2.54E+06	Direct
Ce-137m				1.89E+04	--	1.52E+04	1.73E+04	--	1.52E+04	2.29E-02	6.65E+05	Food

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Ce-139				6.20E+03	--	3.37E+03	4.56E+03	--	3.37E+03	4.93E-01	6.83E+03	Food
Ce-141	1.54E+03	5.41E-02	ing	3.10E+03	--	1.56E+03	9.63E+03	--	1.56E+03	5.48E-02	2.85E+04	Food
Ce-143				1.12E+04	--	7.77E+03	3.27E+03	--	3.27E+03	4.93E-03	6.64E+05	Direct
Ce-144	1.58E+02	4.95E-02	ing	2.28E+02	--	1.61E+02	3.51E+04	--	1.61E+02	5.06E-02	3.19E+03	Food
Ce-145				--	--	--	2.96E+05	--	2.96E+05	6.86E-04	4.31E+08	Direct
Ce-146				2.54E+05	--	2.43E+07	--	--	2.54E+05	2.66E-03	9.53E+07	Inh.
Cf-244				6.20E+03	3.23E+142	1.14E+08	1.97E+07	--	6.20E+03	1.56E-04	3.97E+07	Inh.
Cf-246				2.66E+02	4.29E+04	2.41E+04	6.99E+05	--	2.66E+02	7.45E-04	3.57E+05	Inh.
Cf-247				2.28E+06	3.91E+20	2.87E+07	3.72E+04	--	3.72E+04	9.11E-03	4.08E+06	Direct
Cf-248				1.36E+01	7.21E+01	2.98E+02	5.59E+05	--	1.36E+01	8.63E-03	1.58E+03	Inh.
Cf-249				1.69E+00	5.65E+00	2.30E+01	2.17E+03	--	1.69E+00	4.13E-01	4.09E+00	Inh.
Cf-250				3.49E+00	1.24E+01	5.05E+01	6.05E+05	--	3.49E+00	3.19E-02	1.09E+02	Inh.
Cf-251				1.67E+00	5.49E+00	2.24E+01	5.51E+03	--	1.67E+00	1.05E+00	1.59E+00	Inh.
Cf-252	6.26E+00	1.17E-02	i	6.20E+00	2.21E+01	9.06E+01	6.05E+05	--	6.20E+00	1.15E-02	5.38E+02	Inh.
Cf-253				9.31E+01	2.12E+03	9.80E+03	--	--	9.31E+01	3.21E-03	2.90E+04	Inh.
Cf-254				3.02E+00	5.57E+00	2.42E+01	--	--	3.02E+00	3.55E-04	8.49E+03	Inh.
Cf-255				2.07E+04	4.16E+37	4.55E+07	--	--	2.07E+04	2.39E-03	8.67E+06	Inh.
Cf-256				2.79E+01	1.54E+219	3.80E+06	--	--	2.79E+01	4.68E-07	5.97E+07	Inh.
Cl-34				--	--	--	2.79E+07	--	2.79E+07	1.28E-04	2.18E+11	Direct
Cl-34m				1.49E+05	6.69E+88	1.40E+06	1.07E+04	--	1.07E+04	6.20E-05	1.73E+08	Direct
Cl-36	2.49E+02	7.55E+03	ing	1.62E+03	2.12E+03	2.51E+02	7.26E+06	--	2.51E+02	7.61E+03	3.30E-02	Food
Cl-38				1.53E+05	1.54E+77	1.00E+06	1.31E+04	--	1.31E+04	9.83E-05	1.33E+08	Direct
Cl-39				1.47E+05	6.54E+53	9.48E+05	9.06E+03	--	9.06E+03	1.04E-04	8.68E+07	Direct
Cl-40				--	--	--	1.31E+05	--	1.31E+05	3.77E-05	3.48E+09	Direct
Cm-238				2.33E+04	--	1.35E+07	6.53E+04	--	2.33E+04	4.24E-03	5.49E+06	Inh.
Cm-239				1.27E+06	--	1.09E+07	1.61E+04	--	1.61E+04	3.56E-03	4.52E+06	Direct
Cm-240				3.85E+01	--	1.54E+03	3.68E+05	--	3.85E+01	1.91E-03	2.01E+04	Inh.
Cm-241				3.28E+03	--	1.22E+04	1.46E+03	--	1.46E+03	8.86E-02	1.65E+04	Direct
Cm-242	2.35E+01	7.08E-03	i	2.33E+01	--	7.21E+02	4.04E+05	--	2.33E+01	7.02E-03	3.31E+03	Inh.
Cm-243				3.85E+00	--	5.38E+01	5.41E+03	--	3.85E+00	7.46E-02	5.16E+01	Inh.
Cm-244				4.47E+00	--	6.73E+01	4.54E+05	--	4.47E+00	5.52E-02	8.09E+01	Inh.
Cm-245	2.82E+00	1.64E+01	i	2.79E+00	--	3.84E+01	7.59E+03	--	2.79E+00	1.63E+01	1.72E-01	Inh.
Cm-246				2.79E+00	--	3.84E+01	4.84E+05	--	2.79E+00	9.09E+00	3.07E-01	Inh.
Cm-247				3.10E+00	--	4.24E+01	2.30E+03	--	3.10E+00	3.34E+04	9.28E-05	Inh.
Cm-248				7.98E-01	--	1.05E+01	6.60E+05	--	7.98E-01	1.88E+02	4.25E-03	Inh.

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Cm-249				2.19E+06	--	7.78E+07	5.91E+05	--	5.91E+05	5.03E-02	1.18E+07	Direct
Cm-250				1.41E-01	--	1.83E+00	--	--	1.41E-01	6.82E-01	2.07E-01	Inh.
Cm-251				--	--	--	3.88E+05	--	3.88E+05	8.70E-03	4.46E+07	Direct
Co-54m				--	--	--	1.25E+05	--	1.25E+05	5.29E-05	2.35E+09	Direct
Co-55				1.35E+05	--	1.40E+05	5.64E+02	--	5.64E+02	1.73E-04	3.25E+06	Direct
Co-56				1.77E+04	--	3.71E+03	2.04E+02	--	2.04E+02	6.87E-03	2.96E+04	Direct
Co-57				1.19E+05	--	4.00E+04	5.81E+03	--	5.81E+03	6.86E-01	8.47E+03	Direct
Co-58				5.58E+04	--	1.27E+04	7.48E+02	--	7.48E+02	2.35E-02	3.18E+04	Direct
Co-58m				6.57E+06	--	1.20E+07	7.88E+05	--	7.88E+05	1.33E-01	5.91E+06	Direct
Co-60	2.90E+02	2.56E-01	de	3.85E+03	--	2.38E+03	2.90E+02	--	2.90E+02	2.56E-01	1.13E+03	Direct
Co-60m				8.59E+07	--	8.66E+09	1.02E+07	--	1.02E+07	3.40E-02	3.00E+08	Direct
Co-61				1.49E+06	--	2.11E+07	8.08E+04	--	8.08E+04	2.59E-03	3.12E+07	Direct
Co-62				--	--	--	3.01E+05	--	3.01E+05	1.49E-04	2.02E+09	Direct
Co-62m				3.02E+06	--	2.36E+08	1.93E+04	--	1.93E+04	8.85E-05	2.18E+08	Direct
Cr-48				4.47E+04	5.20E+06	5.98E+04	2.34E+03	--	2.34E+03	8.23E-04	2.85E+06	Direct
Cr-49				1.89E+05	1.76E+69	6.01E+06	1.63E+04	--	1.63E+04	1.79E-04	9.13E+07	Direct
Cr-51	2.26E+04	2.44E-01	de	3.10E+05	6.76E+04	3.06E+04	2.26E+04	--	2.26E+04	2.44E-01	9.25E+04	Direct
Cr-55				--	--	--	3.09E+08	--	3.09E+08	3.16E-01	9.79E+08	Direct
Cr-56				--	--	--	1.33E+06	--	1.33E+06	2.35E-03	5.66E+08	Direct
Cs-121				--	--	--	2.39E+05	--	2.39E+05	3.97E-04	6.02E+08	Direct
Cs-121m				--	--	--	3.01E+05	--	3.01E+05	3.94E-04	7.65E+08	Direct
Cs-123				--	--	--	1.13E+05	--	1.13E+05	4.36E-04	2.60E+08	Direct
Cs-124				--	--	--	1.22E+06	--	1.22E+06	4.11E-04	2.96E+09	Direct
Cs-125				4.86E+05	--	9.78E+06	2.37E+04	--	2.37E+04	7.10E-04	3.35E+07	Direct
Cs-126				--	--	--	4.07E+05	--	4.07E+05	4.47E-04	9.11E+08	Direct
Cs-127				2.79E+05	--	1.74E+06	4.95E+03	--	4.95E+03	1.25E-03	3.95E+06	Direct
Cs-128				--	--	--	2.06E+05	--	2.06E+05	5.47E-04	3.77E+08	Direct
Cs-129				1.38E+05	--	1.46E+05	3.31E+03	--	3.31E+03	4.36E-03	7.58E+05	Direct
Cs-130				7.45E+05	--	1.84E+07	4.69E+04	--	4.69E+04	9.69E-04	4.84E+07	Direct
Cs-130m				--	--	--	2.84E+06	--	2.84E+06	6.79E-03	4.18E+08	Direct
Cs-131				2.48E+05	--	3.22E+04	3.30E+04	--	3.22E+04	3.12E-01	1.03E+05	Food
Cs-132				2.94E+04	--	4.82E+03	1.09E+03	--	1.09E+03	7.10E-03	1.53E+05	Direct
Cs-134	4.20E+01	3.24E-02	ing	1.16E+03	--	4.30E+01	4.67E+02	--	4.30E+01	3.32E-02	1.29E+03	Food
Cs-134m				4.30E+05	--	4.46E+06	1.56E+05	--	1.56E+05	1.94E-02	8.07E+06	Direct
Cs-135				1.13E+04	--	4.02E+02	--	--	4.02E+02	3.49E+05	1.15E-03	Food

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Cs-135m				4.65E+05	--	1.53E+07	8.62E+03	--	8.62E+03	3.28E-04	2.63E+07	Direct
Cs-136				5.88E+03	--	5.27E+02	3.44E+02	--	3.44E+02	4.69E-03	7.33E+04	Direct
Cs-137	6.04E+01	6.95E-01	ing	1.67E+03	--	6.19E+01	--	--	6.19E+01	7.11E-01	8.70E+01	Food
Cs-138				2.43E+05	--	5.20E+06	9.53E+03	--	9.53E+03	2.25E-04	4.23E+07	Direct
Cs-138m				--	--	--	6.00E+05	--	6.00E+05	1.28E-03	4.69E+08	Direct
Cs-139				--	--	--	2.58E+05	--	2.58E+05	1.77E-03	1.46E+08	Direct
Cs-140				--	--	--	3.86E+05	--	3.86E+05	3.05E-04	1.27E+09	Direct
Cu-57				--	--	--	1.76E+08	--	1.76E+08	2.06E-04	8.50E+11	Direct
Cu-59				--	--	--	3.69E+05	--	3.69E+05	1.57E-04	2.35E+09	Direct
Cu-60				1.80E+05	1.80E+120	9.37E+06	8.01E+03	--	8.01E+03	5.93E-05	1.35E+08	Direct
Cu-61				9.31E+04	5.07E+18	6.26E+05	4.31E+03	--	4.31E+03	2.86E-04	1.51E+07	Direct
Cu-62				--	--	--	7.39E+04	--	7.39E+04	2.37E-04	3.12E+08	Direct
Cu-64				7.45E+04	5.43E+08	1.73E+05	6.83E+03	--	6.83E+03	1.77E-03	3.86E+06	Direct
Cu-66				--	--	--	1.68E+06	--	1.68E+06	3.00E-03	5.59E+08	Direct
Cu-67				1.93E+04	7.87E+04	1.43E+04	7.18E+03	--	7.18E+03	9.49E-03	7.57E+05	Direct
Cu-69				--	--	--	4.81E+05	--	4.81E+05	5.03E-04	9.57E+08	Direct
Dy-148				--	--	--	3.06E+05	--	3.06E+05	7.95E-04	3.85E+08	Direct
Dy-149				--	--	--	1.06E+05	--	1.06E+05	3.54E-04	3.01E+08	Direct
Dy-150				--	--	--	3.63E+05	--	3.63E+05	2.07E-03	1.75E+08	Direct
Dy-151				9.31E+04	2.71E+154	4.31E+07	2.95E+04	--	2.95E+04	4.24E-04	6.96E+07	Direct
Dy-152				1.27E+05	2.80E+24	9.88E+05	1.77E+04	--	1.77E+04	2.04E-03	8.67E+06	Direct
Dy-153				6.20E+04	1.68E+12	2.15E+05	2.33E+03	--	2.33E+03	7.28E-04	3.20E+06	Direct
Dy-154				1.02E+00	3.53E+01	1.44E+01	--	--	1.02E+00	1.31E+03	7.74E-04	Inh.
Dy-155				9.31E+04	5.43E+09	2.03E+05	2.56E+03	--	2.56E+03	1.26E-03	2.02E+06	Direct
Dy-157				2.03E+05	1.52E+11	5.32E+05	4.80E+03	--	4.80E+03	1.95E-03	2.47E+06	Direct
Dy-159				3.19E+04	2.08E+04	8.72E+03	1.62E+04	--	8.72E+03	1.53E+00	5.69E+03	Food
Dy-165				1.28E+05	6.57E+24	1.01E+06	1.99E+05	--	1.28E+05	1.58E-02	8.14E+06	Inh.
Dy-165m				--	--	--	3.01E+07	--	3.01E+07	3.32E-02	9.07E+08	Direct
Dy-166				6.20E+03	9.27E+03	2.44E+03	2.00E+04	--	2.44E+03	1.06E-02	2.31E+05	Food
Dy-167				--	--	--	2.19E+05	--	2.19E+05	1.21E-03	1.82E+08	Direct
Dy-168				--	--	--	2.11E+05	--	2.11E+05	1.64E-03	1.29E+08	Direct
Er-154				--	--	--	2.56E+06	--	2.56E+06	7.81E-03	3.27E+08	Direct
Er-155				--	--	--	--	--	--	--	2.29E+08	--
Er-156				3.72E+05	1.20E+142	2.08E+07	5.48E+05	--	3.72E+05	6.02E-03	6.18E+07	Inh.
Er-159				3.72E+05	1.88E+80	1.79E+07	2.09E+04	--	2.09E+04	6.36E-04	3.29E+07	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Er-161				1.31E+05	3.70E+19	1.00E+06	4.10E+03	--	4.10E+03	6.82E-04	6.01E+06	Direct
Er-163				5.08E+06	9.21E+42	7.64E+07	2.40E+05	--	2.40E+05	1.56E-02	1.54E+07	Direct
Er-165				7.98E+05	2.53E+10	1.34E+06	3.88E+04	--	3.88E+04	2.11E-02	1.83E+06	Direct
Er-167m				--	--	--	1.97E+08	--	1.97E+08	6.65E-03	2.96E+10	Direct
Er-169				1.14E+04	1.15E+04	5.18E+03	--	--	5.18E+03	6.23E-02	8.31E+04	Food
Er-171				3.72E+04	7.24E+10	9.70E+04	4.73E+03	--	4.73E+03	1.94E-03	2.44E+06	Direct
Er-172				9.31E+03	4.87E+04	5.97E+03	1.64E+03	--	1.64E+03	4.43E-03	3.70E+05	Direct
Er-173				--	--	--	6.08E+05	--	6.08E+05	8.02E-04	7.58E+08	Direct
Es-249				4.14E+05	3.96E+32	6.89E+07	1.72E+04	--	1.72E+04	2.32E-03	7.39E+06	Direct
Es-250				1.89E+05	4.71E+27	5.86E+07	1.45E+04	--	1.45E+04	2.43E-03	5.97E+06	Direct
Es-250m				--	--	--	9.81E+03	--	9.81E+03	1.74E-03	5.64E+06	Direct
Es-251				5.58E+04	1.13E+06	5.03E+05	9.39E+03	--	9.39E+03	2.48E-02	3.78E+05	Direct
Es-253				4.47E+01	4.61E+02	2.13E+03	6.71E+05	--	4.47E+01	1.77E-03	2.52E+04	Inh.
Es-254				1.40E+01	7.25E+01	3.00E+02	3.81E+04	--	1.40E+01	7.49E-03	1.86E+03	Inh.
Es-254m				2.54E+01	2.38E+04	1.74E+03	1.90E+03	--	2.54E+01	8.09E-05	3.14E+05	Inh.
Es-255				3.10E+01	3.95E+02	1.75E+03	1.08E+06	--	3.10E+01	2.41E-03	1.29E+04	Inh.
Es-256				3.28E+02	4.38E+108	1.48E+06	9.06E+06	--	3.28E+02	1.14E-05	2.89E+07	Inh.
Eu-142				--	--	--	1.55E+07	--	1.55E+07	4.57E-04	3.40E+10	Direct
Eu-142m				--	--	--	1.73E+05	--	1.73E+05	1.59E-04	1.08E+09	Direct
Eu-143				--	--	--	2.49E+05	--	2.49E+05	4.91E-04	5.08E+08	Direct
Eu-144				--	--	--	3.90E+06	--	3.90E+06	5.08E-04	7.69E+09	Direct
Eu-145				1.53E+04	--	3.42E+03	5.28E+02	--	5.28E+02	3.48E-03	1.52E+05	Direct
Eu-146				9.31E+03	--	2.37E+03	3.12E+02	--	3.12E+02	1.61E-03	1.94E+05	Direct
Eu-147				1.12E+04	--	2.78E+03	1.48E+03	--	1.48E+03	4.00E-02	3.70E+04	Direct
Eu-148				4.14E+03	--	7.57E+02	3.36E+02	--	3.36E+02	2.07E-02	1.62E+04	Direct
Eu-149				4.14E+04	--	9.09E+03	1.15E+04	--	9.09E+03	9.65E-01	9.42E+03	Food
Eu-150l				2.23E+02	--	6.20E+02	4.85E+02	--	2.23E+02	3.20E+00	6.97E+01	Inh.
Eu-150s				3.99E+04	--	5.56E+04	2.79E+04	--	2.79E+04	1.69E-02	1.66E+06	Direct
Eu-152	2.89E+02	1.66E+00	i	2.86E+02	--	5.77E+02	6.29E+02	--	2.86E+02	1.62E+00	1.77E+02	Inh.
Eu-152ml				3.49E+04	--	5.66E+04	5.31E+03	--	5.31E+03	2.40E-03	2.21E+06	Direct
Eu-152ms				1.02E+06	--	1.15E+07	1.00E+05	--	1.00E+05	7.78E-03	1.29E+07	Direct
Eu-154	2.25E+02	8.33E-01	i	2.23E+02	--	4.04E+02	5.85E+02	--	2.23E+02	8.46E-01	2.64E+02	Inh.
Eu-154m				1.93E+06	--	3.69E+07	2.23E+05	--	2.23E+05	8.40E-03	2.66E+07	Direct
Eu-155	1.73E+03	3.56E+00	i	1.72E+03	--	2.53E+03	1.20E+04	--	1.72E+03	3.69E+00	4.65E+02	Inh.
Eu-156				3.38E+03	--	6.70E+02	5.59E+02	--	5.59E+02	1.01E-02	5.51E+04	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Eu-157				2.54E+04	--	2.95E+04	4.57E+03	--	4.57E+03	3.46E-03	1.32E+06	Direct
Eu-158				1.49E+05	--	3.58E+06	1.49E+04	--	1.49E+04	5.76E-04	2.59E+07	Direct
Eu-159				3.10E+05	--	1.74E+07	1.32E+05	--	1.32E+05	2.02E-03	6.54E+07	Direct
F-17				--	--	--	6.60E+05	--	6.60E+05	6.42E-05	1.03E+10	Direct
F-18				1.20E+05	2.80E+30	2.88E+06	6.46E+03	--	6.46E+03	6.79E-05	9.52E+07	Direct
Fe-52				1.18E+04	--	2.27E+04	2.28E+03	--	2.28E+03	3.12E-04	7.29E+06	Direct
Fe-53				--	--	--	7.23E+04	--	7.23E+04	1.73E-04	4.17E+08	Direct
Fe-53m				--	--	--	9.39E+04	--	9.39E+04	6.68E-05	1.41E+09	Direct
Fe-55	2.41E+03	1.01E+00	ing	1.21E+04	--	2.47E+03	4.54E+05	--	2.47E+03	1.03E+00	2.41E+03	Food
Fe-59	5.61E+02	1.13E-02	ing	3.19E+03	--	5.70E+02	6.15E+02	--	5.70E+02	1.15E-02	4.98E+04	Food
Fe-60				3.38E+01	--	7.33E+00	--	--	7.33E+00	1.23E+02	5.96E-02	Food
Fe-61				--	--	--	8.71E+04	--	8.71E+04	1.69E-04	5.16E+08	Direct
Fe-62				--	--	--	1.26E+06	--	1.26E+06	4.72E-04	2.68E+09	Direct
Fm-251				6.20E+04	1.41E+14	6.84E+06	1.50E+04	--	1.50E+04	6.37E-03	2.35E+06	Direct
Fm-252				3.72E+02	4.10E+05	4.47E+04	9.31E+05	--	3.72E+02	6.80E-04	5.48E+05	Inh.
Fm-253				3.02E+02	2.09E+04	4.76E+04	9.81E+03	--	3.02E+02	1.76E-03	1.72E+05	Inh.
Fm-254				1.45E+03	6.74E+18	1.82E+06	3.12E+06	--	1.45E+03	3.81E-04	3.81E+06	Inh.
Fm-255				4.30E+02	8.95E+05	5.43E+04	7.85E+04	--	4.30E+02	7.02E-04	6.12E+05	Inh.
Fm-256				1.60E+01	2.01E+20	3.79E+04	3.70E+02	--	1.60E+01	3.42E-06	4.66E+06	Inh.
Fm-257				1.69E+01	1.42E+02	6.01E+02	6.57E+03	--	1.69E+01	3.35E-03	5.05E+03	Inh.
Fr-212				3.99E+03	--	1.09E+06	3.17E+04	--	3.99E+03	8.99E-05	4.43E+07	Inh.
Fr-219				--	--	--	6.09E+11	--	6.09E+11	2.48E-01	2.45E+12	Direct
Fr-220				--	--	--	1.31E+08	--	1.31E+08	7.01E-02	1.87E+09	Direct
Fr-221				--	--	--	4.87E+06	--	4.87E+06	2.75E-02	1.77E+08	Direct
Fr-222				5.32E+02	--	1.51E+06	--	--	5.32E+02	9.04E-06	5.88E+07	Inh.
Fr-223				8.59E+03	--	3.07E+05	5.60E+05	--	8.59E+03	2.22E-04	3.87E+07	Inh.
Fr-224				--	--	--	3.94E+05	--	3.94E+05	1.56E-03	2.52E+08	Direct
Fr-227				--	--	--	6.52E+05	--	6.52E+05	1.94E-03	3.35E+08	Direct
Ga-64				--	--	--	8.18E+04	--	8.18E+04	7.31E-05	1.12E+09	Direct
Ga-65				3.85E+05	2.01E+180	2.74E+07	4.05E+04	--	4.05E+04	2.13E-04	1.91E+08	Direct
Ga-66				1.57E+04	1.19E+09	2.34E+04	6.26E+02	--	6.26E+02	1.24E-04	5.06E+06	Direct
Ga-67				3.99E+04	8.46E+04	2.13E+04	5.10E+03	--	5.10E+03	8.52E-03	5.98E+05	Direct
Ga-68				1.38E+05	1.10E+45	2.27E+06	1.12E+04	--	1.12E+04	2.75E-04	4.07E+07	Direct
Ga-70				4.30E+05	4.19E+131	2.35E+07	4.57E+06	--	4.30E+05	3.38E-03	1.27E+08	Inh.
Ga-72				1.33E+04	2.43E+07	1.73E+04	4.56E+02	--	4.56E+02	1.48E-04	3.09E+06	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Ga-73				5.58E+04	1.91E+14	2.04E+05	8.07E+03	--	8.07E+03	9.22E-04	8.75E+06	Direct
Ga-74				--	--	--	2.83E+04	--	2.83E+04	9.03E-05	3.13E+08	Direct
Gd-142				--	--	--	5.94E+05	--	5.94E+05	5.24E-04	1.13E+09	Direct
Gd-143m				--	--	--	1.86E+05	--	1.86E+05	2.60E-04	7.18E+08	Direct
Gd-144				--	--	--	1.78E+05	--	1.78E+05	6.10E-04	2.92E+08	Direct
Gd-145				3.19E+05	--	1.53E+07	1.40E+04	--	1.40E+04	2.47E-04	5.67E+07	Direct
Gd-145m				--	--	--	7.51E+05	--	7.51E+05	8.20E-04	9.16E+08	Direct
Gd-146				1.86E+03	--	1.05E+03	2.92E+03	--	1.05E+03	5.67E-02	1.85E+04	Food
Gd-147				1.89E+04	--	1.23E+04	6.70E+02	--	6.70E+02	1.20E-03	5.60E+05	Direct
Gd-148				3.72E-01	--	1.47E+01	--	--	3.72E-01	1.43E-02	2.60E+01	Inh.
Gd-149				1.41E+04	--	4.23E+03	1.79E+03	--	1.79E+03	1.92E-02	9.33E+04	Direct
Gd-150				3.99E-01	--	1.55E+01	--	--	3.99E-01	2.99E+02	1.33E-03	Inh.
Gd-151				1.20E+04	--	4.43E+03	1.14E+04	--	4.43E+03	6.14E-01	7.21E+03	Food
Gd-152				5.08E-01	--	1.97E+01	--	--	5.08E-01	2.33E+10	2.18E-11	Inh.
Gd-153	3.06E+03	8.66E-01	ing	4.47E+03	--	3.13E+03	6.89E+03	--	3.13E+03	8.87E-01	3.53E+03	Food
Gd-159				2.86E+04	--	2.98E+04	2.20E+04	--	2.20E+04	2.07E-02	1.06E+06	Direct
Gd-162				--	--	--	2.07E+05	--	2.07E+05	1.50E-03	1.38E+08	Direct
Ge-66				8.59E+04	2.51E+25	1.12E+06	7.75E+03	--	7.75E+03	3.70E-04	2.09E+07	Direct
Ge-67				2.66E+05	4.22E+147	1.25E+07	2.76E+04	--	2.76E+04	1.83E-04	1.50E+08	Direct
Ge-68	6.24E+02	8.79E-02	ing	8.59E+02	1.56E+03	6.37E+02	1.77E+05	--	6.37E+02	9.54E-02	6.67E+03	Food
Ge-69				3.02E+04	4.26E+05	3.02E+04	1.02E+03	--	1.02E+03	8.77E-04	1.16E+06	Direct
Ge-71				1.02E+06	3.03E+05	1.38E+05	1.82E+05	--	1.38E+05	8.82E-01	1.56E+05	Food
Ge-75				2.07E+05	2.50E+38	4.01E+06	2.57E+05	--	2.07E+05	6.82E-03	3.03E+07	Inh.
Ge-77				2.48E+04	5.94E+08	7.02E+04	1.28E+03	--	1.28E+03	3.54E-04	3.61E+06	Direct
Ge-78				7.98E+04	2.64E+36	1.46E+06	3.00E+04	--	3.00E+04	1.08E-03	2.77E+07	Direct
H-3	1.60E+04	1.60E+00	**	5.45E+03	4.71E+04	--	--	--	5.45E+03	5.68E-01	9.60E+03	Inh.
Hf-167				--	--	--	5.73E+05	--	5.73E+05	1.04E-03	5.49E+08	Direct
Hf-169				--	--	--	3.49E+05	--	3.49E+05	1.01E-03	3.44E+08	Direct
Hf-170				2.60E+04	2.09E+07	3.50E+04	2.13E+03	--	2.13E+03	1.85E-03	1.15E+06	Direct
Hf-172				3.02E+02	2.00E+03	8.20E+02	6.17E+03	--	3.02E+02	2.71E-01	1.11E+03	Inh.
Hf-173				5.08E+04	3.58E+06	4.99E+04	2.47E+03	--	2.47E+03	3.27E-03	7.55E+05	Direct
Hf-174				3.10E-01	7.90E+00	3.22E+00	--	--	3.10E-01	3.02E+11	1.03E-12	Inh.
Hf-175				1.02E+04	5.35E+03	2.30E+03	1.98E+03	--	1.98E+03	1.85E-01	1.07E+04	Direct
Hf-177m				7.45E+04	5.38E+57	3.71E+06	6.26E+03	--	6.26E+03	3.03E-04	2.07E+07	Direct
Hf-178m				3.60E+01	4.21E+02	1.72E+02	3.08E+02	--	3.60E+01	5.56E-01	6.48E+01	Inh.

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Hf-179m				3.10E+03	2.20E+03	1.00E+03	8.17E+02	--	8.17E+02	2.81E-02	2.91E+04	Direct
Hf-180m				5.58E+04	2.88E+13	2.79E+05	2.29E+03	--	2.29E+03	7.23E-04	3.17E+06	Direct
Hf-181	9.28E+02	5.45E-02	ing	2.38E+03	2.13E+03	9.43E+02	1.32E+03	--	9.43E+02	5.54E-02	1.70E+04	Food
Hf-182				3.10E+01	6.59E+02	2.69E+02	3.03E+03	--	3.10E+01	1.42E+05	2.18E-04	Inh.
Hf-182m				1.57E+05	3.52E+49	5.99E+06	1.26E+04	--	1.26E+04	7.52E-04	1.68E+07	Direct
Hf-183				1.35E+05	4.17E+47	3.31E+06	1.51E+04	--	1.51E+04	9.38E-04	1.61E+07	Direct
Hf-184				2.48E+04	5.83E+15	1.21E+05	1.19E+04	--	1.19E+04	2.88E-03	4.13E+06	Direct
Hg-187				--	--	--	--	--	--	--	4.57E+08	--
Hg-187m				--	--	--	--	--	--	--	4.19E+08	--
Hg-188				--	--	--	--	--	--	--	3.08E+08	--
Hg-190				1.16E+05	7.60E+138	2.99E+07	1.80E+05	--	1.16E+05	2.35E-03	4.95E+07	Inh.
Hg-191m				3.49E+04	3.22E+58	5.36E+06	9.58E+03	--	9.58E+03	4.94E-04	1.94E+07	Direct
Hg-192				1.12E+04	2.82E+14	2.27E+05	9.36E+03	--	9.36E+03	2.78E-03	3.37E+06	Direct
Hg-193				1.02E+04	3.32E+18	8.77E+05	1.72E+04	--	1.02E+04	2.19E-03	4.64E+06	Inh.
Hg-193m				3.60E+03	5.85E+08	5.80E+04	1.34E+03	--	1.34E+03	9.16E-04	1.46E+06	Direct
Hg-194				2.79E+02	3.87E+01	1.53E+01	2.69E+05	--	1.53E+01	2.16E+00	7.09E+00	Food
Hg-195				7.98E+03	8.14E+09	2.67E+05	7.36E+03	--	7.36E+03	4.53E-03	1.62E+06	Direct
Hg-195m				1.36E+03	1.47E+05	1.20E+04	4.12E+03	--	1.36E+03	3.53E-03	3.86E+05	Inh.
Hg-197				2.54E+03	1.07E+05	2.01E+04	1.18E+04	--	2.54E+03	1.02E-02	2.48E+05	Inh.
Hg-197m				1.93E+03	1.83E+06	2.38E+04	1.07E+04	--	1.93E+03	2.88E-03	6.68E+05	Inh.
Hg-199m				6.20E+04	6.11E+68	1.13E+07	9.14E+04	--	6.20E+04	2.80E-03	2.22E+07	Inh.
Hg-203	5.06E+02	3.67E-02	ing	1.60E+03	1.22E+03	5.18E+02	3.07E+03	--	5.18E+02	3.75E-02	1.38E+04	Food
Hg-205				--	--	--	2.61E+07	--	2.61E+07	1.48E-01	1.76E+08	Direct
Hg-206				--	--	--	8.41E+05	--	8.41E+05	7.51E-03	1.12E+08	Direct
Hg-207				--	--	--	9.39E+04	--	9.39E+04	3.00E-04	3.13E+08	Direct
Ho-150				--	--	--	3.00E+05	--	3.00E+05	3.07E-04	9.80E+08	Direct
Ho-152				--	--	--	--	--	--	--	4.59E+08	--
Ho-153				--	--	--	3.51E+05	--	3.51E+05	5.73E-04	6.12E+08	Direct
Ho-153m				--	--	--	7.34E+04	--	7.34E+04	5.55E-04	1.32E+08	Direct
Ho-154				4.14E+05	--	3.20E+07	3.27E+04	--	3.27E+04	3.15E-04	1.04E+08	Direct
Ho-154m				--	--	--	9.59E+04	--	9.59E+04	2.43E-04	3.94E+08	Direct
Ho-155				3.49E+05	--	8.70E+06	3.90E+04	--	3.90E+04	1.54E-03	2.53E+07	Direct
Ho-156				1.23E+05	--	3.07E+07	6.14E+03	--	6.14E+03	2.85E-04	2.15E+07	Direct
Ho-157				1.47E+06	--	1.88E+08	1.17E+05	--	1.17E+05	1.23E-03	9.51E+07	Direct
Ho-158				7.98E+05	--	1.53E+08	--	--	7.98E+05	7.57E-03	1.05E+08	Inh.

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Ho-159				1.12E+06	--	5.92E+07	6.00E+04	--	6.00E+04	1.67E-03	3.59E+07	Direct
Ho-160				4.65E+05	--	3.55E+07	1.67E+04	--	1.67E+04	3.64E-04	4.59E+07	Direct
Ho-161				1.12E+06	--	7.96E+06	7.86E+04	--	7.86E+04	1.01E-02	7.79E+06	Direct
Ho-162				2.48E+06	--	3.12E+08	2.88E+05	--	2.88E+05	3.72E-03	7.74E+07	Direct
Ho-162m				3.38E+05	--	8.75E+06	1.85E+04	--	1.85E+04	1.08E-03	1.71E+07	Direct
Ho-163				4.65E+04	--	1.18E+05	1.21E+07	--	4.65E+04	9.69E+04	4.80E-01	Inh.
Ho-164				8.59E+05	--	5.60E+07	8.44E+05	--	8.44E+05	2.13E-02	3.96E+07	Direct
Ho-164m				6.98E+05	--	2.57E+07	4.09E+05	--	4.09E+05	1.34E-02	3.06E+07	Direct
Ho-166				1.35E+04	--	7.39E+03	3.36E+04	--	7.39E+03	1.05E-02	7.05E+05	Food
Ho-166m	1.02E+02	5.70E+01	i	1.02E+02	--	4.03E+02	4.16E+02	--	1.02E+02	5.66E+01	1.80E+00	Inh.
Ho-167				1.12E+05	--	1.01E+06	1.07E+04	--	1.07E+04	1.77E-03	6.06E+06	Direct
Ho-168				--	--	--	2.77E+05	--	2.77E+05	7.39E-04	3.74E+08	Direct
Ho-168m				--	--	--	4.53E+07	--	4.53E+07	8.90E-02	5.09E+08	Direct
Ho-170				--	--	--	1.54E+05	--	1.54E+05	3.84E-04	4.01E+08	Direct
I-118				1.31E+03	--	1.12E+05	2.62E+04	--	1.31E+03	1.13E-05	1.16E+08	Inh.
I-118m				--	--	--	2.27E+04	--	2.27E+04	1.21E-04	1.88E+08	Direct
I-119				3.99E+03	--	3.49E+05	4.16E+04	--	3.99E+03	4.82E-05	8.28E+07	Inh.
I-120				7.45E+02	--	1.12E+04	3.28E+03	--	7.45E+02	3.85E-05	1.94E+07	Inh.
I-120m				1.24E+03	--	2.76E+04	2.58E+03	--	1.24E+03	4.19E-05	2.96E+07	Inh.
I-121				2.60E+03	--	2.96E+04	1.36E+04	--	2.60E+03	2.12E-04	1.22E+07	Inh.
I-122				--	--	--	2.12E+05	--	2.12E+05	4.97E-04	4.26E+08	Direct
I-123				1.06E+03	--	1.92E+03	7.44E+03	--	1.06E+03	5.51E-04	1.93E+06	Inh.
I-124				1.86E+01	--	5.09E+00	7.17E+02	--	5.09E+00	2.02E-05	2.52E+05	Food
I-125	1.26E+00	7.17E-05	ing	1.60E+01	--	1.28E+00	1.74E+04	--	1.28E+00	7.38E-05	1.74E+04	Food
I-126				8.59E+00	--	1.09E+00	1.64E+03	--	1.09E+00	1.37E-05	7.97E+04	Food
I-128				3.44E+03	--	2.67E+05	3.41E+05	--	3.44E+03	5.84E-05	5.88E+07	Inh.
I-129				2.33E+00	--	1.46E-01	2.95E+04	--	1.46E-01	8.25E+02	1.77E-04	Food
I-130				1.18E+02	--	2.14E+02	6.18E+02	--	1.18E+02	6.02E-05	1.95E+06	Inh.
I-130m				--	--	--	7.47E+05	--	7.47E+05	4.57E-03	1.64E+08	Direct
I-131	1.93E+00	1.56E-05	ing	1.12E+01	--	1.90E+00	1.99E+03	--	1.90E+00	1.53E-05	1.24E+05	Food
I-132				7.21E+02	--	7.72E+03	2.30E+03	--	7.21E+02	6.98E-05	1.03E+07	Inh.
I-132m				8.27E+02	--	1.67E+04	2.69E+04	--	8.27E+02	4.85E-05	1.71E+07	Inh.
I-133				5.58E+01	--	6.07E+01	1.74E+03	--	5.58E+01	4.93E-05	1.13E+06	Inh.
I-134				1.49E+03	--	5.31E+04	5.25E+03	--	1.49E+03	5.58E-05	2.67E+07	Inh.
I-134m				--	--	--	6.97E+05	--	6.97E+05	1.79E-03	3.90E+08	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
I-135				2.43E+02	--	8.48E+02	1.26E+03	--	2.43E+02	6.91E-05	3.51E+06	Inh.
In-103				--	--	--	2.63E+05	--	2.63E+05	1.44E-04	1.83E+09	Direct
In-105				--	--	--	7.40E+04	--	7.40E+04	2.09E-04	3.53E+08	Direct
In-106				--	--	--	3.29E+04	--	3.29E+04	1.15E-04	2.86E+08	Direct
In-106m				--	--	--	4.93E+04	--	4.93E+04	1.45E-04	3.41E+08	Direct
In-107				2.72E+05	1.56E+88	1.16E+07	1.46E+04	--	1.46E+04	2.69E-04	5.43E+07	Direct
In-108				1.21E+05	7.13E+51	3.21E+06	3.19E+03	--	3.19E+03	1.06E-04	3.00E+07	Direct
In-108m				1.72E+05	1.12E+73	4.59E+06	6.62E+03	--	6.62E+03	1.50E-04	4.40E+07	Direct
In-109				1.53E+05	2.83E+16	9.38E+05	4.36E+03	--	4.36E+03	6.36E-04	6.85E+06	Direct
In-109m				--	--	--	8.89E+05	--	8.89E+05	6.90E-04	1.29E+09	Direct
In-110l				4.47E+04	2.16E+14	2.22E+05	8.36E+02	--	8.36E+02	1.44E-04	5.82E+06	Direct
In-110s				1.38E+05	2.64E+44	2.24E+06	6.74E+03	--	6.74E+03	2.72E-04	2.48E+07	Direct
In-111				3.60E+04	7.45E+04	1.57E+04	2.02E+03	--	2.02E+03	4.85E-03	4.16E+05	Direct
In-111m				--	--	--	2.00E+05	--	2.00E+05	9.10E-04	2.20E+08	Direct
In-112				8.59E+05	3.12E+190	1.07E+08	1.88E+05	--	1.88E+05	1.61E-03	1.17E+08	Direct
In-112m				3.10E+05	2.88E+135	4.41E+07	1.01E+06	--	3.10E+05	3.80E-03	8.17E+07	Inh.
In-113m				3.49E+05	1.61E+33	5.56E+06	2.83E+04	--	2.83E+04	1.69E-03	1.67E+07	Direct
In-114				--	--	--	2.24E+08	--	2.24E+08	1.63E-01	1.38E+09	Direct
In-114m	2.40E+02	1.04E-02	ing	1.02E+03	5.58E+02	2.45E+02	7.74E+03	--	2.45E+02	1.06E-02	2.32E+04	Food
In-115				2.48E+01	6.17E+01	2.52E+01	--	--	2.48E+01	4.07E+13	6.10E-13	Inh.
In-115m				1.28E+05	4.40E+15	6.75E+05	1.71E+04	--	1.71E+04	2.82E-03	6.08E+06	Direct
In-116m				1.40E+05	1.64E+55	4.46E+06	5.41E+03	--	5.41E+03	1.81E-04	3.00E+07	Direct
In-117				2.33E+05	1.22E+67	1.14E+07	2.39E+04	--	2.39E+04	6.51E-04	3.67E+07	Direct
In-117m				1.02E+05	4.46E+28	1.11E+06	6.84E+04	--	6.84E+04	4.96E-03	1.38E+07	Direct
In-118				--	--	--	1.12E+08	--	1.12E+08	5.84E-03	1.91E+10	Direct
In-118m				--	--	--	5.98E+04	--	5.98E+04	1.64E-04	3.65E+08	Direct
In-119				--	--	--	3.93E+05	--	3.93E+05	5.96E-04	6.59E+08	Direct
In-119m				3.85E+05	1.76E+153	1.82E+07	3.59E+06	--	3.85E+05	4.38E-03	8.78E+07	Inh.
In-121				--	--	--	2.03E+06	--	2.03E+06	5.03E-04	4.04E+09	Direct
In-121m				--	--	--	2.94E+06	--	2.94E+06	7.34E-03	4.01E+08	Direct
Ir-179				--	--	--	--	--	--	--	7.98E+08	--
Ir-180				--	--	--	3.03E+05	--	3.03E+05	4.35E-04	6.97E+08	Direct
Ir-181				--	--	--	--	--	--	--	2.12E+08	--
Ir-182				2.79E+06	3.16E+182	2.14E+08	3.61E+04	--	3.61E+04	5.23E-04	6.89E+07	Direct
Ir-183				1.75E+06	1.08E+52	4.84E+07	1.05E+04	--	1.05E+04	5.93E-04	1.77E+07	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Ir-184				5.88E+05	1.80E+20	5.04E+06	2.10E+03	--	2.10E+03	3.73E-04	5.64E+06	Direct
Ir-185				4.30E+05	1.09E+08	7.34E+05	2.07E+03	--	2.07E+03	1.71E-03	1.21E+06	Direct
Ir-186l				2.23E+05	2.25E+07	3.47E+05	7.15E+02	--	7.15E+02	6.71E-04	1.07E+06	Direct
Ir-186s				1.57E+06	2.87E+31	2.41E+07	7.16E+03	--	7.16E+03	7.44E-04	9.63E+06	Direct
Ir-187				9.31E+05	3.47E+09	2.10E+06	3.98E+03	--	3.98E+03	2.50E-03	1.60E+06	Direct
Ir-188				1.80E+05	1.32E+05	1.10E+05	5.56E+02	--	5.56E+02	1.38E-03	4.02E+05	Direct
Ir-189				2.03E+05	1.41E+04	6.54E+04	9.16E+03	--	9.16E+03	1.76E-01	5.20E+04	Direct
Ir-190				4.47E+04	2.98E+03	1.37E+04	5.18E+02	--	5.18E+02	9.11E-03	5.68E+04	Direct
Ir-190ms				1.02E+07	9.32E+43	2.68E+08	5.30E+06	--	5.30E+06	3.85E-01	1.37E+07	Direct
Ir-190ml				7.98E+05	1.05E+20	6.96E+06	2.52E+03	--	2.52E+03	4.73E-04	5.32E+06	Direct
Ir-191m				--	--	--	1.18E+08	--	1.18E+08	9.85E-03	1.20E+10	Direct
Ir-192	8.82E+02	9.57E-02	de	1.80E+04	1.56E+03	6.68E+03	8.92E+02	--	8.92E+02	9.70E-02	9.19E+03	Direct
Ir-192ms				--	--	--	1.71E+08	--	1.71E+08	2.53E-01	6.76E+08	Direct
Ir-192ml				3.10E+03	6.37E+03	2.60E+04	4.51E+03	--	3.10E+03	4.01E+02	7.73E+00	Inh.
Ir-193m				9.31E+04	1.45E+04	6.59E+04	2.82E+05	--	1.45E+04	2.25E-01	6.43E+04	Water
Ir-194				1.49E+05	2.30E+06	1.09E+05	1.20E+04	--	1.20E+04	1.43E-02	8.44E+05	Direct
Ir-194m				9.31E+03	9.82E+02	4.10E+03	3.11E+02	--	3.11E+02	7.91E-02	3.94E+03	Direct
Ir-195				1.12E+06	3.84E+23	1.03E+07	8.27E+04	--	8.27E+04	1.29E-02	6.43E+06	Direct
Ir-195m				4.65E+05	1.23E+17	3.25E+06	7.45E+03	--	7.45E+03	1.76E-03	4.23E+06	Direct
Ir-196				--	--	--	3.60E+06	--	3.60E+06	3.25E-03	1.11E+09	Direct
Ir-196m				6.98E+05	3.02E+37	1.41E+07	3.50E+03	--	3.50E+03	3.06E-04	1.14E+07	Direct
K-38				--	--	--	2.98E+04	--	2.98E+04	4.59E-05	6.49E+08	Direct
K-40	1.23E+02	1.77E+07	ing	3.72E+03	--	1.26E+02	4.64E+03	--	1.26E+02	1.80E+07	6.99E-06	Food
K-42				5.58E+04	--	4.84E+04	4.79E+03	--	4.79E+03	7.92E-04	6.04E+06	Direct
K-43				4.30E+04	--	4.69E+04	1.06E+03	--	1.06E+03	3.28E-04	3.23E+06	Direct
K-44				3.02E+05	--	8.02E+06	1.44E+04	--	1.44E+04	7.47E-05	1.93E+08	Direct
K-45				3.99E+05	--	1.38E+07	1.94E+04	--	1.94E+04	9.28E-05	2.09E+08	Direct
K-46				--	--	--	1.44E+05	--	1.44E+05	6.17E-05	2.34E+09	Direct
Kr-74				--	--	--	--	7.15E+02	7.15E+02	3.23E-06	2.21E+08	Sub
Kr-75				--	--	--	--	6.31E+02	6.31E+02	1.08E-06	5.85E+08	Sub
Kr-76				--	--	--	--	2.01E+03	2.01E+03	7.21E-04	2.79E+06	Sub
Kr-77				--	--	--	--	8.25E+02	8.25E+02	2.52E-05	3.27E+07	Sub
Kr-79				--	--	--	--	3.32E+03	3.32E+03	2.93E-03	1.13E+06	Sub
Kr-81				--	--	--	--	1.53E+05	1.53E+05	7.28E+06	2.10E-02	Sub
Kr-81m				--	--	--	--	6.70E+03	6.70E+03	6.25E-07	1.07E+10	Sub

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Kr-83m				--	--	--	--	1.53E+07	1.53E+07	7.42E-01	2.07E+07	Sub
Kr-85	1.46E+05	3.71E+02	sub	--	--	--	--	1.46E+05	1.46E+05	3.72E+02	3.93E+02	Sub
Kr-85m				--	--	--	--	5.45E+03	5.45E+03	6.62E-04	8.24E+06	Sub
Kr-87				--	--	--	--	9.46E+02	9.46E+02	3.34E-05	2.84E+07	Sub
Kr-88				--	--	--	--	3.83E+02	3.83E+02	3.05E-05	1.26E+07	Sub
Kr-89				--	--	--	--	3.88E+02	3.88E+02	5.77E-07	6.71E+08	Sub
La-128				--	--	--	4.95E+04	--	4.95E+04	1.74E-04	2.84E+08	Direct
La-129				5.32E+05	1.53E+234	4.92E+07	6.78E+04	--	6.78E+04	5.39E-04	1.26E+08	Direct
La-130				--	--	--	3.73E+04	--	3.73E+04	2.24E-04	1.66E+08	Direct
La-131				3.10E+05	2.84E+51	7.48E+06	1.83E+04	--	1.83E+04	7.52E-04	2.43E+07	Direct
La-132				3.99E+04	2.08E+14	1.39E+05	1.29E+03	--	1.29E+03	2.61E-04	4.95E+06	Direct
La-132m				3.28E+05	2.37E+115	1.67E+07	4.45E+04	--	4.45E+04	7.58E-04	5.87E+07	Direct
La-133				3.02E+05	2.55E+17	1.44E+06	1.95E+04	--	1.95E+04	3.24E-03	6.03E+06	Direct
La-134				--	--	--	1.56E+05	--	1.56E+05	7.40E-04	2.11E+08	Direct
La-135				4.47E+05	8.89E+07	4.65E+05	3.02E+04	--	3.02E+04	2.54E-02	1.19E+06	Direct
La-136				--	--	--	1.80E+05	--	1.80E+05	1.29E-03	1.40E+08	Direct
La-137				1.12E+03	2.44E+04	9.95E+03	3.00E+04	--	1.12E+03	2.57E+04	4.35E-02	Inh.
La-138				6.20E+01	1.80E+03	7.32E+02	5.87E+02	--	6.20E+01	3.23E+09	1.92E-08	Inh.
La-140				7.45E+03	4.60E+04	3.57E+03	3.83E+02	--	3.83E+02	6.88E-04	5.56E+05	Direct
La-141				5.08E+04	2.88E+16	1.84E+05	7.27E+04	--	5.08E+04	8.97E-03	5.66E+06	Inh.
La-142				7.45E+04	2.65E+34	9.30E+05	2.85E+03	--	2.85E+03	1.99E-04	1.43E+07	Direct
La-143				3.38E+05	8.52E+191	1.94E+07	5.42E+05	--	3.38E+05	3.66E-03	9.25E+07	Inh.
Lu-164				--	--	--	--	--	--	--	3.65E+08	--
Lu-165				4.86E+05	2.63E+252	6.24E+07	6.08E+04	--	6.08E+04	5.73E-04	1.06E+08	Direct
Lu-166				--	--	--	--	--	--	--	4.28E+08	--
Lu-166m				--	--	--	--	--	--	--	8.04E+08	--
Lu-167				1.86E+05	6.93E+57	6.00E+06	8.32E+03	--	8.32E+03	3.80E-04	2.19E+07	Direct
Lu-168m				--	--	--	--	--	--	--	1.67E+08	--
Lu-169				2.28E+04	3.69E+05	1.81E+04	8.82E+02	--	8.82E+02	1.62E-03	5.45E+05	Direct
Lu-169m				--	--	--	1.62E+08	--	1.62E+08	3.88E-01	4.17E+08	Direct
Lu-170				1.18E+04	5.32E+04	6.18E+03	3.46E+02	--	3.46E+02	9.00E-04	3.84E+05	Direct
Lu-171				1.20E+04	7.01E+03	3.08E+03	1.09E+03	--	1.09E+03	1.17E-02	9.29E+04	Direct
Lu-171m				--	--	--	2.65E+08	--	2.65E+08	3.17E-01	8.35E+08	Direct
Lu-172				6.20E+03	4.37E+03	1.82E+03	4.05E+02	--	4.05E+02	3.57E-03	1.13E+05	Direct
Lu-172m				--	--	--	1.30E+08	--	1.30E+08	4.39E-01	2.96E+08	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Lu-173				4.86E+03	7.71E+03	3.17E+03	5.61E+03	--	3.17E+03	2.10E+00	1.51E+03	Food
Lu-174				2.79E+03	7.36E+03	3.01E+03	5.78E+03	--	2.79E+03	4.50E+00	6.21E+02	Inh.
Lu-174m				2.94E+03	3.92E+03	1.65E+03	1.15E+04	--	1.65E+03	3.12E-01	5.29E+03	Food
Lu-176				1.69E+02	1.10E+03	4.48E+02	1.48E+03	--	1.69E+02	3.00E+09	5.64E-08	Inh.
Lu-176m				6.98E+04	3.72E+17	4.15E+05	2.32E+05	--	6.98E+04	1.44E-02	4.84E+06	Inh.
Lu-177				1.02E+04	1.07E+04	4.45E+03	2.18E+04	--	4.45E+03	4.05E-02	1.10E+05	Food
Lu-177m				7.45E+02	1.22E+03	5.09E+02	7.25E+02	--	5.09E+02	1.11E-01	4.59E+03	Food
Lu-178				2.72E+05	4.07E+99	1.16E+07	1.82E+05	--	1.82E+05	4.91E-03	3.72E+07	Direct
Lu-178m				1.99E+05	1.05E+123	1.79E+07	2.88E+04	--	2.88E+04	6.19E-04	4.65E+07	Direct
Lu-179				6.98E+04	1.06E+15	2.70E+05	8.75E+04	--	6.98E+04	1.83E-02	3.82E+06	Inh.
Lu-180				--	--	--	8.39E+04	--	8.39E+04	4.58E-04	1.83E+08	Direct
Lu-181				--	--	--	3.61E+05	--	3.61E+05	1.21E-03	2.97E+08	Direct
Md-257				4.86E+03	1.24E+14	4.18E+06	2.13E+04	--	4.86E+03	2.07E-03	2.34E+06	Inh.
Md-258				2.03E+01	1.74E+02	7.56E+02	1.18E+05	--	2.03E+01	2.21E-03	9.20E+03	Inh.
Mg-27				--	--	--	8.60E+04	--	8.60E+04	1.17E-04	7.37E+08	Direct
Mg-28				6.57E+03	7.98E+05	5.73E+03	7.68E+02	--	7.68E+02	1.43E-04	5.36E+06	Direct
Mn-50m				--	--	--	8.92E+04	--	8.92E+04	4.15E-05	2.15E+09	Direct
Mn-51				1.64E+05	2.95E+63	3.56E+06	1.57E+04	--	1.57E+04	1.97E-04	7.99E+07	Direct
Mn-52	2.23E+02	4.97E-04	de	6.20E+03	3.86E+03	1.48E+03	2.23E+02	--	2.23E+02	4.97E-04	4.50E+05	Direct
Mn-52m				2.23E+05	3.72E+131	1.05E+07	1.43E+04	--	1.43E+04	8.31E-05	1.72E+08	Direct
Mn-53				2.15E+05	6.59E+04	2.66E+04	5.58E+05	--	2.66E+04	1.46E+07	1.83E-03	Food
Mn-54				7.45E+03	2.85E+03	1.17E+03	8.69E+02	--	8.69E+02	1.12E-01	7.75E+03	Direct
Mn-56				5.58E+04	4.36E+22	3.98E+05	2.77E+03	--	2.77E+03	1.28E-04	2.17E+07	Direct
Mn-57				--	--	--	5.11E+06	--	5.11E+06	2.20E-03	2.32E+09	Direct
Mn-58m				--	--	--	2.80E+05	--	2.80E+05	9.36E-05	2.99E+09	Direct
Mo-101				2.48E+05	--	2.49E+07	3.62E+04	--	3.62E+04	2.84E-04	1.27E+08	Direct
Mo-102				2.66E+05	--	1.96E+07	3.46E+06	--	2.66E+05	1.63E-03	1.63E+08	Inh.
Mo-89				--	--	--	2.82E+05	--	2.82E+05	2.82E-04	1.00E+09	Direct
Mo-90				1.99E+04	--	7.37E+04	2.72E+03	--	2.72E+03	4.42E-04	6.15E+06	Direct
Mo-91				3.19E+05	--	1.62E+07	4.79E+04	--	4.79E+04	3.58E-04	1.34E+08	Direct
Mo-91m				--	--	--	4.86E+05	--	4.86E+05	2.53E-04	1.92E+09	Direct
Mo-93				5.08E+03	--	3.07E+02	6.85E+04	--	3.07E+02	2.80E+02	1.10E+00	Food
Mo-93m				3.72E+04	--	1.35E+05	8.59E+02	--	8.59E+02	1.74E-04	4.92E+06	Direct
Mo-99	3.76E+03	7.84E-03	ing	1.02E+04	--	3.85E+03	5.48E+03	--	3.85E+03	8.01E-03	4.80E+05	Food
N-13				--	--	--	--	8.04E+02	8.04E+02	5.54E-07	1.45E+09	Sub

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
N-16				--	--	--	1.36E+06	--	1.36E+06	1.37E-05	9.89E+10	Direct
Na-22	2.48E+02	3.98E-02	ing	5.58E+03	--	2.54E+02	3.31E+02	--	2.54E+02	4.07E-02	6.25E+03	Food
Na-24				2.11E+04	--	4.15E+04	2.92E+02	--	2.92E+02	3.35E-05	8.71E+06	Direct
Nb-87				--	--	--	1.58E+05	--	1.58E+05	2.75E-04	5.77E+08	Direct
Nb-88				2.23E+05	--	1.71E+07	1.23E+04	--	1.23E+04	8.21E-05	1.50E+08	Direct
Nb-88m				--	--	--	2.27E+04	--	2.27E+04	8.25E-05	2.75E+08	Direct
Nb-89l				5.88E+04	--	4.23E+05	4.27E+03	--	4.27E+03	2.46E-04	1.73E+07	Direct
Nb-89s				9.31E+04	--	1.67E+06	5.70E+03	--	5.70E+03	1.78E-04	3.20E+07	Direct
Nb-90				1.02E+04	--	1.53E+04	2.88E+02	--	2.88E+02	1.21E-04	2.39E+06	Direct
Nb-91				6.57E+03	--	1.75E+04	6.15E+04	--	6.57E+03	1.14E+03	5.78E+00	Inh.
Nb-91m				2.86E+03	--	2.35E+03	2.15E+04	--	2.35E+03	9.97E-02	2.36E+04	Food
Nb-92				4.47E+02	--	8.05E+02	4.82E+02	--	4.47E+02	3.99E+06	1.12E-04	Inh.
Nb-92m				2.07E+04	--	3.64E+03	7.75E+02	--	7.75E+02	5.54E-03	1.40E+05	Direct
Nb-93m				6.98E+03	--	6.73E+03	3.82E+05	--	6.73E+03	2.38E+01	2.83E+02	Food
Nb-94	2.49E+02	1.33E+03	i	2.48E+02	--	4.74E+02	4.61E+02	--	2.48E+02	1.32E+03	1.88E-01	Inh.
Nb-94m				--	--	--	9.91E+06	--	9.91E+06	3.10E-02	3.20E+08	Direct
Nb-95				6.98E+03	--	1.87E+03	9.57E+02	--	9.57E+02	2.45E-02	3.91E+04	Direct
Nb-95m				1.31E+04	--	6.66E+03	1.17E+04	--	6.66E+03	1.75E-02	3.81E+05	Food
Nb-96				1.12E+04	--	1.07E+04	4.11E+02	--	4.11E+02	2.93E-04	1.40E+06	Direct
Nb-97				1.55E+05	--	3.15E+06	1.53E+04	--	1.53E+04	5.70E-04	2.69E+07	Direct
Nb-97m				--	--	--	9.95E+05	--	9.95E+05	5.13E-04	1.94E+09	Direct
Nb-98				1.13E+05	--	2.73E+06	5.80E+03	--	5.80E+03	1.56E-04	3.73E+07	Direct
Nb-99				--	--	--	1.66E+07	--	1.66E+07	2.19E-03	7.60E+09	Direct
Nb-99m				--	--	--	3.68E+05	--	3.68E+05	5.04E-04	7.31E+08	Direct
Nd-134				--	--	--	1.57E+05	--	1.57E+05	9.52E-04	1.65E+08	Direct
Nd-135				2.48E+05	--	2.07E+07	4.63E+04	--	4.63E+04	4.12E-04	1.12E+08	Direct
Nd-136				1.25E+05	--	3.08E+06	4.88E+04	--	4.88E+04	1.79E-03	2.73E+07	Direct
Nd-137				2.23E+05	--	6.80E+06	1.60E+04	--	1.60E+04	4.48E-04	3.57E+07	Direct
Nd-138				2.94E+04	--	8.08E+04	5.77E+04	--	2.94E+04	6.52E-03	4.51E+06	Inh.
Nd-139				6.57E+05	--	2.60E+07	6.02E+04	--	6.02E+04	1.32E-03	4.56E+07	Direct
Nd-139m				4.47E+04	--	1.90E+05	1.47E+03	--	1.47E+03	3.58E-04	4.10E+06	Direct
Nd-140				8.59E+03	--	1.97E+03	2.79E+04	--	1.97E+03	7.11E-03	2.77E+05	Food
Nd-141				1.27E+06	--	1.25E+07	6.45E+04	--	6.45E+04	7.22E-03	8.93E+06	Direct
Nd-141m				--	--	--	9.17E+05	--	9.17E+05	7.15E-04	1.28E+09	Direct
Nd-144				1.51E+00	--	1.97E+01	--	--	1.51E+00	1.39E+12	1.08E-12	Inh.

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Nd-147				4.86E+03	--	1.58E+03	5.34E+03	--	1.58E+03	1.96E-02	8.09E+04	Food
Nd-149				8.59E+04	--	1.24E+06	1.82E+04	--	1.82E+04	1.49E-03	1.22E+07	Direct
Nd-151				3.85E+05	--	4.13E+07	6.36E+04	--	6.36E+04	6.35E-04	1.00E+08	Direct
Nd-152				2.79E+05	--	2.76E+07	3.87E+05	--	2.79E+05	2.57E-03	1.09E+08	Inh.
Ne-19				--	--	--	2.47E+06	--	2.47E+06	7.16E-05	3.45E+10	Direct
Ne-24				--	--	--	3.96E+05	--	3.96E+05	1.71E-04	2.32E+09	Direct
Ni-56				9.31E+03	--	2.92E+03	4.46E+02	--	4.46E+02	1.17E-03	3.83E+05	Direct
Ni-57				1.47E+04	--	9.04E+03	4.71E+02	--	4.71E+02	3.09E-04	1.53E+06	Direct
Ni-59				1.35E+04	--	1.28E+04	3.02E+05	--	1.28E+04	1.58E+05	8.09E-02	Food
Ni-63	5.24E+03	9.21E+01	ing	5.58E+03	--	5.36E+03	--	--	5.36E+03	9.06E+01	5.92E+01	Food
Ni-65				3.10E+04	--	5.69E+05	8.75E+03	--	8.75E+03	4.57E-04	1.92E+07	Direct
Ni-66				5.88E+03	--	1.82E+03	--	--	1.82E+03	2.09E-03	8.71E+05	Food
Np-231				6.57E+04	--	1.09E+08	--	--	6.57E+04	3.94E-03	1.67E+07	Inh.
Np-232				2.38E+06	--	1.08E+09	4.10E+04	--	4.10E+04	7.43E-04	5.51E+07	Direct
Np-233				3.72E+07	--	1.93E+09	2.20E+05	--	2.20E+05	9.89E-03	2.23E+07	Direct
Np-234				1.53E+05	--	3.93E+04	5.44E+02	--	5.44E+02	4.29E-03	1.27E+05	Direct
Np-235				2.79E+05	--	1.56E+05	1.02E+05	--	1.02E+05	7.30E+01	1.40E+03	Direct
Np-236l				3.72E+01	--	4.72E+02	5.33E+03	--	3.72E+01	2.83E+03	1.32E-02	Inh.
Np-236s				2.23E+04	--	6.39E+05	2.03E+04	--	2.03E+04	3.43E-02	5.90E+05	Direct
Np-237	5.36E+00	7.60E+03	i	5.32E+00	--	7.30E+01	2.10E+04	--	5.32E+00	7.55E+03	7.05E-04	Inh.
Np-238	1.54E+03	5.93E-03	de	5.58E+04	--	6.37E+04	1.54E+03	--	1.54E+03	5.94E-03	2.59E+05	Direct
Np-239				1.02E+05	--	6.61E+04	4.84E+03	--	4.84E+03	2.09E-02	2.32E+05	Direct
Np-240				8.59E+05	--	2.89E+07	8.49E+03	--	8.49E+03	7.04E-04	1.20E+07	Direct
Np-240m				--	--	--	2.90E+05	--	2.90E+05	2.74E-03	1.06E+08	Direct
Np-241				5.08E+06	--	6.14E+08	1.32E+06	--	1.32E+06	2.35E-02	5.61E+07	Direct
Np-242				--	--	--	1.24E+06	--	1.24E+06	3.51E-03	3.53E+08	Direct
Np-242m				--	--	--	1.43E+05	--	1.43E+05	1.01E-03	1.41E+08	Direct
O-14				--	--	--	--	2.30E+02	2.30E+02	2.01E-08	1.14E+10	Sub
O-15				--	--	--	--	8.04E+02	8.04E+02	1.31E-07	6.15E+09	Sub
O-19				--	--	--	1.69E+06	--	1.69E+06	7.65E-05	2.21E+10	Direct
Os-177				--	--	--	--	--	--	--	3.79E+08	--
Os-179				--	--	--	--	--	--	--	1.62E+08	--
Os-180				4.47E+05	1.17E+127	4.12E+07	5.11E+05	--	4.47E+05	9.41E-03	4.75E+07	Inh.
Os-181				1.12E+05	1.97E+31	1.66E+06	5.65E+03	--	5.65E+03	5.71E-04	9.90E+06	Direct
Os-182				2.15E+04	2.35E+06	2.22E+04	2.38E+03	--	2.38E+03	3.04E-03	7.83E+05	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Os-183				4.47E+04	2.31E+08	8.92E+04	2.05E+03	--	2.05E+03	1.55E-03	1.32E+06	Direct
Os-183m				5.08E+04	3.76E+09	1.27E+05	1.49E+03	--	1.49E+03	8.61E-04	1.73E+06	Direct
Os-185				7.45E+03	4.19E+03	1.78E+03	1.01E+03	--	1.01E+03	1.35E-01	7.51E+03	Direct
Os-186				2.94E+00	6.17E+01	2.52E+01	--	--	2.94E+00	3.06E+12	9.61E-13	Inh.
Os-189m				1.41E+06	5.42E+13	2.42E+06	1.19E+06	--	1.19E+06	4.32E-01	2.76E+06	Direct
Os-190m				--	--	--	4.61E+04	--	4.61E+04	4.61E-04	1.00E+08	Direct
Os-191				6.20E+03	5.54E+03	2.57E+03	9.34E+03	--	2.57E+03	5.78E-02	4.44E+04	Food
Os-191m				7.45E+04	5.41E+08	2.13E+05	1.41E+05	--	7.45E+04	5.91E-02	1.26E+06	Inh.
Os-193				1.64E+04	3.53E+05	1.15E+04	1.29E+04	--	1.15E+04	2.13E-02	5.41E+05	Food
Os-194				1.41E+02	8.26E+02	3.37E+02	4.27E+05	--	1.41E+02	4.60E-01	3.07E+02	Inh.
Os-196				1.23E+05	7.73E+81	3.69E+06	2.58E+05	--	1.23E+05	4.46E-03	2.75E+07	Inh.
P-30				--	--	--	2.84E+05	--	2.84E+05	1.13E-04	2.51E+09	Direct
P-32	1.13E+01	3.95E-05	ing	6.98E+01	1.36E+03	1.13E+01	--	--	1.13E+01	3.94E-05	2.86E+05	Food
P-33	8.84E+01	5.64E-04	ing	1.60E+02	1.10E+04	8.89E+01	--	--	8.89E+01	5.70E-04	1.56E+05	Food
Pa-227				1.15E+03	--	8.96E+06	8.52E+05	--	1.15E+03	5.32E-05	2.16E+07	Inh.
Pa-228				1.62E+03	--	1.60E+05	9.06E+02	--	9.06E+02	1.45E-03	6.25E+05	Direct
Pa-229				1.67E+04	--	3.59E+05	1.36E+04	--	1.36E+04	3.58E-02	3.80E+05	Direct
Pa-230				1.57E+02	--	1.51E+04	1.14E+03	--	1.57E+02	4.82E-03	3.26E+04	Inh.
Pa-231				8.59E-01	--	1.14E+01	1.51E+04	--	8.59E-01	1.82E+01	4.72E-02	Inh.
Pa-232				1.18E+04	--	1.24E+05	9.96E+02	--	9.96E+02	2.32E-03	4.30E+05	Direct
Pa-233				3.02E+04	--	1.35E+04	3.60E+03	--	3.60E+03	1.74E-01	2.08E+04	Direct
Pa-234				1.93E+05	--	7.67E+05	1.02E+03	--	1.02E+03	5.13E-04	2.00E+06	Direct
Pa-234m				--	--	--	5.39E+07	--	5.39E+07	7.84E-02	6.87E+08	Direct
Pa-235				--	--	--	3.74E+07	--	3.74E+07	1.15E+00	3.27E+07	Direct
Pa-236				--	--	--	8.70E+04	--	8.70E+04	9.94E-04	8.75E+07	Direct
Pa-237				--	--	--	1.37E+05	--	1.37E+05	1.50E-03	9.12E+07	Direct
Pb-194				7.45E+05	--	6.42E+07	5.57E+04	--	5.57E+04	6.90E-04	8.08E+07	Direct
Pb-195m				3.72E+05	--	3.36E+07	2.87E+04	--	2.87E+04	4.70E-04	6.10E+07	Direct
Pb-196				3.60E+05	--	1.49E+07	3.96E+04	--	3.96E+04	1.53E-03	2.59E+07	Direct
Pb-197				--	--	--	5.91E+04	--	5.91E+04	4.95E-04	1.19E+08	Direct
Pb-197m				2.43E+05	--	7.97E+06	1.44E+04	--	1.44E+04	6.47E-04	2.22E+07	Direct
Pb-198				1.28E+05	--	1.08E+06	1.15E+04	--	1.15E+04	1.74E-03	6.60E+06	Direct
Pb-199				2.33E+05	--	3.18E+06	5.45E+03	--	5.45E+03	5.19E-04	1.05E+07	Direct
Pb-200				4.30E+04	--	3.17E+04	4.99E+03	--	4.99E+03	6.85E-03	7.29E+05	Direct
Pb-201				9.31E+04	--	1.75E+05	2.04E+03	--	2.04E+03	1.23E-03	1.66E+06	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Pb-201m				--	--	--	1.95E+06	--	1.95E+06	2.12E-03	9.20E+08	Direct
Pb-202				7.98E+02	--	9.25E+01	3.46E+05	--	9.25E+01	1.57E+04	5.90E-03	Food
Pb-202m				9.31E+04	--	5.51E+05	1.65E+03	--	1.65E+03	3.85E-04	4.29E+06	Direct
Pb-203				6.98E+04	--	2.37E+04	2.72E+03	--	2.72E+03	9.17E-03	2.97E+05	Direct
Pb-204m				2.54E+05	--	4.60E+06	5.12E+03	--	5.12E+03	3.73E-04	1.37E+07	Direct
Pb-205				2.72E+04	--	2.87E+03	3.16E+05	--	2.87E+03	2.36E+07	1.22E-04	Food
Pb-209				3.49E+05	--	1.40E+06	--	--	3.49E+05	7.57E-02	4.61E+06	Inh.
Pb-210	1.16E+00	1.53E-02	ing	1.02E+01	--	1.19E+00	1.51E+05	--	1.19E+00	1.55E-02	7.63E+01	Food
Pb-211				1.99E+03	--	2.37E+06	3.97E+05	--	1.99E+03	8.08E-05	2.47E+07	Inh.
Pb-212				3.38E+02	--	4.22E+03	9.68E+03	--	3.38E+02	2.44E-04	1.39E+06	Inh.
Pb-214				2.33E+03	--	4.11E+06	1.08E+05	--	2.33E+03	7.10E-05	3.28E+07	Inh.
Pd-100				1.15E+04	--	3.93E+03	6.19E+03	--	3.93E+03	1.09E-02	3.60E+05	Food
Pd-101				1.12E+05	--	3.37E+05	5.00E+03	--	5.00E+03	1.33E-03	3.76E+06	Direct
Pd-103				2.79E+04	--	7.34E+03	5.14E+04	--	7.34E+03	9.81E-02	7.48E+04	Food
Pd-107				2.03E+04	--	2.17E+04	--	--	2.03E+04	3.95E+07	5.14E-04	Inh.
Pd-109				2.23E+04	--	3.60E+04	1.08E+05	--	2.23E+04	1.04E-02	2.14E+06	Inh.
Pd-109m				--	--	--	1.39E+06	--	1.39E+06	3.77E-03	3.68E+08	Direct
Pd-111				2.86E+05	--	1.31E+07	6.48E+05	--	2.86E+05	3.95E-03	7.24E+07	Inh.
Pd-112				7.45E+03	--	4.97E+03	2.07E+05	--	4.97E+03	3.73E-03	1.33E+06	Food
Pd-114				--	--	--	1.16E+07	--	1.16E+07	1.70E-02	6.82E+08	Direct
Pd-96				--	--	--	2.47E+05	--	2.47E+05	2.57E-04	9.64E+08	Direct
Pd-97				--	--	--	9.82E+04	--	9.82E+04	1.57E-04	6.26E+08	Direct
Pd-98				2.38E+05	--	1.38E+07	9.85E+04	--	9.85E+04	9.08E-04	1.08E+08	Direct
Pd-99				3.28E+05	--	1.99E+07	2.64E+04	--	2.64E+04	2.97E-04	8.88E+07	Direct
Pm-136				--	--	--	1.49E+05	--	1.49E+05	1.93E-04	7.76E+08	Direct
Pm-137m				--	--	--	1.69E+05	--	1.69E+05	2.96E-04	5.72E+08	Direct
Pm-138				--	--	--	--	--	--	--	4.21E+08	--
Pm-139				--	--	--	1.86E+05	--	1.86E+05	5.70E-04	3.26E+08	Direct
Pm-140				--	--	--	4.50E+06	--	4.50E+06	5.13E-04	8.76E+09	Direct
Pm-140m				--	--	--	4.02E+04	--	4.02E+04	1.78E-04	2.26E+08	Direct
Pm-141				4.47E+05	--	2.05E+07	4.66E+04	--	4.66E+04	7.30E-04	6.38E+07	Direct
Pm-142				--	--	--	1.24E+06	--	1.24E+06	6.30E-04	1.96E+09	Direct
Pm-143				7.98E+03	--	3.66E+03	2.30E+03	--	2.30E+03	6.68E-01	3.45E+03	Direct
Pm-144				1.43E+03	--	8.58E+02	4.65E+02	--	4.65E+02	1.86E-01	2.50E+03	Direct
Pm-145	3.31E+03	2.37E+01	i	3.28E+03	--	7.34E+03	2.34E+04	--	3.28E+03	2.36E+01	1.39E+02	Inh.

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Pm-146				5.88E+02	--	9.00E+02	9.64E+02	--	5.88E+02	1.33E+00	4.43E+02	Inh.
Pm-147	2.40E+03	2.58E+00	i	2.38E+03	--	3.14E+03	--	--	2.38E+03	2.56E+00	9.28E+02	Inh.
Pm-148				5.08E+03	--	1.02E+03	1.35E+03	--	1.02E+03	6.21E-03	1.64E+05	Food
Pm-148m				2.07E+03	--	5.79E+02	3.66E+02	--	3.66E+02	1.71E-02	2.14E+04	Direct
Pm-149				1.36E+04	--	5.66E+03	7.98E+04	--	5.66E+03	1.43E-02	3.96E+05	Food
Pm-150				5.32E+04	--	3.72E+05	3.15E+03	--	3.15E+03	4.04E-04	7.80E+06	Direct
Pm-151				1.75E+04	--	1.34E+04	2.99E+03	--	2.99E+03	4.09E-03	7.31E+05	Direct
Pm-152				--	--	--	6.14E+05	--	6.14E+05	2.04E-03	3.00E+08	Direct
Pm-152m				--	--	--	6.34E+04	--	6.34E+04	3.85E-04	1.65E+08	Direct
Pm-153				--	--	--	1.81E+06	--	1.81E+06	7.71E-03	2.34E+08	Direct
Pm-154				--	--	--	2.34E+05	--	2.34E+05	3.31E-04	7.06E+08	Direct
Pm-154m				--	--	--	1.50E+05	--	1.50E+05	3.30E-04	4.56E+08	Direct
Po-203				1.83E+05	--	8.09E+06	1.20E+04	--	1.20E+04	4.76E-04	2.52E+07	Direct
Po-204				2.94E+04	--	2.37E+05	2.96E+03	--	2.96E+03	6.81E-04	4.35E+06	Direct
Po-205				1.25E+05	--	2.43E+06	4.24E+03	--	4.24E+03	5.00E-04	8.49E+06	Direct
Po-206				2.15E+02	--	4.31E+02	6.33E+02	--	2.15E+02	2.98E-03	7.20E+04	Inh.
Po-207				7.45E+04	--	3.20E+05	1.65E+03	--	1.65E+03	6.36E-04	2.60E+06	Direct
Po-208				3.19E+00	--	2.63E+00	3.63E+07	--	2.63E+00	4.43E-03	5.93E+02	Food
Po-209				3.28E+00	--	2.69E+00	2.34E+05	--	2.69E+00	1.60E-01	1.68E+01	Food
Po-210	3.57E+00	7.94E-04	ing	3.72E+00	--	3.65E+00	--	--	3.65E+00	8.11E-04	4.49E+03	Food
Po-211				--	--	--	1.08E+10	--	1.08E+10	1.04E-01	1.04E+11	Direct
Po-212				--	--	--	--	--	--	--	1.74E+17	--
Po-212m				--	--	--	1.22E+07	--	1.22E+07	1.03E-02	1.18E+09	Direct
Po-213				--	--	--	--	--	--	--	1.26E+16	--
Po-214				--	--	--	--	--	--	--	3.21E+14	--
Po-215				--	--	--	2.44E+14	--	2.44E+14	8.29E+00	2.95E+13	Direct
Po-216				--	--	--	--	--	--	--	3.48E+11	--
Po-218				--	--	--	--	--	--	--	2.83E+08	--
Pr-134				2.23E+05	--	1.73E+07	2.09E+04	--	2.09E+04	1.64E-04	1.28E+08	Direct
Pr-134m				3.28E+05	--	1.97E+07	1.85E+04	--	1.85E+04	2.23E-04	8.26E+07	Direct
Pr-135				3.10E+05	--	1.40E+07	3.45E+04	--	3.45E+04	5.95E-04	5.81E+07	Direct
Pr-136				4.47E+05	--	3.57E+07	2.63E+04	--	2.63E+04	2.49E-04	1.06E+08	Direct
Pr-137				3.19E+05	--	5.05E+06	1.89E+04	--	1.89E+04	1.05E-03	1.79E+07	Direct
Pr-138				--	--	--	6.14E+05	--	6.14E+05	6.54E-04	9.40E+08	Direct
Pr-138m				8.59E+04	--	9.47E+05	2.32E+03	--	2.32E+03	2.15E-04	1.08E+07	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Pr-139				3.72E+05	--	1.86E+06	2.25E+04	--	2.25E+04	4.49E-03	5.00E+06	Direct
Pr-140				--	--	--	3.91E+05	--	3.91E+05	9.86E-04	3.96E+08	Direct
Pr-142				1.51E+04	--	1.09E+04	1.86E+04	--	1.09E+04	9.46E-03	1.15E+06	Food
Pr-142m				1.19E+06	--	6.21E+07	--	--	1.19E+06	1.31E-02	9.08E+07	Inh.
Pr-143				4.86E+03	--	1.30E+03	--	--	1.30E+03	1.93E-02	6.74E+04	Food
Pr-144				3.72E+05	--	1.79E+07	1.32E+06	--	3.72E+05	4.92E-03	7.56E+07	Inh.
Pr-144m				--	--	--	7.99E+06	--	7.99E+06	4.40E-02	1.81E+08	Direct
Pr-145				4.30E+04	--	1.12E+05	1.64E+05	--	4.30E+04	1.19E-02	3.62E+06	Inh.
Pr-146				2.28E+05	--	8.19E+06	2.97E+04	--	2.97E+04	5.56E-04	5.34E+07	Direct
Pr-147				3.72E+05	--	3.44E+07	6.17E+04	--	6.17E+04	6.56E-04	9.41E+07	Direct
Pr-148				--	--	--	3.19E+05	--	3.19E+05	5.76E-04	5.55E+08	Direct
Pr-148m				--	--	--	3.86E+05	--	3.86E+05	6.10E-04	6.32E+08	Direct
Pt-183				--	--	--	--	--	--	--	1.58E+08	--
Pt-184				4.30E+05	2.30E+159	2.96E+07	5.76E+04	--	5.76E+04	9.76E-04	5.91E+07	Direct
Pt-186				1.69E+05	1.23E+28	1.38E+06	8.16E+03	--	8.16E+03	9.69E-04	8.43E+06	Direct
Pt-187				1.86E+05	6.08E+24	1.25E+06	8.32E+03	--	8.32E+03	1.17E-03	7.13E+06	Direct
Pt-188				1.77E+04	5.25E+03	2.38E+03	3.72E+03	--	2.38E+03	3.50E-02	6.81E+04	Food
Pt-189				1.53E+05	2.41E+09	2.03E+05	4.36E+03	--	4.36E+03	2.86E-03	1.53E+06	Direct
Pt-190				8.59E+01	2.91E+02	1.18E+02	--	--	8.59E+01	2.97E+10	2.90E-09	Inh.
Pt-191				5.88E+04	6.50E+04	1.34E+04	2.69E+03	--	2.69E+03	1.10E-02	2.44E+05	Direct
Pt-193				4.14E+05	6.38E+04	2.59E+04	3.46E+05	--	2.59E+04	7.00E+02	3.71E+01	Food
Pt-193m				5.32E+04	2.19E+04	7.17E+03	6.14E+04	--	7.17E+03	4.59E-02	1.56E+05	Food
Pt-195m				3.60E+04	1.76E+04	5.42E+03	1.03E+04	--	5.42E+03	3.25E-02	1.67E+05	Food
Pt-197				6.98E+04	9.97E+06	3.69E+04	4.42E+04	--	3.69E+04	4.24E-02	8.69E+05	Food
Pt-197m				2.60E+05	1.49E+34	1.95E+06	9.20E+04	--	9.20E+04	9.10E-03	1.01E+07	Direct
Pt-199				5.08E+05	2.81E+92	1.28E+07	1.17E+05	--	1.17E+05	3.80E-03	3.07E+07	Direct
Pt-200				2.79E+04	6.27E+07	1.77E+04	2.17E+04	--	1.77E+04	1.41E-02	1.25E+06	Food
Pt-202				7.98E+03	1.53E+04	1.46E+03	--	--	1.46E+03	4.15E-03	3.53E+05	Food
Pu-232				4.47E+03	--	1.58E+07	3.39E+05	--	4.47E+03	1.86E-04	2.40E+07	Inh.
Pu-234				5.08E+03	--	1.87E+06	2.36E+04	--	5.08E+03	3.34E-03	1.52E+06	Inh.
Pu-235				4.30E+07	--	2.91E+09	3.02E+05	--	3.02E+05	9.56E-03	3.16E+07	Direct
Pu-236				6.20E+00	--	9.48E+01	3.63E+05	--	6.20E+00	1.17E-02	5.31E+02	Inh.
Pu-237				3.10E+05	--	1.02E+05	1.40E+04	--	1.40E+04	1.15E+00	1.22E+04	Direct
Pu-238	2.62E+00	1.53E-01	i	2.60E+00	--	3.51E+01	4.03E+05	--	2.60E+00	1.52E-01	1.71E+01	Inh.
Pu-239	2.40E+00	3.86E+01	i	2.38E+00	--	3.22E+01	9.07E+05	--	2.38E+00	3.82E+01	6.21E-02	Inh.

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Pu-240	2.40E+00	1.05E+01	i	2.38E+00	--	3.22E+01	4.27E+05	--	2.38E+00	1.04E+01	2.28E-01	Inh.
Pu-241	1.32E+02	1.29E+00	i	1.31E+02	--	1.72E+03	--	--	1.31E+02	1.28E+00	1.03E+02	Inh.
Pu-242	2.56E+00	6.49E+02	i	2.54E+00	--	3.36E+01	5.19E+05	--	2.54E+00	6.47E+02	3.92E-03	Inh.
Pu-243				1.02E+06	--	6.19E+06	9.86E+04	--	9.86E+04	3.79E-02	2.60E+06	Direct
Pu-244				2.54E+00	--	3.36E+01	6.05E+05	--	2.54E+00	1.43E+05	1.77E-05	Inh.
Pu-245				1.72E+05	--	3.50E+05	3.47E+03	--	3.47E+03	2.85E-03	1.22E+06	Direct
Pu-246				1.47E+04	--	5.31E+03	5.34E+03	--	5.31E+03	1.09E-01	4.89E+04	Food
Ra-219				--	--	--	2.56E+10	--	2.56E+10	4.96E-03	5.15E+12	Direct
Ra-220				--	--	--	5.20E+11	--	5.20E+11	1.82E-01	2.86E+12	Direct
Ra-221				--	--	--	3.98E+07	--	3.98E+07	2.18E-02	1.82E+09	Direct
Ra-222				--	--	--	1.26E+08	--	1.26E+08	9.40E-02	1.34E+09	Direct
Ra-223	1.63E+01	3.19E-04	i	1.62E+01	--	1.70E+02	5.58E+03	--	1.62E+01	3.16E-04	5.12E+04	Inh.
Ra-224	3.88E+01	2.44E-04	i	3.85E+01	--	5.67E+02	8.05E+04	--	3.85E+01	2.42E-04	1.59E+05	Inh.
Ra-225	1.94E+01	4.99E-04	i	1.93E+01	--	1.57E+02	5.46E+04	--	1.93E+01	4.91E-04	3.92E+04	Inh.
Ra-226				3.49E+01	--	2.88E+01	1.08E+05	--	2.88E+01	2.91E+01	9.89E-01	Food
Ra-227				3.99E+05	--	4.36E+07	1.03E+05	--	1.03E+05	5.25E-03	1.96E+07	Direct
Ra-228				4.30E+01	--	1.21E+01	--	--	1.21E+01	4.43E-02	2.73E+02	Food
Ra-230				6.57E+05	--	8.76E+06	9.81E+04	--	9.81E+04	1.12E-02	8.79E+06	Direct
Rb-77				--	--	--	1.07E+05	--	1.07E+05	1.62E-04	6.61E+08	Direct
Rb-78				3.02E+05	--	1.24E+07	1.00E+04	--	1.00E+04	7.34E-05	1.37E+08	Direct
Rb-78m				--	--	--	3.93E+04	--	3.93E+04	9.34E-05	4.20E+08	Direct
Rb-79				3.72E+05	--	1.34E+07	2.33E+04	--	2.33E+04	2.24E-04	1.04E+08	Direct
Rb-80				--	--	--	1.03E+06	--	1.03E+06	2.47E-04	4.15E+09	Direct
Rb-81				1.64E+05	--	1.05E+06	4.35E+03	--	4.35E+03	5.14E-04	8.46E+06	Direct
Rb-81m				8.59E+05	--	4.95E+07	2.26E+06	--	8.59E+05	1.18E-02	7.26E+07	Inh.
Rb-82				--	--	--	5.10E+05	--	5.10E+05	2.89E-04	1.77E+09	Direct
Rb-82m				5.08E+04	--	3.23E+05	7.18E+02	--	7.18E+02	1.16E-04	6.17E+06	Direct
Rb-83				1.12E+04	--	4.81E+02	1.44E+03	--	4.81E+02	2.63E-02	1.83E+04	Food
Rb-84				7.45E+03	--	3.93E+02	7.99E+02	--	3.93E+02	8.28E-03	4.75E+04	Food
Rb-84m				1.25E+06	--	1.07E+08	9.34E+04	--	9.34E+04	8.44E-04	1.11E+08	Direct
Rb-86				8.59E+03	--	4.78E+02	7.83E+03	--	4.78E+02	5.87E-03	8.14E+04	Food
Rb-86m				--	--	--	1.30E+06	--	1.30E+06	6.06E-04	2.15E+09	Direct
Rb-87				1.47E+04	--	5.35E+02	--	--	5.35E+02	6.11E+09	8.75E-08	Food
Rb-88				3.99E+05	--	9.58E+06	6.48E+04	--	6.48E+04	5.39E-04	1.20E+08	Direct
Rb-89				4.47E+05	--	2.15E+07	2.30E+04	--	2.30E+04	1.65E-04	1.39E+08	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Rb-90				--	--	--	1.36E+05	--	1.36E+05	1.71E-04	7.94E+08	Direct
Rb-90m				--	--	--	5.20E+04	--	5.20E+04	1.07E-04	4.86E+08	Direct
Re-177				5.08E+05	2.38E+195	4.76E+07	8.34E+04	--	8.34E+04	1.10E-03	7.59E+07	Direct
Re-178				4.65E+05	5.21E+206	4.44E+07	4.51E+04	--	4.51E+04	5.63E-04	8.00E+07	Direct
Re-179				5.32E+05	2.84E+142	4.70E+07	3.43E+04	--	3.43E+04	6.36E-04	5.39E+07	Direct
Re-180				--	--	--	2.52E+05	--	2.52E+05	5.86E-04	4.30E+08	Direct
Re-181				3.02E+04	5.44E+06	3.08E+04	1.39E+03	--	1.39E+03	1.60E-03	8.66E+05	Direct
Re-182l				6.57E+03	1.76E+04	3.24E+03	4.37E+02	--	4.37E+02	1.62E-03	2.69E+05	Direct
Re-182s				3.72E+04	2.41E+08	7.39E+04	1.10E+03	--	1.10E+03	8.14E-04	1.36E+06	Direct
Re-183				4.30E+03	2.31E+03	9.44E+02	4.63E+03	--	9.44E+02	9.26E-02	1.02E+04	Food
Re-184				6.20E+03	2.39E+03	1.01E+03	8.22E+02	--	8.22E+02	4.40E-02	1.87E+04	Direct
Re-184m				1.83E+03	1.38E+03	5.47E+02	1.87E+03	--	5.47E+02	1.27E-01	4.30E+03	Food
Re-186				9.31E+03	8.18E+03	2.28E+03	3.88E+04	--	2.28E+03	1.23E-02	1.86E+05	Food
Re-186m				1.02E+03	8.98E+02	3.48E+02	3.78E+04	--	3.48E+02	3.62E+04	9.61E-03	Food
Re-187				1.86E+06	3.87E+05	1.50E+05	--	--	1.50E+05	3.93E+12	3.82E-08	Food
Re-188				1.51E+04	4.71E+06	1.08E+04	1.98E+04	--	1.08E+04	1.10E-02	9.82E+05	Food
Re-188m				5.58E+05	5.23E+148	2.63E+07	4.86E+05	--	4.86E+05	9.03E-03	5.38E+07	Direct
Re-189				1.86E+04	9.90E+05	1.38E+04	1.45E+04	--	1.38E+04	2.02E-02	6.82E+05	Food
Re-190				--	--	--	1.75E+05	--	1.75E+05	5.47E-04	3.19E+08	Direct
Re-190m				--	--	--	4.10E+03	--	4.10E+03	7.95E-04	5.16E+06	Direct
Rh-100				1.77E+04	2.55E+06	1.84E+04	3.81E+02	--	3.81E+02	2.53E-04	1.51E+06	Direct
Rh-100m				--	--	--	2.47E+06	--	2.47E+06	6.04E-03	4.09E+08	Direct
Rh-101				2.23E+03	3.61E+03	1.47E+03	2.70E+03	--	1.47E+03	1.33E+00	1.11E+03	Food
Rh-101m				4.14E+04	4.46E+04	1.46E+04	2.56E+03	--	2.56E+03	8.59E-03	2.98E+05	Direct
Rh-102				6.98E+02	7.65E+02	3.12E+02	3.39E+02	--	3.12E+02	2.58E-01	1.21E+03	Food
Rh-102m				1.67E+03	1.71E+03	7.06E+02	1.50E+03	--	7.06E+02	1.14E-01	6.19E+03	Food
Rh-103m				4.47E+06	5.29E+54	7.21E+07	7.59E+06	--	4.47E+06	1.37E-01	3.26E+07	Inh.
Rh-104				--	--	--	8.28E+07	--	8.28E+07	3.22E-02	2.57E+09	Direct
Rh-104m				--	--	--	3.79E+06	--	3.79E+06	9.08E-03	4.17E+08	Direct
Rh-105				2.54E+04	3.97E+05	2.16E+04	1.17E+04	--	1.17E+04	1.39E-02	8.45E+05	Direct
Rh-106				--	--	--	7.10E+06	--	7.10E+06	1.99E-03	3.56E+09	Direct
Rh-106m				5.88E+04	6.65E+25	7.31E+05	1.88E+03	--	1.88E+03	1.40E-04	1.34E+07	Direct
Rh-107				3.99E+05	3.75E+128	2.95E+07	1.07E+05	--	1.07E+05	1.32E-03	8.10E+07	Direct
Rh-108				--	--	--	8.16E+06	--	8.16E+06	1.31E-03	6.22E+09	Direct
Rh-109				--	--	--	1.81E+06	--	1.81E+06	1.40E-03	1.29E+09	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Rh-94				--	--	--	1.64E+05	--	1.64E+05	9.62E-05	1.70E+09	Direct
Rh-95				--	--	--	5.64E+04	--	5.64E+04	1.43E-04	3.95E+08	Direct
Rh-95m				--	--	--	4.12E+05	--	4.12E+05	4.08E-04	1.01E+09	Direct
Rh-96				--	--	--	1.86E+04	--	1.86E+04	9.41E-05	1.98E+08	Direct
Rh-96m				--	--	--	3.74E+05	--	3.74E+05	2.88E-04	1.30E+09	Direct
Rh-97				2.66E+05	4.26E+92	1.02E+07	1.63E+04	--	1.63E+04	2.58E-04	6.32E+07	Direct
Rh-97m				2.23E+05	5.71E+63	6.93E+06	7.12E+03	--	7.12E+03	1.70E-04	4.20E+07	Direct
Rh-98				--	--	--	4.60E+04	--	4.60E+04	2.08E-04	2.21E+08	Direct
Rh-99				1.25E+04	6.08E+03	2.81E+03	1.22E+03	--	1.22E+03	1.48E-02	8.25E+04	Direct
Rh-99m				1.53E+05	1.97E+15	8.35E+05	3.86E+03	--	3.86E+03	5.73E-04	6.74E+06	Direct
Rn-207				--	--	--	7.95E+04	--	7.95E+04	8.10E-04	9.82E+07	Direct
Rn-209				--	--	--	2.13E+04	--	2.13E+04	6.74E-04	3.16E+07	Direct
Rn-210				--	--	--	8.26E+04	--	8.26E+04	1.33E-02	6.22E+06	Direct
Rn-211				--	--	--	6.50E+02	--	6.50E+02	6.38E-04	1.02E+06	Direct
Rn-212				--	--	--	9.19E+07	--	9.19E+07	2.48E+00	3.71E+07	Direct
Rn-215				--	--	--	--	--	--	--	2.28E+16	--
Rn-216				--	--	--	--	--	--	--	1.16E+15	--
Rn-217				--	--	--	--	--	--	--	9.63E+13	--
Rn-218				--	--	--	1.77E+12	--	1.77E+12	1.20E+00	1.48E+12	Direct
Rn-219				--	--	--	1.96E+08	--	1.96E+08	1.50E-02	1.30E+10	Direct
Rn-220				--	--	--	2.61E+09	--	2.61E+09	2.83E+00	9.22E+08	Direct
Rn-222	1.00E+01	6.50E-05	i	--	--	--	2.65E+06	--	2.65E+06	1.72E+01	1.54E+05	Direct
Rn-223				--	--	--	8.66E+04	--	8.66E+04	2.50E-03	3.47E+07	Direct
Ru-103				3.99E+03	--	1.44E+03	1.56E+03	--	1.44E+03	4.47E-02	3.23E+04	Food
Ru-105				4.47E+04	--	2.25E+05	3.55E+03	--	3.55E+03	5.28E-04	6.73E+06	Direct
Ru-106	1.15E+02	3.49E-02	ing	1.80E+02	--	1.19E+02	--	--	1.19E+02	3.54E-02	3.35E+03	Food
Ru-107				--	--	--	5.60E+05	--	5.60E+05	1.19E-03	4.69E+08	Direct
Ru-108				--	--	--	2.54E+06	--	2.54E+06	6.65E-03	3.83E+08	Direct
Ru-92				--	--	--	9.52E+04	--	9.52E+04	1.70E-04	5.60E+08	Direct
Ru-94				1.51E+05	--	3.17E+06	2.62E+04	--	2.62E+04	6.77E-04	3.87E+07	Direct
Ru-95				1.67E+05	--	2.49E+06	5.92E+03	--	5.92E+03	2.95E-04	2.01E+07	Direct
Ru-97				6.98E+04	--	2.96E+04	3.40E+03	--	3.40E+03	7.32E-03	4.65E+05	Direct
S-35	2.21E+01	5.18E-04	ing	1.72E+02	2.79E+03	2.26E+01	--	--	2.26E+01	5.30E-04	4.27E+04	Food
S-37				--	--	--	4.90E+04	--	4.90E+04	4.86E-05	1.01E+09	Direct
S-38				6.20E+02	4.32E+20	2.71E+03	2.52E+03	--	6.20E+02	2.13E-05	2.91E+07	Inh.

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Sb-111				--	--	--	3.90E+05	--	3.90E+05	2.88E-04	1.36E+09	Direct
Sb-113				--	--	--	8.57E+04	--	8.57E+04	3.43E-04	2.50E+08	Direct
Sb-114				--	--	--	7.72E+04	--	7.72E+04	1.63E-04	4.73E+08	Direct
Sb-115				4.86E+05	--	2.01E+07	2.51E+04	--	2.51E+04	4.87E-04	5.15E+07	Direct
Sb-116				4.86E+05	--	3.73E+07	2.13E+04	--	2.13E+04	2.07E-04	1.03E+08	Direct
Sb-116m				1.31E+05	--	3.80E+06	3.82E+03	--	3.82E+03	1.42E-04	2.69E+07	Direct
Sb-117				4.14E+05	--	5.10E+06	2.34E+04	--	2.34E+04	2.45E-03	9.57E+06	Direct
Sb-118				--	--	--	2.48E+05	--	2.48E+05	5.60E-04	4.43E+08	Direct
Sb-118m				4.86E+04	--	2.47E+05	9.69E+02	--	9.69E+02	1.82E-04	5.32E+06	Direct
Sb-119				1.89E+05	--	9.20E+04	3.88E+04	--	3.88E+04	5.61E-02	6.92E+05	Direct
Sb-120s				9.31E+05	--	6.89E+07	1.01E+05	--	1.01E+05	1.02E-03	9.87E+07	Direct
Sb-120l				8.59E+03	--	2.17E+03	3.12E+02	--	3.12E+02	1.65E-03	1.89E+05	Direct
Sb-122				9.31E+03	--	2.76E+03	1.87E+03	--	1.87E+03	4.70E-03	3.97E+05	Direct
Sb-122m				--	--	--	2.44E+06	--	2.44E+06	6.64E-03	3.68E+08	Direct
Sb-124	3.77E+02	2.16E-02	ing	1.83E+03	--	3.84E+02	4.02E+02	--	3.84E+02	2.20E-02	1.75E+04	Food
Sb-124ms				--	--	--	1.33E+06	--	1.33E+06	1.36E-03	9.79E+08	Direct
Sb-124ml				1.35E+06	--	9.48E+07	1.79E+08	--	1.35E+06	1.79E-02	7.51E+07	Inh.
Sb-125				2.48E+03	--	7.36E+02	1.69E+03	--	7.36E+02	7.12E-01	1.03E+03	Food
Sb-126	2.64E+02	3.15E-03	de	3.49E+03	--	6.75E+02	2.63E+02	--	2.63E+02	3.15E-03	8.36E+04	Direct
Sb-126m				3.38E+05	--	2.24E+07	2.46E+04	--	2.46E+04	3.13E-04	7.86E+07	Direct
Sb-127				6.57E+03	--	2.07E+03	1.15E+03	--	1.15E+03	4.31E-03	2.67E+05	Direct
Sb-128l				1.67E+04	--	3.83E+04	5.15E+02	--	5.15E+02	1.89E-04	2.72E+06	Direct
Sb-128s				4.30E+05	--	4.46E+07	3.51E+04	--	3.51E+04	2.48E-04	1.41E+08	Direct
Sb-129				3.19E+04	--	1.42E+05	1.99E+03	--	1.99E+03	3.53E-04	5.63E+06	Direct
Sb-130				1.23E+05	--	4.21E+06	5.55E+03	--	5.55E+03	1.53E-04	3.62E+07	Direct
Sb-130m				--	--	--	4.25E+04	--	4.25E+04	1.85E-04	2.30E+08	Direct
Sb-131				1.35E+05	--	6.66E+06	1.69E+04	--	1.69E+04	2.71E-04	6.24E+07	Direct
Sb-133				--	--	--	1.06E+05	--	1.06E+05	1.87E-04	5.66E+08	Direct
Sc-42m				--	--	--	1.67E+05	--	1.67E+05	3.85E-05	4.34E+09	Direct
Sc-43				6.20E+04	7.13E+16	3.51E+05	2.87E+03	--	2.87E+03	1.53E-04	1.87E+07	Direct
Sc-44				3.72E+04	3.02E+16	1.89E+05	1.46E+03	--	1.46E+03	8.04E-05	1.82E+07	Direct
Sc-44m				5.58E+03	1.27E+04	2.14E+03	2.98E+03	--	2.14E+03	1.76E-03	1.22E+06	Food
Sc-46	3.63E+02	1.07E-02	de	1.75E+03	1.44E+03	6.14E+02	3.63E+02	--	3.63E+02	1.07E-02	3.39E+04	Direct
Sc-47				1.53E+04	2.82E+04	7.33E+03	7.42E+03	--	7.33E+03	8.83E-03	8.30E+05	Food
Sc-48				6.98E+03	4.13E+04	3.91E+03	2.61E+02	--	2.61E+02	1.74E-04	1.50E+06	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Sc-49				1.83E+05	2.17E+52	3.28E+06	1.26E+07	--	1.83E+05	2.74E-03	6.69E+07	Inh.
Sc-50				--	--	--	1.32E+05	--	1.32E+05	6.01E-05	2.20E+09	Direct
Se-70				9.31E+04	--	2.69E+06	1.77E+04	--	1.77E+04	2.70E-04	6.56E+07	Direct
Se-71				--	--	--	9.52E+04	--	9.52E+04	1.70E-04	5.59E+08	Direct
Se-72				2.86E+03	--	4.00E+02	2.20E+04	--	4.00E+02	1.85E-03	2.16E+05	Food
Se-73				4.65E+04	--	9.40E+04	1.72E+03	--	1.72E+03	2.86E-04	6.01E+06	Direct
Se-73m				4.14E+05	--	9.65E+06	7.62E+04	--	7.62E+04	1.15E-03	6.61E+07	Direct
Se-75	3.33E+02	2.29E-02	ing	6.57E+03	--	3.41E+02	1.85E+03	--	3.41E+02	2.34E-02	1.45E+04	Food
Se-77m				--	--	--	2.85E+07	--	2.85E+07	3.39E-03	8.40E+09	Direct
Se-79				3.60E+03	--	2.78E+02	--	--	2.78E+02	3.98E+03	6.97E-02	Food
Se-79m				--	--	--	1.34E+07	--	1.34E+07	2.21E-02	6.08E+08	Direct
Se-81				4.65E+05	--	3.09E+07	4.26E+06	--	4.65E+05	3.70E-03	1.26E+08	Inh.
Se-81m				1.64E+05	--	4.57E+06	6.99E+05	--	1.64E+05	4.05E-03	4.06E+07	Inh.
Se-83				2.11E+05	--	1.34E+07	1.33E+04	--	1.33E+04	1.32E-04	1.01E+08	Direct
Se-83m				--	--	--	6.30E+05	--	6.30E+05	3.24E-04	1.94E+09	Direct
Se-84				--	--	--	5.56E+05	--	5.56E+05	7.70E-04	7.23E+08	Direct
Si-31				1.02E+05	3.52E+22	6.10E+05	5.77E+06	--	1.02E+05	2.63E-03	3.86E+07	Inh.
Si-32				1.02E+02	3.53E+03	1.42E+03	--	--	1.02E+02	4.09E+00	2.48E+01	Inh.
Sm-139				--	--	--	1.94E+05	--	1.94E+05	3.68E-04	5.27E+08	Direct
Sm-140				2.15E+05	--	1.06E+07	8.61E+04	--	8.61E+04	9.50E-04	9.07E+07	Direct
Sm-141				4.14E+05	--	3.88E+07	5.06E+04	--	5.06E+04	3.87E-04	1.31E+08	Direct
Sm-141m				1.99E+05	--	1.05E+07	1.62E+04	--	1.62E+04	2.74E-04	5.90E+07	Direct
Sm-142				1.02E+05	--	1.12E+06	1.06E+05	--	1.02E+05	5.56E-03	1.83E+07	Inh.
Sm-143				--	--	--	1.57E+05	--	1.57E+05	1.04E-03	1.50E+08	Direct
Sm-143m				--	--	--	9.62E+05	--	9.62E+05	8.05E-04	1.20E+09	Direct
Sm-145				7.45E+03	--	3.97E+03	1.11E+04	--	3.97E+03	1.50E+00	2.65E+03	Food
Sm-146				1.13E+00	--	1.49E+01	--	--	1.13E+00	4.74E+04	2.38E-05	Inh.
Sm-147				1.25E+00	--	1.64E+01	--	--	1.25E+00	5.47E+07	2.30E-08	Inh.
Sm-148				1.45E+00	--	1.87E+01	--	--	1.45E+00	4.20E+12	3.45E-13	Inh.
Sm-151	3.04E+03	1.16E+02	i	3.02E+03	--	8.22E+03	--	--	3.02E+03	1.15E+02	2.63E+01	Inh.
Sm-153				1.64E+04	--	8.46E+03	1.39E+04	--	8.46E+03	1.93E-02	4.39E+05	Food
Sm-155				3.99E+05	--	2.41E+07	3.18E+05	--	3.18E+05	5.79E-03	5.49E+07	Direct
Sm-156				3.99E+04	--	1.12E+05	1.28E+04	--	1.28E+04	6.00E-03	2.14E+06	Direct
Sm-157				--	--	--	2.18E+05	--	2.18E+05	1.46E-03	1.49E+08	Direct
Sn-106				--	--	--	3.12E+05	--	3.12E+05	3.38E-04	9.25E+08	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Sn-108				5.58E+05	--	6.50E+07	1.03E+05	--	1.03E+05	6.07E-04	1.69E+08	Direct
Sn-109				5.08E+05	--	4.51E+07	1.82E+04	--	1.82E+04	1.90E-04	9.59E+07	Direct
Sn-110				4.30E+04	--	1.86E+05	1.02E+04	--	1.02E+04	1.43E-03	7.13E+06	Direct
Sn-111				5.08E+05	--	1.90E+07	4.03E+04	--	4.03E+04	8.39E-04	4.80E+07	Direct
Sn-113	1.19E+03	1.19E-01	ing	4.47E+03	--	1.22E+03	3.19E+04	--	1.22E+03	1.21E-01	1.00E+04	Food
Sn-113m				2.11E+06	--	2.18E+08	2.48E+06	--	2.11E+06	2.71E-02	7.78E+07	Inh.
Sn-117m				4.86E+03	--	2.19E+03	4.72E+03	--	2.19E+03	2.67E-02	8.21E+04	Food
Sn-119m				5.58E+03	--	2.46E+03	6.38E+04	--	2.46E+03	6.57E-01	3.75E+03	Food
Sn-121				3.99E+04	--	4.46E+04	--	--	3.99E+04	4.16E-02	9.58E+05	Inh.
Sn-121m				2.66E+03	--	2.12E+03	1.48E+05	--	2.12E+03	3.94E+01	5.38E+01	Food
Sn-123	4.10E+02	4.98E-02	ing	1.45E+03	--	4.19E+02	1.07E+05	--	4.19E+02	5.09E-02	8.22E+03	Food
Sn-123m				2.54E+05	--	1.01E+07	1.30E+05	--	1.30E+05	3.40E-03	3.82E+07	Direct
Sn-125				3.72E+03	--	6.05E+02	2.41E+03	--	6.05E+02	5.58E-03	1.08E+05	Food
Sn-125m				--	--	--	2.20E+05	--	2.20E+05	1.39E-03	1.58E+08	Direct
Sn-126	1.67E+02	5.89E+03	ing	4.14E+02	--	1.71E+02	1.28E+04	--	1.71E+02	6.03E+03	2.84E-02	Food
Sn-127				5.58E+04	--	6.15E+05	3.01E+03	--	3.01E+03	2.56E-04	1.18E+07	Direct
Sn-127m				--	--	--	3.09E+05	--	3.09E+05	8.60E-04	3.59E+08	Direct
Sn-128				7.45E+04	--	1.74E+06	1.84E+04	--	1.84E+04	7.40E-04	2.49E+07	Direct
Sn-129				--	--	--	3.22E+05	--	3.22E+05	4.93E-04	6.54E+08	Direct
Sn-130				--	--	--	2.08E+05	--	2.08E+05	5.34E-04	3.89E+08	Direct
Sn-130m				--	--	--	4.81E+05	--	4.81E+05	5.65E-04	8.51E+08	Direct
Sr-79				--	--	--	2.73E+05	--	2.73E+05	2.58E-04	1.06E+09	Direct
Sr-80				5.32E+04	--	4.07E+05	9.06E+05	--	5.32E+04	2.26E-03	2.35E+07	Inh.
Sr-81				1.83E+05	--	7.14E+06	2.05E+04	--	2.05E+04	2.25E-04	9.11E+07	Direct
Sr-82				1.12E+03	--	1.82E+02	9.44E+04	--	1.82E+02	2.85E-03	6.38E+04	Food
Sr-83				2.28E+04	--	1.38E+04	1.16E+03	--	1.16E+03	9.93E-04	1.17E+06	Direct
Sr-85				1.45E+04	--	1.57E+03	1.43E+03	--	1.43E+03	6.01E-02	2.37E+04	Direct
Sr-85m				1.51E+06	--	3.36E+07	4.75E+04	--	4.75E+04	1.49E-03	3.19E+07	Direct
Sr-87m				3.19E+05	--	2.57E+06	1.35E+04	--	1.35E+04	1.05E-03	1.29E+07	Direct
Sr-89	3.48E+02	1.20E-02	ing	1.49E+03	--	3.53E+02	--	--	3.53E+02	1.22E-02	2.91E+04	Food
Sr-90	2.59E+01	1.87E-01	ing	7.45E+01	--	2.65E+01	--	--	2.65E+01	1.94E-01	1.37E+02	Food
Sr-91				1.96E+04	--	3.36E+04	2.21E+03	--	2.21E+03	6.08E-04	3.63E+06	Direct
Sr-92				3.28E+04	--	1.79E+05	3.34E+03	--	3.34E+03	2.65E-04	1.26E+07	Direct
Sr-93				--	--	--	4.31E+04	--	4.31E+04	1.58E-04	2.73E+08	Direct
Sr-94				--	--	--	4.05E+05	--	4.05E+05	2.54E-04	1.60E+09	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Ta-170				--	--	--	1.01E+05	--	1.01E+05	6.18E-04	1.64E+08	Direct
Ta-172				1.96E+06	2.16E+78	7.92E+07	1.27E+04	--	1.27E+04	4.28E-04	2.97E+07	Direct
Ta-173				6.98E+05	4.20E+17	3.74E+06	5.72E+03	--	5.72E+03	1.15E-03	4.96E+06	Direct
Ta-174				1.69E+06	1.31E+43	3.77E+07	1.60E+04	--	1.60E+04	1.07E-03	1.50E+07	Direct
Ta-175				5.58E+05	1.98E+09	1.20E+06	1.55E+03	--	1.55E+03	9.09E-04	1.71E+06	Direct
Ta-176				3.38E+05	3.09E+10	1.05E+06	7.99E+02	--	7.99E+02	3.62E-04	2.20E+06	Direct
Ta-177				8.59E+05	3.04E+05	4.82E+05	1.25E+04	--	1.25E+04	3.99E-02	3.13E+05	Direct
Ta-178s				--	--	--	7.17E+05	--	7.17E+05	6.31E-03	1.13E+08	Direct
Ta-178l				1.02E+06	1.36E+26	1.51E+07	5.37E+03	--	5.37E+03	6.70E-04	8.00E+06	Direct
Ta-179				2.15E+05	3.07E+04	1.26E+05	2.24E+04	--	2.24E+04	2.04E+01	1.10E+03	Direct
Ta-180				4.65E+03	2.35E+03	9.59E+03	1.30E+03	--	1.30E+03	6.53E+12	1.99E-10	Direct
Ta-180m				1.80E+06	1.72E+11	6.01E+06	3.53E+04	--	3.53E+04	1.64E-02	2.15E+06	Direct
Ta-182				1.15E+04	1.40E+03	5.93E+03	5.63E+02	--	5.63E+02	9.02E-02	6.24E+03	Direct
Ta-182m				3.10E+06	6.19E+173	8.11E+08	1.82E+05	--	1.82E+05	2.79E-03	6.52E+07	Direct
Ta-183				5.58E+04	6.00E+03	2.20E+04	2.65E+03	--	2.65E+03	1.89E-02	1.40E+05	Direct
Ta-184				1.77E+05	5.38E+09	4.45E+05	1.01E+03	--	1.01E+03	5.16E-04	1.96E+06	Direct
Ta-185				1.55E+06	2.14E+60	4.64E+07	7.67E+04	--	7.67E+04	3.70E-03	2.07E+07	Direct
Ta-186				3.60E+06	7.30E+257	4.45E+08	4.42E+04	--	4.42E+04	4.59E-04	9.63E+07	Direct
Tb-146				--	--	--	5.21E+05	--	5.21E+05	1.55E-04	3.36E+09	Direct
Tb-147				9.31E+04	--	9.78E+05	4.60E+03	--	4.60E+03	3.56E-04	1.29E+07	Direct
Tb-147m				--	--	--	2.03E+05	--	2.03E+05	2.96E-04	6.84E+08	Direct
Tb-148				1.12E+05	--	1.98E+06	5.12E+03	--	5.12E+03	2.42E-04	2.12E+07	Direct
Tb-148m				--	--	--	1.05E+05	--	1.05E+05	1.82E-04	5.78E+08	Direct
Tb-149				2.60E+03	--	2.51E+05	1.84E+03	--	1.84E+03	3.62E-04	5.07E+06	Direct
Tb-149m				--	--	--	1.27E+05	--	1.27E+05	4.17E-04	3.03E+08	Direct
Tb-150				6.20E+04	--	3.17E+05	2.21E+03	--	2.21E+03	3.46E-04	6.39E+06	Direct
Tb-150m				--	--	--	4.96E+04	--	4.96E+04	2.29E-04	2.16E+08	Direct
Tb-151				3.38E+04	--	4.52E+04	1.26E+03	--	1.26E+03	1.07E-03	1.18E+06	Direct
Tb-151m				--	--	--	2.15E+07	--	2.15E+07	7.20E-03	2.99E+09	Direct
Tb-152				2.23E+04	--	2.17E+04	7.53E+02	--	7.53E+02	6.39E-04	1.18E+06	Direct
Tb-152m				--	--	--	2.26E+05	--	2.26E+05	7.68E-04	2.95E+08	Direct
Tb-153				4.65E+04	--	2.14E+04	3.66E+03	--	3.66E+03	1.00E-02	3.65E+05	Direct
Tb-154				1.86E+04	--	1.96E+04	4.44E+02	--	4.44E+02	4.67E-04	9.51E+05	Direct
Tb-155				4.47E+04	--	1.32E+04	5.54E+03	--	5.54E+03	3.50E-02	1.58E+05	Direct
Tb-156				7.98E+03	--	2.31E+03	4.24E+02	--	4.24E+02	2.70E-03	1.57E+05	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Tb-156ml				4.86E+04	--	6.64E+04	3.96E+04	--	3.96E+04	4.80E-02	8.24E+05	Direct
Tb-156ms				8.59E+04	--	6.44E+05	5.69E+05	--	8.59E+04	2.14E-02	4.02E+06	Inh.
Tb-157				1.02E+04	--	2.37E+04	2.20E+05	--	1.02E+04	6.69E+02	1.52E+01	Inh.
Tb-158				2.60E+02	--	7.33E+02	9.10E+02	--	2.60E+02	1.72E+01	1.51E+01	Inh.
Tb-160	5.76E+02	5.10E-02	ing	1.69E+03	--	5.87E+02	6.49E+02	--	5.87E+02	5.20E-02	1.13E+04	Food
Tb-161				9.31E+03	--	3.21E+03	2.17E+04	--	3.21E+03	2.74E-02	1.17E+05	Food
Tb-162				--	--	--	8.62E+04	--	8.62E+04	5.64E-04	1.53E+08	Direct
Tb-163				3.85E+05	--	3.60E+07	4.71E+04	--	4.71E+04	7.96E-04	5.92E+07	Direct
Tb-164				--	--	--	9.88E+04	--	9.88E+04	2.58E-04	3.82E+08	Direct
Tb-165				--	--	--	4.11E+05	--	4.11E+05	7.60E-04	5.40E+08	Direct
Tc-101				5.32E+05	6.18E+192	4.29E+07	1.53E+05	--	1.53E+05	1.16E-03	1.31E+08	Direct
Tc-102				--	--	--	1.02E+08	--	1.02E+08	4.86E-03	2.10E+10	Direct
Tc-102m				--	--	--	6.73E+04	--	6.73E+04	1.59E-04	4.24E+08	Direct
Tc-104				2.33E+05	2.51E+151	7.85E+06	2.01E+04	--	2.01E+04	2.02E-04	9.94E+07	Direct
Tc-105				--	--	--	1.19E+05	--	1.19E+05	5.07E-04	2.36E+08	Direct
Tc-91				--	--	--	9.29E+04	--	9.29E+04	1.41E-04	6.59E+08	Direct
Tc-91m				--	--	--	1.54E+05	--	1.54E+05	2.46E-04	6.27E+08	Direct
Tc-92				--	--	--	4.45E+04	--	4.45E+04	9.25E-05	4.81E+08	Direct
Tc-93				1.72E+05	1.82E+22	1.44E+06	3.02E+03	--	3.02E+03	2.46E-04	1.23E+07	Direct
Tc-93m				3.60E+05	4.10E+67	1.11E+07	2.30E+04	--	2.30E+04	4.94E-04	4.65E+07	Direct
Tc-94				5.08E+04	3.10E+14	2.23E+05	9.58E+02	--	9.58E+02	1.40E-04	6.83E+06	Direct
Tc-94m				1.40E+05	1.01E+57	2.03E+06	7.50E+03	--	7.50E+03	1.95E-04	3.85E+07	Direct
Tc-95				6.20E+04	1.43E+07	6.38E+04	1.34E+03	--	1.34E+03	8.13E-04	1.65E+06	Direct
Tc-95m				1.28E+04	3.59E+03	1.17E+03	1.08E+03	--	1.08E+03	4.80E-02	2.26E+04	Direct
Tc-96				1.12E+04	9.10E+03	2.23E+03	3.14E+02	--	3.14E+02	9.87E-04	3.18E+05	Direct
Tc-96m				1.02E+06	2.66E+58	1.73E+07	2.73E+05	--	2.73E+05	7.18E-03	3.81E+07	Direct
Tc-97				5.32E+04	2.38E+04	7.29E+03	6.42E+04	--	7.29E+03	5.14E+06	1.42E-03	Food
Tc-97m				3.60E+03	3.26E+03	1.04E+03	7.67E+04	--	1.04E+03	6.73E-02	1.55E+04	Food
Tc-98				1.38E+03	8.59E+02	2.63E+02	5.14E+02	--	2.63E+02	3.02E+05	8.69E-04	Food
Tc-99	7.61E+02	4.48E+04	ing	2.86E+03	2.53E+03	7.75E+02	--	--	7.75E+02	4.57E+04	1.70E-02	Food
Tc-99m				3.85E+05	4.18E+13	1.48E+06	1.70E+04	--	1.70E+04	3.22E-03	5.26E+06	Direct
Te-113				--	--	--	1.92E+05	--	1.92E+05	1.96E-04	9.80E+08	Direct
Te-114				--	--	--	3.72E+04	--	3.72E+04	3.43E-04	1.09E+08	Direct
Te-115				--	--	--	5.56E+04	--	5.56E+04	1.97E-04	2.82E+08	Direct
Te-115m				--	--	--	4.15E+04	--	4.15E+04	1.70E-04	2.44E+08	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Te-116				6.57E+04	--	6.11E+05	6.65E+04	--	6.57E+04	6.05E-03	1.09E+07	Inh.
Te-117				2.03E+05	--	4.61E+06	7.54E+03	--	7.54E+03	2.91E-04	2.59E+07	Direct
Te-118				4.86E+03	--	8.49E+02	3.86E+04	--	8.49E+02	4.60E-03	1.85E+05	Food
Te-119				6.20E+04	--	9.31E+04	1.52E+03	--	1.52E+03	9.25E-04	1.64E+06	Direct
Te-119m				1.53E+04	--	4.16E+03	5.18E+02	--	5.18E+02	2.22E-03	2.34E+05	Direct
Te-121				2.19E+04	--	3.25E+03	1.28E+03	--	1.28E+03	2.02E-02	6.35E+04	Direct
Te-121m				2.03E+03	--	3.77E+02	3.36E+03	--	3.77E+02	5.38E-02	7.01E+03	Food
Te-123				9.31E+02	--	1.83E+02	3.68E+04	--	1.83E+02	6.29E+11	2.91E-10	Food
Te-123m				2.86E+03	--	6.32E+02	4.92E+03	--	6.32E+02	7.13E-02	8.88E+03	Food
Te-125m				3.38E+03	--	1.12E+03	2.06E+04	--	1.12E+03	6.20E-02	1.80E+04	Food
Te-127				6.20E+04	--	1.66E+05	3.24E+05	--	6.20E+04	2.35E-02	2.64E+06	Inh.
Te-127m	3.80E+02	4.03E-02	ing	1.55E+03	--	3.88E+02	6.50E+04	--	3.88E+02	4.11E-02	9.44E+03	Food
Te-129				1.96E+05	--	3.52E+06	1.75E+05	--	1.75E+05	8.36E-03	2.10E+07	Direct
Te-129m	3.61E+02	1.20E-02	ing	1.77E+03	--	3.66E+02	1.95E+04	--	3.66E+02	1.21E-02	3.01E+04	Food
Te-131				1.64E+05	--	7.09E+06	6.89E+04	--	6.89E+04	1.20E-03	5.75E+07	Direct
Te-131m				4.65E+03	--	4.91E+03	6.64E+02	--	6.64E+02	8.32E-04	7.98E+05	Direct
Te-132				2.19E+03	--	1.09E+03	3.45E+03	--	1.09E+03	3.60E-03	3.04E+05	Food
Te-133				1.99E+05	--	1.72E+07	6.27E+04	--	6.27E+04	5.51E-04	1.14E+08	Direct
Te-133m				5.08E+04	--	9.96E+05	5.66E+03	--	5.66E+03	2.21E-04	2.55E+07	Direct
Te-134				1.02E+05	--	3.36E+06	1.96E+04	--	1.96E+04	5.83E-04	3.36E+07	Direct
Th-223				--	--	--	9.61E+08	--	9.61E+08	1.14E-02	8.43E+10	Direct
Th-224				--	--	--	1.79E+09	--	1.79E+09	3.72E-02	4.80E+10	Direct
Th-226				1.43E+03	--	1.39E+07	2.70E+06	--	1.43E+03	5.32E-05	2.69E+07	Inh.
Th-227				1.16E+01	--	1.51E+03	6.72E+03	--	1.16E+01	3.79E-04	3.07E+04	Inh.
Th-228	2.89E+00	3.52E-03	i	3.02E+00	--	1.14E+02	2.27E+05	--	3.02E+00	3.68E-03	8.19E+02	Inh.
Th-229				1.13E+00	--	1.68E+01	7.58E+03	--	1.13E+00	5.30E+00	2.13E-01	Inh.
Th-230	2.82E+00	1.36E+02	i	2.79E+00	--	3.84E+01	4.84E+05	--	2.79E+00	1.38E+02	2.02E-02	Inh.
Th-231				2.79E+05	--	3.19E+05	3.86E+04	--	3.86E+04	7.26E-02	5.31E+05	Direct
Th-232	2.68E+00	2.44E+07	i	2.66E+00	--	3.66E+01	5.58E+05	--	2.66E+00	2.42E+07	1.10E-07	Inh.
Th-233				3.85E+06	--	3.15E+08	8.67E+05	--	8.67E+05	2.40E-02	3.62E+07	Direct
Th-234				1.53E+04	--	3.59E+03	7.92E+04	--	3.59E+03	1.55E-01	2.31E+04	Food
Th-235				--	--	--	1.90E+06	--	1.90E+06	1.69E-02	1.13E+08	Direct
Th-236				--	--	--	5.58E+05	--	5.58E+05	2.63E-02	2.12E+07	Direct
Ti-44	9.38E+01	5.46E-01	i	9.31E+01	3.41E+02	1.39E+02	5.39E+03	--	9.31E+01	5.41E-01	1.72E+02	Inh.
Ti-45				7.45E+04	1.05E+20	5.61E+05	4.53E+03	--	4.53E+03	2.00E-04	2.26E+07	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Ti-51				--	--	--	3.41E+05	--	3.41E+05	5.32E-04	6.41E+08	Direct
Ti-52				--	--	--	3.32E+06	--	3.32E+06	1.56E-03	2.13E+09	Direct
Tl-190				--	--	--	2.16E+05	--	2.16E+05	5.67E-04	3.81E+08	Direct
Tl-190m				--	--	--	7.98E+04	--	7.98E+04	2.98E-04	2.67E+08	Direct
Tl-194				1.25E+06	--	5.78E+07	2.82E+04	--	2.82E+04	9.59E-04	2.94E+07	Direct
Tl-194m				3.10E+05	--	1.18E+07	9.53E+03	--	9.53E+03	3.22E-04	2.96E+07	Direct
Tl-195				3.72E+05	--	8.23E+06	8.19E+03	--	8.19E+03	5.91E-04	1.39E+07	Direct
Tl-196				1.96E+05	--	2.60E+06	3.50E+03	--	3.50E+03	4.03E-04	8.69E+06	Direct
Tl-197				4.14E+05	--	3.97E+06	1.04E+04	--	1.04E+04	1.86E-03	5.60E+06	Direct
Tl-198				9.31E+04	--	6.74E+05	1.19E+03	--	1.19E+03	3.98E-04	2.99E+06	Direct
Tl-198m				1.53E+05	--	2.56E+06	5.40E+03	--	5.40E+03	6.38E-04	8.46E+06	Direct
Tl-199				3.02E+05	--	1.36E+06	7.31E+03	--	7.31E+03	3.45E-03	2.12E+06	Direct
Tl-200				4.47E+04	--	5.30E+04	7.49E+02	--	7.49E+02	1.25E-03	6.00E+05	Direct
Tl-201				1.47E+05	--	4.51E+04	8.69E+03	--	8.69E+03	4.07E-02	2.13E+05	Direct
Tl-202				3.60E+04	--	3.65E+03	1.60E+03	--	1.60E+03	3.02E-02	5.29E+04	Direct
Tl-204				1.80E+04	--	6.25E+02	6.60E+05	--	6.25E+02	1.35E+00	4.64E+02	Food
Tl-206				--	--	--	1.73E+09	--	1.73E+09	7.94E+00	2.17E+08	Direct
Tl-206m				--	--	--	8.01E+04	--	8.01E+04	3.28E-04	2.44E+08	Direct
Tl-207				--	--	--	6.90E+07	--	6.90E+07	3.63E-01	1.90E+08	Direct
Tl-208				--	--	--	6.99E+04	--	6.99E+04	2.38E-04	2.94E+08	Direct
Tl-209				--	--	--	1.62E+05	--	1.62E+05	3.96E-04	4.09E+08	Direct
Tl-210				--	--	--	2.04E+05	--	2.04E+05	2.96E-04	6.89E+08	Direct
Tm-159				--	--	--	--	--	--	--	1.30E+08	--
Tm-161				--	--	--	1.85E+04	--	1.85E+04	4.77E-04	3.87E+07	Direct
Tm-162				4.14E+05	3.11E+128	2.45E+07	1.88E+04	--	1.88E+04	3.50E-04	5.35E+07	Direct
Tm-163				1.77E+05	4.48E+30	2.55E+06	5.06E+03	--	5.06E+03	4.76E-04	1.06E+07	Direct
Tm-164				--	--	--	4.67E+05	--	4.67E+05	8.14E-04	5.73E+08	Direct
Tm-165				3.60E+04	7.87E+05	2.59E+04	1.68E+03	--	1.68E+03	2.66E-03	6.32E+05	Direct
Tm-166				3.99E+04	6.65E+10	1.22E+05	9.48E+02	--	9.48E+02	3.86E-04	2.45E+06	Direct
Tm-167				1.02E+04	7.64E+03	3.44E+03	5.18E+03	--	3.44E+03	4.06E-02	8.47E+04	Food
Tm-168				2.60E+03	2.14E+03	9.09E+02	5.86E+02	--	5.86E+02	7.02E-02	8.35E+03	Direct
Tm-170	6.63E+02	1.11E-01	ing	1.69E+03	1.61E+03	6.77E+02	1.35E+05	--	6.77E+02	1.13E-01	5.97E+03	Food
Tm-171				8.59E+03	1.81E+04	7.45E+03	1.21E+06	--	7.45E+03	6.84E+00	1.09E+03	Food
Tm-172				7.98E+03	1.47E+04	2.83E+03	1.73E+03	--	1.73E+03	6.03E-03	2.87E+05	Direct
Tm-173				4.30E+04	2.38E+10	1.03E+05	4.35E+03	--	4.35E+03	1.98E-03	2.20E+06	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	**Act (Ci)**	**Mass (g)**	**Limiting Pathway**	**TQ_{inhale} (Ci)**	**TQ_{water} (Ci)**	**TQ_{food} (Ci)**	**TQ_{direct} (Ci)**	**TQ_{sub} (Ci)**	**Act (Ci)**	**Mass (g)**	**Sp. Act. (Ci/g)**	**Limiting Pathway**
Tm-174				--	--	--	7.54E+04	--	7.54E+04	3.77E-04	2.00E+08	Direct
Tm-175				3.60E+05	2.75E+180	3.76E+07	4.53E+04	--	4.53E+04	6.40E-04	7.07E+07	Direct
Tm-176				--	--	--	1.99E+05	--	1.99E+05	3.44E-04	5.78E+08	Direct
U-227				--	--	--	5.50E+06	--	5.50E+06	7.30E-03	7.53E+08	Direct
U-228				--	--	--	1.43E+07	--	1.43E+07	1.57E-01	9.06E+07	Direct
U-230				7.45E+00	--	2.34E+02	2.55E+05	--	7.45E+00	2.73E-04	2.73E+04	Inh.
U-231				2.28E+05	--	1.18E+05	9.60E+03	--	9.60E+03	7.14E-02	1.35E+05	Direct
U-232	3.21E+00	1.49E-01	i	3.19E+00	--	2.44E+01	3.46E+05	--	3.19E+00	1.49E-01	2.14E+01	Inh.
U-233	1.29E+01	1.34E+03	i	1.28E+01	--	1.61E+02	5.58E+05	--	1.28E+01	1.33E+03	9.68E-03	Inh.
U-234	1.32E+01	2.13E+03	i	1.31E+01	--	1.64E+02	4.27E+05	--	1.31E+01	2.10E+03	6.25E-03	Inh.
U-235	1.46E+01	6.76E+06	i	1.45E+01	--	1.75E+02	4.66E+03	--	1.45E+01	6.71E+06	2.16E-06	Inh.
U-235m				--	--	--	--	--	--	--	3.08E+07	--
U-236	1.43E+01	2.20E+05	i	1.41E+01	--	1.75E+02	4.84E+05	--	1.41E+01	2.19E+05	6.47E-05	Inh.
U-237				6.20E+04	--	3.05E+04	5.35E+03	--	5.35E+03	6.55E-02	8.16E+04	Direct
U-238	1.54E+01	4.59E+07	i	1.53E+01	--	1.83E+02	5.58E+05	--	1.53E+01	4.55E+07	3.36E-07	Inh.
U-239				3.19E+06	--	2.34E+08	5.85E+05	--	5.85E+05	1.75E-02	3.34E+07	Direct
U-240				1.33E+05	--	1.73E+05	1.63E+05	--	1.33E+05	1.44E-01	9.26E+05	Inh.
U-242				--	--	--	1.04E+06	--	1.04E+06	2.26E-02	4.62E+07	Direct
V-47				2.23E+05	3.22E+87	7.52E+06	2.23E+04	--	2.23E+04	1.82E-04	1.23E+08	Direct
V-48	2.54E+02	1.49E-03	de	4.14E+03	1.54E+03	7.15E+02	2.54E+02	--	2.54E+02	1.52E-03	1.68E+05	Direct
V-49				3.49E+05	1.12E+05	4.64E+04	8.07E+05	--	4.64E+04	5.74E+00	8.08E+03	Food
V-50				1.13E+02	4.70E+02	1.92E+02	5.10E+02	--	1.13E+02	2.36E+15	4.77E-14	Inh.
V-52				--	--	--	1.34E+05	--	1.34E+05	1.39E-04	9.67E+08	Direct
V-53				--	--	--	4.34E+05	--	4.34E+05	1.97E-04	2.21E+09	Direct
W-176				1.47E+05	1.26E+25	1.02E+06	2.96E+04	--	2.96E+04	3.83E-03	7.74E+06	Direct
W-177				2.43E+05	6.16E+25	1.88E+06	5.95E+03	--	5.95E+03	7.56E-04	7.87E+06	Direct
W-178				9.31E+04	1.10E+04	5.06E+03	5.12E+04	--	5.06E+03	1.50E-01	3.38E+04	Food
W-179				6.20E+06	1.58E+78	1.25E+08	3.23E+05	--	3.23E+05	1.15E-02	2.80E+07	Direct
W-179m				--	--	--	2.02E+06	--	2.02E+06	1.23E-02	1.64E+08	Direct
W-181				2.60E+05	2.56E+04	1.08E+04	1.80E+04	--	1.08E+04	1.81E+00	5.95E+03	Food
W-185				5.08E+04	4.35E+03	1.87E+03	--	--	1.87E+03	1.99E-01	9.40E+03	Food
W-185m				--	--	--	1.58E+07	--	1.58E+07	2.48E-02	6.37E+08	Direct
W-187				3.38E+04	1.19E+06	1.62E+04	2.10E+03	--	2.10E+03	2.99E-03	7.01E+05	Direct
W-188				1.33E+04	9.54E+02	4.10E+02	3.84E+05	--	4.10E+02	4.10E-02	1.00E+04	Food
W-190				1.69E+05	2.49E+94	6.04E+06	1.60E+05	--	1.60E+05	4.84E-03	3.30E+07	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Xe-120				--	--	--	--	2.14E+03	2.14E+03	5.47E-05	3.92E+07	Sub
Xe-121				--	--	--	--	4.29E+02	4.29E+02	1.11E-05	3.88E+07	Sub
Xe-122				--	--	--	--	1.69E+04	1.69E+04	1.32E-02	1.28E+06	Sub
Xe-123				--	--	--	--	1.34E+03	1.34E+03	1.09E-04	1.23E+07	Sub
Xe-125				--	--	--	--	3.46E+03	3.46E+03	2.34E-03	1.48E+06	Sub
Xe-127				--	--	--	--	3.32E+03	3.32E+03	1.17E-01	2.83E+04	Sub
Xe-127m				--	--	--	--	5.36E+03	5.36E+03	4.17E-06	1.28E+09	Sub
Xe-129m				--	--	--	--	3.97E+04	3.97E+04	3.14E-01	1.27E+05	Sub
Xe-131m				--	--	--	--	1.01E+05	1.01E+05	1.20E+00	8.38E+04	Sub
Xe-133	2.67E+04	1.43E-01	sub	--	--	--	--	2.68E+04	2.68E+04	1.43E-01	1.87E+05	Sub
Xe-133m				--	--	--	--	2.92E+04	2.92E+04	6.51E-02	4.49E+05	Sub
Xe-135				--	--	--	--	3.35E+03	3.35E+03	1.31E-03	2.56E+06	Sub
Xe-135m				--	--	--	--	2.01E+03	2.01E+03	2.21E-05	9.12E+07	Sub
Xe-137				--	--	--	--	3.42E+03	3.42E+03	9.51E-06	3.60E+08	Sub
Xe-138				--	--	--	--	6.84E+02	6.84E+02	7.11E-06	9.62E+07	Sub
Y-81				--	--	--	5.28E+05	--	5.28E+05	2.67E-04	1.98E+09	Direct
Y-83				--	--	--	7.60E+04	--	7.60E+04	2.37E-04	3.20E+08	Direct
Y-83m				--	--	--	3.04E+05	--	3.04E+05	3.82E-04	7.96E+08	Direct
Y-84m				1.12E+05	--	3.26E+06	4.61E+03	--	4.61E+03	8.14E-05	5.67E+07	Direct
Y-85				6.98E+04	--	5.08E+05	4.18E+03	--	4.18E+03	3.04E-04	1.38E+07	Direct
Y-85m				4.14E+04	--	1.41E+05	1.94E+03	--	1.94E+03	2.55E-04	7.59E+06	Direct
Y-86				1.38E+04	--	1.89E+04	3.37E+02	--	3.37E+02	1.36E-04	2.47E+06	Direct
Y-86m				2.28E+05	--	5.75E+06	6.85E+04	--	6.85E+04	1.50E-03	4.56E+07	Direct
Y-87				2.11E+04	--	7.20E+03	1.76E+03	--	1.76E+03	3.91E-03	4.49E+05	Direct
Y-87m				5.58E+04	--	9.08E+04	4.13E+03	--	4.13E+03	1.53E-03	2.70E+06	Direct
Y-88				2.72E+03	--	6.89E+02	2.71E+02	--	2.71E+02	1.94E-02	1.39E+04	Direct
Y-89m				--	--	--	3.08E+06	--	3.08E+06	3.80E-04	8.10E+09	Direct
Y-90				6.57E+03	--	1.77E+03	--	--	1.77E+03	3.25E-03	5.45E+05	Food
Y-90m				8.59E+04	--	4.78E+05	6.05E+03	--	6.05E+03	5.54E-04	1.09E+07	Direct
Y-91	3.98E+02	1.62E-02	ing	1.33E+03	--	4.05E+02	2.03E+05	--	4.05E+02	1.65E-02	2.45E+04	Food
Y-91m				7.45E+05	--	2.82E+07	2.75E+04	--	2.75E+04	6.61E-04	4.16E+07	Direct
Y-92				3.99E+04	--	1.50E+05	1.37E+04	--	1.37E+04	1.42E-03	9.63E+06	Direct
Y-93				1.86E+04	--	2.18E+04	1.67E+04	--	1.67E+04	4.99E-03	3.34E+06	Direct
Y-94				2.43E+05	--	9.97E+06	3.42E+04	--	3.42E+04	3.26E-04	1.05E+08	Direct
Y-95				4.30E+05	--	3.13E+07	7.58E+04	--	7.58E+04	4.09E-04	1.85E+08	Direct

Table C.2 Summary of Exposure Pathway TQs and Selection of Final HC-3 TQs (continued)

	from NNSA SD G 1027			Calculated Pathway Specific TQ Values					Selected Final Threshold Quantities			
MASTER ISOTOPE LIST	Act (Ci)	Mass (g)	Limiting Pathway	TQ_{inhale} (Ci)	TQ_{water} (Ci)	TQ_{food} (Ci)	TQ_{direct} (Ci)	TQ_{sub} (Ci)	Act (Ci)	Mass (g)	Sp. Act. (Ci/g)	Limiting Pathway
Yb-162				4.86E+05	3.85E+146	3.55E+07	2.81E+05	--	2.81E+05	4.57E-03	6.14E+07	Direct
Yb-163				7.45E+05	5.06E+245	8.72E+07	9.01E+04	--	9.01E+04	8.63E-04	1.04E+08	Direct
Yb-164				1.67E+05	1.15E+41	2.24E+06	1.76E+05	--	1.67E+05	1.10E-02	1.51E+07	Inh.
Yb-165				--	--	--	2.16E+05	--	2.16E+05	1.87E-03	1.15E+08	Direct
Yb-166				1.18E+04	3.50E+04	5.57E+03	9.75E+03	--	5.57E+03	1.67E-02	3.33E+05	Food
Yb-167				1.18E+06	1.87E+158	1.32E+08	1.55E+05	--	1.55E+05	2.41E-03	6.44E+07	Direct
Yb-169				3.99E+03	3.49E+03	1.57E+03	2.37E+03	--	1.57E+03	6.50E-02	2.41E+04	Food
Yb-175				1.60E+04	2.35E+04	7.54E+03	1.99E+04	--	7.54E+03	4.23E-02	1.78E+05	Food
Yb-177				1.19E+05	1.76E+29	1.40E+06	3.39E+04	--	3.39E+04	3.64E-03	9.32E+06	Direct
Yb-178				1.02E+05	6.24E+41	1.74E+06	2.81E+05	--	1.02E+05	7.11E-03	1.43E+07	Inh.
Yb-179				--	--	--	9.30E+04	--	9.30E+04	7.08E-04	1.31E+08	Direct
Zn-60				--	--	--	1.99E+05	--	1.99E+05	1.51E-04	1.32E+09	Direct
Zn-61				--	--	--	3.18E+05	--	3.18E+05	1.53E-04	2.08E+09	Direct
Zn-62				1.69E+04	1.81E+09	2.88E+04	3.56E+03	--	3.56E+03	6.52E-04	5.46E+06	Direct
Zn-63				1.83E+05	5.14E+75	4.88E+06	1.73E+04	--	1.73E+04	2.21E-04	7.84E+07	Direct
Zn-65	2.01E+02	2.44E-02	ing	3.85E+03	5.22E+02	2.06E+02	1.24E+03	--	2.06E+02	2.50E-02	8.25E+03	Food
Zn-69				2.60E+05	1.21E+53	8.31E+06	--	--	2.60E+05	5.43E-03	4.79E+07	Inh.
Zn-69m				3.38E+04	9.89E+07	5.60E+04	3.00E+03	--	3.00E+03	9.09E-04	3.30E+06	Direct
Zn-71				--	--	--	9.39E+05	--	9.39E+05	8.68E-04	1.08E+09	Direct
Zn-71m				4.65E+04	4.62E+16	2.62E+05	2.01E+03	--	2.01E+03	1.79E-04	1.13E+07	Direct
Zn-72				7.45E+03	4.14E+04	4.27E+03	5.68E+03	--	4.27E+03	4.56E-03	9.37E+05	Food
Zr-85				--	--	--	6.26E+04	--	6.26E+04	2.22E-04	2.82E+08	Direct
Zr-86				1.60E+04	--	1.90E+04	4.01E+03	--	4.01E+03	1.81E-03	2.21E+06	Direct
Zr-87				7.98E+04	--	7.68E+05	7.75E+03	--	7.75E+03	3.61E-04	2.15E+07	Direct
Zr-88				2.72E+03	--	2.79E+03	1.81E+03	--	1.81E+03	1.02E-01	1.78E+04	Direct
Zr-89				1.49E+04	--	5.11E+03	6.92E+02	--	6.92E+02	1.54E-03	4.49E+05	Direct
Zr-89m				--	--	--	2.74E+05	--	2.74E+05	5.40E-04	5.08E+08	Direct
Zr-93	3.88E+02	1.51E+05	i	3.85E+02	--	2.88E+03	--	--	3.85E+02	1.53E+05	2.51E-03	Inh.
Zr-95	9.93E+02	4.62E-02	de	2.03E+03	--	1.09E+03	9.88E+02	--	9.88E+02	4.59E-02	2.15E+04	Direct
Zr-97				7.98E+03	--	7.60E+03	6.36E+03	--	6.36E+03	3.33E-03	1.91E+06	Direct

APPENDIX D. SELECTION OF MASTER RADIONUCLIDE LIST

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APPENDIX D. SELECTION OF MASTER RADIONUCLIDE LIST

This appendix contains the following tables:

- Table D.1: Selection of Radionuclides For Calculating HC-2 and HC-3 TQs

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs																		
1283 Nuclides	*1252 Nuclides*			*825 Nuclides*			*838 Nuclides*			*1252 Nuclides*			*313 Nuclides*					
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Ac-223	Ac-223	2.10E+00	m	Ac-223	2.20E+00	m	Ac-223	2.20E+00	m	Ac-223	2.10E+00	m	Ac-223	2.10E+00	m	ICRP-38	2.20E+00	m
Ac-224	Ac-224	2.78E+00	h	Ac-224	2.90E+00	h	Ac-224	2.90E+00	h	Ac-224	2.78E+00	h				ICRP-38	2.90E+00	h
Ac-225	Ac-225	1.00E+01	d	Ac-225	1.00E+01	d	Ac-225	1.00E+01	d	Ac-225	1.00E+01	d				ICRP-38	1.00E+01	d
Ac-226	Ac-226	2.94E+01	h	Ac-226	2.90E+01	h	Ac-226	2.90E+01	h	Ac-226	2.94E+01	h				ICRP-38	2.90E+01	h
Ac-227	Ac-227	2.18E+01	y	Ac-227	2.18E+01	y	Ac-227	2.18E+01	y	Ac-227	2.18E+01	y				ICRP-38	2.18E+01	y
Ac-228	Ac-228	6.15E+00	h	Ac-228	6.13E+00	h	Ac-228	6.13E+00	h	Ac-228	6.15E+00	h				ICRP-38	6.13E+00	h
Ac-229													Ac-229	6.27E+01	m	JAERI	6.27E+01	m
Ac-230	Ac-230	1.22E+02	s							Ac-230	1.22E+02	s	Ac-230	2.03E+00	m	ICRP-107	1.22E+02	s
Ac-231	Ac-231	7.50E+00	m							Ac-231	7.50E+00	m				ICRP-107	7.50E+00	m
Ac-232	Ac-232	1.19E+02	s							Ac-232	1.19E+02	s				ICRP-107	1.19E+02	s
Ac-233	Ac-233	1.45E+02	s							Ac-233	1.45E+02	s				ICRP-107	1.45E+02	s
Ag-100m	Ag-100m	2.24E+00	m							Ag-100m	2.24E+00	m				ICRP-107	2.24E+00	m
Ag-101	Ag-101	1.11E+01	m							Ag-101	1.11E+01	m	Ag-101	1.11E+01	m	ICRP-107	1.11E+01	m
Ag-102	Ag-102	1.29E+01	m	Ag-102	1.29E+01	m	Ag-102	1.29E+01	m	Ag-102	1.29E+01	m				ICRP-38	1.29E+01	m
Ag-102m	Ag-102m	7.70E+00	m							Ag-102m	7.70E+00	m				ICRP-107	7.70E+00	m
Ag-103	Ag-103	6.57E+01	m	Ag-103	6.57E+01	m	Ag-103	6.57E+01	m	Ag-103	6.57E+01	m				ICRP-38	6.57E+01	m
Ag-104	Ag-104	6.92E+01	m	Ag-104	6.92E+01	m	Ag-104	6.92E+01	m	Ag-104	6.92E+01	m				ICRP-38	6.92E+01	m
Ag-104m	Ag-104m	3.35E+01	m	Ag-104m	3.35E+01	m	Ag-104m	3.35E+01	m	Ag-104m	3.35E+01	m				ICRP-38	3.35E+01	m
Ag-105	Ag-105	4.13E+01	d	Ag-105	4.10E+01	d	Ag-105	4.10E+01	d	Ag-105	4.13E+01	d				ICRP-38	4.10E+01	d
Ag-105m	Ag-105m	7.23E+00	m							Ag-105m	7.23E+00	m	Ag-105m	7.23E+00	m	ICRP-107	7.23E+00	m
Ag-106	Ag-106	2.40E+01	m	Ag-106	2.40E+01	m	Ag-106	2.40E+01	m	Ag-106	2.40E+01	m				ICRP-38	2.40E+01	m
Ag-106m	Ag-106m	8.28E+00	d	Ag-106m	8.41E+00	d	Ag-106m	8.41E+00	d	Ag-106m	8.28E+00	d				ICRP-38	8.41E+00	d
Ag-108	Ag-108	2.37E+00	m	Ag-108	2.37E+00	m	Ag-108	2.37E+00	m	Ag-108	2.37E+00	m	Ag-108	2.37E+00	m	ICRP-38	2.37E+00	m
Ag-108m	Ag-108m	4.18E+02	y	Ag-108m	1.27E+02	y	Ag-108m	1.27E+02	y	Ag-108m	4.18E+02	y				ICRP-38	1.27E+02	y
Ag-109m	Ag-109m	3.96E+01	s	Ag-109m	3.96E+01	s	Ag-109m	3.96E+01	s	Ag-109m	3.96E+01	s				ICRP-38	3.96E+01	s
Ag-110	Ag-110	2.46E+01	s	Ag-110	2.46E+01	s	Ag-110	2.46E+01	s	Ag-110	2.46E+01	s				ICRP-38	2.46E+01	s
Ag-110m	Ag-110m	2.50E+02	d	Ag-110m	2.50E+02	d	Ag-110m	2.50E+02	d	Ag-110m	2.50E+02	d				ICRP-38	2.50E+02	d
Ag-111	Ag-111	7.45E+00	d	Ag-111	7.45E+00	d	Ag-111	7.45E+00	d	Ag-111	7.45E+00	d				ICRP-38	7.45E+00	d
Ag-111m	Ag-111m	6.48E+01	s							Ag-111m	6.48E+01	s	Ag-111m	1.08E+00	m	ICRP-107	6.48E+01	s
Ag-112	Ag-112	3.13E+00	h	Ag-112	3.12E+00	h	Ag-112	3.12E+00	h	Ag-112	3.13E+00	h				ICRP-38	3.12E+00	h
Ag-113	Ag-113	5.37E+00	h							Ag-113	5.37E+00	h	Ag-113	5.37E+00	h	ICRP-107	5.37E+00	h
Ag-113m	Ag-113m	6.87E+01	s							Ag-113m	6.87E+01	s	Ag-113m	1.15E+00	m	ICRP-107	6.87E+01	s
Ag-114	Ag-114	4.60E+00	s							Ag-114	4.60E+00	s				ICRP-107	4.60E+00	s
Ag-115	Ag-115	2.00E+01	m	Ag-115	2.00E+01	m	Ag-115	2.00E+01	m	Ag-115	2.00E+01	m				ICRP-38	2.00E+01	m
Ag-116	Ag-116	2.68E+00	m							Ag-116	2.68E+00	m				ICRP-107	2.68E+00	m
Ag-117	Ag-117	7.36E+01	s							Ag-117	7.36E+01	s				ICRP-107	7.36E+01	s
Ag-99	Ag-99	1.24E+02	s							Ag-99	1.24E+02	s				ICRP-107	1.24E+02	s

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
Al-26	Al-26	7.17E+05	y	Al-26	7.16E+05	y	Al-26	7.16E+05	y	Al-26	7.17E+05	y				ICRP-38	7.16E+05	y
Al-28	Al-28	2.24E+00	m	Al-28	2.24E+00	m	Al-28	2.24E+00	m	Al-28	2.24E+00	m	Al-28	2.24E+00	m	ICRP-38	2.24E+00	m
Al-29	Al-29	6.56E+00	m							Al-29	6.56E+00	m	Al-29	6.56E+00	m	ICRP-107	6.56E+00	m
Am-237	Am-237	7.30E+01	m	Am-237	7.30E+01	m	Am-237	7.30E+01	m	Am-237	7.30E+01	m				ICRP-38	7.30E+01	m
Am-238	Am-238	9.80E+01	m	Am-238	9.80E+01	m	Am-238	9.80E+01	m	Am-238	9.80E+01	m				ICRP-38	9.80E+01	m
Am-239	Am-239	1.19E+01	h	Am-239	1.19E+01	h	Am-239	1.19E+01	h	Am-239	1.19E+01	h				ICRP-38	1.19E+01	h
Am-240	Am-240	5.08E+01	h	Am-240	5.08E+01	h	Am-240	5.08E+01	h	Am-240	5.08E+01	h				ICRP-38	5.08E+01	h
Am-241	Am-241	4.32E+02	y	Am-241	4.32E+02	y	Am-241	4.32E+02	y	Am-241	4.32E+02	y				ICRP-38	4.32E+02	y
Am-242	Am-242	1.60E+01	h	Am-242	1.60E+01	h	Am-242	1.60E+01	h	Am-242	1.60E+01	h				ICRP-38	1.60E+01	h
Am-242m	Am-242m	1.41E+02	y	Am-242m	1.52E+02	y	Am-242m	1.52E+02	y	Am-242m	1.41E+02	y				ICRP-38	1.52E+02	y
Am-243	Am-243	7.37E+03	y	Am-243	7.38E+03	y	Am-243	7.38E+03	y	Am-243	7.37E+03	y				ICRP-38	7.38E+03	y
Am-244	Am-244	1.01E+01	h	Am-244	1.01E+01	h	Am-244	1.01E+01	h	Am-244	1.01E+01	h				ICRP-38	1.01E+01	h
Am-244m	Am-244m	2.60E+01	m	Am-244m	2.60E+01	m	Am-244m	2.60E+01	m	Am-244m	2.60E+01	m				ICRP-38	2.60E+01	m
Am-245	Am-245	2.05E+00	h	Am-245	2.05E+00	h	Am-245	2.05E+00	h	Am-245	2.05E+00	h				ICRP-38	2.05E+00	h
Am-246	Am-246	3.90E+01	m	Am-246	3.90E+01	m	Am-246	3.90E+01	m	Am-246	3.90E+01	m				ICRP-38	3.90E+01	m
Am-246m	Am-246m	2.50E+01	m	Am-246m	2.50E+01	m	Am-246m	2.50E+01	m	Am-246m	2.50E+01	m				ICRP-38	2.50E+01	m
Am-247	Am-247	2.30E+01	m							Am-247	2.30E+01	m	Am-247	2.30E+01	m	ICRP-107	2.30E+01	m
Ar-37	Ar-37	3.50E+01	d	Ar-37	3.50E+01	d	Ar-37	3.50E+01	d	Ar-37	3.50E+01	d				ICRP-38	3.50E+01	d
Ar-39	Ar-39	2.69E+02	y	Ar-39	2.69E+02	y	Ar-39	2.69E+02	y	Ar-39	2.69E+02	y				ICRP-38	2.69E+02	y
Ar-41	Ar-41	1.10E+02	m	Ar-41	1.83E+00	h	Ar-41	1.83E+00	h	Ar-41	1.10E+02	m				ICRP-38	1.83E+00	h
Ar-42	Ar-42	3.29E+01	y							Ar-42	3.29E+01	y	Ar-42	3.29E+01	y	ICRP-107	3.29E+01	y
Ar-43	Ar-43	5.37E+00	m							Ar-43	5.37E+00	m				ICRP-107	5.37E+00	m
Ar-44	Ar-44	1.19E+01	m							Ar-44	1.19E+01	m	Ar-44	1.19E+01	m	ICRP-107	1.19E+01	m
As-68	As-68	1.52E+02	s							As-68	1.52E+02	s	As-68	2.53E+00	m	ICRP-107	1.52E+02	s
As-69	As-69	1.52E+01	m	As-69	1.52E+01	m	As-69	1.52E+01	m	As-69	1.52E+01	m				ICRP-38	1.52E+01	m
As-70	As-70	5.26E+01	m	As-70	5.26E+01	m	As-70	5.26E+01	m	As-70	5.26E+01	m				ICRP-38	5.26E+01	m
As-71	As-71	6.53E+01	h	As-71	6.48E+01	h	As-71	6.48E+01	h	As-71	6.53E+01	h				ICRP-38	6.48E+01	h
As-72	As-72	2.60E+01	h	As-72	2.60E+01	h	As-72	2.60E+01	h	As-72	2.60E+01	h				ICRP-38	2.60E+01	h
As-73	As-73	8.03E+01	d	As-73	8.03E+01	d	As-73	8.03E+01	d	As-73	8.03E+01	d				ICRP-38	8.03E+01	d
As-74	As-74	1.78E+01	d	As-74	1.78E+01	d	As-74	1.78E+01	d	As-74	1.78E+01	d				ICRP-38	1.78E+01	d
As-76	As-76	1.08E+00	d	As-76	2.63E+01	h	As-76	2.63E+01	h	As-76	1.08E+00	d				ICRP-38	2.63E+01	h
As-77	As-77	3.88E+01	h	As-77	3.88E+01	h	As-77	3.88E+01	h	As-77	3.88E+01	h				ICRP-38	3.88E+01	h
As-78	As-78	9.07E+01	m	As-78	9.07E+01	m	As-78	9.07E+01	m	As-78	9.07E+01	m				ICRP-38	9.07E+01	m
As-79	As-79	9.01E+00	m							As-79	9.01E+00	m	As-79	9.01E+00	m	ICRP-107	9.01E+00	m
At-204	At-204	9.20E+00	m							At-204	9.20E+00	m				ICRP-107	9.20E+00	m
At-205	At-205	2.62E+01	m							At-205	2.62E+01	m	At-205	2.62E+01	m	ICRP-107	2.62E+01	m
At-206	At-206	3.06E+01	m							At-206	3.06E+01	m				ICRP-107	3.06E+01	m
At-207	At-207	1.80E+00	h	At-207	1.80E+00	h	At-207	1.80E+00	h	At-207	1.80E+00	h				ICRP-38	1.80E+00	h
At-208	At-208	1.63E+00	h							At-208	1.63E+00	h	At-208	1.63E+00	h	ICRP-107	1.63E+00	h
At-209	At-209	5.41E+00	h							At-209	5.41E+00	h	At-209	5.41E+00	h	ICRP-107	5.41E+00	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
At-210	At-210	8.10E+00	h							At-210	8.10E+00	h	At-210	8.10E+00	h	ICRP-107	8.10E+00	h
At-211	At-211	7.21E+00	h	At-211	7.21E+00	h	At-211	7.21E+00	h	At-211	7.21E+00	h				ICRP-38	7.21E+00	h
At-215	At-215	1.00E-04	s	At-215	1.00E-01	ms	At-215	1.00E-01	ms	At-215	1.00E-04	s				ICRP-38	1.00E-01	ms
At-216	At-216	3.00E-04	s	At-216	3.00E-01	ms	At-216	3.00E-01	ms	At-216	3.00E-04	s				ICRP-38	3.00E-01	ms
At-217	At-217	3.23E-02	s	At-217	3.23E-02	s	At-217	3.23E-02	s	At-217	3.23E-02	s				ICRP-38	3.23E-02	s
At-218	At-218	1.50E+00	s	At-218	2.00E+00	s	At-218	2.00E+00	s	At-218	1.50E+00	s				ICRP-38	2.00E+00	s
At-219	At-219	5.60E+01	s							At-219	5.60E+01	s				ICRP-107	5.60E+01	s
At-220	At-220	3.71E+00	m							At-220	3.71E+00	m				ICRP-107	3.71E+00	m
Au-186	Au-186	1.07E+01	m							Au-186	1.07E+01	m	Au-186	1.07E+01	m	ICRP-107	1.07E+01	m
Au-187	Au-187	8.40E+00	m							Au-187	8.40E+00	m	Au-187	8.40E+00	m	ICRP-107	8.40E+00	m
Au-188													Au-188	8.84E+00	m	JAERI	8.84E+00	m
Au-189m													Au-189m	4.59E+00	m	JAERI	4.59E+00	m
Au-190	Au-190	4.28E+01	m							Au-190	4.28E+01	m	Au-190	4.28E+01	m	ICRP-107	4.28E+01	m
Au-191	Au-191	3.18E+00	h							Au-191	3.18E+00	h	Au-191	3.18E+00	h	ICRP-107	3.18E+00	h
Au-192	Au-192	4.94E+00	h							Au-192	4.94E+00	h	Au-192	4.94E+00	h	ICRP-107	4.94E+00	h
Au-193	Au-193	1.77E+01	h	Au-193	1.77E+01	h	Au-193	1.77E+01	h	Au-193	1.77E+01	h				ICRP-38	1.77E+01	h
Au-193m	Au-193m	3.90E+00	s							Au-193m	3.90E+00	s				ICRP-107	3.90E+00	s
Au-194	Au-194	3.80E+01	h	Au-194	3.95E+01	h	Au-194	3.95E+01	h	Au-194	3.80E+01	h				ICRP-38	3.95E+01	h
Au-195	Au-195	1.86E+02	d	Au-195	1.83E+02	d	Au-195	1.83E+02	d	Au-195	1.86E+02	d				ICRP-38	1.83E+02	d
Au-195m	Au-195m	3.05E+01	s	Au-195m	3.05E+01	s	Au-195m	3.05E+01	s	Au-195m	3.05E+01	s				ICRP-38	3.05E+01	s
Au-196	Au-196	6.18E+00	d							Au-196	6.18E+00	d	Au-196	6.18E+00	d	ICRP-107	6.18E+00	d
Au-196m	Au-196m	9.60E+00	h							Au-196m	9.60E+00	h	Au-196m	9.60E+00	h	ICRP-107	9.60E+00	h
Au-198	Au-198	2.70E+00	d	Au-198	2.70E+00	d	Au-198	2.70E+00	d	Au-198	2.70E+00	d				ICRP-38	2.70E+00	d
Au-198m	Au-198m	2.27E+00	d	Au-198m	2.30E+00	d	Au-198m	2.30E+00	d	Au-198m	2.27E+00	d				ICRP-38	2.30E+00	d
Au-199	Au-199	3.14E+00	d	Au-199	3.14E+00	d	Au-199	3.14E+00	d	Au-199	3.14E+00	d				ICRP-38	3.14E+00	d
Au-200	Au-200	4.84E+01	m	Au-200	4.84E+01	m	Au-200	4.84E+01	m	Au-200	4.84E+01	m				ICRP-38	4.84E+01	m
Au-200m	Au-200m	1.87E+01	h	Au-200m	1.87E+01	h	Au-200m	1.87E+01	h	Au-200m	1.87E+01	h				ICRP-38	1.87E+01	h
Au-201	Au-201	2.60E+01	m	Au-201	2.64E+01	m	Au-201	2.64E+01	m	Au-201	2.60E+01	m				ICRP-38	2.64E+01	m
Au-202	Au-202	2.88E+01	s							Au-202	2.88E+01	s				ICRP-107	2.88E+01	s
Ba-124	Ba-124	1.10E+01	m							Ba-124	1.10E+01	m	Ba-124	1.10E+01	m	ICRP-107	1.10E+01	m
Ba-126	Ba-126	1.00E+02	m	Ba-126	9.65E+01	m	Ba-126	9.65E+01	m	Ba-126	1.00E+02	m				ICRP-38	9.65E+01	m
Ba-127	Ba-127	1.27E+01	m							Ba-127	1.27E+01	m	Ba-127	1.27E+01	m	ICRP-107	1.27E+01	m
Ba-128	Ba-128	2.43E+00	d	Ba-128	2.43E+00	d	Ba-128	2.43E+00	d	Ba-128	2.43E+00	d				ICRP-38	2.43E+00	d
Ba-129	Ba-129	2.23E+00	h							Ba-129	2.23E+00	h	Ba-129	2.23E+00	h	ICRP-107	2.23E+00	h
Ba-129m	Ba-129m	2.16E+00	h							Ba-129m	2.16E+00	h	Ba-129m	2.16E+00	h	ICRP-107	2.16E+00	h
Ba-131	Ba-131	1.15E+01	d	Ba-131	1.18E+01	d	Ba-131	1.18E+01	d	Ba-131	1.15E+01	d				ICRP-38	1.18E+01	d
Ba-131m	Ba-131m	1.46E+01	m	Ba-131m	1.46E+01	m	Ba-131m	1.46E+01	m	Ba-131m	1.46E+01	m				ICRP-38	1.46E+01	m
Ba-133	Ba-133	1.05E+01	y	Ba-133	1.07E+01	y	Ba-133	1.07E+01	y	Ba-133	1.05E+01	y				ICRP-38	1.07E+01	y
Ba-133m	Ba-133m	3.89E+01	h	Ba-133m	3.89E+01	h	Ba-133m	3.89E+01	h	Ba-133m	3.89E+01	h				ICRP-38	3.89E+01	h
Ba-135m	Ba-135m	2.87E+01	h	Ba-135m	2.87E+01	h	Ba-135m	2.87E+01	h	Ba-135m	2.87E+01	h				ICRP-38	2.87E+01	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Ba-137m	Ba-137m	2.55E+00	m	Ba-137m	2.55E+00	m	Ba-137m	2.55E+00	m	Ba-137m	2.55E+00	m	Ba-137m	2.55E+00	m	ICRP-38	2.55E+00	m
Ba-139	Ba-139	8.31E+01	m	Ba-139	8.27E+01	m	Ba-139	8.27E+01	m	Ba-139	8.31E+01	m				ICRP-38	8.27E+01	m
Ba-140	Ba-140	1.28E+01	d	Ba-140	1.27E+01	d	Ba-140	1.27E+01	d	Ba-140	1.28E+01	d				ICRP-38	1.27E+01	d
Ba-141	Ba-141	1.83E+01	m	Ba-141	1.83E+01	m	Ba-141	1.83E+01	m	Ba-141	1.83E+01	m				ICRP-38	1.83E+01	m
Ba-142	Ba-142	1.06E+01	m	Ba-142	1.06E+01	m	Ba-142	1.06E+01	m	Ba-142	1.06E+01	m				ICRP-38	1.06E+01	m
Be-10	Be-10	1.51E+06	y	Be-10	1.60E+06	y	Be-10	1.60E+06	y	Be-10	1.51E+06	y				ICRP-38	1.60E+06	y
Be-7	Be-7	5.32E+01	d	Be-7	5.33E+01	d	Be-7	5.33E+01	d	Be-7	5.32E+01	d				ICRP-38	5.33E+01	d
Bi-197	Bi-197	9.30E+00	m							Bi-197	9.30E+00	m	Bi-197	9.33E+00	m	ICRP-107	9.30E+00	m
Bi-200	Bi-200	3.64E+01	m	Bi-200	3.64E+01	m	Bi-200	3.64E+01	m	Bi-200	3.64E+01	m				ICRP-38	3.64E+01	m
Bi-201	Bi-201	1.08E+02	m	Bi-201	1.08E+02	m	Bi-201	1.08E+02	m	Bi-201	1.08E+02	m				ICRP-38	1.08E+02	m
Bi-202	Bi-202	1.72E+00	h	Bi-202	1.67E+00	h	Bi-202	1.67E+00	h	Bi-202	1.72E+00	h				ICRP-38	1.67E+00	h
Bi-203	Bi-203	1.18E+01	h	Bi-203	1.18E+01	h	Bi-203	1.18E+01	h	Bi-203	1.18E+01	h				ICRP-38	1.18E+01	h
Bi-204	Bi-204	1.12E+01	h				Bi-204	1.12E+01	h	Bi-204	1.12E+01	h	Bi-204	1.12E+01	h	ICRP-38	1.12E+01	h
Bi-205	Bi-205	1.53E+01	d	Bi-205	1.53E+01	d	Bi-205	1.53E+01	d	Bi-205	1.53E+01	d				ICRP-38	1.53E+01	d
Bi-206	Bi-206	6.24E+00	d	Bi-206	6.24E+00	d	Bi-206	6.24E+00	d	Bi-206	6.24E+00	d				ICRP-38	6.24E+00	d
Bi-207	Bi-207	3.29E+01	y	Bi-207	3.80E+01	y	Bi-207	3.80E+01	y	Bi-207	3.29E+01	y				ICRP-38	3.80E+01	y
Bi-208	Bi-208	3.68E+05	y							Bi-208	3.68E+05	y	Bi-208	3.68E+05	y	ICRP-107	3.68E+05	y
Bi-210	Bi-210	5.01E+00	d	Bi-210	5.01E+00	d	Bi-210	5.01E+00	d	Bi-210	5.01E+00	d				ICRP-38	5.01E+00	d
Bi-210m	Bi-210m	3.04E+06	y	Bi-210m	3.00E+06	y	Bi-210m	3.00E+06	y	Bi-210m	3.04E+06	y				ICRP-38	3.00E+06	y
Bi-211	Bi-211	2.14E+00	m	Bi-211	2.14E+00	m	Bi-211	2.14E+00	m	Bi-211	2.14E+00	m	Bi-211	2.14E+00	m	ICRP-38	2.14E+00	m
Bi-212	Bi-212	6.06E+01	m	Bi-212	6.06E+01	m	Bi-212	6.06E+01	m	Bi-212	6.06E+01	m				ICRP-38	6.06E+01	m
Bi-212n	Bi-212n	7.00E+00	m							Bi-212n	7.00E+00	m				ICRP-107	7.00E+00	m
Bi-213	Bi-213	4.56E+01	m	Bi-213	4.57E+01	m	Bi-213	4.57E+01	m	Bi-213	4.56E+01	m				ICRP-38	4.57E+01	m
Bi-214	Bi-214	1.99E+01	m	Bi-214	1.99E+01	m	Bi-214	1.99E+01	m	Bi-214	1.99E+01	m				ICRP-38	1.99E+01	m
Bi-215	Bi-215	7.60E+00	m							Bi-215	7.60E+00	m	Bi-215	7.60E+00	m	ICRP-107	7.60E+00	m
Bi-216	Bi-216	2.17E+00	m							Bi-216	2.17E+00	m				ICRP-107	2.17E+00	m
Bk-244													Bk-244	4.35E+00	h	JAERI	4.35E+00	h
Bk-245	Bk-245	4.94E+00	d	Bk-245	4.94E+00	d	Bk-245	4.94E+00	d	Bk-245	4.94E+00	d				ICRP-38	4.94E+00	d
Bk-246	Bk-246	1.80E+00	d	Bk-246	1.83E+00	d	Bk-246	1.83E+00	d	Bk-246	1.80E+00	d				ICRP-38	1.83E+00	d
Bk-247	Bk-247	1.38E+03	y	Bk-247	1.38E+03	y	Bk-247	1.38E+03	y	Bk-247	1.38E+03	y				ICRP-38	1.38E+03	y
Bk-248m	Bk-248m	2.37E+01	h							Bk-248m	2.37E+01	h	Bk-248m	2.37E+01	h	ICRP-107	2.37E+01	h
Bk-249	Bk-249	3.30E+02	d	Bk-249	3.20E+02	d	Bk-249	3.20E+02	d	Bk-249	3.30E+02	d				ICRP-38	3.20E+02	d
Bk-250	Bk-250	3.21E+00	h	Bk-250	3.22E+00	h	Bk-250	3.22E+00	h	Bk-250	3.21E+00	h				ICRP-38	3.22E+00	h
Bk-251	Bk-251	5.56E+01	m							Bk-251	5.56E+01	m	Bk-251	5.56E+01	m	ICRP-107	5.56E+01	m
Br-72	Br-72	7.86E+01	s							Br-72	7.86E+01	s				ICRP-107	7.86E+01	s
Br-73	Br-73	3.40E+00	m							Br-73	3.40E+00	m				ICRP-107	3.40E+00	m
Br-74	Br-74	2.54E+01	m	Br-74	2.53E+01	m	Br-74	2.53E+01	m	Br-74	2.54E+01	m				ICRP-38	2.53E+01	m
Br-74m	Br-74m	4.60E+01	m	Br-74m	4.15E+01	m	Br-74m	4.15E+01	m	Br-74m	4.60E+01	m				ICRP-38	4.15E+01	m
Br-75	Br-75	9.67E+01	m	Br-75	9.80E+01	m	Br-75	9.80E+01	m	Br-75	9.67E+01	m				ICRP-38	9.80E+01	m
Br-76	Br-76	1.62E+01	h	Br-76	1.62E+01	h	Br-76	1.62E+01	h	Br-76	1.62E+01	h				ICRP-38	1.62E+01	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Br-76m	Br-76m	1.31E+00	s							Br-76m	1.31E+00	s				ICRP-107	1.31E+00	s
Br-77	Br-77	5.70E+01	h	Br-77	5.60E+01	h	Br-77	5.60E+01	h	Br-77	5.70E+01	h				ICRP-38	5.60E+01	h
Br-77m	Br-77m	4.28E+00	m							Br-77m	4.28E+00	m	Br-77m	4.28E+00	m	ICRP-107	4.28E+00	m
Br-78	Br-78	6.46E+00	m							Br-78	6.46E+00	m	Br-78	6.46E+00	m	ICRP-107	6.46E+00	m
Br-80	Br-80	1.77E+01	m	Br-80	1.74E+01	m	Br-80	1.74E+01	m	Br-80	1.77E+01	m				ICRP-38	1.74E+01	m
Br-80m	Br-80m	4.42E+00	h	Br-80m	4.42E+00	h	Br-80m	4.42E+00	h	Br-80m	4.42E+00	h				ICRP-38	4.42E+00	h
Br-82	Br-82	3.53E+01	h	Br-82	3.53E+01	h	Br-82	3.53E+01	h	Br-82	3.53E+01	h				ICRP-38	3.53E+01	h
Br-82m	Br-82m	6.13E+00	m							Br-82m	6.13E+00	m	Br-82m	6.13E+00	m	ICRP-107	6.13E+00	m
Br-83	Br-83	2.40E+00	h	Br-83	2.39E+00	h	Br-83	2.39E+00	h	Br-83	2.40E+00	h				ICRP-38	2.39E+00	h
Br-84	Br-84	3.18E+01	m	Br-84	3.18E+01	m	Br-84	3.18E+01	m	Br-84	3.18E+01	m				ICRP-38	3.18E+01	m
Br-84m	Br-84m	6.00E+00	m							Br-84m	6.00E+00	m	Br-84m	6.00E+00	m	ICRP-107	6.00E+00	m
Br-85	Br-85	2.90E+00	m							Br-85	2.90E+00	m				ICRP-107	2.90E+00	m
C-10	C-10	1.93E+01	s							C-10	1.93E+01	s				ICRP-107	1.93E+01	s
C-11	C-11	2.04E+01	m	C-11	2.04E+01	m	C-11	2.04E+01	m	C-11	2.04E+01	m				ICRP-38	2.04E+01	m
C-14	C-14	5.70E+03	y	C-14	5.73E+03	y	C-14	5.73E+03	y	C-14	5.70E+03	y				ICRP-38	5.73E+03	y
Ca-41	Ca-41	1.02E+05	y	Ca-41	1.40E+05	y	Ca-41	1.40E+05	y	Ca-41	1.02E+05	y				ICRP-38	1.40E+05	y
Ca-45	Ca-45	1.63E+02	d	Ca-45	1.63E+02	d	Ca-45	1.63E+02	d	Ca-45	1.63E+02	d				ICRP-38	1.63E+02	d
Ca-47	Ca-47	4.54E+00	d	Ca-47	4.53E+00	d	Ca-47	4.53E+00	d	Ca-47	4.54E+00	d				ICRP-38	4.53E+00	d
Ca-49	Ca-49	8.72E+00	m	Ca-49	8.72E+00	m	Ca-49	8.72E+00	m	Ca-49	8.72E+00	m	Ca-49	8.72E+00	m	ICRP-38	8.72E+00	m
Cd-101	Cd-101	1.36E+00	m							Cd-101	1.36E+00	m				ICRP-107	1.36E+00	m
Cd-102	Cd-102	5.50E+00	m							Cd-102	5.50E+00	m				ICRP-107	5.50E+00	m
Cd-103	Cd-103	7.30E+00	m							Cd-103	7.30E+00	m				ICRP-107	7.30E+00	m
Cd-104	Cd-104	5.77E+01	m	Cd-104	5.77E+01	m	Cd-104	5.77E+01	m	Cd-104	5.77E+01	m				ICRP-38	5.77E+01	m
Cd-105	Cd-105	5.55E+01	m							Cd-105	5.55E+01	m	Cd-105	5.55E+01	m	ICRP-107	5.55E+01	m
Cd-107	Cd-107	6.50E+00	h	Cd-107	6.49E+00	h	Cd-107	6.49E+00	h	Cd-107	6.50E+00	h				ICRP-38	6.49E+00	h
Cd-109	Cd-109	4.61E+02	d	Cd-109	4.64E+02	d	Cd-109	4.64E+02	d	Cd-109	4.61E+02	d				ICRP-38	4.64E+02	d
Cd-111m	Cd-111m	4.85E+01	m							Cd-111m	4.85E+01	m	Cd-111m	4.85E+01	m	ICRP-107	4.85E+01	m
Cd-113	Cd-113	7.70E+15	y	Cd-113	9.30E+15	y	Cd-113	9.30E+15	y	Cd-113	7.70E+15	y				ICRP-38	9.30E+15	y
Cd-113m	Cd-113m	1.41E+01	y	Cd-113m	1.36E+01	y	Cd-113m	1.36E+01	y	Cd-113m	1.41E+01	y	Cd-113m	1.41E+01	y	ICRP-38	1.36E+01	y
Cd-115	Cd-115	5.35E+01	h	Cd-115	5.35E+01	h	Cd-115	5.35E+01	h	Cd-115	5.35E+01	h				ICRP-38	5.35E+01	h
Cd-115m	Cd-115m	4.46E+01	d	Cd-115m	4.46E+01	d	Cd-115m	4.46E+01	d	Cd-115m	4.46E+01	d				ICRP-38	4.46E+01	d
Cd-117	Cd-117	2.49E+00	h	Cd-117	2.49E+00	h	Cd-117	2.49E+00	h	Cd-117	2.49E+00	h				ICRP-38	2.49E+00	h
Cd-117m	Cd-117m	3.36E+00	h	Cd-117m	3.36E+00	h	Cd-117m	3.36E+00	h	Cd-117m	3.36E+00	h				ICRP-38	3.36E+00	h
Cd-118	Cd-118	5.03E+01	m							Cd-118	5.03E+01	m	Cd-118	5.03E+01	m	ICRP-107	5.03E+01	m
Cd-119	Cd-119	2.69E+00	m							Cd-119	2.69E+00	m				ICRP-107	2.69E+00	m
Cd-119m	Cd-119m	2.20E+00	m							Cd-119m	2.20E+00	m				ICRP-107	2.20E+00	m
Ce-130	Ce-130	2.29E+01	m							Ce-130	2.29E+01	m	Ce-130	2.29E+01	m	ICRP-107	2.29E+01	m
Ce-131	Ce-131	1.02E+01	m							Ce-131	1.02E+01	m	Ce-131	1.02E+01	m	ICRP-107	1.02E+01	m
Ce-131m													Ce-131m	5.00E+00	m	JAERI	5.00E+00	m
Ce-132	Ce-132	3.51E+00	h							Ce-132	3.51E+00	h	Ce-132	3.51E+00	h	ICRP-107	3.51E+00	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Ce-133	Ce-133	9.70E+01	m							Ce-133	9.70E+01	m	Ce-133	9.70E+01	m	ICRP-107	9.70E+01	m
Ce-133m	Ce-133m	4.90E+00	h							Ce-133m	4.90E+00	h	Ce-133m	4.90E+00	h	ICRP-107	4.90E+00	h
Ce-134	Ce-134	3.16E+00	d	Ce-134	7.20E+01	h	Ce-134	7.20E+01	h	Ce-134	3.16E+00	d				ICRP-38	7.20E+01	h
Ce-135	Ce-135	1.77E+01	h	Ce-135	1.76E+01	h	Ce-135	1.76E+01	h	Ce-135	1.77E+01	h				ICRP-38	1.76E+01	h
Ce-137	Ce-137	9.00E+00	h	Ce-137	9.00E+00	h	Ce-137	9.00E+00	h	Ce-137	9.00E+00	h				ICRP-38	9.00E+00	h
Ce-137m	Ce-137m	3.44E+01	h	Ce-137m	3.44E+01	h	Ce-137m	3.44E+01	h	Ce-137m	3.44E+01	h				ICRP-38	3.44E+01	h
Ce-139	Ce-139	1.38E+02	d	Ce-139	1.38E+02	d	Ce-139	1.38E+02	d	Ce-139	1.38E+02	d				ICRP-38	1.38E+02	d
Ce-141	Ce-141	3.25E+01	d	Ce-141	3.25E+01	d	Ce-141	3.25E+01	d	Ce-141	3.25E+01	d				ICRP-38	3.25E+01	d
Ce-143	Ce-143	3.30E+01	h	Ce-143	3.30E+01	h	Ce-143	3.30E+01	h	Ce-143	3.30E+01	h				ICRP-38	3.30E+01	h
Ce-144	Ce-144	2.85E+02	d	Ce-144	2.84E+02	d	Ce-144	2.84E+02	d	Ce-144	2.85E+02	d				ICRP-38	2.84E+02	d
Ce-145	Ce-145	3.01E+00	m							Ce-145	3.01E+00	m				ICRP-107	3.01E+00	m
Ce-146													Ce-146	1.35E+01	m	JAERI	1.35E+01	m
Cf-244	Cf-244	1.94E+01	m	Cf-244	1.94E+01	m	Cf-244	1.94E+01	m	Cf-244	1.94E+01	m				ICRP-38	1.94E+01	m
Cf-246	Cf-246	3.57E+01	h	Cf-246	3.57E+01	h	Cf-246	3.57E+01	h	Cf-246	3.57E+01	h				ICRP-38	3.57E+01	h
Cf-247	Cf-247	3.11E+00	h							Cf-247	3.11E+00	h	Cf-247	3.11E+00	h	ICRP-107	3.11E+00	h
Cf-248	Cf-248	3.34E+02	d	Cf-248	3.34E+02	d	Cf-248	3.34E+02	d	Cf-248	3.34E+02	d				ICRP-38	3.34E+02	d
Cf-249	Cf-249	3.51E+02	y	Cf-249	3.51E+02	y	Cf-249	3.51E+02	y	Cf-249	3.51E+02	y				ICRP-38	3.51E+02	y
Cf-250	Cf-250	1.31E+01	y	Cf-250	1.31E+01	y	Cf-250	1.31E+01	y	Cf-250	1.31E+01	y				ICRP-38	1.31E+01	y
Cf-251	Cf-251	9.00E+02	y	Cf-251	8.98E+02	y	Cf-251	8.98E+02	y	Cf-251	9.00E+02	y				ICRP-38	8.98E+02	y
Cf-252	Cf-252	2.65E+00	y	Cf-252	2.64E+00	y	Cf-252	2.64E+00	y	Cf-252	2.65E+00	y				ICRP-38	2.64E+00	y
Cf-253	Cf-253	1.78E+01	d	Cf-253	1.78E+01	d	Cf-253	1.78E+01	d	Cf-253	1.78E+01	d				ICRP-38	1.78E+01	d
Cf-254	Cf-254	6.05E+01	d	Cf-254	6.05E+01	d	Cf-254	6.05E+01	d	Cf-254	6.05E+01	d				ICRP-38	6.05E+01	d
Cf-255	Cf-255	8.50E+01	m							Cf-255	8.50E+01	m	Cf-255	8.50E+01	m	ICRP-107	8.50E+01	m
Cf-256													Cf-256	1.23E+01	m	JAERI	1.23E+01	m
Cl-34	Cl-34	1.53E+00	s							Cl-34	1.53E+00	s				ICRP-107	1.53E+00	s
Cl-34m	Cl-34m	3.20E+01	m							Cl-34m	3.20E+01	m	Cl-34m	3.20E+01	m	ICRP-107	3.20E+01	m
Cl-36	Cl-36	3.01E+05	y	Cl-36	3.01E+05	y	Cl-36	3.01E+05	y	Cl-36	3.01E+05	y				ICRP-38	3.01E+05	y
Cl-38	Cl-38	3.72E+01	m	Cl-38	3.72E+01	m	Cl-38	3.72E+01	m	Cl-38	3.72E+01	m				ICRP-38	3.72E+01	m
Cl-39	Cl-39	5.56E+01	m	Cl-39	5.56E+01	m	Cl-39	5.56E+01	m	Cl-39	5.56E+01	m				ICRP-38	5.56E+01	m
Cl-40	Cl-40	1.35E+00	m							Cl-40	1.35E+00	m	Cl-40	1.35E+00	m	ICRP-107	1.35E+00	m
Cm-238	Cm-238	2.40E+00	h	Cm-238	2.40E+00	h	Cm-238	2.40E+00	h	Cm-238	2.40E+00	h				ICRP-38	2.40E+00	h
Cm-239	Cm-239	2.90E+00	h							Cm-239	2.90E+00	h	Cm-239	2.90E+00	h	ICRP-107	2.90E+00	h
Cm-240	Cm-240	2.70E+01	d	Cm-240	2.70E+01	d	Cm-240	2.70E+01	d	Cm-240	2.70E+01	d				ICRP-38	2.70E+01	d
Cm-241	Cm-241	3.28E+01	d	Cm-241	3.28E+01	d	Cm-241	3.28E+01	d	Cm-241	3.28E+01	d				ICRP-38	3.28E+01	d
Cm-242	Cm-242	1.63E+02	d	Cm-242	1.63E+02	d	Cm-242	1.63E+02	d	Cm-242	1.63E+02	d				ICRP-38	1.63E+02	d
Cm-243	Cm-243	2.91E+01	y	Cm-243	2.85E+01	y	Cm-243	2.85E+01	y	Cm-243	2.91E+01	y				ICRP-38	2.85E+01	y
Cm-244	Cm-244	1.81E+01	y	Cm-244	1.81E+01	y	Cm-244	1.81E+01	y	Cm-244	1.81E+01	y				ICRP-38	1.81E+01	y
Cm-245	Cm-245	8.50E+03	y	Cm-245	8.50E+03	y	Cm-245	8.50E+03	y	Cm-245	8.50E+03	y				ICRP-38	8.50E+03	y
Cm-246	Cm-246	4.76E+03	y	Cm-246	4.73E+03	y	Cm-246	4.73E+03	y	Cm-246	4.76E+03	y				ICRP-38	4.73E+03	y
Cm-247	Cm-247	1.56E+07	y	Cm-247	1.56E+07	y	Cm-247	1.56E+07	y	Cm-247	1.56E+07	y				ICRP-38	1.56E+07	y

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Cm-248	Cm-248	3.48E+05	y	Cm-248	3.39E+05	y	Cm-248	3.39E+05	y	Cm-248	3.48E+05	y				ICRP-38	3.39E+05	y
Cm-249	Cm-249	6.42E+01	m	Cm-249	6.42E+01	m	Cm-249	6.42E+01	m	Cm-249	6.42E+01	m				ICRP-38	6.42E+01	m
Cm-250	Cm-250	8.30E+03	y	Cm-250	6.90E+03	y	Cm-250	6.90E+03	y	Cm-250	8.30E+03	y				ICRP-38	6.90E+03	y
Cm-251	Cm-251	1.68E+01	m							Cm-251	1.68E+01	m				ICRP-107	1.68E+01	m
Co-54m	Co-54m	1.48E+00	m							Co-54m	1.48E+00	m				ICRP-107	1.48E+00	m
Co-55	Co-55	1.75E+01	h	Co-55	1.75E+01	h	Co-55	1.75E+01	h	Co-55	1.75E+01	h				ICRP-38	1.75E+01	h
Co-56	Co-56	7.72E+01	d	Co-56	7.88E+01	d	Co-56	7.88E+01	d	Co-56	7.72E+01	d				ICRP-38	7.88E+01	d
Co-57	Co-57	2.72E+02	d	Co-57	2.71E+02	d	Co-57	2.71E+02	d	Co-57	2.72E+02	d				ICRP-38	2.71E+02	d
Co-58	Co-58	7.09E+01	d	Co-58	7.08E+01	d	Co-58	7.08E+01	d	Co-58	7.09E+01	d				ICRP-38	7.08E+01	d
Co-58m	Co-58m	9.04E+00	h	Co-58m	9.15E+00	h	Co-58m	9.15E+00	h	Co-58m	9.04E+00	h				ICRP-38	9.15E+00	h
Co-60	Co-60	5.27E+00	y	Co-60	5.27E+00	y	Co-60	5.27E+00	y	Co-60	5.27E+00	y				ICRP-38	5.27E+00	y
Co-60m	Co-60m	1.05E+01	m	Co-60m	1.05E+01	m	Co-60m	1.05E+01	m	Co-60m	1.05E+01	m				ICRP-38	1.05E+01	m
Co-61	Co-61	1.65E+00	h	Co-61	1.65E+00	h	Co-61	1.65E+00	h	Co-61	1.65E+00	h				ICRP-38	1.65E+00	h
Co-62	Co-62	1.50E+00	m							Co-62	1.50E+00	m	Co-62	1.50E+00	m	ICRP-107	1.50E+00	m
Co-62m	Co-62m	1.39E+01	m	Co-62m	1.39E+01	m	Co-62m	1.39E+01	m	Co-62m	1.39E+01	m				ICRP-38	1.39E+01	m
Cr-48	Cr-48	2.16E+01	h	Cr-48	2.30E+01	h	Cr-48	2.30E+01	h	Cr-48	2.16E+01	h				ICRP-38	2.30E+01	h
Cr-49	Cr-49	4.23E+01	m	Cr-49	4.21E+01	m	Cr-49	4.21E+01	m	Cr-49	4.23E+01	m				ICRP-38	4.21E+01	m
Cr-51	Cr-51	2.77E+01	d	Cr-51	2.77E+01	d	Cr-51	2.77E+01	d	Cr-51	2.77E+01	d				ICRP-38	2.77E+01	d
Cr-55	Cr-55	3.50E+00	m							Cr-55	3.50E+00	m	Cr-55	3.50E+00	m	ICRP-107	3.50E+00	m
Cr-56	Cr-56	5.94E+00	m							Cr-56	5.94E+00	m	Cr-56	5.94E+00	m	ICRP-107	5.94E+00	m
Cs-121	Cs-121	1.55E+02	s							Cs-121	1.55E+02	s				ICRP-107	1.55E+02	s
Cs-121m	Cs-121m	1.22E+02	s							Cs-121m	1.22E+02	s				ICRP-107	1.22E+02	s
Cs-123	Cs-123	5.88E+00	m							Cs-123	5.88E+00	m				ICRP-107	5.88E+00	m
Cs-124	Cs-124	3.08E+01	s							Cs-124	3.08E+01	s				ICRP-107	3.08E+01	s
Cs-125	Cs-125	4.50E+01	m	Cs-125	4.50E+01	m	Cs-125	4.50E+01	m	Cs-125	4.50E+01	m				ICRP-38	4.50E+01	m
Cs-126	Cs-126	1.64E+00	m	Cs-126	1.64E+00	m	Cs-126	1.64E+00	m	Cs-126	1.64E+00	m	Cs-126	1.64E+00	m	ICRP-38	1.64E+00	m
Cs-127	Cs-127	6.25E+00	h	Cs-127	6.25E+00	h	Cs-127	6.25E+00	h	Cs-127	6.25E+00	h				ICRP-38	6.25E+00	h
Cs-128	Cs-128	3.64E+00	m	Cs-128	3.90E+00	m	Cs-128	3.90E+00	m	Cs-128	3.64E+00	m	Cs-128	3.62E+00	m	ICRP-38	3.90E+00	m
Cs-129	Cs-129	3.21E+01	h	Cs-129	3.21E+01	h	Cs-129	3.21E+01	h	Cs-129	3.21E+01	h				ICRP-38	3.21E+01	h
Cs-130	Cs-130	2.92E+01	m	Cs-130	2.99E+01	m	Cs-130	2.99E+01	m	Cs-130	2.92E+01	m				ICRP-38	2.99E+01	m
Cs-130m	Cs-130m	3.46E+00	m							Cs-130m	3.46E+00	m	Cs-130m	3.46E+00	m	ICRP-107	3.46E+00	m
Cs-131	Cs-131	9.69E+00	d	Cs-131	9.69E+00	d	Cs-131	9.69E+00	d	Cs-131	9.69E+00	d				ICRP-38	9.69E+00	d
Cs-132	Cs-132	6.48E+00	d	Cs-132	6.48E+00	d	Cs-132	6.48E+00	d	Cs-132	6.48E+00	d				ICRP-38	6.48E+00	d
Cs-134	Cs-134	2.06E+00	y	Cs-134	2.06E+00	y	Cs-134	2.06E+00	y	Cs-134	2.06E+00	y				ICRP-38	2.06E+00	y
Cs-134m	Cs-134m	2.90E+00	h	Cs-134m	2.90E+00	h	Cs-134m	2.90E+00	h	Cs-134m	2.90E+00	h				ICRP-38	2.90E+00	h
Cs-135	Cs-135	2.30E+06	y	Cs-135	2.30E+06	y	Cs-135	2.30E+06	y	Cs-135	2.30E+06	y				ICRP-38	2.30E+06	y
Cs-135m	Cs-135m	5.30E+01	m	Cs-135m	5.30E+01	m	Cs-135m	5.30E+01	m	Cs-135m	5.30E+01	m				ICRP-38	5.30E+01	m
Cs-136	Cs-136	1.32E+01	d	Cs-136	1.31E+01	d	Cs-136	1.31E+01	d	Cs-136	1.32E+01	d				ICRP-38	1.31E+01	d
Cs-137	Cs-137	3.02E+01	y	Cs-137	3.00E+01	y	Cs-137	3.00E+01	y	Cs-137	3.02E+01	y				ICRP-38	3.00E+01	y
Cs-138	Cs-138	3.34E+01	m	Cs-138	3.22E+01	m	Cs-138	3.22E+01	m	Cs-138	3.34E+01	m				ICRP-38	3.22E+01	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
Cs-138m	Cs-138m	2.91E+00	m							Cs-138m	2.91E+00	m				ICRP-107	2.91E+00	m
Cs-139	Cs-139	9.27E+00	m							Cs-139	9.27E+00	m	Cs-139	9.27E+00	m	ICRP-107	9.27E+00	m
Cs-140	Cs-140	6.37E+01	s							Cs-140	6.37E+01	s				ICRP-107	6.37E+01	s
Cu-57	Cu-57	1.96E-01	s				Cu-57	2.33E+02	ms	Cu-57	1.96E-01	s				ICRP-38	2.33E+02	ms
Cu-59	Cu-59	8.15E+01	s							Cu-59	8.15E+01	s				ICRP-107	8.15E+01	s
Cu-60	Cu-60	2.37E+01	m	Cu-60	2.32E+01	m	Cu-60	2.32E+01	m	Cu-60	2.37E+01	m				ICRP-38	2.32E+01	m
Cu-61	Cu-61	3.33E+00	h	Cu-61	3.41E+00	h	Cu-61	3.41E+00	h	Cu-61	3.33E+00	h				ICRP-38	3.41E+00	h
Cu-62	Cu-62	9.67E+00	m	Cu-62	9.74E+00	m	Cu-62	9.74E+00	m	Cu-62	9.67E+00	m	Cu-62	9.74E+00	m	ICRP-38	9.74E+00	m
Cu-64	Cu-64	1.27E+01	h	Cu-64	1.27E+01	h	Cu-64	1.27E+01	h	Cu-64	1.27E+01	h				ICRP-38	1.27E+01	h
Cu-66	Cu-66	5.12E+00	m	Cu-66	5.10E+00	m	Cu-66	5.10E+00	m	Cu-66	5.12E+00	m	Cu-66	5.09E+00	m	ICRP-38	5.10E+00	m
Cu-67	Cu-67	6.18E+01	h	Cu-67	6.19E+01	h	Cu-67	6.19E+01	h	Cu-67	6.18E+01	h				ICRP-38	6.19E+01	h
Cu-69	Cu-69	2.85E+00	m							Cu-69	2.85E+00	m				ICRP-107	2.85E+00	m
Dy-148	Dy-148	3.30E+00	m							Dy-148	3.30E+00	m				ICRP-107	3.30E+00	m
Dy-149	Dy-149	4.20E+00	m							Dy-149	4.20E+00	m	Dy-149	4.20E+00	m	ICRP-107	4.20E+00	m
Dy-150	Dy-150	7.17E+00	m							Dy-150	7.17E+00	m	Dy-150	7.17E+00	m	ICRP-107	7.17E+00	m
Dy-151	Dy-151	1.79E+01	m							Dy-151	1.79E+01	m	Dy-151	1.79E+01	m	ICRP-107	1.79E+01	m
Dy-152	Dy-152	2.38E+00	h							Dy-152	2.38E+00	h	Dy-152	2.38E+00	h	ICRP-107	2.38E+00	h
Dy-153	Dy-153	6.40E+00	h							Dy-153	6.40E+00	h	Dy-153	6.40E+00	h	ICRP-107	6.40E+00	h
Dy-154	Dy-154	3.00E+06	y							Dy-154	3.00E+06	y	Dy-154	3.00E+06	y	ICRP-107	3.00E+06	y
Dy-155	Dy-155	9.90E+00	h	Dy-155	1.00E+01	h	Dy-155	1.00E+01	h	Dy-155	9.90E+00	h				ICRP-38	1.00E+01	h
Dy-157	Dy-157	8.14E+00	h	Dy-157	8.10E+00	h	Dy-157	8.10E+00	h	Dy-157	8.14E+00	h				ICRP-38	8.10E+00	h
Dy-159	Dy-159	1.44E+02	d	Dy-159	1.44E+02	d	Dy-159	1.44E+02	d	Dy-159	1.44E+02	d				ICRP-38	1.44E+02	d
Dy-165	Dy-165	2.33E+00	h	Dy-165	2.33E+00	h	Dy-165	2.33E+00	h	Dy-165	2.33E+00	h				ICRP-38	2.33E+00	h
Dy-165m	Dy-165m	1.26E+00	m							Dy-165m	1.26E+00	m	Dy-165m	1.26E+00	m	ICRP-107	1.26E+00	m
Dy-166	Dy-166	8.16E+01	h	Dy-166	8.16E+01	h	Dy-166	8.16E+01	h	Dy-166	8.16E+01	h				ICRP-38	8.16E+01	h
Dy-167	Dy-167	6.20E+00	m							Dy-167	6.20E+00	m	Dy-167	6.20E+00	m	ICRP-107	6.20E+00	m
Dy-168	Dy-168	8.70E+00	m							Dy-168	8.70E+00	m	Dy-168	8.70E+00	m	ICRP-107	8.70E+00	m
Er-154	Er-154	3.73E+00	m							Er-154	3.73E+00	m				ICRP-107	3.73E+00	m
Er-155													Er-155	5.30E+00	m	JAERI	5.30E+00	m
Er-156	Er-156	1.95E+01	m							Er-156	1.95E+01	m	Er-156	1.95E+01	m	ICRP-107	1.95E+01	m
Er-159	Er-159	3.60E+01	m							Er-159	3.60E+01	m	Er-159	3.60E+01	m	ICRP-107	3.60E+01	m
Er-161	Er-161	3.21E+00	h	Er-161	3.24E+00	h	Er-161	3.24E+00	h	Er-161	3.21E+00	h				ICRP-38	3.24E+00	h
Er-163	Er-163	7.50E+01	m							Er-163	7.50E+01	m	Er-163	7.50E+01	m	ICRP-107	7.50E+01	m
Er-165	Er-165	1.04E+01	h	Er-165	1.04E+01	h	Er-165	1.04E+01	h	Er-165	1.04E+01	h				ICRP-38	1.04E+01	h
Er-167m	Er-167m	2.27E+00	s				Er-167m	2.28E+00	s	Er-167m	2.27E+00	s				ICRP-38	2.28E+00	s
Er-169	Er-169	9.40E+00	d	Er-169	9.30E+00	d	Er-169	9.30E+00	d	Er-169	9.40E+00	d				ICRP-38	9.30E+00	d
Er-171	Er-171	7.52E+00	h	Er-171	7.52E+00	h	Er-171	7.52E+00	h	Er-171	7.52E+00	h				ICRP-38	7.52E+00	h
Er-172	Er-172	4.93E+01	h	Er-172	4.93E+01	h	Er-172	4.93E+01	h	Er-172	4.93E+01	h				ICRP-38	4.93E+01	h
Er-173	Er-173	1.43E+00	m							Er-173	1.43E+00	m				ICRP-107	1.43E+00	m
Es-249	Es-249	1.02E+02	m							Es-249	1.02E+02	m	Es-249	1.02E+02	m	ICRP-107	1.02E+02	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Es-250	Es-250	8.60E+00	h	Es-250	2.10E+00	h	Es-250	2.10E+00	h	Es-250	8.60E+00	h				ICRP-38	2.10E+00	h
Es-250m	Es-250m	2.22E+00	h							Es-250m	2.22E+00	h				ICRP-107	2.22E+00	h
Es-251	Es-251	3.30E+01	h	Es-251	3.30E+01	h	Es-251	3.30E+01	h	Es-251	3.30E+01	h				ICRP-38	3.30E+01	h
Es-253	Es-253	2.05E+01	d	Es-253	2.05E+01	d	Es-253	2.05E+01	d	Es-253	2.05E+01	d				ICRP-38	2.05E+01	d
Es-254	Es-254	2.76E+02	d	Es-254	2.76E+02	d	Es-254	2.76E+02	d	Es-254	2.76E+02	d				ICRP-38	2.76E+02	d
Es-254m	Es-254m	3.93E+01	h	Es-254m	3.93E+01	h	Es-254m	3.93E+01	h	Es-254m	3.93E+01	h				ICRP-38	3.93E+01	h
Es-255	Es-255	3.98E+01	d							Es-255	3.98E+01	d	Es-255	3.98E+01	d	ICRP-107	3.98E+01	d
Es-256	Es-256	2.54E+01	m							Es-256	2.54E+01	m	Es-256	2.54E+01	m	ICRP-107	2.54E+01	m
Eu-142	Eu-142	2.34E+00	s							Eu-142	2.34E+00	s				ICRP-107	2.34E+00	s
Eu-142m	Eu-142m	1.22E+00	m							Eu-142m	1.22E+00	m				ICRP-107	1.22E+00	m
Eu-143	Eu-143	2.59E+00	m							Eu-143	2.59E+00	m	Eu-143	2.59E+00	m	ICRP-107	2.59E+00	m
Eu-144	Eu-144	1.02E+01	s							Eu-144	1.02E+01	s				ICRP-107	1.02E+01	s
Eu-145	Eu-145	5.93E+00	d	Eu-145	5.94E+00	d	Eu-145	5.94E+00	d	Eu-145	5.93E+00	d				ICRP-38	5.94E+00	d
Eu-146	Eu-146	4.61E+00	d	Eu-146	4.61E+00	d	Eu-146	4.61E+00	d	Eu-146	4.61E+00	d				ICRP-38	4.61E+00	d
Eu-147	Eu-147	2.41E+01	d	Eu-147	2.40E+01	d	Eu-147	2.40E+01	d	Eu-147	2.41E+01	d				ICRP-38	2.40E+01	d
Eu-148	Eu-148	5.45E+01	d	Eu-148	5.45E+01	d	Eu-148	5.45E+01	d	Eu-148	5.45E+01	d				ICRP-38	5.45E+01	d
Eu-149	Eu-149	9.31E+01	d	Eu-149	9.31E+01	d	Eu-149	9.31E+01	d	Eu-149	9.31E+01	d				ICRP-38	9.31E+01	d
Eu-150l	Eu-150	3.69E+01	y	Eu-150b	3.42E+01	y	Eu-150b	3.42E+01	y	Eu-150	3.69E+01	y				ICRP-38	3.42E+01	y
Eu-150s	Eu-150m	1.28E+01	h	Eu-150a	1.26E+01	h	Eu-150a	1.26E+01	h	Eu-150m	1.28E+01	h				ICRP-38	1.26E+01	h
Eu-152	Eu-152	1.35E+01	y	Eu-152	1.33E+01	y	Eu-152	1.33E+01	y	Eu-152	1.35E+01	y				ICRP-38	1.33E+01	y
Eu-152ml	Eu-152m	9.31E+00	h	Eu-152m	9.32E+00	h	Eu-152m	9.32E+00	h	Eu-152m	9.31E+00	h				ICRP-38	9.32E+00	h
Eu-152ms	Eu-152n	9.60E+01	m							Eu-152n	9.60E+01	m	Eu-152n	9.60E+01	m	ICRP-107	9.60E+01	m
Eu-154	Eu-154	8.59E+00	y	Eu-154	8.80E+00	y	Eu-154	8.80E+00	y	Eu-154	8.59E+00	y				ICRP-38	8.80E+00	y
Eu-154m	Eu-154m	4.60E+01	m							Eu-154m	4.60E+01	m	Eu-154m	4.60E+01	m	ICRP-107	4.60E+01	m
Eu-155	Eu-155	4.76E+00	y	Eu-155	4.96E+00	y	Eu-155	4.96E+00	y	Eu-155	4.76E+00	y				ICRP-38	4.96E+00	y
Eu-156	Eu-156	1.52E+01	d	Eu-156	1.52E+01	d	Eu-156	1.52E+01	d	Eu-156	1.52E+01	d				ICRP-38	1.52E+01	d
Eu-157	Eu-157	1.52E+01	h	Eu-157	1.52E+01	h	Eu-157	1.52E+01	h	Eu-157	1.52E+01	h				ICRP-38	1.52E+01	h
Eu-158	Eu-158	4.59E+01	m	Eu-158	4.59E+01	m	Eu-158	4.59E+01	m	Eu-158	4.59E+01	m				ICRP-38	4.59E+01	m
Eu-159	Eu-159	1.81E+01	m							Eu-159	1.81E+01	m	Eu-159	1.81E+01	m	ICRP-107	1.81E+01	m
F-17	F-17	6.45E+01	s							F-17	6.45E+01	s				ICRP-107	6.45E+01	s
F-18	F-18	1.10E+02	m	F-18	1.10E+02	m	F-18	1.10E+02	m	F-18	1.10E+02	m				ICRP-38	1.10E+02	m
Fe-52	Fe-52	8.28E+00	h	Fe-52	8.28E+00	h	Fe-52	8.28E+00	h	Fe-52	8.28E+00	h				ICRP-38	8.28E+00	h
Fe-53	Fe-53	8.51E+00	m							Fe-53	8.51E+00	m	Fe-53	8.51E+00	m	ICRP-107	8.51E+00	m
Fe-53m	Fe-53m	2.53E+00	m							Fe-53m	2.53E+00	m				ICRP-107	2.53E+00	m
Fe-55	Fe-55	2.74E+00	y	Fe-55	2.70E+00	y	Fe-55	2.70E+00	y	Fe-55	2.74E+00	y				ICRP-38	2.70E+00	y
Fe-59	Fe-59	4.45E+01	d	Fe-59	4.45E+01	d	Fe-59	4.45E+01	d	Fe-59	4.45E+01	d				ICRP-38	4.45E+01	d
Fe-60	Fe-60	1.50E+06	y	Fe-60	1.00E+05	y	Fe-60	1.00E+05	y	Fe-60	1.50E+06	y				ICRP-38	1.00E+05	y
Fe-61	Fe-61	5.98E+00	m							Fe-61	5.98E+00	m				ICRP-107	5.98E+00	m
Fe-62	Fe-62	6.80E+01	s							Fe-62	6.80E+01	s				ICRP-107	6.80E+01	s
Fm-251	Fm-251	5.30E+00	h							Fm-251	5.30E+00	h	Fm-251	5.30E+00	h	ICRP-107	5.30E+00	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Fm-252	Fm-252	2.54E+01	h	Fm-252	2.27E+01	h	Fm-252	2.27E+01	h	Fm-252	2.54E+01	h				ICRP-38	2.27E+01	h
Fm-253	Fm-253	3.00E+00	d	Fm-253	3.00E+00	d	Fm-253	3.00E+00	d	Fm-253	3.00E+00	d				ICRP-38	3.00E+00	d
Fm-254	Fm-254	3.24E+00	h	Fm-254	3.24E+00	h	Fm-254	3.24E+00	h	Fm-254	3.24E+00	h				ICRP-38	3.24E+00	h
Fm-255	Fm-255	2.01E+01	h	Fm-255	2.01E+01	h	Fm-255	2.01E+01	h	Fm-255	2.01E+01	h				ICRP-38	2.01E+01	h
Fm-256	Fm-256	1.58E+02	m							Fm-256	1.58E+02	m	Fm-256	1.58E+02	m	ICRP-107	1.58E+02	m
Fm-257	Fm-257	1.01E+02	d	Fm-257	1.01E+02	d	Fm-257	1.01E+02	d	Fm-257	1.01E+02	d				ICRP-38	1.01E+02	d
Fr-212	Fr-212	2.00E+01	m							Fr-212	2.00E+01	m	Fr-212	2.00E+01	m	ICRP-107	2.00E+01	m
Fr-219	Fr-219	2.00E-02	s	Fr-219	2.10E+01	ms	Fr-219	2.10E+01	ms	Fr-219	2.00E-02	s				ICRP-38	2.10E+01	ms
Fr-220	Fr-220	2.74E+01	s	Fr-220	2.74E+01	s	Fr-220	2.74E+01	s	Fr-220	2.74E+01	s				ICRP-38	2.74E+01	s
Fr-221	Fr-221	4.90E+00	m	Fr-221	4.80E+00	m	Fr-221	4.80E+00	m	Fr-221	4.90E+00	m	Fr-221	4.90E+00	m	ICRP-38	4.80E+00	m
Fr-222	Fr-222	1.42E+01	m	Fr-222	1.44E+01	m	Fr-222	1.44E+01	m	Fr-222	1.42E+01	m				ICRP-38	1.44E+01	m
Fr-223	Fr-223	2.20E+01	m	Fr-223	2.18E+01	m	Fr-223	2.18E+01	m	Fr-223	2.20E+01	m				ICRP-38	2.18E+01	m
Fr-224	Fr-224	3.33E+00	m							Fr-224	3.33E+00	m				ICRP-107	3.33E+00	m
Fr-227	Fr-227	2.47E+00	m							Fr-227	2.47E+00	m				ICRP-107	2.47E+00	m
Ga-64	Ga-64	2.63E+00	m							Ga-64	2.63E+00	m				ICRP-107	2.63E+00	m
Ga-65	Ga-65	1.52E+01	m	Ga-65	1.52E+01	m	Ga-65	1.52E+01	m	Ga-65	1.52E+01	m				ICRP-38	1.52E+01	m
Ga-66	Ga-66	9.49E+00	h	Ga-66	9.40E+00	h	Ga-66	9.40E+00	h	Ga-66	9.49E+00	h				ICRP-38	9.40E+00	h
Ga-67	Ga-67	3.26E+00	d	Ga-67	7.83E+01	h	Ga-67	7.83E+01	h	Ga-67	3.26E+00	d				ICRP-38	7.83E+01	h
Ga-68	Ga-68	6.77E+01	m	Ga-68	6.80E+01	m	Ga-68	6.80E+01	m	Ga-68	6.77E+01	m				ICRP-38	6.80E+01	m
Ga-70	Ga-70	2.11E+01	m	Ga-70	2.12E+01	m	Ga-70	2.12E+01	m	Ga-70	2.11E+01	m				ICRP-38	2.12E+01	m
Ga-72	Ga-72	1.41E+01	h	Ga-72	1.41E+01	h	Ga-72	1.41E+01	h	Ga-72	1.41E+01	h				ICRP-38	1.41E+01	h
Ga-73	Ga-73	4.86E+00	h	Ga-73	4.91E+00	h	Ga-73	4.91E+00	h	Ga-73	4.86E+00	h				ICRP-38	4.91E+00	h
Ga-74	Ga-74	8.12E+00	m							Ga-74	8.12E+00	m				ICRP-107	8.12E+00	m
Gd-142	Gd-142	7.02E+01	s							Gd-142	7.02E+01	s				ICRP-107	7.02E+01	s
Gd-143m	Gd-143m	1.10E+02	s							Gd-143m	1.10E+02	s				ICRP-107	1.10E+02	s
Gd-144	Gd-144	4.47E+00	m							Gd-144	4.47E+00	m				ICRP-107	4.47E+00	m
Gd-145	Gd-145	2.30E+01	m	Gd-145	2.29E+01	m	Gd-145	2.29E+01	m	Gd-145	2.30E+01	m				ICRP-38	2.29E+01	m
Gd-145m	Gd-145m	8.50E+01	s							Gd-145m	8.50E+01	s	Gd-145m	1.42E+00	m	ICRP-107	8.50E+01	s
Gd-146	Gd-146	4.83E+01	d	Gd-146	4.83E+01	d	Gd-146	4.83E+01	d	Gd-146	4.83E+01	d				ICRP-38	4.83E+01	d
Gd-147	Gd-147	3.81E+01	h	Gd-147	3.81E+01	h	Gd-147	3.81E+01	h	Gd-147	3.81E+01	h				ICRP-38	3.81E+01	h
Gd-148	Gd-148	7.46E+01	y	Gd-148	9.30E+01	y	Gd-148	9.30E+01	y	Gd-148	7.46E+01	y				ICRP-38	9.30E+01	y
Gd-149	Gd-149	9.28E+00	d	Gd-149	9.40E+00	d	Gd-149	9.40E+00	d	Gd-149	9.28E+00	d				ICRP-38	9.40E+00	d
Gd-150	Gd-150	1.79E+06	y							Gd-150	1.79E+06	y	Gd-150	1.79E+06	y	ICRP-107	1.79E+06	y
Gd-151	Gd-151	1.24E+02	d	Gd-151	1.20E+02	d	Gd-151	1.20E+02	d	Gd-151	1.24E+02	d				ICRP-38	1.20E+02	d
Gd-152	Gd-152	1.08E+14	y	Gd-152	1.08E+14	y	Gd-152	1.08E+14	y	Gd-152	1.08E+14	y				ICRP-38	1.08E+14	y
Gd-153	Gd-153	2.40E+02	d	Gd-153	2.42E+02	d	Gd-153	2.42E+02	d	Gd-153	2.40E+02	d				ICRP-38	2.42E+02	d
Gd-159	Gd-159	1.85E+01	h	Gd-159	1.86E+01	h	Gd-159	1.86E+01	h	Gd-159	1.85E+01	h				ICRP-38	1.86E+01	h
Gd-162	Gd-162	8.40E+00	m							Gd-162	8.40E+00	m				ICRP-107	8.40E+00	m
Ge-66	Ge-66	2.26E+00	h	Ge-66	2.27E+00	h	Ge-66	2.27E+00	h	Ge-66	2.26E+00	h				ICRP-38	2.27E+00	h
Ge-67	Ge-67	1.89E+01	m	Ge-67	1.87E+01	m	Ge-67	1.87E+01	m	Ge-67	1.89E+01	m				ICRP-38	1.87E+01	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Ge-68	Ge-68	2.71E+02	d	Ge-68	2.88E+02	d	Ge-68	2.88E+02	d	Ge-68	2.71E+02	d				ICRP-38	2.88E+02	d
Ge-69	Ge-69	3.91E+01	h	Ge-69	3.91E+01	h	Ge-69	3.91E+01	h	Ge-69	3.91E+01	h				ICRP-38	3.91E+01	h
Ge-71	Ge-71	1.14E+01	d	Ge-71	1.18E+01	d	Ge-71	1.18E+01	d	Ge-71	1.14E+01	d				ICRP-38	1.18E+01	d
Ge-75	Ge-75	8.28E+01	m	Ge-75	8.28E+01	m	Ge-75	8.28E+01	m	Ge-75	8.28E+01	m				ICRP-38	8.28E+01	m
Ge-77	Ge-77	1.13E+01	h	Ge-77	1.13E+01	h	Ge-77	1.13E+01	h	Ge-77	1.13E+01	h				ICRP-38	1.13E+01	h
Ge-78	Ge-78	8.80E+01	m	Ge-78	8.70E+01	m	Ge-78	8.70E+01	m	Ge-78	8.80E+01	m				ICRP-38	8.70E+01	m
H-3	H-3	1.23E+01	y	H-3	1.24E+01	y	H-3	1.24E+01	y	H-3	1.23E+01	y				ICRP-38	1.24E+01	y
Hf-167	Hf-167	2.05E+00	m							Hf-167	2.05E+00	m	Hf-167	2.05E+00	m	ICRP-107	2.05E+00	m
Hf-169	Hf-169	3.24E+00	m							Hf-169	3.24E+00	m	Hf-169	3.24E+00	m	ICRP-107	3.24E+00	m
Hf-170	Hf-170	1.60E+01	h	Hf-170	1.60E+01	h	Hf-170	1.60E+01	h	Hf-170	1.60E+01	h				ICRP-38	1.60E+01	h
Hf-172	Hf-172	1.87E+00	y	Hf-172	1.87E+00	y	Hf-172	1.87E+00	y	Hf-172	1.87E+00	y				ICRP-38	1.87E+00	y
Hf-173	Hf-173	2.36E+01	h	Hf-173	2.40E+01	h	Hf-173	2.40E+01	h	Hf-173	2.36E+01	h				ICRP-38	2.40E+01	h
Hf-174	Hf-174	2.00E+15	y							Hf-174	2.00E+15	y	Hf-174	2.00E+15	y	ICRP-107	2.00E+15	y
Hf-175	Hf-175	7.00E+01	d	Hf-175	7.00E+01	d	Hf-175	7.00E+01	d	Hf-175	7.00E+01	d				ICRP-38	7.00E+01	d
Hf-177m	Hf-177m	5.14E+01	m	Hf-177m	5.14E+01	m	Hf-177m	5.14E+01	m	Hf-177m	5.14E+01	m				ICRP-38	5.14E+01	m
Hf-178m	Hf-178m	3.10E+01	y	Hf-178m	3.10E+01	y	Hf-178m	3.10E+01	y	Hf-178m	3.10E+01	y				ICRP-38	3.10E+01	y
Hf-179m	Hf-179m	2.51E+01	d	Hf-179m	2.51E+01	d	Hf-179m	2.51E+01	d	Hf-179m	2.51E+01	d				ICRP-38	2.51E+01	d
Hf-180m	Hf-180m	5.50E+00	h	Hf-180m	5.50E+00	h	Hf-180m	5.50E+00	h	Hf-180m	5.50E+00	h				ICRP-38	5.50E+00	h
Hf-181	Hf-181	4.24E+01	d	Hf-181	4.24E+01	d	Hf-181	4.24E+01	d	Hf-181	4.24E+01	d				ICRP-38	4.24E+01	d
Hf-182	Hf-182	9.00E+06	y	Hf-182	9.00E+06	y	Hf-182	9.00E+06	y	Hf-182	9.00E+06	y				ICRP-38	9.00E+06	y
Hf-182m	Hf-182m	6.15E+01	m	Hf-182m	6.15E+01	m	Hf-182m	6.15E+01	m	Hf-182m	6.15E+01	m				ICRP-38	6.15E+01	m
Hf-183	Hf-183	1.07E+00	h	Hf-183	6.40E+01	m	Hf-183	6.40E+01	m	Hf-183	1.07E+00	h				ICRP-38	6.40E+01	m
Hf-184	Hf-184	4.12E+00	h	Hf-184	4.12E+00	h	Hf-184	4.12E+00	h	Hf-184	4.12E+00	h				ICRP-38	4.12E+00	h
Hg-187													Hg-187	2.20E+00	m	JAERI	2.20E+00	m
Hg-187m													Hg-187m	2.40E+00	m	JAERI	2.40E+00	m
Hg-188													Hg-188	3.25E+00	m	JAERI	3.25E+00	m
Hg-190	Hg-190	2.00E+01	m							Hg-190	2.00E+01	m	Hg-190	2.00E+01	m	ICRP-107	2.00E+01	m
Hg-191m	Hg-191m	5.08E+01	m							Hg-191m	5.08E+01	m	Hg-191m	5.08E+01	m	ICRP-107	5.08E+01	m
Hg-192	Hg-192	4.85E+00	h							Hg-192	4.85E+00	h	Hg-192	4.85E+00	h	ICRP-107	4.85E+00	h
Hg-193	Hg-193	3.80E+00	h	Hg-193	3.50E+00	h	Hg-193	3.50E+00	h	Hg-193	3.80E+00	h				ICRP-38	3.50E+00	h
Hg-193m	Hg-193m	1.18E+01	h	Hg-193m	1.11E+01	h	Hg-193m	1.11E+01	h	Hg-193m	1.18E+01	h				ICRP-38	1.11E+01	h
Hg-194	Hg-194	4.40E+02	y	Hg-194	2.60E+02	y	Hg-194	2.60E+02	y	Hg-194	4.40E+02	y				ICRP-38	2.60E+02	y
Hg-195	Hg-195	1.05E+01	h	Hg-195	9.90E+00	h	Hg-195	9.90E+00	h	Hg-195	1.05E+01	h				ICRP-38	9.90E+00	h
Hg-195m	Hg-195m	4.16E+01	h	Hg-195m	4.16E+01	h	Hg-195m	4.16E+01	h	Hg-195m	4.16E+01	h				ICRP-38	4.16E+01	h
Hg-197	Hg-197	6.49E+01	h	Hg-197	6.41E+01	h	Hg-197	6.41E+01	h	Hg-197	6.49E+01	h				ICRP-38	6.41E+01	h
Hg-197m	Hg-197m	2.38E+01	h	Hg-197m	2.38E+01	h	Hg-197m	2.38E+01	h	Hg-197m	2.38E+01	h				ICRP-38	2.38E+01	h
Hg-199m	Hg-199m	4.27E+01	m	Hg-199m	4.26E+01	m	Hg-199m	4.26E+01	m	Hg-199m	4.27E+01	m				ICRP-38	4.26E+01	m
Hg-203	Hg-203	4.66E+01	d	Hg-203	4.66E+01	d	Hg-203	4.66E+01	d	Hg-203	4.66E+01	d				ICRP-38	4.66E+01	d
Hg-205	Hg-205	5.20E+00	m							Hg-205	5.20E+00	m	Hg-205	5.20E+00	m	ICRP-107	5.20E+00	m
Hg-206	Hg-206	8.15E+00	m				Hg-206	8.15E+00	m	Hg-206	8.15E+00	m	Hg-206	8.15E+00	m	ICRP-38	8.15E+00	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
Hg-207	Hg-207	2.90E+00	m							Hg-207	2.90E+00	m				ICRP-107	2.90E+00	m
Ho-150	Ho-150	7.68E+01	s							Ho-150	7.68E+01	s				ICRP-107	7.68E+01	s
Ho-152													Ho-152	2.70E+00	m	JAERI	2.70E+00	m
Ho-153	Ho-153	2.01E+00	m							Ho-153	2.01E+00	m	Ho-153	2.02E+00	m	ICRP-107	2.01E+00	m
Ho-153m	Ho-153m	9.30E+00	m							Ho-153m	9.30E+00	m	Ho-153m	9.30E+00	m	ICRP-107	9.30E+00	m
Ho-154	Ho-154	1.18E+01	m							Ho-154	1.18E+01	m	Ho-154	1.18E+01	m	ICRP-107	1.18E+01	m
Ho-154m	Ho-154m	3.10E+00	m							Ho-154m	3.10E+00	m	Ho-154m	3.10E+00	m	ICRP-107	3.10E+00	m
Ho-155	Ho-155	4.80E+01	m	Ho-155	4.80E+01	m	Ho-155	4.80E+01	m	Ho-155	4.80E+01	m				ICRP-38	4.80E+01	m
Ho-156	Ho-156	5.60E+01	m							Ho-156	5.60E+01	m	Ho-156	5.60E+01	m	ICRP-107	5.60E+01	m
Ho-157	Ho-157	1.26E+01	m	Ho-157	1.26E+01	m	Ho-157	1.26E+01	m	Ho-157	1.26E+01	m				ICRP-38	1.26E+01	m
Ho-158													Ho-158	1.13E+01	m	JAERI	1.13E+01	m
Ho-159	Ho-159	3.31E+01	m	Ho-159	3.30E+01	m	Ho-159	3.30E+01	m	Ho-159	3.31E+01	m				ICRP-38	3.30E+01	m
Ho-160	Ho-160	2.56E+01	m							Ho-160	2.56E+01	m	Ho-160	2.56E+01	m	ICRP-107	2.56E+01	m
Ho-161	Ho-161	2.48E+00	h	Ho-161	2.50E+00	h	Ho-161	2.50E+00	h	Ho-161	2.48E+00	h				ICRP-38	2.50E+00	h
Ho-162	Ho-162	1.50E+01	m	Ho-162	1.50E+01	m	Ho-162	1.50E+01	m	Ho-162	1.50E+01	m				ICRP-38	1.50E+01	m
Ho-162m	Ho-162m	6.70E+01	m	Ho-162m	6.80E+01	m	Ho-162m	6.80E+01	m	Ho-162m	6.70E+01	m				ICRP-38	6.80E+01	m
Ho-163	Ho-163	4.57E+03	y							Ho-163	4.57E+03	y	Ho-163	4.57E+03	y	ICRP-107	4.57E+03	y
Ho-164	Ho-164	2.90E+01	m	Ho-164	2.90E+01	m	Ho-164	2.90E+01	m	Ho-164	2.90E+01	m				ICRP-38	2.90E+01	m
Ho-164m	Ho-164m	3.80E+01	m	Ho-164m	3.75E+01	m	Ho-164m	3.75E+01	m	Ho-164m	3.80E+01	m				ICRP-38	3.75E+01	m
Ho-166	Ho-166	2.68E+01	h	Ho-166	2.68E+01	h	Ho-166	2.68E+01	h	Ho-166	2.68E+01	h				ICRP-38	2.68E+01	h
Ho-166m	Ho-166m	1.20E+03	y	Ho-166m	1.20E+03	y	Ho-166m	1.20E+03	y	Ho-166m	1.20E+03	y				ICRP-38	1.20E+03	y
Ho-167	Ho-167	3.10E+00	h	Ho-167	3.10E+00	h	Ho-167	3.10E+00	h	Ho-167	3.10E+00	h				ICRP-38	3.10E+00	h
Ho-168	Ho-168	2.99E+00	m							Ho-168	2.99E+00	m	Ho-168	2.99E+00	m	ICRP-107	2.99E+00	m
Ho-168m	Ho-168m	1.32E+02	s							Ho-168m	1.32E+02	s	Ho-168m	2.20E+00	m	ICRP-107	1.32E+02	s
Ho-170	Ho-170	2.76E+00	m							Ho-170	2.76E+00	m	Ho-170	2.76E+00	m	ICRP-107	2.76E+00	m
I-118	I-118	1.37E+01	m							I-118	1.37E+01	m	I-118	1.37E+01	m	ICRP-107	1.37E+01	m
I-118m	I-118m	8.50E+00	m							I-118m	8.50E+00	m				ICRP-107	8.50E+00	m
I-119	I-119	1.91E+01	m							I-119	1.91E+01	m	I-119	1.91E+01	m	ICRP-107	1.91E+01	m
I-120	I-120	8.16E+01	m	I-120	8.10E+01	m	I-120	8.10E+01	m	I-120	8.16E+01	m				ICRP-38	8.10E+01	m
I-120m	I-120m	5.30E+01	m	I-120m	5.30E+01	m	I-120m	5.30E+01	m	I-120m	5.30E+01	m				ICRP-38	5.30E+01	m
I-121	I-121	2.12E+00	h	I-121	2.12E+00	h	I-121	2.12E+00	h	I-121	2.12E+00	h				ICRP-38	2.12E+00	h
I-122	I-122	3.63E+00	m	I-122	3.62E+00	m	I-122	3.62E+00	m	I-122	3.63E+00	m	I-122	3.63E+00	m	ICRP-38	3.62E+00	m
I-123	I-123	1.33E+01	h	I-123	1.32E+01	h	I-123	1.32E+01	h	I-123	1.33E+01	h				ICRP-38	1.32E+01	h
I-124	I-124	4.18E+00	d	I-124	4.18E+00	d	I-124	4.18E+00	d	I-124	4.18E+00	d				ICRP-38	4.18E+00	d
I-125	I-125	5.94E+01	d	I-125	6.01E+01	d	I-125	6.01E+01	d	I-125	5.94E+01	d				ICRP-38	6.01E+01	d
I-126	I-126	1.29E+01	d	I-126	1.30E+01	d	I-126	1.30E+01	d	I-126	1.29E+01	d				ICRP-38	1.30E+01	d
I-128	I-128	2.50E+01	m	I-128	2.50E+01	m	I-128	2.50E+01	m	I-128	2.50E+01	m				ICRP-38	2.50E+01	m
I-129	I-129	1.57E+07	y	I-129	1.57E+07	y	I-129	1.57E+07	y	I-129	1.57E+07	y				ICRP-38	1.57E+07	y
I-130	I-130	1.24E+01	h	I-130	1.24E+01	h	I-130	1.24E+01	h	I-130	1.24E+01	h				ICRP-38	1.24E+01	h
I-130m	I-130m	8.84E+00	m							I-130m	8.84E+00	m				ICRP-107	8.84E+00	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
I-131	I-131	8.02E+00	d	I-131	8.04E+00	d	I-131	8.04E+00	d	I-131	8.02E+00	d				ICRP-38	8.04E+00	d
I-132	I-132	2.30E+00	h	I-132	2.30E+00	h	I-132	2.30E+00	h	I-132	2.30E+00	h				ICRP-38	2.30E+00	h
I-132m	I-132m	1.39E+00	h	I-132m	8.36E+01	m	I-132m	8.36E+01	m	I-132m	1.39E+00	h				ICRP-38	8.36E+01	m
I-133	I-133	2.08E+01	h	I-133	2.08E+01	h	I-133	2.08E+01	h	I-133	2.08E+01	h				ICRP-38	2.08E+01	h
I-134	I-134	5.25E+01	m	I-134	5.26E+01	m	I-134	5.26E+01	m	I-134	5.25E+01	m				ICRP-38	5.26E+01	m
I-134m	I-134m	3.60E+00	m							I-134m	3.60E+00	m				ICRP-107	3.60E+00	m
I-135	I-135	6.57E+00	h	I-135	6.61E+00	h	I-135	6.61E+00	h	I-135	6.57E+00	h				ICRP-38	6.61E+00	h
In-103	In-103	6.00E+01	s							In-103	6.00E+01	s				ICRP-107	6.00E+01	s
In-105	In-105	5.07E+00	m							In-105	5.07E+00	m				ICRP-107	5.07E+00	m
In-106	In-106	6.20E+00	m							In-106	6.20E+00	m				ICRP-107	6.20E+00	m
In-106m	In-106m	5.20E+00	m							In-106m	5.20E+00	m				ICRP-107	5.20E+00	m
In-107	In-107	3.24E+01	m							In-107	3.24E+01	m	In-107	3.24E+01	m	ICRP-107	3.24E+01	m
In-108	In-108	5.80E+01	m							In-108	5.80E+01	m	In-108	5.80E+01	m	ICRP-107	5.80E+01	m
In-108m	In-108m	3.96E+01	m							In-108m	3.96E+01	m	In-108m	3.96E+01	m	ICRP-107	3.96E+01	m
In-109	In-109	4.20E+00	h	In-109	4.20E+00	h	In-109	4.20E+00	h	In-109	4.20E+00	h				ICRP-38	4.20E+00	h
In-109m	In-109m	1.34E+00	m							In-109m	1.34E+00	m	In-109m	1.34E+00	m	ICRP-107	1.34E+00	m
In-110l	In-110	4.90E+00	h	In-110b	4.90E+00	h	In-110b	4.90E+00	h	In-110	4.90E+00	h				ICRP-38	4.90E+00	h
In-110s	In-110m	6.91E+01	m	In-110a	6.91E+01	m	In-110a	6.91E+01	m	In-110m	6.91E+01	m				ICRP-38	6.91E+01	m
In-111	In-111	2.80E+00	d	In-111	2.83E+00	d	In-111	2.83E+00	d	In-111	2.80E+00	d				ICRP-38	2.83E+00	d
In-111m	In-111m	7.70E+00	m				In-111m	7.70E+00	m	In-111m	7.70E+00	m	In-111m	7.70E+00	m	ICRP-38	7.70E+00	m
In-112	In-112	1.50E+01	m	In-112	1.44E+01	m	In-112	1.44E+01	m	In-112	1.50E+01	m				ICRP-38	1.44E+01	m
In-112m	In-112m	2.06E+01	m							In-112m	2.06E+01	m	In-112m	2.06E+01	m	ICRP-107	2.06E+01	m
In-113m	In-113m	1.66E+00	h	In-113m	1.66E+00	h	In-113m	1.66E+00	h	In-113m	1.66E+00	h				ICRP-38	1.66E+00	h
In-114	In-114	7.19E+01	s	In-114	7.19E+01	s	In-114	7.19E+01	s	In-114	7.19E+01	s	In-114	1.20E+00	m	ICRP-38	7.19E+01	s
In-114m	In-114m	4.95E+01	d	In-114m	4.95E+01	d	In-114m	4.95E+01	d	In-114m	4.95E+01	d				ICRP-38	4.95E+01	d
In-115	In-115	4.41E+14	y	In-115	5.10E+15	y	In-115	5.10E+15	y	In-115	4.41E+14	y				ICRP-38	5.10E+15	y
In-115m	In-115m	4.49E+00	h	In-115m	4.49E+00	h	In-115m	4.49E+00	h	In-115m	4.49E+00	h				ICRP-38	4.49E+00	h
In-116m	In-116m	5.44E+01	m	In-116m	5.42E+01	m	In-116m	5.42E+01	m	In-116m	5.44E+01	m				ICRP-38	5.42E+01	m
In-117	In-117	4.32E+01	m	In-117	4.38E+01	m	In-117	4.38E+01	m	In-117	4.32E+01	m				ICRP-38	4.38E+01	m
In-117m	In-117m	1.16E+02	m	In-117m	1.17E+02	m	In-117m	1.17E+02	m	In-117m	1.16E+02	m				ICRP-38	1.17E+02	m
In-118	In-118	5.00E+00	s							In-118	5.00E+00	s				ICRP-107	5.00E+00	s
In-118m	In-118m	4.36E+00	m							In-118m	4.36E+00	m	In-118m	4.36E+00	m	ICRP-107	4.36E+00	m
In-119	In-119	2.40E+00	M	In-119	2.40E+00	m	In-119	2.40E+00	m	In-119	2.40E+00	m	In-119	2.40E+00	m	ICRP-38	2.40E+00	m
In-119m	In-119m	1.80E+01	m	In-119m	1.80E+01	m	In-119m	1.80E+01	m	In-119m	1.80E+01	m				ICRP-38	1.80E+01	m
In-121	In-121	2.31E+01	S							In-121	2.31E+01	s				ICRP-107	2.31E+01	s
In-121m	In-121m	3.88E+00	M							In-121m	3.88E+00	m				ICRP-107	3.88E+00	m
Ir-179													Ir-179	1.32E+00	m	JAERI	1.32E+00	m
Ir-180	Ir-180	1.50E+00	m							Ir-180	1.50E+00	m	Ir-180	1.50E+00	m	ICRP-107	1.50E+00	m
Ir-181													Ir-181	4.90E+00	m	JAERI	4.90E+00	m
Ir-182	Ir-182	1.50E+01	m	Ir-182	1.50E+01	m	Ir-182	1.50E+01	m	Ir-182	1.50E+01	m				ICRP-38	1.50E+01	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Ir-183	Ir-183	5.80E+01	m							Ir-183	5.80E+01	m	Ir-183	5.80E+01	m	ICRP-107	5.80E+01	m
Ir-184	Ir-184	3.09E+00	h	Ir-184	3.02E+00	h	Ir-184	3.02E+00	h	Ir-184	3.09E+00	h				ICRP-38	3.02E+00	h
Ir-185	Ir-185	1.44E+01	h	Ir-185	1.40E+01	h	Ir-185	1.40E+01	h	Ir-185	1.44E+01	h				ICRP-38	1.40E+01	h
Ir-186l	Ir-186	1.66E+01	h	Ir-186a	1.58E+01	h	Ir-186a	1.58E+01	h	Ir-186	1.66E+01	h				ICRP-38	1.58E+01	h
Ir-186s	Ir-186m	1.92E+00	h	Ir-186b	1.75E+00	h	Ir-186b	1.75E+00	h	Ir-186m	1.92E+00	h				ICRP-38	1.75E+00	h
Ir-187	Ir-187	1.05E+01	h	Ir-187	1.05E+01	h	Ir-187	1.05E+01	h	Ir-187	1.05E+01	h				ICRP-38	1.05E+01	h
Ir-188	Ir-188	4.15E+01	h	Ir-188	4.15E+01	h	Ir-188	4.15E+01	h	Ir-188	4.15E+01	h				ICRP-38	4.15E+01	h
Ir-189	Ir-189	1.32E+01	d	Ir-189	1.33E+01	d	Ir-189	1.33E+01	d	Ir-189	1.32E+01	d				ICRP-38	1.33E+01	d
Ir-190	Ir-190	1.18E+01	d	Ir-190	1.21E+01	d	Ir-190	1.21E+01	d	Ir-190	1.18E+01	d				ICRP-38	1.21E+01	d
Ir-190ms	Ir-190m	1.12E+00	h	Ir-190m	1.20E+00	h	Ir-190m	1.20E+00	h	Ir-190m	1.12E+00	h				ICRP-38	1.20E+00	h
Ir-190ml	Ir-190n	3.09E+00	h	Ir-190n	3.10E+00	h	Ir-190n	3.10E+00	h	Ir-190n	3.09E+00	h				ICRP-38	3.10E+00	h
Ir-191m	Ir-191m	4.94E+00	s	Ir-191m	4.94E+00	s	Ir-191m	4.94E+00	s	Ir-191m	4.94E+00	s				ICRP-38	4.94E+00	s
Ir-192	Ir-192	7.38E+01	d	Ir-192	7.40E+01	d	Ir-192	7.40E+01	d	Ir-192	7.38E+01	d				ICRP-38	7.40E+01	d
Ir-192ms	Ir-192m	1.45E+00	m							Ir-192m	1.45E+00	m				ICRP-107	1.45E+00	m
Ir-192ml	Ir-192n	2.41E+02	y	Ir-192m	2.41E+02	y	Ir-192m	2.41E+02	y	Ir-192n	2.41E+02	y				ICRP-38	2.41E+02	y
Ir-193m	Ir-193m	1.05E+01	d							Ir-193m	1.05E+01	d				ICRP-107	1.05E+01	d
Ir-194	Ir-194	1.93E+01	h	Ir-194	1.92E+01	h	Ir-194	1.92E+01	h	Ir-194	1.93E+01	h				ICRP-38	1.92E+01	h
Ir-194m	Ir-194m	1.71E+02	d	Ir-194m	1.71E+02	d	Ir-194m	1.71E+02	d	Ir-194m	1.71E+02	d				ICRP-38	1.71E+02	d
Ir-195	Ir-195	2.50E+00	h	Ir-195	2.50E+00	h	Ir-195	2.50E+00	h	Ir-195	2.50E+00	h				ICRP-38	2.50E+00	h
Ir-195m	Ir-195m	3.80E+00	h	Ir-195m	3.80E+00	h	Ir-195m	3.80E+00	h	Ir-195m	3.80E+00	h				ICRP-38	3.80E+00	h
Ir-196	Ir-196	5.20E+01	s							Ir-196	5.20E+01	s				ICRP-107	5.20E+01	s
Ir-196m	Ir-196m	1.40E+00	h							Ir-196m	1.40E+00	h	Ir-196m	1.40E+00	h	ICRP-107	1.40E+00	h
K-38	K-38	7.64E+00	m	K-38	7.64E+00	m	K-38	7.64E+00	m	K-38	7.64E+00	m	K-38	7.64E+00	m	ICRP-38	7.64E+00	m
K-40	K-40	1.25E+09	y	K-40	1.28E+09	y	K-40	1.28E+09	y	K-40	1.25E+09	y				ICRP-38	1.28E+09	y
K-42	K-42	1.24E+01	h	K-42	1.24E+01	h	K-42	1.24E+01	h	K-42	1.24E+01	h				ICRP-38	1.24E+01	h
K-43	K-43	2.23E+01	h	K-43	2.26E+01	h	K-43	2.26E+01	h	K-43	2.23E+01	h				ICRP-38	2.26E+01	h
K-44	K-44	2.21E+01	m	K-44	2.21E+01	m	K-44	2.21E+01	m	K-44	2.21E+01	m				ICRP-38	2.21E+01	m
K-45	K-45	1.73E+01	m	K-45	2.00E+01	m	K-45	2.00E+01	m	K-45	1.73E+01	m				ICRP-38	2.00E+01	m
K-46	K-46	1.05E+02	s							K-46	1.05E+02	s				ICRP-107	1.05E+02	s
Kr-74	Kr-74	1.15E+01	m	Kr-74	1.15E+01	m	Kr-74	1.15E+01	m	Kr-74	1.15E+01	m				ICRP-38	1.15E+01	m
Kr-75	Kr-75	4.29E+00	m							Kr-75	4.29E+00	m	Kr-75	4.29E+00	m	ICRP-107	4.29E+00	m
Kr-76	Kr-76	1.48E+01	h	Kr-76	1.48E+01	h	Kr-76	1.48E+01	h	Kr-76	1.48E+01	h				ICRP-38	1.48E+01	h
Kr-77	Kr-77	7.44E+01	m	Kr-77	7.47E+01	m	Kr-77	7.47E+01	m	Kr-77	7.44E+01	m				ICRP-38	7.47E+01	m
Kr-79	Kr-79	3.50E+01	h	Kr-79	3.50E+01	h	Kr-79	3.50E+01	h	Kr-79	3.50E+01	h				ICRP-38	3.50E+01	h
Kr-81	Kr-81	2.29E+05	y	Kr-81	2.10E+05	y	Kr-81	2.10E+05	y	Kr-81	2.29E+05	y				ICRP-38	2.10E+05	y
Kr-81m	Kr-81m	1.31E+01	s	Kr-81m	1.30E+01	s	Kr-81m	1.30E+01	s	Kr-81m	1.31E+01	s				ICRP-38	1.30E+01	s
Kr-83m	Kr-83m	1.83E+00	h	Kr-83m	1.83E+00	h	Kr-83m	1.83E+00	h	Kr-83m	1.83E+00	h				ICRP-38	1.83E+00	h
Kr-85	Kr-85	1.08E+01	y	Kr-85	1.07E+01	y	Kr-85	1.07E+01	y	Kr-85	1.08E+01	y				ICRP-38	1.07E+01	y
Kr-85m	Kr-85m	4.48E+00	h	Kr-85m	4.48E+00	h	Kr-85m	4.48E+00	h	Kr-85m	4.48E+00	h				ICRP-38	4.48E+00	h
Kr-87	Kr-87	7.63E+01	m	Kr-87	7.63E+01	m	Kr-87	7.63E+01	m	Kr-87	7.63E+01	m				ICRP-38	7.63E+01	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
Kr-88	Kr-88	2.84E+00	h	Kr-88	2.84E+00	h	Kr-88	2.84E+00	h	Kr-88	2.84E+00	h				ICRP-38	2.84E+00	h
Kr-89	Kr-89	3.15E+00	m							Kr-89	3.15E+00	m	Kr-89	3.15E+00	m	ICRP-107	3.15E+00	m
La-128	La-128	5.18E+00	m							La-128	5.18E+00	m				ICRP-107	5.18E+00	m
La-129	La-129	1.16E+01	m							La-129	1.16E+01	m	La-129	1.16E+01	m	ICRP-107	1.16E+01	m
La-130	La-130	8.70E+00	m							La-130	8.70E+00	m	La-130	8.70E+00	m	ICRP-107	8.70E+00	m
La-131	La-131	5.90E+01	m	La-131	5.90E+01	m	La-131	5.90E+01	m	La-131	5.90E+01	m				ICRP-38	5.90E+01	m
La-132	La-132	4.80E+00	h	La-132	4.80E+00	h	La-132	4.80E+00	h	La-132	4.80E+00	h				ICRP-38	4.80E+00	h
La-132m	La-132m	2.43E+01	m							La-132m	2.43E+01	m	La-132m	2.43E+01	m	ICRP-107	2.43E+01	m
La-133	La-133	3.91E+00	h							La-133	3.91E+00	h	La-133	3.91E+00	h	ICRP-107	3.91E+00	h
La-134	La-134	6.45E+00	m	La-134	6.67E+00	m	La-134	6.67E+00	m	La-134	6.45E+00	m	La-134	6.45E+00	m	ICRP-38	6.67E+00	m
La-135	La-135	1.95E+01	h	La-135	1.95E+01	h	La-135	1.95E+01	h	La-135	1.95E+01	h				ICRP-38	1.95E+01	h
La-136	La-136	9.87E+00	m							La-136	9.87E+00	m	La-136	9.87E+00	m	ICRP-107	9.87E+00	m
La-137	La-137	6.00E+04	y	La-137	6.00E+04	y	La-137	6.00E+04	y	La-137	6.00E+04	y				ICRP-38	6.00E+04	y
La-138	La-138	1.02E+11	y	La-138	1.35E+11	y	La-138	1.35E+11	y	La-138	1.02E+11	y				ICRP-38	1.35E+11	y
La-140	La-140	1.68E+00	d	La-140	4.03E+01	h	La-140	4.03E+01	h	La-140	1.68E+00	d				ICRP-38	4.03E+01	h
La-141	La-141	3.92E+00	h	La-141	3.93E+00	h	La-141	3.93E+00	h	La-141	3.92E+00	h				ICRP-38	3.93E+00	h
La-142	La-142	9.11E+01	m	La-142	9.25E+01	m	La-142	9.25E+01	m	La-142	9.11E+01	m				ICRP-38	9.25E+01	m
La-143	La-143	1.42E+01	m	La-143	1.42E+01	m	La-143	1.42E+01	m	La-143	1.42E+01	m				ICRP-38	1.42E+01	m
Lu-164													Lu-164	3.14E+00	m	JAERI	3.14E+00	m
Lu-165	Lu-165	1.07E+01	m							Lu-165	1.07E+01	m	Lu-165	1.07E+01	m	ICRP-107	1.07E+01	m
Lu-166													Lu-166	2.65E+00	m	JAERI	2.65E+00	m
Lu-166m													Lu-166m	1.41E+00	m	JAERI	1.41E+00	m
Lu-167	Lu-167	5.15E+01	m							Lu-167	5.15E+01	m	Lu-167	5.15E+01	m	ICRP-107	5.15E+01	m
Lu-168m													Lu-168m	6.70E+00	m	JAERI	6.70E+00	m
Lu-169	Lu-169	3.41E+01	h	Lu-169	3.41E+01	h	Lu-169	3.41E+01	h	Lu-169	3.41E+01	h				ICRP-38	3.41E+01	h
Lu-169m	Lu-169m	1.60E+02	s							Lu-169m	1.60E+02	s	Lu-169m	2.67E+00	m	ICRP-107	1.60E+02	s
Lu-170	Lu-170	2.01E+00	d	Lu-170	2.00E+00	d	Lu-170	2.00E+00	d	Lu-170	2.01E+00	d				ICRP-38	2.00E+00	d
Lu-171	Lu-171	8.24E+00	d	Lu-171	8.22E+00	d	Lu-171	8.22E+00	d	Lu-171	8.24E+00	d				ICRP-38	8.22E+00	d
Lu-171m	Lu-171m	7.90E+01	s							Lu-171m	7.90E+01	s	Lu-171m	1.32E+00	m	ICRP-107	7.90E+01	s
Lu-172	Lu-172	6.70E+00	d	Lu-172	6.70E+00	d	Lu-172	6.70E+00	d	Lu-172	6.70E+00	d				ICRP-38	6.70E+00	d
Lu-172m	Lu-172m	3.70E+00	m							Lu-172m	3.70E+00	m	Lu-172m	3.70E+00	m	ICRP-107	3.70E+00	m
Lu-173	Lu-173	1.37E+00	y	Lu-173	1.37E+00	y	Lu-173	1.37E+00	y	Lu-173	1.37E+00	y				ICRP-38	1.37E+00	y
Lu-174	Lu-174	3.31E+00	y	Lu-174	3.31E+00	y	Lu-174	3.31E+00	y	Lu-174	3.31E+00	y				ICRP-38	3.31E+00	y
Lu-174m	Lu-174m	1.42E+02	d	Lu-174m	1.42E+02	d	Lu-174m	1.42E+02	d	Lu-174m	1.42E+02	d				ICRP-38	1.42E+02	d
Lu-176	Lu-176	3.85E+10	y	Lu-176	3.60E+10	y	Lu-176	3.60E+10	y	Lu-176	3.85E+10	y				ICRP-38	3.60E+10	y
Lu-176m	Lu-176m	3.64E+00	h	Lu-176m	3.68E+00	h	Lu-176m	3.68E+00	h	Lu-176m	3.64E+00	h				ICRP-38	3.68E+00	h
Lu-177	Lu-177	6.65E+00	d	Lu-177	6.71E+00	d	Lu-177	6.71E+00	d	Lu-177	6.65E+00	d				ICRP-38	6.71E+00	d
Lu-177m	Lu-177m	1.60E+02	d	Lu-177m	1.61E+02	d	Lu-177m	1.61E+02	d	Lu-177m	1.60E+02	d				ICRP-38	1.61E+02	d
Lu-178	Lu-178	2.84E+01	m	Lu-178	2.84E+01	m	Lu-178	2.84E+01	m	Lu-178	2.84E+01	m				ICRP-38	2.84E+01	m
Lu-178m	Lu-178m	2.31E+01	m	Lu-178m	2.27E+01	m	Lu-178m	2.27E+01	m	Lu-178m	2.31E+01	m				ICRP-38	2.27E+01	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Lu-179	Lu-179	4.59E+00	h	Lu-179	4.59E+00	h	Lu-179	4.59E+00	h	Lu-179	4.59E+00	h				ICRP-38	4.59E+00	h
Lu-180	Lu-180	5.70E+00	m							Lu-180	5.70E+00	m				ICRP-107	5.70E+00	m
Lu-181	Lu-181	3.50E+00	m							Lu-181	3.50E+00	m				ICRP-107	3.50E+00	m
Md-257				Md-257	5.20E+00	h	Md-257	5.20E+00	h							ICRP-38	5.20E+00	h
Md-258				Md-258	5.50E+01	d	Md-258	5.50E+01	d							ICRP-38	5.50E+01	d
Mg-27	Mg-27	9.46E+00	m							Mg-27	9.46E+00	m	Mg-27	9.46E+00	m	ICRP-107	9.46E+00	m
Mg-28	Mg-28	2.09E+01	h	Mg-28	2.09E+01	h	Mg-28	2.09E+01	h	Mg-28	2.09E+01	h				ICRP-38	2.09E+01	h
Mn-50m	Mn-50m	1.75E+00	m							Mn-50m	1.75E+00	m				ICRP-107	1.75E+00	m
Mn-51	Mn-51	4.62E+01	m	Mn-51	4.62E+01	m	Mn-51	4.62E+01	m	Mn-51	4.62E+01	m				ICRP-38	4.62E+01	m
Mn-52	Mn-52	5.59E+00	d	Mn-52	5.59E+00	d	Mn-52	5.59E+00	d	Mn-52	5.59E+00	d				ICRP-38	5.59E+00	d
Mn-52m	Mn-52m	2.11E+01	m	Mn-52m	2.11E+01	m	Mn-52m	2.11E+01	m	Mn-52m	2.11E+01	m				ICRP-38	2.11E+01	m
Mn-53	Mn-53	3.70E+06	y	Mn-53	3.70E+06	y	Mn-53	3.70E+06	y	Mn-53	3.70E+06	y				ICRP-38	3.70E+06	y
Mn-54	Mn-54	3.12E+02	d	Mn-54	3.13E+02	d	Mn-54	3.13E+02	d	Mn-54	3.12E+02	d				ICRP-38	3.13E+02	d
Mn-56	Mn-56	2.58E+00	h	Mn-56	2.58E+00	h	Mn-56	2.58E+00	h	Mn-56	2.58E+00	h				ICRP-38	2.58E+00	h
Mn-57	Mn-57	8.54E+01	s							Mn-57	8.54E+01	s	Mn-57	1.42E+00	m	ICRP-107	8.54E+01	s
Mn-58m	Mn-58m	6.52E+01	s							Mn-58m	6.52E+01	s	Mn-58m	1.09E+00	m	ICRP-107	6.52E+01	s
Mo-101	Mo-101	1.46E+01	m	Mo-101	1.46E+01	m	Mo-101	1.46E+01	m	Mo-101	1.46E+01	m				ICRP-38	1.46E+01	m
Mo-102	Mo-102	1.13E+01	m							Mo-102	1.13E+01	m	Mo-102	1.13E+01	m	ICRP-107	1.13E+01	m
Mo-89	Mo-89	2.11E+00	m							Mo-89	2.11E+00	m				ICRP-107	2.11E+00	m
Mo-90	Mo-90	5.56E+00	h	Mo-90	5.67E+00	h	Mo-90	5.67E+00	h	Mo-90	5.56E+00	h				ICRP-38	5.67E+00	h
Mo-91	Mo-91	1.55E+01	m							Mo-91	1.55E+01	m	Mo-91	1.55E+01	m	ICRP-107	1.55E+01	m
Mo-91m	Mo-91m	6.46E+01	s							Mo-91m	6.46E+01	s				ICRP-107	6.46E+01	s
Mo-93	Mo-93	4.00E+03	y	Mo-93	3.50E+03	y	Mo-93	3.50E+03	y	Mo-93	4.00E+03	y				ICRP-38	3.50E+03	y
Mo-93m	Mo-93m	6.85E+00	h	Mo-93m	6.85E+00	h	Mo-93m	6.85E+00	h	Mo-93m	6.85E+00	h				ICRP-38	6.85E+00	h
Mo-99	Mo-99	6.59E+01	h	Mo-99	6.60E+01	h	Mo-99	6.60E+01	h	Mo-99	6.59E+01	h				ICRP-38	6.60E+01	h
N-13	N-13	9.97E+00	m	N-13	9.97E+00	m	N-13	9.97E+00	m	N-13	9.97E+00	m	N-13	9.97E+00	m	ICRP-38	9.97E+00	m
N-16	N-16	7.13E+00	s							N-16	7.13E+00	s				ICRP-107	7.13E+00	s
Na-22	Na-22	2.60E+00	y	Na-22	2.60E+00	y	Na-22	2.60E+00	y	Na-22	2.60E+00	y				ICRP-38	2.60E+00	y
Na-24	Na-24	1.50E+01	h	Na-24	1.50E+01	h	Na-24	1.50E+01	h	Na-24	1.50E+01	h				ICRP-38	1.50E+01	h
Nb-87	Nb-87	3.75E+00	m							Nb-87	3.75E+00	m				ICRP-107	3.75E+00	m
Nb-88	Nb-88	1.45E+01	m	Nb-88	1.43E+01	m	Nb-88	1.43E+01	m	Nb-88	1.45E+01	m				ICRP-38	1.43E+01	m
Nb-88m	Nb-88m	7.78E+00	m							Nb-88m	7.78E+00	m	Nb-88m	7.80E+00	m	ICRP-107	7.78E+00	m
Nb-89l	Nb-89	2.03E+00	h	Nb-89b	1.22E+02	m	Nb-89b	1.22E+02	m	Nb-89	2.03E+00	h				ICRP-38	1.22E+02	m
Nb-89s	Nb-89m	6.60E+01	m	Nb-89a	6.60E+01	m	Nb-89a	6.60E+01	m	Nb-89m	6.60E+01	m				ICRP-38	6.60E+01	m
Nb-90	Nb-90	1.46E+01	h	Nb-90	1.46E+01	h	Nb-90	1.46E+01	h	Nb-90	1.46E+01	h				ICRP-38	1.46E+01	h
Nb-91	Nb-91	6.80E+02	y							Nb-91	6.80E+02	y	Nb-91	6.80E+02	y	ICRP-107	6.80E+02	y
Nb-91m	Nb-91m	6.09E+01	d							Nb-91m	6.09E+01	d	Nb-91m	6.09E+01	d	ICRP-107	6.09E+01	d
Nb-92	Nb-92	3.47E+07	y							Nb-92	3.47E+07	y	Nb-92	3.47E+07	y	ICRP-107	3.47E+07	y
Nb-92m	Nb-92m	1.02E+01	d							Nb-92m	1.02E+01	d	Nb-92m	1.02E+01	d	ICRP-107	1.02E+01	d
Nb-93m	Nb-93m	1.61E+01	y	Nb-93m	1.36E+01	y	Nb-93m	1.36E+01	y	Nb-93m	1.61E+01	y				ICRP-38	1.36E+01	y

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Nb-94	Nb-94	2.03E+04	y	Nb-94	2.03E+04	y	Nb-94	2.03E+04	y	Nb-94	2.03E+04	y				ICRP-38	2.03E+04	y
Nb-94m	Nb-94m	6.26E+00	m							Nb-94m	6.26E+00	m	Nb-94m	6.26E+00	m	ICRP-107	6.26E+00	m
Nb-95	Nb-95	3.50E+01	d	Nb-95	3.52E+01	d	Nb-95	3.52E+01	d	Nb-95	3.50E+01	d				ICRP-38	3.52E+01	d
Nb-95m	Nb-95m	3.61E+00	d	Nb-95m	8.66E+01	h	Nb-95m	8.66E+01	h	Nb-95m	3.61E+00	d				ICRP-38	8.66E+01	h
Nb-96	Nb-96	2.34E+01	h	Nb-96	2.34E+01	h	Nb-96	2.34E+01	h	Nb-96	2.34E+01	h				ICRP-38	2.34E+01	h
Nb-97	Nb-97	7.21E+01	m	Nb-97	7.21E+01	m	Nb-97	7.21E+01	m	Nb-97	7.21E+01	m				ICRP-38	7.21E+01	m
Nb-97m				Nb-97m	6.00E+01	s	Nb-97m	6.00E+01	s							ICRP-38	6.00E+01	s
Nb-98	Nb-98m	5.13E+01	m	Nb-98	5.15E+01	m	Nb-98	5.15E+01	m	Nb-98m	5.13E+01	m				ICRP-38	5.15E+01	m
Nb-99	Nb-99	1.50E+01	s							Nb-99	1.50E+01	s				ICRP-107	1.50E+01	s
Nb-99m	Nb-99m	2.60E+00	m							Nb-99m	2.60E+00	m				ICRP-107	2.60E+00	m
Nd-134	Nd-134	8.50E+00	m							Nd-134	8.50E+00	m				ICRP-107	8.50E+00	m
Nd-135	Nd-135	1.24E+01	m							Nd-135	1.24E+01	m	Nd-135	1.24E+01	m	ICRP-107	1.24E+01	m
Nd-136	Nd-136	5.07E+01	m	Nd-136	5.07E+01	m	Nd-136	5.07E+01	m	Nd-136	5.07E+01	m				ICRP-38	5.07E+01	m
Nd-137	Nd-137	3.85E+01	m							Nd-137	3.85E+01	m	Nd-137	3.85E+01	m	ICRP-107	3.85E+01	m
Nd-138	Nd-138	5.04E+00	h	Nd-138	5.04E+00	h	Nd-138	5.04E+00	h	Nd-138	5.04E+00	h				ICRP-38	5.04E+00	h
Nd-139	Nd-139	2.97E+01	m	Nd-139	2.97E+01	m	Nd-139	2.97E+01	m	Nd-139	2.97E+01	m				ICRP-38	2.97E+01	m
Nd-139m	Nd-139m	5.50E+00	h	Nd-139m	5.50E+00	h	Nd-139m	5.50E+00	h	Nd-139m	5.50E+00	h				ICRP-38	5.50E+00	h
Nd-140	Nd-140	3.37E+00	d							Nd-140	3.37E+00	d	Nd-140	3.37E+00	d	ICRP-107	3.37E+00	d
Nd-141	Nd-141	2.49E+00	h	Nd-141	2.49E+00	h	Nd-141	2.49E+00	h	Nd-141	2.49E+00	h				ICRP-38	2.49E+00	h
Nd-141m	Nd-141m	6.20E+01	s	Nd-141m	6.24E+01	s	Nd-141m	6.24E+01	s	Nd-141m	6.20E+01	s	Nd-141m	1.03E+00	m	ICRP-38	6.24E+01	s
Nd-144	Nd-144	2.29E+15	y							Nd-144	2.29E+15	y	Nd-144	2.29E+15	y	ICRP-107	2.29E+15	y
Nd-147	Nd-147	1.10E+01	d	Nd-147	1.10E+01	d	Nd-147	1.10E+01	d	Nd-147	1.10E+01	d				ICRP-38	1.10E+01	d
Nd-149	Nd-149	1.73E+00	h	Nd-149	1.73E+00	h	Nd-149	1.73E+00	h	Nd-149	1.73E+00	h				ICRP-38	1.73E+00	h
Nd-151	Nd-151	1.24E+01	m	Nd-151	1.24E+01	m	Nd-151	1.24E+01	m	Nd-151	1.24E+01	m				ICRP-38	1.24E+01	m
Nd-152	Nd-152	1.14E+01	m							Nd-152	1.14E+01	m	Nd-152	1.14E+01	m	ICRP-107	1.14E+01	m
Ne-19	Ne-19	1.72E+01	s	Ne-19	1.72E+01	s	Ne-19	1.72E+01	s	Ne-19	1.72E+01	s				ICRP-38	1.72E+01	s
Ne-24	Ne-24	3.38E+00	m							Ne-24	3.38E+00	m				ICRP-107	3.38E+00	m
Ni-56	Ni-56	6.08E+00	d	Ni-56	6.10E+00	d	Ni-56	6.10E+00	d	Ni-56	6.08E+00	d				ICRP-38	6.10E+00	d
Ni-57	Ni-57	3.56E+01	h	Ni-57	3.61E+01	h	Ni-57	3.61E+01	h	Ni-57	3.56E+01	h				ICRP-38	3.61E+01	h
Ni-59	Ni-59	1.01E+05	y	Ni-59	7.50E+04	y	Ni-59	7.50E+04	y	Ni-59	1.01E+05	y				ICRP-38	7.50E+04	y
Ni-63	Ni-63	1.00E+02	y	Ni-63	9.60E+01	y	Ni-63	9.60E+01	y	Ni-63	1.00E+02	y				ICRP-38	9.60E+01	y
Ni-65	Ni-65	2.52E+00	h	Ni-65	2.52E+00	h	Ni-65	2.52E+00	h	Ni-65	2.52E+00	h				ICRP-38	2.52E+00	h
Ni-66	Ni-66	5.46E+01	h	Ni-66	5.46E+01	h	Ni-66	5.46E+01	h	Ni-66	5.46E+01	h				ICRP-38	5.46E+01	h
Np-231													Np-231	4.88E+01	m	JAERI	4.88E+01	m
Np-232	Np-232	1.47E+01	m	Np-232	1.47E+01	m	Np-232	1.47E+01	m	Np-232	1.47E+01	m				ICRP-38	1.47E+01	m
Np-233	Np-233	3.62E+01	m	Np-233	3.62E+01	m	Np-233	3.62E+01	m	Np-233	3.62E+01	m				ICRP-38	3.62E+01	m
Np-234	Np-234	4.40E+00	d	Np-234	4.40E+00	d	Np-234	4.40E+00	d	Np-234	4.40E+00	d				ICRP-38	4.40E+00	d
Np-235	Np-235	3.96E+02	d	Np-235	3.96E+02	d	Np-235	3.96E+02	d	Np-235	3.96E+02	d				ICRP-38	3.96E+02	d
Np-236l	Np-236	1.54E+05	y	Np-236a	1.15E+05	y	Np-236a	1.15E+05	y	Np-236	1.54E+05	y				ICRP-38	1.15E+05	y
Np-236s	Np-236m	2.25E+01	h	Np-236b	2.25E+01	h	Np-236b	2.25E+01	h	Np-236m	2.25E+01	h				ICRP-38	2.25E+01	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
Np-237	Np-237	2.14E+06	y	Np-237	2.14E+06	y	Np-237	2.14E+06	y	Np-237	2.14E+06	y				ICRP-38	2.14E+06	y
Np-238	Np-238	2.12E+00	d	Np-238	2.12E+00	d	Np-238	2.12E+00	d	Np-238	2.12E+00	d				ICRP-38	2.12E+00	d
Np-239	Np-239	2.36E+00	d	Np-239	2.36E+00	d	Np-239	2.36E+00	d	Np-239	2.36E+00	d				ICRP-38	2.36E+00	d
Np-240	Np-240	6.19E+01	m	Np-240	6.50E+01	m	Np-240	6.50E+01	m	Np-240	6.19E+01	m				ICRP-38	6.50E+01	m
Np-240m	Np-240m	7.22E+00	m	Np-240m	7.40E+00	m	Np-240m	7.40E+00	m	Np-240m	7.22E+00	m	Np-240m	7.22E+00	m	ICRP-38	7.40E+00	m
Np-241	Np-241	1.39E+01	m							Np-241	1.39E+01	m	Np-241	1.39E+01	m	ICRP-107	1.39E+01	m
Np-242	Np-242	2.20E+00	m							Np-242	2.20E+00	m				ICRP-107	2.20E+00	m
Np-242m	Np-242m	5.50E+00	m							Np-242m	5.50E+00	m				ICRP-107	5.50E+00	m
O-14	O-14	7.06E+01	s				O-14	7.06E+01	s	O-14	7.06E+01	s	O-14	1.18E+00	m	ICRP-38	7.06E+01	s
O-15	O-15	1.22E+02	s	O-15	1.22E+02	s	O-15	1.22E+02	s	O-15	1.22E+02	s	O-15	2.04E+00	m	ICRP-38	1.22E+02	s
O-19	O-19	2.65E+01	s				O-19	2.69E+01	s	O-19	2.65E+01	s				ICRP-38	2.69E+01	s
Os-177													Os-177	2.80E+00	m	JAERI	2.80E+00	m
Os-179													Os-179	6.50E+00	m	JAERI	6.50E+00	m
Os-180	Os-180	2.15E+01	m	Os-180	2.20E+01	m	Os-180	2.20E+01	m	Os-180	2.15E+01	m				ICRP-38	2.20E+01	m
Os-181	Os-181	1.05E+02	m	Os-181	1.05E+02	m	Os-181	1.05E+02	m	Os-181	1.05E+02	m				ICRP-38	1.05E+02	m
Os-182	Os-182	2.21E+01	h	Os-182	2.20E+01	h	Os-182	2.20E+01	h	Os-182	2.21E+01	h				ICRP-38	2.20E+01	h
Os-183	Os-183	1.30E+01	h							Os-183	1.30E+01	h	Os-183	1.30E+01	h	ICRP-107	1.30E+01	h
Os-183m	Os-183m	9.90E+00	h							Os-183m	9.90E+00	h	Os-183m	9.90E+00	h	ICRP-107	9.90E+00	h
Os-185	Os-185	9.36E+01	d	Os-185	9.40E+01	d	Os-185	9.40E+01	d	Os-185	9.36E+01	d				ICRP-38	9.40E+01	d
Os-186	Os-186	2.00E+15	y							Os-186	2.00E+15	y	Os-186	2.00E+15	y	ICRP-107	2.00E+15	y
Os-189m	Os-189m	5.80E+00	h	Os-189m	6.00E+00	h	Os-189m	6.00E+00	h	Os-189m	5.80E+00	h				ICRP-38	6.00E+00	h
Os-190m	Os-190m	9.90E+00	m	Os-190m	9.90E+00	m	Os-190m	9.90E+00	m	Os-190m	9.90E+00	m	Os-190m	9.90E+00	m	ICRP-38	9.90E+00	m
Os-191	Os-191	1.54E+01	d	Os-191	1.54E+01	d	Os-191	1.54E+01	d	Os-191	1.54E+01	d				ICRP-38	1.54E+01	d
Os-191m	Os-191m	1.31E+01	h	Os-191m	1.30E+01	h	Os-191m	1.30E+01	h	Os-191m	1.31E+01	h				ICRP-38	1.30E+01	h
Os-193	Os-193	3.01E+01	h	Os-193	3.00E+01	h	Os-193	3.00E+01	h	Os-193	3.01E+01	h				ICRP-38	3.00E+01	h
Os-194	Os-194	6.00E+00	y	Os-194	6.00E+00	y	Os-194	6.00E+00	y	Os-194	6.00E+00	y				ICRP-38	6.00E+00	y
Os-196	Os-196	3.49E+01	m							Os-196	3.49E+01	m	Os-196	3.49E+01	m	ICRP-107	3.49E+01	m
P-30	P-30	2.50E+00	m	P-30	2.50E+00	m	P-30	2.50E+00	m	P-30	2.50E+00	m	P-30	2.50E+00	m	ICRP-38	2.50E+00	m
P-32	P-32	1.43E+01	d	P-32	1.43E+01	d	P-32	1.43E+01	d	P-32	1.43E+01	d				ICRP-38	1.43E+01	d
P-33	P-33	2.53E+01	d	P-33	2.54E+01	d	P-33	2.54E+01	d	P-33	2.53E+01	d				ICRP-38	2.54E+01	d
Pa-227	Pa-227	3.83E+01	m	Pa-227	3.83E+01	m	Pa-227	3.83E+01	m	Pa-227	3.83E+01	m				ICRP-38	3.83E+01	m
Pa-228	Pa-228	2.20E+01	h	Pa-228	2.20E+01	h	Pa-228	2.20E+01	h	Pa-228	2.20E+01	h				ICRP-38	2.20E+01	h
Pa-229	Pa-229	1.50E+00	d							Pa-229	1.50E+00	d	Pa-229	1.50E+00	d	ICRP-107	1.50E+00	d
Pa-230	Pa-230	1.74E+01	d	Pa-230	1.74E+01	d	Pa-230	1.74E+01	d	Pa-230	1.74E+01	d				ICRP-38	1.74E+01	d
Pa-231	Pa-231	3.28E+04	y	Pa-231	3.28E+04	y	Pa-231	3.28E+04	y	Pa-231	3.28E+04	y				ICRP-38	3.28E+04	y
Pa-232	Pa-232	1.31E+00	d	Pa-232	1.31E+00	d	Pa-232	1.31E+00	d	Pa-232	1.31E+00	d				ICRP-38	1.31E+00	d
Pa-233	Pa-233	2.70E+01	d	Pa-233	2.70E+01	d	Pa-233	2.70E+01	d	Pa-233	2.70E+01	d				ICRP-38	2.70E+01	d
Pa-234	Pa-234	6.70E+00	h	Pa-234	6.70E+00	h	Pa-234	6.70E+00	h	Pa-234	6.70E+00	h				ICRP-38	6.70E+00	h
Pa-234m	Pa-234m	1.17E+00	m	Pa-234m	1.17E+00	m	Pa-234m	1.17E+00	m	Pa-234m	1.17E+00	m	Pa-234m	1.17E+00	m	ICRP-38	1.17E+00	m
Pa-235	Pa-235	2.45E+01	m							Pa-235	2.45E+01	m				ICRP-107	2.45E+01	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Pa-236	Pa-236	9.10E+00	m							Pa-236	9.10E+00	m	Pa-236	9.10E+00	m	ICRP-107	9.10E+00	m
Pa-237	Pa-237	8.70E+00	m							Pa-237	8.70E+00	m				ICRP-107	8.70E+00	m
Pb-194	Pb-194	1.20E+01	m							Pb-194	1.20E+01	m	Pb-194	1.20E+01	m	ICRP-107	1.20E+01	m
Pb-195m	Pb-195m	1.50E+01	m	Pb-195m	1.58E+01	m	Pb-195m	1.58E+01	m	Pb-195m	1.50E+01	m				ICRP-38	1.58E+01	m
Pb-196	Pb-196	3.70E+01	m							Pb-196	3.70E+01	m	Pb-196	3.70E+01	m	ICRP-107	3.70E+01	m
Pb-197	Pb-197	8.00E+00	m							Pb-197	8.00E+00	m	Pb-197	8.00E+00	m	ICRP-107	8.00E+00	m
Pb-197m	Pb-197m	4.30E+01	m							Pb-197m	4.30E+01	m	Pb-197m	4.30E+01	m	ICRP-107	4.30E+01	m
Pb-198	Pb-198	2.40E+00	h	Pb-198	2.40E+00	h	Pb-198	2.40E+00	h	Pb-198	2.40E+00	h				ICRP-38	2.40E+00	h
Pb-199	Pb-199	9.00E+01	m	Pb-199	9.00E+01	m	Pb-199	9.00E+01	m	Pb-199	9.00E+01	m				ICRP-38	9.00E+01	m
Pb-200	Pb-200	2.15E+01	h	Pb-200	2.15E+01	h	Pb-200	2.15E+01	h	Pb-200	2.15E+01	h				ICRP-38	2.15E+01	h
Pb-201	Pb-201	9.33E+00	h	Pb-201	9.40E+00	h	Pb-201	9.40E+00	h	Pb-201	9.33E+00	h				ICRP-38	9.40E+00	h
Pb-201m	Pb-201m	6.10E+01	s							Pb-201m	6.10E+01	s				ICRP-107	6.10E+01	s
Pb-202	Pb-202	5.25E+04	y	Pb-202	3.00E+05	y	Pb-202	3.00E+05	y	Pb-202	5.25E+04	y				ICRP-38	3.00E+05	y
Pb-202m	Pb-202m	3.53E+00	h	Pb-202m	3.62E+00	h	Pb-202m	3.62E+00	h	Pb-202m	3.53E+00	h				ICRP-38	3.62E+00	h
Pb-203	Pb-203	5.19E+01	h	Pb-203	5.21E+01	h	Pb-203	5.21E+01	h	Pb-203	5.19E+01	h				ICRP-38	5.21E+01	h
Pb-204m	Pb-204m	6.72E+01	m				Pb-204m	6.72E+01	m	Pb-204m	6.72E+01	m	Pb-204m	6.72E+01	m	ICRP-38	6.72E+01	m
Pb-205	Pb-205	1.53E+07	y	Pb-205	1.43E+07	y	Pb-205	1.43E+07	y	Pb-205	1.53E+07	y				ICRP-38	1.43E+07	y
Pb-209	Pb-209	3.25E+00	h	Pb-209	3.25E+00	h	Pb-209	3.25E+00	h	Pb-209	3.25E+00	h				ICRP-38	3.25E+00	h
Pb-210	Pb-210	2.22E+01	y	Pb-210	2.23E+01	y	Pb-210	2.23E+01	y	Pb-210	2.22E+01	y				ICRP-38	2.23E+01	y
Pb-211	Pb-211	3.61E+01	m	Pb-211	3.61E+01	m	Pb-211	3.61E+01	m	Pb-211	3.61E+01	m				ICRP-38	3.61E+01	m
Pb-212	Pb-212	1.06E+01	h	Pb-212	1.06E+01	h	Pb-212	1.06E+01	h	Pb-212	1.06E+01	h				ICRP-38	1.06E+01	h
Pb-214	Pb-214	2.68E+01	m	Pb-214	2.68E+01	m	Pb-214	2.68E+01	m	Pb-214	2.68E+01	m				ICRP-38	2.68E+01	m
Pd-100	Pd-100	3.63E+00	d	Pd-100	3.63E+00	d	Pd-100	3.63E+00	d	Pd-100	3.63E+00	d				ICRP-38	3.63E+00	d
Pd-101	Pd-101	8.47E+00	h	Pd-101	8.27E+00	h	Pd-101	8.27E+00	h	Pd-101	8.47E+00	h				ICRP-38	8.27E+00	h
Pd-103	Pd-103	1.70E+01	d	Pd-103	1.70E+01	d	Pd-103	1.70E+01	d	Pd-103	1.70E+01	d				ICRP-38	1.70E+01	d
Pd-107	Pd-107	6.50E+06	y	Pd-107	6.50E+06	y	Pd-107	6.50E+06	y	Pd-107	6.50E+06	y				ICRP-38	6.50E+06	y
Pd-109	Pd-109	1.37E+01	h	Pd-109	1.34E+01	h	Pd-109	1.34E+01	h	Pd-109	1.37E+01	h				ICRP-38	1.34E+01	h
Pd-109m	Pd-109m	4.69E+00	m							Pd-109m	4.69E+00	m	Pd-109m	4.69E+00	m	ICRP-107	4.69E+00	m
Pd-111	Pd-111	2.34E+01	m							Pd-111	2.34E+01	m	Pd-111	2.34E+01	m	ICRP-107	2.34E+01	m
Pd-112	Pd-112	2.10E+01	h							Pd-112	2.10E+01	h	Pd-112	2.10E+01	h	ICRP-107	2.10E+01	h
Pd-114	Pd-114	2.42E+00	m							Pd-114	2.42E+00	m				ICRP-107	2.42E+00	m
Pd-96	Pd-96	1.22E+02	s							Pd-96	1.22E+02	s				ICRP-107	1.22E+02	s
Pd-97	Pd-97	3.10E+00	m							Pd-97	3.10E+00	m				ICRP-107	3.10E+00	m
Pd-98	Pd-98	1.77E+01	m							Pd-98	1.77E+01	m	Pd-98	1.77E+01	m	ICRP-107	1.77E+01	m
Pd-99	Pd-99	2.14E+01	m							Pd-99	2.14E+01	m	Pd-99	2.14E+01	m	ICRP-107	2.14E+01	m
Pm-136	Pm-136	1.07E+02	s							Pm-136	1.07E+02	s				ICRP-107	1.07E+02	s
Pm-137m	Pm-137m	2.40E+00	m							Pm-137m	2.40E+00	m				ICRP-107	2.40E+00	m
Pm-138													Pm-138	3.24E+00	m	JAERI	3.24E+00	m
Pm-139	Pm-139	4.15E+00	m							Pm-139	4.15E+00	m	Pm-139	4.15E+00	m	ICRP-107	4.15E+00	m
Pm-140	Pm-140	9.20E+00	s							Pm-140	9.20E+00	s				ICRP-107	9.20E+00	s

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Pm-140m	Pm-140m	5.95E+00	m							Pm-140m	5.95E+00	m	Pm-140m	5.95E+00	m	ICRP-107	5.95E+00	m
Pm-141	Pm-141	2.09E+01	m	Pm-141	2.09E+01	m	Pm-141	2.09E+01	m	Pm-141	2.09E+01	m				ICRP-38	2.09E+01	m
Pm-142	Pm-142	4.05E+01	s	Pm-142	4.05E+01	s	Pm-142	4.05E+01	s	Pm-142	4.05E+01	s				ICRP-38	4.05E+01	s
Pm-143	Pm-143	2.65E+02	d	Pm-143	2.65E+02	d	Pm-143	2.65E+02	d	Pm-143	2.65E+02	d				ICRP-38	2.65E+02	d
Pm-144	Pm-144	3.63E+02	d	Pm-144	3.63E+02	d	Pm-144	3.63E+02	d	Pm-144	3.63E+02	d				ICRP-38	3.63E+02	d
Pm-145	Pm-145	1.77E+01	y	Pm-145	1.77E+01	y	Pm-145	1.77E+01	y	Pm-145	1.77E+01	y				ICRP-38	1.77E+01	y
Pm-146	Pm-146	5.53E+00	y	Pm-146	2.02E+03	d	Pm-146	2.02E+03	d	Pm-146	5.53E+00	y				ICRP-38	2.02E+03	d
Pm-147	Pm-147	2.62E+00	y	Pm-147	2.62E+00	y	Pm-147	2.62E+00	y	Pm-147	2.62E+00	y				ICRP-38	2.62E+00	y
Pm-148	Pm-148	5.37E+00	d	Pm-148	5.37E+00	d	Pm-148	5.37E+00	d	Pm-148	5.37E+00	d				ICRP-38	5.37E+00	d
Pm-148m	Pm-148m	4.13E+01	d	Pm-148m	4.13E+01	d	Pm-148m	4.13E+01	d	Pm-148m	4.13E+01	d				ICRP-38	4.13E+01	d
Pm-149	Pm-149	5.31E+01	h	Pm-149	5.31E+01	h	Pm-149	5.31E+01	h	Pm-149	5.31E+01	h				ICRP-38	5.31E+01	h
Pm-150	Pm-150	2.68E+00	h	Pm-150	2.68E+00	h	Pm-150	2.68E+00	h	Pm-150	2.68E+00	h				ICRP-38	2.68E+00	h
Pm-151	Pm-151	2.84E+01	h	Pm-151	2.84E+01	h	Pm-151	2.84E+01	h	Pm-151	2.84E+01	h				ICRP-38	2.84E+01	h
Pm-152	Pm-152	4.12E+00	m							Pm-152	4.12E+00	m	Pm-152	4.12E+00	m	ICRP-107	4.12E+00	m
Pm-152m	Pm-152m	7.52E+00	m							Pm-152m	7.52E+00	m				ICRP-107	7.52E+00	m
Pm-153	Pm-153	5.25E+00	m							Pm-153	5.25E+00	m				ICRP-107	5.25E+00	m
Pm-154	Pm-154	1.73E+00	m							Pm-154	1.73E+00	m				ICRP-107	1.73E+00	m
Pm-154m	Pm-154m	2.68E+00	m							Pm-154m	2.68E+00	m				ICRP-107	2.68E+00	m
Po-203	Po-203	3.67E+01	m	Po-203	3.67E+01	m	Po-203	3.67E+01	m	Po-203	3.67E+01	m				ICRP-38	3.67E+01	m
Po-204	Po-204	3.53E+00	h							Po-204	3.53E+00	h	Po-204	3.53E+00	h	ICRP-107	3.53E+00	h
Po-205	Po-205	1.66E+00	h	Po-205	1.80E+00	h	Po-205	1.80E+00	h	Po-205	1.66E+00	h				ICRP-38	1.80E+00	h
Po-206	Po-206	8.80E+00	d							Po-206	8.80E+00	d	Po-206	8.80E+00	d	ICRP-107	8.80E+00	d
Po-207	Po-207	5.80E+00	h	Po-207	3.50E+02	m	Po-207	3.50E+02	m	Po-207	5.80E+00	h				ICRP-38	3.50E+02	m
Po-208	Po-208	2.90E+00	y							Po-208	2.90E+00	y	Po-208	2.90E+00	y	ICRP-107	2.90E+00	y
Po-209	Po-209	1.02E+02	y				Po-209	1.02E+02	y	Po-209	1.02E+02	y	Po-209	1.02E+02	y	ICRP-38	1.02E+02	y
Po-210	Po-210	1.38E+02	d	Po-210	1.38E+02	d	Po-210	1.38E+02	d	Po-210	1.38E+02	d				ICRP-38	1.38E+02	d
Po-211	Po-211	5.16E-01	s	Po-211	5.16E-01	s	Po-211	5.16E-01	s	Po-211	5.16E-01	s				ICRP-38	5.16E-01	s
Po-212	Po-212	2.99E-07	s	Po-212	3.05E-01	us	Po-212	3.05E-01	us	Po-212	2.99E-07	s				ICRP-38	3.05E-01	us
Po-212m	Po-212m	4.51E+01	s							Po-212m	4.51E+01	s				ICRP-107	4.51E+01	s
Po-213	Po-213	4.20E-06	s	Po-213	4.20E+00	us	Po-213	4.20E+00	us	Po-213	4.20E-06	s				ICRP-38	4.20E+00	us
Po-214	Po-214	1.64E-04	s	Po-214	1.64E+02	us	Po-214	1.64E+02	us	Po-214	1.64E-04	s				ICRP-38	1.64E+02	us
Po-215	Po-215	1.78E-03	s	Po-215	1.78E-03	s	Po-215	1.78E-03	s	Po-215	1.78E-03	s				ICRP-38	1.78E-03	s
Po-216	Po-216	1.45E-01	s	Po-216	1.50E-01	s	Po-216	1.50E-01	s	Po-216	1.45E-01	s				ICRP-38	1.50E-01	s
Po-218	Po-218	3.10E+00	m	Po-218	3.05E+00	m	Po-218	3.05E+00	m	Po-218	3.10E+00	m	Po-218	3.10E+00	m	ICRP-38	3.05E+00	m
Pr-134	Pr-134	1.10E+01	m							Pr-134	1.10E+01	m	Pr-134	1.70E+01	m	ICRP-107	1.10E+01	m
Pr-134m	Pr-134m	1.70E+01	m							Pr-134m	1.70E+01	m	Pr-134m	1.10E+01	m	ICRP-107	1.70E+01	m
Pr-135	Pr-135	2.40E+01	m							Pr-135	2.40E+01	m	Pr-135	2.40E+01	m	ICRP-107	2.40E+01	m
Pr-136	Pr-136	1.31E+01	m	Pr-136	1.31E+01	m	Pr-136	1.31E+01	m	Pr-136	1.31E+01	m				ICRP-38	1.31E+01	m
Pr-137	Pr-137	1.28E+00	h	Pr-137	7.66E+01	m	Pr-137	7.66E+01	m	Pr-137	1.28E+00	h				ICRP-38	7.66E+01	m
Pr-138	Pr-138	1.45E+00	m	Pr-138	1.45E+00	m	Pr-138	1.45E+00	m	Pr-138	1.45E+00	m	Pr-138	1.45E+00	m	ICRP-38	1.45E+00	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Pr-138m	Pr-138m	2.12E+00	h	Pr-138m	2.10E+00	h	Pr-138m	2.10E+00	h	Pr-138m	2.12E+00	h				ICRP-38	2.10E+00	h
Pr-139	Pr-139	4.41E+00	h	Pr-139	4.51E+00	h	Pr-139	4.51E+00	h	Pr-139	4.41E+00	h				ICRP-38	4.51E+00	h
Pr-140	Pr-140	3.39E+00	m							Pr-140	3.39E+00	m	Pr-140	3.39E+00	m	ICRP-107	3.39E+00	m
Pr-142	Pr-142	1.91E+01	h	Pr-142	1.91E+01	h	Pr-142	1.91E+01	h	Pr-142	1.91E+01	h				ICRP-38	1.91E+01	h
Pr-142m	Pr-142m	1.46E+01	m	Pr-142m	1.46E+01	m	Pr-142m	1.46E+01	m	Pr-142m	1.46E+01	m				ICRP-38	1.46E+01	m
Pr-143	Pr-143	1.36E+01	d	Pr-143	1.36E+01	d	Pr-143	1.36E+01	d	Pr-143	1.36E+01	d				ICRP-38	1.36E+01	d
Pr-144	Pr-144	1.73E+01	m	Pr-144	1.73E+01	m	Pr-144	1.73E+01	m	Pr-144	1.73E+01	m				ICRP-38	1.73E+01	m
Pr-144m	Pr-144m	7.20E+00	m	Pr-144m	7.20E+00	m	Pr-144m	7.20E+00	m	Pr-144m	7.20E+00	m	Pr-144m	7.20E+00	m	ICRP-38	7.20E+00	m
Pr-145	Pr-145	5.98E+00	h	Pr-145	5.98E+00	h	Pr-145	5.98E+00	h	Pr-145	5.98E+00	h				ICRP-38	5.98E+00	h
Pr-146	Pr-146	2.42E+01	m							Pr-146	2.42E+01	m	Pr-146	2.42E+01	m	ICRP-107	2.42E+01	m
Pr-147	Pr-147	1.34E+01	m	Pr-147	1.36E+01	m	Pr-147	1.36E+01	m	Pr-147	1.34E+01	m				ICRP-38	1.36E+01	m
Pr-148	Pr-148	2.29E+00	m							Pr-148	2.29E+00	m				ICRP-107	2.29E+00	m
Pr-148m	Pr-148m	2.01E+00	m							Pr-148m	2.01E+00	m				ICRP-107	2.01E+00	m
Pt-183													Pt-183	6.50E+00	m	JAERI	6.50E+00	m
Pt-184	Pt-184	1.73E+01	m							Pt-184	1.73E+01	m	Pt-184	1.73E+01	m	ICRP-107	1.73E+01	m
Pt-186	Pt-186	2.08E+00	h	Pt-186	2.00E+00	h	Pt-186	2.00E+00	h	Pt-186	2.08E+00	h				ICRP-38	2.00E+00	h
Pt-187	Pt-187	2.35E+00	h							Pt-187	2.35E+00	h	Pt-187	2.35E+00	h	ICRP-107	2.35E+00	h
Pt-188	Pt-188	1.02E+01	d	Pt-188	1.02E+01	d	Pt-188	1.02E+01	d	Pt-188	1.02E+01	d				ICRP-38	1.02E+01	d
Pt-189	Pt-189	1.09E+01	h	Pt-189	1.09E+01	h	Pt-189	1.09E+01	h	Pt-189	1.09E+01	h				ICRP-38	1.09E+01	h
Pt-190	Pt-190	6.50E+11	y							Pt-190	6.50E+11	y	Pt-190	6.50E+11	y	ICRP-107	6.50E+11	y
Pt-191	Pt-191	2.80E+00	d	Pt-191	2.80E+00	d	Pt-191	2.80E+00	d	Pt-191	2.80E+00	d				ICRP-38	2.80E+00	d
Pt-193	Pt-193	5.00E+01	y	Pt-193	5.00E+01	y	Pt-193	5.00E+01	y	Pt-193	5.00E+01	y				ICRP-38	5.00E+01	y
Pt-193m	Pt-193m	4.33E+00	d	Pt-193m	4.33E+00	d	Pt-193m	4.33E+00	d	Pt-193m	4.33E+00	d				ICRP-38	4.33E+00	d
Pt-195m	Pt-195m	4.02E+00	d	Pt-195m	4.02E+00	d	Pt-195m	4.02E+00	d	Pt-195m	4.02E+00	d				ICRP-38	4.02E+00	d
Pt-197	Pt-197	1.99E+01	h	Pt-197	1.83E+01	h	Pt-197	1.83E+01	h	Pt-197	1.99E+01	h				ICRP-38	1.83E+01	h
Pt-197m	Pt-197m	9.54E+01	m	Pt-197m	9.44E+01	m	Pt-197m	9.44E+01	m	Pt-197m	9.54E+01	m				ICRP-38	9.44E+01	m
Pt-199	Pt-199	3.08E+01	m	Pt-199	3.08E+01	m	Pt-199	3.08E+01	m	Pt-199	3.08E+01	m				ICRP-38	3.08E+01	m
Pt-200	Pt-200	1.25E+01	h	Pt-200	1.25E+01	h	Pt-200	1.25E+01	h	Pt-200	1.25E+01	h				ICRP-38	1.25E+01	h
Pt-202	Pt-202	4.40E+01	h							Pt-202	4.40E+01	h	Pt-202	4.40E+01	h	ICRP-107	4.40E+01	h
Pu-232	Pu-232	3.37E+01	m							Pu-232	3.37E+01	m	Pu-232	3.41E+01	m	ICRP-107	3.37E+01	m
Pu-234	Pu-234	8.80E+00	h	Pu-234	8.80E+00	h	Pu-234	8.80E+00	h	Pu-234	8.80E+00	h				ICRP-38	8.80E+00	h
Pu-235	Pu-235	2.53E+01	m	Pu-235	2.53E+01	m	Pu-235	2.53E+01	m	Pu-235	2.53E+01	m				ICRP-38	2.53E+01	m
Pu-236	Pu-236	2.86E+00	y	Pu-236	2.85E+00	y	Pu-236	2.85E+00	y	Pu-236	2.86E+00	y				ICRP-38	2.85E+00	y
Pu-237	Pu-237	4.52E+01	d	Pu-237	4.53E+01	d	Pu-237	4.53E+01	d	Pu-237	4.52E+01	d				ICRP-38	4.53E+01	d
Pu-238	Pu-238	8.77E+01	y	Pu-238	8.77E+01	y	Pu-238	8.77E+01	y	Pu-238	8.77E+01	y				ICRP-38	8.77E+01	y
Pu-239	Pu-239	2.41E+04	y	Pu-239	2.41E+04	y	Pu-239	2.41E+04	y	Pu-239	2.41E+04	y				ICRP-38	2.41E+04	y
Pu-240	Pu-240	6.56E+03	y	Pu-240	6.54E+03	y	Pu-240	6.54E+03	y	Pu-240	6.56E+03	y				ICRP-38	6.54E+03	y
Pu-241	Pu-241	1.44E+01	y	Pu-241	1.44E+01	y	Pu-241	1.44E+01	y	Pu-241	1.44E+01	y				ICRP-38	1.44E+01	y
Pu-242	Pu-242	3.75E+05	y	Pu-242	3.76E+05	y	Pu-242	3.76E+05	y	Pu-242	3.75E+05	y				ICRP-38	3.76E+05	y
Pu-243	Pu-243	4.96E+00	h	Pu-243	4.96E+00	h	Pu-243	4.96E+00	h	Pu-243	4.96E+00	h				ICRP-38	4.96E+00	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Pu-244	Pu-244	8.00E+07	y	Pu-244	8.26E+07	y	Pu-244	8.26E+07	y	Pu-244	8.00E+07	y				ICRP-38	8.26E+07	y
Pu-245	Pu-245	1.05E+01	h	Pu-245	1.05E+01	h	Pu-245	1.05E+01	h	Pu-245	1.05E+01	h				ICRP-38	1.05E+01	h
Pu-246	Pu-246	1.08E+01	d	Pu-246	1.09E+01	d	Pu-246	1.09E+01	d	Pu-246	1.08E+01	d				ICRP-38	1.09E+01	d
Ra-219	Ra-219	1.00E+01	ms							Ra-219	1.00E+01	ms				ICRP-107	1.00E+01	ms
Ra-220	Ra-220	1.79E-02	s							Ra-220	1.79E-02	s				ICRP-107	1.79E-02	s
Ra-221	Ra-221	2.80E+01	s							Ra-221	2.80E+01	s				ICRP-107	2.80E+01	s
Ra-222	Ra-222	3.80E+01	s	Ra-222	3.80E+01	s	Ra-222	3.80E+01	s	Ra-222	3.80E+01	s				ICRP-38	3.80E+01	s
Ra-223	Ra-223	1.14E+01	d	Ra-223	1.14E+01	d	Ra-223	1.14E+01	d	Ra-223	1.14E+01	d				ICRP-38	1.14E+01	d
Ra-224	Ra-224	3.66E+00	d	Ra-224	3.66E+00	d	Ra-224	3.66E+00	d	Ra-224	3.66E+00	d				ICRP-38	3.66E+00	d
Ra-225	Ra-225	1.49E+01	d	Ra-225	1.48E+01	d	Ra-225	1.48E+01	d	Ra-225	1.49E+01	d				ICRP-38	1.48E+01	d
Ra-226	Ra-226	1.60E+03	y	Ra-226	1.60E+03	y	Ra-226	1.60E+03	y	Ra-226	1.60E+03	y				ICRP-38	1.60E+03	y
Ra-227	Ra-227	4.22E+01	m	Ra-227	4.22E+01	m	Ra-227	4.22E+01	m	Ra-227	4.22E+01	m				ICRP-38	4.22E+01	m
Ra-228	Ra-228	5.75E+00	y	Ra-228	5.75E+00	y	Ra-228	5.75E+00	y	Ra-228	5.75E+00	y				ICRP-38	5.75E+00	y
Ra-230	Ra-230	9.30E+01	m							Ra-230	9.30E+01	m	Ra-230	9.30E+01	m	ICRP-107	9.30E+01	m
Rb-77	Rb-77	3.77E+00	m				Rb-77	3.70E+00	m	Rb-77	3.77E+00	m	Rb-77	3.77E+00	m	ICRP-38	3.70E+00	m
Rb-78	Rb-78	1.77E+01	m							Rb-78	1.77E+01	m	Rb-78	1.77E+01	m	ICRP-107	1.77E+01	m
Rb-78m	Rb-78m	5.74E+00	m							Rb-78m	5.74E+00	m				ICRP-107	5.74E+00	m
Rb-79	Rb-79	2.29E+01	m	Rb-79	2.29E+01	m	Rb-79	2.29E+01	m	Rb-79	2.29E+01	m				ICRP-38	2.29E+01	m
Rb-80	Rb-80	3.34E+01	s	Rb-80	3.40E+01	s	Rb-80	3.40E+01	s	Rb-80	3.34E+01	s				ICRP-38	3.40E+01	s
Rb-81	Rb-81	4.58E+00	h	Rb-81	4.58E+00	h	Rb-81	4.58E+00	h	Rb-81	4.58E+00	h				ICRP-38	4.58E+00	h
Rb-81m	Rb-81m	3.05E+01	m	Rb-81m	3.20E+01	m	Rb-81m	3.20E+01	m	Rb-81m	3.05E+01	m				ICRP-38	3.20E+01	m
Rb-82	Rb-82	1.27E+00	m	Rb-82	1.30E+00	m	Rb-82	1.30E+00	m	Rb-82	1.27E+00	m	Rb-82	1.27E+00	m	ICRP-38	1.30E+00	m
Rb-82m	Rb-82m	6.47E+00	h	Rb-82m	6.20E+00	h	Rb-82m	6.20E+00	h	Rb-82m	6.47E+00	h				ICRP-38	6.20E+00	h
Rb-83	Rb-83	8.62E+01	d	Rb-83	8.62E+01	d	Rb-83	8.62E+01	d	Rb-83	8.62E+01	d				ICRP-38	8.62E+01	d
Rb-84	Rb-84	3.28E+01	d	Rb-84	3.28E+01	d	Rb-84	3.28E+01	d	Rb-84	3.28E+01	d				ICRP-38	3.28E+01	d
Rb-84m	Rb-84m	2.03E+01	m							Rb-84m	2.03E+01	m	Rb-84m	2.03E+01	m	ICRP-107	2.03E+01	m
Rb-86	Rb-86	1.86E+01	d	Rb-86	1.87E+01	d	Rb-86	1.87E+01	d	Rb-86	1.86E+01	d				ICRP-38	1.87E+01	d
Rb-86m	Rb-86m	1.02E+00	m							Rb-86m	1.02E+00	m	Rb-86m	1.02E+00	m	ICRP-107	1.02E+00	m
Rb-87	Rb-87	4.92E+10	y	Rb-87	4.70E+10	y	Rb-87	4.70E+10	y	Rb-87	4.92E+10	y				ICRP-38	4.70E+10	y
Rb-88	Rb-88	1.78E+01	m	Rb-88	1.78E+01	m	Rb-88	1.78E+01	m	Rb-88	1.78E+01	m				ICRP-38	1.78E+01	m
Rb-89	Rb-89	1.52E+01	m	Rb-89	1.52E+01	m	Rb-89	1.52E+01	m	Rb-89	1.52E+01	m				ICRP-38	1.52E+01	m
Rb-90	Rb-90	1.58E+02	s							Rb-90	1.58E+02	s	Rb-90	2.63E+00	m	ICRP-107	1.58E+02	s
Rb-90m	Rb-90m	2.58E+02	s							Rb-90m	2.58E+02	s	Rb-90m	4.30E+00	m	ICRP-107	2.58E+02	s
Re-177				Re-177	1.40E+01	m	Re-177	1.40E+01	m							ICRP-38	1.40E+01	m
Re-178	Re-178	1.32E+01	m	Re-178	1.32E+01	m	Re-178	1.32E+01	m	Re-178	1.32E+01	m				ICRP-38	1.32E+01	m
Re-179	Re-179	1.95E+01	m							Re-179	1.95E+01	m	Re-179	1.95E+01	m	ICRP-107	1.95E+01	m
Re-180	Re-180	2.44E+00	m	Re-180	2.43E+00	m	Re-180	2.43E+00	m	Re-180	2.44E+00	m	Re-180	2.44E+00	m	ICRP-38	2.43E+00	m
Re-181	Re-181	1.99E+01	h	Re-181	2.00E+01	h	Re-181	2.00E+01	h	Re-181	1.99E+01	h				ICRP-38	2.00E+01	h
Re-182l	Re-182	6.40E+01	h	Re-182b	6.40E+01	h	Re-182b	6.40E+01	h	Re-182	6.40E+01	h				ICRP-38	6.40E+01	h
Re-182s	Re-182m	1.27E+01	h	Re-182a	1.27E+01	h	Re-182a	1.27E+01	h	Re-182m	1.27E+01	h				ICRP-38	1.27E+01	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Re-183	Re-183	7.00E+01	d							Re-183	7.00E+01	d	Re-183	7.00E+01	d	ICRP-107	7.00E+01	d
Re-184	Re-184	3.80E+01	d	Re-184	3.80E+01	d	Re-184	3.80E+01	d	Re-184	3.80E+01	d				ICRP-38	3.80E+01	d
Re-184m	Re-184m	1.69E+02	d	Re-184m	1.65E+02	d	Re-184m	1.65E+02	d	Re-184m	1.69E+02	d				ICRP-38	1.65E+02	d
Re-186	Re-186	3.72E+00	d	Re-186	9.06E+01	h	Re-186	9.06E+01	h	Re-186	3.72E+00	d				ICRP-38	9.06E+01	h
Re-186m	Re-186m	2.00E+05	y	Re-186m	2.00E+05	y	Re-186m	2.00E+05	y	Re-186m	2.00E+05	y				ICRP-38	2.00E+05	y
Re-187	Re-187	4.12E+10	y	Re-187	5.00E+10	y	Re-187	5.00E+10	y	Re-187	4.12E+10	y				ICRP-38	5.00E+10	y
Re-188	Re-188	1.70E+01	h	Re-188	1.70E+01	h	Re-188	1.70E+01	h	Re-188	1.70E+01	h				ICRP-38	1.70E+01	h
Re-188m	Re-188m	1.86E+01	m	Re-188m	1.86E+01	m	Re-188m	1.86E+01	m	Re-188m	1.86E+01	m				ICRP-38	1.86E+01	m
Re-189	Re-189	2.43E+01	h	Re-189	2.43E+01	h	Re-189	2.43E+01	h	Re-189	2.43E+01	h				ICRP-38	2.43E+01	h
Re-190	Re-190	3.10E+00	m							Re-190	3.10E+00	m	Re-190	3.10E+00	m	ICRP-107	3.10E+00	m
Re-190m	Re-190m	3.20E+00	h							Re-190m	3.20E+00	h				ICRP-107	3.20E+00	h
Rh-100	Rh-100	2.08E+01	h	Rh-100	2.08E+01	h	Rh-100	2.08E+01	h	Rh-100	2.08E+01	h				ICRP-38	2.08E+01	h
Rh-100m	Rh-100m	4.60E+00	m							Rh-100m	4.60E+00	m	Rh-100m	4.60E+00	m	ICRP-107	4.60E+00	m
Rh-101	Rh-101	3.30E+00	y	Rh-101	3.20E+00	y	Rh-101	3.20E+00	y	Rh-101	3.30E+00	y				ICRP-38	3.20E+00	y
Rh-101m	Rh-101m	4.34E+00	d	Rh-101m	4.34E+00	d	Rh-101m	4.34E+00	d	Rh-101m	4.34E+00	d				ICRP-38	4.34E+00	d
Rh-102	Rh-102m	3.74E+00	y	Rh-102	2.90E+00	y	Rh-102	2.90E+00	y	Rh-102m	3.74E+00	y				ICRP-38	2.90E+00	y
Rh-102m	Rh-102	2.07E+02	d	Rh-102m	2.07E+02	d	Rh-102m	2.07E+02	d	Rh-102	2.07E+02	d				ICRP-38	2.07E+02	d
Rh-103m	Rh-103m	5.61E+01	m	Rh-103m	5.61E+01	m	Rh-103m	5.61E+01	m	Rh-103m	5.61E+01	m				ICRP-38	5.61E+01	m
Rh-104	Rh-104	4.23E+01	s							Rh-104	4.23E+01	s				ICRP-107	4.23E+01	s
Rh-104m	Rh-104m	4.34E+00	m							Rh-104m	4.34E+00	m				ICRP-107	4.34E+00	m
Rh-105	Rh-105	3.54E+01	h	Rh-105	3.54E+01	h	Rh-105	3.54E+01	h	Rh-105	3.54E+01	h				ICRP-38	3.54E+01	h
Rh-106	Rh-106	2.98E+01	s	Rh-106	2.99E+01	s	Rh-106	2.99E+01	s	Rh-106	2.98E+01	s				ICRP-38	2.99E+01	s
Rh-106m	Rh-106m	1.31E+02	m	Rh-106m	1.32E+02	m	Rh-106m	1.32E+02	m	Rh-106m	1.31E+02	m				ICRP-38	1.32E+02	m
Rh-107	Rh-107	2.17E+01	m	Rh-107	2.17E+01	m	Rh-107	2.17E+01	m	Rh-107	2.17E+01	m				ICRP-38	2.17E+01	m
Rh-108	Rh-108	1.68E+01	s							Rh-108	1.68E+01	s				ICRP-107	1.68E+01	s
Rh-109	Rh-109	8.00E+01	s							Rh-109	8.00E+01	s				ICRP-107	8.00E+01	s
Rh-94	Rh-94	7.06E+01	s							Rh-94	7.06E+01	s				ICRP-107	7.06E+01	s
Rh-95	Rh-95	5.02E+00	m							Rh-95	5.02E+00	m				ICRP-107	5.02E+00	m
Rh-95m	Rh-95m	1.96E+00	m							Rh-95m	1.96E+00	m				ICRP-107	1.96E+00	m
Rh-96	Rh-96	9.90E+00	m							Rh-96	9.90E+00	m				ICRP-107	9.90E+00	m
Rh-96m	Rh-96m	1.51E+00	m							Rh-96m	1.51E+00	m				ICRP-107	1.51E+00	m
Rh-97	Rh-97	3.07E+01	m							Rh-97	3.07E+01	m	Rh-97	3.07E+01	m	ICRP-107	3.07E+01	m
Rh-97m	Rh-97m	4.62E+01	m							Rh-97m	4.62E+01	m	Rh-97m	4.62E+01	m	ICRP-107	4.62E+01	m
Rh-98	Rh-98	8.70E+00	m							Rh-98	8.70E+00	m	Rh-98	8.70E+00	m	ICRP-107	8.70E+00	m
Rh-99	Rh-99	1.61E+01	d	Rh-99	1.60E+01	d	Rh-99	1.60E+01	d	Rh-99	1.61E+01	d				ICRP-38	1.60E+01	d
Rh-99m	Rh-99m	4.70E+00	h	Rh-99m	4.70E+00	h	Rh-99m	4.70E+00	h	Rh-99m	4.70E+00	h				ICRP-38	4.70E+00	h
Rn-207	Rn-207	9.25E+00	m							Rn-207	9.25E+00	m				ICRP-107	9.25E+00	m
Rn-209	Rn-209	2.85E+01	m							Rn-209	2.85E+01	m				ICRP-107	2.85E+01	m
Rn-210	Rn-210	2.40E+00	h							Rn-210	2.40E+00	h				ICRP-107	2.40E+00	h
Rn-211	Rn-211	1.46E+01	h							Rn-211	1.46E+01	h				ICRP-107	1.46E+01	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Rn-212	Rn-212	2.39E+01	m							Rn-212	2.39E+01	m				ICRP-107	2.39E+01	m
Rn-215	Rn-215	2.30E+00	us							Rn-215	2.30E+00	us				ICRP-107	2.30E+00	us
Rn-216	Rn-216	4.50E-05	s							Rn-216	4.50E-05	s				ICRP-107	4.50E-05	s
Rn-217	Rn-217	5.40E-04	s							Rn-217	5.40E-04	s				ICRP-107	5.40E-04	s
Rn-218	Rn-218	3.50E-02	s	Rn-218	3.50E+01	ms	Rn-218	3.50E+01	ms	Rn-218	3.50E-02	s				ICRP-38	3.50E+01	ms
Rn-219	Rn-219	3.96E+00	s	Rn-219	3.96E+00	s	Rn-219	3.96E+00	s	Rn-219	3.96E+00	s				ICRP-38	3.96E+00	s
Rn-220	Rn-220	5.56E+01	s	Rn-220	5.56E+01	s	Rn-220	5.56E+01	s	Rn-220	5.56E+01	s				ICRP-38	5.56E+01	s
Rn-222	Rn-222	3.82E+00	d	Rn-222	3.82E+00	d	Rn-222	3.82E+00	d	Rn-222	3.82E+00	d				ICRP-38	3.82E+00	d
Rn-223	Rn-223	2.43E+01	m							Rn-223	2.43E+01	m				ICRP-107	2.43E+01	m
Ru-103	Ru-103	3.93E+01	d	Ru-103	3.93E+01	d	Ru-103	3.93E+01	d	Ru-103	3.93E+01	d				ICRP-38	3.93E+01	d
Ru-105	Ru-105	4.44E+00	h	Ru-105	4.44E+00	h	Ru-105	4.44E+00	h	Ru-105	4.44E+00	h				ICRP-38	4.44E+00	h
Ru-106	Ru-106	3.74E+02	d	Ru-106	3.68E+02	d	Ru-106	3.68E+02	d	Ru-106	3.74E+02	d				ICRP-38	3.68E+02	d
Ru-107	Ru-107	3.75E+00	m							Ru-107	3.75E+00	m				ICRP-107	3.75E+00	m
Ru-108	Ru-108	4.55E+00	m							Ru-108	4.55E+00	m				ICRP-107	4.55E+00	m
Ru-92	Ru-92	3.65E+00	m							Ru-92	3.65E+00	m				ICRP-107	3.65E+00	m
Ru-94	Ru-94	5.18E+01	m	Ru-94	5.18E+01	m	Ru-94	5.18E+01	m	Ru-94	5.18E+01	m				ICRP-38	5.18E+01	m
Ru-95	Ru-95	1.64E+00	h							Ru-95	1.64E+00	h	Ru-95	1.64E+00	h	ICRP-107	1.64E+00	h
Ru-97	Ru-97	2.90E+00	d	Ru-97	2.90E+00	d	Ru-97	2.90E+00	d	Ru-97	2.90E+00	d				ICRP-38	2.90E+00	d
S-35	S-35	8.75E+01	d	S-35	8.74E+01	d	S-35	8.74E+01	d	S-35	8.75E+01	d				ICRP-38	8.74E+01	d
S-37	S-37	5.05E+00	m							S-37	5.05E+00	m	S-37	5.05E+00	m	ICRP-107	5.05E+00	m
S-38	S-38	1.70E+02	m							S-38	1.70E+02	m	S-38	1.70E+02	m	ICRP-107	1.70E+02	m
Sb-111	Sb-111	7.50E+01	s							Sb-111	7.50E+01	s				ICRP-107	7.50E+01	s
Sb-113	Sb-113	6.67E+00	m							Sb-113	6.67E+00	m				ICRP-107	6.67E+00	m
Sb-114	Sb-114	3.49E+00	m							Sb-114	3.49E+00	m	Sb-114	3.49E+00	m	ICRP-107	3.49E+00	m
Sb-115	Sb-115	3.21E+01	m	Sb-115	3.18E+01	m	Sb-115	3.18E+01	m	Sb-115	3.21E+01	m				ICRP-38	3.18E+01	m
Sb-116	Sb-116	1.58E+01	m	Sb-116	1.58E+01	m	Sb-116	1.58E+01	m	Sb-116	1.58E+01	m				ICRP-38	1.58E+01	m
Sb-116m	Sb-116m	6.03E+01	m	Sb-116m	6.03E+01	m	Sb-116m	6.03E+01	m	Sb-116m	6.03E+01	m				ICRP-38	6.03E+01	m
Sb-117	Sb-117	2.80E+00	h	Sb-117	2.80E+00	h	Sb-117	2.80E+00	h	Sb-117	2.80E+00	h				ICRP-38	2.80E+00	h
Sb-118	Sb-118	3.60E+00	m				Sb-118	3.60E+00	m	Sb-118	3.60E+00	m	Sb-118	3.60E+00	m	ICRP-38	3.60E+00	m
Sb-118m	Sb-118m	5.00E+00	h	Sb-118m	5.00E+00	h	Sb-118m	5.00E+00	h	Sb-118m	5.00E+00	h				ICRP-38	5.00E+00	h
Sb-119	Sb-119	3.82E+01	h	Sb-119	3.81E+01	h	Sb-119	3.81E+01	h	Sb-119	3.82E+01	h				ICRP-38	3.81E+01	h
Sb-120s	Sb-120	1.59E+01	m	Sb-120a	1.59E+01	m	Sb-120a	1.59E+01	m	Sb-120	1.59E+01	m				ICRP-38	1.59E+01	m
Sb-120l	Sb-120m	5.76E+00	d	Sb-120b	5.76E+00	d	Sb-120b	5.76E+00	d	Sb-120m	5.76E+00	d				ICRP-38	5.76E+00	d
Sb-122	Sb-122	2.72E+00	d	Sb-122	2.70E+00	d	Sb-122	2.70E+00	d	Sb-122	2.72E+00	d				ICRP-38	2.70E+00	d
Sb-122m	Sb-122m	4.19E+00	m							Sb-122m	4.19E+00	m	Sb-122m	4.19E+00	m	ICRP-107	4.19E+00	m
Sb-124	Sb-124	6.02E+01	d	Sb-124	6.02E+01	d	Sb-124	6.02E+01	d	Sb-124	6.02E+01	d				ICRP-38	6.02E+01	d
Sb-124ms	Sb-124m	9.30E+01	s	Sb-124m	9.30E+01	s	Sb-124m	9.30E+01	s	Sb-124m	9.30E+01	s	Sb-124m	1.55E+00	m	ICRP-38	9.30E+01	s
Sb-124ml	Sb-124n	2.02E+01	m	Sb-124n	2.02E+01	m	Sb-124n	2.02E+01	m	Sb-124n	2.02E+01	m				ICRP-38	2.02E+01	m
Sb-125	Sb-125	2.76E+00	y	Sb-125	2.77E+00	y	Sb-125	2.77E+00	y	Sb-125	2.76E+00	y				ICRP-38	2.77E+00	y
Sb-126	Sb-126	1.24E+01	d	Sb-126	1.24E+01	d	Sb-126	1.24E+01	d	Sb-126	1.24E+01	d				ICRP-38	1.24E+01	d

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Sb-126m	Sb-126m	1.92E+01	m	Sb-126m	1.90E+01	m	Sb-126m	1.90E+01	m	Sb-126m	1.92E+01	m				ICRP-38	1.90E+01	m
Sb-127	Sb-127	3.85E+00	d	Sb-127	3.85E+00	d	Sb-127	3.85E+00	d	Sb-127	3.85E+00	d				ICRP-38	3.85E+00	d
Sb-128l	Sb-128	9.01E+00	h	Sb-128b	9.01E+00	h	Sb-128b	9.01E+00	h	Sb-128	9.01E+00	h				ICRP-38	9.01E+00	h
Sb-128s	Sb-128m	1.04E+01	m	Sb-128a	1.04E+01	m	Sb-128a	1.04E+01	m	Sb-128m	1.04E+01	m				ICRP-38	1.04E+01	m
Sb-129	Sb-129	4.40E+00	h	Sb-129	4.32E+00	h	Sb-129	4.32E+00	h	Sb-129	4.40E+00	h				ICRP-38	4.32E+00	h
Sb-130	Sb-130	3.95E+01	m	Sb-130	4.00E+01	m	Sb-130	4.00E+01	m	Sb-130	3.95E+01	m				ICRP-38	4.00E+01	m
Sb-130m	Sb-130m	6.30E+00	m							Sb-130m	6.30E+00	m				ICRP-107	6.30E+00	m
Sb-131	Sb-131	2.30E+01	m	Sb-131	2.30E+01	m	Sb-131	2.30E+01	m	Sb-131	2.30E+01	m				ICRP-38	2.30E+01	m
Sb-133	Sb-133	2.50E+00	m							Sb-133	2.50E+00	m				ICRP-107	2.50E+00	m
Sc-42m	Sc-42m	6.20E+01	s							Sc-42m	6.20E+01	s				ICRP-107	6.20E+01	s
Sc-43	Sc-43	3.89E+00	h	Sc-43	3.89E+00	h	Sc-43	3.89E+00	h	Sc-43	3.89E+00	h				ICRP-38	3.89E+00	h
Sc-44	Sc-44	3.97E+00	h	Sc-44	3.93E+00	h	Sc-44	3.93E+00	h	Sc-44	3.97E+00	h				ICRP-38	3.93E+00	h
Sc-44m	Sc-44m	5.86E+01	h	Sc-44m	5.86E+01	h	Sc-44m	5.86E+01	h	Sc-44m	5.86E+01	h				ICRP-38	5.86E+01	h
Sc-46	Sc-46	8.38E+01	d	Sc-46	8.38E+01	d	Sc-46	8.38E+01	d	Sc-46	8.38E+01	d				ICRP-38	8.38E+01	d
Sc-47	Sc-47	3.35E+00	d	Sc-47	3.35E+00	d	Sc-47	3.35E+00	d	Sc-47	3.35E+00	d				ICRP-38	3.35E+00	d
Sc-48	Sc-48	4.37E+01	h	Sc-48	4.37E+01	h	Sc-48	4.37E+01	h	Sc-48	4.37E+01	h				ICRP-38	4.37E+01	h
Sc-49	Sc-49	5.72E+01	m	Sc-49	5.74E+01	m	Sc-49	5.74E+01	m	Sc-49	5.72E+01	m				ICRP-38	5.74E+01	m
Sc-50	Sc-50	1.03E+02	s							Sc-50	1.03E+02	s				ICRP-107	1.03E+02	s
Se-70	Se-70	4.11E+01	m	Se-70	4.10E+01	m	Se-70	4.10E+01	m	Se-70	4.11E+01	m				ICRP-38	4.10E+01	m
Se-71	Se-71	4.74E+00	m							Se-71	4.74E+00	m	Se-71	4.74E+00	m	ICRP-107	4.74E+00	m
Se-72	Se-72	8.40E+00	d				Se-72	8.40E+00	d	Se-72	8.40E+00	d	Se-72	8.40E+00	d	ICRP-38	8.40E+00	d
Se-73	Se-73	7.15E+00	h	Se-73	7.15E+00	h	Se-73	7.15E+00	h	Se-73	7.15E+00	h				ICRP-38	7.15E+00	h
Se-73m	Se-73m	3.98E+01	m	Se-73m	3.90E+01	m	Se-73m	3.90E+01	m	Se-73m	3.98E+01	m				ICRP-38	3.90E+01	m
Se-75	Se-75	1.20E+02	d	Se-75	1.20E+02	d	Se-75	1.20E+02	d	Se-75	1.20E+02	d				ICRP-38	1.20E+02	d
Se-77m	Se-77m	1.74E+01	s	Se-77m	1.75E+01	s	Se-77m	1.75E+01	s	Se-77m	1.74E+01	s				ICRP-38	1.75E+01	s
Se-79	Se-79	2.95E+05	y	Se-79	6.50E+04	y	Se-79	6.50E+04	y	Se-79	2.95E+05	y				ICRP-38	6.50E+04	y
Se-79m	Se-79m	3.92E+00	m							Se-79m	3.92E+00	m	Se-79m	3.92E+00	m	ICRP-107	3.92E+00	m
Se-81	Se-81	1.85E+01	m	Se-81	1.85E+01	m	Se-81	1.85E+01	m	Se-81	1.85E+01	m				ICRP-38	1.85E+01	m
Se-81m	Se-81m	5.73E+01	m	Se-81m	5.73E+01	m	Se-81m	5.73E+01	m	Se-81m	5.73E+01	m				ICRP-38	5.73E+01	m
Se-83	Se-83	2.23E+01	m	Se-83	2.25E+01	m	Se-83	2.25E+01	m	Se-83	2.23E+01	m				ICRP-38	2.25E+01	m
Se-83m	Se-83m	7.01E+01	s							Se-83m	7.01E+01	s				ICRP-107	7.01E+01	s
Se-84	Se-84	3.10E+00	m							Se-84	3.10E+00	m				ICRP-107	3.10E+00	m
Si-31	Si-31	1.57E+02	m	Si-31	1.57E+02	m	Si-31	1.57E+02	m	Si-31	1.57E+02	m				ICRP-38	1.57E+02	m
Si-32	Si-32	1.32E+02	y	Si-32	4.50E+02	y	Si-32	4.50E+02	y	Si-32	1.32E+02	y				ICRP-38	4.50E+02	y
Sm-139	Sm-139	2.57E+00	m							Sm-139	2.57E+00	m				ICRP-107	2.57E+00	m
Sm-140	Sm-140	1.48E+01	m							Sm-140	1.48E+01	m	Sm-140	1.48E+01	m	ICRP-107	1.48E+01	m
Sm-141	Sm-141	1.02E+01	m	Sm-141	1.02E+01	m	Sm-141	1.02E+01	m	Sm-141	1.02E+01	m				ICRP-38	1.02E+01	m
Sm-141m	Sm-141m	2.26E+01	m	Sm-141m	2.26E+01	m	Sm-141m	2.26E+01	m	Sm-141m	2.26E+01	m				ICRP-38	2.26E+01	m
Sm-142	Sm-142	7.25E+01	m	Sm-142	7.25E+01	m	Sm-142	7.25E+01	m	Sm-142	7.25E+01	m				ICRP-38	7.25E+01	m
Sm-143	Sm-143	8.75E+00	m							Sm-143	8.75E+00	m	Sm-143	8.83E+00	m	ICRP-107	8.75E+00	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Sm-143m	Sm-143m	6.60E+01	s							Sm-143m	6.60E+01	s	Sm-143m	1.10E+00	m	ICRP-107	6.60E+01	s
Sm-145	Sm-145	3.40E+02	d	Sm-145	3.40E+02	d	Sm-145	3.40E+02	d	Sm-145	3.40E+02	d				ICRP-38	3.40E+02	d
Sm-146	Sm-146	1.03E+08	y	Sm-146	1.03E+08	y	Sm-146	1.03E+08	y	Sm-146	1.03E+08	y				ICRP-38	1.03E+08	y
Sm-147	Sm-147	1.06E+11	y	Sm-147	1.06E+11	y	Sm-147	1.06E+11	y	Sm-147	1.06E+11	y				ICRP-38	1.06E+11	y
Sm-148	Sm-148	7.00E+15	y							Sm-148	7.00E+15	y	Sm-148	7.00E+15	y	ICRP-107	7.00E+15	y
Sm-151	Sm-151	9.00E+01	y	Sm-151	9.00E+01	y	Sm-151	9.00E+01	y	Sm-151	9.00E+01	y				ICRP-38	9.00E+01	y
Sm-153	Sm-153	4.65E+01	h	Sm-153	4.67E+01	h	Sm-153	4.67E+01	h	Sm-153	4.65E+01	h				ICRP-38	4.67E+01	h
Sm-155	Sm-155	2.23E+01	m	Sm-155	2.21E+01	m	Sm-155	2.21E+01	m	Sm-155	2.23E+01	m				ICRP-38	2.21E+01	m
Sm-156	Sm-156	9.40E+00	h	Sm-156	9.40E+00	h	Sm-156	9.40E+00	h	Sm-156	9.40E+00	h				ICRP-38	9.40E+00	h
Sm-157	Sm-157	8.03E+00	m							Sm-157	8.03E+00	m				ICRP-107	8.03E+00	m
Sn-106	Sn-106	1.92E+00	m							Sn-106	1.92E+00	m				ICRP-107	1.92E+00	m
Sn-108	Sn-108	1.03E+01	m							Sn-108	1.03E+01	m	Sn-108	1.03E+01	m	ICRP-107	1.03E+01	m
Sn-109	Sn-109	1.80E+01	m							Sn-109	1.80E+01	m	Sn-109	1.80E+01	m	ICRP-107	1.80E+01	m
Sn-110	Sn-110	4.11E+00	h	Sn-110	4.00E+00	h	Sn-110	4.00E+00	h	Sn-110	4.11E+00	h				ICRP-38	4.00E+00	h
Sn-111	Sn-111	3.53E+01	m	Sn-111	3.53E+01	m	Sn-111	3.53E+01	m	Sn-111	3.53E+01	m				ICRP-38	3.53E+01	m
Sn-113	Sn-113	1.15E+02	d	Sn-113	1.15E+02	d	Sn-113	1.15E+02	d	Sn-113	1.15E+02	d				ICRP-38	1.15E+02	d
Sn-113m	Sn-113m	2.14E+01	m							Sn-113m	2.14E+01	m	Sn-113m	2.14E+01	m	ICRP-107	2.14E+01	m
Sn-117m	Sn-117m	1.38E+01	d	Sn-117m	1.36E+01	d	Sn-117m	1.36E+01	d	Sn-117m	1.38E+01	d				ICRP-38	1.36E+01	d
Sn-119m	Sn-119m	2.93E+02	d	Sn-119m	2.93E+02	d	Sn-119m	2.93E+02	d	Sn-119m	2.93E+02	d				ICRP-38	2.93E+02	d
Sn-121	Sn-121	2.70E+01	h	Sn-121	2.71E+01	h	Sn-121	2.71E+01	h	Sn-121	2.70E+01	h				ICRP-38	2.71E+01	h
Sn-121m	Sn-121m	4.39E+01	y	Sn-121m	5.50E+01	y	Sn-121m	5.50E+01	y	Sn-121m	4.39E+01	y				ICRP-38	5.50E+01	y
Sn-123	Sn-123	1.29E+02	d	Sn-123	1.29E+02	d	Sn-123	1.29E+02	d	Sn-123	1.29E+02	d				ICRP-38	1.29E+02	d
Sn-123m	Sn-123m	4.01E+01	m	Sn-123m	4.01E+01	m	Sn-123m	4.01E+01	m	Sn-123m	4.01E+01	m				ICRP-38	4.01E+01	m
Sn-125	Sn-125	9.64E+00	d	Sn-125	9.64E+00	d	Sn-125	9.64E+00	d	Sn-125	9.64E+00	d				ICRP-38	9.64E+00	d
Sn-125m	Sn-125m	9.52E+00	m							Sn-125m	9.52E+00	m	Sn-125m	9.52E+00	m	ICRP-107	9.52E+00	m
Sn-126	Sn-126	2.30E+05	y	Sn-126	1.00E+05	y	Sn-126	1.00E+05	y	Sn-126	2.30E+05	y				ICRP-38	1.00E+05	y
Sn-127	Sn-127	2.10E+00	h	Sn-127	2.10E+00	h	Sn-127	2.10E+00	h	Sn-127	2.10E+00	h				ICRP-38	2.10E+00	h
Sn-127m	Sn-127m	4.13E+00	m							Sn-127m	4.13E+00	m				ICRP-107	4.13E+00	m
Sn-128	Sn-128	5.91E+01	m	Sn-128	5.91E+01	m	Sn-128	5.91E+01	m	Sn-128	5.91E+01	m				ICRP-38	5.91E+01	m
Sn-129	Sn-129	2.23E+00	m							Sn-129	2.23E+00	m				ICRP-107	2.23E+00	m
Sn-130	Sn-130	3.72E+00	m							Sn-130	3.72E+00	m				ICRP-107	3.72E+00	m
Sn-130m	Sn-130m	1.70E+00	m							Sn-130m	1.70E+00	m				ICRP-107	1.70E+00	m
Sr-79	Sr-79	2.25E+00	m							Sr-79	2.25E+00	m				ICRP-107	2.25E+00	m
Sr-80	Sr-80	1.06E+02	m	Sr-80	1.00E+02	m	Sr-80	1.00E+02	m	Sr-80	1.06E+02	m				ICRP-38	1.00E+02	m
Sr-81	Sr-81	2.23E+01	m	Sr-81	2.55E+01	m	Sr-81	2.55E+01	m	Sr-81	2.23E+01	m				ICRP-38	2.55E+01	m
Sr-82	Sr-82	2.54E+01	d	Sr-82	2.50E+01	d	Sr-82	2.50E+01	d	Sr-82	2.54E+01	d				ICRP-38	2.50E+01	d
Sr-83	Sr-83	3.24E+01	h	Sr-83	3.24E+01	h	Sr-83	3.24E+01	h	Sr-83	3.24E+01	h				ICRP-38	3.24E+01	h
Sr-85	Sr-85	6.48E+01	d	Sr-85	6.48E+01	d	Sr-85	6.48E+01	d	Sr-85	6.48E+01	d				ICRP-38	6.48E+01	d
Sr-85m	Sr-85m	6.76E+01	m	Sr-85m	6.95E+01	m	Sr-85m	6.95E+01	m	Sr-85m	6.76E+01	m				ICRP-38	6.95E+01	m
Sr-87m	Sr-87m	2.82E+00	h	Sr-87m	2.81E+00	h	Sr-87m	2.81E+00	h	Sr-87m	2.82E+00	h				ICRP-38	2.81E+00	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Sr-89	Sr-89	5.05E+01	d	Sr-89	5.05E+01	d	Sr-89	5.05E+01	d	Sr-89	5.05E+01	d				ICRP-38	5.05E+01	d
Sr-90	Sr-90	2.88E+01	y	Sr-90	2.91E+01	y	Sr-90	2.91E+01	y	Sr-90	2.88E+01	y				ICRP-38	2.91E+01	y
Sr-91	Sr-91	9.63E+00	h	Sr-91	9.50E+00	h	Sr-91	9.50E+00	h	Sr-91	9.63E+00	h				ICRP-38	9.50E+00	h
Sr-92	Sr-92	2.66E+00	h	Sr-92	2.71E+00	h	Sr-92	2.71E+00	h	Sr-92	2.66E+00	h				ICRP-38	2.71E+00	h
Sr-93	Sr-93	7.42E+00	m							Sr-93	7.42E+00	m				ICRP-107	7.42E+00	m
Sr-94	Sr-94	7.53E+01	s							Sr-94	7.53E+01	s				ICRP-107	7.53E+01	s
Ta-170	Ta-170	6.76E+00	m							Ta-170	6.76E+00	m	Ta-170	6.76E+00	m	ICRP-107	6.76E+00	m
Ta-172	Ta-172	3.68E+01	m	Ta-172	3.68E+01	m	Ta-172	3.68E+01	m	Ta-172	3.68E+01	m				ICRP-38	3.68E+01	m
Ta-173	Ta-173	3.14E+00	h	Ta-173	3.65E+00	h	Ta-173	3.65E+00	h	Ta-173	3.14E+00	h				ICRP-38	3.65E+00	h
Ta-174	Ta-174	1.14E+00	h	Ta-174	1.20E+00	h	Ta-174	1.20E+00	h	Ta-174	1.14E+00	h				ICRP-38	1.20E+00	h
Ta-175	Ta-175	1.05E+01	h	Ta-175	1.05E+01	h	Ta-175	1.05E+01	h	Ta-175	1.05E+01	h				ICRP-38	1.05E+01	h
Ta-176	Ta-176	8.09E+00	h	Ta-176	8.08E+00	h	Ta-176	8.08E+00	h	Ta-176	8.09E+00	h				ICRP-38	8.08E+00	h
Ta-177	Ta-177	5.66E+01	h	Ta-177	5.66E+01	h	Ta-177	5.66E+01	h	Ta-177	5.66E+01	h				ICRP-38	5.66E+01	h
Ta-178s	Ta-178	9.31E+00	m	Ta-178a	9.31E+00	m	Ta-178a	9.31E+00	m	Ta-178	9.31E+00	m	Ta-178	9.31E+00	m	ICRP-38	9.31E+00	m
Ta-178l	Ta-178m	2.36E+00	h	Ta-178b	2.20E+00	h	Ta-178b	2.20E+00	h	Ta-178m	2.36E+00	h				ICRP-38	2.20E+00	h
Ta-179	Ta-179	1.82E+00	y	Ta-179	6.65E+02	d	Ta-179	6.65E+02	d	Ta-179	1.82E+00	y				ICRP-38	6.65E+02	d
Ta-180				Ta-180	1.00E+13	y	Ta-180	1.00E+13	y							ICRP-38	1.00E+13	y
Ta-180m	Ta-180	8.15E+00	h	Ta-180m	8.10E+00	h	Ta-180m	8.10E+00	h	Ta-180	8.15E+00	h				ICRP-38	8.10E+00	h
Ta-182	Ta-182	1.14E+02	d	Ta-182	1.15E+02	d	Ta-182	1.15E+02	d	Ta-182	1.14E+02	d				ICRP-38	1.15E+02	d
Ta-182m	Ta-182m	1.58E+01	m	Ta-182m	1.58E+01	m	Ta-182m	1.58E+01	m	Ta-182m	1.58E+01	m				ICRP-38	1.58E+01	m
Ta-183	Ta-183	5.10E+00	d	Ta-183	5.10E+00	d	Ta-183	5.10E+00	d	Ta-183	5.10E+00	d				ICRP-38	5.10E+00	d
Ta-184	Ta-184	8.70E+00	h	Ta-184	8.70E+00	h	Ta-184	8.70E+00	h	Ta-184	8.70E+00	h				ICRP-38	8.70E+00	h
Ta-185	Ta-185	4.94E+01	m	Ta-185	4.90E+01	m	Ta-185	4.90E+01	m	Ta-185	4.94E+01	m				ICRP-38	4.90E+01	m
Ta-186	Ta-186	1.05E+01	m	Ta-186	1.05E+01	m	Ta-186	1.05E+01	m	Ta-186	1.05E+01	m				ICRP-38	1.05E+01	m
Tb-146	Tb-146	2.30E+01	s							Tb-146	2.30E+01	s				ICRP-107	2.30E+01	s
Tb-147	Tb-147	1.64E+00	h	Tb-147	1.65E+00	h	Tb-147	1.65E+00	h	Tb-147	1.64E+00	h				ICRP-38	1.65E+00	h
Tb-147m	Tb-147m	1.87E+00	m							Tb-147m	1.87E+00	m	Tb-147m	1.87E+00	m	ICRP-107	1.87E+00	m
Tb-148	Tb-148	6.00E+01	m							Tb-148	6.00E+01	m	Tb-148	6.00E+01	m	ICRP-107	6.00E+01	m
Tb-148m	Tb-148m	2.20E+00	m							Tb-148m	2.20E+00	m	Tb-148m	2.20E+00	m	ICRP-107	2.20E+00	m
Tb-149	Tb-149	4.12E+00	h	Tb-149	4.15E+00	h	Tb-149	4.15E+00	h	Tb-149	4.12E+00	h				ICRP-38	4.15E+00	h
Tb-149m	Tb-149m	4.16E+00	m							Tb-149m	4.16E+00	m	Tb-149m	4.16E+00	m	ICRP-107	4.16E+00	m
Tb-150	Tb-150	3.48E+00	h	Tb-150	3.27E+00	h	Tb-150	3.27E+00	h	Tb-150	3.48E+00	h				ICRP-38	3.27E+00	h
Tb-150m	Tb-150m	5.80E+00	m							Tb-150m	5.80E+00	m	Tb-150m	5.80E+00	m	ICRP-107	5.80E+00	m
Tb-151	Tb-151	1.76E+01	h	Tb-151	1.76E+01	h	Tb-151	1.76E+01	h	Tb-151	1.76E+01	h				ICRP-38	1.76E+01	h
Tb-151m	Tb-151m	2.50E+01	s							Tb-151m	2.50E+01	s				ICRP-107	2.50E+01	s
Tb-152	Tb-152	1.75E+01	h							Tb-152	1.75E+01	h	Tb-152	1.75E+01	h	ICRP-107	1.75E+01	h
Tb-152m	Tb-152m	4.20E+00	m							Tb-152m	4.20E+00	m	Tb-152m	4.20E+00	m	ICRP-107	4.20E+00	m
Tb-153	Tb-153	2.34E+00	d	Tb-153	2.34E+00	d	Tb-153	2.34E+00	d	Tb-153	2.34E+00	d				ICRP-38	2.34E+00	d
Tb-154	Tb-154	2.15E+01	h	Tb-154	2.14E+01	h	Tb-154	2.14E+01	h	Tb-154	2.15E+01	h				ICRP-38	2.14E+01	h
Tb-155	Tb-155	5.32E+00	d	Tb-155	5.32E+00	d	Tb-155	5.32E+00	d	Tb-155	5.32E+00	d				ICRP-38	5.32E+00	d

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
Tb-156	Tb-156	5.35E+00	d	Tb-156	5.34E+00	d	Tb-156	5.34E+00	d	Tb-156	5.35E+00	d				ICRP-38	5.34E+00	d
Tb-156ml	Tb-156m	2.44E+01	h	Tb-156m	2.44E+01	h	Tb-156m	2.44E+01	h	Tb-156m	2.44E+01	h				ICRP-38	2.44E+01	h
Tb-156ms	Tb-156n	5.30E+00	h	Tb-156n	5.00E+00	h	Tb-156n	5.00E+00	h	Tb-156n	5.30E+00	h				ICRP-38	5.00E+00	h
Tb-157	Tb-157	7.10E+01	y	Tb-157	1.50E+02	y	Tb-157	1.50E+02	y	Tb-157	7.10E+01	y				ICRP-38	1.50E+02	y
Tb-158	Tb-158	1.80E+02	y	Tb-158	1.50E+02	y	Tb-158	1.50E+02	y	Tb-158	1.80E+02	y				ICRP-38	1.50E+02	y
Tb-160	Tb-160	7.23E+01	d	Tb-160	7.23E+01	d	Tb-160	7.23E+01	d	Tb-160	7.23E+01	d				ICRP-38	7.23E+01	d
Tb-161	Tb-161	6.91E+00	d	Tb-161	6.91E+00	d	Tb-161	6.91E+00	d	Tb-161	6.91E+00	d				ICRP-38	6.91E+00	d
Tb-162	Tb-162	7.60E+00	m							Tb-162	7.60E+00	m	Tb-162	7.60E+00	m	ICRP-107	7.60E+00	m
Tb-163	Tb-163	1.95E+01	m							Tb-163	1.95E+01	m	Tb-163	1.95E+01	m	ICRP-107	1.95E+01	m
Tb-164	Tb-164	3.00E+00	m							Tb-164	3.00E+00	m	Tb-164	3.00E+00	m	ICRP-107	3.00E+00	m
Tb-165	Tb-165	2.11E+00	m							Tb-165	2.11E+00	m	Tb-165	2.11E+00	m	ICRP-107	2.11E+00	m
Tc-101	Tc-101	1.42E+01	m	Tc-101	1.42E+01	m	Tc-101	1.42E+01	m	Tc-101	1.42E+01	m				ICRP-38	1.42E+01	m
Tc-102	Tc-102	5.28E+00	s							Tc-102	5.28E+00	s				ICRP-107	5.28E+00	s
Tc-102m	Tc-102m	4.35E+00	m							Tc-102m	4.35E+00	m	Tc-102m	4.35E+00	m	ICRP-107	4.35E+00	m
Tc-104	Tc-104	1.83E+01	m	Tc-104	1.82E+01	m	Tc-104	1.82E+01	m	Tc-104	1.83E+01	m				ICRP-38	1.82E+01	m
Tc-105	Tc-105	7.60E+00	m							Tc-105	7.60E+00	m				ICRP-107	7.60E+00	m
Tc-91	Tc-91	3.14E+00	m							Tc-91	3.14E+00	m				ICRP-107	3.14E+00	m
Tc-91m	Tc-91m	3.30E+00	m							Tc-91m	3.30E+00	m				ICRP-107	3.30E+00	m
Tc-92	Tc-92	4.25E+00	m							Tc-92	4.25E+00	m				ICRP-107	4.25E+00	m
Tc-93	Tc-93	2.75E+00	h	Tc-93	2.75E+00	h	Tc-93	2.75E+00	h	Tc-93	2.75E+00	h				ICRP-38	2.75E+00	h
Tc-93m	Tc-93m	4.35E+01	m	Tc-93m	4.35E+01	m	Tc-93m	4.35E+01	m	Tc-93m	4.35E+01	m				ICRP-38	4.35E+01	m
Tc-94	Tc-94	2.93E+02	m	Tc-94	2.93E+02	m	Tc-94	2.93E+02	m	Tc-94	2.93E+02	m				ICRP-38	2.93E+02	m
Tc-94m	Tc-94m	5.20E+01	m	Tc-94m	5.20E+01	m	Tc-94m	5.20E+01	m	Tc-94m	5.20E+01	m				ICRP-38	5.20E+01	m
Tc-95	Tc-95	2.00E+01	h	Tc-95	2.00E+01	h	Tc-95	2.00E+01	h	Tc-95	2.00E+01	h				ICRP-38	2.00E+01	h
Tc-95m	Tc-95m	6.10E+01	d	Tc-95m	6.10E+01	d	Tc-95m	6.10E+01	d	Tc-95m	6.10E+01	d				ICRP-38	6.10E+01	d
Tc-96	Tc-96	4.28E+00	d	Tc-96	4.28E+00	d	Tc-96	4.28E+00	d	Tc-96	4.28E+00	d				ICRP-38	4.28E+00	d
Tc-96m	Tc-96m	5.15E+01	m	Tc-96m	5.15E+01	m	Tc-96m	5.15E+01	m	Tc-96m	5.15E+01	m				ICRP-38	5.15E+01	m
Tc-97	Tc-97	2.60E+06	y	Tc-97	2.60E+06	y	Tc-97	2.60E+06	y	Tc-97	2.60E+06	y				ICRP-38	2.60E+06	y
Tc-97m	Tc-97m	9.01E+01	d	Tc-97m	8.70E+01	d	Tc-97m	8.70E+01	d	Tc-97m	9.01E+01	d				ICRP-38	8.70E+01	d
Tc-98	Tc-98	4.20E+06	y	Tc-98	4.20E+06	y	Tc-98	4.20E+06	y	Tc-98	4.20E+06	y				ICRP-38	4.20E+06	y
Tc-99	Tc-99	2.11E+05	y	Tc-99	2.13E+05	y	Tc-99	2.13E+05	y	Tc-99	2.11E+05	y				ICRP-38	2.13E+05	y
Tc-99m	Tc-99m	6.02E+00	h	Tc-99m	6.02E+00	h	Tc-99m	6.02E+00	h	Tc-99m	6.02E+00	h				ICRP-38	6.02E+00	h
Te-113	Te-113	1.70E+00	m							Te-113	1.70E+00	m				ICRP-107	1.70E+00	m
Te-114	Te-114	1.52E+01	m							Te-114	1.52E+01	m				ICRP-107	1.52E+01	m
Te-115	Te-115	5.80E+00	m							Te-115	5.80E+00	m				ICRP-107	5.80E+00	m
Te-115m	Te-115m	6.70E+00	m							Te-115m	6.70E+00	m				ICRP-107	6.70E+00	m
Te-116	Te-116	2.49E+00	h	Te-116	2.49E+00	h	Te-116	2.49E+00	h	Te-116	2.49E+00	h				ICRP-38	2.49E+00	h
Te-117	Te-117	6.20E+01	m							Te-117	6.20E+01	m	Te-117	6.20E+01	m	ICRP-107	6.20E+01	m
Te-118	Te-118	6.00E+00	d							Te-118	6.00E+00	d	Te-118	6.00E+00	d	ICRP-107	6.00E+00	d
Te-119	Te-119	1.61E+01	h							Te-119	1.61E+01	h	Te-119	1.60E+01	h	ICRP-107	1.61E+01	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Te-119m	Te-119m	4.70E+00	d							Te-119m	4.70E+00	d	Te-119m	4.70E+00	d	ICRP-107	4.70E+00	d
Te-121	Te-121	1.92E+01	d	Te-121	1.70E+01	d	Te-121	1.70E+01	d	Te-121	1.92E+01	d				ICRP-38	1.70E+01	d
Te-121m	Te-121m	1.54E+02	d	Te-121m	1.54E+02	d	Te-121m	1.54E+02	d	Te-121m	1.54E+02	d				ICRP-38	1.54E+02	d
Te-123	Te-123	6.00E+14	y	Te-123	1.00E+13	y	Te-123	1.00E+13	y	Te-123	6.00E+14	y				ICRP-38	1.00E+13	y
Te-123m	Te-123m	1.19E+02	d	Te-123m	1.20E+02	d	Te-123m	1.20E+02	d	Te-123m	1.19E+02	d				ICRP-38	1.20E+02	d
Te-125m	Te-125m	5.74E+01	d	Te-125m	5.80E+01	d	Te-125m	5.80E+01	d	Te-125m	5.74E+01	d				ICRP-38	5.80E+01	d
Te-127	Te-127	9.35E+00	h	Te-127	9.35E+00	h	Te-127	9.35E+00	h	Te-127	9.35E+00	h				ICRP-38	9.35E+00	h
Te-127m	Te-127m	1.09E+02	d	Te-127m	1.09E+02	d	Te-127m	1.09E+02	d	Te-127m	1.09E+02	d				ICRP-38	1.09E+02	d
Te-129	Te-129	6.96E+01	m	Te-129	6.96E+01	m	Te-129	6.96E+01	m	Te-129	6.96E+01	m				ICRP-38	6.96E+01	m
Te-129m	Te-129m	3.36E+01	d	Te-129m	3.36E+01	d	Te-129m	3.36E+01	d	Te-129m	3.36E+01	d				ICRP-38	3.36E+01	d
Te-131	Te-131	2.50E+01	m	Te-131	2.50E+01	m	Te-131	2.50E+01	m	Te-131	2.50E+01	m				ICRP-38	2.50E+01	m
Te-131m	Te-131m	3.00E+01	h	Te-131m	3.00E+01	h	Te-131m	3.00E+01	h	Te-131m	3.00E+01	h				ICRP-38	3.00E+01	h
Te-132	Te-132	3.20E+00	d	Te-132	7.82E+01	h	Te-132	7.82E+01	h	Te-132	3.20E+00	d				ICRP-38	7.82E+01	h
Te-133	Te-133	1.25E+01	m	Te-133	1.25E+01	m	Te-133	1.25E+01	m	Te-133	1.25E+01	m				ICRP-38	1.25E+01	m
Te-133m	Te-133m	5.54E+01	m	Te-133m	5.54E+01	m	Te-133m	5.54E+01	m	Te-133m	5.54E+01	m				ICRP-38	5.54E+01	m
Te-134	Te-134	4.18E+01	m	Te-134	4.18E+01	m	Te-134	4.18E+01	m	Te-134	4.18E+01	m				ICRP-38	4.18E+01	m
Th-223	Th-223	6.00E-01	s							Th-223	6.00E-01	s				ICRP-107	6.00E-01	s
Th-224	Th-224	1.05E+00	s							Th-224	1.05E+00	s				ICRP-107	1.05E+00	s
Th-226	Th-226	3.06E+01	m	Th-226	3.09E+01	m	Th-226	3.09E+01	m	Th-226	3.06E+01	m				ICRP-38	3.09E+01	m
Th-227	Th-227	1.87E+01	d	Th-227	1.87E+01	d	Th-227	1.87E+01	d	Th-227	1.87E+01	d				ICRP-38	1.87E+01	d
Th-228	Th-228	1.91E+00	y	Th-228	1.91E+00	y	Th-228	1.91E+00	y	Th-228	1.91E+00	y				ICRP-38	1.91E+00	y
Th-229	Th-229	7.34E+03	y	Th-229	7.34E+03	y	Th-229	7.34E+03	y	Th-229	7.34E+03	y				ICRP-38	7.34E+03	y
Th-230	Th-230	7.54E+04	y	Th-230	7.70E+04	y	Th-230	7.70E+04	y	Th-230	7.54E+04	y				ICRP-38	7.70E+04	y
Th-231	Th-231	2.55E+01	h	Th-231	2.55E+01	h	Th-231	2.55E+01	h	Th-231	2.55E+01	h				ICRP-38	2.55E+01	h
Th-232	Th-232	1.41E+10	y	Th-232	1.41E+10	y	Th-232	1.41E+10	y	Th-232	1.41E+10	y				ICRP-38	1.41E+10	y
Th-233	Th-233	2.23E+01	m							Th-233	2.23E+01	m	Th-233	2.23E+01	m	ICRP-107	2.23E+01	m
Th-234	Th-234	2.41E+01	d	Th-234	2.41E+01	d	Th-234	2.41E+01	d	Th-234	2.41E+01	d				ICRP-38	2.41E+01	d
Th-235	Th-235	7.10E+00	m							Th-235	7.10E+00	m				ICRP-107	7.10E+00	m
Th-236	Th-236	3.75E+01	m							Th-236	3.75E+01	m				ICRP-107	3.75E+01	m
Ti-44	Ti-44	6.00E+01	y	Ti-44	4.73E+01	y	Ti-44	4.73E+01	y	Ti-44	6.00E+01	y				ICRP-38	4.73E+01	y
Ti-45	Ti-45	1.85E+02	m	Ti-45	3.08E+00	h	Ti-45	3.08E+00	h	Ti-45	1.85E+02	m				ICRP-38	3.08E+00	h
Ti-51	Ti-51	5.76E+00	m							Ti-51	5.76E+00	m	Ti-51	5.76E+00	m	ICRP-107	5.76E+00	m
Ti-52	Ti-52	1.70E+00	m							Ti-52	1.70E+00	m				ICRP-107	1.70E+00	m
Tl-190	Tl-190	2.60E+00	m							Tl-190	2.60E+00	m	Tl-190	2.60E+00	m	ICRP-107	2.60E+00	m
Tl-190m	Tl-190m	3.70E+00	m							Tl-190m	3.70E+00	m	Tl-190m	3.70E+00	m	ICRP-107	3.70E+00	m
Tl-194	Tl-194	3.30E+01	m	Tl-194	3.30E+01	m	Tl-194	3.30E+01	m	Tl-194	3.30E+01	m				ICRP-38	3.30E+01	m
Tl-194m	Tl-194m	3.28E+01	m	Tl-194m	3.28E+01	m	Tl-194m	3.28E+01	m	Tl-194m	3.28E+01	m				ICRP-38	3.28E+01	m
Tl-195	Tl-195	1.16E+00	h	Tl-195	1.16E+00	h	Tl-195	1.16E+00	h	Tl-195	1.16E+00	h				ICRP-38	1.16E+00	h
Tl-196	Tl-196	1.84E+00	h							Tl-196	1.84E+00	h	Tl-196	1.84E+00	h	ICRP-107	1.84E+00	h
Tl-197	Tl-197	2.84E+00	h	Tl-197	2.84E+00	h	Tl-197	2.84E+00	h	Tl-197	2.84E+00	h				ICRP-38	2.84E+00	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Tl-198	Tl-198	5.30E+00	h	Tl-198	5.30E+00	h	Tl-198	5.30E+00	h	Tl-198	5.30E+00	h				ICRP-38	5.30E+00	h
Tl-198m	Tl-198m	1.87E+00	h	Tl-198m	1.87E+00	h	Tl-198m	1.87E+00	h	Tl-198m	1.87E+00	h				ICRP-38	1.87E+00	h
Tl-199	Tl-199	7.42E+00	h	Tl-199	7.42E+00	h	Tl-199	7.42E+00	h	Tl-199	7.42E+00	h				ICRP-38	7.42E+00	h
Tl-200	Tl-200	2.61E+01	h	Tl-200	2.61E+01	h	Tl-200	2.61E+01	h	Tl-200	2.61E+01	h				ICRP-38	2.61E+01	h
Tl-201	Tl-201	7.29E+01	h	Tl-201	3.04E+00	d	Tl-201	3.04E+00	d	Tl-201	7.29E+01	h				ICRP-38	3.04E+00	d
Tl-202	Tl-202	1.22E+01	d	Tl-202	1.22E+01	d	Tl-202	1.22E+01	d	Tl-202	1.22E+01	d				ICRP-38	1.22E+01	d
Tl-204	Tl-204	3.78E+00	y	Tl-204	3.78E+00	y	Tl-204	3.78E+00	y	Tl-204	3.78E+00	y				ICRP-38	3.78E+00	y
Tl-206	Tl-206	4.20E+00	m	Tl-206	4.20E+00	m	Tl-206	4.20E+00	m	Tl-206	4.20E+00	m	Tl-206	4.20E+00	m	ICRP-38	4.20E+00	m
Tl-206m	Tl-206m	3.74E+00	m							Tl-206m	3.74E+00	m	Tl-206m	3.74E+00	m	ICRP-107	3.74E+00	m
Tl-207	Tl-207	4.77E+00	m	Tl-207	4.77E+00	m	Tl-207	4.77E+00	m	Tl-207	4.77E+00	m	Tl-207	4.77E+00	m	ICRP-38	4.77E+00	m
Tl-208	Tl-208	3.05E+00	m	Tl-208	3.07E+00	m	Tl-208	3.07E+00	m	Tl-208	3.05E+00	m	Tl-208	3.05E+00	m	ICRP-38	3.07E+00	m
Tl-209	Tl-209	2.16E+00	m	Tl-209	2.20E+00	m	Tl-209	2.20E+00	m	Tl-209	2.16E+00	m	Tl-209	2.16E+00	m	ICRP-38	2.20E+00	m
Tl-210	Tl-210	1.30E+00	m				Tl-210	1.30E+00	m	Tl-210	1.30E+00	m	Tl-210	1.30E+00	m	ICRP-38	1.30E+00	m
Tm-159													Tm-159	9.13E+00	m	JAERI	9.13E+00	m
Tm-161	Tm-161	3.02E+01	m							Tm-161	3.02E+01	m				ICRP-107	3.02E+01	m
Tm-162	Tm-162	2.17E+01	m	Tm-162	2.17E+01	m	Tm-162	2.17E+01	m	Tm-162	2.17E+01	m				ICRP-38	2.17E+01	m
Tm-163	Tm-163	1.81E+00	h							Tm-163	1.81E+00	h	Tm-163	1.81E+00	h	ICRP-107	1.81E+00	h
Tm-164	Tm-164	2.00E+00	m							Tm-164	2.00E+00	m	Tm-164	2.00E+00	m	ICRP-107	2.00E+00	m
Tm-165	Tm-165	3.01E+01	h							Tm-165	3.01E+01	h	Tm-165	3.01E+01	h	ICRP-107	3.01E+01	h
Tm-166	Tm-166	7.70E+00	h	Tm-166	7.70E+00	h	Tm-166	7.70E+00	h	Tm-166	7.70E+00	h				ICRP-38	7.70E+00	h
Tm-167	Tm-167	9.25E+00	d	Tm-167	9.24E+00	d	Tm-167	9.24E+00	d	Tm-167	9.25E+00	d				ICRP-38	9.24E+00	d
Tm-168	Tm-168	9.31E+01	d							Tm-168	9.31E+01	d	Tm-168	9.31E+01	d	ICRP-107	9.31E+01	d
Tm-170	Tm-170	1.29E+02	d	Tm-170	1.29E+02	d	Tm-170	1.29E+02	d	Tm-170	1.29E+02	d				ICRP-38	1.29E+02	d
Tm-171	Tm-171	1.92E+00	y	Tm-171	1.92E+00	y	Tm-171	1.92E+00	y	Tm-171	1.92E+00	y				ICRP-38	1.92E+00	y
Tm-172	Tm-172	6.36E+01	h	Tm-172	6.36E+01	h	Tm-172	6.36E+01	h	Tm-172	6.36E+01	h				ICRP-38	6.36E+01	h
Tm-173	Tm-173	8.24E+00	h	Tm-173	8.24E+00	h	Tm-173	8.24E+00	h	Tm-173	8.24E+00	h				ICRP-38	8.24E+00	h
Tm-174	Tm-174	5.40E+00	m							Tm-174	5.40E+00	m				ICRP-107	5.40E+00	m
Tm-175	Tm-175	1.52E+01	m	Tm-175	1.52E+01	m	Tm-175	1.52E+01	m	Tm-175	1.52E+01	m				ICRP-38	1.52E+01	m
Tm-176	Tm-176	1.85E+00	m							Tm-176	1.85E+00	m				ICRP-107	1.85E+00	m
U-227	U-227	1.10E+00	m							U-227	1.10E+00	m				ICRP-107	1.10E+00	m
U-228	U-228	9.10E+00	m							U-228	9.10E+00	m	U-228	9.10E+00	m	ICRP-107	9.10E+00	m
U-230	U-230	2.08E+01	d	U-230	2.08E+01	d	U-230	2.08E+01	d	U-230	2.08E+01	d				ICRP-38	2.08E+01	d
U-231	U-231	4.20E+00	d	U-231	4.20E+00	d	U-231	4.20E+00	d	U-231	4.20E+00	d				ICRP-38	4.20E+00	d
U-232	U-232	6.89E+01	y	U-232	7.20E+01	y	U-232	7.20E+01	y	U-232	6.89E+01	y				ICRP-38	7.20E+01	y
U-233	U-233	1.59E+05	y	U-233	1.59E+05	y	U-233	1.59E+05	y	U-233	1.59E+05	y				ICRP-38	1.59E+05	y
U-234	U-234	2.46E+05	y	U-234	2.45E+05	y	U-234	2.45E+05	y	U-234	2.46E+05	y				ICRP-38	2.45E+05	y
U-235	U-235	7.04E+08	y	U-235	7.04E+08	y	U-235	7.04E+08	y	U-235	7.04E+08	y				ICRP-38	7.04E+08	y
U-235m	U-235m	2.60E+01	m							U-235m	2.60E+01	m				ICRP-107	2.60E+01	m
U-236	U-236	2.34E+07	y	U-236	2.34E+07	y	U-236	2.34E+07	y	U-236	2.34E+07	y				ICRP-38	2.34E+07	y
U-237	U-237	6.75E+00	d	U-237	6.75E+00	d	U-237	6.75E+00	d	U-237	6.75E+00	d				ICRP-38	6.75E+00	d

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
U-238	U-238	4.47E+09	y	U-238	4.47E+09	y	U-238	4.47E+09	y	U-238	4.47E+09	y				ICRP-38	4.47E+09	y
U-239	U-239	2.35E+01	m	U-239	2.35E+01	m	U-239	2.35E+01	m	U-239	2.35E+01	m				ICRP-38	2.35E+01	m
U-240	U-240	1.41E+01	h	U-240	1.41E+01	h	U-240	1.41E+01	h	U-240	1.41E+01	h				ICRP-38	1.41E+01	h
U-242	U-242	1.68E+01	m							U-242	1.68E+01	m				ICRP-107	1.68E+01	m
V-47	V-47	3.26E+01	m	V-47	3.26E+01	m	V-47	3.26E+01	m	V-47	3.26E+01	m				ICRP-38	3.26E+01	m
V-48	V-48	1.60E+01	d	V-48	1.62E+01	d	V-48	1.62E+01	d	V-48	1.60E+01	d				ICRP-38	1.62E+01	d
V-49	V-49	3.30E+02	d	V-49	3.30E+02	d	V-49	3.30E+02	d	V-49	3.30E+02	d				ICRP-38	3.30E+02	d
V-50	V-50	1.50E+17	y							V-50	1.50E+17	y	V-50	1.50E+17	y	ICRP-107	1.50E+17	y
V-52	V-52	3.74E+00	m							V-52	3.74E+00	m	V-52	3.74E+00	m	ICRP-107	3.74E+00	m
V-53	V-53	1.61E+00	m							V-53	1.61E+00	m	V-53	1.61E+00	m	ICRP-107	1.61E+00	m
W-176				W-176	2.30E+00	h	W-176	2.30E+00	h							ICRP-38	2.30E+00	h
W-177	W-177	1.32E+02	m	W-177	1.35E+02	m	W-177	1.35E+02	m	W-177	1.32E+02	m				ICRP-38	1.35E+02	m
W-178	W-178	2.16E+01	d	W-178	2.17E+01	d	W-178	2.17E+01	d	W-178	2.16E+01	d				ICRP-38	2.17E+01	d
W-179	W-179	3.71E+01	m	W-179	3.75E+01	m	W-179	3.75E+01	m	W-179	3.71E+01	m				ICRP-38	3.75E+01	m
W-179m	W-179m	6.40E+00	m							W-179m	6.40E+00	m	W-179m	6.40E+00	m	ICRP-107	6.40E+00	m
W-181	W-181	1.21E+02	d	W-181	1.21E+02	d	W-181	1.21E+02	d	W-181	1.21E+02	d				ICRP-38	1.21E+02	d
W-185	W-185	7.51E+01	d	W-185	7.51E+01	d	W-185	7.51E+01	d	W-185	7.51E+01	d				ICRP-38	7.51E+01	d
W-185m	W-185m	1.60E+00	m							W-185m	1.60E+00	m	W-185m	1.60E+00	m	ICRP-107	1.60E+00	m
W-187	W-187	2.37E+01	h	W-187	2.39E+01	h	W-187	2.39E+01	h	W-187	2.37E+01	h				ICRP-38	2.39E+01	h
W-188	W-188	6.98E+01	d	W-188	6.94E+01	d	W-188	6.94E+01	d	W-188	6.98E+01	d				ICRP-38	6.94E+01	d
W-190	W-190	3.00E+01	m							W-190	3.00E+01	m	W-190	3.00E+01	m	ICRP-107	3.00E+01	m
Xe-120	Xe-120	4.00E+01	m	Xe-120	4.00E+01	m	Xe-120	4.00E+01	m	Xe-120	4.00E+01	m				ICRP-38	4.00E+01	m
Xe-121	Xe-121	4.01E+01	m	Xe-121	4.01E+01	m	Xe-121	4.01E+01	m	Xe-121	4.01E+01	m				ICRP-38	4.01E+01	m
Xe-122	Xe-122	2.01E+01	h	Xe-122	2.01E+01	h	Xe-122	2.01E+01	h	Xe-122	2.01E+01	h				ICRP-38	2.01E+01	h
Xe-123	Xe-123	2.08E+00	h	Xe-123	2.08E+00	h	Xe-123	2.08E+00	h	Xe-123	2.08E+00	h				ICRP-38	2.08E+00	h
Xe-125	Xe-125	1.69E+01	h	Xe-125	1.70E+01	h	Xe-125	1.70E+01	h	Xe-125	1.69E+01	h				ICRP-38	1.70E+01	h
Xe-127	Xe-127	3.64E+01	d	Xe-127	3.64E+01	d	Xe-127	3.64E+01	d	Xe-127	3.64E+01	d				ICRP-38	3.64E+01	d
Xe-127m	Xe-127m	6.92E+01	s							Xe-127m	6.92E+01	s	Xe-127m	1.15E+00	m	ICRP-107	6.92E+01	s
Xe-129m	Xe-129m	8.88E+00	d	Xe-129m	8.00E+00	d	Xe-129m	8.00E+00	d	Xe-129m	8.88E+00	d				ICRP-38	8.00E+00	d
Xe-131m	Xe-131m	1.18E+01	d	Xe-131m	1.19E+01	d	Xe-131m	1.19E+01	d	Xe-131m	1.18E+01	d				ICRP-38	1.19E+01	d
Xe-133	Xe-133	5.24E+00	d	Xe-133	5.25E+00	d	Xe-133	5.25E+00	d	Xe-133	5.24E+00	d				ICRP-38	5.25E+00	d
Xe-133m	Xe-133m	2.19E+00	d	Xe-133m	2.19E+00	d	Xe-133m	2.19E+00	d	Xe-133m	2.19E+00	d				ICRP-38	2.19E+00	d
Xe-135	Xe-135	9.14E+00	h	Xe-135	9.09E+00	h	Xe-135	9.09E+00	h	Xe-135	9.14E+00	h				ICRP-38	9.09E+00	h
Xe-135m	Xe-135m	1.53E+01	m	Xe-135m	1.53E+01	m	Xe-135m	1.53E+01	m	Xe-135m	1.53E+01	m				ICRP-38	1.53E+01	m
Xe-137	Xe-137	3.82E+00	m							Xe-137	3.82E+00	m	Xe-137	3.82E+00	m	ICRP-107	3.82E+00	m
Xe-138	Xe-138	1.41E+01	m	Xe-138	1.42E+01	m	Xe-138	1.42E+01	m	Xe-138	1.41E+01	m				ICRP-38	1.42E+01	m
Y-81	Y-81	7.04E+01	s							Y-81	7.04E+01	s				ICRP-107	7.04E+01	s
Y-83	Y-83	7.08E+00	m							Y-83	7.08E+00	m	Y-83	7.08E+00	m	ICRP-107	7.08E+00	m
Y-83m	Y-83m	2.85E+00	m							Y-83m	2.85E+00	m	Y-83m	2.85E+00	m	ICRP-107	2.85E+00	m
Y-84m	Y-84m	3.95E+01	m							Y-84m	3.95E+01	m	Y-84m	4.00E+01	m	ICRP-107	3.95E+01	m

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)

	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Nuclide**	**Half-Life (original units)**		**Selected Half-Life Reference**	**Selected Half-Life (original units)**	
Y-85	Y-85	2.68E+00	h							Y-85	2.68E+00	h	Y-85	2.68E+00	h	ICRP-107	2.68E+00	h
Y-85m	Y-85m	4.86E+00	h							Y-85m	4.86E+00	h	Y-85m	4.86E+00	h	ICRP-107	4.86E+00	h
Y-86	Y-86	1.47E+01	h	Y-86	1.47E+01	h	Y-86	1.47E+01	h	Y-86	1.47E+01	h				ICRP-38	1.47E+01	h
Y-86m	Y-86m	4.80E+01	m	Y-86m	4.80E+01	m	Y-86m	4.80E+01	m	Y-86m	4.80E+01	m				ICRP-38	4.80E+01	m
Y-87	Y-87	7.98E+01	h	Y-87	8.03E+01	h	Y-87	8.03E+01	h	Y-87	7.98E+01	h				ICRP-38	8.03E+01	h
Y-87m	Y-87m	1.34E+01	h							Y-87m	1.34E+01	h	Y-87m	1.34E+01	h	ICRP-107	1.34E+01	h
Y-88	Y-88	1.07E+02	d	Y-88	1.07E+02	d	Y-88	1.07E+02	d	Y-88	1.07E+02	d				ICRP-38	1.07E+02	d
Y-89m	Y-89m	1.57E+01	s							Y-89m	1.57E+01	s				ICRP-107	1.57E+01	s
Y-90	Y-90	6.41E+01	h	Y-90	6.40E+01	h	Y-90	6.40E+01	h	Y-90	6.41E+01	h				ICRP-38	6.40E+01	h
Y-90m	Y-90m	3.19E+00	h	Y-90m	3.19E+00	h	Y-90m	3.19E+00	h	Y-90m	3.19E+00	h				ICRP-38	3.19E+00	h
Y-91	Y-91	5.85E+01	d	Y-91	5.85E+01	d	Y-91	5.85E+01	d	Y-91	5.85E+01	d				ICRP-38	5.85E+01	d
Y-91m	Y-91m	4.97E+01	m	Y-91m	4.97E+01	m	Y-91m	4.97E+01	m	Y-91m	4.97E+01	m				ICRP-38	4.97E+01	m
Y-92	Y-92	3.54E+00	h	Y-92	3.54E+00	h	Y-92	3.54E+00	h	Y-92	3.54E+00	h				ICRP-38	3.54E+00	h
Y-93	Y-93	1.02E+01	h	Y-93	1.01E+01	h	Y-93	1.01E+01	h	Y-93	1.02E+01	h				ICRP-38	1.01E+01	h
Y-94	Y-94	1.87E+01	m	Y-94	1.91E+01	m	Y-94	1.91E+01	m	Y-94	1.87E+01	m				ICRP-38	1.91E+01	m
Y-95	Y-95	1.03E+01	m	Y-95	1.07E+01	m	Y-95	1.07E+01	m	Y-95	1.03E+01	m				ICRP-38	1.07E+01	m
Yb-162	Yb-162	1.89E+01	m	Yb-162	1.89E+01	m	Yb-162	1.89E+01	m	Yb-162	1.89E+01	m				ICRP-38	1.89E+01	m
Yb-163	Yb-163	1.11E+01	m							Yb-163	1.11E+01	m	Yb-163	1.11E+01	m	ICRP-107	1.11E+01	m
Yb-164	Yb-164	7.58E+01	m							Yb-164	7.58E+01	m	Yb-164	7.58E+01	m	ICRP-107	7.58E+01	m
Yb-165	Yb-165	9.90E+00	m							Yb-165	9.90E+00	m	Yb-165	9.90E+00	m	ICRP-107	9.90E+00	m
Yb-166	Yb-166	5.67E+01	h	Yb-166	5.67E+01	h	Yb-166	5.67E+01	h	Yb-166	5.67E+01	h				ICRP-38	5.67E+01	h
Yb-167	Yb-167	1.75E+01	m	Yb-167	1.75E+01	m	Yb-167	1.75E+01	m	Yb-167	1.75E+01	m				ICRP-38	1.75E+01	m
Yb-169	Yb-169	3.20E+01	d	Yb-169	3.20E+01	d	Yb-169	3.20E+01	d	Yb-169	3.20E+01	d				ICRP-38	3.20E+01	d
Yb-175	Yb-175	4.19E+00	d	Yb-175	4.19E+00	d	Yb-175	4.19E+00	d	Yb-175	4.19E+00	d				ICRP-38	4.19E+00	d
Yb-177	Yb-177	1.91E+00	h	Yb-177	1.90E+00	h	Yb-177	1.90E+00	h	Yb-177	1.91E+00	h				ICRP-38	1.90E+00	h
Yb-178	Yb-178	7.40E+01	m	Yb-178	7.40E+01	m	Yb-178	7.40E+01	m	Yb-178	7.40E+01	m				ICRP-38	7.40E+01	m
Yb-179	Yb-179	8.00E+00	m							Yb-179	8.00E+00	m				ICRP-107	8.00E+00	m
Zn-60	Zn-60	2.38E+00	m							Zn-60	2.38E+00	m				ICRP-107	2.38E+00	m
Zn-61	Zn-61	8.91E+01	s							Zn-61	8.91E+01	s				ICRP-107	8.91E+01	s
Zn-62	Zn-62	9.19E+00	h	Zn-62	9.26E+00	h	Zn-62	9.26E+00	h	Zn-62	9.19E+00	h				ICRP-38	9.26E+00	h
Zn-63	Zn-63	3.85E+01	m	Zn-63	3.81E+01	m	Zn-63	3.81E+01	m	Zn-63	3.85E+01	m				ICRP-38	3.81E+01	m
Zn-65	Zn-65	2.44E+02	d	Zn-65	2.44E+02	d	Zn-65	2.44E+02	d	Zn-65	2.44E+02	d				ICRP-38	2.44E+02	d
Zn-69	Zn-69	5.64E+01	m	Zn-69	5.70E+01	m	Zn-69	5.70E+01	m	Zn-69	5.64E+01	m				ICRP-38	5.70E+01	m
Zn-69m	Zn-69m	1.38E+01	h	Zn-69m	1.38E+01	h	Zn-69m	1.38E+01	h	Zn-69m	1.38E+01	h				ICRP-38	1.38E+01	h
Zn-71	Zn-71	2.45E+00	m							Zn-71	2.45E+00	m				ICRP-107	2.45E+00	m
Zn-71m	Zn-71m	3.96E+00	h	Zn-71m	3.92E+00	h	Zn-71m	3.92E+00	h	Zn-71m	3.96E+00	h				ICRP-38	3.92E+00	h
Zn-72	Zn-72	4.65E+01	h	Zn-72	4.65E+01	h	Zn-72	4.65E+01	h	Zn-72	4.65E+01	h				ICRP-38	4.65E+01	h
Zr-85	Zr-85	7.86E+00	m							Zr-85	7.86E+00	m	Zr-85	7.86E+00	m	ICRP-107	7.86E+00	m
Zr-86	Zr-86	1.65E+01	h	Zr-86	1.65E+01	h	Zr-86	1.65E+01	h	Zr-86	1.65E+01	h				ICRP-38	1.65E+01	h
Zr-87	Zr-87	1.68E+00	h							Zr-87	1.68E+00	h	Zr-87	1.68E+00	h	ICRP-107	1.68E+00	h

Table D.1 Selection of Radionuclides For Calculating HC-2 and HC-3 TQs (continued)																		
	DOE-STD-1196			FGR-12			ICRP-38			ICRP-107			JAERI					
MASTER LIST	Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Nuclide	Half-Life (original units)		Selected Half-Life Reference	Selected Half-Life (original units)	
Zr-88	Zr-88	8.34E+01	d	Zr-88	8.34E+01	d	Zr-88	8.34E+01	d	Zr-88	8.34E+01	d				ICRP-38	8.34E+01	d
Zr-89	Zr-89	7.84E+01	h	Zr-89	7.84E+01	h	Zr-89	7.84E+01	h	Zr-89	7.84E+01	h				ICRP-38	7.84E+01	h
Zr-89m	Zr-89m	4.16E+00	m							Zr-89m	4.16E+00	m	Zr-89m	4.18E+00	m	ICRP-107	4.16E+00	m
Zr-93	Zr-93	1.53E+06	y	Zr-93	1.53E+06	y	Zr-93	1.53E+06	y	Zr-93	1.53E+06	y				ICRP-38	1.53E+06	y
Zr-95	Zr-95	6.40E+01	d	Zr-95	6.40E+01	d	Zr-95	6.40E+01	d	Zr-95	6.40E+01	d				ICRP-38	6.40E+01	d
Zr-97	Zr-97	1.67E+01	h	Zr-97	1.69E+01	h	Zr-97	1.69E+01	h	Zr-97	1.67E+01	h				ICRP-38	1.69E+01	h

APPENDIX E. PRECISION LIMITATIONS FOR THE CALCULATION OF THE EFFECTIVE EXPOSURE DURATION

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APPENDIX E. PRECISION LIMITATIONS FOR THE CALCULATION OF THE EFFECTIVE EXPOSURE DURATION

E.1 Background

The calculation of updated Hazard Category (HC)- 2 and HC-3 Thresholds Quantities (TQs) was accomplished through the use of Microsoft (MS) Excel 2010 ®, Version 14.0.7184.5000 (32-bit). MS Excel was selected based on its calculational capabilities and its widespread availability, thus allowing for effective sharing of the calculation between developers, reviewers and the end-users.

MS Excel nominally works with 8-byte numbers. Although Excel can display numbers up to 30 decimal places, its precision for a specific number is confined to 15 significant figures. Accordingly, some calculations conducted in MS Excel experience limited accuracy due to the limitation associated with the significant figures retained to describe a number. ‡‡‡‡‡‡‡

E.2 Precision Limitations Associated with the Calculation of the Effective Exposure Duration

During the calculation of HC-3 pathway specific TQs, these numerical precision limitations of MS Excel were noted to occur. Specifically, the calculation of Contact Times for the Water Ingestion pathway and the Direct Exposure pathway were observed to return inaccurate results for radionuclides with very long half-lives.

For the Water Ingestion pathway and the Direct Exposure pathway, the Contact Time (a.k.a., effective exposure duration) is calculated via the following equation:

$$\mathrm{CT} = \frac{1 - \exp(-\lambda * \mathrm{t})}{\lambda} \qquad \text{Eqn E-1}$$

Where;

CT = Contact Time (a.k.a, Effective Exposure Duration) [days]

λ = Radionuclide decay constant (day^{-1}) = $\ln(2)/t_{1/2}$

t = Actual Exposure Duration [9 days for Water Ingestion pathway and 1 day for Direct Exposure pathway]

As noted above, the radionuclide decay constant, λ, is inversely proportional to the radionuclide half-life. Therefore, the radionuclide decay constant becomes smaller for larger evaluated half-life values. A solution to Equation E-1 can be determined by evaluating the limit of $\lambda \rightarrow 0$ by using L'Hôpital's rule (35) per Equation E-2:

$$\lim_{\lambda \to 0} \frac{f(\lambda)}{g(\lambda)} = \lim_{\lambda \to 0} \frac{f'(\lambda)}{g'(\lambda)} \qquad \text{Eqn E-2}$$

‡‡‡‡‡‡‡ Numerical precision in Microsoft Excel; https://en.wikipedia.org/wiki/Numeric_precision_in_Microsoft_Excel

Where;

$f(\lambda)$ = 1-exp(-λt)

$f'(\lambda)$ = t*exp(-λt)

$g(\lambda)$ = λ

$g'(\lambda)$ = 1

Substitution into Equation E-2 yields:

$$\lim_{\lambda \to 0} \frac{f'(\lambda)}{g'(\lambda)} = \lim_{\lambda \to 0} \frac{t * \exp(-\lambda t)}{1} = t \qquad \text{Eqn E-3}$$

Based on the results of Equation E-3, it is concluded that as the radionuclide decay constant approaches a value of zero, the calculated value for the CT is equal to the actual exposure duration, t. With respect to the HC-3 exposure pathways, the consequences of Equation E-3 are as follows:

- For the Water Ingestion pathway: CT = 9 days as $\lambda \rightarrow 0$
- For the Direct Exposure pathway: CT = 1 days as $\lambda \rightarrow 0$

During the calculation of the CT for the Water Ingestion pathway and the Direct Exposure pathway, anomalous values were noted to occur. Specifically, for increasingly large half-life values, the CT did not converge to the expected value as predicted by Equation E-3. The observed behavior of the MS Excel calculation of the CT using Equation E-1 is illustrated in Figure E.1.

- Water Ingestion Pathway: The calculated CT asymptotically approaches an effective exposure duration of 9 days. At a radionuclide half-life equal to 3E+14 days (~8.22E+11 yrs), the CT value reported by MS Excel drifts from the expected CT value of 9 days. The deviation from the actual CT gradually grows worse as the evaluated radionuclide half-life increases. For radionuclide half-life values greater than 2E+17 days, MS Excel reports a calculated CT value of zero instead of the expected value of 9 days.

- Direct Exposure Pathway: The calculated CT asymptotically approaches an effective exposure duration of 1 day. At a radionuclide half-life equal to 8E+12 days (~2.19E+10 yrs), the CT value reported by MS Excel displays small perturbations. The deviation from the actual CT gradually grows worse as the evaluated radionuclide half-life increases. For radionuclide half-life values greater than 2E+16 days, MS Excel reports a calculated CT value of zero instead of the expected value of 1 day.

The radionuclide data set used for the calculation of HC-2 and HC-3 TQs was reviewed to determine the extent of the CT calculation issue for the Water Ingestion pathway and Direct Exposure pathway. Table E.1 lists all the evaluated radionuclides with a reported half-life equal to or greater than 1E+12 days.

Table E.1 Radionuclides with Half-Life ≥ 1E+12 Days	
Radionuclide	**Half-Life (d)**
Cd-113	3.40E+18
Gd-152	3.94E+16
Hf-174	7.31E+17
In-115	1.86E+18
La-138	4.93E+13
Lu-176	1.31E+13
Nd-144	8.36E+17
Os-186	7.31E+17
Pt-190	2.37E+14
Rb-87	1.72E+13
Re-187	1.83E+13
Sm-147	3.87E+13
Sm-148	2.56E+18
Ta-180	3.65E+15
Te-123	3.65E+15
Th-232	5.13E+12
U-238	1.63E+12
V-50	5.48E+19

In order to work preserve calculational accuracy of the pathway specific TQ values for the radionuclides in Table E.1, a conditional statement was used to calculate the CT for the Water Ingestion pathway and the Direct Exposure pathway.

- If the radionuclide half-life was noted to be less than or equal to 1E+12 days, the CT was calculated using Equation E-1.

- Otherwise, if the radionuclide half-life was noted to be greater than 1E+12 days, the CT was set to be equal to the actual exposure duration (9 days for the Water Ingestion pathway and 1 day for the Direct Exposure pathway).

It was noted that the calculated CT for the Food Ingestion pathway did not display the same precision instability as observed for the Water Ingestion pathway and the Direct Exposure pathway. The equation for the Food Ingestion pathway CT is represented as follows:

$$\mathrm{CT} = \left(\frac{1 - \exp(-[(\lambda_I + \lambda_W)\mathrm{t}_G])}{\lambda_I + \lambda_W}\right) \qquad \text{Eqn. E-4}$$

Where;

λ_I = Radionuclide decay constant [day^{-1}] = ln(2)/$t_{1/2}$

$t_{1/2}$ = Radionuclide half-life [days]

λ_W = Weathering decay constant [day^{-1}] = ln(2)/14 days

t_G = Growing season time [60 days]

A solution for the Food Ingestion pathway CT can be determined by directly evaluating the limit as λ_I approaches zero as follows:

$$\lim_{\lambda \to 0} \mathrm{CT} = \left(\frac{1-\exp(-(\lambda_W t_G))}{\lambda_W}\right) = \frac{1-\exp(-(0.04951\ d)*(60\ d))}{0.04951\ d} = 19.2\ \mathrm{d} \qquad \text{Eqn E-5}$$

As determined per Equation E-5, the calculated CT for the Food Ingestion pathway is equal to 19.2 days as the radionuclide decay constant, λ_I, goes to zero. As noted in Figure E.1, MS Excel accurately calculates the CT for the Food Ingestion pathway for the entire span of evaluated half-life data (up-to $t_{1/2}$ = 1E+20 days). Since the CT for the Food Ingestion pathway did not incur any MS Excel calculation precision errors, no conditional adjustment to the CT calculation was needed.

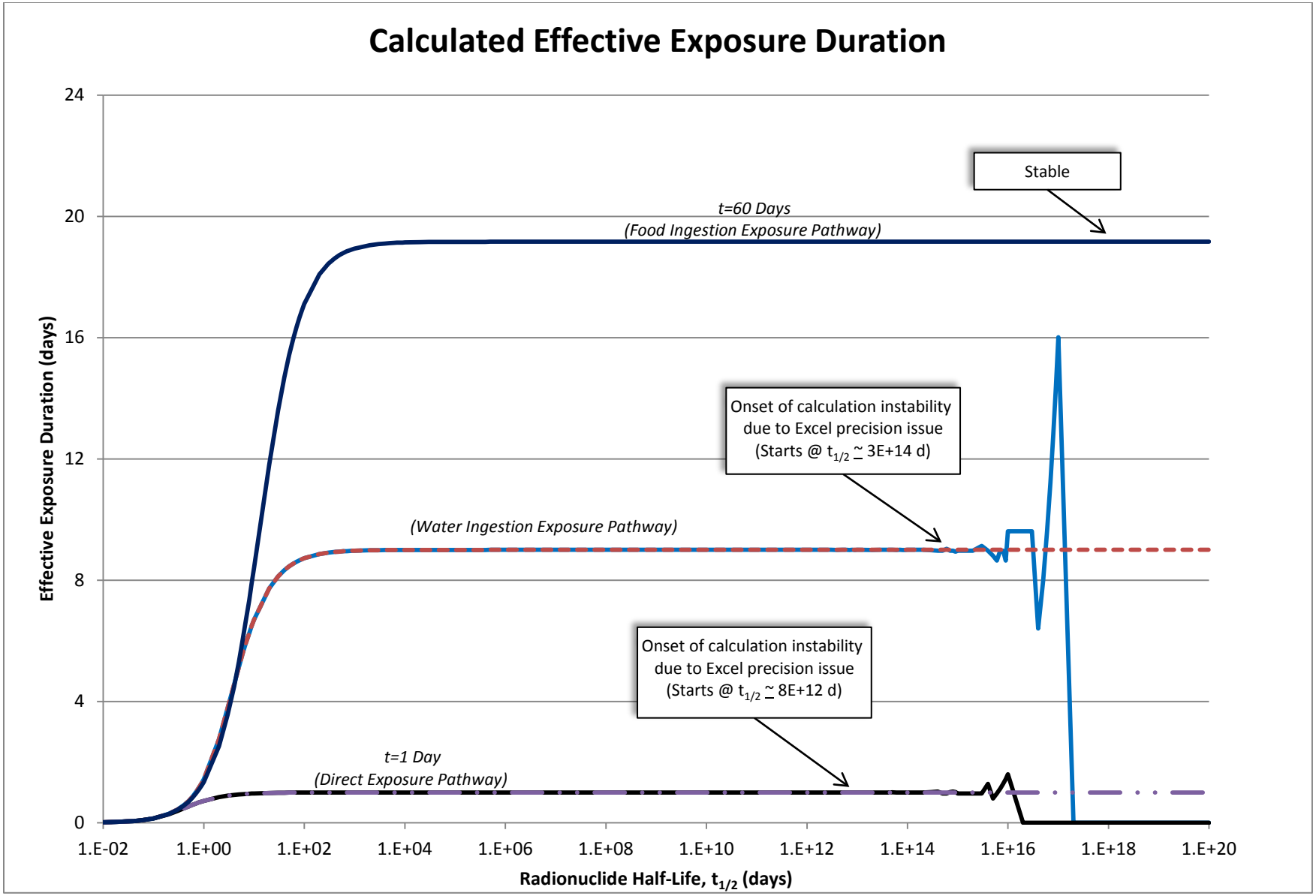

Figure E.1 Accuracy Limitation of MS Excel Regarding the Calculation Exposure Pathway Contact Times