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HEALTH EFFECTS ASSESSMENT

SUMMARY TABLES

FY-1994 Annual

Office of Research and Development
Office of Emergency and Remedial Response
U.S. Environmental Protection Agency
Washington, DC 20460

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DISCLAIMER

This report has been prepared by the U.S. Environmental Protection Agency. The information contained herein has been taken from final documents prepared by the Office of Health and Environmental Assessment for the Office of Solid Waste and Emergency Response and the Office of Water, Washington, DC and the Office of Air Quality Planning and Standards, Research Triangle Park, NC. These documents were reviewed in accordance with Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

TABLE OF CONTENTS

Page

INTRODUCTION 1

WHAT'S NEW IN THE ANNUAL FY94 HEAST. 11

USER'S GUIDE: CHEMICAL TOXICITY 19

USER'S GUIDE: RADIONUCLIDE CARCINOGENICITY 32

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) 1-1

REFERENCES FOR HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) R1-1

HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) 2-1

REFERENCES FOR HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) R2-1

HEAST TABLE 3: CARCINOGENICITY 3-1

REFERENCES FOR HEAST TABLE 3: CARCINOGENICITY R3-1

HEAST TABLE 4A: RADIONUCLIDE CARCINOGENICITY - SLOPE FACTORS (IN PICOCURIES) 4A-1

HEAST TABLE 4B: RADIONUCLIDE CARCINOGENICITY - SLOPE FACTORS (IN BECQUERELS) 4B-1

APPENDIX A: TECHNICAL INFORMATION A-1

INTRODUCTION

This document is the FY94 Annual Update of the Health Effects Assessment Summary Tables (HEAST) prepared by EPA's Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for use at both Superfund and RCRA sites. It **completely** replaces all former editions of the HEAST.

This version of the HEAST will be updated in 1994 by a July 1994 Supplement No. 1 and a November 1994 Supplement No. 2. These supplements will supercede the information in this document, the March 1994 HEAST Annual Update. Therefore, if the supplement(s) are available they should be checked whenever this document is consulted. These supplements, however, will not be produced to stand alone and will not contain the User's Guides or Appendix that are available in the annual update. Thus, the user is strongly encouraged to refer to the March 1994 HEAST Annual Update for this information.

The HEAST is a comprehensive listing consisting almost entirely of PROVISIONAL RISK ASSESSMENT INFORMATION relative to oral and inhalation routes for chemicals of interest to Superfund, the Resource Conservation and Recovery Act (RCRA), and the EPA in general. These entries in the HEAST are limited to chemicals that have undergone review and have the concurrence of individual Agency Program Offices, and each is supported by an Agency reference. This risk assessment information has not, however, had enough review to be recognized as high quality, Agency-wide consensus information.

The Integrated Risk Information System (IRIS) is the Agency's official repository of Agency-wide consensus chronic human health risk information. IRIS evaluations are conducted by the Agency's Work Group Review process, i.e., they have been examined by either the Reference Dose/Reference Concentration (RfD/RfC) Work Group or the Carcinogen Risk Assessment Verification Endeavor (CRAVE) Work Group. These Agency Work Groups conduct a process that leads to internal Agency scientific consensus regarding risk assessment information on a chemical. This information is recorded on IRIS, is considered to be "Work Group Verified", and does not appear on the HEAST. Thus, provisional risk assessment information on the HEAST is subject to possible review and revision by these Agency Work Groups.

There are two exceptions to the above discussion. The HEAST also contains information on chemicals that are a part of the National Ambient Air Quality Standards (NAAQS) or the Drinking Water Criteria Document (DWCD) series. In each of these cases, the chemicals are subject to extensive scientific peer review processes of extremely high quality.

CHEMICAL STATUS DEFINITIONS

Chemicals reviewed by the Agency Work Groups are classified according to their status as either "verified", "not verifiable", or "under review". The toxicity values (other than NAAQS or DWCD values) listed on the HEAST are considered to be "provisional". The Agency has no official definitions for these terms, but the HEAST user may interpret them as follows:

Provisional: A toxicity value or a cancer value is "provisional" if the value has had some form of Agency review, but it does not appear on the IRIS system. These values are generated in several ways. Often they are determined in the course of developing an Agency document on a chemical or on a class of chemicals. Some have been generated through the Work Group process, but have not yet been input to the IRIS system. At the time each value was derived, all available information on the chemical was evaluated, the value was calculated using the most current methodology, and a consensus was reached on the value by Agency scientists.

Brackets are placed around the names of toxicity and carcinogenicity values on the HEAST to distinguish these "provisional" values from information on IRIS. The following names are affected: RfD to [RfD], RfC to [RfC], slope factor to [slope factor], EPA group to [EPA Group] and unit risk to [unit risk].

These "provisional" values are found on the HEAST. They do not appear on IRIS.

Verified: A toxicity value or a cancer value is "Work Group Verified" if all available information on the value has been examined by an Agency Work Group, the value has been calculated using current Work Group methodology, a unanimous consensus has been reached on the value by the Work Group, and the value appears on IRIS.

Some numbers that have achieved unanimous concensus by the Work Group may appear on the HEAST for a short time until they are loaded onto IRIS, at which time they are termed, "verified." During the interim, they are considered to be "provisional" values that are still "under review" by the Work Group.

These "verified" numbers only appear on IRIS. They do not appear on the HEAST.

Not verifiable: A toxicity value is "not verifiable" if an Agency Work Group has considered all available data on a chemical and has unanimously determined that data are inadequate to generate a value that would be suitable for inclusion on IRIS. No toxicity value is calculated; no toxicity value is available for IRIS or the HEAST.

This "not verifiable" status is noted on IRIS, and is sometimes found on the HEAST, with a pointer to the IRIS system.

Under Review: A toxicity value is "under review" if an Agency Work Group is in the process of considering all available data on a chemical. All Work Group chemicals will have this status until the toxicity value is placed on the IRIS system. Toxicity values that have been withdrawn from IRIS by a Work Group for further review will have this status.

This "under review" status may be indicated on IRIS or on the HEAST. During this time, "provisional" toxicity values may appear on the HEAST.

In all cases, the status of a chemical may change as new data become available, and the assessment is revisited.

CAUTION

It is imperative for each user of the HEAST to recognize that the values listed in the toxicity tables and the cancer table are generally considered to be PROVISIONAL RISK ASSESSMENT INFORMATION. The user is referred to IRIS for "Work Group Verified" values. It is also important to remember that the numbers in these tables alone tell very little about the adverse effects of a chemical or the quality of evidence on which risk assessment information is based. Original assessment documents must be consulted by users of the HEAST in order to fully appreciate the strengths and limitations of a specific data base. Original source documents will allow for the most complete characterization of potential toxicity associated with the range of exposure pathways generally evaluated at Superfund and RCRA sites. The Reference Tables point the user to these sources.

CONTRIBUTORS

Chemicals commonly found at RCRA sites as identified by the Office of Solid Waste's (OSW) Technical Assessment Branch are included in the HEAST. The Office of Radiation Programs has provided data on radionuclide carcinogenicity for Tables 4A and 4B of the HEAST. Finally, the Office of Air Quality Planning and Standards (OAQPS) has provided information on chemicals for which Air Quality Criteria Documents and National Ambient Air Quality Standards have been developed.

CHEMICALS LISTED

Most of the chemicals included on the toxicity tables and carcinogenicity table are those for which at least one of the following EPA documents has been written: Health Effects Assessment Document (HEA), Health and Environmental Effects Profile (HEEP), Health and Environmental Effects Document (HEED), Health Assessment Document (HAD), Air Quality Criteria Document (AQCD), Drinking Water Criteria Document (DWCD). A description of each is provided in Appendix A, Section I. In a few cases, the values are supported by other written material, such as Work Group meeting notes or Carcinogen Assessment Group (CAG) Profiles. Radionuclide slope factor values are calculated by the EPA's Office of Radiation Programs.

The names of criteria pollutants that are regulated as National Ambient Air Quality Standards (NAAQS) under the Clean Air Act are listed in the main body of the HEAST, but the actual criteria are included as Section V of Appendix A: Technical Information. The NAAQS were not included in the tables in order to distinguish them from the reference concentration ([RfC]) values. The NAAQS and [RfC]s represent different levels

of review and different methods of calculation and thus, must be interpreted and used differently.

HIERARCHY OF SOURCES

It is recognized that at any point in time there may be multiple old and new Agency documents or data bases that present different values on a specific chemical. For chemicals other than those represented by the NAAQS or DWCDs, the following hierarchy of sources is recommended in evaluating chemical toxicity for Superfund sites:

1. The Agency's Integrated Risk Information System (IRIS) and cited references. Changes are made in this data base on a monthly basis, but there may be data gaps. Call IRIS USER SUPPORT at (513)569-7254 for further information.

2. The Health Effects Assessment Summary Tables (HEAST) and cited references.

3. Consultation with the Superfund Health Risk Technical Support Center (TSC) at (513)569-7300.

4. Do not consult either the toxicity tables (Appendix A) in the Superfund Public Health Evaluation Manual (SPHEM, U.S. EPA, 1986) or the September 1988 Public Health Risk Evaluation Data Base (PHRED) as these sources are likely to contain numerous values that have since become out-of-date.

QUESTIONS

Chemical Toxicity and Carcinogenicity

Regional EPA Superfund Staff may direct questions regarding the contents of the chemical toxicity and carcinogenicity tables on the HEAST (e.g., chemicals not covered, chemicals with pending [RfD]s) to EPA's Superfund Health Risk Technical Support

Center (TSC) in Cincinnati, OH at (513)569-7300. Questions from other users must be submitted to the TSC in writing and must contain the following information:

- Superfund site name, site location and twelve-digit site number;
- Name and phone number of the site Remedial Project Manager (RPM) or Regional Risk Assessor/Toxicologist;
- Detailed description of the risk assessment related question.

Please send requests via mail or FAX to:

Superfund Health Risk Technical Support Center
US EPA
26 W. ML King Dr.
Environmental Criteria and Assessment Office
MS 117
Cincinnati, OH 45268
FAX#: (513)569-7159

RCRA Chemicals

Questions about RCRA chemicals may be addressed by calling the Office of Solid Waste at (202)260-4761.

Radionuclide Carcinogenicity

Questions concerning radionuclide carcinogenicity should first be addressed by contacting the appropriate Regional Radiation Program Manager. A listing of these managers and several contacts in the Office of Radiation Programs can be found in Exhibit 2 of the User's Guide - Radionuclide Carcinogenicity.

REFERENCES

Most cited Agency references (e.g., HEAs, HEEPs, HEEDs), are (or will soon be) available through the National Technical Information Service (NTIS), 5285 Port Royal

Road. Springfield, VA 22161 [(703)487-4650]. Carcinogen Assessment Group (CAG) Profiles cited in Table 3 are available through the RCRA docket (202)260-9327.

Drinking water documents are available by calling the Drinking Water Docket at (202)260-3027.

ORDERING INFORMATION

Limited copies of the HEAST are available for EPA Superfund staff, State Superfund programs and other Federal agencies working on Superfund sites, and EPA contractors working for the EPA Superfund program. Users in these groups can call Syracuse Research Corporation (202)479-0881 to be put on the mailing list.

EPA's Office of Solid Waste (OSW) requests that their users (i.e., OSW staff, contractors, State solid waste programs) call the Health Assessment Section (202)260-4761 to obtain copies of the HEAST. Regional OSW staff are reminded that copies are sent to all EPA Regional libraries.

Users of the HEAST in EPA's Office of Air and Radiation and State air programs should call Kelly Rimer of EPA's Office of Air Quality Planning and Standards at (919)541-2962.

All other users must purchase the document from:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
(703)487-4650

For ordering information, call the NTIS Subscriptions Department at (703)487-4630. NTIS normally ships 4th class United States mail. When ordering the

1994 Health Effects Assessment Summary Table annual update from NTIS refer to the folowing order number:

PB94-963310: Annual HEAST update

STRUCTURE OF THE HEAST

The HEAST Introduction contains explanatory material relative to the quality of information on the HEAST, its sources, and its availability. This is followed by a listing of changes since the last HEAST was published and then by User's Guides for both Chemical Toxicity and Carcinogenicity, and Radionuclide Carcinogenicity. The values on the HEAST are presented in a series of five tables that contain toxicity information and three tables of references. The information contained in each table and their designations are as follows:

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
Table 1 lists subchronic and chronic non-cancer toxicity values that were calculated using the current methodology practiced by the RfD/RfC Work Group.

HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
Table 2 lists subchronic and chronic non-cancer toxicity values that are found in Agency documents, but were calculated by alternative methods that are not currently practiced by the RfD/RfC Work Group. These values are considered to be adequate provisional values for risk assessment purposes at Superfund and RCRA sites, but are subject to being reviewed by the RfD/RfC Work Group and revised when necessary to reflect current work group practices.

HEAST TABLE 3: CARCINOGENICITY
Table 3 lists carcinogenicity values that were calculated using the current methodology of the CRAVE Work Group.

HEAST TABLES 4A AND 4B: RADIONUCLIDE CARCINOGENICITY – SLOPE FACTORS
Tables 4A and 4B list ingestion, inhalation and external exposure carcinogenicity slope factors for radionuclides in two equivalent, but different units, picocuries and becquerels, respectively.

HEAST TABLE 1 REFERENCES: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
The references for Table 1 are numerically coded to associate each toxicity value clearly with its corresponding reference.

HEAST TABLE 2 REFERENCES: ALTERNATE METHODS – SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
The references for Table 2 are numerically coded to associate each toxicity value clearly with its corresponding reference.

HEAST TABLE 3 REFERENCES: CARCINOGENICITY
The references for Table 3 are numerically coded to associate each toxicity value clearly with its corresponding reference.

Following the tables, a Technical Appendix (Appendix A) is available, containing the following sections:

I. Data Sources and Selection Criteria Used in HEAST

II. Dose Conversions on HEAST

III. Chemical Name and Chemical Abstracts Service Registry Number Cross Reference

IV. Effect Level Definitions

V. National Ambient Air Quality Standards (NAAQS)

WHAT'S NEW IN THE FY94 HEAST

GENERAL CHANGES - CHEMICAL TOXICITY AND CARCINOGENICITY

The changes in this version of the HEAST reflect changes in IRIS through Januray 1, 1994. It is also current with RfD/RfC and CRAVE Work Group activities through January 1, 1994.

CHEMICAL-SPECIFIC CHANGES -- CHEMICAL TOXICITY AND CARCINOGENICITY

A. CHEMICAL-SPECIFIC CHANGES ON HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

Aldicarb 000116-06-3
The chronic oral RfD has been replaced on IRIS. The chronic oral RfD on IRIS was adopted as the subchronic oral [RfD].

Bromoform 000075-25-2
A comment was added to indicate that the chronic inhalation RfC is considered not verifiable by the RfD/RfC (02/11/93) Work Group.

Dichlorobenzene, 1,4- 000106-46-7
An indicator was added to show that the inhalation RfC is now available on IRIS. The chronic inhalation RfC on IRIS was modified to derive the subchronic inhalation [RfC].

Dichloroethane, 1,2- 000107-06-2
The CAS Registry Number was corrected from 106-06-2 to 107-06-2. No other changes in the table.

Glycidaldehyde 000765-34-4
The NOAEL which was inadvertently omitted from the 1993 HEAST has been replaced and converted from 10 ppm to 29 mg/cu m.

Hexachlorocyclopentadiene 000077-47-4
No change in the tables. Reference to one of two studies used in the HEED to derive the RfC (Batelle Northwest Laboratories, 1984) was replaced in the reference section.

Manganese 007439-96-5
The chronic inhalation RfC has been replaced on IRIS. A subchronic inhalation [RfC] has not been derived.

Methoxychlor 000072-43-5
A comment was added to indicate that the chronic inhalation RfC is considered not verifiable by the RfD/RfC (11/07/91) Work Group.

Trichloro-2'-hydroxydiphenylether, 2,2,4'- 003380-34-5
The Target and Critical effect which were inadvertently omitted from the 1993 Annual HEAST have been replaced.

B. CHEMICAL-SPECIFIC CHANGES ON HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

Dichlorobenzene, 1,2- 000095-50-1
The subchronic inhalation [RfC] which had inadvertently been omitted from the 1993 Annual HEAST has been replaced.

Ethoxyethanol acetate, 2- 000111-15-9
The NOEL units were corrected.

C. CHEMICAL-SPECIFIC CHANGES ON HEAST TABLE 3: CARCINOGENICITY

Dimethyl hydrazine, 1,1- 000057-14-7
No EPA Group Classification was provided in the reference document, therefore this compound was removed from Table 3.

Methyl hydrazine 000060-34-4
No EPA Group Classification was provided in the reference document, therefore this compound was removed from Table 3.

Metholachlor 051218-45-2
An indicator was added to show that the EPA Group Classification is now available on IRIS.

D. CHEMICAL-SPECIFIC CHANGES IN THE JULY 1993 AND NOVEMBER 1993 SUPPLEMENTS ON HEAST TABLE 4A AND 4B: RADIONUCLIDE CARCINOGENICITY – SLOPE FACTORS

Uranium (92) U-238 +D
The ingestion, inhalation, and external slope factors in Tables 4A and 4B have changed to correct an error in summation for the +D values of U-238.

Annnouncement of Upcoming Changes to Radionuclide Slope Factors

Slope factors for radionuclides are currently being revised to incorporate EPA's revised methodology for estimating radiogenic cancer risk. The new methodology is being reviewed by experts within and outside the EPA. Users of the HEAST should expect revised radionuclide slope factors to be available sometime during 1994. The new

values and a synopsis of the revised methodology will be published in the HEAST quarterly update when available.

CHEMICAL SPECIFIC CHANGES MADE IN THE JULY 1993 SUPPLEMENT NO. 1 AND THE NOVEMBER 1993 SUPPLEMENT NO. 2 TO THE MARCH 1993 HEAST ANNUAL UPDATE

The following changes were made in the July 1993 and November 1993 supplemental editions of the March 1993 Heast Annual Update and represent those changes that have occurred between the publication of the March 1993 HEAST Annual Update and this document, the March 1994 Heast Annual Update. Because some HEAST users may have been unaware of the publications of these supplements, the following information will indicate additional changes in toxicity information that should be noted. Note: These changes have been incorporated into the March 1994 Annual Update.

A. CHEMICAL-SPECIFIC CHANGES IN THE JULY 1993 AND NOVEMBER 1993 SUPPLEMENTS ON HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

Acrylonitrile 000107-13-1
Added to Table 1. The chronic oral [RfD] under review by the RfD/RfC Work Group was modified to derive the subchronic oral [RfD].

Arochlor 1248 012672-29-6
Added to Table 1. A comment was added to indicate that the chronic oral RfD is considered not verifiable (07/20/93) by the RfD/RfC Work Group.

Atrazine 001912-24-9
An indicator was added to show that the chronic oral RfD is now available on IRIS. The chronic oral RfD on IRIS was adopted as the subchronic oral [RfD].

Barium cyanide 000542-62-1
A comment was added to indicate that the chronic oral RfD is considered not verifiable (07/20/93) by the RfD/RfC Work Group.

Benzenethiol / (Thiophenol) 000108-98-5
Added to Table 1. The chronic oral [RfD] under review by the RfD/RfD Work Group was modified to derive the subchronic oral [RfD].

Boron 007440-42-8
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for Boron was added.

Bromoethene / (Vinyl bromide) 000593-60-2
Added to Table 1. An indicator was added to show that the chronic inhalation RfC is now available on IRIS. The chronic inhalation RfC on IRIS was adopted as the subchronic inhalation [RfC].

Bromoform 000075-25-2
A comment was added to indicate that the chronic inhalation RfC is considered not verifiable (02/11/93) by the RfD/RfC Work Group.

Bromomethane 000074-83-9
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for Bromomethane was added.

Chlorobenzilate 000510-15-6
A comment was added to indicate that the chronic inhalation RfC is considered not verifiable (02/11/93) by the RfD/RfC Work Group.

Chromium(III) 016065-83-1
The subchronic oral [RfD] was changed to agree with IRIS. The uncertainty factor was changed to incorporate an additional Modifying Factor of 10 as on IRIS.

Cresol, p- / (Methylphenol, 4-) 000106-44-5
Study information was changed to be consistent with information under review by the RfD/RfC work group. The NOEL is changed to a NOAEL, critical effects are changed, and the chronic oral [RfD] is adopted as the subchronic oral [RfD].

Cyanazine 021725-46-2
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for Cyanazine was added.

Dicamba 001918-00-9
Added to Table 1. An indicator was added to show that the chronic oral RfD is available on IRIS. The chronic oral RfD was adopted as the subchronic oral [RfD].

Dichloropropene, 1,3- / (Telone II) 000542-75-6
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for 1,3-Dichloropropene was added.

Dinitro-o-cresol, 4,6- 000534-52-1
A comment was added to indicate that the chronic inhalation RfC is considered not verifiable (02/11/93) by the RfD/RfC Work Group.

Endosulfan 000115-29-7
The chronic oral RfD was withdrawn from IRIS (12/01/92). The chronic oral [RfD] was changed to reflect the value currently under review by the RfD/RfC Work Group (11/04/92). The chronic oral [RfD] was adopted as the subchronic oral [RfD].

Hexachlorobutadiene 000087-59-1
The chronic oral RfD was withdrawn from IRIS (05/01/93). The chronic oral [RfD] was changed to reflect the value currently under review by the RfD/RfC Work Group (04/01/93).

Isophorone 000078-59-1
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for Isophorone was added.

Manganese 007439-96-5
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Criteria Document for Manganese was added.

Methoxyethanol, 2- 000109-86-4
The chronic oral [RfD] and the subchronic oral [RfD] were moved from Table 1 to Table 2 because they were derived from methodology that is not current with the interim methodology used by the RfD/RfC Work Group.

Methyl ethyl ketone 000078-93-3
An indicator was added to show that the chronic oral RfD is now available on IRIS. The subchronic oral [RfD] and the subchronic inhalation [RfC] were changed to be consistent with IRIS.

Methyl ethyl ketone peroxide 001338-23-4
Added to Table 1. A comment was added to indicate that the chronic oral RfD is considered not verifiable (07/20/93) by the RfD/RfC Work Group

Methylene-bis(2-chloroaniline), 4,4'- 000101-14-4
A comment was added to indicate that the chronic inhalation RfC is considered not verifiable (02/10/93) by the RfD/RfC Work Group.

Methyl isobutyl ketone 000108-10-1
The chronic oral [RfD] was changed to reflect the value currently under review by the RfD/RfC Work Group (07/22/93). The chronic oral [RfD] was modified to derive the subchronic oral [RfD].

Metolachlor 051218-45-2
Added to Table 1 from the 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for Metolachlor. The chronic oral [RfD] was adopted as the subchronic oral [RfD].

Metribuzin 021087-64-9
Added to Table 1. An indicator was added to show that the chronic oral RfD is now available on IRIS. The chronic oral RfD on IRIS was adopted as the subchronic oral [RfD].

Naphthalene 000091-20-3
The record for Naphthalene, which was inadvertently omitted from Table 1 of the Annual HEAST, has been replaced.

Nickel cyanide 000557-19-7
Added to Table 1. A comment was added to indicate that the chronic oral RfD is considered not verifiable (07/20/93) by the RfD/RfC Work Group

Nitroaniline, 2- 000088-74-4
The record for Nitroaniline, 2-, which was inadvertently omitted from Table 1 of the Annual HEAST, has been replaced.

Osmium tetroxide 020816-12-0
Added to Table 1. A comment was added to indicate that the chronic oral RfD is considered not verifiable (07/22/93) by the RfD/RfC Work Group

Simazine 000122-34-9
An indicator was added to show that the chronic oral RfD is now available on IRIS. The chronic oral RfD on IRIS was adopted as the subchronic oral [RfD].

Tetrachloroethane,1,1,1,2- 000630-20-6
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for
1,1,1,2-Tetrachloroethane was added.

Thallic oxide 001314-32-5
A comment was added to indicate that the chronic oral RfD is considered not verifiable (07/20/93) by the RfD/RfC Work Group.

Thallium Selenite 012039-52-0
The chronic oral RfD was withdrawn from IRIS (08/93). A comment was added to indicate that the chronic oral RfD is considered not verifiable (07/20/93) by the RfD/RfC Work Group

Trichlorobenzene, 1,2,4- 000120-82-1
The chronic inhalation [RfC] was removed from Table 2. The chronic inhalation [RfC] under review by the RfD/RfC Work Group was added to Table 1. The chronic inhalation [RfC] under review by the RfD/RfC Work Group was modified to derive the subchronic inhalation [RfC].

Trifluralin 001582-09-8
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for Trifluralin was added.

Zinc (metallic) 007440-66-6
The record for Zinc (metallic), which was inadvertently omitted from Table 1 of the Annual HEAST, has been replaced.

B. CHEMICAL-SPECIFIC CHANGES IN THE JULY 1993 AND NOVEMBER 1993 SUPPLEMENTS ON HEAST TABLE 2: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

Methoxyethanol, 2- 000109-86-4
The chronic oral [RfD] and the subchronic oral [RfD] were moved from Table 1 to Table 2 because they were derived from methodology that is not current with the interim methodology used by the RfD/RfC Work Group.

Trichlorobenzene, 1,2,4 000120-82-1
The chronic inhalation [RfC] was removed from Table 2 and the chronic inhalation [RfC] under review by the RfD/RfC Work Group was added to Table 1.

C. CHEMICAL-SPECIFIC CHANGES IN THE JULY 1993 AND NOVEMBER 1993 SUPPLEMENTS ON HEAST TABLE 3: CARCINOGENICITY

Chloromethane / (Methyl chloride) 000074-87-3
The record for Chloromethane, which was inadvertently omitted from Table 3 of the Annual HEAST, has been replaced.

Coke Oven Emissions 008007-45-2
An indicator was added to show that the EPA Group classification is now on IRIS.

Cyanazine 021725-46-2
Carcinogenicity information was added to Table 3 of the July 1993 Supplement from the 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for Cyanazine. The record was revised (cancers reported and the references changed) on the November 1993 Supplement to reflect CRAVE Work Group review. There was no change in quantitative values.

Dibromo-3-chloropropane, 1,2- 000096-12-8
The inhalation [slope] and the inhalation [unit risk] were inadvertently reversed on the July 1992 Supplement 1.

Dichloropropene, 1,3- / (Telone II) 000542-75-6
The record was revised (cancers reported and the references changed) to reflect the information currently under review by the CRAVE Work Group.

Ethylene thiourea 000096-45-7
The oral [slope] and the oral [unit risk] were changed to reflect the values currently under review by the CRAVE Work Group.

Methylenebis(benzeneamine), 4,4- 000101-77-9
No [EPA Group] classification was provided in the reference document, therefore the compound was removed from Table 3.

Metolachlor 051218-45-2
Added to Table 3 from the 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for Metolachlor.

Mirex 002385-85-5
The oral [slope] and the oral [unit risk] are under review by the CRAVE Work Group and were removed from Table 3.

TCDD, 2,3,7,8- 001746-01-6
The units for the inhalation [unit risk] were added to Table 3. There are no additional changes to the Table.

Tetrachloroethane,1,1,1,2- 000630-20-6
No change in the tables. Reference to 1993 Revised and Updated Drinking Water Quantification of Toxicologic Effects for 1,1,1,2-Tetrachloroethane was added.

Trichloropropane, 1,2,3- 000096-18-4
The oral [slope] and the oral [unit risk] being considered by the CRAVE Work Group and were added to Table 3.

D. CHEMICAL-SPECIFIC CHANGES IN THE JULY 1993 AND NOVEMBER 1993 SUPPLEMENTS ON HEAST TABLE 4A AND 4B: RADIONUCLIDE CARCINOGENICITY – SLOPE FACTORS

No new radionuclide slope factors were added to Tables 4A and 4B, and none of the slope factors listed in the March 1993 HEAST Annual Update were changed.

USER'S GUIDE: CHEMICAL TOXICITY

The HEAST summarizes provisional toxicity and cancer values as well as values developed for the NAAQS and DWCD chemicals. The provisional status of the toxicity and cancer values is indicated by placing brackets around the title of the value. These include provisional reference concentrations ([RfC]) and provisional reference doses ([RfD]) for toxicity from subchronic and chronic inhalation and oral exposure (Tables 1 and 2) and provisional slope factors ([slope factor]), provisional cancer classifications ([EPA Group]) and provisional unit risk values ([unit risk]) for carcinogenicity, based on lifetime inhalation and oral exposure (Table 3). Brackets should be included with the acronym whenever a user quotes the value in an assessment document, and the provisional nature of the value should be noted. A more complete discussion of how Superfund develops and considers the toxicity assessment in hazardous waste sites is presented in Chapter 7 of Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual, Part A, EPA/540/1-89/002.

The references listed for each chemical in the Reference Tables for Tables 1, 2 and 3 represent the study or studies that are the basis for the [RfC], [RfD], [slope factor], [EPA Group], or [unit risk], as well as the EPA reference that is the source of the Agency analysis or risk assessment information. In some cases, additional EPA documents are also listed as a source of information on the chemical. Work Group verified values found on IRIS are not found on the HEAST, but are indicated in the tables by the word "IRIS" in place of the number.

TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

The [RfC] or [RfD] is a provisional estimate (with uncertainty spanning perhaps an order of magnitude) of the daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a portion of the lifetime, in the case of a subchronic [RfC] or [RfD], or during a lifetime, in the case of a chronic [RfC] or [RfD]. The [RfC] and [RfD] values are listed in Tables 1 and 2 in columns with the headings "Subchronic" and "Chronic". The critical dose or concentration level is usually a No-Observed-Adverse-Effect Level (NOAEL) or a Lowest-Observed-Adverse-Effect Level (LOAEL) (See Appendix A, Section IV: Effect Level Definitions, for more information). The [RfC] or [RfD] is derived by dividing the NOAEL or LOAEL by an uncertainty factor (UF) times a modifying factor (MF):

$$[RfC] \text{ or } [RfD] = \frac{NOAEL \text{ or } LOAEL}{UF \times MF}$$

In Tables 1 and 2, the information listed is the following:

Chemical	=	Chemical Name/CASRN
Level	=	Effect Level
Dose	=	Administered Dose or Concentration
Route	=	Route of Administration
Species	=	Tested Species
Experiment Length	=	Length of Exposure
Target	=	Target Organ(s) Affected at Critical Level
Critical Effect	=	Effect(s) Observed at Critical Level
Subchronic [RfC]	=	Subchronic Inhalation [Reference Concentration]
UF	=	Uncertainty Factor for the Subchronic Inhalation [Reference Concentration]
Subchronic [RfD]	=	Subchronic Oral [Reference Dose]
UF	=	Uncertainty Factor for the Subchronic Oral [Reference Dose]
Chronic [RfC]	=	Chronic Inhalation [Reference Concentration]

UF	=	Uncertainty Factor for the Chronic Inhalation [Reference Concentration]
Chronic [RfD]	=	Chronic Oral [Reference Dose]
UF	=	Uncertainty Factor for the Chronic Oral [Reference Dose]
Reference	=	Reference Identification Number for All Toxicity Values on the Same Line.

An example of this information is shown in Figure 1, HEAST Table 1:

Chemical	=	GLYCIDALDEHYDE/000765-34-4
Level	=	NOAEL
Dose	=	10 PPM
Route	=	INHALATION: INTERMITTENT
Species	=	RAT
Experiment Length	=	12 WEEKS
Target	=	WHOLE BODY, BLOOD, KIDNEY
Critical Effect	=	DECREASED WEIGHT GAIN, HEMATOPOIETIC EFFECTS, EFFECTS
Subchronic [RfC]	=	1E-2 mg/cu.m
UF	=	300
Subchronic [RfD]	=	4E-3 mg/kg/day
UF	=	300
Chronic [RfC]	=	1E-3 mg/cu.m
UF	=	3000
Chronic [RfD]	=	IRIS
UF	=	IRIS
Reference	=	005968

Notice that a Chronic RfD for Glycidaldehyde is available on IRIS, so it is not listed here. Also notice that there are footnotes for this chemical that indicate a route-to-route extrapolation was performed and that there is information available on Table 3: Carcinogenicity.

Also given in Figure 1 is an example of the References for Table 1 for the same chemical. The reference is identified by the chemical name (Glycidaldehyde), the CASRN (00765-34-4), and the reference number that links it with the toxicity values (005968).

The uncertainty factor used in calculating the [RfC] or [RfD] reflects scientific judgment regarding the various types of data used to estimate [RfC] or [RfD] values. An

FIGURE 1

Example Data and References for Chemical Toxicity

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) January 1992

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
GLYCIDALDEHYDE		000765-34-4								
NOAEL	10 PPM INHALATION: INTERMITTENT	RAT	12 WEEKS	WHOLE BODY BLOOD KIDNEY	DECREASED WEIGHT GAIN HEMATOPOIETIC EFFECTS EFFECTS	1E-2 300	4E-3 300	1E-3 3000	IRIS	005968

SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5.
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5.
GENERAL COMMENT: ALSO SEE TABLE 3: CARCINOGENICITY.

REFERENCES FOR HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

January 1992

GLYCIDALDEHYDE 000765-34-4

005968 HINE CH, RJ GUZMAN, MK DUNLAP, R LIMA AND GS LOQUVAM. 1961. STUDIES ON THE TOXICITY OF GLYCIDALDEHYDE. ARCH ENVIRON HEALTH 2: 23-30.

US EPA. 1989. HEALTH AND ENVIRONMENTAL EFFECTS DOCUMENTFOR GLYCIDALDEHYDE PREPARED BY THE OFFICE OF HEALTH AND ENVIRONMENTAL ASSESSMENT, ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE, CINCINNATI, OH FOR THE OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, WASHINGTON, DC.

000025

uncertainty factor of 10 is usually used to account for variation in human sensitivity among populations. An additional 10-fold factor is usually used to account for each of the uncertainties assumed when extrapolating from animal data to humans, when extrapolating from a LOAEL to a NOAEL, and when extrapolating from subchronic to chronic exposure. In order to reflect professional assessment of the uncertainties of the study and the data base not explicitly addressed by the above uncertainty factors (e.g., completeness of the overall data base), an additional uncertainty factor or modifying factor ranging from greater than 0 to less than or equal to 10 is applied. The default value for this modifying factor is 1.

For chemicals for which a chronic [RfC] or [RfD] is presented in Tables 1 and 2, a subchronic [RfC] or [RfD] is usually derived, if not previously derived in the Agency documents that originally addressed the chemical. Subchronic toxicity values are not evaluated by the RfD/RfC Work Group. The subchronic [RfC] or [RfD] is derived in either of two ways: 1) If an uncertainty factor was used to account for extrapolation from subchronic to chronic exposure in the derivation of the chronic [RfC] or [RfD], then, the subchronic [RfC] or [RfD] is derived from the same benchmark concentration or dose without applying the uncertainty factor for subchronic to chronic exposure extrapolation. 2) If the chronic [RfC] or [RfD] was derived without use of an uncertainty factor for extrapolating from subchronic to chronic exposure (e.g., if chronic data were available), then, the chronic [RfC] or [RfD] is adopted as the subchronic [RfC] or [RfD].

Tables 1 and 2 list the uncertainty factor and modifying factor, multiplied together, to form a single factor under the heading "Uncertainty Factor." For example, the uncertainty factor of 3000 listed for the chronic inhalation [RfC] for Glycidaldehyde reflects an uncertainty factor of 1000 (10 for human sensitivity, 10 for extrapolation from

animal to human, and 10 for extrapolation from subchronic to chronic) and a modifying factor of 3 (for an inadequate data base); the uncertainty factor of 500 listed for the subchronic oral [RfD] for cyanide reflects an uncertainty factor of 100 (10 for human sensitivity, and 10 for extrapolation from animal to human) and a modifying factor of 5 (to account for tolerance to cyanide when ingested by food rather than administration by gavage or by drinking water).

[RfC] and [RfD] values are specific for the route of exposure for which they are listed on Tables 1 and 2. In the few instances where an [RfD] or [RfC] has been determined from another exposure route, route-to-route extrapolation is indicated by a footnote.

The current methodology for the derivation of inhalation RfCs is detailed in the document, "Interim Methods for Development of Inhalation Reference Doses" (U.S. EPA 1990, EPA/600/8-88/066F, NTIS PB90-145723). These methods are different from those used for oral RfDs because of (1) the dynamics of the respiratory system and its diversity across species, and (2) differences in the physicochemical properties of contaminants (such as the size and shape of a particle or whether the contaminant is an aerosol or a gas). Parameters such as deposition, clearance mechanisms and the physicochemical properties of the inhaled agent are considered in the determination of the effective dose delivered to the target organ.

An RfC value calculated using this interim methodology is generally reported as a concentration in air (mg/m^3), although it may be converted to a corresponding inhaled dose (mg/kg/day) by dividing by 70 kg (an assumed human body weight), multiplying by 20 m^3/day (an assumed human inhalation rate), and adjusting by an appropriate absorption factor. This conversion, however, may often be technically incorrect, and the

appropriateness of doing this must be evaluated on a case-by-case basis. It is recommended that HEAST users that plan to use this technique read a further discussion of the difficulties inherent in this dose conversion that can be found in Appendix A, Section II: Dose Conversions On HEAST.

Inhalation [RfC] values reported in HEAs and early HEEDs that were finalized prior to the implementation of the interim methods were calculated using methods similar in concept to those used for oral [RfD]s. These values are reported both as a concentration in air (in mg/m^3 for continuous, 24 hours/day exposure) under the column [RfC], and as a corresponding inhaled dose (in mg/kg/day) in the footnotes called, Chronic (Subchronic) [RfC] Comment. These chemicals are listed in Table 2: Alternate Methods - Subchronic and Chronic Toxicity (Other Than Carcinogenicity).

[RfD] values for oral exposure are reported as mg/kg/day. An oral [RfD] value can be converted to a corresponding concentration in drinking water, assuming human body weight of 70 kg and water consumption of 2 L/day, as follows:

$$mg/L \text{ in water} = \frac{\text{oral [RfD] (in mg/kg/day)} \times 70 \text{ kg}}{2 \text{ L/day}}$$

The [RfC] or [RfD] is used as a reference point for gauging the potential effects of other exposures. Usually, exposures that are less than the [RfC] or [RfD] are not likely to be associated with health risks. As the frequency of exposures exceeding the [RfC] or [RfD] increases and as the size of the excess increases, the probability increases that adverse health effects may be observed in a human population. Nonetheless, a clear distinction that would categorize all exposures below the [RfC] or [RfD] as "acceptable" (risk-free) and all exposures in excess of the [RfC] or [RfD] as

"unacceptable" (causing adverse effects) cannot be made. In addition, [RfC] and [RfD] values, and particularly those with limitations in the quality or quantity of supporting data, are subject to change as additional information becomes available.

When [RfC] or [RfD] values are listed in Tables 1 or 2 for chemicals that are carcinogens, a footnote will refer to Table 3 if additional information concerning carcinogenicity is available in that table. [RfC] and [RfD] values that have been derived for carcinogens are based on noncancer endpoints only and should not be assumed to be protective against carcinogenicity.

TABLE 2: ALTERNATE METHODS – SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

Chemicals are listed in Table 2 when the [RfD] or [RfC] was derived from alternative methods that are not currently practiced by the RfD/RfC Work Group. The table consists primarily of inhalation [RfC] values determined from methodology that does not follow the interim inhalation methods adopted by the Agency, and [RfC] or [RfD] values based on route-to-route extrapolation with inadequate pharmacokinetic and toxicity data. A footnote is added to each chemical to provide a short explanation of the specific methodology used in calculating these provisional toxicity values. Most of these toxicity values were formerly listed in Table 1. In some instances, the chemical may be listed in both Tables 1 and 2 if the chemical has more than one toxicity value. Table 2 follows the same format as Table 1 (refer to Figure 1).

TABLE 3: CARCINOGENICITY

In assessing the carcinogenic potential of a chemical, the Human Health Assessment Group (HHAG) of EPA classifies the chemical into one of the following groups, according to the weight of evidence from epidemiologic and animal studies:

Group A - Human Carcinogen (sufficient evidence of carcinogenicity in humans)

Group B - Probable Human Carcinogen (B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans)

Group C - Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data)

Group D - Not Classifiable as to Human Carcinogenicity (inadequate or no evidence)

Group E - Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies).

These classifications are shown under [EPA Group] on Table 3.

Quantitative carcinogenic risk assessments are performed for chemicals in Groups A and B, and on a case-by-case basis for chemicals in Group C. Cancer [slope factors] (formerly called cancer potency factors in the Superfund Public Health Evaluation Manual) are estimated through the use of mathematical extrapolation models, most commonly the linearized multistage model, for estimating the largest possible linear slope (within the 95% confidence limit) at low extrapolated doses that is consistent with the data. The [slope factor] or risk is characterized as an upper-bound estimate, i.e., the true risk to humans, while not identifiable, is not likely to exceed the upper-bound estimate and in fact may be lower.

Quantitative carcinogenic estimates listed in Table 3 include the following:

[slope factor] = risk per unit dose = risk per mg/kg/day

[unit risk] for inhalation exposure = risk per concentration unit in air = risk per $\mu g/m^3$

[unit risk] for oral exposure = risk per concentration unit in water = risk per $\mu g/L$

[Unit risk] estimates for inhalation and oral exposure can be calculated by dividing the appropriate [slope factor] by 70 kg and multiplying by the inhalation rate (20 m^3/day) or the water consumption rate (2 L/day), respectively, for risk associated with unit concentration in air or water. Hence,

$$\text{risk per } \mu g/m^3 \text{ (air)} = (\text{risk per mg/kg/day}) \times \frac{1}{70\text{ kg}} \times 20\ m^3/\text{day} \times 10^{-3}(\text{mg}/\mu g)$$

$$\text{risk per } \mu g/L \text{ (water)} = (\text{risk per mg/kg/day}) \times \frac{1}{70\text{ kg}} \times 2\ L/\text{day} \times 10^{-3}\ (\text{mg}/\mu g)$$

Quantitative estimates of carcinogenic risk are listed under [Unit Risk] or [Slope Factor] in Table 3. Information on the study and data set used for estimation of the [slope factor] is given in the other columns of Table 3.

In Table 3, the information listed is the following:

Chemical	=	Chemical Name/CASRN
Route	=	Route of Administration
Species	=	Tested Species
Experiment Length	=	Length of Exposure
Target	=	Target Organ(s) Affected at Critical Level
Cancer	=	Tumors Observed at Critical Level (Not Specified if More Than One Type of Tumor)
[EPA Group]	=	EPA Classification by Weight of Evidence
Oral [Slope Factor]	=	Risk Per Unit Dose
Inhalation [Slope Factor]	=	Risk Per Unit Dose
Oral [Unit Risk]	=	Risk Per Concentration Unit in Water
Inhalation [Unit Risk]	=	Risk Per Concentration Unit in Air
Reference	=	Reference Identification Number for All Toxicity Values on the Same Line.

An example of this information is shown in Figure 2, HEAST Table 3:

Chemical	=	DIMETHYLHYDRAZINE, 1,2-/000077-78-1
Route	=	ORAL: DRINKING WATER
Species	=	MOUSE
Experiment Length	=	LIFETIME
Target	=	CARDIOVASCULAR SYSTEM
Cancer	=	TUMORS
[EPA Group]	=	B2
Oral [Slope Factor]	=	3.7E+1 (MG/KG/DAY)-1
Inhalation [Slope Factor]	=	3.7E+1 (MG/KG/DAY)-1
Oral [Unit Risk]	=	1.1E-3 (UG/L)-1
Inhalation [Unit Risk]	=	1.1E-2 (UG/CU M)-1
Reference	=	009993

Notice that the inhalation values for 1,2-Dimethylhydrazine was extrapolated from the oral data.

Also given in Figure 2 is an example of the References for Table 3 for the same chemical. The reference is identified by the chemical name (Dimethylhydrazine, 1,2-), the CASRN (000077-78-1), and the reference number that links it with the toxicity values (009993).

Quantitative carcinogenic estimates are specific for the route of exposure for which they are listed on Table 3. Footnotes are used to indicate those instances in which the values for inhalation or oral exposure are based on extrapolation from another route of exposure. The route-to-route conversion required to present inhalation [slope factors] in the units of mg/kg/day is considered by the CRAVE Work Group to be technically incorrect. It is recommended that HEAST users who plan to use this information read a further discussion of the difficulties inherent in this dose conversion which can be found in Appendix A, Section II: Dose Conversions On HEAST.

To estimate risk-specific concentrations in air from the [unit risk] in air as presented in Table 3, the specified level of risk is divided by the [unit

FIGURE 2

Example Data and References for Carcinogenicity

HEAST TABLE 3: CARCINOGENICITY

January 1992

CHEMICAL ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)$^{-1}$	REFERENCE
DIMETHYLHYDRAZINE,1,2- 000077-78-1									
ORAL: DRINKING WATER	LIFETIME MOUSE	CARDIOVASCULAR SYSTEM	TUMORS	B2	3.7E+1	3.7E+1	1.1E-3	1.1E-2	009993

Inhalation [Slope] Comment: BASED ON ROUTE TO ROUTE EXTRAPOLATION.

REFERENCES FOR HEAST TABLE 3: CARCINOGENICITY

January 1992

DIMETHYLHYDRAZINE, 1,2- 000077-78-1

009993 TOTH B AND K PATEL. 1982. CARCINOGENICITY DOSE-RESPONSE STUDY BY CONTINUOUS ADMINISTRATION OF 1,2-DIMETHYLHYDRAZINE DI-HYDROCHLORIDE IN MICE. I. LIGHT AND TRANSMISSION ELECTRON MICROSCOPIC STUDY OF COLONOIC NEOPLASMS. AM. J. OF PATH 84:69-86.

US EPA. 1988. CARCINOGEN RISK ASSESSMENT VERIFICATION ENDEAVOR (CRAVE) WORK GROUP.

risk] for air. Hence, the air concentration (in $\mu g/m^3$) corresponding to an upper-bound increased lifetime cancer risk of 1×10^{-5} is calculated as follows:

$$\mu g/m^3 \text{ in air} = \frac{1 \times 10^{-5}}{[\text{unit risk}] \text{ in } (\mu g/m^3)^{-1}}$$

To estimate risk-specific concentrations in drinking water from the oral [slope factor] values presented in Table 3, the specified level of risk is multiplied by 70 kg and divided by the [slope factor] times 2 L/day. Hence, the water concentration corresponding to an upper-bound increased lifetime cancer risk of 1×10^{-5} is calculated as follows:

$$mg/L \text{ in water} = \frac{1 \times 10^{-5} \times 70 \text{ kg}}{[\text{slope factor}] \text{ in } (mg/kg/day)^{-1} \times 2 \text{ L/day}}$$

USER'S GUIDE: RADIONUCLIDE CARCINOGENICITY

INTRODUCTION

EPA classifies all radionuclides as Group A (known human) carcinogens. HEAST Tables 4A and 4B list ingestion, inhalation and external exposure cancer slope factors for radionuclides in units of picocuries and becquerels, respectively.[1] Ingestion and inhalation slope factors are best estimates (i.e., median or 50th percentile values) of the age-averaged, lifetime excess cancer incidence (fatal and nonfatal cancer) risk per unit of activity inhaled or ingested, expressed as risk/pCi or risk/Bq. External exposure slope factors are best estimates of the lifetime excess cancer incidence risk for each year of exposure to external radiation from photon-emitting radionuclides distributed uniformly in a thick layer of soil, and are expressed as risk/yr per pCi (or Bq)/gram of soil. When combined with site-specific media concentration data and appropriate exposure assumptions[2], slope factors can be used to estimate lifetime cancer risks to members of the general population due to radionuclide exposures.

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1 Slope factors are reported in Tables 4A and 4B in two different units of activity. Table 4A presents slope factors in the customary units of picocuries (1 pCi = 10^{-12} curies (Ci) = 3.7×10^{-2} nuclear transformations per second) for consistency with the system used for radionuclides in the IRIS database; Table 4B presents slope factors in the International System (SI) units of becquerels (1 Bq = 1 nuclear transformation per second; approximately 27 pCi). Users can calculate cancer risks using slope factors expressed in either customary units or SI units with equivalent results, provided that they also use air, water and soil concentration values in the same system of units.

2 Agency standardized default exposure scenarios and assumptions for use in baseline risk assessment are provided in EPA (1991), *Human Health Evaluation Manual, Supplemental Guidance:* "Standard Default Exposure Factors" (Interim Final), Office of Emergency and Remedial Response, OSWER Directive 9285.6-03. [NTIS order number: PB 91-921314.]

INTENDED USERS AND APPLICATIONS

HEAST users include individuals from the EPA, other Federal agencies, States and contractors who are responsible for the identification, characterization and remediation of sites contaminated with radioactive materials. Radionuclide slope factors are calculated by EPA's Office of Radiation and Indoor Air (ORIA) to assist HEAST users with risk-related evaluations and decision-making at various stages of the remediation process. During site assessment, for example, slope factors are used in EPA's Hazard Ranking System (HRS) to assign toxicity factor values to radionuclides to calculate site scores. During the remedial investigation and feasibility study (RI/FS), slope factors are used to determine baseline site risk, to develop preliminary remediation goals, and to evaluate cleanup alternatives. For further examples on the application of radionuclide slope factors in risk evaluations, users are referred to the following EPA documents:

- Hazard Ranking System (HRS), *Federal Register* (55 FR 515320), December 1990.
- *Risk Assessment Guidance for Superfund; Volume I - Human Health Evaluation Manual* (RAGS/HHEM), Part A, Baseline Risk Assessment (EPA/540/1-89/002).
- RAGS/HHEM Part B, Development of Risk-Based Preliminary Remediation Goals (OSWER Directive 9285.7-01B). [NTIS order number: PB 92-963333.]
- RAGS/HHEM Part C, Risk Evaluation of Remedial Alternatives (OSWER Directive 9285.7-01C). [NTIS order number: PB 92-963334.]

Copies of RAGS/HHEM Parts A, B and C are available to the public from the National Technical Information Service (NTIS) at (703)487-4650. Copies are available to EPA staff by calling the Superfund Documents Center at (202)260-9760.

RADIATION EFFECTS

Ionizing radiation has been shown to be a carcinogen, a mutagen, and a teratogen. At sufficiently high doses, radiation acts as a complete carcinogen, serving as both an initiator and promoter, and can induce cancers in nearly any tissue or organ in both humans and animals. At lower doses and dose rates, radiation produces delayed responses in the form of increased incidence of cancer long after the exposure period. These delayed responses have been documented extensively in epidemiological studies of Japanese atomic bomb survivors, underground uranium miners, radium dial painters, and patients subject to a variety of radiation treatments. Laboratory animal research and mammalian tissue culture studies have provided additional, collaborative data.

Mutagenic effects of radiation have been demonstrated primarily in animal and tissue culture studies; limited data from studies of A-bomb survivors indicate that humans may be as sensitive or less sensitive than animals to radiogenic mutagenicity. Data are also available from both human and animal studies on the teratogenic effects of radiation. These data show that the fetus is most sensitive to radiation injury during the early stages of organ development (between 8 and 15 weeks for the human fetus). Resultant radiation-induced malformations depend on which cells are most actively differentiating at the time of exposure.

EPA classifies all radionuclides as Group A carcinogens, based on their property of emitting ionizing radiation and on the extensive weight of evidence provided by epidemiological studies of radiogenic cancers in humans. At Superfund radiation sites, EPA generally evaluates potential human health risks based on the radiotoxicity, i.e., adverse health effects caused by ionizing radiation, rather than on the chemical toxicity, of each radionuclide present. These evaluations consider the carcinogenic effects of

radionuclides only. In most cases, cancer risks are limiting, exceeding both mutagenic and teratogenic risks.

DERIVATION OF RADIONUCLIDE SLOPE FACTORS

EPA's Office of Radiation and Indoor Air (ORIA) calculates radionuclide slope factor values using health effects data and dose and risk models from a number of national and international scientific advisory commissions and organizations, including the National Academy of Sciences (NAS), the National Council on Radiation Protection and Measurements (NCRP), the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), and the International Commission on Radiological Protection (ICRP). A detailed discussion of ORP's approach and assumptions is provided in *Risk Assessment Methodology, Environmental Impact Statement, NESHAPS for Radionuclides, Background Information Document - Volume I* (EPA 520/1-89-005: September 1989).

Radionuclide slope factors are calculated for each radionuclide individually, based on its unique chemical, metabolic and radioactive properties. The calculation uses EPA's computer code RADRISK[3], life table analyses (described in EPA 520/1-89-005), and cancer risk estimates based largely on the results of the NAS BEIR III report.[4] Ingestion and inhalation slope factors for radionuclides account for:

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3 Dunning, D.E. Jr., Leggett, R.W., and Yalcinatas, M.G. (1980). "A Combined Methodology for Estimating Dose Rates and Health Effects from Exposure to Radioactive Pollutants." ORNL/TM-7105.

4 National Academy of Sciences (1980). The Effects on Populations of Exposure to Low Levels of Ionizing Radiation, Report of the Committee on the Biological Effects of Ionizing Radiation (BEIR III), National Research Council, Washington, D.C. EPA anticipates that the slope factors for radionuclides in HEAST will be modified in the future to incorporate the results of BEIR V (1990) and/or other relevant sources.

- the amount of radionuclide transported into the bloodstream from either the gastrointestinal (GI) tract following ingestion, or from the lungs following inhalation;

- the ingrowth and decay of radioactive progeny produced within the body subsequent to intake;

- the distribution and retention of each radionuclide (and its associated progeny, if appropriate) in body tissues and organs;

- the radiation dose delivered to body tissues and organs from the radionuclide (and its associated progeny, if appropriate); and

- the sex, age, and organ-specific risk factors over the lifetime of exposure.

The slope factors are the average risk per unit intake or exposure for an individual in a stationary population with vital statistics (mortality rates) of the United States in 1970. (The expected lifetime for an individual in this population is about 70 years.) Consequently, radionuclide ingestion and inhalation slope factors are not expressed as a function of body weight and time, and do not require corrections for gastrointestinal absorption or lung transfer efficiencies.

NOTE: ***The GI absorption values (f_1), ICRP lung classifications (D, W, Y) and radioactive half-lives are provided in HEAST Tables 4A and 4B for reference only and should not be used to correct, modify, or in any way adjust radionuclide slope factors or intake assumptions in risk calculations.***

External slope factors provide cancer risk estimates per unit exposure to a uniform radionuclide concentration in soil. These factors, which account for photon energy flux attenuation and buildup in soil, are calculated for each radionuclide using volume and surface dose factors derived using the computer code DFSOIL.[5]

Because of the radiation risk models employed for both internal and external exposures, slope factors for radionuclides are characterized as best estimates (i.e., median or 50th percentile values) of the age-averaged lifetime total excess cancer incidence risk per unit intake or exposure.

ABOUT THE INFORMATION PROVIDED IN TABLES 4A AND 4B:

Tables 4A and 4B list ingestion, inhalation and external exposure slope factors of principal radionuclides, and provide key parameter values used in the derivation of slope factor values. In both tables, radionuclides are presented alphabetically by element and atomic weight.

Selected radionuclides that have radioactive Decay products are designated within the HEAST tables with the suffix "+D" (e.g., U-238+D, Ra-226+D, Cs-137+D) to indicate

Sjoreen, A.L., Kocher, D.C., Killough, G.G. and Miller C.W. (1984). "MLSOIL and DFSOIL - Computer Codes to Estimate Effective Ground Surface Concentrations for Dose Computations," Oak Ridge National Laboratory. Oak Ridge, TN. ORNL-5974.

that the cancer risk estimates for such radionuclides include the contributions from either all, or only some, of their decay products. The slope factor for a radionuclide marked with a "+D" accounts for risk from all direct progeny with half-lives of less than one year. The slope factor for U-238+D, for example, includes the risk from U-238, Th-234, and Pa-234, but not from U-234 or any of its progeny.

Decay sub-chains included in the HEAST Tables 4A and 4B are identified in Exhibit 1, and members of such sub-chains are noted in the HEAST tables with a dagger ("†"). The rationale for the one year half-life cutoff for members of a sub-chain is that such radionuclides are likely to achieve secular equilibrium with the parent over the time scales commonly encountered in environmental remediation, while radionuclides with longer half-lives may not.

When a radionuclide is in secular equilibrium with all its progeny, one should add the slope factors for all the relevant sub-chains. To assess risk from Ra-226 in equilibrium with all its progeny, for example, one adds the slope factors for Ra-226+D and Pb-210+D.

In most cases, site-specific analytical data should be used to establish the actual degree of equilibrium between each parent radionuclide and its decay products in each media sampled. However, in the absence of empirical data, the "+D" values for radionuclides should be used unless there are compelling reasons not to. For example, the external slope factors for Cs-137 and Cs-137+D are 0.0 and 2×10^{-6} (risk per year per pCi/gram), respectively. The value for Cs-137+D is higher because it includes the risk contribution from cesium's short-lived gamma-emitting decay product Ba-137m (half-life, 25.5 minutes) which, under most environmental conditions, will be in secular equilibrium with Cs-137.

Note that there may be circumstances, such as long disposal times or technologically enhanced concentrations of naturally occurring radionuclides, that may necessitate the combination of the risks of a parent radionuclide and its decay products over several contiguous subchains. For example, Ra-226 soil analyses at a site might show that all radium decay products are present in secular equilibrium down to stable Pb-206 (See Exhibit 1). In this case, Ra-226 risk calculations should be based on the ingestion, inhalation and external exposure slope factors for the Ra-226+D subchain, plus the ingestion, inhalation and external exposure factors for the Pb-210+D subchain. For actual sites, users should consult with a health physicist or radiochemist (1) to evaluate the site-specific analytical data to determine the degree of equilibrium between parent radionuclides and decay members of contiguous decay chains, and (2) to assist in the combination of appropriate slope factor values. For health physics and radioanalytical support, HEAST users may contact EPA's Regional Radiation Program Staff, ORIA's National Air and Radiation Laboratory (NAREL) in Montgomery, Alabama, ORIA's Las Vegas Laboratory (ORP-LV) in Las Vegas, Nevada, or the ORIA staff at EPA Headquarters in Washington, DC, listed in Exhibit 2.

A Chemical Abstract System Reference Number (CASRN) is assigned to each radionuclide for identification and reporting accuracy during risk assessments. Users should report a CASRN for all radionuclides (both parent and decay product radionuclides) included in risk calculations. Radioactive half-lives are provided in the HEAST tables for reference.

The designations "D", "W", and "Y" presented under the heading "ICRP Lung Class" in the tables refer to the lung clearance times for inhaled particulate radionuclides, expressed as days (D), weeks (W), or years (Y), as recommended by the International

Commission on Radiological Protection (ICRP). Gaseous radionuclides, e.g., Rn-222, are designated with an asterisk ("*"). "GI Absorption Factors, f_1" are the fractional amounts of each radionuclide that may be absorbed from the gastrointestinal (GI) tract into blood following an oral intake. The ICRP lung clearance classifications and GI absorption factors provided in Tables 4A and 4B are the default values that EPA used to calculate radionuclide slope factors for inhalation and ingestion exposures, respectively. These factors are provided for reference only (see the Note Box on the previous page).

WHERE TO ADDRESS QUESTIONS ABOUT RADIONUCLIDE SLOPE FACTORS

EPA continuously reviews the scientific literature on radiation effects to ensure that the Agency's risk assessment methodologies are consistent with current models and assumptions. As risk assessment methodologies are refined, the slope factors in Tables 4A and 4B will be revised and updated.

HEAST users with questions about radionuclide slope factor values and their use in radiation risk assessments should contact the Remedial Guidance Section of the Radiation Assessment Branch of ORIA at (202)233-9350. Written requests for assistance can be sent by fax to (202)233-9650.

000043

Exhibit 1: Radioactive Decay Chains Included in HEAST Tables 4A and 4B*

Principal Decay Chain	Subchain[a]	Members[b]	Half-life[c]
Uranium-238	U-238+D	U-238	4.468E+09 Y
		Th-234	2.410E+01 D
		Pa-234	1.170E+00 M
	U-234	U-234	2.445E+05 Y
	Th-230	Th-230	7.700E+04 Y
	Ra-226+D	Ra-226	1.600E+03 Y
		Rn-222''	3.823E+00 D
		Po-218	3.050E+00 M
		Pb-214	2.680E+01 M
		Bi-214	1.990E+01 M
		Po-214	1.637E-04 S
	Pb-210+D	Pb-210	2.226E+01 Y
		Bi-210	5.013E+00 D
		Po-210	1.384E+02 D
	Pb-206	Pb-206	[Stable]
Uranium-235	U-235+D	U-235	7.038E+08 Y
		Th-231	2.552E+01 H
	Pa-231	Pa-231	3.726E+04 Y
	Ac-227+D	Ac-227	2.177E+01 Y
		Th-227 [99%]	1.872E+01 D
		Ra-233	1.143E+01 D
		Rn-219	3.960E+00 S
		Po-215	1.778E-03 S
		Pb-211	3.610E+01 M
		Bi-211	2.130E+00 M
		Tl-207	4.770E+00 M
	Pb-207	Pb-207	[Stable]
Thorium-232	Th-232	Th-232	1.405E+10 Y
	Ra-228+D	Ra-228	5.750E+00 Y
		Ac-228	6.130E+00 H
	Th-228+D	Th-228	1.913E+00 Y
		Ra-224	3.620E+00 D
		Rn-220	5.561E+01 S
		Po-216	1.460E-01 S
		Pb-212	1.064E+01 H
		Bi-212	6.055E+01 M
		Po-212 [64%]	2.980E-07 S
		Tl-208 [36%]	3.053E+00 M
	Pb-208	Pb-208	[Stable]

Exhibit 1: Radioactive Decay Chains Included in HEAST Tables 4A and 4B

(Continued)*

Principal Decay Chain	Subchain[a]	Members[b]	Half-life[c]
Neptunium-237	Np-237+D	Np-237	2.140E+06 Y
		Pa-233	2.700E+01 D
	U-233	U-233	1.592E+05 Y
	Th-229+D	Th-229	7.340E+03 Y
		Ra-225	1.480E+01 D
		Ac-225	1.000E+01 D
		Fr-221	4.800E+00 M
		At-217	3.230E-02 S
		Bi-213	4.565E+01 M
		Po-213 [98%]	4.200E-06 S
		Tl-209 [2%]	2.200E+00 M
		Pd-209	3.253E+00 H
	Bi-209	Bi-209	[Stable]
Americium-243	Am-243+D	Am-243	7.380E+03 Y
		Np-239	2.355E+00 D
Cesium-137	Cs-137+D	Cs-137	3.017E+01 Y
		Ba-137m	2.552E+00 M
Strontium-90	Sr-90+D	Sr-90	2.860E+01 Y
		Y-90	6.410E+01 H

* See the discussion on radioactive decay chains in the User's Guide.

[a] Radioactive decay chains included in HEAST Tables 4A and 4B. Radionuclides marked with the suffix "+D" include risks from decay chain members, assuming secular equilibrium (i.e., equal activity concentrations) in the environment.

[b] The chain of decay products of a parent radionuclide extends to (but does not include) members of the next subchain (e.g., U-238+D includes U-238, Th-234 and Pa-234, but not U-234). Note that there may be circumstances when it may be necessary to combine the risks for a parent radionuclide over several contiguous subchains, depending on the conditions of equilibrium. Branches in the decay chain are indicated in square brackets with branching percentages in parentheses.

" A radon-222 decay subchain, Rn-222+D, is also included in the HEAST tables, comprised of ingestion, inhalation and external exposure slope factors for Rn-222 plus the corresponding slope factors for each of its decay products (Po-218, Pb-214, Bi-214 and Po-214). For the ingestion and external exposure slope factors for Rn-222+D, decay products are assumed to be in secular equilibrium. For the inhalation slope factor, decay products are assumed to be j 50% equilibrium.

[c] Radioactive half-life in years (Y), days (D), hours (H), minutes (M) or seconds (S).

Exhibit 2. EPA Radiation Program Staff

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ACENAPHTHENE		**000083-32-9**							
NOAEL 175 MG/KG/DAY	ORAL: GAVAGE	MOUSE 90 DAYS	LIVER	HEPATOTOXICITY		6E-1 300		IRIS	010165
ACENAPTHYLENE		**000208-96-8**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005202
ACEPHATE		**030560-19-1**							
LOAEL 2 PPM	ORAL: DIET	RAT 13 WEEKS	BRAIN	DECREASED CHOLINESTERASE ACTIVITY		4E-3 30		IRIS	005833
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
ACETONE		**000067-64-1**							
NOEL 100 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	LIVER	INCREASED WEIGHT		1E+0		IRIS	005204
			KIDNEY	INCREASED WEIGHT		100			
			KIDNEY	NEPHROTOXICITY					
ACETONE CYANOHYDRIN		**000075-86-5**							
NOEL 10.8 MG CN/KG/DAY	ORAL: DIET	RAT 104 WEEKS	WHOLE BODY	ALTERED WEIGHT		7E-2		7E-2	005776
			THYROID	EFFECTS		500		500	
			CENTRAL NERVOUS SYSTEM	EFFECTS					

SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ACETONITRILE		**000075-05-8**							
NOAEL 100 PPM	INHALATION: INTERMITTENT	MOUSE 92 DAYS	ERYTHROCYTES	DECREASED CELL COUNT		6E-2		IRIS	005210
			BLOOD	DECREASED HEMATOCRIT		300			
			LIVER	HEPATIC LESIONS					

SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5.
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5. UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.

ACETOPHENONE		**000098-86-2**							
NOAEL 10,000 PPM	ORAL: DIET	RAT 17 WEEKS		NONE OBSERVED		1E+0 300		IRIS	005212

CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (06/25/92) BY THE RfD/RfC WORK GROUP. 010874

ACROLEIN		**000107-02-8**							
NOAEL 15.6 MG/KG/DAY	ORAL: WATER	RAT 90 DAYS						2E-2 1000	010390

GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

IRIS 010856

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

ACRYLAMIDE		**000079-06-1**							
NOEL 0.2 MG/KG/DAY	ORAL: DRINKING WATER	RAT 90 DAYS	NERVE	DAMAGE		2E-3 100		IRIS	005835

GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

IRIS 010876

CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (09/20/90) BY THE RfD/RfC WORK GROUP.

010050

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ACRYLIC ACID		**000079-10-7**							
NOAEL 83 MG/KG/DAY	ORAL: DRINKING WATER	RAT 3 MONTHS	WHOLE BODY ORGANS, MAJOR	DECREASED WEIGHT ALTERED WEIGHT		8E-1 100		IRIS	005836
LOAEL 5 PPM	INHALATION: INTERMITTENT	MOUSE 13 WEEKS	NASAL MUCOSA	LESIONS	3E-3 100		IRIS		010346
ACRYLONITRILE		**000107-13-1**							
NOAEL 1 MG/(KG-DAY)	ORAL: GAVAGE	MOUSE 60 DAYS	TESTES TESTES	DECREASED SPERM COUNTS SEMINIFEROUS TUBULE DEGENERATION		1E-2 100		1E-3 1000	010939

SUBCHRONIC [RfD] COMMENT: THE CHRONIC [RfD] UNDER REVIEW BY THE RfD/RfC WORK GROUP WAS MODIFIED TO DERIVE THE SUBCHRONIC [RfD].
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY

ADIPONITRILE 000111-69-3

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT — 005157

ALACHLOR		**015972-60-8**							
NOEL 1 MG/KG/DAY	ORAL: CAPSULE	DOG 1 YEAR	BLOOD SITES, MULTIPLE	ANEMIA HEMOSIDEROSIS		1E-2 100		IRIS	005837

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ALDICARB		**000116-06-3**							
NOAEL 0.01 MG/KG-DAY	ORAL	HUMAN ACUTE	CENTRAL NERVOUS SYSTEM	SWEATING		1E-3 10		IRIS	010960
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: CLINICAL SIGNS OF ACETYL CHOLINESTERASE INHIBITION INCLUDING SWEATING, PINPOINT PUPILS, LEG WEAKNESS, NAUSEA, DIARRHEA AND OTHER EFFECTS WERE OBSERVED IN THE PRINCIPAL AND SUPPORTING STUDIES.									
ALDRIN		**000309-00-2**							
LOAEL 0.025 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	LIVER	LESIONS		3E-5 1000		IRIS	005159
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
ALLIDOCHLOR		**000093-71-0**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005838
ALLYL ALCOHOL		**000107-18-6**							
NOEL 50 PPM	ORAL: DRINKING WATER	RAT 15 WEEKS	LIVER KIDNEY	EFFECTS EFFECTS		5E-2 100		IRIS	005839
ALLYL CHLORIDE		**000107-05-1**							
NOAEL 17 MG/CU M	INHALATION: INTERMITTENT	RABBIT 5 MONTHS	NERVOUS SYSTEM	NEUROTOXICITY	1E-2 300		IRIS		010369
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
ALUMINUM		**007429-90-5**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005162

000032

78334

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ALUMINUM PHOSPHIDE		020859-73-8								
NOAEL 0.43 MG/KG/DAY	ORAL: DIET	RAT	2 YEARS	WHOLE BODY	ALTERED WEIGHT		4E-4		IRIS	010255
				UNSPECIFIED	ALTERED CLINICAL PARAMETERS		100			
AMETRYN		000834-12-8								
NOEL 10 MG/KG/DAY	ORAL: GAVAGE	RAT	13 WEEKS	LIVER	EFFECTS		9E-2		IRIS	005841
							100			
AMINO-2-NAPHTHOL, 1-		002834-92-6								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										005842
AMINO-2-NAPHTOL HYDROCHLORIDE, 1-		001198-27-2								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										005843
AMINOPHENOL, M-		000591-27-5								
NOAEL 1300 PPM	ORAL: DIET	RAT	13 WEEKS	WHOLE BODY	ALTERED WEIGHT		7E-1		7E-2	005844
				THYROID	ALTERED WEIGHT		100		1000	
AMINOPHENOL, O-		000095-55-6								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										005845
AMINOPHENOL, P-		000123-30-8								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										005846
AMINOPYRIDINE, 4-		000504-24-5								
NOAEL 3 PPM	ORAL: DIET	RAT	90 DAYS	LIVER	INCREASED WEIGHT		2E-4		2E-5	005847
				BRAIN	INCREASED WEIGHT		1000		10000	

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
AMMONIA		**007664-41-7**							
NOAEL 34 MG/L	ORAL: DRINKING WATER	HUMAN	SENSORY	TASTE THRESHOLD		34 MG/L 1		34 MG/L 1	005166
SUBCHRONIC [RfD] COMMENT: GIVEN AS CONCENTRATION IN DRINKING WATER. SPECIFICALLY RELATED TO ORGANOLEPTIC THRESHOLD. SAFE CONCENTRATION MAY BE HIGHER, BUT DATA ARE INADEQUATE TO ASSESS.									
CHRONIC [RfD] COMMENT: GIVEN AS CONCENTRATION IN DRINKING WATER. SPECIFICALLY RELATED TO ORGANOLEPTIC THRESHOLD. SAFE CONCENTRATION MAY BE HIGHER, BUT DATA ARE INADEQUATE TO ASSESS.									
NOAEL 6.4 MG/CU M	INHALATION: INTERMITTENT	HUMAN	NASAL CAVITY	RHINITIS	1E-1		IRIS		010392
			LUNGS	PNEUMONIA	30				
			LUNGS	LESIONS					
ANILINE		**000062-53-3**							
NOAEL 19 MG/CU M	INHALATION: INTERMITTENT	MOUSE 20-26 WEEKS	SPLEEN	PATHOLOGY	1E-2 300		IRIS		010370
		RAT 20-26 WEEKS	SPLEEN	PATHOLOGY					
		GUINEA PIG 20-26 WEEKS	SPLEEN	PATHOLOGY					
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
ANTHRACENE		**000120-12-7**							
NOEL 1000 MG/KG/DAY	ORAL: GAVAGE	MOUSE 90 DAYS		NONE OBSERVED		3E+0 300		IRIS	010166
ANTIMONY PENTOXIDE		**001314-60-9**							
LOAEL 0.46 MG/KG/DAY	ORAL: DRINKING WATER	RAT LIFETIME	WHOLE BODY	INCREASED MORTALITY		5E-4		5E-4	005174
			BLOOD	ALTERED CHEMISTRIES		1000		1000	
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ANTIMONY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ANTIMONY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									

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7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ANTIMONY POTASSIUM TARTRATE 000304-61-0									
LOAEL 0.91 MG/KG/DAY	ORAL: DRINKING WATER	RAT LIFETIME	WHOLE BODY	INCREASED MORTALITY		9E-4		9E-4	005234
			BLOOD	ALTERED CHEMISTRIES		1000		1000	
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ANTIMONY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ANTIMONY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
ANTIMONY TETROXIDE 001332-81-6									
LOAEL 0.44 MG/KG/DAY	ORAL: DRINKING WATER	RAT LIFETIME	WHOLE BODY	INCREASED MORTALITY		4E-4		4E-4	005238
			BLOOD	ALTERED CHEMISTRIES		1000		1000	
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ANTIMONY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ANTIMONY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
ANTIMONY TRIOXIDE 001309-64-4									
LOAEL 0.42 MG/KG/DAY	ORAL: DRINKING WATER	RAT LIFETIME	WHOLE BODY	INCREASED MORTALITY		4E-4		4E-4	005242
			BLOOD	ALTERED CHEMISTRIES		1000		1000	
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ANTIMONY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ANTIMONY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
ANTIMONY, METALLIC 007440-36-0									
LOAEL 0.35 MG SB/KG/DAY	ORAL: DRINKING WATER	RAT LIFETIME	WHOLE BODY	INCREASED MORTALITY		4E-4		IRIS	005170
			BLOOD	ALTERED CHEMISTRIES		1000			

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ARAMITE		**000140-57-8**							
NOAEL 100 PPM	ORAL: DIET	RAT 104 WEEKS	LIVER	INCREASED WEIGHT				5E-2 100	005850
NOAEL 500 PPM	ORAL: DIET	DOG 52 WEEKS	LIVER	DEGENERATION		1E-1 100			005849
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
AROCHLOR 1248		**012672-29-6**							
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] IS CONSIDERED NOT VERIFIABLE (07/20/93) BY THE RfD/RfC WORK GROUP.									010940
ARSENIC, INORGANIC		**007440-38-2**							
NOAEL 0.009 MG/L	ORAL	HUMAN	SKIN SKIN	KERATOSIS HYPERPIGMENTATION		3E-4 3		IRIS	010434
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
ATRAZINE		**001912-24-9**							
NOEL 3.5 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY	DECREASED WEIGHT GAIN		3.5E-2 100		IRIS	010855
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
BARIUM		**007440-39-3**							
NOAEL 0.21 MG/KG/DAY	ORAL: WATER	HUMAN 10 WEEKS	CARDIOVASCULAR SYSTEM	INCREASED BLOOD PRESSURE		7E-2 3		IRIS	010348
SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

000056

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CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
BARIUM CYANIDE 000542-62-1									
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] IS CONSIDERED NOT VERIFIABLE (07/20/93) BY THE RfD/RfC WORK GROUP.									010941
BENEFIN 001861-40-1									
NOAEL 25 MG/KG/DAY	ORAL: DIET	DOG 1 YEAR	ERYTHROCYTE	DECREASED COUNT		3E-1 100		IRIS	005852
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
BENZAL CHLORIDE 000098-87-3									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005853
BENZALDEHYDE 000100-52-7									
NOEL 200 MG/KG/DAY	ORAL: GAVAGE	RAT 13 WEEKS	KIDNEY FORESTOMACH	EFFECTS LESIONS		1E+0 100		IRIS	005854
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS MODIFIED TO DERIVE THE SUBCHRONIC ORAL [RfD].									
BENZALDEHYDE CYANOHYDRIN 000532-28-5									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005781
BENZENE 000071-43-2									
SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
BENZENETHIOL / (THIOPHENOL) 000108-98-5									
LOAEL 0.1 MG/(KG-DAY)	ORAL: GAVAGE	RAT 90 DAYS	LIVER	CENTRILOBULAR EOSINOPHILIC CHANGES		1E-4 1000		1E-5 10,000	010942
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] UNDER REVIEW BY THE RfD/RfC WORKGROUP WAS MODIFIED TO DERIVE THE SUBCHRONIC [RfD].									

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
BENZIDINE		000092-87-5							
LOAEL 2.7 MG/KG/DAY	ORAL: DRINKING WATER	MOUSE 33 MONTHS	BRAIN	CELLULAR CHANGES		3E-3		IRIS	005830
			LIVER	CELLULAR CHANGES		1000			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
							IRIS		010877
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (03/28/91) BY THE RfD/RfC WORK GROUP.									
BENZOIC ACID		000065-85-0							
NOAEL 312 MG/DAY	ORAL: DIET	HUMAN		NONE OBSERVED		4E+0 1		IRIS	005260
SUBCHRONIC [RfD] COMMENT: THE HUMAN DAILY PER CAPITA INTAKE WAS USED AS THE CRITICAL DOSE LEVEL. THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CHRONIC [RfD] COMMENT: THE HUMAN DAILY PER CAPITA INTAKE WAS USED AS THE CRITICAL DOSE LEVEL.									
BENZO[B]FLUORANTHENE		000205-99-2							
SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
BENZYL ALCOHOL		000100-51-6							
LOAEL 286 MG/KG/DAY	ORAL: GAVAGE	RAT 103 WEEKS	FORESTOMACH	EPITHELIAL HYPERPLASIA				3E-1 1000	005855
NOAEL 143 MG/KG/DAY	ORAL: GAVAGE	RAT 13 WEEKS	WHOLE BODY	DECREASED WEIGHT		1E+0 100			005856

000038

78334

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL / LEVEL	DOSE / ROUTE	SPECIES / EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
BERYLLIUM		**007440-41-7**							
NOAEL 0.54 MG/KG/DAY	ORAL: DRINKING WATER	RAT LIFETIME		NONE OBSERVED		5E-3 100		IRIS	005262
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
BIPHENYL, 1,1'		**000092-52-4**							
NOAEL 50 MG/KG/DAY	ORAL: DIET	RAT 700 DAYS	KIDNEY	DAMAGE		5E-2 1000		IRIS	005857
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (09/20/90) BY THE RfD/RfC WORK GROUP.							IRIS		010878
BIS(2-CHLOROISOPROPYL) ETHER		**039638-32-9**							
NOAEL 35.8 MG/KG/DAY	ORAL: DIET	MOUSE 2 YEARS	ERYTHROCYTES	DECREASED HEMOGLOBIN		4E-2 1000		IRIS	010257
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
BIS(2-ETHYLHEXYL) PHTHALATE / (DEHP)		**000117-81-7**							
								IRIS	010859
SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300. SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
BISPHENOL A		**000080-05-7**							
								IRIS	005268
NOAEL 750 PPM	ORAL	RAT 13 WEEKS	WHOLE BODY	DECREASED WEIGHT		6E-1 100			005266

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER ˜MATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
BORON TRIFLUORIDE		007637-07-2							
NOAEL 6 MG/CU M	INHALATION: INTERMITTENT	RAT 13 WEEKS	KIDNEY	NECROSIS	7E-3 300		7E-4 3000		010395
BORON, ELEMENTAL		007440-42-8							
NOAEL 8.8 MG/KG/DAY	ORAL: DIET	DOG 2 YEARS	TESTIS	LESIONS		9E-2 100		IRIS	005272
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
LOAEL 4.5 MG/CU M	INHALATION: INTERMITTENT	HUMAN	RESPIRATORY TRACT BRONCHUS	IRRITATION BRONCHITIS	2E-2 100		2E-2 100		005269
SUBCHRONIC [RfC] COMMENT: THE SUBCHRONIC INHALATION [RfC] IS SPECIFICALLY FOR ANHYDROUS BORAX. CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS SPECIFICALLY FOR ANHYDROUS BORAX.									
BROMINATED DIBENZO-P-DIOXINS									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005858
BROMINATED DIBENZOFURANS									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005859
BROMOACETONE		000598-31-2							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005860
BROMOCHLOROETHANES									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005861

000030

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
BROMODICHLOROMETHANE 000075-27-4									
LOAEL 17.9 MG/KG/DAY	ORAL: GAVAGE	MOUSE 102 WEEKS	KIDNEY	CYTOMEGALY		2E-2 1000		IRIS	005715
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
BROMOETHENE / (VINYL BROMIDE) 000593-60-2									
LOAEL 9.7 PPM	INHALATION: INTERMITTENT	RAT 24 MONTHS	LIVER	HYPERTROPHY	3E-3		IRIS		010929
			LIVER	BASOPHILIC FOCI	3000				
			LIVER	EOSINOPHILIC FOCI					
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
BROMOFORM 000075-25-2									
NOEL 17.9 MG/KG/DAY	ORAL: GAVAGE	RAT 13 WEEKS	LIVER	EFFECTS		2E-1 100		IRIS	005722
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
							IRIS		010961
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (02/11/93) BY THE RfD/RfC WORK GROUP.									
BROMOMETHANE 000074-83-9								IRIS	010861
							IRIS		010860
SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
BROMOPHENYL PHENYL ETHER, 4- 000101-55-3									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005864

IRIS, [illegible]'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER [illegible]RMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
BROMOPHOS		**002104-96-3**							
NOAEL 5 MG/KG/DAY	ORAL: DIET	RAT 3 GENERATIONS	BLOOD	DECREASED CHOLINESTERASE ACTIVITY		5E-2 100		5E-3 1000	005865
			LIVER	DECREASED CHOLINESTERASE ACTIVITY					
SUBCHRONIC [RfD] COMMENT: BASED ON A REPRODUCTION STUDY.									
CHRONIC [RfD] COMMENT: BASED ON A REPRODUCTION STUDY.									
BROMOXYNIL		**001689-84-5**							
NOEL 5 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS		NONE OBSERVED		2E-2 300		IRIS	005866
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
BROMOXYNIL OCTANOATE		**001689-99-2**							
NOEL 7.3 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS		NONE OBSERVED		2E-2 300		IRIS	005867
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
BUSAN 77		**031512-74-0**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005868
BUSAN 90		**002491-38-5**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005869
BUTANOL, 1-		**000071-36-3**							
NOAEL 125 MG/KG/DAY	ORAL: GAVAGE	RAT 13 WEEKS	CENTRAL NERVOUS SYSTEM	HYPOACTIVITY		1E+0 100		IRIS	005870
			CENTRAL NERVOUS SYSTEM	ATAXIA					

000052

78334

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
BUTYL BENZYL PHTHALATE, N- 000085-68-7									
NOAEL 159 MG/KG/DAY	ORAL: DIET	RAT 26 WEEKS	LIVER	ALTERED WEIGHT		2E+0 100		IRIS	005616
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
BUTYLATE 002008-41-5									
NOEL 5 MG/KG/DAY	ORAL: CAPSULE	DOG 12 MONTHS	LIVER	INCREASED RELATIVE WEIGHT		5E-2 100		IRIS	005871
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
BUTYLCHLORIDE, T- 000507-20-0									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005810
BUTYROLACTONE, GAMMA- 000096-48-0									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005872
CACODYLIC ACID 000075-60-5									
NOEL 9.2 MG/KG/DAY	ORAL: DIET	RAT 90 DAYS		NONE OBSERVED		3E-2 300		3E-3 3000	005873
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ARSENIC BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO ARSENIC BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
CADMIUM 007440-43-9									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.							IRIS	005280	

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CALCIUM CYANIDE		**000592-01-8**							
NOAEL 19.1 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY	DECREASED WEIGHT		4E-2		IRIS	010258
			THYROID	EFFECTS		500			
			NERVE	MYELIN DEGENERATION					

SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.

CAPROLACTAM		**000105-60-2**							
NOAEL 50 MG/KG/DAY	ORAL: DIET	RAT 90 DAYS	KIDNEY	EFFECTS		5E-1		IRIS	005284
						100			005282
CAPTAFOL		**002425-06-1**							
LOAEL 2 MG/KG/DAY	ORAL: CAPSULE	DOG 12 MONTHS	KIDNEY	EFFECTS		2E-3		IRIS	005874
			BLADDER	EFFECTS		1000			

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

CAPTAN		**000133-06-2**							
NOEL 12.5 MG/KG/DAY	ORAL: DIET	RAT	WHOLE BODY	DECREASED WEIGHT		1.3E-1		IRIS	005875
						100			

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (05/27/92) BY THE RfD/RfC WORK GROUP.
CHRONIC [RfD] COMMENT: BASED ON A MULTI-GENERATION REPRODUCTION STUDY.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

000052

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CARBARYL		**000063-25-2**							
NOAEL 9.6 MG/KG/DAY		RAT							
	ORAL: DIET	2 YEARS	KIDNEY	TOXICITY		1E-1		IRIS	005876
			LIVER	TOXICITY		100			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
							IRIS		010882
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (08/15/91) BY THE RfD/RfC WORK GROUP.									
CARBOFURAN		**001563-66-2**							
NOEL 0.5 MG/KG/DAY		DOG							
	ORAL: DIET	1 YEAR	BLOOD	CHOLINESTERASE INHIBITION		5E-3		IRIS	005877
			TESTIS	EFFECTS		100			
			UTERUS	EFFECTS					
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CARBON DISULFIDE		**000075-15-0**							
NOEL 11 MG/KG/DAY		RABBIT							
	INHALATION: INTERMITTENT		FETUS	TOXICITY		1E-1 100		IRIS	010259
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS DETERMINED FROM A TERATOLOGY STUDY WITH EXPOSURES BEFORE AND DURING THE ENTIRE GESTATION PERIOD.									
NOAEL 10 MG/CU M		RAT							
	INHALATION: INTERMITTENT	GESTATION	FETUS	TOXICITY	1E-2 1000		1E-2 1000		010430
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC].									
CARBON MONOXIDE		**000630-05-0**							
CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS.									010493

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CARBON TETRACHLORIDE		**000056-23-5**							
								IRIS	010862

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

CHLORAL		**000075-87-6**							
LOAEL 15.7 MG/KG/DAY	ORAL: DRINKING WATER	MOUSE 90 DAYS	LIVER	EFFECTS		2E-2 1000		IRIS	005290

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

CHLORDANE		**000057-74-9**							
NOEL 0.055 MG/KG/DAY	ORAL: DIET	RAT 130 WEEKS	LIVER	HYPERTROPHY		6E-5 1000		IRIS	005296

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

CHLORINE CYANIDE		**000506-77-4**							
NOAEL 25.3 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY THYROID NERVE	DECREASED WEIGHT EFFECTS MYELIN DEGENERATION		5E-2 500		IRIS	010261

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

000036

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CHLORO-1,3-BUTADIENE, 2- / (CHLOROPRENE) 000126-99-8										
NOAEL 32 PPM	INHALATION	RAT	90 DAYS	OLFACTORY EPITHELIUM	DEGENERATION	7E-2 30		7E-3 300		010515
SUBCHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)										
CHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)										
GENERAL COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)										010491
CHLORO-M-CRESOL, P- 000059-50-7										
NOAEL 200 MG/KG/DAY	ORAL: GAVAGE	RAT	28 DAYS	WHOLE BODY	DECREASED WEIGHT GAIN		2E+0 100			005366
CHLOROACETALDEHYDE 000107-20-0										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										005342
CHLOROACETIC ACID 000079-11-8										
LOAEL 30 MG/KG	ORAL: GAVAGE	RAT	13 WEEKS	HEART	MYOCARDITIS		2E-2 1000		2E-3 10000	005346
CHLOROANILINE, 2- 000095-51-2										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										005347
CHLOROANILINE, 3- 000108-42-9										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										005348
CHLOROANILINE, 4- 000106-47-8										
LOAEL 12.5 MG/KG/DAY	ORAL: DIET	RAT	78 WEEKS	SPLEEN	PROLIFERATIVE LESIONS		4E-3 3000		IRIS	005349
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CHLOROBENZENE		**000108-90-7**							
								IRIS	010863

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

CHLOROBENZILATE		**000510-15-6**							
NOEL	5 MG/KG/DAY	RABBIT							
	ORAL: GAVAGE	13 DAYS	GASTRO-INTESTINAL SYSTEM	DECREASED STOOL QUANTITY		2E-2 300		IRIS	010260
			WHOLE BODY	DECREASED FOOD CONSUMPTION					
			WHOLE BODY	DECREASED WEIGHT GAIN					
			NERVOUS SYSTEM	HYPERIRRITABILITY					

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. BASED ON A TERATOLOGY STUDY WITH EXPOSURES DURING DAYS 7-19 OF GESTATION.
CHRONIC [RfD] COMMENT: BASED ON A TERATOLOGY STUDY WITH EXPOSURES DURING DAYS 7-19 OF GESTATION.
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (02/11/93) BY THE RfD/RfC WORK GROUP. 010931

CHLOROBENZOIC ACID, P-		**000074-11-3**							
NOAEL	26 MG/DAY	RAT							
	ORAL: DIET	5 MONTHS		NONE OBSERVED		2E+0 100		2E-1 1000	005360
CHLOROBENZOTRIFLUORIDE, 4-		**000098-56-6**							
NOAEL	15 MG/KG/DAY	RAT							
	ORAL: GAVAGE		KIDNEY	TUBULAR DEGENERATION		2E-1 100		2E-2 1000	005364

SUBCHRONIC [RfD] COMMENT: BASED ON A 2-GENERATION REPRODUCTION STUDY WITH EXPOSURES 4 WEEKS PRIOR TO MATING, DURING GESTATION, AND FOR 90 DAYS POST-WEANING.
CHRONIC [RfD] COMMENT: BASED ON A 2-GENERATION REPRODUCTION STUDY WITH EXPOSURES 4 WEEKS PRIOR TO MATING, DURING GESTATION, AND FOR 90 DAYS POST-WEANING.

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7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CHLOROBUTANE, 1- 000109-69-3									
NOAEL 43 MG/KG/DAY	ORAL: GAVAGE	RAT 103 WEEKS	WHOLE BODY	INCREASED MORTALITY				4E-1 100	005808
			CENTRAL NERVOUS SYSTEM	EFFECTS					
			BLOOD	HEMATOLOGIC EFFECTS					
NOAEL 86 MG/KG/DAY	ORAL: GAVAGE	RAT 13 WEEKS	WHOLE BODY	DECREASED WEIGHT GAIN		9E-1 100			005806
			CENTRAL NERVOUS SYSTEM	EFFECTS					
			SPLEEN	HEMATOPOIESIS					
CHLOROBUTANE, 2- 000078-86-4									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005809
CHLOROCYCLOPENTADIENE 041851-50-7									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005297
CHLOROFORM 000067-66-3									
LOAEL 12.9 MG/KG/DAY	ORAL: CAPSULE	DOG 7.5 YEARS	LIVER	LESIONS		1E-2 1000		IRIS	005372

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

CHLOROMETHANE / (METHYL CHLORIDE) 000074-87-3

010005

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CHLORONITROBENZENE, M- 000121-73-3										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										005879
CHLOROPHENOL, 2- 000095-57-8										
NOAEL 50 PPM	ORAL: DRINKING WATER	RAT		REPRODUCTION	REPRODUCTIVE EFFECTS		5E-2 100		IRIS	010436
SUBCHRONIC [RfD] COMMENT: BASED ON A REPRODUCTIVE STUDY WITH EXPOSURE 10 WEEKS PRIOR TO AND DURING MATING, GESTATION AND WEANING. CHRONIC [RfD] COMMENT: BASED ON A REPRODUCTIVE STUDY WITH EXPOSURE 10 WEEKS PRIOR TO AND DURING MATING, GESTATION AND WEANING.										
CHLOROPHENOL, 3- 000108-43-0										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										005309
CHLOROPHENOL, 4- 000106-48-9										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										005310
CHLOROPROPANE, 2- 000075-29-6										
NOAEL 91.4 MG/KG/DAY	INHALATION: INTERMITTENT	RAT	4 WEEKS	LIVER	EFFECTS	1E+0 100		1E-1 1000		010444
CHLOROTOLUENE, M- 000108-41-8										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										005880
CHLOROTOLUENE, O- 000095-49-8										
NOAEL 20 MG/KG/DAY	ORAL: GAVAGE	RAT	103 DAYS	WHOLE BODY	DECREASED WEIGHT GAIN		2E-1 100		IRIS	010167
CHLOROTOLUENE, P- 000106-43-4										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										010200

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

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7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CHLORPYRIFOS		**002921-88-2**								
NOEL 0.03 MG/KG/DAY	ORAL: CAPSULE	HUMAN	20 DAYS OR 9 DAYS	BLOOD	DECREASED CHOLINESTERASE ACTIVITY		3E-3 10		IRIS	005881
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
CHLORPYRIFOS METHYL		**005598-13-0**								
NOAEL 1 MG/KG/DAY	ORAL: DIET	RAT	3 GENERATIONS	REPRODUCTION	DECREASED FERTILITY		1E-2 100		1E-2 100	005882
		RAT	2 YEARS	LIVER	EFFECTS					
CHLOROTHALONIL		**001897-45-6**								
NOEL 1.5 MG/KG/DAY	ORAL: DIET	DOG	2 YEARS	KIDNEY	EFFECTS		1.5E-2 100		IRIS	005883
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.										
CHLORTHIOPHOS		**060238-56-4**								
NOAEL 0.08 MG/KG/DAY	ORAL: DIET	RAT	2 YEARS		NONE OBSERVED		8E-4 100		8E-4 100	005884
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
CHROMIUM(III)		**016065-83-1**								
NOEL 5 % (CR2O3)	ORAL: DIET	RAT	840 DAYS		NONE OBSERVED		1E+0 1000		IRIS	005731
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfC] COMMENT: INHALATION ISSUES ARE UNDER REVIEW BY THE RFD/RFC WORK GROUP. SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.										

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER [illegible]RMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CHROMIUM(VI)		**018540-29-9**							
NOAEL 2.4 MG/KG/DAY	ORAL: DRINKING WATER	RAT 1 YEAR		NONE OBSERVED		2E-2 100		IRIS	005522
CHRONIC [RfC] COMMENT: INHALATION ISSUES ARE UNDER REVIEW BY THE RFD/RFC WORK GROUP.									
SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
CHRYSENE		**000218-01-9**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT. ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									005885
COPPER		**007440-50-8**							
LOAEL 5.3 MG	ORAL	HUMAN SINGLE DOSE	GASTRO-INTESTINAL SYSTEM	IRRITATION		1.3 MG/L		1.3 MG/L	005374
SUBCHRONIC [RfD] COMMENT: CURRENT DRINKING WATER STANDARD OF 1.3 MG/L. DWCD (1987) CONCLUDED TOXICITY DATA WERE INADEQUATE FOR CALCULATION OF AN RfD FOR COPPER.									
CHRONIC [RfD] COMMENT: CURRENT DRINKING WATER STANDARD OF 1.3 MG/L. DWCD (1987) CONCLUDED TOXICITY DATA WERE INADEQUATE FOR CALCULATION OF AN RfD FOR COPPER.									
COPPER CYANIDE		**000544-92-3**							
NOAEL 5 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	LIVER	HISTOPATHOLOGY		5E-2 100		IRIS	010262
			KIDNEY	HISTOPATHOLOGY					
			WHOLE BODY	DECREASED WEIGHT					
			ORGANS	DECREASED WEIGHT					

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78334

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CRESOL, M- / (3-METHYLPHENOL) 000108-39-4									
NOAEL 50 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	WHOLE BODY	DECREASED WEIGHT GAIN		5E-1		IRIS	005380
			NERVOUS SYSTEM	NEUROTOXICITY		100			
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (12/11/91) BY THE RfD/RfC WORK GROUP.							IRIS		010888
CRESOL, O- / (2-METHYLPHENOL) 000095-48-7									
NOAEL 50 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	WHOLE BODY	DECREASED WEIGHT GAIN		5E-1		IRIS	005384
			NERVOUS SYSTEM	NEUROTOXICITY		100			
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (12/11/91) BY THE RfD/RfC WORK GROUP.							IRIS		010889
CRESOL, P- / (4-METHYLPHENOL) 000106-44-5									
NOAEL 5 MG/(KG-DAY)	ORAL: GAVAGE	RABBIT GESTATION DAYS 6-18	CENTRAL NERVOUS SYSTEM	HYPOACTIVITY		5E-3 1000		5E-3 1000	010516
			RESPIRATORY SYSTEM	DISTRESS					
			WHOLE BODY	MATERNAL DEATH					
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (12/11/91) BY THE RfD/RfC WORK GROUP.							IRIS		010890

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CUMENE		**000098-82-8**							
NOAEL 154 MG/KG/DAY	ORAL: GAVAGE	RAT 194 DAYS	KIDNEY	INCREASED WEIGHT		4E-1 300		IRIS	005392
NOAEL 105.1 PPM	INHALATION: INTERMITTENT	RAT 4 WEEKS	CENTRAL NERVOUS SYSTEM	INVOLVEMENT	9E-2 1000		9E-3 10000		005908
			NOSE	IRRITATION					
CYANAZINE		**021725-46-2**							
NOEL 0.625 MG/KG/DAY	ORAL: DIET	DOG 1 YEAR	WHOLE BODY	DECREASED WEIGHT		2E-3 300		2E-3 300	010411
			BLOOD	INCREASED PLATELET COUNT					
			BLOOD	ALTERED CLINICAL CHEMISTRY PARAMETERS					

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS WITHDRAWN FROM IRIS (07/01/92). UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

CYANIDE		**000057-12-5**							
NOAEL 10.8 MG/KG/DAY	ORAL: DIET	RAT 104 WEEKS	WHOLE BODY	DECREASED WEIGHT		2E-2 500		IRIS	005396
			THYROID	EFFECTS					
			NERVE	MYELIN DEGENERATION					

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
GENERAL COMMENT: THE CASRN FOR CN- IS 000057-12-5; THE CASRN FOR HCN IS 000074-90-8.

CYANOGEN		**000460-19-5**							
NOAEL 21.6 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY	DECREASED WEIGHT		4E-2 500		IRIS	010263
			THYROID	EFFECTS					
			NERVE	MYELIN DEGENERATION					

SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

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7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CYANOGEN BROMIDE		**000506-68-3**							
NOAEL 44 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY	DECREASED WEIGHT		9E-2		IRIS	010264
			THYROID	EFFECTS		500			
			NERVE	MYELIN DEGENERATION					
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CYCLOATE		**001134-23-2**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005886
CYCLOHEXANOL		**000108-93-0**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005887
CYCLOHEXYLAMINE		**000108-91-8**							
NOAEL 30 MG/KG/DAY	ORAL: DIET	RAT 90 DAYS	WHOLE BODY	DECREASED WEIGHT GAIN		3E-1		IRIS	005400
			TESTIS	DECREASED WEIGHT		100			005398
CYCLOPENTADIENE		**000542-92-7**							
GENERAL COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									010494
DACTHAL		**001861-32-1**							
NOEL 50 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	KIDNEY	INCREASED WEIGHT		5E-1		IRIS	005888
			ADRENAL	INCREASED RELATIVE WEIGHT		100			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DALAPON		**000075-99-0**							
NOEL	8.45 MG/KG/DAY ORAL: DIET	RAT 2 YEARS	KIDNEY	INCREASED RELATIVE WEIGHT		3E-2 300		IRIS	005889
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO DALAPON SODIUM BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
DDT		**000050-29-3**							
NOEL	0.05 MG/KG/DAY ORAL: DIET	RAT 27 WEEKS	LIVER	LESIONS		5E-4 100		IRIS	005408
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
DECABROMODIPHENYL ETHER		**001163-19-5**							
NOEL	1 MG/KG/DAY ORAL: DIET	RAT 2 YEARS	LIVER	INCREASED WEIGHT		1E-2 100		IRIS	005891
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
DI-N-OCTYL PHTHALATE		**000117-84-0**							
LOAEL	175 MG/KG/DAY ORAL: DIET	RAT 7-12 MONTHS	KIDNEY	INCREASED WEIGHT		2E-2 1000		2E-2 1000	010275
			LIVER	INCREASED WEIGHT					
			LIVER	INCREASED SGOT ACTIVITY					
			LIVER	INCREASED SGPT ACTIVITY					
DIAZINON		**000333-41-5**							
NOAEL	0.09 MG/KG/DAY ORAL: DIET	RAT 35-42 DAYS	BLOOD	DECREASED CHOLINESTERASE ACTIVITY		9E-4 100		9E-4 100	005892

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CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DIBENZOFURAN 000132-64-9									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005409
DIBROMOBENZENE, 1,4- 000106-37-6									
NOAEL 10 MG/KG/DAY	ORAL: GAVAGE	RAT 45 OR 90 DAYS	LIVER	INCREASED RELATIVE WEIGHT		1E-1 100		IRIS	005893
			LIVER	ALTERED ENZYME ACTIVITIES					
DIBROMOCHLOROMETHANE 000124-48-1									
NOEL 21.4 MG/KG/DAY	ORAL: GAVAGE	RAT 13 WEEKS	LIVER	LESIONS		2E-1 100		IRIS	005894
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
DIBROMOETHANE, 1,2- 000106-93-4									
LOAEL 88 PPB	INHALATION: INTERMITTENT	HUMAN	SPERM	EFFECTS	8E-4 300		2E-4 1000		010854
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] WAS MODIFIED TO ESTIMATE THE SUBCHRONIC INHALATION [RfC].									
CHRONIC [RfC] COMMENT: UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
DIBUTYL PHTHALATE 000084-74-2									
NOAEL 125 MG/KG/DAY	ORAL: DIET	RAT 52 WEEKS	WHOLE BODY	INCREASED MORTALITY		1E+0 100		IRIS	005622
							IRIS		010892
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (07/26/90) BY THE RfD/RfC WORK GROUP.									

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DICAMBA		**001918-00-9**							
NOAEL 3 MG/KG/DAY	ORAL: GAVAGE	RABBIT GESTATION DAYS 6-18	FETUS	DECREASED WEIGHT		3E-2		IRIS	010945
			FETUS	INCREASED POST-IMPLANTATION LOSSES		100			
			FETUS	INCREASED MORTALITY					
			DAM	DECREASED WEIGHT GAIN					

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

DICHLOROBENZENE, 1,2- **000095-50-1**

IRIS 010864

SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
GENERAL COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

DICHLOROBENZENE, 1,3- **000541-73-1**

CHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] IS CONSIDERED NOT VERIFIABLE (06/23/92) BY THE RfD/RfC WORK GROUP. 005414

DICHLOROBENZENE, 1,4- **000106-46-7**

NOAEL 75 MG/CU M	INHALATION: INTERMITTENT	RAT MULTI-GENERATION	LIVER	INCREASED WEIGHT IN MALE PARENTS	2.5E+0 30		IRIS	010840

SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS MODIFIED TO DERIVE THE SUBCHRONIC INHALATION [RfC].
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

DICHLOROBUTENES

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT. 005415

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DICHLORODIFLUOROMETHANE 000075-71-8									
NOAEL 90 MG/KG/DAY	ORAL: DIET	DOG 90 DAYS		NONE OBSERVED		9E-1 100		IRIS	005498 005496

SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

DICHLOROETHANE, 1,1- 000075-34-3									
NOEL 115 MG/KG/DAY	INHALATION: INTERMITTENT	RAT 13 WEEKS		NONE OBSERVED		1E+0 100		1E-1 1000	005790

SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

DICHLOROETHANE, 1,2- 000107-06-2

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

DICHLOROETHYLENE, 1,1- 000075-35-4									
LOAEL 9 MG/KG/DAY	ORAL: DRINKING WATER	RAT 2 YEARS	LIVER	LESIONS		9E-3 1000		IRIS	005419

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
CHRONIC [RfD] COMMENT: UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

IRIS : INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER ATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DICHLOROETHYLENE, 1,2- (MIXED ISOMERS) 000540-59-0									
LOAEL 50 PPM	ORAL: DRINKING WATER	RAT 2 YEARS	LIVER	LESIONS		9E-3 1000		9E-3 1000	010509
SUBCHRONIC [RfD] COMMENT: VALUES DERIVED FOR 1,1-DICHLOROETHYLENE WERE ADOPTED FOR 1,2- DICHLOROETHYLENE MIXED ISOMERS BASED ON ANALOGY. CHRONIC [RfD] COMMENT: VALUES DERIVED FOR 1,1-DICHLOROETHYLENE (000075-35-4) WERE ADOPTED FOR 1,2-DICHLOROETHYLENE MIXED ISOMERS BASED ON ANALOGY.									
DICHLOROETHYLENE, 1,2-C- 000156-59-2									
NOAEL 32 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	BLOOD BLOOD	DECREASED HEMATOCRIT DECREASED HEMOGLOBIN		1E-1 300		1E-2 3000	005420
CHRONIC [RfD] COMMENT: UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.									
DICHLOROETHYLENE, 1,2-T- 000156-60-5									
NOAEL 17 MG/KG/DAY	ORAL: DRINKING WATER	MOUSE 90 DAYS	BLOOD	INCREASED ALKALINE PHOSPHATASE		2E-1 100		IRIS	005895
DICHLOROPHENOL, 2,3- 000576-24-9									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005315
DICHLOROPHENOL, 2,4- 000120-83-2									
NOEL 3 PPM	ORAL: DRINKING WATER	RAT 2 GENERATIONS	IMMUNE SYSTEM	ALTERED IMMUNE FUNCTION		3E-3 100		IRIS	005314
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfD] COMMENT: BASED ON A 2-GENERATION REPRODUCTION STUDY WITH EXPOSURES BEFORE AND DURING GESTATION, PARTURITION, AND WEANING OF PUPS.									
DICHLOROPHENOL, 2,5- 000583-78-8									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005316

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DICHLOROPHENOL, 2,6- 000087-65-0									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005317
DICHLOROPHENOL, 3,4- 000095-77-2									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005318
DICHLOROPHENOL, 3,5- 000591-35-5									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005319
DICHLOROPHENOXY ACETIC ACID, 2,4- 000094-75-7									
NOAEL 1 MG/KG/DAY	ORAL: DIET	RAT 91 DAYS	BLOOD	TOXICITY		1E-2		IRIS	010265
			LIVER	TOXICITY		100			
			KIDNEY	TOXICITY					
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
DICHLOROPHENOXY) BUTYRIC ACID, 4-(2,4- / (2,4-DB) 000094-82-6									
NOAEL 8 MG/KG/DAY	ORAL: DIET	DOG 90 DAYS	CARDIOVASCULAR SYSTEM	HEMORRHAGE		8E-2		IRIS	005890
			WHOLE BODY	INCREASED MORTALITY		100			
DICHLOROPROPANE, 1,1- 000078-99-9									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005897
DICHLOROPROPANE, 1,2- 000078-87-5									
NOAEL 69.3 MG/CU	INHALATION: INTERMITTENT	MRAT 13 WEEKS	NASAL MUCOSA	HYPERPLASIA	1.3E-2 100		IRIS		005898
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DICHLOROPROPANE, 1,3- 000142-28-9									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005899
DICHLOROPROPANE, 2,2- 000594-20-7									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005900
DICHLOROPROPENE, 1,3- / (TELONE II) 000542-75-6									
NOEL 3 MG/KG/DAY	ORAL: DIET	RAT 90 DAYS	ORGANS	INCREASED WEIGHT		3E-3 1000		IRIS	005901
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
NOAEL 5 PPM	INHALATION: INTERMITTENT	MOUSE 2 YEARS	NASAL MUCOSA	HYPERTROPHY	2E-2		IRIS		010351
			NASAL MUCOSA	HYPERPLASIA	30				
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC].									
DICHLORPROP 000120-36-5									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005896
DICYCLOPENTADIENE 000077-73-6									
NOEL 32 MG/KG/DAY	ORAL: DIET	RAT 3 GENERATIONS		NONE OBSERVED		3E-1 100		3E-2 1000	005425

SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
SUBCHRONIC [RfD] COMMENT: BASED ON A 3-GENERATION REPRODUCTION STUDY.
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
CHRONIC [RfD] COMMENT: BASED ON A 3-GENERATION REPRODUCTION STUDY.

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DIELDRIN		000060-57-1							
NOAEL 0.005 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	LIVER	LESIONS		5E-5 100		IRIS	005429
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
DIETHYL PHTHALATE		000084-66-2							
NOAEL 750 MG/KG/DAY	ORAL: DIET	RAT 16 WEEKS	WHOLE BODY	DECREASED GROWTH		8E+0		IRIS	005620
			ORGANS	DECREASED WEIGHT		100			
DIETHYL-P-NITROPHENYL PHOSPHATE		000311-45-5							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005922
DIETHYLANILINE, N,N-		000091-66-7							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005903
DIETHYLENE GLYCOL MONOBUTYL ETHER		000112-34-5							
NOAEL 18 PPM		RAT		NONE OBSERVED	2E-1 100		2E-2 1000		005482
CHRONIC [RfC] COMMENT: UNDER REVIEW.									
DIETHYLENE GLYCOL MONOETHYL ETHER		000111-90-0							
NOEL 200 MG/KG/DAY	ORAL: DRINKING WATER	RAT	KIDNEY	HISTOPATHOLOGY				2E+0 100	005478
CHRONIC [RfD] COMMENT: BASED ON A 3-GENERATION REPRODUCTION STUDY.									
NOEL 500 MG/KG/DAY	ORAL: DIET	RAT 90 DAYS	KIDNEY	IMPAIRED FUNCTION		5E+0			005476
			TESTIS	INCREASED WEIGHT		100			

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DIETHYLFORMAMIDE		**000617-84-5**							
NOEL 0.546 MG/DAY, 5 DAYS/WEEK	ORAL: GAVAGE	RAT 73 WEEKS		NONE OBSERVED		1.1E-2 100		1.1E-2 100	010437
DIETHYLHYDRAZINE, 1,2-		**001615-80-1**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT. ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									005921
DIMETHOATE		**000060-51-5**							
NOEL 0.05 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	BRAIN	DECREASED CHOLINESTERASE ACTIVITY		2E-4 300		IRIS	005923
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
DIMETHYLANILINE, N,N-		**000121-69-7**							
LOAEL 22.32 MG/KG/DAY	ORAL: GAVAGE	MOUSE 13 WEEKS	SPLEEN	EFFECTS		2E-2 1000		IRIS	005924
DIMETHYLFORMAMIDE, N,N-		**000068-12-2**							
NOAEL 96 MG/KG/DAY	ORAL: DIET	RAT 119 DAYS	LIVER	EFFECTS		1E+0 100		1E-1 1000	005925
LOAEL 22 MG/CU M	INHALATION: INTERMITTENT	HUMAN	LIVER GASTRO INTESTINAL SYSTEM	EFFECTS EFFECTS	3E-2 300		IRIS		010352
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RFC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RFC].									
DIMETHYLPHENOL, 2,3-		**000526-75-0**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005926

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2834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DIMETHYLPHENOL, 2,4-		**000105-67-9**								
NOAEL 50 MG/KG/DAY		MOUSE								
	ORAL: GAVAGE		90 DAYS	NERVOUS SYSTEM	EFFECTS		2E-1		IRIS	010266
				BLOOD	ALTERATIONS		300			
DIMETHYLPHENOL, 2,5-		**000095-87-4**								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.										005928
DIMETHYLPHENOL, 2,6-		**000576-26-1**								
NOEL 0.6 MG/KG/DAY		RAT								
	ORAL		8 MONTHS	WHOLE BODY	INCREASED WEIGHT		6E-3		IRIS	005431
				ORGANS, MAJOR	LESIONS		100			
DIMETHYLPHENOL, 3,4-		**000095-65-8**								
NOEL 1.4 MG/KG/DAY		RAT								
	ORAL		8 MONTHS	WHOLE BODY	DECREASED WEIGHT		1E-2		IRIS	005437
				ORGANS, MAJOR	LESIONS		100			
				CARDIOVASCULAR SYSTEM	ALTERED BLOOD PRESSURE					
DIMETHYLPHTHALATE		**000131-11-3**								
NOEL 1000 MG/KG/DAY		RAT								
	ORAL: DIET		2 YEARS	KIDNEY	EFFECTS		1E+1		1E+1	010267
							100		100	
								IRIS		010894
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (07/26/90) BY THE RfD/RfC WORK GROUP.										
DIMETHYLTEREPHTHALATE		**000120-61-6**								
LOAEL 125 MG/KG/DAY		RAT								
	ORAL: DIET		103 WEEKS	KIDNEY	INFLAMMATION		1E-1		IRIS	005930
							1000			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DIMETHYLUREA, N,N- 000598-94-7									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005931
DINITRO-O-CRESOL, 4,6- 000534-52-1									
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (02/11/93) BY THE RfD/RfC WORK GROUP.									010470
DINITRO-P-CRESOL, 2,6- 000609-93-8									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005934
DINITROBENZENE, 1,2- 000528-29-0									
NOAEL 0.4 MG/KG/DAY	ORAL: DRINKING WATER	RAT 16 WEEKS	SPLEEN	INCREASED WEIGHT		4E-3 100		4E-4 1000	010201
SUBCHRONIC [RfD] COMMENT: DERIVED BY ANALOGY TO 1,3-DINITROBENZENE. CHRONIC [RfD] COMMENT: DERIVED BY ANALOGY TO 1,3-DINITROBENZENE.									
DINITROBENZENE, 1,3- 000099-65-0									
NOAEL 0.4 MG/KG/DAY	ORAL: DRINKING WATER	RAT	SPLEEN	INCREASED WEIGHT		1E-3 100		IRIS	010471
DINITROBENZENE, 1,4- 000100-25-4									
NOAEL 0.4 MG/KG/DAY	ORAL: DRINKING WATER	RAT 16 WEEKS	SPLEEN	INCREASED WEIGHT		4E-3 100		4E-4 1000	010202
SUBCHRONIC [RfD] COMMENT: DERIVED BY ANALOGY TO 1,3-DINITROBENZENE. CHRONIC [RfD] COMMENT: DERIVED BY ANALOGY TO 1,3-DINITROBENZENE.									
DINITROPHENOL, 2,3- 000066-56-8									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005936

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

000036

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DINITROPHENOL, 2,4- 000051-28-5									
LOAEL 2 MG/KG/DAY	ORAL	HUMAN	EYE	CATARACT		2E-3 1000		IRIS	010438
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (06/13/91) BY THE RfD/RfC WORK GROUP.							IRIS		010895
DINITROPHENOL, 2,5- 000329-71-5									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005937
DINITROPHENOL, 2,6- 000573-56-8									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005938
DINITROPHENOL, 3,5- 000586-11-8									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005939
DINITROTOLUENE, 2,3- 000602-01-7									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005940
DINITROTOLUENE, 2,4- 000121-14-2									
NOAEL 0.2 MG/KG/DAY	ORAL: GELATIN CAPSULE	DOG UP TO 2 YEARS	CENTRAL NERVOUS SYSTEM	NEUROTOXICITY		2E-3 100		IRIS	005941
			ERYTHROCYTES	HEINZ BODIES					
			BILIARY TRACT	HYPERPLASIA					
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD IS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (12/20/90) BY THE RfD/RfC WORK GROUP.							IRIS		010896
DINITROTOLUENE, 2,5- 000619-15-8									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005942

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL / LEVEL	DOSE / ROUTE	SPECIES / EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DINITROTOLUENE, 2,6-		**000606-20-2**							
NOAEL 4	MG/KG/DAY	DOG							
	ORAL: DIET	13 WEEKS	WHOLE BODY	MORTALITY		1E-2		1E-3	005943
			CENTRAL NERVOUS SYSTEM	NEUROTOXICITY		300		3000	
			BLOOD	HEINZ BODIES					
			BLOOD	METHEMOGLOBINEMIA					
			BILE DUCT	HYPERPLASIA					
			KIDNEY	HISTOPATHOLOGY					

CHRONIC [RfD] COMMENT: UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

DINITROTOLUENE, 3,4- 000610-39-9

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT — 005944

DINOSEB 000088-85-7

LOAEL 1	MG/KG/DAY	RAT							
	ORAL: DIET	29 WEEKS	FETUS	DECREASED WEIGHT		1E-3		IRIS	005945
						1000			

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RFD WAS ADOPTED AS THE SUBCHRONIC ORAL [RFD].
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL RFD WAS DETERMINED FROM A 3-GENERATION REPRODUCTION STUDY.

DIPHENYLAMINE, N,N- 000122-39-4

NOEL	2.5 MG/KG/DAY	DOG							
	ORAL: DIET	2 YEARS	WHOLE BODY	DECREASED WEIGHT GAIN		2.5E-2		IRIS	005946
			LIVER	INCREASED WEIGHT		100			
			KIDNEY	INCREASED WEIGHT					

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

DIRECT LIGHTFAST BLUE 004399-55-7

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT — 005947

000038
7834

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DISULFOTON		**000298-04-4**							
LOAEL 0.04 MG/KG/DAY		RAT							
	ORAL: DIET	2 YEARS	EYE	DEGENERATION		4E-5		IRIS	010412
			BLOOD	CHOLINESTERASE INHIBITION		1000			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
ENDOSULFAN		**000115-29-7**							
NOAEL 15 PPM		RAT							
	ORAL: DIET	2 YEARS	WHOLE BODY	DECREASED WEIGHT GAIN		6E-3		6E-3	010926
			KIDNEY	GLOMERULONEPHROSIS		100		100	
			BLOOD VESSEL	ANEURYSMS					
NOAEL 10 PPM		DOG							
	ORAL: DIET	1 YEAR	WHOLE BODY	DECREASED WEIGHT GAIN					010938
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] IS ADOPTED AS THE SUBCHORNIC ORAL [RfD]. CHRONIC [RfD] COMMENT: WITHDRAWN FROM IRIS (12/01/92). UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE. BASED ON CO-CRITICAL RAT AND DOG STUDIES.									
ENDOTHALL		**000145-73-3**							
NOEL 2 MG/KG/DAY		DOG							
	ORAL: DIET	2 YEARS	STOMACH	INCREASED WEIGHT		2E-2		IRIS	005948
			SMALL INTESTINE	INCREASED WEIGHT		100			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
ENDRIN		**000072-20-8**							
NOEL 0.025 MG/KG/DAY		DOG							
	ORAL: DIET	2 YEARS	CENTRAL NERVOUS SYSTEM	CONVULSIONS		3E-4		IRIS	005445
			LIVER	LESIONS		100			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									

000039

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
EPICHLOROHYDRIN		**000106-89-8**							
LOAEL 37.8 MG/CU M	INHALATION: INTERMITTENT	RAT 136 WEEKS	KIDNEY	LESIONS		2E-3 1000		2E-3 1000	010440
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE-TO-ROUTE EXTRAPOLATION. THE CHRONIC ORAL [RfD] WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfD] COMMENT: WITHDRAWN FROM IRIS (04/01/92). GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
NOAEL 19 MG/CU M	INHALATION: INTERMITTENT	RAT 90 DAYS	NASAL EPITHELIUM	LESIONS	1E-2 100		IRIS		010492
EPTC		**000759-94-4**							
NOEL 2.5 MG/KG/DAY	ORAL: DIET	RAT 2 GENERATIONS	HEART	DEGENERATIVE CARDIOMYOPATHY		2.5E-2 100		IRIS	005959
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfD] COMMENT: THE CHRONIC ORAL RFD WAS DETERMINED FROM A 2-GENERATION REPRODUCTION STUDY.									
ETHOPROP		**013194-48-4**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005951
ETHOXYETHANOL ACETATE, 2-		**000111-15-9**							
SUBCHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) CHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									010507
ETHOXYETHANOL ACRYLATE, 2-		**000106-74-1**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005953
ETHOXYETHANOL DODECANOATE, 2-		**000106-13-8**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005956

000000

28334

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ETHOXYETHANOL PHOSPHATE, 2- 068554-00-7									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005955
ETHOXYETHANOL, 2- 000110-80-5									
LOAEL 357 MG/KG/DAY	ORAL: GAVAGE	RAT 103 WEEKS	WHOLE BODY	DECREASED WEIGHT				4E-1 1000	005470
NOEL 50 UL/KG/DAY	ORAL: GAVAGE	RAT 21 DAYS	FETUS	SKELETAL MALFORMATIONS		5E-1 100			005468
SUBCHRONIC [RfD] COMMENT: BASED ON A REPRODUCTION STUDY WITH EXPOSURES DURING DAYS 1-21 OF GESTATION.									
NOAEL 380 MG/CU M	INHALATION: INTERMITTENT	RABBIT 13 WEEKS	BLOOD	ALTERED HEMATOLOGY	2E+0 30		IRIS		010441
ETHOXYETHYL METHACRYLATE, 2- 002370-63-0									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005954
ETHYL ACETATE 000141-78-6									
NOEL 900 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	WHOLE BODY	INCREASED MORTALITY		9E+0		IRIS	005957
			WHOLE BODY	DECREASED WEIGHT		100			
ETHYL BENZENE 000100-41-4									
								IRIS	010867
							IRIS		010866
SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ETHYL CHLORIDE		000075-00-3							
NOAEL 1504 PPM	INHALATION: INTERMITTENT	MOUSE 10 DAYS	FETUS	DEVELOPMENTAL TOXICITY	1E+1 300		IRIS		010371
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC]. CHRONIC [RfC] COMMENT: BASED ON A DEVELOPMENTAL STUDY WITH EXPOSURES DURING DAYS 6-15 OF GESTATION.									
ETHYL ETHER		000060-29-7							
NOAEL 500 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	LIVER	EFFECTS		2E+0 300		IRIS	010396
ETHYL METHACRYLATE		000097-63-2							
NOEL 7.5 MG/KG/DAY	ORAL: DRINKING WATER	RAT 2 YEARS	KIDNEY	INCREASED RELATIVE WEIGHT		9E-2 100		9E-2 100	005961
CHRONIC [RfD] COMMENT: CALCULATED FROM METHYL METHACRYLATE DATA BY MULTIPLYING BY THE RATIO OF THE MOLECULAR WEIGHTS (114.5/100.13).									
ETHYL-O-XYLENE, 4-		000934-80-5							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									010472
ETHYLANILINE, N-		000103-69-5							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005958
ETHYLENE CYANOHYDRIN		000109-78-4							
NOEL 30 MG/KG/DAY	ORAL: DRINKING WATER	RAT 90 DAYS	HEART	DECREASED WEIGHT		3E-1 100		3E-1 100	005780
			BRAIN	DECREASED WEIGHT					

000032

28334

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ETHYLENE DIAMINE		**000107-15-3**							
NOAEL 22.6 MG/KG/DAY	ORAL: DIET	RAT 3 MONTHS	HEART	DECREASED WEIGHT		2E-1		2E-2	005796
			BLOOD	HEMATOLOGIC CHANGES		100		1000	
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (12/18/90) BY THE RfD/RfC WORK GROUP.							IRIS		010898
ETHYLENE GLYCOL		**000107-21-1**							
NOEL 200 MG/KG/DAY	ORAL: DIET	RAT						IRIS	005454
			FETUS	FETOTOXICITY		2E+0			005452
						100			
SUBCHRONIC [RfD] COMMENT: BASED ON A REPRODUCTION STUDY WITH EXPOSURES DURING DAYS 6-15 OF GESTATION.									
ETHYLENE GLYCOL MONOBUTYL ETHER		**000111-76-2**							
NOAEL 121 MG/CU M	INHALATION: INTERMITTENT	RAT 13 WEEKS	BLOOD	ALTERED HEMATOLOGY	2E-1		2E-2		010353
					100		1000		
CHRONIC [RfC] COMMENT: UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.									
ETHYLENE THIOUREA		**000096-45-7**							
LOAEL 0.25 MG/KG/DAY	ORAL: DIET	RAT 24 MONTHS	THYROID	HYPERPLASIA		8E-5		IRIS	010397
						3000			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (08/12/92) BY THE RfD/RfC WORK GROUP.									010899
ETHYLTOLUENE, M-		**000620-14-4**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005963

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ETHYLTOLUENE, O-		000611-14-3							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005962
ETHYLTOLUENE, P-		000622-96-8							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005964
FLUORANTHENE		000206-44-0							
NOAEL 125 MG/KG/DAY	ORAL: GAVAGE	MOUSE 90 DAYS	KIDNEY	NEPHROPATHY		4E-1		IRIS	010168
			LIVER	WEIGHT CHANGES		300			
			BLOOD	HEMATOLOGICAL CHANGES					
FLUORENE		000086-73-7							
NOAEL 125 MG/KG/DAY	ORAL: GAVAGE	MOUSE 13 WEEKS	ERYTHROCYTES	DECREASED COUNTS		4E-1		IRIS	010169
						300			
FLUORINE / (SOLUBLE FLUORIDE)		007782-41-4							
NOAEL 0.06 MG/KG/DAY	ORAL: DRINKING WATER	HUMAN	TOOTH	FLUOROSIS		6E-2		IRIS	005965
						1			
FLURIDONE		059756-60-4							
NOEL 200 PPM	ORAL: DIET	RAT 2 YEARS	KIDNEY	GLOMERULONEPHRITIS		8E-2		IRIS	005966
			TESTIS	ATROPHY		100			
			WHOLE BODY	DECREASED WEIGHT					
			ORGANS	DECREASED WEIGHT					

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

000094

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
FOLPET		**000133-07-3**							
NOEL	10 MG/KG/DAY ORAL: CAPSULE	DOG 1 YEAR	WHOLE BODY BLOOD	ALTERED WEIGHT GAIN ALTERED CHEMISTRY		1E-1 100		IRIS	005967
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
FORMALDEHYDE		**000050-00-0**							
NOAEL	15 MG/KG/DAY ORAL: WATER	RAT 2 YEARS	GASTRO-INTESTINAL TRACT	LESIONS		2E-1 100		IRIS	010398
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
FORMALDEHYDE CYANOHYDRIN		**000107-16-4**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005782
FORMIC ACID		**000064-18-6**							
NOAEL	200 MG/KG/DAY ORAL: WATER	RAT MULTI-GENERATION	WHOLE BODY	DECREASED GROWTH		2E+0 100		2E+0 100	010268
CHRONIC [RfD] COMMENT: BASED ON A MULTI-GENERATION STUDY. WITHDRAWN FROM IRIS (12/01/90). UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.									
FURAN		**000110-00-9**							
NOAEL	1.4 MG/KG/DAY ORAL: GAVAGE	MOUSE 13 WEEKS	LIVER	LESIONS		1E-2 100		IRIS	005462

000095

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL / LEVEL	DOSE / ROUTE	SPECIES / EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
FURFURAL		000098-01-1							
LOAEL 7.9 MG/KG/DAY	ORAL: GAVAGE	RAT 13 WEEKS	LIVER	HEPATOTOXICITY		3E-2 300		IRIS	005466
SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
GLYCIDALDEHYDE		000765-34-4							
NOAEL 29 MG/CU M	INHALATION: INTERMITTENT	RAT 12 WEEKS	WHOLE BODY KIDNEY	DECREASED WEIGHT EFFECTS	1E-2 300	4E-3 300	1E-3 3000	IRIS	005968
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5.									
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5.									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
HEPTACHLOR		000076-44-8							
NOEL 0.15 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	LIVER	INCREASED WEIGHT		5E-4 300		IRIS	005506
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY									
HEPTACHLOR EPOXIDE		001024-57-3							
LOAEL 0.0125 MG/KG/DAY	ORAL: DIET	DOG 60 WEEKS	LIVER	INCREASED RELATIVE WEIGHT		1.3E-5 1000		IRIS	010399
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
HEPTANE, N-		000142-82-5							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005969

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL / LEVEL	DOSE / ROUTE	SPECIES / EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
HEXABROMOBENZENE		000087-82-1								
NOAEL 2 MG/KG/DAY	ORAL: DIET	RAT	12 WEEKS	LIVER	INDUCED CARBOXYLESTERASE ACTIVITY		2E-2 100		IRIS	005970
HEXACHLOROBENZENE		000118-74-1								
								IRIS	IRIS	010868 010900

CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (11/15/90) BY THE RfD/RfC WORK GROUP.

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

HEXACHLOROBUTADIENE		000087-68-3								
LOAEL 0.5 MG/KG/DAY	ORAL: DIET	MOUSE	13 WEEKS	RENAL TUBULES	REGENERATION				2E-4 1000	010927

CHRONIC [RfD] COMMENT: WITHDRAWN FROM IRIS (05/01/93). UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

HEXACHLOROCYCLOHEXANE, DELTA- 000319-86-8

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT. ALSO SEE HEAST TABLE 3: CARCINOGENICITY. 010495

HEXACHLOROCYCLOHEXANE, EPSILON- 006108-10-7

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT. ALSO SEE HEAST TABLE 3: CARCINOGENICITY. 010496

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
HEXACHLOROCYCLOHEXANE, GAMMA- 000058-89-9									
Lindane NOAEL 0.33 MG/KG/DAY	ORAL: DIET	RAT 12 WEEKS	LIVER	TOXICITY		3E-3		IRIS	005537
			KIDNEY	TOXICITY		100			
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (05/27/92) BY THE RfD/RfC WORK GROUP.									010903
HEXACHLOROCYCLOPENTADIENE 000077-47-4									
NOAEL 7.1 MG/KG/DAY	ORAL	RAT 13 WEEKS	FORESTOMACH	LESIONS		7E-2		IRIS	005299
						100			
NOAEL 0.15 PPM	INHALATION: INTERMITTENT	RAT 13 WEEKS	NASAL CAVITY	SQUAMOUS METAPLASIA	7E-4		7E-5		010445
					100		1000		
HEXACHLOROETHANE 000067-72-1									
NOAEL 1 MG/KG/DAY	ORAL: DIET	RAT 16 WEEKS	KIDNEY	DEGENERATION		1E-2		IRIS	005518
						100			
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (11/05/92), BY THE RfD/RfC WORK GROUP.									010904
HEXACHLOROPHENE 000070-30-4									
LOAEL 0.75 MG/KG/DAY	ORAL: DIET	DOG 13 WEEKS	NERVOUS SYSTEM	EFFECTS		3E-3		IRIS	005972
						300			
HEXAMETHYLENE DIAMINE 000124-09-4									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005973

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
HEXANE, N-		**000110-54-3**							
LOAEL 570 MG/KG/DAY	ORAL	RAT	NERVOUS SYSTEM	NEUROPATHY		6E-1		6E-2	005974
			TESTIS	ATROPHY		1000		10000	
LOAEL 73 MG/CU M	INHALATION: INTERMITTENT	HUMAN	NERVOUS SYSTEM	NEUROTOXICITY	2E-1 300		IRIS		010273
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC].									
HEXANONE, 2-		**000591-78-6**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005976
HYDROGEN SULFIDE		**007783-06-4**							
NOAEL 3.1 MG/KG/DAY	ORAL: FOOD	PIG 105 DAYS	GASTRO-INTESTINAL SYSTEM	DISTURBANCE		3E-2 100		IRIS	010269
NOAEL 42 MG/CU M	INHALATION: INTERMITTENT	MOUSE 13 WEEKS	NASAL MUCOSA	INFLAMMATION	9E-3 100		IRIS		010354
HYDROQUINONE		**000123-31-9**							
NOAEL 4.29 MG/KG/DAY	ORAL	HUMAN 3-5 MONTHS	BLOOD	HEMATOLOGICAL EFFECTS		4E-1 10		4E-2 100	005526
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (10/01/90) BY THE RfD/RfC WORK GROUP.							IRIS		010905
IRON		**007439-89-6**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005527

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ISOBUTYL ALCOHOL		**000078-83-1**							
NOEL	316 MG/KG/DAY	RAT							
	ORAL: GAVAGE	13 WEEKS	NERVOUS SYSTEM	HYPOACTIVITY		3E+0		IRIS	005977
			NERVOUS SYSTEM	ATAXIA		100			
ISOPHORONE		**000078-59-1**							
NOEL	150 MG/KG/DAY	DOG							
	ORAL: CAPSULE	90 DAYS	KIDNEY	LESIONS		2E+0		IRIS	005910
						100			
	GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.								
	CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (11/15/90) BY THE RfD/RfC WORK GROUP.						IRIS		010906
ISOPROPALIN		**033820-53-0**							
NOEL	15 MG/KG/DAY	RAT							
	ORAL: DIET	90 DAYS	BLOOD	HEMATOLIGICAL EFFECTS		1.5E-1		IRIS	005978
			ORGANS, UNSPECIFIED	ALTERED WEIGHTS		100			
LACTONITRILE		**000078-97-7**							
	GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT								005783
LEAD		**007439-92-1**							
	CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS. CHRONIC [RfD] COMMENT: REFER TO IRIS GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.								010447
LEAD ALKYLS									
	CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS. CHRONIC [RfD] COMMENT: REFER TO IRIS GENERAL COMMENT: DIMETHYLETHYL LEAD; METHYLTRIETHYL LEAD; TETRABUTYL LEAD; TETRAETHYL LEAD; TETRAMETHYL LEAD; TETRAPROPYL LEAD; TRIETHYL LEAD; TRIMETHYL LEAD; TRIMETHYLETHYL LEAD; TRIPROPYL LEAD								010448

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL / LEVEL	DOSE / ROUTE	SPECIES / EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) / UF	Subchronic [RfD] (mg/kg/day) / UF	Chronic [RfC] (mg/cu m) / UF	Chronic [RfD] (mg/kg/day) / UF	REFERENCE
LINURON		000330-55-2							
LOAEL 0.625 MG/KG/DAY	ORAL: DIET	DOG / 2 YEARS	BLOOD	HEMATOLOGICAL EFFECTS		2E-3 / 300		IRIS	005990
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
MALATHION		000121-75-5							
NOEL 0.23 MG/KG/DAY	ORAL: CAPSULE	HUMAN / 47 DAYS	BLOOD	HEMATOLOGICAL EFFECTS		2E-2 / 10		IRIS	005991
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CHRONIC [RfC] COMMENT: UNDER REVIEW.									
MALEIC ANHYDRIDE		000108-31-6							
NOAEL 10 MG/KG/DAY	ORAL: DIET	RAT / 2 YEARS	KIDNEY	LESIONS		1E-1 / 100		IRIS	005992
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
MALEIC HYDRAZIDE		000123-33-1							
LOAEL 500 MG/KG/DAY	ORAL: DIET	RAT / 28 MONTHS	KIDNEY	ALTERED FUNCTION		5E-1 / 1000		IRIS	005993
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
MALONONITRILE		000109-77-3							
LOAEL 0.21 MG/KG/DAY	ORAL: GAVAGE	RAT / 120 DAYS	LIVER SPLEEN	EFFECTS EFFECTS		2E-4 / 1000		2E-5 / 10000	005994

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
MANCOZEB		**008018-01-7**							
NOEL	2.9 MG/KG/DAY ORAL: DIET	RAT 90 WEEKS	THYROID	GOITROGENIC EFFECTS		3E-2 100		3E-2 100	005995
MANEB		**012427-38-2**							
NOEL	5 MG/KG/DAY ORAL: DIET	MONKEY 6 MONTHS	THYROID	INCREASED WEIGHT		5E-2 100		IRIS	005996
MANGANESE		**007439-96-5**							
NOAEL	0.005 MG/KG/DAY ORAL: DRINKING WATER	HUMAN CHRONIC	CENTRAL NERVOUS SYSTEM	EFFECTS		5E-3 1		IRIS	010850
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL WATER RfD WAS ADOPTED AS THE SUBCHRONIC ORAL WATER [RfD]. SEE IRIS FOR SPECIFIC DIETARY INFORMATION.									
NOAEL	0.14 MG/KG/DAY ORAL: DIET	HUMAN CHRONIC	CENTRAL NERVOUS SYSTEM	EFFECTS		1.4E-1 1		IRIS	010851
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL FOOD RfD WAS ADOPTED AS THE SUBCHRONIC ORAL FOOD [RfD]. SEE IRIS FOR SPECIFIC DIETARY INFORMATION.									
SUBCHRONIC [RfC] COMMENT: A SUBCHRONIC [RfC] HAS NOT BEEN DERIVED FOR MANGANESE.							IRIS		010959
MEPHOSFOLAN		**000950-10-7**							
NOEL	0.09 MG/KG/DAY ORAL: DIET	RAT 17 WEEKS	LIVER	ALTERED WEIGHT		9E-4 100		9E-5 1000	005997
			KIDNEY	ALTERED WEIGHT					
			BLOOD	DECREASED CHOLINESTERASE ACTIVITY					
			ERYTHROCYTES	DECREASED CHOLINESTERASE ACTIVITY					
			BRAIN	DECREASED CHOLINESTERASE ACTIVITY					

000102

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
MERCURY, ELEMENTAL VAPOR 007439-97-6										
SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.										
MERCURY, INORGANIC 007439-97-6										
	ORAL: PARENTERAL	RAT		KIDNEY	EFFECTS		3E-4 1000		3E-4 1000	005800
CHRONIC [RfD] COMMENT: UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.										
NOAEL 0.009 MG/CU M	INHALATION:	HUMAN		NERVOUS SYSTEM	NEUROTOXICITY	3E-4 30		3E-4 30		010270
SUBCHRONIC [RfC] COMMENT: THIS VALUE IS SPECIFICALLY FOR ELEMENTAL MERCURY. CHRONIC [RfC] COMMENT: THIS VALUE IS SPECIFICALLY FOR ELEMENTAL MERCURY. UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.										
MERPHOS 000150-50-5										
NOEL 0.1 MG/KG/DAY	ORAL: CAPSULE	MEN	3 MONTHS	NERVOUS SYSTEM NERVOUS SYSTEM WHOLE BODY	ATAXIA DELAYED NEUROTOXICITY DECREASED WEIGHT		3E-4 300		IRIS	005998
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (06/25/92) BY THE RfD/RfC WORK GROUP. SUBCHRONIC [RfD] CPMMENT: THE CHRONIC ORAL RfD WAS MODIFIED TO ESTIMATE THE SUBCHRONIC ORAL [RfD].										010907
MERPHOS OXIDE 000078-48-8										
NOEL 0.1 MG/KG/DAY	ORAL: CAPSULE	MEN	3 MONTHS	NERVOUS SYSTEM NERVOUS SYSTEM WHOLE BODY	ATAXIA DELAYED NEUROTOXICITY DECREASED WEIGHT		3E-4 300		IRIS	005999
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (06/25/92) BY THE RfD/RfC WORK GROUP. SUBCHRONIC [RfD] CPMMENT: THE CHRONIC ORAL RfD WAS MODIFIED TO ESTIMATE THE SUBCHRONIC ORAL [RfD].										010908

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
METHACRYLONITRILE		**000126-98-7**							
NOAEL 3.2 PPM	INHALATION: INTERMITTENT	DOG 90 DAYS	LIVER	INCREASED SGOT		1E-3		IRIS	005812
			LIVER	INCREASED SGPT		300			
			CENTRAL NERVOUS SYSTEM	LOSS OF HINDLIMB MOTOR CONTROL					
			BRAIN	LESIONS					

SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.

METHANOL		**000067-56-1**							
NOEL 500 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	BLOOD	INCREASED ALKALINE PHOSPHATASE		5E+0		IRIS	010271
			BLOOD	INCREASED SGPT		100			
			BRAIN	DECREASED WEIGHT					
METHOMYL		**016752-77-5**							
NOEL 2.5 MG/KG/DAY	ORAL: DIET	DOG 24 MONTHS	KIDNEY	LESIONS		2.5E-2 100		IRIS	005802

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

METHOXYCHLOR		**000072-43-5**							
NOEL 5.01 MG/KG/DAY	ORAL: GAVAGE	RABBIT 13 DAYS	REPRODUCTION	LOSS OF LITTERS		5E-3 1000		IRIS	010357

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (11/07/91) BY THE RfD/RfC WORK GROUP. IRIS 010909

000430

78834

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE

METHOXYETHANOL ACETATE, 2- 000110-49-6

010497

CHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
SUBCHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

METHOXYETHANOL, 2- 000109-86-4

NOAEL 93 MG/CU M	RABBIT							
INHALATION:	13 WEEKS	TESTICLE	EFFECTS		2E-1		IRIS	010372
INTERMITTENT					100			

SUBCHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).
CHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

METHYL ACETATE 000079-20-9

NOEL 1156 MG/KG/DAY	RAT							
ORAL: GAVAGE	90 DAYS	LIVER	INCREASED ALKALINE PHOSPHATASE		1E+1		1E+0	010002
		LIVER	INCREASED SGPT		100		1000	

CHRONIC [RfD] COMMENT: CALCULATED FROM DATA OBTAINED WITH METHANOL BY MULTIPLYING BY THE MOLECULAR WEIGHT RATIO (74.08/32.04).

METHYL ACRYLATE 000096-33-3

010498

CHRONIC [RfD] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)
GENERAL COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

METHYL CHLOROCARBONATE 000079-22-1

CHRONIC [RfD] COMMENT: WITHDRAWN FROM IRIS (05/01/89).
GENERAL COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

000105

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
METHYL ETHYL KETONE 000078-93-3									
NOAEL 1711 MG/KG/DAY	ORAL: DRINKING WATER	RAT MULTI-GENERATION	FETUS	DECREASED BIRTH WEIGHT		2E+0 1000		IRIS	010853
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS MODIFIED TO ESTIMATE THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: MULTI-GENERATION DEVELOPMENTAL STUDY PERFORMED WHT THE SURROGATE 2-BUTANOL, A METABOLITE OF METHYL ETHYL KETONE.									
NOAEL 1010 PPM	INHALATION: INTERMITTENT	MOUSE 10 DAYS	FETUS	DECREASED BIRTH WEIGHT	1E+0 3000		IRIS		010845
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC].									
METHYL ETHYL KETONE PEROXIDE 001338-23-4									
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] IS CONSIDERED NOT VERIFIABLE (07/22/93) BY THE RfD/RfC WORK GROUP.									010948
METHYL ISOBUTYL KETONE 000108-10-1									
NOAEL 250 MG/(KG-DAY)	ORAL: GAVAGE	RAT 13 WEEKS	WHOLE BODY	LETHARGY	8E-1 300		8E-2 3000		010949
			LIVER	INCREASED RELATIVE WEIGHT IN FEMALES					
			LIVER	INCREASED ABSOLUTE WEIGHT IN FEMALES					
			KIDNEY	INCREASED RELATIVE WEIGHT IN FEMALES					
			KIDNEY	INCREASED ABSOLUTE WEIGHT IN FEMALES					
			KIDNEY	INCREASED URINARY PROTEIN LEVELS IN FEMALES					
SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) CHRONIC [RfD] COMMENT: WITHDRAWN FROM IRIS (03/01/91), UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.									
METHYL ISOCYANATE 000624-83-9									
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (12/18/90) BY THE RfD/RfC WORK GROUP.							IRIS		010013

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

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7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
METHYL MERCURY 022967-92-6									
LOAEL 0.003 MG HG/KG/DAY	ORAL	HUMAN	CENTRAL NERVOUS SYSTEM	EFFECTS		3E-4 10		IRIS	005547
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CHRONIC [RfD] COMMENT: THE ADMINISTERED DOSE WAS CALCULATED FROM 200 NG HG/ML OF BLOOD.									
METHYL METHACRYLATE 000080-62-6									
NOEL 7.5 MG/KG/DAY	ORAL: WATER	RAT 24 MONTHS	KIDNEY	INCREASED RELATIVE WEIGHT		8E-2 100		8E-2 100	010014
METHYL PARATHION 000298-00-0									
NOAEL 2.5 PPM	ORAL: DIET	RAT 90 DAYS	ERYTHROCYTES	CHOLINESTERASE INHIBITION		2E-3 100		IRIS	010015 010846
METHYL STYRENE (MIXED ISOMERS) 025013-15-4									
CHRONIC [RfD] COMMENT: UNDER REVIEW. ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									010500
GENERAL COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
METHYL STYRENE, ALPHA 000098-83-9									
GENERAL COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									010499

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
METHYL-4-CHLOROPHENOXY) BUTYRIC ACID, 4-(2-					000094-81-5				
NOEL	12 MG/KG/DAY	RAT							
	ORAL: DIET	13 WEEKS	LIVER	EFFECTS		1E-1		IRIS	010008
			KIDNEY	EFFECTS		100			
		DOG							
	ORAL: DIET	13 WEEKS	LIVER	EFFECTS					
			KIDNEY	EFFECTS					
METHYL-4-CHLOROPHENOXY) PROPIONIC ACID, 2-(2-					000093-65-2				
NOEL	3 MG/KG/DAY	RAT							
	ORAL: DIET	90 DAYS	KIDNEY	ALTERED WEIGHT		1E-2		IRIS	010009
						300			
METHYL-4-CHLOROPHENOXYACETIC ACID, 2-					000094-74-6				
NOEL	0.15 MG/KG/DAY	DOG							
	ORAL: DIET	52 WEEKS	KIDNEY	EFFECTS		5E-4		IRIS	010007
			LIVER	EFFECTS		300			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
METHYLCYCLOHEXANE					000108-87-2				
NOAEL	287 MG/CU M	RAT							
	INHALATION:	1 YEAR	KIDNEY	MINERALIZATION	3E+0		3E+0		010431
	INTERMITTENT		KIDNEY	PAPILLARY HYPERPLASIA	100		100		
METHYLENE BROMIDE					000074-95-3				
GENERAL COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									010501

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
METHYLENE CHLORIDE / (DICHLOROMETHANE) 000075-09-2										
NOAEL 5.85 MG/KG/DAY	ORAL: DRINKING WATER	RAT	24 MONTHS	LIVER	TOXICITY		6E-2 100		IRIS	005553
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
NOAEL 694.8 MG/CU M	INHALATION: INTERMITTENT	RAT	2 YEARS	LIVER	TOXICITY	3E+0 100		3E+0 100		005552
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.										
METHYLENE-BIS(2-CHLOROANILINE), 4,4'- 000101-14-4										
LOAEL 7.3 MG/KG/DAY	ORAL	DOG	9 YEARS	LIVER BLADDER	EFFECTS EFFECTS		7E-4 10000		7E-4 10000	010413
										010933
CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE 02/10/93) BY THE RfD/RfC WORK GROUP.										
METHYLENEDIPHENYL ISOCYANATE, 4,4- / (DIPEHNYLMETHANE DIISOCYANATE) 000101-68-8										
NOAEL 0.2 MG/CU M	INHALATION: INTERMITTENT	RAT	24 MONTHS	NASAL CAVITY	LESIONS	2E-5 300		2E-5 300		010449
CHRONIC [RfC] COMMENT: UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.										
METOLACHLOR 051218-45-2										
NOAEL 300 PPM	ORAL: DIET	RAT	2 YEARS	WHOLE BODY	DECREASED WEIGHT GAIN		1.5E-1 100		1.5E-1 100	010950
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] WAS ADOPTED AS THE SUCHRONIC ORAL [RfD].										

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
METRIBUZIN		**021087-64-9**							
NOAEL 100 PPM	ORAL: DIET	DOG 2 YEARS	LIVER	EFFECTS		2.5E-2		IRIS	010928
			KIDNEY	EFFECTS		100			
			WHOLE BODY	MORTALITY					
			WHOLE BODY	DECREASED WEIGHT					
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
MIREX		**002385-85-5**							
NOAEL 0.07 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	LIVER	CYTOMEGALY		2E-4		IRIS	010841
			LIVER	FATTY METAMORPHOSIS		300			
			LIVER	ANGIECTASIS					
			THYROID	CYSTIC FOLLICLES					
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
MOLINATE		**002212-67-1**							
NOEL 0.2 MG/KG/DAY	ORAL: GAVAGE	RAT	REPRODUCTIVE SYSTEM	TOXICITY		2E-3		IRIS	010017
						100			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfD] COMMENT: BASED ON A REPRODUCTION STUDY.									
MOLYBDENUM		**007439-98-7**							
LOAEL 0.14 MG/KG/DAY	ORAL: WATER, DIET	HUMAN	URINE	INCREASED URIC ACID		5E-3		IRIS	010489
			JOINTS	PAIN, SWELLING		30			
			BLOOD	DECREASED COPPER LEVELS					
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
MONOCHLORAMINE		**010599-90-3**								
NOAEL 9.5 MG/KG/DAY	ORAL: DRINKING WATER	RAT	2 YEARS	WHOLE BODY	WEIGHT CHANGES		1E-1		IRIS	010517
				LIVER	WEIGHT CHANGES		100			
				KIDNEY	WEIGHT CHANGES					
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
NAPHTHALENE		**000091-20-3**								
CHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.										
NAPHTHOQUINONE, 1,4-		**000130-15-4**								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										010020
NICKEL (METALLIC)		**007440-02-0**								
NOAEL 100 PPM	ORAL: DIET	RAT	2 YEARS	WHOLE BODY	DECREASED WEIGHT		2E-2		IRIS	005579
				ORGANS, MAJOR	DECREASED WEIGHT		300			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
NICKEL CYANIDE		**000557-19-7**								
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] IS CONSIDERED NOT VERIFIABLE (07/20/93) BY THE RfD/RfC WORK GROUP.										010953
NICOTINONITRILE		**000100-54-9**								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										005584
NITRIC OXIDE		**010102-43-9**								
CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS.										010451

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
NITRITE		**014797-65-0**							
NOEL	10 PPM	HUMAN							
	ORAL: WATER		BLOOD	METHEMOGLOBINEMIA		1E-1 10		IRIS	010021

SUBCHRONIC [RfD] COMMENT: THIS VALUE IS BASED ON NITRATE (NITROGEN) DATA FROM THE MOST SENSITIVE HUMAN POPULATION (INFANTS). THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
CHRONIC [RfD] COMMENT: THIS VALUE IS BASED ON NITRATE (NITROGEN) DATA FROM THE MOST SENSITIVE HUMAN POPULATION (INFANTS).

NITROANILINE, 2-		**000088-74-4**							
									010936

CHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RFD] IS CONSIDERED NOT VERIFIABLE (06/23/92) BY THE RFD/RFC WORK GROUP.

LOAEL	9.8 MG/CU M	RAT							
	INHALATION: INTERMITTENT	4 WEEKS	BLOOD	HEMATOLOGICAL EFFECTS	2E-3 1000		2E-4 10000		010935
NITROANILINE, M-		**000099-09-2**							

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT 010400

NITROANILINE, P- **000100-01-6**

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT 010024

000112

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
NITROBENZENE		**000098-95-3**							
LOAEL 25 MG/CU M	INHALATION: INTERMITTENT	MOUSE 90 DAYS	BLOOD	HEMATOLOGICAL EFFECTS		5E-3		IRIS	005589
			ADRENAL	LESIONS		1000			
			KIDNEY	LESIONS					
			LIVER	LESIONS					
	INHALATION: INTERMITTENT	RAT 90 DAYS	BLOOD	HEMATOLOGICAL EFFECTS					
			ADRENAL	LESIONS					
			KIDNEY	LESIONS					
			LIVER	LESIONS					

SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS SUBCHRONIC AND CHRONICTOXICITY (OTHER THAN CARCINOGENICITY)
CHRONIC [RfD] COMMENT: THE ORAL RFD, WHILE STILL AVAILABLE ON IRIS, IS BEING RECONSIDERED BY THE RFD WORKGROUP. BASED ON ROUTE TO ROUTE EXTRAPOLATION.

NITROFURANTOIN		**000067-20-9**							
NOAEL 300 PPM	ORAL: DIET	MOUSE 13 WEEKS	TESTIS	DAMAGE		7E-1		7E-2	005593
						100		1000	
NITROGEN DIOXIDE		**010102-44-0**							
NOEL 10 PPM	ORAL: WATER	HUMAN	BLOOD	METHEMOGLOBINEMIA		1E+0		IRIS	010402
						1			

SUBCHRONIC [RfD] COMMENT: THIS VALUE IS BASED ON NITRATE (NITROGEN) DATA FROM THE MOST SENSITIVE HUMAN POPULATION (INFANTS). THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].
CHRONIC [RfD] COMMENT: THIS VALUE IS BASED ON NITRATE (NITROGEN) DATA FROM THE MOST SENSITIVE HUMAN POPULATION (INFANTS).

010912

CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS.

NITROGEN OXIDES

CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS. 010170

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
NITROMETHANE		000075-52-5							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010026
NITROPHENOLS									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005594
NITROPROPANE, 2-		000079-46-9							
LOAEL 78 MG/CU M	INHALATION: INTERMITTENT	RAT 22 MONTHS	LIVER	LESIONS	2E-2 1000		IRIS		010374
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC].									
NITROSODIPHENYLAMINE, P-		000156-10-5							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010027
NITROTOLUENE, M-		000099-08-1							
LOAEL 200 MG/KG/DAY	ORAL: GAVAGE	RAT 6 MONTHS	SPLEEN	LESIONS		1E-1 1000		1E-2 10000	010029
SUBCHRONIC [RfD] COMMENT: BASED ON DATA OBTAINED WITH O-NITROTOLUENE. CHRONIC [RfD] COMMENT: BASED ON DATA OBTAINED WITH O-NITROTOLUENE.									
NITROTOLUENE, O-		000088-72-2							
LOAEL 200 MG/KG/DAY	ORAL: GAVAGE	RAT 6 MONTHS	SPLEEN	LESIONS		1E-1 1000		1E-2 10000	010028

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
NITROTOLUENE, P- 000099-99-0									
LOAEL 200 MG/KG/DAY	ORAL: GAVAGE	RAT 6 MONTHS	SPLEEN	LESIONS		1E-1 1000		1E-2 10000	010030
SUBCHRONIC [RfD] COMMENT: BASED ON DATA OBTAINED WITH O-NITROTOLUENE. CHRONIC [RfD] COMMENT: BASED ON DATA OBTAINED WITH O-NITROTOLUENE.									
OCTABROMODIPHENYL ETHER 032536-52-0									
NOAEL 2.5 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	LIVER	HISTOLOGICAL CHANGES		3E-2 100		IRIS	010032
OCTAMETHYLPYROPHOSPHORAMIDE 000152-16-9									
NOAEL 0.02 MG/KG/DAY	ORAL	HUMAN AT LEAST 30 DAYS	BLOOD	DECREASED CHOLINESTERASE ACTIVITY		2E-3 10		2E-3 10	010031
OSMIUM TETROXIDE 020816-12-0									010954
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] IS CONSIDERED NOT VERIFIABLE (07/22/93) BY THE RfD/RfC WORK GROUP.									
OZONE 010028-15-6									
CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS.									010171
PARALDEHYDE 000123-63-7									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									010033
PARATHION 000056-38-2									
NOAEL 0.064 MG/KG/DAY	ORAL	HUMAN	CHOLINESTERASE	DECREASED CHOLINESTERASE ACTIVITY		6E-3 10		6E-3 10	005598
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
PARTICULATE MATTER									
CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS.									010034
PEBULATE		001114-71-2							
NOEL 5 MG/KG/DAY	ORAL: DIET	RAT SUBCHRONIC	BLOOD	INCREASED CLOTTING TIME		5E-2 100		5E-2 100	010036
PENDIMETHALIN		040487-42-1							
NOEL 12.5 MG/KG/DAY	ORAL: CAPSULE	DOG 2 YEARS	LIVER	EFFECTS		4E-2 300		IRIS	010037
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
PENTABROMODIPHENYL ETHER		032534-81-9							
NOAEL 1.8 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	LIVER	ALTERED ENZYME ACTIVITIES		2E-2 100		IRIS	010038
PENTACHLOROBENZENE		000608-93-5							
LOAEL 8.3 MG/KG/DAY	ORAL: DIET	RAT 100 DAYS	LIVER KIDNEY	TOXICITY TOXICITY		8E-3 1000		IRIS	010039
PENTACHLOROCYCLOPENTADIENE		025329-35-5							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									005302
PENTACHLORONITROBENZENE		000082-68-8							
NOEL 0.75 MG/KG/DAY	ORAL: DIET	DOG 2 YEARS	LIVER	TOXICITY		3E-3 300		IRIS	010040
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
PENTACHLOROPHENOL										
NOEL	3 MG/KG/DAY ORAL: GAVAGE	RAT	62 DAYS	FETUS	FETOTOXICITY		3E-2 100		IRIS	005600
SUBCHRONIC [RfD] COMMENT: BASED ON A TERATOLOGY STUDY WITH EXPOSURE 62 DAYS PRIOR TO MATING AND THROUGHOUT GESTATION AND LACTATION. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.										
PENTACHLOROPROPENE, 1,1,2,3,3,-										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										010041
PENTANE, N-										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										005603
PHENANTHRENE										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										005604
PHENOL										
NOAEL	60 MG/KG/DAY ORAL: GAVAGE	RAT		FETUS	DECREASED WEIGHT		6E-1 100		IRIS	005824
SUBCHRONIC [RfD] COMMENT: BASED ON A DEVELOPMENTAL STUDY WITH EXPOSURES DURING DAYS 6-15 OF GESTATION. THE ORAL CHRONIC RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfD] COMMENT: BASED ON A DEVELOPMENTAL STUDY WITH EXPOSURES DURING DAYS 6-15 OF GESTATION.										
								IRIS		010913
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (02/22/90) BY THE RfD/RfC WORK GROUP.										
PHENYLENEDIAMINE, M-										
NOEL	6 MG/KG/DAY ORAL	RAT	90 DAYS	LIVER	LESIONS		6E-2 100		IRIS	010044

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
PHENYLENEDIAMINE, O- 000095-54-5										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT. ALSO SEE HEAST TABLE 3: CARCINOGENICITY.										010042
PHENYLENEDIAMINE, P- 000106-50-3										
NOAEL 18.7 MG/KG/DAY	ORAL: DIET	RAT	2 YEARS	WHOLE BODY	EFFECTS				1.9E-1 100	010043
PHENYLMERCURIC ACETATE 000062-38-4										
NOAEL 0.0084 MG/KG/DAY	ORAL: DIET	RAT	2 YEARS	KIDNEY	DAMAGE		8E-5 100		IRIS	010277
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CALCULATED BY ANALOGY TO MERCURY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.										
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO MERCURY BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.										
PHORATE 000298-02-2										
NOAEL 0.033 MG/KG/DAY	ORAL: DIET	RAT	13 WEEKS	CHOLINESTERASE	INHIBITION		2E-4 200		2E-4 200	010403
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
PHOSGENE 000075-44-5										
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (10/01/90) BY THE RfD/RfC WORK GROUP.								IRIS		010045

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7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
PHOSPHINE		**007803-51-2**							
NOEL	0.026 MG/KG/DAY ORAL: DIET	RAT 2 YEARS				3E-4 100		IRIS	010174
	SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].								
NOAEL	1.4 MG/CU M INHALATION: INTERMITTENT	RAT 24 WKS	KIDNEY	RENAL EFFECTS	3E-4 1000		3E-5 10000		010173
PHOSPHORUS, WHITE		**007723-14-0**							
								IRIS	010452
	GENERAL COMMENT: FORMERLY LISTED AS PHOSPHORUS (INORGANIC COMPOUNDS).								
PHOTOCHEMICAL OXIDANTS									
	GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.								010172
PHTHALIC ACID, M-		**000121-91-5**							
	GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT								010047
PHTHALIC ACID, O-		**000088-99-3**							
	GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT								010046
PHTHALIC ACID, P-		**000100-21-0**							
NOEL	142 MG/KG/DAY ORAL: DIET	RAT 2 YEARS	BLADDER	HYPERPLASIA		1E+0 100		1E+0 100	010048

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
PHTHALIC ANHYDRIDE		**000085-44-9**							
LOAEL 1562 MG/KG/DAY	ORAL: DIET	MOUSE 104 WEEKS	LUNG	HISTOPATHOLOGY		2E+0		IRIS	010049
			KIDNEY	HISTOPATHOLOGY		1000			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
LOAEL 0.1 MG/CU M	INHALATION: INTERMITTENT	HUMAN 12 YEARS	NOSE	RHINITIS	1.2E-1		1.2E-1		010847
			LUNGS	BRONCHITIS	300		300		
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC].									
POLYBROMINATED BIPHENYLS									
LOAEL 0.07 MG/KG/DAY	ORAL: GAVAGE	RAT 25 WEEKS	LIVER	INCREASED WEIGHT		7E-5		7E-6	010050
			LIVER	LESIONS		1000		10000	
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
POTASSIUM CYANIDE		**000151-50-8**							
NOAEL 27 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY	DECREASED WEIGHT		5E-2		IRIS	010278
			THYROID	EFFECTS		500			
			NERVE	MYELIN DEGENERATION					
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. THE ORAL CHRONIC RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									

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7834

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
POTASSIUM SILVER CYANIDE 000506-61-6									
NOAEL 82.7 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY THYROID NERVE	DECREASED WEIGHT EFFECTS MYELIN DEGENERATION		2E-1 500		IRIS	010279
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. THE ORAL CHRONIC RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
PROFLURALIN 026399-36-0									
NOEL 3 MG/KG/DAY	ORAL: DIET	RAT SUBCHRONIC		NONE OBSERVED		6E-3 500		6E-3 500	010051
PRONAMIDE 023950-58-5									
NOEL 7.5 MG/KG/DAY	ORAL: DIET	DOG 2 YEARS		NONE OBSERVED		7.5E-2 100		IRIS	010280
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
PROPACHLOR 001918-16-7									
NOEL 13.3 MG/KG/DAY	ORAL: DIET	RAT 90 DAYS	WHOLE BODY	DECREASED WEIGHT GAIN		1.3E-1 100		IRIS	010175
PROPAZINE 000139-40-2									
NOEL 5 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY	DECREASED WEIGHT GAIN		2E-2 300		IRIS	010052
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
PROPIONITRILE 000107-12-0									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010053

000122

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
PROPYL ALCOHOL, N- 000071-23-8										
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT										005627
PROPYLENE GLYCOL 000057-55-6										
NOEL 50000 PPM	ORAL: DIET	DOG	2 YEARS	ERYTHROCYTES	DECREASED COUNT				2E+1	005631
				BLOOD	DECREASED HEMATOCRIT				100	
				BLOOD	DECREASED HEMOGLOBIN					
NOEL 6 %	ORAL: DIET	RAT	20 WEEKS	KIDNEY	LESIONS		3E+1			005629
							100			
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (04/25/91) BY THE RfD/RfC WORK GROUP.								IRIS		010914
PROPYLENE GLYCOL MONOETHYL ETHER 001569-02-4										
NOEL 680 MG/KG/DAY	ORAL: DRINKING WATER	RAT	30 DAYS	WHOLE BODY	DECREASED WEIGHT GAIN		7E+0		7E-1	005488
							100		1000	
CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (04/25/91) BY THE RfD/RfC WORK GROUP.								IRIS		010915
PROPYLENE GLYCOL MONOMETHYL ETHER 000107-98-2										
NOEL 947 MG/KG/DAY	ORAL: GAVAGE	RAT	35 DAYS	LIVER	HISTOPATHOLOGY		7E+0		7E-1	005486
				KIDNEY	HISTOPATHOLOGY		100		1000	
NOAEL 1000 PPM	INHALATION: INTERMITTENT	RAT, RABBIT	13 WEEKS	CENTRAL NERVOUS SYSTEM	EFFECTS	2E+1		IRIS		010276
						30				

000123

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
PROPYLENE OXIDE		**000075-56-9**							
LOAEL 71 MG/CU M	INHALATION: INTERMITTENT	RAT 2 YEARS	EPITHELIUM	UNSPECIFIED	3E-2 100		IRIS		010375
SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RFC].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
PYRENE		**000129-00-0**							
NOAEL 75 MG/KG/DAY	ORAL: GAVAGE	MOUSE 13 WKS	KIDNEY	EFFECTS		3E-1 300		IRIS	010176
PYRIDINE		**000110-86-1**							
NOAEL 1 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	LIVER	INCREASED WEIGHT		1E-2		IRIS	010055
			LIVER	INCREASED RELATIVE WEIGHT		100			
RDX / (CYCLONITE)		**000121-82-4**							
NOEL 0.3 MG/KG/DAY	ORAL	RAT 105 WEEKS	PROSTATE	INFLAMMATION		3E-3		IRIS	010056
			PROSTATE	HEMOSIDEROSIS		100			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
RONNEL		**000299-84-3**							
NOAEL 5 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	LIVER	EFFECTS		5E-2 100		5E-2 100	010057

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
SELENIOUS ACID		**007783-00-8**							
NOAEL 0.046 MG/KG/DAY	ORAL: DIET	HUMAN	WHOLE BODY	SELENOSIS, CLINICAL		5E-3 3		IRIS	010504
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
SELENIUM		**007782-49-2**							
NOAEL 0.853 MG/DAY	ORAL: DIET	HUMAN	WHOLE BODY	SELENOSIS, CLINICAL		5E-3 3		IRIS	010404
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
SELENOUREA		**000630-10-4**							
NOAEL 0.072 MG/KG/DAY	ORAL: DIET	HUMAN	WHOLE BODY	SELENOSIS		5E-3 15		5E-3 15	010473
CHRONIC [RfD] COMMENT: WITHDRAWN FROM IRIS (05/01/91). UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.									
SILVER		**007440-22-4**							
LOAEL 0.014 MG/KG/DAY	IV	HUMAN 2-9 YEARS	SKIN	ARGYRIA		5E-3 3		IRIS	010453
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. CHRONIC [RfD] COMMENT: BASED ON A TOTAL IV DOSE OF 1 GRAM.									

000126

28334

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
SILVER CYANIDE		**000506-64-9**								
NOAEL 55.7 MG/KG/DAY		RAT								
	ORAL: DIET		2 YEARS	WHOLE BODY	DECREASED WEIGHT		1E-1		IRIS	010283
				THYROID	EFFECTS		500			
				NERVE	MYELIN DEGENERATION					
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. THE ORAL CHRONIC RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.										
SIMAZINE		**000122-34-9**								
NOAEL 0.52 MG/(KG-DAY)		RAT								
	ORAL: DIET		2 YEARS	WHOLE BODY	DECREASED WEIGHT GAIN		5E-3		IRIS	010955
				BLOOD	HEMATOLOGICAL EFFECTS		100			
SUBCHRONIC [RfD] COMMENT: THE ORAL CHRONIC RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY										
SODIUM CYANIDE		**000143-33-9**								
NOAEL 20.4 MG/KG/DAY		RAT								
	ORAL: DIET			CENTRAL NERVOUS	EFFECTS		4E-2		IRIS	005640
				SYSTEM			500			
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. THE ORAL CHRONIC RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].										
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.										
SODIUM DIETHYLDITHIOCARBAMATE		**000148-18-5**								
NOEL 30 MG/KG/DAY		RAT								
	ORAL		90 DAYS	EYE	CATARACTS		3E-1		IRIS	005644
				WHOLE BODY	DECREASED WEIGHT		100			
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.										
SODIUM METAVANADATE		**013718-26-8**								
NOAEL 10 PPM		RAT								
	ORAL: DRINKING WATER		3 MONTHS	KIDNEY	IMPAIRED FUNCTION		1E-2		1E-3	005735
							100		1000	

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
STRONTIUM, STABLE		**007440-24-6**							
NOAEL 190 MG/KG/DAY	ORAL: DRINKING WATER	RAT, YOUNG 20 DAYS	BONE	RACHITIC CHANGES		6E-1 300		IRIS	010842
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
STRYCHNINE		**000057-24-9**							
LOAEL 2.5 MG/KG/DAY	ORAL: GAVAGE	RAT 28 DAYS	UNSPECIFIED UNSPECIFIED	TOXICITY HISTOPATHOLOGY		3E-3 1000		IRIS	010285
GENERAL COMMENT: THE LOAEL IS ALSO THE FEL.									
STYRENE		**000100-42-5**							
								IRIS	010059
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
NOAEL 22 PPM	INHALATION: OCCUPATIONAL	HUMAN	CENTRAL NERVOUS SYSTEM	EFFECTS	3E+0 10		IRIS		010511
CHRONIC [RfC] COMMENT: THE MEAN DURATION OF EXPOSURE FOR 50 WORKERS WAS 8.6 YEARS. AIR EXPOSURE CONCENTRATIONS WERE ESTIMATED FROM THE SUMMATION OF THE PRINCIPLE URINARY METABOLITES OF STYRENE, MANDELIC ACID AND PHENYLGLYOXYLIC ACID. SEE IRIS FOR MORE INFORMATION.									
GENERAL COMMENT: ALSO SEE TABLE 3: CARCINOGENICITY.									
SUCCINONITRILE		**000110-61-2**							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005585
SULFUR DIOXIDE		**007446-09-5**							
CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS.									010505

000126

78334

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
SULFUR OXIDES									
CHRONIC [RfC] COMMENT: REFER TO APPENDIX A: TECHNICAL INFORMATION, SECTION V ON NATIONAL AMBIENT AIR QUALITY STANDARDS.									010035
SULFURIC ACID	007664-93-9								
NOAEL 0.066-0.098 MG/CU M HUMAN	INHALATION		RESPIRATORY SYSTEM	RESPIRATORY EFFECTS					005647
CHRONIC [RfC] COMMENT: REPORTED EFFECTS OCCURRED AT PORTAL OF ENTRY. ESTIMATES OF MG/DAY REFERENCE DOSES ARE INAPPROPRIATE BECAUSE EFFECTS AT PORTAL OF ENTRY DEPEND ON CONCENTRATION IN AIR. AN ACCEPTABLE AIR CONCENTRATION OF 0.07 MG/CU M WAS ESTIMATED BY CARSON ET AL (1981) FROM AVAILABLE DATA.									
TEMEPHOS	003383-96-8								
NOAEL 200 PPM	ORAL: DIET	RAT 99 DAYS			2E-1 100			2E-2 1000	010060
TERBUFOS	013071-79-9								
NOAEL 0.0025 MG/KG/DAY	ORAL: DIET	DOG 6 MONTHS	CHOLINESTERASE	INHIBITION	2.5E-5 100			2.5E-5 100	010408
TEREPHTHALIC ACID	000100-21-0								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT.									010474
TETRACHLOROAZOXYBENZENE	021232-47-3								
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010064
TETRACHLOROBENZENE, 1,2,4,5-	000095-94-3								
NOAEL 0.34 MG/KG/DAY	ORAL: DIET	RAT 13 WEEKS	KIDNEY	LESIONS	3E-3 100			IRIS	010286

000427

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TETRACHLOROCYCLOPENTADIENE 000695-77-2									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005303
TETRACHLOROETHANE, 1,1,1,2- 000630-20-6									
LOAEL 89.3 MG/KG/DAY	ORAL: GAVAGE	RAT 103 WEEKS	LIVER	LESIONS		3E-2		IRIS	010407
			KIDNEY	LESIONS		3000			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
TETRACHLOROETHYLENE 000127-18-4									
NOAEL 14 MG/KG/DAY	ORAL	MOUSE 6 WEEKS	LIVER	HEPATOTOXICITY		1E-1		IRIS	005650
						100			
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
TETRACHLOROHYDRAZOBENZENE 071753-42-9									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010065
TETRACHLOROPHENOL, 2,3,4,5- 004901-51-3									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005324
TETRACHLOROPHENOL, 2,3,4,6- 000058-90-2									
NOAEL 25 MG/KG/DAY	ORAL: GAVAGE	RAT 90 DAYS	LIVER	INCREASED WEIGHT		3E-1		IRIS	005323
			LIVER	CENTRILOBULAR HYPERTROPHY		100			
TETRACHLOROPHENOL, 2,3,5,6- 000935-95-5									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005325
TETRACHLOROPROPENE, 1,1,2,3- 010436-39-2									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010066

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

000128

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TETRACHLOROVINPHOS / (STIROPHOS) 000961-11-5									
NOEL 3.1 MG/KG/DAY	ORAL: DIET	DOG 2 YEARS	LIVER	INCREASED WEIGHT		3E-2		IRIS	010067
			KIDNEY	INCREASED WEIGHT		100			
			WHOLE BODY						
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
TETRAETHYL DITHIOPYROPHOSPHATE 003689-24-5									
NOEL 0.5 MG/KG/DAY	ORAL: DIET	RAT 3 MONTHS	ERYTHROCYTES	DECREASED CHOLINESTERASE ACTIVITY		5E-3		IRIS	010287
			BLOOD	DECREASED CHOLINESTERASE ACTIVITY		100			
THALLIC OXIDE 001314-32-5									
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL [RfD] IS CONSIDERED NOT VERIFIABLE (07/22/93) BY THE RfD/RfC WORK GROUP.									010956
THALLIUM (I) ACETATE 000563-68-8									
NOAEL 0.26 MG/KG/DAY	ORAL	RAT 90 DAYS	LIVER	INCREASED SGOT		9E-4		IRIS	005664
			BLOOD	INCREASED SERUM LDH		300			
			HAIR	ALOPECIA					
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO THALLIUM (I) SULFATE BY CORRECTING FOR MOLECULAR WEIGHT DIFFERENCES.									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO THALLIUM (I) SULFATE BY CORRECTING FOR MOLECULAR WEIGHT DIFFERENCES.									
THALLIUM (I) CARBONATE 006533-73-9									
NOAEL 0.23 MG/KG/DAY	ORAL	RAT 90 DAYS	LIVER	INCREASED SGOT		8E-4		IRIS	005668
			BLOOD	INCREASED SERUM LDH		300			
			HAIR	ALOPECIA					
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO THALLIUM (I) SULFATE BY CORRECTING FOR MOLECULAR WEIGHT DIFFERENCES.									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO THALLIUM (I) SULFATE BY CORRECTING FOR MOLECULAR WEIGHT DIFFERENCES.									

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
THALLIUM (I) CHLORIDE		**007791-12-0**							
NOAEL 0.23 MG/KG/DAY	ORAL	RAT 90 DAYS	LIVER	INCREASED SGOT		8E-4		IRIS	005672
			BLOOD	INCREASED SERUM LDH		300			
			HAIR	ALOPECIA					
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO THALLIUM (I) SULFATE BY CORRECTING FOR MOLECULAR WEIGHT DIFFERENCES.									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO THALLIUM (I) SULFATE BY CORRECTING FOR MOLECULAR WEIGHT DIFFERENCES.									
THALLIUM (I) NITRATE		**010102-45-1**							
NOAEL 0.26 MG/KG/DAY	ORAL	RAT 90 DAYS	LIVER	INCREASED SGOT		9E-4		IRIS	005676
			BLOOD	INCREASED SERUM LDH		300			
			HAIR	ALOPECIA					
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO THALLIUM (I) SULFATE BY CORRECTING FOR MOLECULAR WEIGHT DIFFERENCES.									
CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO THALLIUM (I) SULFATE BY CORRECTING FOR MOLECULAR WEIGHT DIFFERENCES.									
THALLIUM (I) SULFATE		**007446-18-6**							
NOAEL 0.25 MG/KG/DAY	ORAL	RAT 90 DAYS	LIVER	INCREASED SGOT		8E-4		IRIS	005682
			BLOOD	INCREASED SERUM LDH		300			
			HAIR	ALOPECIA					
THALLIUM (IN SOLUBLE SALTS)									
CHRONIC [RfD] COMMENT: REFER TO IRIS FOR OTHER THALLIUM SALTS.									010458
THALLIUM SELENITE		**012039-52-0**							
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS WITHDRAWN FROM IRIS (08/01/93). THE CHRONIC ORAL [RfD] IS CONSIDERED NOT VERIFIABLE (07/22/93) BY THE RfD/RfC WORK GROUP.									010957

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2834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
THIOCYANOMETHYLTHIO)BENZOTHIAZOLE, 2-(021564-17-0									
NOEL	25 MG/KG/DAY ORAL: DIET	RAT SUBCHRONIC	STOMACH	LESIONS		3E-1 100		3E-2 1000	010068
SUBCHRONIC [RfD] COMMENT: BASED ON CONFIDENTIAL BUSINESS INFORMATION DATA CHRONIC [RfD] COMMENT: BASED ON CONFIDENTIAL BUSINESS INFORMATION DATA									
THIOFANOX 013196-18-4									
NOAEL	0.025 MG/KG/DAY ORAL	DOG 8 DAYS	CHOLINESTERASE	DECREASED CHOLINESTERASE ACTIVITY		3E-4 100		3E-4 100	010069
SUBCHRONIC [RfD] COMMENT: BASED ON CONFIDENTIAL BUSINESS INFORMATION DATA. CHRONIC [RfD] COMMENT: BASED ON CONFIDENTIAL BUSINESS INFORMATION DATA.									
THIRAM 000137-26-8									
NOAEL	0.61 MG/KG/DAY ORAL	FERRET 24 WEEKS	REPRODUCTION	IMPAIRED				IRIS	010450
						6E-3 100			010070
TIN AND COMPOUNDS									
NOAEL	2000 PPM ORAL: DIET	RAT 2 YEARS	LIVER KIDNEY	LESIONS LESIONS		6E-1 100		6E-1 100	005688
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO STANNOUS CHLORIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO STANNOUS CHLORIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TOLUENE		000108-88-3							
NOAEL 223 MG/KG/DAY	ORAL: GAVAGE	RAT 13 WEEKS	LIVER	ALTERED WEIGHT		2E+0		IRIS	010469
			KIDNEY	ALTERED WEIGHT		100			
							IRIS		010844
SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
TOLUENE-2,5-DIAMINE		000095-70-5							
NOAEL 56 MG/KG/DAY	ORAL: DIET	RAT 78 WEEKS				6E-1		6E-1	010073
						100		100	
SUBCHRONIC [RfD] COMMENT: DETERMINED FROM DATA OBTAINED WITH THE SULFATE SALT.									
CHRONIC [RfD] COMMENT: DETERMINED FROM DATA OBTAINED WITH THE SULFATE SALT.									
TOLUENE-2,6-DIAMINE		000823-40-5							
NOAEL 16 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS				2E-1		2E-1	010074
						100		100	
SUBCHRONIC [RfD] COMMENT: DETERMINED FROM DATA OBTAINED WITH THE DIHYDROCHLORIDE.									
CHRONIC [RfD] COMMENT: DETERMINED FROM DATA OBTAINED WITH THE DIHYDROCHLORIDE.									
TOLUENEDIAMINE, 2,3-		002687-25-4							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010071
TOLUENEDIAMINE, 3,4-		000496-72-0							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010072
TOLUIDINE, M-		000108-44-1							
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010075

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0001132

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TRIALLATE		**002303-17-5**							
NOAEL 1.275 MG/KG/DAY		DOG							
	ORAL: DIET	24 MONTHS	SPLEEN	EFFECTS		1.3E-2		IRIS	010076
			LIVER	EFFECTS		100			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
TRIBROMOBENZENE, 1,2,4-		**000615-54-3**							
NOAEL 5 MG/KG/DAY		RAT							
	ORAL: DIET	45 OR 90 DAYS	LIVER	ALTERED WEIGHT		5E-2		IRIS	010077
			LIVER	ENZYME INDUCTION		100			
TRICHLORO-1,2,2-TRIFLUOROETHANE, 1,1,2-		**000076-13-1**							
NOEL 2000 PPM		RAT						IRIS	010460
	INHALATION: INTERMITTENT	24 MONTHS	WHOLE BODY	DECREASED WEIGHT	3E+1 100	3E+0 100	3E+1 100		010376
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.2.									
TRICHLORO-2'-HYDROXYDIPHENYLETHER, 2,2,4'-		**003380-34-5**							
NOEL 500 MG/KG/DAY		RAT							
	ORAL	4 WEEKS	WHOLE BODY	DECREASED WEIGHT		4E+0 100			005492
TRICHLOROBENZENE, 1,2,4-		**000120-82-1**							
NOAEL 100 PPM		RAT							
	ORAL: DRINKING WATER		ADRENAL	INCREASED WEIGHT		1E-2 1000		IRIS	010506
SUBCHRONIC [RfD] COMMENT: BASED ON A MULTIGENERATION REPRODUCTION STUDY.									
NOAEL 104 PPM		RAT, RABBIT, DOG, MONKEY							
	INHALATION	6 AND 26 WEEKS	LIVER	NON-ADVERSE WEIGHT CHANGES	2E+0 100		2E-1 1000		010958

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TRICHLOROCYCLOPENTADIENE 077323-84-3									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005304
TRICHLOROETHANE, 1,1,1- 000071-55-6									
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
TRICHLOROETHANE, 1,1,2- 000079-00-5									
NOAEL 3.9 MG/KG/DAY	ORAL: DRINKING WATER	MOUSE 90 DAYS	BLOOD	CLINICAL CHEMISTRY ALTERATIONS		4E-2 100		IRIS	005702
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
TRICHLOROFLUOROMETHANE 000075-69-4									
								IRIS	005502
LOAEL 1000 MG/KG/DAY	ORAL	RAT 6 WEEKS	WHOLE BODY	INCREASED MORTALITY		7E-1 1000			005500
SUBCHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY) CHRONIC [RfC] COMMENT: ALSO SEE HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
TRICHLOROPHENOL, 2,3,4- 015950-66-0									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005330
TRICHLOROPHENOL, 2,3,5- 000933-78-8									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005331
TRICHLOROPHENOL, 2,3,6- 000933-75-5									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005332

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000132

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TRICHLOROPHENOL, 2,4,5- 000095-95-4										
NOEL	1000 PPM	RAT								
	ORAL: DIET		98 DAYS	LIVER	HEPATOTOXICITY		1E+0		IRIS	005329
				KIDNEY	EFFECTS		100			
	CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (04/24/91) BY THE RfD/RfC WORK GROUP.							IRIS		010919
TRICHLOROPHENOL, 2,4,6- 000088-06-2										
	CHRONIC RfC COMMENT: THE CHRONIC INHALATION RfC IS CONSIDERED NOT VERIFIABLE (04/24/91) BY THE RfD/RfC WORK GROUP.							IRIS		010461
	GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
TRICHLOROPHENOL, 3,4,5- 000609-19-8										
	GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005333
TRICHLOROPHENOXY) PROPIONIC ACID, 2(2,4,5- 000093-72-1										
NOEL	0.75 MG/KG/DAY	DOG								
	ORAL: DIET		2 YEARS	LIVER	HISTOPATHOLOGY		8E-3		IRIS	010284
							100			
	SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
TRICHLOROPHENOXYACETIC ACID, 2,4,5- 000093-76-5										
NOEL	10 MG/KG/DAY	RAT							IRIS	010178
	ORAL: DIET		90 DAYS	KIDNEY	WEIGHT EFFECTS		1E-1			010179
				LIVER	WEIGHT EFFECTS		100			
TRICHLOROPROPANE, 1,1,1- 007789-89-1										
	GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005705

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TRICHLOROPROPANE, 1,1,2- 000598-77-6									
NOEL 100 MG/L	ORAL: DRINKING WATER	RAT 13 WEEKS	LIVER	HISTOPATHOLOGY		5E-2		IRIS	005708
			KIDNEY	HISTOPATHOLOGY		300			
			THYROID	HISTOPATHOLOGY					
TRICHLOROPROPANE, 1,2,2- 003175-23-3									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005706
TRICHLOROPROPANE, 1,2,3- 000096-18-4									
NOAEL 8 MG/KG/DAY	ORAL	RAT 120 DAYS	WHOLE BODY	TOXICITY		6E-2		IRIS	005714
			LIVER	LESIONS		100			
			KIDNEY	LESIONS					
			ERYTHROCYTES	DECREASED COUNT					
			BLOOD	DECREASED HEMATOCRIT					
			BLOOD	DECREASED HEMOGLOBIN					
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
TRICHLOROPROPENE, 1,2,3- 000096-19-5									
NOEL 18 MG/CU M	INHALATION: INTERMITTENT	DOG 66 WEEKS	EYE	IRRITATION		5E-3		5E-3	010078
						100		100	
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5.									
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5.									
TRICHLOROTOLUENE, 2,3,6- 002077-46-5									
LOAEL 0.5 PPM	ORAL: DIET	RAT 28 DAYS	LIVER	LESIONS		5E-5			005335
			KIDNEY	LESIONS		1000			
			THYROID	LESIONS					

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0001136

7834

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TRICHLOROTOLUENE, ALPHA,2,6- 002014-83-7									
LOAEL 0.5 PPM	ORAL: DIET	RAT 28 DAYS	LIVER	LESIONS		5E-5			005339
			KIDNEY	LESIONS		1000			
			THYROID	LESIONS					
TRIFLURALIN 001582-09-8									
NOEL 0.75 MG/KG/DAY	ORAL: DIET	DOG 12 MONTHS	LIVER	INCREASED WEIGHT		7.5E-3		IRIS	010080
			BLOOD	METHEMOGLOBINEMIA		100			
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
TRIMETHYLBENZENES									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									005727
TRINITROBENZENE, 1,3,5- 000099-35-4									
NOAEL 0.51 MG/KG/DAY	ORAL: WATER	RAT 16 WEEKS	SPLEEN	INCREASED WEIGHT		5E-4		IRIS	010081
						1000			
SUBCHRONIC [RfD] COMMENT: CALCULATED FROM DATA OBTAINED WITH 1,3-DINITROBENZENE.									
CHRONIC [RfD] COMMENT: CALCULATED FROM DATA OBTAINED WITH 1,3-DINITROBENZENE.									
TRINITROPHENOLS									
GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT									010082
TRINITROPHENYLMETHYLNITRAMINE 000479-45-8									
LOAEL 125 MG/KG/DAY	ORAL: GAVAGE	RABBIT 9 MONTHS	LIVER	HISTOPATHOLOGICAL EFFECTS		1E-1		1E-2	010377
			KIDNEY	HISTOPATHOLOGICAL EFFECTS		1000		10000	
			SPLEEN	HISTOPATHOLOGICAL EFFECTS					

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
TRINITROTOLUENE, 2,4,6-		000118-96-7							
LOAEL 0.5 MG/KG/DAY	ORAL: GAVAGE	DOG	LIVER	EFFECTS		5E-4 1000		IRIS	010416
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD]. GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.									
URANIUM, SOLUBLE SALTS									
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									
VANADIUM		007440-62-2							
NOAEL 5 PPM	ORAL: DRINKING WATER	RAT LIFETIME				7E-3 100		7E-3 100	005739
VANADIUM PENTOXIDE		001314-62-1							
NOAEL 17.85 PPM	ORAL: DIET	RAT LIFETIME				9E-3 100		IRIS	005743
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
VANADIUM SULFATE		036907-42-3							
NOAEL 2.24 MG/KG/DAY	ORAL: DRINKING WATER	RAT LIFETIME				2E-2 100		2E-2 100	005747
VERNAM / (VERNOLATE)		001929-77-7							
NOEL 1 MG/KG/DAY	ORAL: DIET	RAT	WHOLE BODY	DECREASED WEIGHT		1E-2 100		IRIS	010083

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000138

7834

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
VINYL ACETATE		**000108-05-4**							
NOAEL 100 MG/KG/DAY	ORAL: WATER	RAT 2 YEARS	WHOLE BODY	ALTERED WEIGHT		1E+0		1E+0	010417
			KIDNEY	ALTERED WEIGHT		100		100	
NOAEL 176 MG/CU M	INHALATION: INTERMITTENT	MOUSE 104 WEEKS	NASAL CAVITY	LESIONS	2E-1 30		IRIS		010418

SUBCHRONIC [RfC] COMMENT: THE CHRONIC INHALATION RfC WAS ADOPTED AS THE SUBCHRONIC INHALATION [RfC].

VINYL CHLORIDE 000075-01-4

SUBCHRONIC [RfC] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.
GENERAL COMMENT: ALSO SEE HEAST TABLE 3: CARCINOGENICITY.

VINYL-1-CYCLOHEXENE, 4- 000100-40-3

GENERAL COMMENT: DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT 010084

WARFARIN 000081-81-2

LOAEL 2 MG/DAY	ORAL	HUMAN	BLOOD	INCREASED PROTHROMBIN TIME		3E-4 100		IRIS	010409

SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].

HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
XYLENE, M-		**000108-38-3**							
NOAEL 250 MG/KG	ORAL: GAVAGE	RAT 103 WEEKS	CENTRAL NERVOUS SYSTEM	HYPERACTIVITY				2E+0 100	005755
			WHOLE BODY	DECREASED WEIGHT					
			WHOLE BODY						

SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (12/11/91) BY THE RfD/RfC WORK GROUP. 010920

XYLENE, MIXTURE **001330-20-7**

IRIS 010872

SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (12/11/91) BY THE RfD/RfC WORK GROUP. 010921

XYLENE, O-		**000095-47-6**							
NOEL 250 MG/KG	ORAL: GAVAGE	RAT 103 WEEKS	CENTRAL NERVOUS SYSTEM	HYPERACTIVITY				2E+0 100	005751
			WHOLE BODY	DECREASED WEIGHT					

SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (12/11/91) BY THE RfD/RfC WORK GROUP. 010922

XYLENE, P- **000106-42-3**

SUBCHRONIC [RfD] COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

CHRONIC [RfC] COMMENT: THE CHRONIC INHALATION [RfC] IS CONSIDERED NOT VERIFIABLE (12/11/91) BY THE RfD/RfC WORK GROUP. 010923

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HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ZINC (METALLIC)		**007440-66-6**							
LOAEL 1.0 MG/KG/DAY	ORAL: DIET SUPPLEMENT	HUMAN 10 WEEKS	BLOOD	DECREASED BLOOD ENZYME		3E-1 3		IRIS	010937
CHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									
ZINC CYANIDE		**000557-21-1**							
NOAEL 24.3 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	WHOLE BODY	DECREASED WEIGHT		5E-2 500		IRIS	010289
			THYROID	EFFECTS					
			NERVE	MYELIN DEGENERATION					
SUBCHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT. CHRONIC [RfD] COMMENT: CALCULATED BY ANALOGY TO FREE CYANIDE BY CORRECTING FOR DIFFERENCES IN MOLECULAR WEIGHT.									
ZINC PHOSPHIDE		**001314-84-7**							
LOAEL 3.48 MG/KG/DAY	ORAL: DIET	RAT 13 WEEKS	WHOLE BODY	DECREASED WEIGHT		3E-3 1000		IRIS	010290
			WHOLE BODY	DECREASED FOOD INTAKE					
ZINEB		**012122-67-7**							
LOAEL 25 MG/KG/DAY	ORAL: DIET	RAT 2 YEARS	THYROID	HYPERPLASIA		5E-2 500		IRIS	010085
SUBCHRONIC [RfD] COMMENT: THE CHRONIC ORAL RfD WAS ADOPTED AS THE SUBCHRONIC ORAL [RfD].									

REFERENCES FOR HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

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ANTIMONY TETROXIDE 001332-81-6

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March 1994

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HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
ACETONE CYANOHYDRIN										
NOEL 4.0 MG/KG/DAY		RAT								
	INHALATION:	14 WEEKS		CENTRAL NERVOUS	EFFECTS	1E-1		1E-2		010432
	INTERMITTENT			SYSTEM		100		1000		

SUBCHRONIC [RfC] COMMENT: 4E-2 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). AN ERROR IN THE UNCERTAINTY FACTOR THAT WAS REPORTED IN HEED (1988) WAS CORRECTED.
CHRONIC [RfC] COMMENT: 4E-2 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

ACETONITRILE										
NOAEL 100 PPM		MOUSE								
	INHALATION:	92 DAYS		LIVER	INCREASED RELATIVE WEIGHT	5E-1		5E-2		005208
	INTERMITTENT					300		3000		

SUBCHRONIC [RfC] COMMENT: 1E-1 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
CHRONIC [RfC] COMMENT: 1E-2 MG/KG/DAY. (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

BARIUM										
NOEL 0.8 MG/CU M		RAT								
	INHALATION:	4 MONTHS		FETUS	FETOTOXICITY	5E-3		5E-4		005249
	INTERMITTENT					100		1000		

SUBCHRONIC [RfC] COMMENT: 1E-3 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). BASED ON A REPRODUCTION STUDY.
CHRONIC [RfC] COMMENT: 1E-4 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). BASED ON A REPRODUCTION STUDY.
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

CHLORO-1,3-BUTADIENE / (CHLOROPRENE)										
NOAEL 10 PPM		RAT								
	INHALATION:	2 YEARS		HAIR	ALOPECIA		2E-2		2E-2	005878
	INTERMITTENT			WHOLE BODY	DECREASED WEIGHT GAIN		100		100	

SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION ASSUMING AN INHALATION ABSORPTION FACTOR OF 0.5.
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION ASSUMING AN INHALATION ABSORPTION FACTOR OF 0.5.
GENERAL COMMENT: SEE ALSO HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT	LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
CHLOROBENZENE		**000108-90-7**								
LOAEL 75 PPM	INHALATION: INTERMITTENT	RAT	120 DAYS	LIVER	EFFECTS			2E-2		005353
				KIDNEY	EFFECTS			10000		
CYCLOPENTADIENE		**000542-92-7**								
NOEL 87.3 MG/KG/DAY	INHALATION: INTERMITTENT	RAT	194 DAYS	LIVER	LESIONS	3E+0				005401
				KIDNEY	LESIONS	100				
DICHLOROBENZENE, 1,2-		**000095-50-1**								
NOEL 49 PPM	INHALATION: INTERMITTENT	RAT	UP TO 7 MONTHS	WHOLE BODY	DECREASED WEIGHT GAIN	2E+0 100		2E-1 1000		005412
DICHLORODIFLUOROMETHANE		**000075-71-8**								
LOAEL 482.3 MG/KG/DAY	INHALATION: INTERMITTENT	GUINEA PIG	6 WEEKS	LIVER	LESIONS	2E+0 1000		2E-1 10000		005497

CHLOROBENZENE

CHRONIC [RfC] COMMENT: 5E-3 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). UNDER REVIEW, CURRENT NUMBER SUBJECT TO CHANGE.
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

CYCLOPENTADIENE

SUBCHRONIC [RfC] COMMENT: 9E-1 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
GENERAL COMMENT: THE SUBCHRONIC INHALATION [RfC] VALUE WAS DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP.

DICHLOROBENZENE, 1,2-

CHRONIC [RfC] COMMENT: 4E-2 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

DICHLORODIFLUOROMETHANE

SUBCHRONIC [RfC] COMMENT: 5E-1 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
CHRONIC [RfC] COMMENT: 5E-2 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

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HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
DICHLOROETHANE, 1,1- 000075-34-3									
NOEL 138 MG/KG/DAY	INHALATION: INTERMITTENT	CAT 13 WEEKS	KIDNEY	DAMAGE	5E+0 100		5E-1 1000		005789
SUBCHRONIC [RfC] COMMENT: 1E+0 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).									
CHRONIC [RfC] COMMENT: 1E-1 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).									
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE HEAST TABLE 1: CHRONIC AND SUBCHRONIC TOXICITY AND									
DICYCLOPENTADIENE 000077-73-6									
LOAEL 1 PPM	INHALATION: INTERMITTENT	RAT 90 DAYS	LIVER	DYSFUNCTION	2E-3 1000		2E-4 10000		005424
SUBCHRONIC [RfC] COMMENT: 6E-4 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).									
CHRONIC [RfC] COMMENT: 6E-5 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).									
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.									
ETHOXYETHANOL ACETATE, 2- 000111-15-9									
NOEL 30.1 MG/KG/DAY	INHALATION: INTERMITTENT	RAT DAY 6-18 OF GESTATION	FETUS	DECREASED OSSIFICATION		3E-1 100		3E-1 100	005952
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. THE SUBCHRONIC ORAL [RfD]WAS BASED ON A REPRODUCTION STUDY WITH EXPOSURES DURING DAYS 6-18 OF GESTATION.									
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. THE CHRONIC ORAL [RfD] WAS BASED ON A REPRODUCTION STUDY WITH EXPOSURES DURING DAYS 6-18 OF GESTATION.									
GENERAL COMMENT: NO PHARMACOKINETIC DATA WERE PROVIDED TO JUSTIFY ROUTE TO ROUTE EXTRAPOLATION FOR THE ORAL [RfD] VALUES. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY VALUES.									

HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
FURFURAL		**000098-01-1**							
NOAEL 20 PPM	INHALATION: INTERMITTENT	HAMSTER 13 WEEKS	NASAL CAVITY	OLFACTORY DEGENERATION	5E-1 100		5E-2 1000		005465

SUBCHRONIC [RfC] COMMENT: 1E-1 MG/KG/DAY (SEE APPENDIX A-11, DOSE CONVERSIONS ON HEAST).
CHRONIC [RfC] COMMENT: 1E-2 MG/KG/DAY (SEE APPENDIX A-11, DOSE CONVERSIONS ON HEAST).
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

METHACRYLONITRILE		**000126-98-7**							
NOEL 3.2 PPM	INHALATION: INTERMITTENT	DOG 90 DAYS	LIVER LIVER	INCREASED SGOT INCREASED SGPT	7E-3 300		7E-4 3000		005811

SUBCHRONIC [RfC] COMMENT: 2E-3 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). THESE VALUES DIFFER FROM THOSE IN THE 1987 NEED.
CHRONIC [RfC] COMMENT: 2E-4 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). THESE VALUES DIFFER FROM THOSE IN THE 1987 NEED.
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

METHOXYETHANOL ACETATE, 2-		**000110-49-6**							
NOAEL 10 PPM	INHALATION: INTERMITTENT	RABBIT 13 WEEKS	TESTIS	DEGENERATION		2E-2 100		2E-3 1000	010001

SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5. CALCULATED FROM DATA OBTAINED WITH METHOXYETHANOL CONVERTED BY MULTIPLYING BY THE MOLECULAR WEIGHT RATIO (118.13/76.09).
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5. CALCULATED FROM DATA OBTAINED WITH METHOXYETHANOL CONVERTED BY MULTIPLYING BY THE MOLECULAR WEIGHT RATIO (118.13/76.09).
GENERAL COMMENT: NO PHARMACOKINETIC DATA WERE PROVIDED TO JUSTIFY ROUTE TO ROUTE EXTRAPOLATION FOR THE ORAL [RfD] VALUES.

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HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
METHOXYETHANOL, 2-		**000109-86-4**							
NOAEL 31 MG/CU M		RABBIT							
	INHALATION:	13 WEEKS	TESTICLE	EFFECTS		1E-2		1E-3	010910
	INTERMITTENT					100		1000	

SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
GENERAL COMMENT: ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

METHYL ACRYLATE		**000096-33-3**							
NOEL 15 PPM		RAT							
	INHALATION:	2 YEARS		NONE OBSERVED		3E-2		3E-2	010003
	INTERMITTENT					100		100	

SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
GENERAL COMMENT: NO PHARMACOKINETIC DATA WERE PROVIDED TO JUSTIFY ROUTE TO ROUTE EXTRAPOLATION FOR THE ORAL [RfD] VALUES.

METHYL ISOBUTYL KETONE		**000108-10-1**							
NOEL 50 PPM		RAT							
	INHALATION:	90 DAYS	LIVER	INCREASED WEIGHT	8E-1		8E-2		005562
	INTERMITTENT		KIDNEY	EFFECTS	100		1000		

SUBCHRONIC [RfC] COMMENT: 2E-1 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSION ON HEAST).
CHRONIC [RfC] COMMENT: 2E-2 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSION ON HEAST).
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
METHYL STYRENE (MIXED ISOMERS) 025013-15-4									
LOAEL 5.6 MG/KG/DAY	INHALATION: INTERMITTENT	MOUSE 103 WEEKS	NASAL CAVITY	LESIONS		6E-3 1000		6E-3 1000	005567
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION WITH AN ABSORPTION FACTOR OF 0.5. CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION WITH AN ABSORPTION FACTOR OF 0.5. GENERAL COMMENT: NO PHARMACOKINETIC DATA WERE PROVIDED TO JUSTIFY ROUTE TO ROUTE EXTRAPOLATION FOR THE ORAL [RfD] VALUES.									
LOAEL 11.2 MG/KG/DAY	INHALATION: INTERMITTENT	MOUSE 103 WEEKS	NASAL CAVITY	LESIONS	4E-2 1000		4E-2 1000		005566
SUBCHRONIC [RfC] COMMENT: 1E-2 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). CHRONIC [RfC] COMMENT: 1E-2 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST). GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP.									
METHYL STYRENE, ALPHA 000098-83-9									
NOEL 970 MG/CU M	INHALATION: INTERMITTENT	RAT 197 DAYS	LIVER	INCREASED WEIGHT	7E-1 100			7E-2 1000	010016
			KIDNEY	INCREASED WEIGHT					
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5. CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION USING AN ABSORPTION FACTOR OF 0.5. GENERAL COMMENT: NO PHARMACOKINETIC DATA WERE PROVIDED TO JUSTIFY ROUTE TO ROUTE EXTRAPOLATION FOR THE ORAL [RfD] VALUES.									
METHYLENE BROMIDE 000074-95-3									
NOAEL 11 MG/KG/DAY	INHALATION: INTERMITTENT	RAT 90 DAYS	BLOOD	INCREASED CARBOXYHEMOGLOBIN	1E-1 100			1E-2 1000	010011
SUBCHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION, INCLUDING AN ABSORPTION FACTOR OF 0.5. CHRONIC [RfD] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION, INCLUDING AN ABSORPTION FACTOR OF 0.5. GENERAL COMMENT: NO PHARMACOKINETIC DATA WERE PROVIDED TO JUSTIFY ROUTE TO ROUTE EXTRAPOLATION FOR THE ORAL [RfD] VALUES.									

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HEAST TABLE 2: ALTERNATE METHODS - SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

CHEMICAL LEVEL	DOSE ROUTE	SPECIES EXPERIMENT LENGTH	TARGET	CRITICAL EFFECT	Subchronic [RfC] (mg/cu m) UF	Subchronic [RfD] (mg/kg/day) UF	Chronic [RfC] (mg/cu m) UF	Chronic [RfD] (mg/kg/day) UF	REFERENCE
NITROBENZENE		**000098-95-3**							
LOAEL 25 MG/CU M	INHALATION: INTERMITTENT	MOUSE 90 DAYS	BLOOD	HEMATOLOGICAL EFFECTS	2E-2		2E-3		010518
			ADRENAL	LESIONS	1000		10000		
			KIDNEY	LESIONS					
			LIVER	LESIONS					
	INHALATION: INTERMITTENT	RAT 90 DAYS	BLOOD	HEMATOLOGICAL EFFECTS					
			ADRENAL	LESIONS					
			KIDNEY	LESIONS					
			LIVER	LESIONS					

SUBCHRONIC [RfC] COMMENT: 6E-4 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
CHRONIC [RfC] COMMENT: 6E-4 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

TRICHLOROBENZENE, 1,2,4- 000120-82-1

GENERAL COMMENT: INFORMATION REMOVED FROM THIS TABLE. SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

TRICHLOROFLUOROMETHANE		**000075-69-4**							
LOAEL 1940 MG/KG/DAY	INHALATION: CONTINUOUS	DOG 90 DAYS	KIDNEY	INCREASED BUN	7E+0		7E-1		005501
			LUNG	INFLAMMATION	1000		10000		

SUBCHRONIC [RfC] COMMENT: 2E+0 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
CHRONIC [RfC] COMMENT: 2E-1 MG/KG/DAY (SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST).
GENERAL COMMENT: THE SUBCHRONIC AND CHRONIC INHALATION [RfC] VALUES WERE DERIVED FROM METHODOLOGY THAT IS NOT CURRENT WITH THE INTERIM INHALATION METHODOLOGY USED BY THE RfD/RfC WORK GROUP. ALSO SEE TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.

REFERENCES FOR HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

March 1994

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March 1994

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REFERENCES FOR HEAST TABLE 2: ALTERNATE METHODS -- SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
ACEPHATE		030560-19-1								
					IRIS	IRIS		IRIS		010086
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
ACROLEIN		000107-02-8								
					IRIS					005001
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
ACRYLAMIDE		000079-06-1								
	ORAL: DRINKING WATER	2 YEARS RAT	MAMMARY	TUMORS	IRIS	IRIS	4.5E+0	IRIS	IRIS	010087
			THYROID	TUMORS						
			UTERUS	TUMORS						
			ORAL CAVITY	TUMORS						
			CENTRAL NERVOUS SYSTEM	TUMORS						
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
ACRYLONITRILE		000107-13-1								
					IRIS	IRIS		IRIS		005004
	INHALATION: OCCUPATIONAL	HUMAN	LUNG	TUMORS	IRIS		2.4E-1		IRIS	005003
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
ALACHLOR		015972-60-8								
	ORAL: DIET	MULTIPLE SITES	TUMORS		B2	8E-2		2.3E-6		010180
	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

REFERENCES FOR HEAST TABLE 3: CARCINOGENICITY

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ACROLEIN 000107-02-8

005001 US EPA. 1987. HEALTH EFFECTS ASSESSMENT FOR ACROLEIN. PREPARED BY THE OFFICE OF HEALTH AND ENVIRONMENTAL ASSESSMENT, ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE, CINCINNATI, OH FOR THE OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, WASHINGTON DC.

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ACRYLAMIDE 000079-06-1

010087 JOHNSON K, S GORZINSKI, KM BODNER, ET AL. 1986. CHRONIC TOXICITY AND ONCOGENICITY STUDY ON ACRYLAMIDE INCORPORATED IN THE DRINKING WATER OF FISCHER 344 RATS. DOW CHEMICAL, USA, MIDLAND, MI.

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
TRINITROTOLUENE, 2,4,6- 000118-96-7										
					IRIS	IRIS		IRIS		010476
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
VINYL CHLORIDE 000075-01-4										
	ORAL: DIET	1001 DAYS RAT	LUNG	TUMORS	B	1.9E+0		5.4E-5		010368
			LIVER	TUMORS						
ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.										
	INHALATION: INTERMITTENT	1 YEAR RAT	LIVER	TUMORS	A		3.0E-1		8.4E-5	010367

INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST.
INHALATION [UNIT RISK] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.
GENERAL COMMENT: THE MOST RECENTLY REVIEWED QUANTITATIVE TOXICITY VALUES LISTED HERE APPEAR IN EPA DOCUMENTS PUBLISHED IN 1984 AND 1985. THE AGENCY IS AWARE THAT THESE VALUES DO NOT INCORPORATE CONSIDERABLE INFORMATION THAT IS NOW AVAILABLE. THE OFFICE OF HEALTH AND ENVIRONMENTAL ASSESSMENT'S POSITION IS THAT THESE TOXICITY VALUES DO NOT REFLECT STATE-OF-THE-ART SCIENCE FOR VINYL CHLORIDE. EPA NOW HAS INDIVIDUAL ANIMAL DATA, NOT AVAILABLE WHEN THE ORAL UNIT RISK WAS CALCULATED, THAT MAY INFLUENCE THIS VALUE. ADDITIONAL INFORMATION THAT MAY BE FACTORED INTO A REVISED QUANTITATIVE TOXICITY VALUE INCLUDES DATA ON INCREASED SENSITIVITY OBSERVED IN YOUNG ANIMALS AND DATA ON METABOLISM/PHARMACOKINETICS. A UNIT RISK FOR AIR THAT CONSIDERS INFORMATION ON YOUNG AGE EXPOSURE INCREASES THE RISK (I.E., LOWERS THE RISK SPECIFIC DOSE) BY AT LEAST 3-FOLD. THE CONSIDERATION OF METABOLISM PHARMACOKINETICS WILL FURTHER INCREASE THE RISK. ONE UNPUBLISHED PHYSIOLOGICALLY-BASED PHARMACOKINETIC MODEL PREDICTION RESULTS IN A 100-FOLD INCREASED RISK.

HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
TRICHLOROETHANE, 1,1,2- 000079-00-5										
	ORAL: GAVAGE	78 WEEKS MOUSE	LIVER	CARCINOMA	IRIS	IRIS	5.7E-2	IRIS	IRIS	005144
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
TRICHLOROETHYLENE 000079-01-6										
	GENERAL COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.									010483
TRICHLOROPHENOL, 2,4,6- 000088-06-2										
	ORAL: DIET	107 WEEKS MOUSE	BLOOD	LEUKEMIA	IRIS	IRIS	1E-2	IRIS	IRIS	010428
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
TRICHLOROPROPANE, 1,2,3- 000096-18-4										
	ORAL: GAVAGE	RAT	MULTIPLE SITES	TUMORS, BENIGN/MALIGNANT, COMBINED	B2	7E+0		2E-4		010849
	[EPA GROUP] COMMENT: UNDER REVIEW, CLASSIFICATION SUBJECT TO CHANGE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
TRIFLURALIN 001582-09-8										
					IRIS	IRIS		IRIS		010163
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
TRIMETHYL PHOSPHATE 000512-56-1										
	ORAL: GAVAGE	103 WEEKS MOUSE	UTERUS	TUMORS	B2	3.7E-2		1.1E-6		010164

IRIS, EPA'' 'NTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INF" "ION: RISK INFORMATION HOTLINE: (513) 569-7254.

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
TETRACHLOROTOLUENE, PARA, ALPHA, ALPHA, ALPHA- 005216-25-1										
	ORAL: GAVAGE	17.5 WEEKS MOUSE	LUNG	ADENOCARCINOMA	B2	2.0E+1		5.7E-4		005028
TETRACHLOROVINPHOS / (STIROFOS) 000961-11-5										
	ORAL: DIET	560 DAYS MOUSE	LIVER	TUMORS	C	2.4E-2		6.9E-7		010159
[EPA GROUP] COMMENT: UNDER REVIEW, CLASSIFICATION SUBJECT TO CHANGE. GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
TOLUENE-2,4-DIAMINE 000095-80-7										
	ORAL: DIET	84-103 WEEKS RAT	MAMMARY	TUMORS	B2	3.2E+0		9.1E-5		010160
TOLUIDINE, P- 000106-49-0										
	ORAL: DIET	18 MONTHS MOUSE	LIVER	TUMORS	C	1.9E-1		5.4E-6		010162
TOXAPHENE 008001-35-2										
	ORAL: DIET	18 MONTHS MOUSE	LIVER	TUMORS	IRIS	IRIS	1.1E+0	IRIS	IRIS	005134
INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST. INHALATION [UNIT RISK] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.										
TRICHLOROANILINE HYDROCHLORIDE, 2,4,6- 033663-50-2										
	ORAL: DIET	18 MONTHS MOUSE	VASCULAR SYSTEM	TUMORS	C	2.9E-2		8.2E-7		005142
TRICHLOROANILINE, 2,4,6- 000634-93-5										
	ORAL: DIET	18 MONTHS MOUSE	VASCULAR SYSTEM	TUMORS	C	3.4E-2		1E-6		010487

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
STYRENE		**000100-42-5**								010480
GENERAL COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300. ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
TCDD, 2,3,7,8-		**001746-01-6**								
	ORAL: DIET	720 DAYS			B2	1.5E+5	1.5E+5	4.5E+0	3.3E-5 (PG/CU M)-1	005128
		RAT	RESPIRATORY SYSTEM	TUMORS						
			LIVER	TUMORS						
ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE. INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST. INHALATION [UNIT RISK] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE. BASED ON ROUTE TO ROUTE EXTRAPOLATION. AN ABSORPTION FACTOR OF 75% IS USED TO CALCULATE THE UNIT RISK FROM THE SLOPE FACTOR.										
TETRACHLOROETHANE, 1,1,1,2-		**000630-20-6**								
	ORAL: GAVAGE	103 WEEKS	LIVER	TUMOR	IRIS	IRIS	2.6E-2	IRIS	IRIS	010302
INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										
TETRACHLOROETHANE, 1,1,2,2-		**000079-34-5**								
	ORAL: GAVAGE	75 WEEKS MOUSE	LIVER	CARCINOMA	IRIS	IRIS	2.0E-1	IRIS	IRIS	005130
INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										
TETRACHLOROETHYLENE		**000127-18-4**								010482
GENERAL COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300. ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHENICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
PROPYLENE OXIDE		**000075-56-9**								
					IRIS	IRIS		IRIS		010156
	INHALATION: INTERMITTENT	2 YEARS MOUSE	NASAL CAVITY	TUMORS	IRIS		1.3E-2		IRIS	010155
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
QUINOLINE		**000091-22-5**								
	ORAL: DIET	20-40 WEEKS RAT	LIVER	TUMORS	C	1.2E+1		3.5E-4		010158
RDX / (CYCLONITE)		**000121-82-4**								
					IRIS	IRIS		IRIS		010157
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
SELENIUM SULFIDE		**007446-34-6**								
	ORAL [SLOPE] COMMENT: STUDY RESULTS WERE CONSIDERED INCONCLUSIVE FOR QUANTITATIVE RISK ASSESSMENT.				IRIS					010194
SIMAZINE		**000122-34-9**								
	ORAL: DIET	2 YEARS RAT	MAMMARY	CARCINOMA	C	1.2E-1		3.4E-6		010195
	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
SODIUM DIETHYLDITHIOCARBAMATE		**000148-18-5**								
	ORAL: DIET	77 WEEKS MOUSE	LIVER	TUMORS	C	2.7E-1		7.7E-6		005126
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									

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CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
PENTACHLORONITROBENZENE 000082-68-8										
	ORAL	72 WEEKS MOUSE	LIVER	TUMORS	C	2.6E-1		7.4E-6		010151
ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
PENTACHLOROPHENOL 000087-86-5										
					IRIS	IRIS		IRIS		010381
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
PHENYLENEDIAMINE, O- 000095-54-5										
	ORAL: DIET	548 DAYS RAT	LIVER	TUMORS	B2	4.7E-2		1.3E-6		010152
ORAL [SLOPE] COMMENT: BASED ON LIVER TUMORS IN RATS TREATED WITH O-PHENYLENEDIAMINE DIHYDROCHLORIDE.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY.										
PHENYLPHENOL, 2- 000090-43-7										
	ORAL: DIET	637 DAYS RAT	URINARY BLADDER	TUMORS	C	1.94E-3		5.5E-8		010153
POLYBROMINATED BIPHENYLS										
	ORAL: GAVAGE	25 WEEKS RAT	LIVER LIVER	CARCINOMA NEOPLASTIC NODULE	B2	8.9E+0		2.5E-4		010154
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)										
POLYCHLORINATED BIPHENYLS 001336-36-3										
					IRIS	IRIS		IRIS		005118

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
NITROSODIPHENYLAMINE, N- 000086-30-6					IRIS	IRIS		IRIS		005112
NITROSOMETHYLETHYLAMINE, N- 010595-95-6					IRIS	IRIS		IRIS		010148
NITROSOMETHYLVINYLAMINE, N 004549-40-0										
	INHALATION	RAT	UPPER RESPIRATORY TRACT	CARCINOMAS	B2					010149
	ORAL: DRINKING WATER		UPPER DIGESTIVE TRACT	CARCINOMAS						
NITROSOPYRROLIDINE, N- 000930-55-2										
	ORAL: DIET	LIFETIME RAT	LIVER	TUMORS	IRIS	IRIS	2.1E+0	IRIS	IRIS	010300
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
PARATHION 000056-38-2										
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).				IRIS					005116
PENTABROMO-6-CHLOROCYCLOHEXANE, 1,2,3,4,5- 000087-84-3										
	ORAL: DIET	2 YEARS RAT	INTESTINE, LARGE	TUMORS	C	2.3E-2		6.6E-7		010150
	ORAL [SLOPE] COMMENT: BASED ON RESULTS WITH THE ALPHA ISOMER.									

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CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
NITROSO-DI-N-PROPYLAMINE, N- 000621-64-7										
					IRIS	IRIS		IRIS		010147
NITROSO-N-ETHYLUREA, N- 000759-73-9										
	ORAL: DRINKING WATER	203 DAYS RAT	INTESTINE	GASTROINTESTINAL TUMORS	B2	1.4E+2				010426
[EPA GROUP] COMMENT: UNDER REVIEW, CLASSIFICATION SUBJECT TO CHANGE. GENERAL COMMENT: FOR RCRA ACTIVITIES ONLY, CONTACT THE HEALTH ASSESSMENT SECTION (202) 382-4761 FOR RCRA-APPROVED NUMERIC ASSESSMENT FOR THIS COMPOUND. UNDER REVIEW.										
NITROSO-N-METHYLUREA, N- 000684-93-5										
	ORAL: GAVAGE	308 DAYS GUINEA PIG	PANCREAS	ADENOCARCINOMA	B2					010427
[EPA GROUP] COMMENT: UNDER REVIEW, CLASSIFICATION SUBJECT TO CHANGE. GENERAL COMMENT: THE CRAVE WORK GROUP (04/01/92) STATES THERE IS NO ACCEPTABLE QUANTITATION FOR NITROSO-N-METHYLUREA, N-.										
NITROSODIETHANOLAMINE, N- 001116-54-7										
					IRIS	IRIS		IRIS		010144
NITROSODIETHYLAMINE, N- 000055-18-5										
	ORAL: DRINKING WATER	6 OR 12 MONTHS RAT	LIVER	TUMORS	IRIS	IRIS	1.5E+2	IRIS	IRIS	010145
INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										
NITROSODIMETHYLAMINE, N- 000062-75-9										
	ORAL: DRINKING WATER	RAT	LIVER	TUMORS	IRIS	IRIS	5.1E+1	IRIS	IRIS	010146
INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH	SPECIES	TARGET	CANCER	IEPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
NICKEL REFINERY DUST											
	INHALATION: OCCUPATIONAL		HUMAN	RESPIRATORY SYSTEM	TUMORS	IRIS		8.4E-1		IRIS	005103
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: FORMERLY LISTED AS NICKEL. ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (UNDER NICKEL).										
NICKEL SUBSULFIDE		012035-72-2									
	INHALATION: OCCUPATIONAL		HUMAN	RESPIRATORY SYSTEM	TUMORS	IRIS		1.7E+0		IRIS	005768
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: FORMERLY LISTED AS NICKEL. ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (UNDER NICKEL).										
NITROFURAZONE		000059-87-0									
	ORAL: DIET	46 WEEKS	RAT	MAMMARY	TUMORS	B2	1.5E+0		4.3E-5		005110
NITROPROPANE, 2-		000079-46-9									
	INHALATION: INTERMITTENT	22 MONTHS	RAT	LIVER	TUMORS	B2		9.4E+0		2.7E-3	010142
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST.										
NITROSO-DI-N-BUTYLAMINE, N-		000924-16-3									
	ORAL: DRINKING WATER	LIFETIME	MOUSE	BLADDER	TUMORS	IRIS	IRIS	5.4E+0	IRIS	IRIS	010143
				ESOPHAGUS	TUMORS						
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
METHYLENE-BIS(BENZENEAMINE), 4,4- / (4,4'-METHYLENEDIANILINE) 000101-77-9										
GENERAL COMMENT: NO EPA GROUP CLASSIFICATION WAS PROVIDED IN THE REFERENCE DOCUMENT, THEREFORE THIS COMPOUND WAS REMOVED FROM TABLE 3.										
METHYLENE-BIS(2-CHLOROANILINE), 4,4'- 000101-14-4										
	ORAL: DIET	2 YEARS RAT	LUNG	TUMORS	B2	1.3E-1	1.3E-1	3.7E-6	3.7E-5	010425
INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST. BASED ON ROUTE TO ROUTE EXTRAPOLATION.										
METHYLENE-BIS(N,N'-DIMETHYL)ANILINE, 4,4'- 000101-61-1										
					IRIS	IRIS		IRIS		010137
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
METOLACHLOR 051218-45-2										
					IRIS					010951
MIREX 002385-85-5										
	ORAL: DIET	2 YEARS RAT	LIVER	ADENOMA	B2					010952
			LIVER	CARCINOMA						
[EPA GROUP] COMMENT: UNDER REVIEW, CLASSIFICATION SUBJECT TO CHANGE.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)										
NIAGARA BLUE 4B 002429-74-5										
					B2					010141
[EPA GROUP] COMMENT: BASED ON THE FACT THAT 3,3-DIMETHOXYBENZIDINE, A KNOWN EPA GROUP B2 CARCINOGEN, IS A METABOLITE OF NIAGARA BLUE 4B.										

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
METHOXY-5-NITROANILINE, 2- 000099-59-2										
	ORAL: DIET	104 WEEKS RAT	SKIN	CARCINOMA	B2	4.6E-2		1.3E-6		010132
METHYL HYDRAZINE 000060-34-4										
	GENERAL COMMENT: NO EPA GROUP CLASSIFICATION WAS PROVIDED IN THE REFERENCE DOCUMENT, THEREFORE THIS COMPOUND WAS REMOVED FROM TABLE 3.									
METHYL-5-NITROANILINE, 2- 000099-55-8										
	ORAL: DIET	98 WEEKS MOUSE	LIVER	CARCINOMA	C	3.3E-2		9.4E-7		010140
METHYLANILINE HYDROCHLORIDE, 2- 000636-21-5										
	ORAL: DIET	93 WEEKS RAT	SKIN	FIBROMA	B2	1.8E-1		3.1E-6		010134
METHYLANILINE, 2- 000095-53-4										
	ORAL: DIET	93 WEEKS RAT	SKIN	FIBROMA	B2	2.4E-1		6.9E-6		010133
	GENERAL COMMENT: THE 1984 NEEP CALLED THIS COMPOUND O-TOLUIDINE, THE 1987 NEEP CALLED IT 2-METHYLANILINE.									
METHYLCHOLANTHRACENE, 3- 000056-49-5										
	GENERAL COMMENT: FOR RCRA ACTIVITIES ONLY, CONTACT THE HEALTH ASSESSMENT SECTION (202) 260-4761 FOR RCRA APPROVED NUMERIC ASSESSMENT OF THIS COMPOUND.									010299
METHYLENE CHLORIDE / (DICHLOROMETHANE) 000075-09-2										
					IRIS	IRIS		IRIS		005100
					IRIS				IRIS	005904
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									

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CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
HYDRAZINE		**000302-01-2**								
					IRIS	IRIS		IRIS		010129
	INHALATION: INTERMITTENT	1 YEAR RAT	NASAL CAVITY	TUMORS	IRIS		1.7E+1		IRIS	010128
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
HYDRAZINE SULFATE		**010034-93-2**								
					IRIS	IRIS		IRIS		010131
	INHALATION: INTERMITTENT	1 YEAR RAT	NASAL CAVITY	TUMORS	IRIS		1.7E+1		IRIS	010130
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: LISTED UNDER "HYDRAZINE" ON IRIS.									
INDENO[1,2,3-CD]PYRENE		**000193-39-5**								
					IRIS					010192
ISOPHORONE		**000078-59-1**								
					IRIS	IRIS		IRIS		005094
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
LEAD		**007439-92-1**								
					IRIS					005096
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
LINURON		**000330-55-2**								
					IRIS					010383
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
HEXACHLOROCYCLOHEXANE, BETA- 000319-85-7										
	ORAL: DIET	110 WEEKS MOUSE	LIVER	TUMORS	IRIS	IRIS	1.8E+0	IRIS	IRIS	010124
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
HEXACHLOROCYCLOHEXANE, DELTA- 000319-86-8										
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).				IRIS					010125
HEXACHLOROCYCLOHEXANE, EPSILON- 006108-10-7										
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).				IRIS					010126
HEXACHLOROCYCLOHEXANE, GAMMA- 000058-89-9										
Lindane	ORAL: DIET	110 WEEKS MOUSE	LIVER	TUMORS	B2-C	1.3E+0		3.7E-5		005098
?	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
HEXACHLOROCYCLOHEXANE-TECHNICAL 000608-73-1										
	ORAL: DIET	6-20 MONTHS MOUSE	LIVER	TUMORS	IRIS	IRIS	1.8E+0	IRIS	IRIS	010127
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
HEXACHLOROETHANE 000067-72-1										
	ORAL: GAVAGE	78 WEEKS MOUSE	LIVER	CARCINOMA	IRIS	IRIS	1.4E-2	IRIS	IRIS	005090
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									

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CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
HEPTACHLOR	000076-44-8									
	ORAL: DIET	MOUSE	LIVER	CARCINOMA	IRIS	IRIS	4.5E+0	IRIS	IRIS	005820
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
HEPTACHLOR EPOXIDE	001024-57-3									
	ORAL: DIET	18-24 MONTHS MOUSE	LIVER	CARCINOMA	IRIS	IRIS	9.1E+0	IRIS	IRIS	010424
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
HEXACHLOROBENZENE	000118-74-1									
	ORAL: DIET	RAT	LIVER	TUMORS	IRIS	IRIS	1.6E+0	IRIS	IRIS	010365
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
HEXACHLOROBUTADIENE	000087-68-3									
	ORAL: DIET	22-24 MONTHS RAT	KIDNEY	TUMORS	IRIS	IRIS	7.8E-2	IRIS	IRIS	005088
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
HEXACHLOROCYCLOHEXANE, ALPHA-	000319-84-6									
	ORAL: DIET	24 WEEKS MOUSE	LIVER	TUMORS	IRIS	IRIS	6.3E+0	IRIS	IRIS	010123
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
ETHYLENE THIOUREA		**000096-45-7**								
	ORAL: GAVAGE	2 YEARS MOUSE	LIVER	ADENOMA/ CARCINOMA, COMBINED	B2	1.1E-1		3.4E-6		010947
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
FOLPET		**000133-07-3**								
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).				IRIS	IRIS		IRIS		010120
FORMALDEHYDE		**000050-00-0**								
	INHALATION	24 MONTHS RAT	NASAL CAVITY	TUMORS	IRIS		4.5E-2		IRIS	010121
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
FURAZOLIDONE		**000067-45-8**								
	ORAL: DIET	45 WEEKS RAT	MAMMARY	TUMORS	B2	3.8E+0		1E-4		005106
	GENERAL COMMENT: FORMERLY LISTED UNDER NITROFURANS									
FURIUM		**000531-82-8**								
	ORAL: DIET	28 WEEKS MOUSE	BLOOD	LEUKEMIA	B2	5.0E+1		1.4E-3		005108
	GENERAL COMMENT: FORMERLY LISTED UNDER NITROFURANS									
GLYCIDALDEHYDE		**000765-34-4**								
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).				IRIS					010122

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
DIRECT BROWN 95		**016071-86-6**								
	ORAL: DIET	91 DAYS			A	9.3E+0		2.6E-4		010115
		RAT	LIVER	TUMORS						
	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
DIRECT SKY BLUE 6B		**002610-05-1**								
					B2					010116
	[EPA GROUP] COMMENT: BASED ON THE FACT THAT 3,3-DIMETHOXYBENZIDINE, A KNOWN EPA GROUP B2 CARCINOGEN, IS A METABOLITE OF DIRECT SKY BLUE 6B.									
EPICHLOROHYDRIN		**000106-89-8**								
					IRIS	IRIS		IRIS		010198
	INHALATION: INTERMITTENT	30 DAYS, OBSERVED LIFETIME			IRIS		4.2E-3		IRIS	010117
		RAT	NASAL CAVITY	TUMORS						
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
ETHYL ACRYLATE		**000140-88-5**								
	ORAL: GAVAGE	104 WEEKS			B2	4.8E-2		1.4E-6		010118
		RAT	FORESTOMACH	TUMORS						
ETHYLENE OXIDE		**000075-21-8**								
	ORAL: GAVAGE	LIFETIME, TWICE WEEKLY			B1	1.02E+0		2.9E-5		010421
		RAT	STOMACH	TUMORS						
	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
	INHALATION: INTERMITTENT	2 YEARS			B1		3.5E-1		1E-4	010422
		RAT	BLOOD	LEUKEMIA						
			BRAIN	GLIOMA						
	INHALATION [UNIT RISK] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)$^{-1}$	REFERENCE
DINITROTOLUENE, 2,4-	**000121-14-2**									
					IRIS	IRIS		IRIS		005066
GENERAL COMMENT: LISTED AS "DINITROTOLUENE MIXTURE, 2,4-/2,6-" ON IRIS. ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
DINITROTOLUENE, 2,6-	**000606-20-2**									
					IRIS	IRIS		IRIS		005068
GENERAL COMMENT: LISTED AS "DINITROTOLUENE MIXTURE, 2,4-/2,6-" ON IRIS. ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
DIOXANE, 1,4-	**000123-91-1**									
					IRIS	IRIS		IRIS		010298
DIPHENYLHYDRAZINE, 1,2-	**000122-66-7**									
ORAL: DIET		2 YEARS RAT	LIVER	TUMORS	IRIS	IRIS	8.0E-1	IRIS	IRIS	005070
INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										
DIRECT BLACK 38	**001937-37-7**									
ORAL: DIET		93 DAYS RAT	LIVER	TUMORS	B	8.6E+0		2.4E-4		010113
ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.										
DIRECT BLUE 6	**002602-46-2**									
ORAL: DIET		91 DAYS RAT	LIVER	TUMORS	A	8.1E+0		2.3E-4		010114
ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.										

HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
DIETHYLSTILBESTROL 000056-53-1										
	ORAL: DIET	MOUSE	MAMMARY GLAND	CARCINOMA	A	4.7E+3		1.3E-1		010485
DIMETHOXYBENZIDINE, 3,3'- 000119-90-4										
	ORAL: DIET	LIFETIME HAMSTER	FORESTOMACH	PAPILLOMA	B2	1.4E-2		4E-7		010106
DIMETHYLANILINE HYDROCHLORIDE, 2,4- 021436-96-4										
	ORAL: DIET	18 MONTHS MOUSE	LUNG	TUMORS	C	5.8E-1		1.7E-5		010108
DIMETHYLANILINE, 2,4- 000095-68-1										
	ORAL: DIET	18 MONTHS MOUSE	LUNG	TUMORS	C	7.5E-1		2.1E-5		010107
DIMETHYLBENZIDINE, 3,3'- 000119-93-7										
	ORAL: GAVAGE	30 DAYS RAT	MAMMARY	TUMORS	B2	9.2E+0		2.6E-4		010109
DIMETHYLBENZ[A]ANTHRACENE, 7,12- 000057-97-6										
	GENERAL COMMENT: FOR RCRA ACTIVITIES ONLY, CONTACT THE HEALTH ASSESSMENT SECTION (202) 260-4761 FOR RCRA APPROVED NUMERIC ASSESSMENT OF THIS COMPOUND.									010297
DIMETHYLHYDRAZINE, 1,1- 000057-14-7										
	GENERAL COMMENT: NO EPA GROUP CLASSIFICATION WAS PROVIDED IN THE REFERENCE DOCUMENT, THEREFORE THIS COMPOUND WAS REMOVED FROM TABLE 3.									
DIMETHYLHYDRAZINE, 1,2- 000540-73-8										
	GENERAL COMMENT: CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.				B2					010962
DIMETHYLSULFATE 000077-78-1										
					IRIS					010112

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	IEPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
DICHLOROPROPANE, 1,2-		**000078-87-5**								
	ORAL: GAVAGE	MOUSE	LIVER	TUMORS	B2	6.8E-2		1.9E-6		005062
	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
DICHLOROPROPENE, 1,3- / (TELONE II)		**000542-75-6**								
	ORAL: GAVAGE	104 WEEKS MOUSE	BLADDER	CARCINOMA	IRIS	1.8E-1		5E-6		010946
			RESPIRATORY SYSTEM	ALVEOLAR/ BRONCHIOLAR ADENOMA						
			FORESTOMACH	PAPILLOMA/ CARCINOMA						
	ORAL: GAVAGE	104 WEEKS RAT	LIVER	NEOPLASTIC NODULE/CARCINOMA						
			FORESTOMACH	PAPILLOMA/ CARCINOMA						
	ORAL [SLOPE] COMMENT: THE [SLOPE] IS THE GEOMETRIC MEAN OF SLOPE FACTORS OF COMBINED TUMORS LISTED.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
	INHALATION: INTERMITTENT	2 YEARS MOUSE	LUNG	ADENOMA	IRIS		1.3E-1		3.7E-5	010104
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
DIELDRIN		**000060-57-1**								
	ORAL: DIET	MOUSE	LIVER	CARCINOMA	IRIS	IRIS	1.6E+1	IRIS	IRIS	005816
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	INHALATION [UNIT RISK] COMMENT: BASED ON ROUTE-TO-ROUTE EXTRAPOLATION.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
DICHLOROBENZENE, 1,4- 000106-46-7										
	ORAL: GAVAGE	103 WEEKS MOUSE	LIVER	TUMORS	B2	2.4E-2		6.8E-7		005050
ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
DICHLOROBENZIDINE, 3,3'- 000091-94-1										
					IRIS	IRIS		IRIS		005815
DICHLOROETHANE, 1,1- 000075-34-3										
					IRIS					005055
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
DICHLOROETHANE, 1,2- 000107-06-2										
	ORAL: GAVAGE	78 WEEKS. RAT	CIRCULATORY SYSTEM	SARCOMA	IRIS	IRIS	9.1E-2	IRIS	IRIS	005058
INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)										
DICHLOROETHYLENE, 1,1- 000075-35-4										
					IRIS	IRIS		IRIS		005060
	INHALATION	12 MONTHS MOUSE	KIDNEY	ADENOCARCINOMA	IRIS		1.2E+0		IRIS	005059
INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
DIBROMO-3-CHLOROPROPANE, 1,2 000096-12-8										
	ORAL: DIET									
			STOMACH	TUMORS	B2	1.4E+0		4E-5		010484
			KIDNEY	TUMORS						
			LIVER	TUMORS						
	[EPA GROUP] COMMENT: UNDER REVIEW, CLASSIFICATION SUBJECT TO CHANGE.									
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST.									
	INHALATION: INTERMITTENT	RAT, MOUSE	NASAL CAVITY	TUMORS	B2		2.4E-3		6.9E-7	010519
DIBROMOCHLOROMETHANE 000124-48-1										
	GENERAL COMMENT: FORMERLY LISTED AS CHLORODIBROMOMETHANE. ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).				IRIS	IRIS		IRIS		010891
DIBROMOETHANE, 1,2- 000106-93-4										
	GENERAL COMMENT: FORMERLY LISTED UNDER ETHYLENE DIBROMIDE				IRIS	IRIS		IRIS		005818
	INHALATION: INTERMITTENT	88-103 WEEKS RAT	NASAL CAVITY	TUMORS	IRIS		7.6E-1		IRIS	005071
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
DICHLORO-2-BUTENE, 1,4- 000764-41-0										
	INHALATION: INTERMITTENT	90 DAYS RAT	NASAL PASSAGES	TUMORS	B2		9.3E+0		2.6E-3	005053
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: FORMERLY LISTED UNDER DICHLOROBUTENES									

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
CYANAZINE		021725-46-2								
	ORAL: DIET	2 YEARS RAT	MAMMARY GLAND	ADENOMA/ CARCINOMA, COMBINED	C	8.4E-1		2.4E-5		010944
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
DDD		000072-54-8								
					IRIS	IRIS		IRIS		010291
DDE		000072-55-9								
					IRIS	IRIS		IRIS		010292
DDT		000050-29-3								
	ORAL: DIET	MOUSE, RAT	LIVER	TUMORS	IRIS	IRIS	3.4E-1	IRIS	IRIS	005044
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
DECABROMODIPHENYL ETHER		001163-19-5								
					IRIS					010102
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
DIALLATE		002303-16-4								
	ORAL	19 MONTHS MOUSE	LIVER	TUMORS	B2	6.1E-2		1.7E-6		010103
DIBENZO[A,H]ANTHRACENE		000053-70-3								
					IRIS					010191
	GENERAL COMMENT: FOR RCRA ACTIVITIES ONLY, CONTACT THE HEALTH ASSESSMENT SECTION (202) 260-4761 FOR RCRA APPROVED NUMERIC ASSESSMENT OF THIS COMPOUND.									

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
COKE OVEN EMISSIONS 008007-45-2										
	INHALATION: OCCUPATIONAL	HUMAN	LUNG	TUMORS	IRIS		2.2E+0		IRIS	005039
INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: FORMERLY LISTED UNDER COAL TARS.										
CREOSOTE, COAL TAR 008001-58-9										
					IRIS					005042
CRESOL, M- / (3-METHYLPHENOL) 000108-39-4										
					IRIS					010187
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
CRESOL, O- / (2-METHYLPHENOL) 000095-48-7										
					IRIS					010186
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
CRESOL, P- / (4-METHYLPHENOL) 000106-44-5										
					IRIS					010188
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
CROTONALDEHYDE 000123-73-9										
	ORAL: DRINKING WATER	113 WKS RAT	LIVER	TUMOR	IRIS	1.9E+0		5.4E-5		010190
ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.										

HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	EPA GROUP	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
CHLOROMETHYL METHYL ETHER 000107-30-2										
					IRIS					005081
GENERAL COMMENT: FOR RCRA ACTIVITIES ONLY, CONTACT THE HEALTH ASSESSMENT SECTION (202) 260-4761 FOR RCRA APPROVED NUMERIC ASSESSMENT OF THIS COMPOUND.										
CHLORONITROBENZENE, O- 000088-73-3										
	ORAL: DIET	18 MONTHS MOUSE	LIVER	TUMORS	B2	2.5E-2		7.1E-7		010099
CHLORONITROBENZENE, P- 000100-00-5										
	ORAL: DIET	18 MONTHS MOUSE	CARDIOVASCULAR SYSTEM	TUMORS	B2	1.8E-2		5.1E-7		010100
CHLOROTHALONIL 001897-45-6										
	ORAL: DIET	27-32 MONTHS RAT	KIDNEY	TUMOR	B2	1.1E-2		3.1E-7		010384
ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE. GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
CHROMIUM(VI) 018540-29-9										
	INHALATION: OCCUPATIONAL	HUMAN	LUNG	TUMORS	IRIS		4.1E+1		IRIS	005091
INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
CHRYSENE 000218-01-9										
					IRIS					010185
GENERAL COMMENT: FOR RCRA ACTIVITIES ONLY, CONTACT THE HEALTH ASSESSMENT SECTION (202) 260-4761 FOR RCRA APPROVED NUMERIC ASSESSMENT OF THIS COMPOUND. ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										

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CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
CHLORO-2-METHYLANILINE, 4- 000095-69-2										
	ORAL: DIET	18 MONTHS MOUSE	CARDIOVASCULAR SYSTEM	HEMANGIOMA	B2	5.8E-1		1.6E-5		010098
			CARDIOVASCULAR SYSTEM	HEMANGIOSARCOMA						
ORAL [SLOPE] COMMENT: BASED ON VASCULAR TUMORS IN MICE TREATED WITH 4- CHLORO-2-METHYLANILINE HYDROCHLORIDE.										
CHLOROBENZILATE 000510-15-6										
	ORAL: GAVAGE, DIET	82 WEEKS MOUSE	LIVER	HEPATOMA	B2	2.7E-1	2.7E-1	7.8E-6	7.8E-5	010848
INHALATION [SLOPE] COMMENT: ABSORBANCE BY THE INHALATION ROUTE WAS ASSUMED TO EQUAL ORAL ABSORPTION SINCE THERE WERE NO PHARMACOKINETIC DATA TO THE CONTRARY. SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST.										
INHALATION [UNIT RISK] COMMENT: ABSORBANCE BY THE INHALATION ROUTE WAS ASSUMED TO EQUAL ORAL ABSORPTION SINCE THERE WERE NO PHARMACOKINETIC DATA TO THE CONTRARY.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
CHLOROFORM 000067-66-3										
					IRIS	IRIS		IRIS		005036
	ORAL: GAVAGE	78 WEEKS MOUSE	LIVER	CARCINOMA	IRIS		8.1E-2		IRIS	005035
INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
CHLOROMETHANE 000074-87-3										
	INHALATION: INTERMITTENT	24 MONTHS MOUSE	KIDNEY	TUMORS	C	1.3E-2	6.3E-3	3.7E-7	1.8E-6	005038
ORAL [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.										
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENCIITY).										

HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
CARBAZOLE		**000086-74-8**								
	ORAL: DIET	96 WEEKS MOUSE	LIVER	TUMORS	B2	2E-2		5.7E-7		010096
CARBON TETRACHLORIDE		**000056-23-5**								
	ORAL: DIET		LIVER	TUMORS	IRIS	IRIS	5.3E-2	IRIS	IRIS	005022

INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST.
INHALATION [UNIT RISK] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. INCORPORATES AN ABSORPTION FACTOR OF 0.4.
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

CHLORANIL		**000118-75-2**								
	ORAL: DIET	82 WEEKS MOUSE	LIVER	TUMORS	C	4.03E-1		1.2E-5		010097
			LUNG	TUMORS						
CHLORDANE		**000057-74-9**								
	ORAL: DIET	MOUSE	LIVER	CARCINOMA	IRIS	IRIS	1.3E+0	IRIS	IRIS	005026

INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST.
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

CHLORO-2-METHYLANILINE HYDROCHLORIDE, 4-		**003165-93-3**								
	ORAL: DIET	18 MONTHS MOUSE	CARDIOVASCULAR SYSTEM	HEMANGIOMA	B2	4.6E-1		1.3E-5		010419
			CARDIOVASCULAR SYSTEM	HEMANGIOSARCOMA						

0002080

7834

000234

HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
BROMOFORM		000075-25-2								
	ORAL: GAVAGE	2 YEARS RAT	INTESTINE, LARGE	ADENOMATOUS POLYP ADENOCARCINOMA	IRIS	IRIS	3.9E-3	IRIS	IRIS	005150
	INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
BUTADIENE, 1,3-		000106-99-0								
	INHALATION: INTERMITTENT	MOUSE	MULTIPLE SITES	TUMORS	IRIS		1.8E+0		IRIS	010477
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
BUTYL BENZYL PHTHALATE, N-		000085-68-7								
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)				IRIS					005122
CADMIUM		007440-43-9								
					IRIS				IRIS	005019
	ORAL [SLOPE] COMMENT: THERE IS INADEQUATE EVIDENCE FOR THE CARCINOGENICITY OF THIS COMPOUND BY THE ORAL ROUTE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
CAPTAFOL		002425-06-1								
	ORAL: DIET	MOUSE	LYMPHATIC SYSTEM	LYMPHOSARCOMA	C	8.6E-3		2.4E-7		010095
	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									
CAPTAN		000133-06-2								
					B2	3.5E-3		1.0E-7		010184
	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).									

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	IEPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
BIS(2-CHLOROISOPROPYL) ETHER 039638-32-9										
	ORAL: GAVAGE	2 YEARS MOUSE	LIVER	TUMORS	C	7E-2	3.5E-2	2E-6	1E-5	005079
			LUNG	TUMORS						
INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION (50% RESPIRATORY ABSORPTION). SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: FORMERLY LISTED AS BIS(2-CHLORO-1-METHYL(ETHYL)ETHER). ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
BIS(2-ETHYLHEXYL) PHTHALATE / (DEHP) 000117-81-7					IRIS	IRIS		IRIS		005120
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
BIS(CHLOROMETHYL) ETHER 000542-88-1										
	INHALATION: INTERMITTENT	10-100 DAYS RAT	RESPIRATORY SYSTEM	TUMORS	IRIS	IRIS	2.2E+2	IRIS	IRIS	005077
ORAL [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.										
BROMODICHLOROMETHANE 000075-27-4					IRIS	IRIS		IRIS		005148
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).										
BROMOETHENE / (VINYL BROMIDE) 000593-60-2										
	INHALATION: INTERMITTENT	2 YEARS RAT	LIVER	TUMORS	B2		1.1E-1		3.2E-5	010094
INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II: DOSE CONVERSIONS ON HEAST. GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)										

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
BENZO[A]ANTHRACENE		**000056-55-3**								
					IRIS					010182
BENZO[A]PYRENE		**000050-32-8**								
					IRIS	IRIS		IRIS		010508
BENZO[B]FLUORANTHENE		**000205-99-2**								
					IRIS					010183
BENZO[K]FLUORANTHENE		**000207-08-9**								
					IRIS					010090
BENZYL CHLORIDE		**000100-44-7**								
					IRIS	IRIS		IRIS		010093
BERYLLIUM		**007440-41-7**								
					IRIS	IRIS		IRIS		005018
	INHALATION: OCCUPATIONAL	HUMAN	LUNG	TUMORS	IRIS		8.4E+0		IRIS	005017
BIS(2-CHLOROETHYL) ETHER		**000111-44-4**								
	ORAL	560 DAYS MOUSE	LIVER	TUMORS	IRIS	IRIS	1.1E+0	IRIS	IRIS	005076

GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

GENERAL COMMENT: FOR RCRA ACTIVITIES ONLY, CONTACT THE HEALTH ASSESSMENT SECTION (202) 260-4761 FOR RCRA APPROVED NUMERIC ASSESSMENT OF THIS COMPOUND.

GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.

INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.

HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
ASBESTOS		**001332-21-4**								
					IRIS					005010
					IRIS				IRIS	005919
ATRAZINE		**001912-24-9**								
	ORAL: DIET	2 YEARS RAT	MAMMARY GLAND	ADENOMA	C	2.22E-1		6.3E-6		010380
			MAMMARY GLAND	FIBROADENOMA						
			MAMMARY GLAND	ADENOCARCINOMA						
			MAMMARY GLAND	CARCINOSARCOMA						
	ORAL [SLOPE] COMMENT: UNDER REVIEW, NUMBER SUBJECT TO CHANGE.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
AZOBENZENE		**000103-33-3**								
	ORAL: DIET	2 YEARS RAT	ABDOMINAL CAVITY	SARCOMA	IRIS	IRIS	1.1E-1	IRIS	IRIS	010089
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
BENZENE		**000071-43-2**								
	INHALATION: OCCUPATIONAL	HUMAN	BLOOD	LEUKEMIA	IRIS	IRIS	2.9E-2	IRIS	IRIS	005011
	ORAL [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.									
	INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.									
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)									
BENZIDINE		**000092-87-5**								
	GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).				IRIS	IRIS	IRIS	IRIS	IRIS	005014
BENZOTRICHLORIDE		**000098-07-7**								
					IRIS	IRIS		IRIS		010092

IRIS, EPA'S INTEGRATED RISK INFORMATION SYSTEM, IS UPDATED MONTHLY. FURTHER INFORMATION: RISK INFORMATION HOTLINE: (513) 569-7254.

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HEAST TABLE 3: CARCINOGENICITY

March 1994

CHEMICAL	ROUTE	EXPERIMENT LENGTH / SPECIES	TARGET	CANCER	[EPA GROUP]	[SLOPE FACTOR] ORAL (mg/kg/day)$^{-1}$	[SLOPE FACTOR] INHALATION (mg/kg/day)$^{-1}$	[UNIT RISK] ORAL (ug/L)$^{-1}$	[UNIT RISK] INHALATION (ug/cu m)-1	REFERENCE
ALDRIN		000309-00-2								
	ORAL: DIET	MOUSE	LIVER	CARCINOMA	IRIS	IRIS	1.7E+1	IRIS	IRIS	005006

INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.
INHALATION [UNIT RISK] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION.
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

ALLYL CHLORIDE		000107-05-1								
					IRIS					010181

GENERAL COMMENT: FOR RCRA ACTIVITIES ONLY, CONTACT THE HEALTH ASSESSMENT SECTION (202) 260-4761 FOR RCRA APPROVED NUMERIC ASSESSMENT OF THIS COMPOUND.
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY)

ANILINE		000062-53-3								
					IRIS	IRIS		IRIS		010088

GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

ARAMITE		000140-57-8								
	ORAL: DIET	104 WKS RAT	LIVER	TUMORS	IRIS	IRIS	2.5E-2	IRIS	IRIS	010206

INHALATION [SLOPE] COMMENT: BASED ON ROUTE TO ROUTE EXTRAPOLATION. SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

ARSENIC, INORGANIC		007440-38-2								
								IRIS		010925
	INHALATION: OCCUPATIONAL	HUMAN	RESPIRATORY SYSTEM	TUMORS	IRIS		5.0E+1		IRIS	005007

INHALATION [SLOPE] COMMENT: SEE APPENDIX A-II, DOSE CONVERSIONS ON HEAST.
GENERAL COMMENT: ALSO SEE HEAST TABLE 1: SUBCHRONIC AND CHRONIC TOXICITY (OTHER THAN CARCINOGENICITY).

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000345

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STYRENE 000100-42-5

010480 CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

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TCDD, 2,3,7,8- 001746-01-6

005128 KOCIBA, RJ, DG KEYES, JE BOWER ET AL. 1978. RESULTS OF A TWO-YEAR CHRONIC TOXICITY AND ONCOGENICITY STUDY OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN IN RATS. TOXICOL APPL PHARMACOL. 46(2): 279-303.

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TETRACHLOROETHYLENE 000127-18-4

010482 CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

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TRICHLOROANILINE HYDROCHLORIDE, 2,4,6- 033663-50-2

005142 WEISBURGER, EL, AB RUSSFIELD, R HOMBURGER, ET AL. 1978. TESTING OF 21 ENVIRONMENTAL AROMATIC AMINES OR DERIVATIVES FOR LONG-TERM TOXICITY OR CARCINOGENICITY. J ENVIRON PATHOL TOXICOL. 2: 325-356.

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TRICHLOROANILINE, 2,4,6- 000634-93-5

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US EPA. 1986. CARCINOGEN RISK ASSESSMENT VERIFICATION ENDEAVOR (CRAVE) WORK GROUP.

TRICHLOROETHYLENE 000079-01-6

010483 CONTACT THE SUPERFUND HEALTH RISK TECHNICAL SUPPORT CENTER: (513) 569-7300.

TRICHLOROPHENOL, 2,4,6- 000088-06-2

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US EPA. 1987. CARCINOGEN RISK ASSESSMENT VERIFICATION ENDEAVOR (CRAVE) WORK GROUP.

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TRINITROTOLUENE, 2,4,6- 000118-96-7

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VINYL CHLORIDE 000075-01-4

010368 FERON, VJ, CFM HENDRIKSEN, AJ SPEEK, ET AL. 1981. LIFESPAN ORAL TOXICITY STUDY OF VINYL CHLORIDE IN RATS. FOOD COSMET TOXICOL. 19(3): 317-333.

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US EPA. 1990. CARCINOGEN RISK ASSESSMENT VERIFICATION ENDEAVOR (CRAVE) WORK GROUP.

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
Actinium (89)	Ac-225[i]	014265-85-1	1.000E+01	D	Y	1.0E-03	1.7E-11	2.4E-09	7.6E-09
	Ac-227[i]	014952-40-0	2.180E+01	Y	Y	1.0E-03	2.8E-10	8.0E-08	2.6E-11
	Ac-227+D	014952-40-0(+D)	2.180E+01	Y	Y	1.0E-03	3.5E-10	8.8E-08	8.5E-07
	Ac-228[i]	014331-83-0	6.130E+00	H	Y	1.0E-03	5.0E-13	2.6E-11	2.9E-06
Americium (95)	Am-241[i]	014596-10-2	4.320E+02	Y	W	1.0E-03	2.4E-10	3.2E-08	4.9E-09
	Am-242	013981-54-9	1.600E+01	H	W	1.0E-03	3.6E-13	1.2E-11	5.8E-09
	Am-242m	013981-54-9(m)	1.520E+02	Y	W	1.0E-03	2.3E-10	2.8E-08	1.2E-10
	Am-243[i]	014993-75-0	7.380E+03	Y	W	1.0E-03	2.4E-10	3.2E-08	2.4E-08
	Am-243+D	014993-75-0(+D)	7.380E+03	Y	W	1.0E-03	2.4E-10	3.2E-08	2.5E-07
Antimony (51)	Sb-122	014374-79-9	2.700E+00	D	W	1.0E-01	2.0E-12	3.4E-12	1.4E-06
	Sb-124	014683-10-4	6.020E+01	D	W	1.0E-01	2.9E-12	2.2E-11	6.5E-06
	Sb-125	014234-35-6	2.770E+00	Y	W	1.0E-01	8.4E-13	1.1E-11	1.2E-06
	Sb-126	015756-32-8	1.240E+01	D	W	1.0E-01	2.8E-12	8.8E-12	9.1E-06
	Sb-126m	015756-32-8(m)	1.900E+01	M	W	1.0E-01	7.2E-14	2.6E-14	5.1E-06
	Sb-127	013968-50-8	3.850E+00	D	W	1.0E-01	2.0E-12	4.1E-12	2.1E-06
	Sb-129	014331-88-5	4.400E+00	H	W	1.0E-01	5.9E-13	5.1E-13	4.9E-06
Argon (18)	Ar-41	014163-25-8	1.830E+00	H	*	1.0E+00	----------	5.8E-16	4.4E-06
Astatine (85)	At-217[i]	017239-90-6	3.230E-02	S	D	1.0E+00	4.5E-18	5.6E-17	7.7E-10

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

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Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
Barium (56)	Ba-131	014914-75-1	1.180E+01	D	D	1.0E-01	4.8E-13	3.6E-13	1.2E-06
	Ba-133	013981-41-4	1.050E+01	Y	D	1.0E-01	1.2E-12	3.6E-12	8.4E-07
	Ba-133m	013981-41-4(m)	3.890E+01	H	D	1.0E-01	6.2E-13	3.5E-13	9.5E-08
	Ba-137m[t]	013981-97-0(m)	2.550E+00	M	D	1.0E-01	2.4E-15	6.0E-16	2.0E-06
	Ba-139	014378-25-7	8.310E+01	M	D	1.0E-01	2.1E-13	1.5E-13	7.7E-08
	Ba-140	014798-08-4	1.280E+01	D	D	1.0E-01	2.7E-12	2.0E-12	5.4E-07
Beryllium (4)	Be-7	013966-02-4	5.340E+01	D	Y	5.0E-03	3.0E-14	2.7E-13	1.5E-07
Bismuth (83)	Bi-206	015776-19-9	6.240E+00	D	W	5.0E-02	2.2E-12	4.3E-12	1.1E-05
	Bi-207	013982-38-2	3.340E+01	Y	W	5.0E-02	1.4E-12	1.8E-11	4.9E-06
	Bi-210[t]	014331-79-4	5.010E+00	D	W	5.0E-02	1.6E-12	8.0E-11	0.0E+00
	Bi-211[t]	015229-37-5	2.130E+00	M	W	5.0E-02	1.2E-14	1.9E-13	1.3E-07
	Bi-212[t]	014913-49-6	6.055E+01	M	W	5.0E-02	3.1E-13	6.6E-12	5.9E-07
	Bi-213[t]	015776-20-2	4.570E+01	M	W	5.0E-02	2.3E-13	3.0E-13	4.1E-07
	Bi-214[t]	014733-03-0	1.990E+01	M	W	5.0E-02	1.3E-13	2.1E-12	5.3E-06
Bromine (35)	Br-82	014686-69-2	3.530E+01	H	D	1.0E+00	1.1E-12	8.7E-13	8.9E-06
Cadmium (20)	Cd-109	014109-32-1	4.640E+02	D	Y	5.0E-02	7.9E-12	6.5E-11	7.3E-10
	Cd-115	014336-68-6	5.350E+01	H	Y	5.0E-02	1.7E-12	2.6E-12	6.3E-07
	Cd-115m	014336-68-6(m)	4.460E+01	D	Y	5.0E-02	5.2E-12	3.9E-11	7.5E-08

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
Calcium (20)	Ca-45	013966-05-7	1.630E+02 D	W	3.0E-01	9.9E-13	5.1E-12	5.8E-18
	Ca-47	001439-99-2	4.540E+00 D	W	3.0E-01	2.0E-12	4.6E-12	3.6E-06
Carbon (6)	C-11	014333-33-6	2.050E+01 M	D	1.0E+00	4.9E-14	2.1E-14	3.2E-06
	C-14	014762-75-5	5.730E+03 Y	•	1.0E+00	9.0E-13	6.4E-15	0.0E+00
	C-15	015929-23-4	2.450E+00 S	D	1.0E+00	8.1E-16	2.1E-16	---------
Cerium (58)	Ce-141	013967-74-3	3.250E+01 D	Y	3.0E-04	8.3E-13	8.4E-12	1.3E-07
	Ce-143	014119-19-8	3.300E+01 H	Y	3.0E-04	1.3E-12	2.2E-12	6.7E-07
	Ce-144	014762-78-8	2.840E+02 D	Y	3.0E-04	6.1E-12	3.4E-10	2.5E-08
Cesium (55)	Cs-131	014914-76-2	9.690E+00 D	D	1.0E+00	1.4E-13	1.0E-13	2.8E-09
	Cs-134	013967-70-9	2.060E+00 Y	D	1.0E+00	4.1E-11	2.8E-11	5.2E-06
	Cs-134m	013967-70-9(m)	2.900E+00 H	D	1.0E+00	4.1E-14	3.9E-14	2.0E-08
	Cs-135	015726-30-4	2.300E+06 Y	D	1.0E+00	4.0E-12	2.7E-12	0.0E+00
	Cs-136	014234-29-8	1.320E+01 D	D	1.0E+00	6.7E-12	4.6E-12	7.2E-06
	Cs-137[i]	010045-97-3	3.020E+01 Y	D	1.0E+00	2.8E-11	1.9E-11	0.0E+00
	Cs-137+D	010045-97-3(+D)	3.020E+01 Y	D	1.0E+00	2.8E-11	1.9E-11	2.0E-06
	Cs-138	015758-29-9	3.220E+01 M	D	1.0E+00	1.9E-13	9.6E-14	8.3E-06
Chlorine (17)	Cl-36	013981-43-6	3.010E+05 Y	D	1.0E+00	1.8E-12	1.4E-12	0.0E+00
	Cl-38	014158-34-0	3.720E+01 M	D	1.0E+00	2.3E-13	1.3E-13	5.7E-06

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

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Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
Chromium (24)	Cr-51	014392-02-0	2.770E+01	D	Y	1.0E-01	4.3E-14	3.0E-13	9.2E-08
Cobalt (27)	Co-57	013981-50-5	2.710E+02	D	Y	3.0E-01	5.8E-13	8.2E-12	1.9E-07
	Co-58	01381-38-9	7.080E+01	D	Y	3.0E-01	1.6E-12	9.8E-12	3.3E-06
	Co-58m	01381-38-9(m)	9.150E+00	H	Y	3.0E-01	3.2E-14	7.3E-14	4.8E-11
	Co-60	010198-40-0	5.270E+00	Y	Y	3.0E-01	1.5E-11	1.5E-10	8.6E-06
Copper (29)	Cu-64	013981-25-4	1.270E+01	H	Y	5.0E-01	1.7E-13	2.0E-13	6.0E-07
Curium (96)	Cm-242	015510-73-3	1.630E+02	D	W	1.0E-03	1.3E-11	3.9E-09	3.4E-11
	Cm-243	015757-87-6	2.850E+01	Y	W	1.0E-03	1.9E-10	2.6E-08	1.6E-07
	Cm-244	013981-15-2	1.810E+01	Y	W	1.0E-03	1.6E-10	2.2E-08	3.0E-11
	Cm-245	015621-76-8	8.500E+03	Y	W	1.0E-03	2.4E-10	3.2E-08	5.3E-08
	Cm-246	015757-90-1	4.750E+03	Y	W	1.0E-03	2.4E-10	3.2E-08	2.7E-11
	Cm-247	015758-32-4	1.560E+07	Y	W	1.0E-03	2.2E-10	3.0E-08	9.2E-07
	Cm-248	015758-33-5	3.390E+05	Y	W	1.0E-03	9.1E-10	1.2E-07	2.2E-11
Dysprosium (66)	Dy-165	013967-64-1	2.330E+00	H	W	3.0E-04	1.5E-13	1.1E-13	5.7E-08
	Dy-166	015840-01-4	8.160E+01	H	W	3.0E-04	1.9E-12	5.0E-12	2.7E-08
Erbium (63)	Er-169	015840-13-8	9.400E+00	D	W	3.0E-04	4.4E-13	1.5E-12	8.4E-12
	Er-171	014391-45-8	7.520E+00	H	W	3.0E-04	4.6E-13	3.9E-13	9.4E-07
Europium (63)	Eu-152	014683-23-9	1.360E+01	Y	W	1.0E-03	2.1E-12	1.1E-10	3.6E-06

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	Eu-154	015585-10-1	8.800E+00 Y	W	1.0E-03	3.0E-12	1.4E-10	4.1E-06
	Eu-155	014391-16-3	4.960E+00 Y	W	1.0E-03	4.5E-13	1.8E-11	5.9E-08
	Eu-156	014280-35-4	1.520E+01 D	W	1.0E-03	2.5E-12	1.1E-11	4.8E-06
Fluorine (9)	F-18	013981-56-1	1.100E+02 M	D	1.0E+00	9.8E-14	7.1E-14	3.1E-06
Francium (87)	Fr-221[i]	015756-41-9	4.800E+00 M	D	1.0E+00	5.9E-14	9.2E-13	6.2E-08
	Fr-223[i]	015756-98-6	2.180E+00 M	D	1.0E+00	1.7E-13	4.2E-13	4.1E-08
Gadolinium (64)	Gd-153	014276-65-4	2.420E+02 D	W	3.0E-04	3.1E-13	5.8E-12	7.3E-08
	Gd-159	014041-42-0	1.860E+01 H	W	3.0E-04	5.9E-13	6.3E-13	8.9E-08
Gallium (31)	Ga-67	014119-09-6	3.260E+00 D	W	1.0E-03	2.1E-13	3.6E-13	3.3E-07
	Ga-72	013982-22-4	1.410E+01 H	W	1.0E-03	1.3E-12	1.2E-12	9.8E-06
Germanium (32)	Ge-71	014374-81-3	1.180E+01 D	W	1.0E+00	6.8E-15	1.3E-13	2.3E-11
Gold (79)	Au-196	014914-16-0	6.180E+00 D	Y	1.0E-01	3.9E-13	8.7E-13	1.3E-06
	Au-198	010043-49-0	2.700E+00 D	Y	1.0E-01	1.2E-12	2.1E-12	1.2E-06
Holmium (67)	Ho-166	013967-65-2	2.680E+01 H	W	3.0E-04	1.7E-12	2.2E-12	6.5E-08
Hydrogen (1)	H-3	010028-17-8	1.230E+01 Y	•	1.0E+00	5.4E-14	7.8E-14	0.0E+00
Indium (49)	In-113m	014885-78-0(m)	1.660E+00 H	W	2.0E-02	4.9E-14	2.9E-14	7.0E-07
	In-114	013981-55-0	7.190E+01 S	W	2.0E-02	5.5E-15	1.5E-15	1.0E-07
	In-114m	013981-55-0(m)	4.950E+01 D	W	2.0E-02	5.4E-12	4.2E-11	1.8E-07

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

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Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	In-115	014191-71-0	4.600E+15	Y	W	2.0E-02	3.2E-11	2.2E-10	0.0E+00
	In-115m	014191-71-0(m)	4.360E+00	H	W	2.0E-02	1.2E-13	9.4E-14	3.9E-07
Iodine (53)	I-122	018287-75-7	3.620E+00	M	D	1.0E+00	2.5E-14	7.9E-15	3.0E-06
	I-123	015715-08-9	1.310E+01	H	D	1.0E+00	1.0E-12	5.7E-13	2.4E-07
	I-125	014158-31-7	6.010E+01	D	D	1.0E+00	7.9E-12	5.3E-12	2.9E-09
	I-126	014158-32-8	1.290E+01	D	D	1.0E+00	1.5E-11	9.8E-12	1.3E-06
	I-129	015046-84-1	1.570E+07	Y	D	1.0E+00	1.9E-10	1.2E-10	4.1E-09
	I-130	014914-02-4	1.240E+01	H	D	1.0E+00	9.1E-12	5.1E-12	7.0E-06
	I-131	010043-66-0	8.040E+00	D	D	1.0E+00	3.6E-11	2.4E-11	1.5E-06
	I-132	014683-16-0	2.300E+00	H	D	1.0E+00	1.0E-12	5.8E-13	7.7E-06
	I-133	014834-67-4	2.080E+01	H	D	1.0E+00	2.1E-11	1.2E-11	2.0E-06
	I-134	014914-27-3	5.260E+01	M	D	1.0E+00	2.8E-13	1.6E-13	9.0E-06
	I-135	014834-68-5	6.610E+00	H	D	1.0E+00	4.2E-12	2.4E-12	5.5E-06
	Ir-190	014981-91-0	1.180E+01	D	Y	1.0E-02	1.4E-12	4.8E-12	4.2E-06
Iridium (77)	Ir-192	014694-69-0	7.400E+01	D	Y	1.0E-02	1.7E-12	2.7E-11	2.4E-06
	Ir-194	014158-35-1	1.920E+01	H	Y	1.0E-02	1.6E-12	1.8E-12	2.8E-07
Iron (26)	Fe-55	014681-59-5	2.700E+00	Y	W	1.0E-01	2.7E-13	8.4E-13	0.0E+00
	Fe-59	014596-12-4	4.460E+01	D	W	1.0E-01	2.8E-12	9.7E-12	4.1E-06

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
Krypton (36)	Kr-83m	013965-98-5(m)	1.830E+00	H	•	1.0E+00	----------	6.2E-17	3.4E-11
	Kr-85	013983-27-2	1.070E+01	Y	•	1.0E+00	----------	4.7E-17	7.0E-09
	Kr-85m	013983-27-2(m)	4.480E+00	H	•	1.0E+00	----------	4.9E-16	3.4E-07
	Kr-87	014809-68-8	7.630E+01	M	•	1.0E+00	----------	2.2E-15	2.8E-06
	Kr-88	014995-61-0	2.840E+00	H	•	1.0E+00	----------	4.7E-15	7.3E-06
	Kr-89	016316-03-3	3.160E+00	M	•	1.0E+00	----------	2.6E-15	6.5E-06
	Kr-90	015741-13-6	3.230E+01	S	•	1.0E+00	----------	2.4E-15	4.2E-06
Lanthanum (57)	La-140	013981-28-7	4.020E+01	H	W	1.0E-03	2.3E-12	3.0E-12	8.0E-06
Lead (82)	Pb-203	014687-25-3	5.200E+01	H	D	2.0E-01	3.2E-13	2.6E-13	5.9E-07
	Pb-209[t]	014119-30-3	3.250E+00	H	D	2.0E-01	8.5E-14	7.0E-14	0.0E+00
	Pb-210[t]	014255-04-0	2.230E+01	Y	D	2.0E-01	5.1E-10	1.3E-09	1.3E-10
	Pb-210+D	014255-04-0(+D)	2.230E+01	Y	D	2.0E-01	6.6E-10	4.0E-09	1.6E-10
	Pb-211[t]	015816-77-0	3.610E+01	M	D	2.0E-01	1.8E-13	2.8E-12	1.6E-07
	Pb-212[t]	015092-94-1	1.060E+01	H	D	2.0E-01	5.5E-12	4.3E-11	2.8E-07
	Pb-214[t]	015067-28-4	2.680E+01	M	D	2.0E-01	1.7E-13	2.9E-12	6.4E-07
Lutetium (71)	Lu-177	014265-75-9	6.710E+00	D	Y	3.0E-04	6.2E-13	1.9E-12	6.7E-08
Manganese (25)	Mn-52	014092-99-0	5.590E+00	D	W	1.0E-01	2.2E-12	3.7E-12	1.2E-05
	Mn-54	013966-31-9	3.130E+02	D	W	1.0E-01	1.1E-12	5.3E-12	2.9E-06

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

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Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	Mn-56	014681-52-8	2.580E+00	H	W	1.0E-01	4.0E-13	2.8E-13	6.1E-06
Mercury (80)	Hg-197	013981-51-6	6.410E+01	H	W	2.0E-02	2.7E-13	4.5E-13	5.5E-08
	Hg-203	013982-78-0	4.660E+01	D	W	2.0E-02	6.6E-13	4.8E-12	5.7E-07
Molybdenum (42)	Mo-99	014119-15-4	6.600E+01	H	Y	8.0E-01	1.5E-12	2.6E-12	4.9E-07
Neodymium (60)	Nd-147	014269-74-0	1.100E+01	D	Y	3.0E-04	1.3E-12	5.5E-12	3.0E-07
	Nd-149	015749-81-2	1.730E+00	H	Y	3.0E-04	1.9E-13	1.6E-13	9.8E-07
Neptunium (93)	Np-236	015700-36-4	1.150E+05	Y	W	1.0E-03	2.3E-13	3.9E-12	8.9E-08
	Np-237[i]	013994-20-2	2.140E+06	Y	W	1.0E-03	2.2E-10	2.9E-08	7.8E-09
	Np-237+D	013994-20-2(+D)	2.140E+06	Y	W	1.0E-03	2.2E-10	2.9E-08	4.3E-07
	Np-238	015766-25-3	2.120E+00	D	W	1.0E-03	1.1E-12	3.3E-12	1.7E-06
	Np-239[i]	013968-59-7	2.360E+00	D	W	1.0E-03	9.4E-13	1.5E-12	2.3E-07
	Np-240	015690-84-3	6.500E+01	M	W	1.0E-03	1.3E-13	6.5E-14	3.2E-06
	Np-240m	015690-84-3(m)	7.400E+00	M	W	1.0E-03	2.9E-14	9.0E-15	9.3E-07
Nickel (28)	Ni-59	014336-70-0	7.500E+04	Y	W	5.0E-02	9.1E-14	7.0E-13	0.0E+00
	Ni-63	013981-37-8	1.000E+02	Y	W	5.0E-02	2.4E-13	1.8E-12	0.0E+00
	Ni-65	014833-49-9	2.520E+00	H	W	5.0E-02	2.6E-13	1.9E-13	1.9E-06
Niobium (41)	Nb-93m	007440-03-1(m)	1.460E+01	Y	Y	1.0E-02	1.5E-13	1.9E-11	5.3E-11
	Nb-94	014681-63-1	2.030E+04	Y	Y	1.0E-02	2.1E-12	2.1E-10	5.4E-06

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

000329

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	Nb-95	013967-76-5	3.510E+01	D	Y	1.0E-02	6.5E-13	5.1E-12	2.6E-06
	Nb-95m	013967-76-5(m)	8.660E+01	H	Y	1.0E-02	6.6E-13	1.6E-12	8.1E-08
	Nb-97	018496-04-3	7.210E+01	M	Y	1.0E-02	1.2E-13	6.9E-14	2.2E-06
	Nb-97m	018496-04-3(m)	6.000E+01	S	Y	1.0E-02	2.4E-15	1.1E-15	2.5E-06
Osmium (76)	Os-185	015766-50-4	9.360E+01	D	Y	1.0E-02	6.3E-13	8.9E-12	2.2E-06
	Os-191	014119-24-5	1.540E+01	D	Y	1.0E-02	6.7E-13	3.6E-12	8.5E-08
	Os-191m	014119-24-5(m)	1.300E+01	H	Y	1.0E-02	1.2E-13	2.1E-13	3.4E-09
	Os-193	016057-77-5	3.000E+01	H	Y	1.0E-02	9.6E-13	1.2E-12	1.7E-07
Palladium (46)	Pd-100	015690-69-4	3.640E+00	D	Y	5.0E-03	1.0E-12	2.3E-12	----------
	Pd-101	015749-54-9	8.480E+00	H	Y	5.0E-03	1.2E-13	1.1E-13	----------
	Pd-103	014967-68-1	1.700E+01	D	Y	5.0E-03	2.2E-13	1.4E-12	7.3E-10
	Pd-107	017637-99-9	6.500E+06	Y	Y	5.0E-03	4.4E-14	6.4E-12	0.0E+00
	Pd-109	014981-64-7	1.350E+01	H	Y	5.0E-03	7.9E-13	8.1E-13	2.2E-09
Phosphorus (15)	P-32	014596-37-3	1.430E+01	D	D	8.0E-01	3.5E-12	3.0E-12	0.0E+00
	P-33	015749-66-3	2.540E+01	D	D	8.0E-01	5.6E-13	4.6E-13	0.0E+00
Platinum (78)	Pt-191	015706-36-2	2.710E+00	D	D	1.0E-02	3.8E-13	3.0E-13	6.3E-07
	Pt-193	015735-70-3	5.000E+01	Y	D	1.0E-02	3.5E-14	8.2E-14	0.0E+00
	Pt-193m	015735-70-3(m)	4.330E+00	D	D	1.0E-02	5.3E-13	4.0E-13	7.6E-09

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

000330

1834

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	Pt-197	015735-74-7	1.830E+01	H	D	1.0E-02	4.9E-13	3.2E-13	3.1E-08
	Pt-197m	015735-74-7(m)	9.440E+01	M	D	1.0E-02	1.2E-13	8.7E-14	1.6E-07
Plutonium (94)	Pu-236	015411-92-4	2.850E+00	Y	Y	1.0E-03	5.0E-11	2.4E-08	3.4E-11
	Pu-238	013981-16-3	8.780E+01	Y	Y	1.0E-03	2.2E-10	3.9E-08	2.8E-11
	Pu-239	015117-48-3	2.410E+04	Y	Y	1.0E-03	2.3E-10	3.8E-08	1.7E-11
	Pu-240	014119-33-6	6.570E+03	Y	Y	1.0E-03	2.3E-10	3.8E-08	2.7E-11
	Pu-241	014119-32-5	1.440E+01	Y	Y	1.0E-03	3.6E-12	2.3E-10	0.0E+00
	Pu-242	013982-10-0	3.760E+05	Y	Y	1.0E-03	2.2E-10	3.6E-08	2.3E-11
	Pu-243	015706-37-3	4.960E+00	H	Y	1.0E-03	1.1E-13	1.0E-13	1.8E-08
	Pu-244	014119-34-7	8.260E+07	Y	Y	1.0E-03	2.2E-10	3.6E-08	1.9E-11
Polonium (84)	Po-210[t]	013981-52-7	1.380E+02	D	W	1.0E-01	1.5E-10	2.6E-09	2.9E-11
	Po-212[t]	015389-34-1	2.980E-07	S	W	1.0E-01	2.2E-23	6.1E-22	0.0E+00
	Po-213[t]	015756-57-7	4.200E-06	S	W	1.0E-01	3.2E-22	8.0E-21	1.0E-10
	Po-214[t]	015735-67-8	1.640E-04	S	W	1.0E-01	1.0E-20	2.8E-19	2.8E-10
	Po-215[t]	015706-52-2	1.780E-03	S	W	1.0E-01	2.8E-19	5.7E-18	4.6E-10
	Po-216[t]	015756-58-8	1.460E-01	S	W	1.0E-01	3.0E-17	4.8E-16	5.0E-11
	Po-218[t]	015422-24-9	3.050E+00	M	W	1.0E-01	2.8E-14	5.8E-13	0.0E+00
Potassium (19)	K-40	013966-00-2	1.280E+09	Y	D	1.0E+00	1.1E-11	7.6E-12	5.4E-07

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	K-42	014378-21-3	1.240E+01	H	D	1.0E+00	8.9E-13	1.2E-12	9.6E-07
Praseodymium (59)	Pr-142	014191-64-1	1.910E+01	H	Y	3.0E-04	1.6E-12	1.8E-12	2.1E-07
	Pr-143	014981-79-4	1.360E+01	D	Y	3.0E-04	1.4E-12	7.0E-12	3.0E-14
	Pr-144	014119-05-2	1.730E+01	M	Y	3.0E-04	9.5E-14	3.6E-14	1.2E-07
	Pr-144m	014119-05-2(m)	7.200E+00	M	Y	3.0E-04	3.7E-14	1.6E-14	2.1E-09
Promethium (61)	Pm-147	014380-75-7	2.620E+00	Y	Y	3.0E-04	3.1E-13	3.0E-11	6.0E-12
	Pm-148	014683-19-3	5.370E+00	D	Y	3.0E-04	3.1E-12	7.9E-12	1.9E-06
	Pm-148m	014683-19-3(m)	4.130E+01	D	Y	3.0E-04	2.5E-12	4.8E-11	6.5E-06
	Pm-149	015765-31-8	5.310E+01	H	Y	3.0E-04	1.2E-12	1.9E-12	3.3E-08
Protactinium (91)	Pa-231[1]	014331-85-2	3.730E+04	Y	Y	1.0E-03	9.2E-11	3.6E-08	2.6E-08
	Pa-233[1]	013981-14-1	2.700E+01	D	Y	1.0E-03	1.0E-12	8.6E-12	4.2E-07
	Pa-234	015100-28-4	6.700E+00	H	Y	1.0E-03	6.8E-13	5.4E-13	5.9E-06
	Pa-234m[1]	015100-28-4(m)	1.170E+00	M	Y	1.0E-03	5.8E-15	1.6E-15	3.6E-08
Radium (88)	Ra-223[1]	015623-45-7	1.140E+01	D	W	2.0E-01	6.4E-11	3.1E-09	2.3E-07
	Ra-224[1]	013233-32-4	3.620E+00	D	W	2.0E-01	3.8E-11	1.2E-09	2.3E-08
	Ra-225[1]	013981-53-8	1.480E+01	D	W	2.0E-01	5.1E-11	1.5E-09	1.9E-09
	Ra-226[1]	013982-63-3	1.600E+03	Y	W	2.0E-01	1.2E-10	3.0E-09	1.2E-08
	Ra-226+D	013982-63-3(+D)	1.600E+03	Y	W	2.0E-01	1.2E-10	3.0E-09	6.0E-06

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

000332

7834

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	Ra-228'	015262-20-1	5.750E+00 Y	W	2.0E-01	1.0E-10	6.6E-10	0.0E+00
	Ra-228+D	015262-20-1(+D)	5.750E+00 Y	W	2.0E-01	1.0E-10	6.9E-10	2.9E-06
Radon (86)	Rn-219'	014835-02-0	3.960E+00 S	*	1.0E+00	----------	4.6E-14	1.6E-07
	Rn-220'	022481-48-7	5.560E+01 S	*	1.0E+00	----------	1.2E-13	1.7E-09
	Rn-222'	014859-67-7	3.820E+00 D	*	1.0E+00	1.4E-12	7.3E-13	1.2E-09
	Rn-222+D	014859-67-7(+D)	3.820E+00 D	*	1.0E+00	1.7E-12	7.7E-12	5.9E-06
Rhodium (45)	Rh-103m	007440-16-6(m)	5.610E+01 M	Y	5.0E-02	6.9E-15	3.9E-15	7.9E-11
	Rh-105	014913-89-4	3.540E+01 H	Y	5.0E-02	4.3E-13	5.9E-13	2.2E-07
	Rh-105m	014913-89-4(m)	4.500E+01 S	Y	5.0E-02	6.2E-16	3.4E-16	2.2E-08
	Rh-106	014234-34-5	2.990E+01 S	Y	5.0E-02	4.4E-15	1.2E-15	6.7E-07
Rubidium (37)	Rb-82	014391-63-0	1.250E+00 M	D	1.0E+00	1.2E-14	3.5E-15	3.5E-06
	Rb-86	014932-53-7	1.870E+01 D	D	1.0E+00	5.9E-12	4.5E-12	3.3E-07
	Rb-87	013982-13-3	4.730E+10 Y	D	1.0E+00	3.4E-12	2.4E-12	0.0E+00
	Rb-88	014928-36-0	1.780E+01 M	D	1.0E+00	1.7E-13	7.9E-14	2.4E-06
	Rb-89	014191-65-2	1.540E+01 M	D	1.0E+00	9.3E-14	3.9E-14	7.4E-06
Ruthenium (44)	Ru-97	015758-35-7	2.900E+00 D	Y	5.0E-02	1.7E-13	2.6E-13	4.2E-07
	Ru-103	013968-53-1	3.940E+01 D	Y	5.0E-02	9.0E-13	8.4E-12	1.5E-06
	Ru-105	014331-95-4	4.440E+00 H	Y	5.0E-02	3.7E-13	3.3E-13	2.6E-06

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

000333

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	Ru-106	013967-48-1	3.680E+02	D	Y	5.0E-02	9.5E-12	4.4E-10	0.0E+00
Samarium (62)	Sm-147	014392-33-7	1.060E+11	Y	W	3.0E-04	1.6E-11	7.2E-09	0.0E+00
	Sm-151	015715-94-3	9.000E+01	Y	W	3.0E-04	1.1E-13	8.7E-12	4.0E-13
	Sm-153	015766-00-4	4.670E+01	H	W	3.0E-04	8.7E-13	1.3E-12	4.6E-08
Scandium (21)	Sc-46	013967-63-0	8.380E+01	D	Y	1.0E-04	1.6E-12	2.7E-11	6.9E-06
	Sc-47	014391-96-9	3.420E+00	D	Y	1.0E-04	6.4E-13	1.2E-12	2.3E-07
	Sc-48	014391-86-7	4.370E+01	H	Y	1.0E-04	1.9E-12	2.3E-12	1.2E-05
Selenium (34)	Se-75	014265-71-5	1.200E+02	D	W	8.0E-01	5.8E-12	6.0E-12	8.1E-07
Silicon (14)	Si-31	014276-49-4	1.570E+02	M	W	1.0E-02	2.2E-13	1.7E-13	3.0E-09
Silver (47)	Ag-105	014928-14-4	4.130E+01	D	Y	5.0E-02	7.3E-13	4.0E-12	---------
	Ag-108	014391-65-2	2.370E+00	M	Y	5.0E-02	8.5E-15	2.4E-15	5.1E-08
	Ag-108m	014391-65-2(m)	1.270E+02	Y	Y	5.0E-02	3.5E-12	1.5E-10	5.0E-06
	Ag-109m	014378-38-2(m)	3.960E+01	S	Y	5.0E-02	3.3E-16	8.9E-17	1.3E-09
	Ag-110	014391-76-5	2.460E+01	S	Y	5.0E-02	3.0E-15	8.1E-16	1.0E-07
	Ag-110m	014391-76-5(m)	2.500E+02	D	Y	5.0E-02	4.7E-12	6.9E-11	9.3E-06
	Ag-111	157690-04-0	7.460E+00	D	Y	5.0E-02	1.6E-12	4.8E-12	7.7E-08
Sodium (11)	Na-22	013966-32-0	2.600E+00	Y	D	1.0E+00	6.8E-12	4.8E-12	7.2E-06
	Na-24	013982-04-2	1.500E+01	H	D	1.0E+00	1.0E-12	9.6E-13	1.6E-05

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

000332

7834

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
Strontium (38)	Sr-82	014809-50-8	2.500E+01	D	D	3.0E-01	7.5E-12	6.9E-12	1.3E-10
	Sr-85	013967-73-2	6.480E+01	D	D	3.0E-01	7.7E-13	1.0E-12	1.4E-06
	Sr-85m	013967-73-2(m)	6.770E+01	M	D	3.0E-01	1.2E-14	6.1E-15	4.8E-07
	Sr-89	014158-27-1	5.060E+01	D	D	3.0E-01	3.0E-12	2.9E-12	4.7E-10
	Sr-90[i]	010098-97-2	2.860E+01	Y	D	3.0E-01	3.3E-11	5.6E-11	0.0E+00
	Sr-90+D	010098-97-2(+D)	2.860E+01	Y	D	3.0E-01	3.6E-11	6.2E-11	0.0E+00
	Sr-91	014331-91-0	9.500E+00	H	D	3.0E-01	8.5E-13	6.9E-13	2.4E-06
	Sr-92	014928-29-1	2.710E+00	H	D	3.0E-01	5.7E-13	4.5E-13	4.6E-06
Sulfur (16)	S-35	015117-53-0	8.740E+01	D	D	8.0E-01	2.2E-13	1.9E-13	0.0E+00
Tantalum (73)	Ta-182	013982-00-8	1.150E+02	D	Y	1.0E-03	1.7E-12	4.3E-11	4.1E-06
Technetium (43)	Tc-95	014809-56-4	2.000E+01	H	W	8.0E-01	5.6E-14	2.3E-14	2.4E-06
	Tc-95m	014809-56-4(m)	6.100E+01	D	W	8.0E-01	1.8E-12	4.0E-12	1.9E-06
	Tc-96	014808-44-7	4.280E+00	D	W	8.0E-01	1.8E-12	2.1E-12	8.3E-06
	Tc-96m	014808-44-7(m)	5.150E+01	M	W	8.0E-01	2.3E-14	2.1E-14	7.0E-08
	Tc-97	015759-35-0	2.600E+06	Y	W	8.0E-01	1.5E-13	9.8E-13	3.5E-10
	Tc-97m	015759-35-0(m)	8.900E+01	D	W	8.0E-01	1.1E-12	5.0E-12	3.7E-10
	Tc-99	014133-76-7	2.130E+05	Y	W	8.0E-01	1.3E-12	8.3E-12	6.0E-13
	Tc-99m	014133-76-7(m)	6.020E+00	H	W	8.0E-01	5.0E-14	2.7E-14	2.3E-07

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
Tellurium (52)	Te-125m	014390-73-9(m)	5.800E+01	D	W	2.0E-01	8.5E-13	5.4E-12	2.6E-09
	Te-127	013981-49-2	9.350E+00	H	W	2.0E-01	2.3E-13	2.3E-13	1.4E-08
	Te-127m	013981-49-2(m)	1.090E+02	D	W	2.0E-01	2.2E-12	1.6E-11	8.4E-10
	Te-129	014269-71-7	6.960E+01	M	W	2.0E-01	1.1E-13	6.8E-14	1.3E-07
	Te-129m	014269-71-7(m)	3.360E+01	D	W	2.0E-01	3.2E-12	2.0E-11	6.3E-08
	Te-131	014683-12-6	2.500E+01	M	W	2.0E-01	2.8E-13	1.4E-13	1.2E-06
	Te-131m	014683-12-6(m)	3.000E+01	H	W	2.0E-01	3.8E-12	5.4E-12	4.7E-06
	Te-132	014234-28-7	7.820E+01	H	W	2.0E-01	3.0E-12	5.3E-12	4.0E-07
Terbium (65)	Tb-158	015759-55-4	1.500E+02	Y	W	3.0E-04	1.2E-12	9.4E-11	----------
	Tb-160	013981-29-8	7.230E+01	D	W	3.0E-04	1.8E-12	1.9E-11	3.6E-06
Thallium (81)	Tl-202	015720-57-7	1.220E+01	D	D	1.0E+00	8.4E-13	6.0E-13	1.3E-06
	Tl-204	013968-51-9	3.780E+00	Y	D	1.0E+00	1.7E-12	1.3E-12	8.7E-10
	Tl-207'	014133-67-6	4.770E+00	M	D	1.0E+00	1.3E-14	4.5E-15	7.5E-09
	Tl-208'	014913-50-9	3.050E+00	M	D	1.0E+00	1.8E-14	5.0E-15	1.3E-05
	Tl-209'	015690-73-0	2.200E+00	M	D	1.0E+00	1.4E-14	4.3E-15	6.9E-06
Thorium (90)	Th-227'	015623-47-9	1.870E+01	D	Y	2.0E-04	4.5E-12	4.9E-09	1.6E-07
	Th-228'	014274-82-9	1.910E+00	Y	Y	2.0E-04	1.1E-11	7.7E-08	5.5E-10
	Th-228+D	014274-82-9(+D)	1.910E+00	Y	Y	2.0E-04	5.5E-11	7.8E-08	5.6E-06

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

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Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	Th-229'	015594-54-4	7.340E+03 Y	Y	2.0E-04	2.1E-11	7.3E-08	5.8E-08
	Th-229+D	015594-54-4(+D)	7.340E+03 Y	Y	2.0E-04	8.9E-11	7.7E-08	6.8E-07
	Th-230'	014269-63-7	7.700E+04 Y	Y	2.0E-04	1.3E-11	2.9E-08	5.4E-11
	Th-231'	014932-40-2	2.550E+01 H	Y	2.0E-04	4.0E-13	4.9E-13	2.3E-09
	Th-232'	007440-29-1	1.410E+10 Y	Y	2.0E-04	1.2E-11	2.8E-08	2.6E-11
	Th-234'	015065-10-8	2.410E+01 D	Y	2.0E-04	4.0E-12	3.2E-11	3.5E-09
Thulium (69)	Tm-170	013981-30-1	1.290E+02 D	W	3.0E-04	1.5E-12	2.1E-11	3.8E-09
	Tm-171	014333-45-0	1.920E+00 Y	W	3.0E-04	1.2E-13	3.1E-12	3.3E-10
Tin (50)	Sn-113	013966-06-8	1.150E+02 D	W	2.0E-02	8.7E-13	9.4E-12	3.3E-09
	Sn-121	014683-06-8	2.710E+01 H	W	2.0E-02	2.7E-13	3.2E-13	----------
	Sn-121m	014683-06-8(m)	5.550E+01 Y	W	2.0E-02	5.4E-13	9.3E-12	----------
	Sn-125	014683-08-0	9.640E+00 D	W	2.0E-02	3.6E-12	1.2E-11	1.1E-06
	Sn-126	015832-50-5	1.000E+05 Y	W	2.0E-02	5.6E-12	7.7E-11	3.3E-08
Tungsten (74)	W-181	015749-46-9	1.210E+02 D	D	3.0E-01	8.3E-14	6.4E-14	2.2E-08
	W-185	014932-41-3	7.510E+01 D	D	3.0E-01	4.7E-13	3.0E-13	4.7E-11
	W-187	014983-48-3	2.380E+01 H	D	3.0E-01	6.3E-13	3.9E-13	1.5E-06
Uranium (92)	U-232	014158-29-3	7.200E+01 Y	Y	5.0E-02	3.7E-11	6.0E-08	4.6E-11
	U-233	013968-55-3	1.590E+05 Y	Y	5.0E-02	1.6E-11	2.7E-08	4.2E-11

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	U-234'	013966-29-5	2.450E+05 Y	Y	5.0E-02	1.6E-11	2.6E-08	3.0E-11
	U-235'	015117-96-1	7.040E+08 Y	Y	5.0E-02	1.6E-11	2.5E-08	2.4E-07
	U-235+D	015117-96-1(+D)	7.040E+08 Y	Y	5.0E-02	1.6E-11	2.5E-08	2.4E-07
	U-236	013982-70-2	2.340E+07 Y	Y	5.0E-02	1.5E-11	2.5E-08	2.4E-11
	U-237	014269-75-1	6.750E+00 D	Y	5.0E-02	8.9E-13	2.6E-12	1.3E-07
	U-238'	007440-61-1	4.470E+09 Y	Y	5.0E-02	1.6E-11	2.4E-08	2.1E-11
	U-238+D	007440-61-1(+D)	4.470E+09 Y	Y	5.0E-02	2.0E-11	2.4E-08	5.1E-08
	U-240	015687-53-3	1.410E+01 H	Y	5.0E-02	1.2E-12	1.2E-12	1.5E-10
Vanadium (23)	V-48	014331-97-6	1.600E+01 D	W	1.0E-02	2.2E-12	7.6E-12	9.9E-06
Xenon (54)	Xe-122	015151-09-4	2.010E+01 H	•	1.0E+00	----------	3.3E-15	8.4E-08
	Xe-123	015700-10-4	2.140E+00 H	•	1.0E+00	----------	7.4E-16	1.7E-06
	Xe-125	013994-18-8	1.680E+01 H	•	1.0E+00	----------	4.2E-16	4.7E-07
	Xe-127	013994-19-9	3.640E+01 D	•	1.0E+00	----------	4.0E-16	5.0E-07
	Xe-129m	013965-99-6(m)	8.890E+00 D	•	1.0E+00	----------	6.0E-16	1.3E-08
	Xe-131m	014683-11-5(m)	1.180E+01 D	•	1.0E+00	----------	4.3E-16	4.5E-09
	Xe-133	014932-42-4	5.250E+00 D	•	1.0E+00	----------	4.3E-16	2.3E-08
	Xe-133m	014932-42-4(m)	2.190E+00 D	•	1.0E+00	----------	5.4E-16	3.3E-08
	Xe-135	014995-62-1	9.110E+00 H	•	1.0E+00	----------	8.0E-16	6.2E-07

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

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Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)
	Xe-135m	014995-62-1(m)	1.540E+01	M	•	1.0E+00	----------	2.1E-16	1.3E-06
	Xe-137	014835-21-3	3.830E+00	M	•	1.0E+00	----------	1.8E-15	6.0E-07
	Xe-138	015751-81-2	1.410E+01	M	•	1.0E+00	----------	2.8E-15	4.0E-06
Yttrium (39)	Y-90'	010098-91-6	6.410E+01	H	Y	1.0E-04	3.2E-12	5.5E-12	0.0E+00
	Y-91	014234-24-3	5.850E+01	D	Y	1.0E-04	2.8E-12	4.8E-11	1.2E-08
	Y-91m	014234-24-3(m)	4.970E+01	M	Y	1.0E-04	2.2E-14	3.5E-14	1.7E-06
	Y-92	015751-59-4	3.540E+00	H	Y	1.0E-04	7.1E-13	5.8E-13	8.6E-07
	Y-93	014981-70-5	1.010E+01	H	Y	1.0E-04	1.4E-12	1.4E-12	3.0E-07
Zinc (30)	Zn-65	013982-39-3	2.440E+02	D	Y	5.0E-01	8.5E-12	1.6E-11	2.0E-06
	Zn-69	013982-23-5	5.560E+01	M	Y	5.0E-01	5.6E-14	3.2E-14	1.8E-11
	Zn-69m	013982-23-5(m)	1.380E+01	H	Y	5.0E-01	4.3E-13	5.7E-13	1.3E-06
Zirconium (40)	Zr-93	015751-77-6	1.530E+06	Y	W	2.0E-03	1.7E-13	6.5E-12	0.0E+00
	Zr-95	013967-71-0	6.400E+01	D	W	2.0E-03	9.9E-13	1.0E-11	2.5E-06
	Zr-97	014928-30-4	1.690E+01	H	W	2.0E-03	2.4E-12	2.5E-12	6.1E-07

[Table 4A continues on the following page: Refer to Endnotes on the last page.]

Table 4A: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Picocuries[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/pCi)	Inhalation (Risk/pCi)	External Exposure (Risk/yr per pCi/g soil)

ENDNOTES:

[a] EPA classifies all radionuclides as Group A (known human) carcinogens. Radionuclide slope factors are calculated by EPA's Office of Radiation and Indoor Air (ORIA) to assist HEAST users with risk-related evaluations and decision-making at various stages of the remediation process. Ingestion and inhalation slope factors are best estimates (i.e., median or 50th percentile values) of the age-averaged, lifetime excess cancer incidence (fatal and nonfatal cancer) risk per unit of activity inhaled or ingested, expressed as risk/picocurie (pCi) in Table 4A or as risk/becquerel (Bq) in Table 4B. External exposure slope factors are best estimates of the lifetime excess cancer incidence risk for each year of exposure to external radiation from photon-emitting radionuclides distributed uniformly in a thick layer of soil, and are expressed as risk/yr per pCi/gram of soil (Table 4A) or as risk/yr per Bq/gram of soil (Table 4B). For a discussion on the derivation of radionuclide slope factors and guidance on their use, refer to the User's Guide section on radionuclide carcinogenicity.

[b] A curie (Ci), the customary unit of activity, is equal to 3.7×10^{10} nuclear transformations per second. 1 picocurie (pCi) = 10^{-12} Ci.

[c] For each radionuclide listed, slope factors correspond to the risks per unit intake or exposure for that radionuclide only, except when marked with a "+D" to indicate that the risks from radioactive decay chain products are also included. Radionuclides designated with a "†" are members of a decay chain. Refer to Exhibit 1 in the User's Guide section on radionuclide carcinogenicity for guidance on determining slope factors for partial or complete radioactive decay chains.

[d] Chemical Abstract Service Reference Number (CASRN). For risk calculations involving decay chains, a CASRN should be reported for the parent radionuclide and each chain member.

[e] Radioactive half-life: S = Second, M = Minute, D = Day, Y = Year. For those radionuclides with decay products (+D), half-lives are listed for the parent radionuclide.

[f] Lung clearance classification recommended by the International Commission on Radiological Protection (ICRP): Y = Year, W = Week, D = Day, * = Gas.

[g] Gastrointestinal (GI) absorption factors are the fractional amounts of each radionuclide absorbed across the GI tract into the bloodstream. Lung clearance classifications and GI absorption factors are provided for reference only. Do not use these factors to adjust (i.e., multiply or divide) inhalation or ingestion slope factors. See the User's Guide for instructions.

[Table 4A concluded.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
Actinium (89)	Ac-225'	014265-85-1	1.000E+01	D	Y	1.0E-03	4.6E-10	6.5E-08	2.1E-07
	Ac-227'	014952-40-0	2.180E+01	Y	Y	1.0E-03	7.6E-09	2.2E-06	7.0E-10
	Ac-227+D	014952-40-0(+D)	2.180E+01	Y	Y	1.0E-03	9.5E-09	2.4E-06	2.3E-05
	Ac-228	014331-83-0	6.130E+00	H	Y	1.0E-03	1.4E-11	7.0E-10	7.8E-05
Americium (95)	Am-241'	014596-10-2	4.320E+02	Y	W	1.0E-03	6.5E-09	8.6E-07	1.3E-07
	Am-242	013981-54-9	1.600E+01	H	W	1.0E-03	9.7E-12	3.2E-10	1.6E-07
	Am-242m	013981-54-9(m)	1.520E+02	Y	W	1.0E-03	6.2E-09	7.6E-07	3.2E-09
	Am-243'	014993-75-0	7.380E+03	Y	W	1.0E-03	6.5E-09	8.6E-07	6.5E-07
	Am-243+D	014993-75-0(+D)	7.380E+03	Y	W	1.0E-03	6.5E-09	8.6E-07	6.8E-06
Antimony (51)	Sb-122	014374-79-9	2.700E+00	D	W	1.0E-01	5.4E-11	9.2E-11	3.8E-05
	Sb-124	014683-10-4	6.020E+01	D	W	1.0E-01	7.8E-11	5.9E-10	1.8E-04
	Sb-125	014234-35-6	2.770E+00	Y	W	1.0E-01	2.3E-11	3.0E-10	3.2E-05
	Sb-126	015756-32-8	1.240E+01	D	W	1.0E-01	7.6E-11	2.4E-10	2.5E-04
	Sb-126m	015756-32-8(m)	1.900E+01	M	W	1.0E-01	1.9E-12	7.0E-13	1.4E-04
	Sb-127	013968-50-8	3.850E+00	D	W	1.0E-01	5.4E-11	1.1E-10	5.7E-05
	Sb-129	014331-88-5	4.400E+00	H	W	1.0E-01	1.6E-11	1.4E-11	1.3E-04
Argon (18)	Ar-41	014163-25-8	1.830E+00	H	*	1.0E+00	----------	1.6E-14	1.2E-04
Astatine (85)	At-217'	017239-90-6	3.230E-02	S	D	1.0E+00	1.2E-16	1.5E-15	2.1E-08

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
Barium (56)	Ba-131	014914-75-1	1.180E+01	D	D	1.0E-01	1.3E-11	9.7E-12	3.2E-05
	Ba-133	013981-41-4	1.050E+01	Y	D	1.0E-01	3.2E-11	9.7E-11	2.3E-05
	Ba-133m	013981-41-4(m)	3.890E+01	H	D	1.0E-01	1.7E-11	9.5E-12	2.6E-06
	Ba-137m'	013981-97-0(m)	2.550E+00	M	D	1.0E-01	6.5E-14	1.6E-14	5.4E-05
	Ba-139	014378-25-7	8.310E+01	M	D	1.0E-01	5.7E-12	4.1E-12	2.1E-06
	Ba-140	014798-08-4	1.280E+01	D	D	1.0E-01	7.3E-11	5.4E-11	1.5E-05
Beryllium (4)	Be-7	013966-02-4	5.340E+01	D	Y	5.0E-03	8.1E-13	7.3E-12	4.1E-06
Bismuth (83)	Bi-206	015776-19-9	6.240E+00	D	W	5.0E-02	5.9E-11	1.2E-10	3.0E-04
	Bi-207	013982-38-2	3.340E+01	Y	W	5.0E-02	3.8E-11	4.9E-10	1.3E-04
	Bi-210'	014331-79-4	5.010E+00	D	W	5.0E-02	4.3E-11	2.2E-09	0.0E+00
	Bi-211'	015229-37-5	2.130E+00	M	W	5.0E-02	3.3E-13	5.2E-12	3.6E-06
	Bi-212'	014913-49-6	6.055E+01	M	W	5.0E-02	8.4E-12	1.8E-10	1.6E-05
	Bi-213'	015776-20-2	4.570E+01	M	W	5.0E-02	6.2E-12	8.1E-12	1.1E-05
	Bi-214'	014733-03-0	1.990E+01	M	W	5.0E-02	3.5E-12	5.7E-11	1.4E-04
Bromine (35)	Br-82	014686-69-2	3.530E+01	H	D	1.0E+00	3.0E-11	2.4E-11	2.4E-04
Cadmium (20)	Cd-109	014109-32-1	4.640E+02	D	Y	5.0E-02	2.1E-10	1.8E-09	2.0E-08
	Cd-115	014336-68-6	5.350E+01	H	Y	5.0E-02	4.6E-11	7.0E-11	1.7E-05
	Cd-115m	014336-68-6(m)	4.460E+01	D	Y	5.0E-02	1.4E-10	1.1E-09	2.0E-06

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
Calcium (20)	Ca-45	013966-05-7	1.630E+02	D	W	3.0E-01	2.7E-11	1.4E-10	1.6E-16
	Ca-47	001439-99-2	4.540E+00	D	W	3.0E-01	5.4E-11	1.2E-10	9.7E-05
Carbon (6)	C-11	014333-33-6	2.050E+01	M	D	1.0E+00	1.3E-12	5.7E-13	8.6E-05
	C-14	014762-75-5	5.730E+03	Y	•	1.0E+00	2.4E-11	1.7E-13	0.0E+00
	C-15	015929-23-4	2.450E+00	S	D	1.0E+00	2.2E-14	5.7E-15	---------
Cerium (58)	Ce-141	013967-74-3	3.250E+01	D	Y	3.0E-04	2.2E-11	2.3E-10	3.5E-06
	Ce-143	014119-19-8	3.300E+01	H	Y	3.0E-04	3.5E-11	5.9E-11	1.8E-05
	Ce-144	014762-78-8	2.840E+02	D	Y	3.0E-04	1.6E-10	9.2E-09	6.8E-07
Cesium (55)	Cs-131	014914-76-2	9.690E+00	D	D	1.0E+00	3.8E-12	2.7E-12	7.6E-08
	Cs-134	013967-70-9	2.060E+00	Y	D	1.0E+00	1.1E-09	7.6E-10	1.4E-04
	Cs-134m	013967-70-9(m)	2.900E+00	H	D	1.0E+00	1.1E-12	1.1E-12	5.4E-07
	Cs-135	015726-30-4	2.300E+06	Y	D	1.0E+00	1.1E-10	7.3E-11	0.0E+00
	Cs-136	014234-29-8	1.320E+01	D	D	1.0E+00	1.8E-10	1.2E-10	1.9E-04
	Cs-137[i]	010045-97-3	3.020E+01	Y	D	1.0E+00	7.6E-10	5.1E-10	0.0E+00
	Cs-137+D	010045-97-3(+D)	3.020E+01	Y	D	1.0E+00	7.6E-10	5.1E-10	5.4E-05
	Cs-138	015758-29-9	3.220E+01	M	D	1.0E+00	5.1E-12	2.6E-12	2.2E-04
Chlorine (17)	Cl-36	013981-43-6	3.010E+05	Y	D	1.0E+00	4.9E-11	3.8E-11	0.0E+00
	Cl-38	014158-34-0	3.720E+01	M	D	1.0E+00	6.2E-12	3.5E-12	1.5E-04

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
Chromium (24)	Cr-51	014392-02-0	2.770E+01 D	Y	1.0E-01	1.2E-12	8.1E-12	2.5E-06
Cobalt (27)	Co-57	013981-50-5	2.710E+02 D	Y	3.0E-01	1.6E-11	2.2E-10	5.1E-06
	Co-58	01381-38-9	7.080E+01 D	Y	3.0E-01	4.3E-11	2.6E-10	8.9E-05
	Co-58m	01381-38-9(m)	9.150E+00 H	Y	3.0E-01	8.6E-13	2.0E-12	1.3E-09
	Co-60	010198-40-0	5.270E+00 Y	Y	3.0E-01	4.1E-10	4.1E-09	2.3E-04
Copper (29)	Cu-64	013981-25-4	1.270E+01 H	Y	5.0E-01	4.6E-12	5.4E-12	1.6E-05
Curium (96)	Cm-242	015510-73-3	1.630E+02 D	W	1.0E-03	3.5E-10	1.1E-07	9.2E-10
	Cm-243	015757-87-6	2.850E+01 Y	W	1.0E-03	5.1E-09	7.0E-07	4.3E-06
	Cm-244	013981-15-2	1.810E+01 Y	W	1.0E-03	4.3E-09	5.9E-07	8.1E-10
	Cm-245	015621-76-8	8.500E+03 Y	W	1.0E-03	6.5E-09	8.6E-07	1.4E-06
	Cm-246	015757-90-1	4.750E+03 Y	W	1.0E-03	6.5E-09	8.6E-07	7.3E-10
	Cm-247	015758-32-4	1.560E+07 Y	W	1.0E-03	5.9E-09	8.1E-07	2.5E-05
	Cm-248	015758-33-5	3.390E+05 Y	W	1.0E-03	2.5E-08	3.2E-06	5.9E-10
Dysprosium (66)	Dy-165	013967-64-1	2.330E+00 H	W	3.0E-04	4.1E-12	3.0E-12	1.5E-06
	Dy-166	015840-01-4	8.160E+01 H	W	3.0E-04	5.1E-11	1.4E-10	7.3E-07
Erbium (63)	Er-169	015840-13-8	9.400E+00 D	W	3.0E-04	1.2E-11	4.1E-11	2.3E-10
	Er-171	014391-45-8	7.520E+00 H	W	3.0E-04	1.2E-11	1.1E-11	2.5E-05
Europium (63)	Eu-152	014683-23-9	1.360E+01 Y	W	1.0E-03	5.7E-11	3.0E-09	9.7E-05

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	Eu-154	015585-10-1	8.800E+00	Y	W	1.0E-03	8.1E-11	3.8E-09	1.1E-04
	Eu-155	014391-16-3	4.960E+00	Y	W	1.0E-03	1.2E-11	4.9E-10	1.6E-06
	Eu-156	014280-35-4	1.520E+01	D	W	1.0E-03	6.8E-11	3.0E-10	1.3E-04
Florin (9)	F-18	013981-56-1	1.100E+02	M	D	1.0E+00	2.6E-12	1.9E-12	8.4E-05
Francium (87)	Fr-221[i]	015756-41-9	4.800E+00	M	D	1.0E+00	1.6E-12	2.5E-11	1.7E-06
	Fr-223[i]	015756-98-6	2.180E+00	M	D	1.0E+00	4.6E-12	1.1E-11	1.1E-06
Gadolinium (64)	Gd-153	014276-65-4	2.420E+02	D	W	3.0E-04	8.4E-12	1.6E-10	2.0E-06
	Gd-159	014041-42-0	1.860E+01	H	W	3.0E-04	1.6E-11	1.7E-11	2.4E-06
Gallium (31)	Ga-67	014119-09-6	3.260E+00	D	W	1.0E-03	5.7E-12	9.7E-12	8.9E-06
	Ga-72	013982-22-4	1.410E+01	H	W	1.0E-03	3.5E-11	3.2E-11	2.6E-04
Germanium (32)	Ge-71	014374-81-3	1.180E+01	D	W	1.0E+00	1.8E-13	3.5E-12	6.2E-10
Gold (79)	Au-196	014914-16-0	6.180E+00	D	Y	1.0E-01	1.1E-11	2.4E-11	3.5E-05
	Au-198	010043-49-0	2.700E+00	D	Y	1.0E-01	3.2E-11	5.7E-11	3.2E-05
Holmium (67)	Ho-166	013967-65-2	2.680E+01	H	W	3.0E-04	4.6E-11	5.9E-11	1.8E-06
Hydrogen (1)	H-3	010028-17-8	1.230E+01	Y	•	1.0E+00	1.5E-12	2.1E-12	0.0E+00
Indium (49)	In-113m	014885-78-0(m)	1.660E+00	H	W	2.0E-02	1.3E-12	7.8E-13	1.9E-05
	In-114	013981-55-0	7.190E+01	S	W	2.0E-02	1.5E-13	4.1E-14	2.7E-06
	In-114m	013981-55-0(m)	4.950E+01	D	W	2.0E-02	1.5E-10	1.1E-09	4.9E-06

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	In-115	014191-71-0	4.600E+15	Y	W	2.0E-02	8.6E-10	5.9E-09	0.0E+00
	In-115m	014191-71-0(m)	4.360E+00	H	W	2.0E-02	3.2E-12	2.5E-12	1.1E-05
Iodine (53)	I-122	018287-75-7	3.620E+00	M	D	1.0E+00	6.8E-13	2.1E-13	8.1E-05
	I-123	015715-08-9	1.310E+01	H	D	1.0E+00	2.7E-11	1.5E-11	6.5E-06
	I-125	014158-31-7	6.010E+01	D	D	1.0E+00	2.1E-10	1.4E-10	7.8E-08
	I-126	014158-32-8	1.290E+01	D	D	1.0E+00	4.1E-10	2.6E-10	3.5E-05
	I-129	015046-84-1	1.570E+07	Y	D	1.0E+00	5.1E-09	3.2E-09	1.1E-07
	I-130	014914-02-4	1.240E+01	H	D	1.0E+00	2.5E-10	1.4E-10	1.9E-04
	I-131	010043-66-0	8.040E+00	D	D	1.0E+00	9.7E-10	6.5E-10	4.1E-05
	I-132	014683-16-0	2.300E+00	H	D	1.0E+00	2.7E-11	1.6E-11	2.1E-04
	I-133	014834-67-4	2.080E+01	H	D	1.0E+00	5.7E-10	3.2E-10	5.4E-05
	I-134	014914-27-3	5.260E+01	M	D	1.0E+00	7.6E-12	4.3E-12	2.4E-04
	I-135	014834-68-5	6.610E+00	H	D	1.0E+00	1.1E-10	6.5E-11	1.5E-04
	Ir-190	014981-91-0	1.180E+01	D	Y	1.0E-02	3.8E-11	1.3E-10	1.1E-04
Iridium (77)	Ir-192	014694-69-0	7.400E+01	D	Y	1.0E-02	4.6E-11	7.3E-10	6.5E-05
	Ir-194	014158-35-1	1.920E+01	H	Y	1.0E-02	4.3E-11	4.9E-11	7.6E-06
Iron (26)	Fe-55	014681-59-5	2.700E+00	Y	W	1.0E-01	7.3E-12	2.3E-11	0.0E+00
	Fe-59	014596-12-4	4.460E+01	D	W	1.0E-01	7.6E-11	2.6E-10	1.1E-04

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
Krypton (36)	Kr-83m	013965-98-5(m)	1.830E+00	H	•	1.0E+00	----------	1.7E-15	9.2E-10
	Kr-85	013983-27-2	1.070E+01	Y	•	1.0E+00	----------	1.3E-15	1.9E-07
	Kr-85m	013983-27-2(m)	4.480E+00	H	•	1.0E+00	----------	1.3E-14	9.2E-06
	Kr-87	014809-68-8	7.630E+01	M	•	1.0E+00	----------	5.9E-14	7.6E-05
	Kr-88	014995-61-0	2.840E+00	H	•	1.0E+00	----------	1.3E-13	2.0E-04
	Kr-89	016316-03-3	3.160E+00	M	•	1.0E+00	----------	7.0E-14	1.8E-04
	Kr-90	015741-13-6	3.230E+01	S	•	1.0E+00	----------	6.5E-14	1.1E-04
Lanthanum (57)	La-140	013981-28-7	4.020E+01	H	W	1.0E-03	6.2E-11	8.1E-11	2.2E-04
Lead (82)	Pb-203	014687-25-3	5.200E+01	H	D	2.0E-01	8.6E-12	7.0E-12	1.6E-05
	Pb-209[i]	014119-30-3	3.250E+00	H	D	2.0E-01	2.3E-12	1.9E-12	0.0E+00
	Pb-210[i]	014255-04-0	2.230E+01	Y	D	2.0E-01	1.4E-08	3.5E-08	3.5E-09
	Pb-210+D	014255-04-0(+D)	2.230E+01	Y	D	2.0E-01	1.8E-08	1.1E-07	4.3E-09
	Pb-211[i]	015816-77-0	3.610E+01	M	D	2.0E-01	4.9E-12	7.6E-11	4.3E-06
	Pb-212[i]	015092-94-1	1.060E+01	H	D	2.0E-01	1.5E-10	1.2E-09	7.6E-06
	Pb-214[i]	015067-28-4	2.680E+01	M	D	2.0E-01	4.6E-12	7.8E-11	1.7E-05
Lutetium (71)	Lu-177	014265-75-9	6.710E+00	D	Y	3.0E-04	1.7E-11	5.1E-11	1.8E-06
Manganese (25)	Mn-52	014092-99-0	5.590E+00	D	W	1.0E-01	5.9E-11	1.0E-10	3.2E-04
	Mn-54	013966-31-9	3.130E+02	D	W	1.0E-01	3.0E-11	1.4E-10	7.8E-05

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	Mn-56	014681-52-8	2.580E+00	H	W	1.0E-01	1.1E-11	7.6E-12	1.6E-04
Mercury (80)	Hg-197	013981-51-6	6.410E+01	H	W	2.0E-02	7.3E-12	1.2E-11	1.5E-06
	Hg-203	013982-78-0	4.660E+01	D	W	2.0E-02	1.8E-11	1.3E-10	1.5E-05
Molybdenum (42)	Mo-99	014119-15-4	6.600E+01	H	Y	8.0E-01	4.1E-11	7.0E-11	1.3E-05
Neodymium (60)	Nd-147	014269-74-0	1.100E+01	D	Y	3.0E-04	3.5E-11	1.5E-10	8.1E-06
	Nd-149	015749-81-2	1.730E+00	H	Y	3.0E-04	5.1E-12	4.3E-12	2.6E-05
Neptunium (93)	Np-236	015700-36-4	1.150E+05	Y	W	1.0E-03	6.2E-12	1.1E-10	2.4E-06
	Np-237[i]	013994-20-2	2.140E+06	Y	W	1.0E-03	5.9E-09	7.8E-07	2.1E-07
	Np-237+D	013994-20-2(+D)	2.140E+06	Y	W	1.0E-03	5.9E-09	7.8E-07	1.2E-05
	Np-238	015766-25-3	2.120E+00	D	W	1.0E-03	3.0E-11	8.9E-11	4.6E-05
	Np-239[i]	013968-59-7	2.360E+00	D	W	1.0E-03	2.5E-11	4.1E-11	6.2E-06
	Np-240	015690-84-3	6.500E+01	M	W	1.0E-03	3.5E-12	1.8E-12	8.6E-05
	Np-240m	015690-84-3(m)	7.400E+00	M	W	1.0E-03	7.8E-13	2.4E-13	2.5E-05
Nickel (28)	Ni-59	014336-70-0	7.500E+04	Y	W	5.0E-02	2.5E-12	1.9E-11	0.0E+00
	Ni-63	013981-37-8	1.000E+02	Y	W	5.0E-02	6.5E-12	4.9E-11	0.0E+00
	Ni-65	014833-49-9	2.520E+00	H	W	5.0E-02	7.0E-12	5.1E-12	5.1E-05
Niobium (41)	Nb-93m	007440-03-1(m)	1.460E+01	Y	Y	1.0E-02	4.1E-12	5.1E-10	1.4E-09
	Nb-94	014681-63-1	2.030E+04	Y	Y	1.0E-02	5.7E-11	5.7E-09	1.5E-04

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	Nb-95	013967-76-5	3.510E+01	D	Y	1.0E-02	1.8E-11	1.4E-10	7.0E-05
	Nb-95m	013967-76-5(m)	8.660E+01	H	Y	1.0E-02	1.8E-11	4.3E-11	2.2E-06
	Nb-97	018496-04-3	7.210E+01	M	Y	1.0E-02	3.2E-12	1.9E-12	5.9E-05
	Nb-97m	018496-04-3(m)	6.000E+01	S	Y	1.0E-02	6.5E-14	3.0E-14	6.8E-05
Osmium (76)	Os-185	015766-50-4	9.360E+01	D	Y	1.0E-02	1.7E-11	2.4E-10	5.9E-05
	Os-191	014119-24-5	1.540E+01	D	Y	1.0E-02	1.8E-11	9.7E-11	2.3E-06
	Os-191m	014119-24-5(m)	1.300E+01	H	Y	1.0E-02	3.2E-12	5.7E-12	9.2E-08
	Os-193	016057-77-5	3.000E+01	H	Y	1.0E-02	2.6E-11	3.2E-11	4.6E-06
Palladium (46)	Pd-100	015690-69-4	3.640E+00	D	Y	5.0E-03	2.7E-11	6.2E-11	---------
	Pd-101	015749-54-9	8.480E+00	H	Y	5.0E-03	3.2E-12	3.0E-12	---------
	Pd-103	014967-68-1	1.700E+01	D	Y	5.0E-03	5.9E-12	3.8E-11	2.0E-08
	Pd-107	017637-99-9	6.500E+06	Y	Y	5.0E-03	1.2E-12	1.7E-10	0.0E+00
	Pd-109	014981-64-7	1.350E+01	H	Y	5.0E-03	2.1E-11	2.2E-11	5.9E-08
Phosphorus (15)	P-32	014596-37-3	1.430E+01	D	D	8.0E-01	9.5E-11	8.1E-11	0.0E+00
	P-33	015749-66-3	2.540E+01	D	D	8.0E-01	1.5E-11	1.2E-11	0.0E+00
Platinum (78)	Pt-191	015706-36-2	2.710E+00	D	D	1.0E-02	1.0E-11	8.1E-12	1.7E-05
	Pt-193	015735-70-3	5.000E+01	Y	D	1.0E-02	9.5E-13	2.2E-12	0.0E+00
	Pt-193m	015735-70-3(m)	4.330E+00	D	D	1.0E-02	1.4E-11	1.1E-11	2.1E-07

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	Pt-197	015735-74-7	1.830E+01	H	D	1.0E-02	1.3E-11	8.6E-12	8.4E-07
	Pt-197m	015735-74-7(m)	9.440E+01	M	D	1.0E-02	3.2E-12	2.4E-12	4.3E-06
Plutonium (94)	Pu-236	015411-92-4	2.850E+00	Y	Y	1.0E-03	1.4E-09	6.5E-07	9.2E-10
	Pu-238	013981-16-3	8.780E+01	Y	Y	1.0E-03	5.9E-09	1.1E-06	7.6E-10
	Pu-239	015117-48-3	2.410E+04	Y	Y	1.0E-03	6.2E-09	1.0E-06	4.6E-10
	Pu-240	014119-33-6	6.570E+03	Y	Y	1.0E-03	6.2E-09	1.0E-06	7.3E-10
	Pu-241	014119-32-5	1.440E+01	Y	Y	1.0E-03	9.7E-11	6.2E-09	0.0E+00
	Pu-242	013982-10-0	3.760E+05	Y	Y	1.0E-03	5.9E-09	9.7E-07	6.2E-10
	Pu-243	015706-37-3	4.960E+00	H	Y	1.0E-03	3.0E-12	2.7E-12	4.9E-07
	Pu-244	014119-34-7	8.260E+07	Y	Y	1.0E-03	5.9E-09	9.7E-07	5.1E-10
Polonium (84)	Po-210'	013981-52-7	1.380E+02	D	W	1.0E-01	4.1E-09	7.0E-08	7.8E-10
	Po-212'	015389-34-1	2.980E-07	S	W	1.0E-01	5.9E-22	1.6E-20	0.0E+00
	Po-213'	015756-57-7	4.200E-06	S	W	1.0E-01	8.6E-21	2.2E-19	2.7E-09
	Po-214'	015735-67-8	1.640E-04	S	W	1.0E-01	2.7E-19	7.6E-18	7.6E-09
	Po-215'	015706-52-2	1.780E-03	S	W	1.0E-01	7.6E-18	1.5E-16	1.2E-08
	Po-216'	015756-58-8	1.460E-01	S	W	1.0E-01	8.1E-16	1.3E-14	1.4E-09
	Po-218'	015422-24-9	3.050E+00	M	W	1.0E-01	7.6E-13	1.6E-11	0.0E+00
Potassium (19)	K-40	013966-00-2	1.280E+09	Y	D	1.0E+00	3.0E-10	2.1E-10	1.5E-05

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	K-42	014378-21-3	1.240E+01	H	D	1.0E+00	2.4E-11	3.2E-11	2.6E-05
Praseodymium (59)	Pr-142	014191-64-1	1.910E+01	H	Y	3.0E-04	4.3E-11	4.9E-11	5.7E-06
	Pr-143	014981-79-4	1.360E+01	D	Y	3.0E-04	3.8E-11	1.9E-10	8.1E-13
	Pr-144	014119-05-2	1.730E+01	M	Y	3.0E-04	2.6E-12	9.7E-13	3.2E-06
	Pr-144m	014119-05-2(m)	7.200E+00	M	Y	3.0E-04	1.0E-12	4.3E-13	5.7E-08
Promethium (61)	Pm-147	014380-75-7	2.620E+00	Y	Y	3.0E-04	8.4E-12	8.1E-10	1.6E-10
	Pm-148	014683-19-3	5.370E+00	D	Y	3.0E-04	8.4E-11	2.1E-10	5.1E-05
	Pm-148m	014683-19-3(m)	4.130E+01	D	Y	3.0E-04	6.8E-11	1.3E-09	1.8E-04
	Pm-149	015765-31-8	5.310E+01	H	Y	3.0E-04	3.2E-11	5.1E-11	8.9E-07
Protactinium (91)	Pa-231[1]	014331-85-2	3.730E+04	Y	Y	1.0E-03	2.5E-09	9.7E-07	7.0E-07
	Pa-233[1]	013981-14-1	2.700E+01	D	Y	1.0E-03	2.7E-11	2.3E-10	1.1E-05
	Pa-234	015100-28-4	6.700E+00	H	Y	1.0E-03	1.8E-11	1.5E-11	1.6E-04
	Pa-234m[1]	015100-28-4(m)	1.170E+00	M	Y	1.0E-03	1.6E-13	4.3E-14	9.7E-07
Radium (88)	Ra-223[1]	015623-45-7	1.140E+01	D	W	2.0E-01	1.7E-09	8.4E-08	6.2E-06
	Ra-224[1]	013233-32-4	3.620E+00	D	W	2.0E-01	1.0E-09	3.2E-08	6.2E-07
	Ra-225[1]	013981-53-8	1.480E+01	D	W	2.0E-01	1.4E-09	4.1E-08	5.1E-08
	Ra-226[1]	013982-63-3	1.600E+03	Y	W	2.0E-01	3.2E-09	8.1E-08	3.2E-07
	Ra-226+D	013982-63-3(+D)	1.600E+03	Y	W	2.0E-01	3.2E-09	8.1E-08	1.6E-04

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	Ra-228'	015262-20-1	5.750E+00	Y	W	2.0E-01	2.7E-09	1.8E-08	0.0E+00
	Ra-228+D	015262-20-1(+D)	5.750E+00	Y	W	2.0E-01	2.7E-09	1.9E-08	7.8E-05
Radon (86)	Rn-219'	014835-02-0	3.960E+00	S	•	1.0E+00	----------	1.2E-12	4.3E-06
	Rn-220'	022481-48-7	5.560E+01	S	•	1.0E+00	----------	3.2E-12	4.6E-08
	Rn-222'	014859-67-7	3.820E+00	D	•	1.0E+00	3.8E-11	2.0E-11	3.2E-08
	Rn-222+D	014859-67-7(+D)	3.820E+00	D	•	1.0E+00	4.6E-11	2.1E-10	1.6E-04
Rhodium (45)	Rh-103m	007440-16-6(m)	5.610E+01	M	Y	5.0E-02	1.9E-13	1.1E-13	2.1E-09
	Rh-105	014913-89-4	3.540E+01	H	Y	5.0E-02	1.2E-11	1.6E-11	5.9E-06
	Rh-105m	014913-89-4(m)	4.500E+01	S	Y	5.0E-02	1.7E-14	9.2E-15	5.9E-07
	Rh-106	014234-34-5	2.990E+01	S	Y	5.0E-02	1.2E-13	3.2E-14	1.8E-05
Rubidium (37)	Rb-82	014391-63-0	1.250E+00	M	D	1.0E+00	3.2E-13	9.5E-14	9.5E-05
	Rb-86	014932-53-7	1.870E+01	D	D	1.0E+00	1.6E-10	1.2E-10	8.9E-06
	Rb-87	013982-13-3	4.730E+10	Y	D	1.0E+00	9.2E-11	6.5E-11	0.0E+00
	Rb-88	014928-36-0	1.780E+01	M	D	1.0E+00	4.6E-12	2.1E-12	6.5E-05
	Rb-89	014191-65-2	1.540E+01	M	D	1.0E+00	2.5E-12	1.1E-12	2.0E-04
Ruthenium (44)	Ru-97	015758-35-7	2.900E+00	D	Y	5.0E-02	4.6E-12	7.0E-12	1.1E-05
	Ru-103	013968-53-1	3.940E+01	D	Y	5.0E-02	2.4E-11	2.3E-10	4.1E-05
	Ru-105	014331-95-4	4.440E+00	H	Y	5.0E-02	1.0E-11	8.9E-12	7.0E-05

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	Ru-106	013967-48-1	3.680E+02	D	Y	5.0E-02	2.6E-10	1.2E-08	0.0E+00
Samarium (62)	Sm-147	014392-33-7	1.060E+11	Y	W	3.0E-04	4.3E-10	1.9E-07	0.0E+00
	Sm-151	015715-94-3	9.000E+01	Y	W	3.0E-04	3.0E-12	2.4E-10	1.1E-11
	Sm-153	015766-00-4	4.670E+01	H	W	3.0E-04	2.4E-11	3.5E-11	1.2E-06
Scandium (21)	Sc-46	013967-63-0	8.380E+01	D	Y	1.0E-04	4.3E-11	7.3E-10	1.9E-04
	Sc-47	014391-96-9	3.420E+00	D	Y	1.0E-04	1.7E-11	3.2E-11	6.2E-06
	Sc-48	014391-86-7	4.370E+01	H	Y	1.0E-04	5.1E-11	6.2E-11	3.2E-04
Selenium (34)	Se-75	014265-71-5	1.200E+02	D	W	8.0E-01	1.6E-10	1.6E-10	2.2E-05
Silicon (14)	Si-31	014276-49-4	1.570E+02	M	W	1.0E-02	5.9E-12	4.6E-12	8.1E-08
Silver (47)	Ag-105	014928-14-4	4.130E+01	D	Y	5.0E-02	2.0E-11	1.1E-10	----------
	Ag-108	014391-65-2	2.370E+00	M	Y	5.0E-02	2.3E-13	6.5E-14	1.4E-06
	Ag-108m	014391-65-2(m)	1.270E+02	Y	Y	5.0E-02	9.5E-11	4.1E-09	1.4E-04
	Ag-109m	014378-38-2(m)	3.960E+01	S	Y	5.0E-02	8.9E-15	2.4E-15	3.5E-08
	Ag-110	014391-76-5	2.460E+01	S	Y	5.0E-02	8.1E-14	2.2E-14	2.7E-06
	Ag-110m	014391-76-5(m)	2.500E+02	D	Y	5.0E-02	1.3E-10	1.9E-09	2.5E-04
	Ag-111	157690-04-0	7.460E+00	D	Y	5.0E-02	4.3E-11	1.3E-10	2.1E-06
Sodium (11)	Na-22	013966-32-0	2.600E+00	Y	D	1.0E+00	1.8E-10	1.3E-10	1.9E-04
	Na-24	013982-04-2	1.500E+01	H	D	1.0E+00	2.7E-11	2.6E-11	4.3E-04

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
Strontium (38)	Sr-82	014809-50-8	2.500E+01 D	D	3.0E-01	2.0E-10	1.9E-10	3.5E-09
	Sr-85	013967-73-2	6.480E+01 D	D	3.0E-01	2.1E-11	2.7E-11	3.8E-05
	Sr-85m	013967-73-2(m)	6.770E+01 M	D	3.0E-01	3.2E-13	1.6E-13	1.3E-05
	Sr-89	014158-27-1	5.060E+01 D	D	3.0E-01	8.1E-11	7.8E-11	1.3E-08
	Sr-90'	010098-97-2	2.860E+01 Y	D	3.0E-01	8.9E-10	1.5E-09	0.0E+00
	Sr-90+D	010098-97-2(+D)	2.860E+01 Y	D	3.0E-01	9.7E-10	1.7E-09	0.0E+00
	Sr-91	014331-91-0	9.500E+00 H	D	3.0E-01	2.3E-11	1.9E-11	6.5E-05
	Sr-92	014928-29-1	2.710E+00 H	D	3.0E-01	1.5E-11	1.2E-11	1.2E-04
Sulfur (16)	S-35	015117-53-0	8.740E+01 D	D	8.0E-01	5.9E-12	5.1E-12	0.0E+00
Tantalum (73)	Ta-182	013982-00-8	1.150E+02 D	Y	1.0E-03	4.6E-11	1.2E-09	1.1E-04
Technetium (43)	Tc-95	014809-56-4	2.000E+01 H	W	8.0E-01	1.5E-12	6.2E-13	6.5E-05
	Tc-95m	014809-56-4(m)	6.100E+01 D	W	8.0E-01	4.9E-11	1.1E-10	5.1E-05
	Tc-96	014808-44-7	4.280E+00 D	W	8.0E-01	4.9E-11	5.7E-11	2.2E-04
	Tc-96m	014808-44-7(m)	5.150E+01 M	W	8.0E-01	6.2E-13	5.7E-13	1.9E-06
	Tc-97	015759-35-0	2.600E+06 Y	W	8.0E-01	4.1E-12	2.6E-11	9.5E-09
	Tc-97m	015759-35-0(m)	8.900E+01 D	W	8.0E-01	3.0E-11	1.4E-10	1.0E-08
	Tc-99	014133-76-7	2.130E+05 Y	W	8.0E-01	3.5E-11	2.2E-10	1.6E-11
	Tc-99m	014133-76-7(m)	6.020E+00 H	W	8.0E-01	1.4E-12	7.3E-13	6.2E-06

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
Tellurium (52)	Te-125m	014390-73-9(m)	5.800E+01	D	W	2.0E-01	2.3E-11	1.5E-10	7.0E-08
	Te-127	013981-49-2	9.350E+00	H	W	2.0E-01	6.2E-12	6.2E-12	3.8E-07
	Te-127m	013981-49-2(m)	1.090E+02	D	W	2.0E-01	5.9E-11	4.3E-10	2.3E-08
	Te-129	014269-71-7	6.960E+01	M	W	2.0E-01	3.0E-12	1.8E-12	3.5E-06
	Te-129m	014269-71-7(m)	3.360E+01	D	W	2.0E-01	8.6E-11	5.4E-10	1.7E-06
	Te-131	014683-12-6	2.500E+01	M	W	2.0E-01	7.6E-12	3.8E-12	3.2E-05
	Te-131m	014683-12-6(m)	3.000E+01	H	W	2.0E-01	1.0E-10	1.5E-10	1.3E-04
	Te-132	014234-28-7	7.820E+01	H	W	2.0E-01	8.1E-11	1.4E-10	1.1E-05
Terbium (65)	Tb-158	015759-55-4	1.500E+02	Y	W	3.0E-04	3.2E-11	2.5E-09	----------
	Tb-160	013981-29-8	7.230E+01	D	W	3.0E-04	4.9E-11	5.1E-10	9.7E-05
Thallium (81)	Tl-202	015720-57-7	1.220E+01	D	D	1.0E+00	2.3E-11	1.6E-11	3.5E-05
	Tl-204	013968-51-9	3.780E+00	Y	D	1.0E+00	4.6E-11	3.5E-11	2.4E-08
	Tl-207'	014133-67-6	4.770E+00	M	D	1.0E+00	3.5E-13	1.2E-13	2.0E-07
	Tl-208'	014913-50-9	3.050E+00	M	D	1.0E+00	4.9E-13	1.4E-13	3.5E-04
	Tl-209'	015690-73-0	2.200E+00	M	D	1.0E+00	3.8E-13	1.2E-13	1.9E-04
Thorium (90)	Th-227'	015623-47-9	1.870E+01	D	Y	2.0E-04	1.2E-10	1.3E-07	4.3E-06
	Th-228'	014274-82-9	1.910E+00	Y	Y	2.0E-04	3.0E-10	2.1E-06	1.5E-08
	Th-228+D	014274-82-9(+D)	1.910E+00	Y	Y	2.0E-04	1.5E-09	2.1E-06	1.5E-04

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	Th-229[i]	015594-54-4	7.340E+03	Y	Y	2.0E-04	5.7E-10	2.0E-06	---------
	Th-229+D	015594-54-4(+D)	7.340E+03	Y	Y	2.0E-04	2.4E-09	2.1E-06	1.8E-05
	Th-230[i]	014269-63-7	7.700E+04	Y	Y	2.0E-04	3.5E-10	7.8E-07	1.5E-09
	Th-231[i]	014932-40-2	2.550E+01	H	Y	2.0E-04	1.1E-11	1.3E-11	6.2E-08
	Th-232[i]	007440-29-1	1.410E+10	Y	Y	2.0E-04	3.2E-10	7.6E-07	7.0E-10
	Th-234[i]	015065-10-8	2.410E+01	D	Y	2.0E-04	1.1E-10	8.6E-10	9.5E-08
Thulium (69)	Tm-170	013981-30-1	1.290E+02	D	W	3.0E-04	4.1E-11	5.7E-10	1.0E-07
	Tm-171	014333-45-0	1.920E+00	Y	W	3.0E-04	3.2E-12	8.4E-11	8.9E-09
Tin (50)	Sn-113	013966-06-8	1.150E+02	D	W	2.0E-02	2.4E-11	2.5E-10	8.9E-08
	Sn-121	014683-06-8	2.710E+01	H	W	2.0E-02	7.3E-12	8.6E-12	---------
	Sn-121m	014683-06-8(m)	5.550E+01	Y	W	2.0E-02	1.5E-11	2.5E-10	---------
	Sn-125	014683-08-0	9.640E+00	D	W	2.0E-02	9.7E-11	3.2E-10	3.0E-05
	Sn-126	015832-50-5	1.000E+05	Y	W	2.0E-02	1.5E-10	2.1E-09	8.9E-07
Tungsten (74)	W-181	015749-46-9	1.210E+02	D	D	3.0E-01	2.2E-12	1.7E-12	5.9E-07
	W-185	014932-41-3	7.510E+01	D	D	3.0E-01	1.3E-11	8.1E-12	1.3E-09
	W-187	014983-48-3	2.380E+01	H	D	3.0E-01	1.7E-11	1.1E-11	4.1E-05
Uranium (92)	U-232	014158-29-3	7.200E+01	Y	Y	5.0E-02	1.0E-09	1.6E-06	1.2E-09
	U-233	013968-55-3	1.590E+05	Y	Y	5.0E-02	4.3E-10	7.3E-07	1.1E-09

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

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Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	U-234[i]	013966-29-5	2.450E+05 Y	Y	5.0E-02	4.3E-10	7.0E-07	8.1E-10
	U-235[i]	015117-96-1	7.040E+08 Y	Y	5.0E-02	4.3E-10	6.8E-07	6.5E-06
	U-235+D	015117-96-1(+D)	7.040E+08 Y	Y	5.0E-02	4.3E-10	6.8E-07	6.5E-06
	U-236	013982-70-2	2.340E+07 Y	Y	5.0E-02	4.1E-10	6.8E-07	6.5E-10
	U-237	014269-75-1	6.750E+00 D	Y	5.0E-02	2.4E-11	7.0E-11	3.5E-06
	U-238[i]	007440-61-1	4.470E+09 Y	Y	5.0E-02	4.3E-10	6.5E-07	5.7E-10
	U-238+D	007440-61-1(+D)	4.470E+09 Y	Y	5.0E-02	5.4E-10	6.5E-07	1.4E-06
	U-240	015687-53-3	1.410E+01 H	Y	5.0E-02	3.2E-11	3.2E-11	4.1E-09
Vanadium (23)	V-48	014331-97-6	1.600E+01 D	W	1.0E-02	5.9E-11	2.1E-10	2.7E-04
Xenon (54)	Xe-122	015151-09-4	2.010E+01 H	•	1.0E+00	----------	8.9E-14	2.3E-06
	Xe-123	015700-10-4	2.140E+00 H	•	1.0E+00	----------	2.0E-14	4.6E-05
	Xe-125	013994-18-8	1.680E+01 H	•	1.0E+00	----------	1.1E-14	1.3E-05
	Xe-127	013994-19-9	3.640E+01 D	•	1.0E+00	----------	1.1E-14	1.4E-05
	Xe-129m	013965-99-6(m)	8.890E+00 D	•	1.0E+00	----------	1.6E-14	3.5E-07
	Xe-131m	014683-11-5(m)	1.180E+01 D	•	1.0E+00	----------	1.2E-14	1.2E-07
	Xe-133	014932-42-4	5.250E+00 D	•	1.0E+00	----------	1.2E-14	6.2E-07
	Xe-133m	014932-42-4(m)	2.190E+00 D	•	1.0E+00	----------	1.5E-14	8.9E-07
	Xe-135	014995-62-1	9.110E+00 H	•	1.0E+00	----------	2.2E-14	1.7E-05

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]		ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure: Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)
	Xe-135m	014995-62-1(m)	1.540E+01	M	*	1.0E+00	----------	5.7E-15	3.5E-05
	Xe-137	014835-21-3	3.830E+00	M	*	1.0E+00	----------	4.9E-14	1.6E-05
	Xe-138	015751-81-2	1.410E+01	M	*	1.0E+00	----------	7.6E-14	1.1E-04
Yttrium (39)	Y-90[i]	010098-91-6	6.410E+01	H	Y	1.0E-04	8.6E-11	1.5E-10	0.0E+00
	Y-91	014234-24-3	5.850E+01	D	Y	1.0E-04	7.6E-11	1.3E-09	3.2E-07
	Y-91m	014234-24-3(m)	4.970E+01	M	Y	1.0E-04	5.9E-13	9.5E-13	4.6E-05
	Y-92	015751-59-4	3.540E+00	H	Y	1.0E-04	1.9E-11	1.6E-11	2.3E-05
	Y-93	014981-70-5	1.010E+01	H	Y	1.0E-04	3.8E-11	3.8E-11	8.1E-06
Zinc (30)	Zn-65	013982-39-3	2.440E+02	D	Y	5.0E-01	2.3E-10	4.3E-10	5.4E-05
	Zn-69	013982-23-5	5.560E+01	M	Y	5.0E-01	1.5E-12	8.6E-13	4.9E-10
	Zn-69m	013982-23-5(m)	1.380E+01	H	Y	5.0E-01	1.2E-11	1.5E-11	3.5E-05
Zirconium (40)	Zr-93	015751-77-6	1.530E+06	Y	W	2.0E-03	4.6E-12	1.8E-10	0.0E+00
	Zr-95	013967-71-0	6.400E+01	D	W	2.0E-03	2.7E-11	2.7E-10	6.8E-05
	Zr-97	014928-30-4	1.690E+01	H	W	2.0E-03	6.5E-11	6.8E-11	1.6E-05

[Table 4B continues on the following page: Refer to Endnotes on the last page.]

000353

7834

Table 4B: Radionuclide Carcinogenicity -- Slope Factors[a] (In Units of Becquerels[b])

MARCH 1994

Element (Atomic Number)	Isotope[c]	CASRN[d]	Radioactive Half-life[e]	ICRP Lung Class[f]	GI Absorption Factor (f_1)[g]	Slope Factor: Lifetime Excess Total Cancer Risk Per Unit Intake or Exposure		
						Ingestion (Risk/Bq)	Inhalation (Risk/Bq)	External Exposure (Risk/yr per Bq/g soil)

ENDNOTES:

[a] EPA classifies all radionuclides as Group A (known human) carcinogens. Radionuclide slope factors are calculated by EPA's Office of Radiation and Indoor Air (ORIA) to assist HEAST users with risk-related evaluations and decision-making at various stages of the remediation process. Ingestion and inhalation slope factors are best estimates (i.e., median or 50th percentile values) of the age-averaged, lifetime excess cancer incidence (fatal and nonfatal cancer) risk per unit of activity inhaled or ingested, expressed as risk/picocurie (pCi) in Table 4A or as risk/becquerel (Bq) in Table 4B. External exposure slope factors are best estimates of the lifetime excess cancer incidence risk for each year of exposure to external radiation from photon-emitting radionuclides distributed uniformly in a thick layer of soil, and are expressed as risk/yr per pCi/gram of soil (Table 4A) or as risk/yr per Bq/gram of soil (Table 4B). For a discussion on the derivation of radionuclide slope factors and guidance on their use, refer to the User's Guide section on radionuclide carcinogenicity.

[b] A becquerel (Bq), the International System (SI) unit of activity, is equal to one nuclear transformations per second. 1 Bq ≈ 27 picocuries (pCi).

[c] For each radionuclide listed, slope factors correspond to the risks per unit intake or exposure for that radionuclide only, except when marked with a "+D" to indicate that the risks from radioactive decay chain products are also included. Radionuclides designated with a "†" are members of a decay chain. Refer to Exhibit 1 in the User's Guide section on radionuclide carcinogenicity for guidance on determining slope factors for partial or complete radioactive decay chains.

[d] Chemical Abstract Service Reference Number (CASRN). For risk calculations involving decay chains, a CASRN should be reported for the parent radionuclide and each chain member.

[e] Radioactive half-life: S = Second, M = Minute, D = Day, Y = Year. For those radionuclides with decay products (+D), half-lives are listed for the parent radionuclide.

[f] Lung clearance classification recommended by the International Commission on Radiological Protection (ICRP): Y = Year, W = Week, D = Day, * = Gas.

[g] Gastrointestinal (GI) absorption factors are the fractional amounts of each radionuclide absorbed across the GI tract into the bloodstream. Lung clearance classifications and GI absorption factors are provided for reference only. Do not use these factors to adjust (i.e., multiply or divide) inhalation or ingestion slope factors. See the User's Guide for instructions.

[Table 4B concluded.]

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APPENDIX A: TECHNICAL INFORMATION

I. DATA SOURCES AND SELECTION CRITERIA USED IN HEAST

II. DOSE CONVERSIONS ON HEAST

III. CHEMICAL NAME AND CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBERS CROSS REFERENCE

IV. EFFECT LEVEL DEFINITIONS

V. NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

APPENDIX A-I

I. DATA SOURCES AND SELECTION CRITERIA USED IN HEAST

A. Description of Sources and Documents Cited in HEAST

1. The Integrated Risk Information System (IRIS)

IRIS is an on-line data base developed by the EPA for compilation of risk assessment and regulatory information on chemicals and physical agents. IRIS is the primary communications mechanism for distribution of health hazard assessment information derived by the various intra-Agency Work Groups. The primary intent of IRIS is to provide guidance to EPA personnel in making risk management decisions. An IRIS chemical file contains a Work Group verified summary of the available information on hazard and dose-response assessment for noncarcinogenic and/or carcinogenic effects for that chemical and is not an extensive toxicologic data base. Risk assessment values placed on IRIS are considered Agency consensus and take precedence over differing risk assessment values from other EPA sources. Each file includes referenced citations and EPA contacts for obtaining further information on any specific chemical or agent. The IRIS data base was made available to State and local governments, as well as to the public, in April 1988.

* Questions concerning IRIS: Call RISK INFORMATION HOTLINE at (513) 569-7254

2. EPA Work Groups:

Risk assessment values for chemicals currently being considered by EPA Work Groups, but not yet on IRIS, are included in HEAST. The EPA Reference Dose/Reference Concentration (RfD/RfC) Work Group and the Carcinogen Risk Assessment Verification Endeavor (CRAVE) Work Group validates Agency systemic toxicity and carcinogen risk assessments, respectively. These Work Groups are also responsible for resolving any conflicts regarding toxicity values developed by various Program Offices. Work Group members represent many different EPA offices and are scientists experienced in issues related to both the qualitative and quantitative risk assessment of carcinogenic and toxic agents. Values verified by these Work Groups have undergone extensive peer review and represent an Agency consensus. Verified risk assessment values are entered into the IRIS data base monthly.

* Questions concerning RfD/RfC Work Group: Call Mike Dourson (ECAO-Cincinnati) at (513) 569-7533 or Annie Jarabek (ECAO-Research Triangle Park) at (919) 541-4847

• Questions concerning CRAVE Work Group: Call Jim Cogliano at (202) 260-3814 (OHEA-Washington, DC)

3. Office of Research and Development (ORD/Office of Health and Environmental Assessment (OHEA) OSWER-OAQPS (Office of Solid Waste and Emergency Response-Office of Air Quality Planning and Standards) Documents:

A listing of most ORD/OHEA OSWER-OAQPS documents can be found in the Chemical Assessments and Related Activities (CARA) list (available through NTIS) or in the CERI (Center for Environmental Research Information) Office of Research and Development publications list. The CARA is produced by the Office of Health and Environmental Assessment (OHEA). All OSWER-OAQPS documents are subject to a minimum of internal EPA peer review or a maximum of EPA/Peer Review Workshop/Science Advisory Board and public comments prior to finalization.

• Information on the availability of OSWER-OAQPS documents can be obtained from the following sources:

All Documents:

Technical Information Staff
Office of Health and Environmental Assessment (RD-689)
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460
(202) 260-7345

Published Documents:

Center for Environmental Research Information (CERI)
Office of Research and Development
U.S. Environmental Protection Agency
26 W. Martin Luther King Drive
Cincinnati, OH 45268
(513) 569-7562

Documents Available Through RCRA/Superfund:

Hotline Number 1-800-424-9346

000362

Documents Available from NTIS:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

Health Effects Assessments (HEAs): This document series was prepared by the Environmental Criteria and Assessment Office (ECAO-Cincinnati) for the Office of Emergency and Remedial Response (Superfund). HEAs are intended for use by the OERR in evaluating risk for its preliminary assessment process at uncontrolled sites, and for appraising clean-up alternatives in its remedial investigation/feasibility studies. HEAs are brief, quantitatively oriented, preliminary assessment of relevant health effects data. HEAs are subject to internal EPA review by staff within the Office of Health and Environmental Assessment. Final drafts of HEAs become part of the RCRA and Superfund dockets and are available through NTIS. This series has recently been incorporated into the following HEED series.

Health and Environmental Effects Documents (HEEDs): This document series is prepared by the Environmental Criteria and Assessment Office (ECAO-Cincinnati) for the Office of Solid Waste and Emergency Response (OSWER). HEEDs are intended to support listings under the Resource Conservation and Recovery Act (RCRA) as well as to provide health-related limits and goals for emergency and remedial actions under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Within a HEED, both published literature and information within Agency Program Offices are evaluated as they pertain to potential human health, aquatic life and environmental effects of hazardous waste constituents. Quantitative estimates, including reference doses for chronic and subchronic duration for both inhalation and oral exposures, carcinogenic potency factors, unit risk estimates for air and drinking water, and reportable quantities (RQs) based on chronic toxicity and carcinogenicity are determined when sufficient data are available. HEEDs are subject to internal EPA review by staff within the Office of Health and Environmental Assessment and the Office of Pesticides and Toxic Substances. Final drafts of HEEDs become part of the RCRA and Superfund public dockets and are available through NTIS.

Health and Environmental Effects Profiles (HEEPs): This document series was prepared by the Environmental Criteria and Assessment Office (ECAO-Cincinnati) for the Office of Solid Waste and Emergency Response (OSWER). HEEPs have been superseded by HEEDs since mid-FY87. HEEPs are intended to support listings of hazardous constituents of a wide range of waste streams under Section 3001 of the Resource Conservation and Recovery Act (RCRA), as well as to provide health-related limits for emergency actions under Section 010 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). HEEPs are summaries of the

literature concerning health hazards associated with environmental exposures to chemicals or compounds and are very similar to HEEDs as described above. HEEPs were subject to internal EPA review by staff within the Office of Health and Environmental Assessment. HEEPS are part of the RCRA and CERCLA public dockets. Final drafts are available through NTIS.

Air Quality Criteria Documents (AQCDs): This document series is prepared by the Environmental Criteria and Assessment Office (ECAO-Research Triangle Park) for the Office of Air and Radiation (OAR). AQCDs are intended to support National Ambient Air Quality Standards (NAAQS) set under Sections 108-110 of the Clean Air Act. These documents are evaluations of the available scientific literature on the potential health effects of air pollutants. AQCDs are subject to internal EPA review by staff within the Office of Health and Environmental Assessment and the Office of Air and Radiation. Further review is conducted by the Science Advisory Board/Clean Air Scientific Advisory Committee, and then, these documents are subject to peer review workshops and public comments. The AQCDs are mandated by the Clean Air Act and are revised at 5-year intervals. AQCDs become part of the OAR public docket and final drafts are available through NTIS.

Health Assessment Documents (HADs): This document series is prepared by the Environmental Criteria and Assessment Office (ECAO-Research Triangle Park and ECAO-Cincinnati) for the Office of Air and Radiation (OAR). HADs are intended for use by the Office of Air Quality Planning and Standards (OAQPS) to determine possible listing of hazardous air pollutants (HAP) under sections 111 and 112 of the Clean Air Act. These documents are evaluations of the available scientific literature on the potential health effects of air pollutants and serve as the scientific data base for establishing relationships between exposure concentrations and potential health risks. HADs are subject to internal EPA review by staff within the Office of Health and Environmental Assessment and the Office of Air and Radiation. Further review is conducted by the Science Advisory Board/Clean Air Scientific Advisory Committee, and then, these documents are subject to peer review workshops and public comments. HADs become part of the OAR public docket and final drafts are available through NTIS.

4. Miscellaneous Documents:

Drinking Water Criteria Documents (DWCDs): The Environmental Criteria and Assessment Office (ECAO-Cin) prepares a portion of this document series for the Office of Water (OW). DWCDs are intended to assist the OW in deriving criteria standards for chemicals in drinking water, as required under Section 412(b)(3)(A) of the Safe Drinking Water Act, as amended in 1986. The DWCDs are comprehensive evaluations of potential health effects, including mechanisms of toxicity, with specific emphasis on data providing dose-response information. DWCDs contain Health

000364

Advisories (Has) for 1-day, 10-day and longer-term exposures and drinking water equivalent levels for lifetime exposures. DWCDs are subject to internal EPA review by staff within the Office of Health and Environmental Assessment and the Office of Water. Selected documents are reviewed by the Science Advisory Board and are subject to peer review workshops and public comments. DWCDs become part of the Safe Drinking Water (SDW) public docket and final drafts are available through NTIS.

B. Selection Criteria and Sources of HEAST Values

Chemicals with derived noncarcinogenic and/or carcinogen risk assessment values that have had some level of peer review (i.e., those in peer reviewed EPA documents or under review by EPA Work Groups) are included in HEAST; this does not include many interim values (values not found in final EPA documents or not being considered by Work Groups) derived for various purposes within Superfund and other Program Offices. In updating the HEAST, the first source that is checked is the Integrated Risk Information System (IRIS) for revised or newly added risk assessment values. Secondly, the status of chemicals under discussion by the RfD/RfC and CRAVE Work Groups is reviewed. The Office of Health and Environmental Assessment's Chemical Assessments and Related Activities (CARA) list is also reviewed for new Office of Water, Office of Air Quality Planning and Standards, and Office of Solid Waste and Emergency Response risk assessment documents (HEEDs, HEEPs, HEAs, HADs, AQCDs, DWCDs).

The HEAST also contains chemicals commonly found at RCRA (Resource Conservation and Recovery Act) sites as identified by the Office of Solid Waste's Technical Assessment Branch. Questions about RCRA chemicals may be addressed by calling the Health Assessment Section (Office of Solid Waste) at (202) 260-4761. Finally, the Office of Radiation Programs provides data on radionuclides for Table 4A and 4B of the HEAST. Radionuclides included are those thought to be most commonly encountered at Superfund sites. Questions concerning radionuclides carcinogenicity should first be addressed by contacting the appropriate Regional Radiation Program Manager. A listing of these managers and several contacts in the Office of Radiation Programs can be found in Exhibit 2 of the User's Guide -Radionuclide Carcinogenicity.

APPENDIX A-II

II. DOSE CONVERSIONS ON HEAST

In January 1991, the decision was made to replace inhalation Reference Doses (RfDi) for noncancer toxicity and inhalation slope factors for carcinogenicity, previously available on the IRIS data base, with Reference Concentrations (RFC) and inhalation unit risks, respectively. RfCs and unit risks are expressed in terms of concentration in air (mg/m^3), not in terms of "dose" (mg/kg-day) like the RfDs and the oral and inhalation slope factors. This presents a problem for the Superfund program, since the current Hazard Ranking System (HRS) and the Risk Assessment Guidance for superfund (RAGS): Human Health Evaluation manual, Parts A and B were developed using chronic daily intakes and health criteria expressed in units of mg/kg-day.

The decision to replace inhalation slope factors and RfDi values expressed in mg/kg-day with unit risk and RfC values expressed in mg/m_3 was based on two major factors: 1) the workgroups felt that it was technically more accurate to base toxicity values directly on measured air concentrations instead of making the metabolic pharmacokinetic and/or surface area adjustments required to estimate an "internal dose"; and 2) there are compounds that elicit route-of-entry effects (e.g., sensitizers and irritants) where the toxic effect is to the respiratory system or exchange boundary where a measure of "internal dose" might inappropriately imply effects to other organ systems or effects from other exposure routes.

Superfund recognizes the importance of these issues and is actively working with EPA's Office of Research and Development to evaluate the impact of these changes on its program regulations and guidance. In the short term, however, modification of program regulations and guidance is not a viable option. Therefore, the chairs of the RfD/RfC and CRAVE Work Groups were consulted regarding Superfund's need to make the conversion from a concentration in air to dose. There was agreement that, in many cases, converting the air concentration data to a dose (in mg/kg-day) may not add significant uncertainty to the Superfund risk assessment process, and therefore may be a reasonable use of the data <u>given appropriate circumstances and Superfund program objectives.</u> These Work Groups will continue to work with the Superfund program to identify specific instances where it is not appropriate to make the conversion from unit risk/RfC to inhalation slope factor/RfD due to the large uncertainty introduced by the assumptions used in the conversion.

Generally, the Superfund Health Risk Technical Support Center will be responsible for making all appropriate conversions and the values will be identified with appropriate highlights or footnotes in the Health Effects Assessment Summary Tables (HEAST). Therefore, <u>HEAST users are strongly advised against making such conversions themselves.</u> However, it is a critical responsibility of the risk assessor to

000357

consult the original reports cited in the HEAST and to appropriately characterize or caveat the resulting risk estimates derived from these values so that managers are fully informed of their origin and related uncertainties.

000368

APPENDIX A-III

II. CHEMICAL NAME AND CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER CROSS REFERENCE

This section lists chemicals and their respective Chemical Abstracts Service Registry Number (CASRN) for cross referencing on the HEAST. Chemicals may be searched either alphabetically by chemical name or numerically by the CASRN.

000369

CHEMICAL NAME AND CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER CROSS REFERENCE
(LISTED BY NAME)

March 1994

ACENAPHTHENE	000083-32-9
ACENAPTHYLENE	000208-96-8
ACEPHATE	030560-19-1
ACETONE	000067-64-1
ACETONE CYANOHYDRIN	000075-86-5
ACETONITRILE	000075-05-8
ACETOPHENONE	000098-86-2
ACROLEIN	000107-02-8
ACRYLAMIDE	000079-06-1
ACRYLIC ACID	000079-10-7
ACRYLONITRILE	000107-13-1
ADIPONITRILE	000111-69-3
ALACHLOR	015972-60-8
ALDICARB	000116-06-3
ALDRIN	000309-00-2
ALLIDOCHLOR	000093-71-0
ALLYL ALCOHOL	000107-18-6
ALLYL CHLORIDE	000107-05-1
ALUMINUM	007429-90-5
ALUMINUM PHOSPHIDE	020859-73-8
AMETRYN	000834-12-8
AMINO-2-NAPHTHOL, 1-	002834-92-6
AMINO-2-NAPHTOL HYDROCHLORIDE, 1-	001198-27-2
AMINOPHENOL, M-	000591-27-5
AMINOPHENOL, O-	000095-55-6
AMINOPHENOL, P-	000123-30-8
AMINOPYRIDINE, 4-	000504-24-5
AMMONIA	007664-41-7
ANILINE	000062-53-3
ANTHRACENE	000120-12-7
ANTIMONY, METALLIC	007440-36-0
ANTIMONY PENTOXIDE	001314-60-9
ANTIMONY POTASSIUM TARTRATE	000304-61-0
ANTIMONY TETROXIDE	001332-81-6
ANTIMONY TRIOXIDE	001309-64-4
ARAMITE	000140-57-8
AROCHLOR 1248	012672-29-6
ARSENIC, INORGANIC	007440-38-2
ASBESTOS	001332-21-4
ATRAZINE	001912-24-9
AZOBENZENE	000103-33-3
BARIUM	007440-39-3
BARIUM CYANIDE	000542-62-1
BENEFIN	001861-40-1
BENZAL CHLORIDE	000098-87-3
BENZALDEHYDE	000100-52-7
BENZALDEHYDE CYANOHYDRIN	000532-28-5
BENZENE	000071-43-2
BENZENETHIOL / (THIOPHENOL)	000108-98-5
BENZIDINE	000092-87-5
BENZOIC ACID	000065-85-0
BENZOTRICHLORIDE	000098-07-7
BENZO[A]ANTHRACENE	000056-55-3
BENZO[A]PYRENE	000050-32-8
BENZO[B]FLUORANTHENE	000205-99-2
BENZO[K]FLUORANTHENE	000207-08-9
BENZYL ALCOHOL	000100-51-6
BENZYL CHLORIDE	000100-44-7
BERYLLIUM	007440-41-7
BIPHENYL, 1,1'	000092-52-4
BIS(2-CHLOROETHYL) ETHER	000111-44-4
BIS(2-CHLOROISOPROPYL) ETHER	039638-32-9
BIS(2-ETHYLHEXYL) PHTHALATE / (DEHP)	000117-81-7
BIS(CHLOROMETHYL) ETHER	000542-88-1
BISPHENOL A	000080-05-7
BORON, ELEMENTAL	007440-42-8
BORON TRIFLUORIDE	007637-07-2
BROMINATED DIBENZO-P-DIOXINS	NO CASRN
BROMINATED DIBENZOFURANS	NO CASRN
BROMOACETONE	000598-31-2
BROMOCHLOROETHANES	NO CASRN
BROMODICHLOROMETHANE	000075-27-4
BROMOETHENE / (VINYL BROMIDE)	000593-60-2
BROMOFORM	000075-25-2
BROMOMETHANE	000074-83-9
BROMOPHENYL PHENYL ETHER, 4-	000101-55-3
BROMOPHOS	002104-96-3
BROMOXYNIL	001689-84-5
BROMOXYNIL OCTANOATE	001689-99-2
BUSAN 77	031512-74-0
BUSAN 90	002491-38-5
BUTADIENE, 1,3-	000106-99-0
BUTANOL, 1-	000071-36-3
BUTYL BENZYL PHTHALATE, N-	000085-68-7
BUTYLATE	002008-41-5
BUTYLCHLORIDE, T-	000507-20-0
BUTYROLACTONE, GAMMA-	000096-48-0
CACODYLIC ACID	000075-60-5
CADMIUM	007440-43-9
CALCIUM CYANIDE	000592-01-8
CAPROLACTAM	000105-60-2
CAPTAFOL	002425-06-1
CAPTAN	000133-06-2
CARBARYL	000063-25-2
CARBAZOLE	000086-74-8
CARBOFURAN	001563-66-2
CARBON DISULFIDE	000075-15-0
CARBON MONOXIDE	000630-05-0
CARBON TETRACHLORIDE	000056-23-5
CHLORAL	000075-87-6
CHLORANIL	000118-75-2
CHLORDANE	000057-74-9
CHLORINE CYANIDE	000506-77-4
CHLORO-1,3-BUTADIENE, 2- / (CHLOROPRENE)	000126-99-8
CHLORO-2-METHYLANILINE, 4-	000095-69-2
CHLORO-2-METHYLANILINE HYDROCHLORIDE, 4-	003165-93-3
CHLORO-M-CRESOL, P-	000059-50-7
CHLOROACETALDEHYDE	000107-20-0
CHLOROACETIC ACID	000079-11-8
CHLOROANILINE, 2-	000095-51-2
CHLOROANILINE, 3-	000108-42-9
CHLOROANILINE, 4-	000106-47-8
CHLOROBENZENE	000108-90-7
CHLOROBENZILATE	000510-15-6
CHLOROBENZOIC ACID, P-	000074-11-3
CHLOROBENZOTRIFLUORIDE, 4-	000098-56-6
CHLOROBUTANE, 1-	000109-69-3
CHLOROBUTANE, 2-	000078-86-4
CHLOROCYCLOPENTADIENE	041851-50-7
CHLOROFORM	000067-66-3
CHLOROMETHANE / (METHYL CHLORIDE)	000074-87-3
CHLOROMETHYL METHYL ETHER	000107-30-2
CHLORONITROBENZENE, M-	000121-73-3
CHLORONITROBENZENE, O-	000088-73-3
CHLORONITROBENZENE, P-	000100-00-5
CHLOROPHENOL, 2-	000095-57-8
CHLOROPHENOL, 3-	000108-43-0
CHLOROPHENOL, 4-	000106-48-9
CHLOROPROPANE, 2-	000075-29-6
CHLOROTHALONIL	001897-45-6
CHLOROTOLUENE, M-	000108-41-8
CHLOROTOLUENE, O-	000095-49-8
CHLOROTOLUENE, P-	000106-43-4
CHLORPYRIFOS	002921-88-2
CHLORPYRIFOS METHYL	005598-13-0
CHLORTHIOPHOS	060238-56-4
CHROMIUM(III)	016065-83-1
CHROMIUM(VI)	018540-29-9
CHRYSENE	000218-01-9
COKE OVEN EMISSIONS	008007-45-2
COPPER	007440-50-8
COPPER CYANIDE	000544-92-3
CREOSOTE, COAL TAR	008001-58-9
CRESOL, M- / (3-METHYLPHENOL)	000108-39-4
CRESOL, O- / (2-METHYLPHENOL)	000095-48-7

000340

CHEMICAL NAME AND CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER CROSS REFERENCE (LISTED BY NAME) Continued

March 1994

CRESOL, P- / (4-METHYLPHENOL)	000106-44-5
CROTONALDEHYDE	000123-73-9
CUMENE	000098-82-8
CYANAZINE	021725-46-2
CYANIDE	000057-12-5
CYANOGEN	000460-19-5
CYANOGEN BROMIDE	000506-68-3
CYCLOATE	001134-23-2
CYCLOHEXANOL	000108-93-0
CYCLOHEXYLAMINE	000108-91-8
CYCLOPENTADIENE	000542-92-7
DACTHAL	001861-32-1
DALAPON	000075-99-0
DDD	000072-54-8
DDE	000072-55-9
DDT	000050-29-3
DECABROMODIPHENYL ETHER	001163-19-5
DI-N-OCTYL PHTHALATE	000117-84-0
DIALLATE	002303-16-4
DIAZINON	000333-41-5
DIBENZOFURAN	000132-64-9
DIBENZO[A,H]ANTHRACENE	000053-70-3
DIBROMO-3-CHLOROPROPANE, 1,2	000096-12-8
DIBROMOBENZENE, 1,4-	000106-37-6
DIBROMOCHLOROMETHANE	000124-48-1
DIBROMOETHANE, 1,2-	000106-93-4
DIBUTYL PHTHALATE	000084-74-2
DICAMBA	001918-00-9
DICHLORO-2-BUTENE, 1,4-	000764-41-0
DICHLOROBENZENE, 1,2-	000095-50-1
DICHLOROBENZENE, 1,3-	000541-73-1
DICHLOROBENZENE, 1,4-	000106-46-7
DICHLOROBENZIDINE, 3,3'-	000091-94-1
DICHLOROBUTENES	NO CASRN
DICHLORODIFLUOROMETHANE	000075-71-8
DICHLOROETHANE, 1,1-	000075-34-3
DICHLOROETHANE, 1,2-	000107-06-2
DICHLOROETHYLENE, 1,1-	000075-35-4
DICHLOROETHYLENE, 1,2- (MIXED ISOMERS)	000540-59-0
DICHLOROETHYLENE, 1,2-C-	000156-59-2
DICHLOROETHYLENE, 1,2-T-	000156-60-5
DICHLOROPHENOL, 2,3-	000576-24-9
DICHLOROPHENOL, 2,4-	000120-83-2
DICHLOROPHENOL, 2,5-	000583-78-8
DICHLOROPHENOL, 2,6-	000087-65-0
DICHLOROPHENOL, 3,4-	000095-77-2
DICHLOROPHENOL, 3,5-	000591-35-5
DICHLOROPHENOXY ACETIC ACID, 2,4-	000094-75-7
DICHLOROPHENOXY) BUTYRIC ACID, 4-(2,4- / (2,4-DB)	000094-82-6
DICHLOROPROPANE, 1,1-	000078-99-9
DICHLOROPROPANE, 1,2-	000078-87-5
DICHLOROPROPANE, 1,3-	000142-28-9
DICHLOROPROPANE, 2,2-	000594-20-7
DICHLOROPROPENE, 1,3- / (TELONE II)	000542-75-6
DICHLORPROP	000120-36-5
DICYCLOPENTADIENE	000077-73-6
DIELDRIN	000060-57-1
DIETHYL-P-NITROPHENYL PHOSPHATE	000311-45-5
DIETHYL PHTHALATE	000084-66-2
DIETHYLANILINE, N,N-	000091-66-7
DIETHYLENE GLYCOL MONOBUTYL ETHER	000112-34-5
DIETHYLENE GLYCOL MONOETHYL ETHER	000111-90-0
DIETHYLFORMAMIDE	000617-84-5
DIETHYLHYDRAZINE, 1,2-	001615-80-1
DIETHYLSTILBESTROL	000056-53-1
DIMETHOATE	000060-51-5
DIMETHOXYBENZIDINE, 3,3'-	000119-90-4
DIMETHYLANILINE, 2,4-	000095-68-1
DIMETHYLANILINE HYDROCHLORIDE, 2,4-	021436-96-4
DIMETHYLANILINE, N,N-	000121-69-7
DIMETHYLBENZIDINE, 3,3'-	000119-93-7
DIMETHYLBENZ[A]ANTHRACENE, 7,12-	000057-97-6
DIMETHYLFORMAMIDE, N,N-	000068-12-2
DIMETHYLHYDRAZINE, 1,1-	000057-14-7
DIMETHYLHYDRAZINE, 1,2-	000540-73-8
DIMETHYLPHENOL, 2,3-	000526-75-0
DIMETHYLPHENOL, 2,4-	000105-67-9
DIMETHYLPHENOL, 2,5-	000095-87-4
DIMETHYLPHENOL, 2,6-	000576-26-1
DIMETHYLPHENOL, 3,4-	000095-65-8
DIMETHYLPHTHALATE	000131-11-3
DIMETHYLSULFATE	000077-78-1
DIMETHYLTEREPHTHALATE	000120-61-6
DIMETHYLUREA, N,N-	000598-94-7
DINITRO-O-CRESOL, 4,6-	000534-52-1
DINITRO-P-CRESOL, 2,6-	000609-93-8
DINITROBENZENE, 1,2-	000528-29-0
DINITROBENZENE, 1,3-	000099-65-0
DINITROBENZENE, 1,4-	000100-25-4
DINITROPHENOL, 2,3-	000066-56-8
DINITROPHENOL, 2,4-	000051-28-5
DINITROPHENOL, 2,5-	000329-71-5
DINITROPHENOL, 2,6-	000573-56-8
DINITROPHENOL, 3,5-	000586-11-8
DINITROTOLUENE, 2,3-	000602-01-7
DINITROTOLUENE, 2,4	000121-14-2
DINITROTOLUENE, 2,5-	000619-15-8
DINITROTOLUENE, 2,6-	000606-20-2
DINITROTOLUENE, 3,4-	000610-39-9
DINOSEB	000088-85-7
DIOXANE, 1,4-	000123-91-1
DIPHENYLAMINE, N,N-	000122-39-4
DIPHENYLHYDRAZINE, 1,2-	000122-66-7
DIRECT BLACK 38	001937-37-7
DIRECT BLUE 6	002602-46-2
DIRECT BROWN 95	016071-86-6
DIRECT LIGHTFAST BLUE	004399-55-7
DIRECT SKY BLUE 68	002610-05-1
DISULFOTON	000298-04-4
ENDOSULFAN	000115-29-7
ENDOTHALL	000145-73-3
ENDRIN	000072-20-8
EPICHLOROHYDRIN	000106-89-8
EPTC	000759-94-4
ETHOPROP	013194-48-4
ETHOXYETHANOL, 2-	000110-80-5
ETHOXYETHANOL ACETATE, 2-	000111-15-9
ETHOXYETHANOL ACRYLATE, 2-	000106-74-1
ETHOXYETHANOL DODECANOATE, 2-	000106-13-8
ETHOXYETHANOL PHOSPHATE, 2-	068554-00-7
ETHOXYETHYL METHACRYLATE, 2-	002370-63-0
ETHYL ACETATE	000141-78-6
ETHYL ACRYLATE	000140-88-5
ETHYL BENZENE	000100-41-4
ETHYL CHLORIDE	000075-00-3
ETHYL ETHER	000060-29-7
ETHYL METHACRYLATE	000097-63-2
ETHYL-O-XYLENE, 4-	000934-80-5
ETHYLANILINE, N-	000103-69-5
ETHYLENE CYANOHYDRIN	000109-78-4
ETHYLENE DIAMINE	000107-15-3
ETHYLENE GLYCOL	000107-21-1
ETHYLENE GLYCOL MONOBUTYL ETHER	000111-76-2
ETHYLENE OXIDE	000075-21-8
ETHYLENE THIOUREA	000096-45-7
ETHYLTOLUENE, M-	000620-14-4
ETHYLTOLUENE, O-	000611-14-3
ETHYLTOLUENE, P-	000622-96-8
FLUORANTHENE	000206-44-0
FLUORENE	000086-73-7
FLUORINE / (SOLUBLE FLUORIDE)	007782-41-4
FLURIDONE	059756-60-4

000374

7834

CHEMICAL NAME AND CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER CROSS REFERENCE (LISTED BY NAME) Continued

FOLPET	000133-07-3
FORMALDEHYDE	000050-00-0
FORMALDEHYDE CYANOHYDRIN	000107-16-4
FORMIC ACID	000064-18-6
FURAN	000110-00-9
FURAZOLIDONE	000067-45-8
FURFURAL	000098-01-1
FURIUM	000531-82-8
GLYCIDALDEHYDE	000765-34-4
HEPTACHLOR	000076-44-8
HEPTACHLOR EPOXIDE	001024-57-3
HEPTANE, N-	000142-82-5
HEXABROMOBENZENE	000087-82-1
HEXACHLOROBENZENE	000118-74-1
HEXACHLOROBUTADIENE	000087-68-3
HEXACHLOROCYCLOHEXANE, ALPHA-	000319-84-6
HEXACHLOROCYCLOHEXANE, BETA-	000319-85-7
HEXACHLOROCYCLOHEXANE, DELTA-	000319-86-8
HEXACHLOROCYCLOHEXANE, EPSILON-	006108-10-7
HEXACHLOROCYCLOHEXANE, GAMMA-	000058-89-9
HEXACHLOROCYCLOHEXANE-TECHNICAL	000608-73-1
HEXACHLOROCYCLOPENTADIENE	000077-47-4
HEXACHLOROETHANE	000067-72-1
HEXACHLOROPHENE	000070-30-4
HEXAMETHYLENE DIAMINE	000124-09-4
HEXANE, N-	000110-54-3
HEXANONE, 2-	000591-78-6
HYDRAZINE	000302-01-2
HYDRAZINE SULFATE	010034-93-2
HYDROGEN SULFIDE	007783-06-4
HYDROQUINONE	000123-31-9
INDENO[1,2,3-CD]PYRENE	000193-39-5
IRON	007439-89-6
ISOBUTYL ALCOHOL	000078-83-1
ISOPHORONE	000078-59-1
ISOPROPALIN	033820-53-0
LACTONITRILE	000078-97-7
LEAD	007439-92-1
LEAD ALKYLS	NO CASRN
LINURON	000330-55-2
MALATHION	000121-75-5
MALEIC ANHYDRIDE	000108-31-6
MALEIC HYDRAZIDE	000123-33-1
MALONONITRILE	000109-77-3
MANCOZEB	008018-01-7
MANEB	012427-38-2
MANGANESE	007439-96-5
MEPHOSFOLAN	000950-10-7
MERCURY, ELEMENTAL VAPOR	007439-97-6
MERCURY, INORGANIC	007439-97-6
MERPHOS	000150-50-5
MERPHOS OXIDE	000078-48-8
METHACRYLONITRILE	000126-98-7
METHOMYL	016752-77-5
METHOXY-5-NITROANILINE, 2-	000099-59-2
METHOXYCHLOR	000072-43-5
METHOXYETHANOL, 2-	000109-86-4
METHOXYETHANOL ACETATE, 2-	000110-49-6
METHYL-4-CHLOROPHENOXY) BUTYRIC ACID, 4-(2-	000094-81-5
METHYL-4-CHLOROPHENOXY) PROPIONIC ACID, 2-(2-	000093-65-2
METHYL-4-CHLOROPHENOXY ACETIC ACID, 2-	000094-74-6
METHYL-5-NITROANILINE, 2-	000099-55-8
METHYL ACETATE	000079-20-9
METHYL ACRYLATE	000096-33-3
METHYL CHLOROCARBONATE	000079-22-1
METHYL ETHYL KETONE	000078-93-3
METHYL ETHYL KETONE PEROXIDE	001338-23-4
METHYL HYDRAZINE	000060-34-4
METHYL ISOBUTYL KETONE	000108-10-1
METHYL ISOCYANATE	000624-83-9
METHYL MERCURY	022967-92-6
METHYL METHACRYLATE	000080-62-6
METHYL PARATHION	000298-00-0
METHYL STYRENE (MIXED ISOMERS)	025013-15-4
METHYL STYRENE, ALPHA	000098-83-9
METHYLANILINE, 2-	000095-53-4
METHYLANILINE HYDROCHLORIDE, 2-	000636-21-5
METHYLCHOLANTHRACENE, 3-	000056-49-5
METHYLCYCLOHEXANE	000108-87-2
METHYLENE-BIS(2-CHLOROANILINE), 4,4'-	000101-14-4
METHYLENE-BIS(N,N'-DIMETHYL)ANILINE, 4,4'-	000101-61-1
METHYLENE BROMIDE	000074-95-3
METHYLENE CHLORIDE / (DICHLOROMETHANE)	000075-09-2
METHYLENE-BIS(BENZENEAMINE), 4,4- / (METHYLENE DIANILINE, 4,4-)	000101-77-9
METHYLENEDIPHENYL ISOCYANATE, 4,4- / (DIPHENYLMETHANE DIISOCYANATE)	000101-68-8
METOLACHLOR	051218-45-2
METRIBUZIN	021087-64-9
MIREX	002385-85-5
MOLINATE	002212-67-1
MOLYBDENUM	007439-98-7
MONOCHLORAMINE	010599-90-3
NAPHTHALENE	000091-20-3
NAPHTHOQUINONE, 1,4-	000130-15-4
NIAGARA BLUE 4B	002429-74-5
NICKEL (METALLIC)	007440-02-0
NICKEL CYANIDE	000557-19-7
NICKEL REFINERY DUST	NO CASRN
NICKEL SUBSULFIDE	012035-72-2
NICOTINONITRILE	000100-54-9
NITRIC OXIDE	010102-43-9
NITRITE	014797-65-0
NITROANILINE, 2-	000088-74-4
NITROANILINE, M-	000099-09-2
NITROANILINE, P-	000100-01-6
NITROBENZENE	000098-95-3
NITROFURANTOIN	000067-20-9
NITROFURAZONE	000059-87-0
NITROGEN DIOXIDE	010102-44-0
NITROGEN OXIDES	NO CASRN
NITROMETHANE	000075-52-5
NITROPHENOLS	NO CASRN
NITROPROPANE, 2-	000079-46-9
NITROSO-DI-N-BUTYLAMINE, N-	000924-16-3
NITROSO-DI-N-PROPYLAMINE, N-	000621-64-7
NITROSO-N-ETHYLUREA, N-	000759-73-9
NITROSO-N-METHYLUREA, N-	000684-93-5
NITROSODIETHANOLAMINE, N-	001116-54-7
NITROSODIETHYLAMINE, N-	000055-18-5
NITROSODIMETHYLAMINE, N-	000062-75-9
NITROSODIPHENYLAMINE, P-	000156-10-5
NITROSODIPHENYLAMINE, N-	000086-30-6
NITROSOMETHYLETHYLAMINE, N-	010595-95-6
NITROSOMETHYLVINYLAMINE, N	004549-40-0
NITROSOPYRROLIDINE, N-	000930-55-2
NITROTOLUENE, M-	000099-08-1
NITROTOLUENE, O-	000088-72-2
NITROTOLUENE, P-	000099-99-0
OCTABROMODIPHENYL ETHER	032536-52-0
OCTAMETHYLPYROPHOSPHORAMIDE	000152-16-9
OSMIUM TETROXIDE	020816-12-0
OZONE	010028-15-6
PARALDEHYDE	000123-63-7
PARATHION	000056-38-2
PARTICULATE MATTER	NO CASRN
PEBULATE	001114-71-2
PENDIMETHALIN	040487-42-1

CHEMICAL NAME AND CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER CROSS REFERENCE (LISTED BY NAME) Continued

March 1994

PENTABROMO-6-CHLOROCYCLOHEXANE, 1,2,3,4,5-	000087-84-3
PENTABROMODIPHENYL ETHER	032534-81-9
PENTACHLOROBENZENE	000608-93-5
PENTACHLOROCYCLOPENTADIENE	025329-35-5
PENTACHLORONITROBENZENE	000082-68-8
PENTACHLOROPHENOL	000087-86-5
PENTACHLOROPROPENE, 1,1,2,3,3,-	001600-37-9
PENTANE, N-	000109-66-0
PHENANTHRENE	000085-01-8
PHENOL	000108-95-2
PHENYLENEDIAMINE, M-	000108-45-2
PHENYLENEDIAMINE, O-	000095-54-5
PHENYLENEDIAMINE, P-	000106-50-3
PHENYLMERCURIC ACETATE	000062-38-4
PHENYLPHENOL, 2-	000090-43-7
PHORATE	000298-02-2
PHOSGENE	000075-44-5
PHOSPHINE	007803-51-2
PHOSPHORUS, WHITE	007723-14-0
PHOTOCHEMICAL OXIDANTS	NO CASRN
PHTHALIC ACID, M-	000121-91-5
PHTHALIC ACID, O-	000088-99-3
PHTHALIC ACID, P-	000100-21-0
PHTHALIC ANHYDRIDE	000085-44-9
POLYBROMINATED BIPHENYLS	NO CASRN
POLYCHLORINATED BIPHENYLS	001336-36-3
POTASSIUM CYANIDE	000151-50-8
POTASSIUM SILVER CYANIDE	000506-61-6
PROFLURALIN	026399-36-0
PRONAMIDE	023950-58-5
PROPACHLOR	001918-16-7
PROPAZINE	000139-40-2
PROPIONITRILE	000107-12-0
PROPYL ALCOHOL, N-	000071-23-8
PROPYLENE GLYCOL	000057-55-6
PROPYLENE GLYCOL MONOMETHYL ETHER	000107-98-2
PROPYLENE OXIDE	000075-56-9
PYRENE	000129-00-0
PYRIDINE	000110-86-1
QUINOLINE	000091-22-5
RDX / (CYCLONITE)	000121-82-4
RONNEL	000299-84-3
SELENIOUS ACID	007783-00-8
SELENIUM	007782-49-2
SELENIUM SULFIDE	007446-34-6
SELENOUREA	000630-10-4
SILVER	007440-22-4
SILVER CYANIDE	000506-64-9
SIMAZINE	000122-34-9
SODIUM CYANIDE	000143-33-9
SODIUM DIETHYLDITHIOCARBAMATE	000148-18-5
SODIUM METAVANADATE	013718-26-8
STRONTIUM, STABLE	007440-24-6
STRYCHNINE	000057-24-9
STYRENE	000100-42-5
SUCCINONITRILE	000110-61-2
SULFUR DIOXIDE	007446-09-5
SULFUR OXIDES	NO CASRN
SULFURIC ACID	007664-93-9
TCDD, 2,3,7,8-	001746-01-6
TEMEPHOS	003383-96-8
TERBUFOS	013071-79-9
TEREPHTHALIC ACID	000100-21-0
TETRACHLOROAZOXYBENZENE	021232-47-3
TETRACHLOROBENZENE, 1,2,4,5-	000095-94-3
TETRACHLOROCYCLOPENTADIENE	000695-77-2
TETRACHLOROETHANE, 1,1,1,2-	000630-20-6
TETRACHLOROETHANE, 1,1,2,2-	000079-34-5
TETRACHLOROETHYLENE	000127-18-4
TETRACHLOROHYDRAZOBENZENE	071753-42-9
TETRACHLOROPHENOL, 2,3,4,5-	004901-51-3
TETRACHLOROPHENOL, 2,3,4,6-	000058-90-2
TETRACHLOROPHENOL, 2,3,5,6-	000935-95-5
TETRACHLOROPROPENE, 1,1,2,3-	010436-39-2
TETRACHLOROTOLUENE, PARA, ALPHA, ALPHA, ALPHA-	005216-25-1
TETRACHLOROVINPHOS / (STIROPHOS)	000961-11-5
TETRAETHYL DITHIOPYROPHOSPHATE	003689-24-5
THALLIC OXIDE	001314-32-5
THALLIUM (I) ACETATE	000563-68-8
THALLIUM (I) CARBONATE	006533-73-9
THALLIUM (I) CHLORIDE	007791-12-0
THALLIUM (I) NITRATE	010102-45-1
THALLIUM (I) SULFATE	007446-18-6
THALLIUM (IN SOLUBLE SALTS)	NO CASRN
THALLIUM SELENITE	012039-52-0
THIOCYANOMETHYLTHIO)BENZOTHIAZOLE, 2-(	021564-17-0
THIOFANOX	013196-18-4
THIRAM	000137-26-8
TIN AND COMPOUNDS	NO CASRN
TOLUENE	000108-88-3
TOLUENE-2,4-DIAMINE	000095-80-7
TOLUENE-2,5-DIAMINE	000095-70-5
TOLUENE-2,6-DIAMINE	000823-40-5
TOLUENEDIAMINE, 2,3-	002687-25-4
TOLUENEDIAMINE, 3,4-	000496-72-0
TOLUIDINE, M-	000108-44-1
TOLUIDINE, P-	000106-49-0
TOXAPHENE	008001-35-2
TRIALLATE	002303-17-5
TRIBROMOBENZENE, 1,2,4-	000615-54-3
TRICHLORO-1,2,2-TRIFLUOROETHANE, 1,1,2-	000076-13-1
TRICHLORO-2'-HYDROXYDIPHENYLETHER, 2,2,4'-	003380-34-5
TRICHLOROANILINE, 2,4,6-	000634-93-5
TRICHLOROANILINE HYDROCHLORIDE, 2,4,6-	033663-50-2
TRICHLOROBENZENE, 1,2,4-	000120-82-1
TRICHLOROCYCLOPENTADIENE	077323-84-3
TRICHLOROETHANE, 1,1,1-	000071-55-6
TRICHLOROETHANE, 1,1,2-	000079-00-5
TRICHLOROETHYLENE	000079-01-6
TRICHLOROFLUOROMETHANE	000075-69-4
TRICHLOROPHENOL, 2,3,4-	015950-66-0
TRICHLOROPHENOL, 2,3,5-	000933-78-8
TRICHLOROPHENOL, 2,3,6-	000933-75-5
TRICHLOROPHENOL, 2,4,5-	000095-95-4
TRICHLOROPHENOL, 2,4,6-	000088-06-2
TRICHLOROPHENOL, 3,4,5-	000609-19-8
TRICHLOROPHENOXY) PROPIONIC ACID, 2(2,4,5-	000093-72-1
TRICHLOROPHENOXY ACETIC ACID, 2,4,5-	000093-76-5
TRICHLOROPROPANE, 1,1,1-	007789-89-1
TRICHLOROPROPANE, 1,1,2-	000598-77-6
TRICHLOROPROPANE, 1,2,2-	003175-23-3
TRICHLOROPROPANE, 1,2,3-	000096-18-4
TRICHLOROPROPENE, 1,2,3-	000096-19-5
TRICHLOROTOLUENE, 2,3,6-	002077-46-5
TRICHLOROTOLUENE, ALPHA,2,6-	002014-83-7
TRIFLURALIN	001582-09-8
TRIMETHYL PHOSPHATE	000512-56-1
TRIMETHYLBENZENES	NO CASRN
TRINITROBENZENE, 1,3,5-	000099-35-4
TRINITROPHENOLS	NO CASRN
TRINITROPHENYLMETHYLNITRAMINE	000479-45-8
TRINITROTOLUENE, 2,4,6-	000118-96-7
URANIUM, SOLUBLE SALTS	NO CASRN
VANADIUM	007440-62-2
VANADIUM PENTOXIDE	001314-62-1
VANADIUM SULFATE	036907-42-3

000320

7834

VERNAM / (VERNOLATE)	001929-77-7
VINYL-1-CYCLOHEXENE, 4-	000100-40-3
VINYL ACETATE	000108-05-4
VINYL CHLORIDE	000075-01-4
WARFARIN	000081-81-2
XYLENE, M-	000108-38-3
XYLENE, MIXTURE	001330-20-7
XYLENE, O-	000095-47-6
XYLENE, P-	000106-42-3
ZINC (METALLIC)	007440-66-6
ZINC CYANIDE	000557-21-1
ZINC PHOSPHIDE	001314-84-7
ZINEB	012122-67-7

CHEMICAL NAME AND CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER CROSS REFERENCE
(LISTED BY CAS REGISTRY NUMBER)

March 1994

000050-32-8 BENZO[A]PYRENE
000050-00-0 FORMALDEHYDE
000050-29-3 DDT
000051-28-5 DINITROPHENOL, 2,4-
000053-70-3 DIBENZO[A,H]ANTHRACENE
000055-18-5 NITROSODIETHYLAMINE, N-
000056-53-1 DIETHYLSTILBESTROL
000056-38-2 PARATHION
000056-55-3 BENZO[A]ANTHRACENE
000056-23-5 CARBON TETRACHLORIDE
000056-49-5 METHYLCHOLANTHRACENE, 3-
000057-74-9 CHLORDANE
000057-12-5 CYANIDE
000057-14-7 DIMETHYLHYDRAZINE, 1,1-
000057-55-6 PROPYLENE GLYCOL
000057-97-6 DIMETHYLBENZ[A]ANTHRACENE, 7,12-
000057-24-9 STRYCHNINE
000058-89-9 HEXACHLOROCYCLOHEXANE, GAMMA-
000058-90-2 TETRACHLOROPHENOL, 2,3,4,6-
000059-87-0 NITROFURAZONE
000059-50-7 CHLORO-M-CRESOL, P-
000060-34-4 METHYL HYDRAZINE
000060-57-1 DIELDRIN
000060-29-7 ETHYL ETHER
000060-51-5 DIMETHOATE
000062-38-4 PHENYLMERCURIC ACETATE
000062-53-3 ANILINE
000062-75-9 NITROSODIMETHYLAMINE, N-
000063-25-2 CARBARYL
000064-18-6 FORMIC ACID
000065-85-0 BENZOIC ACID
000066-56-8 DINITROPHENOL, 2,3-
000067-45-8 FURAZOLIDONE
000067-72-1 HEXACHLOROETHANE
000067-66-3 CHLOROFORM
000067-20-9 NITROFURANTOIN
000067-64-1 ACETONE
000068-12-2 DIMETHYLFORMAMIDE, N,N-
000070-30-4 HEXACHLOROPHENE
000071-23-8 PROPYL ALCOHOL, N-
000071-36-3 BUTANOL, 1-
000071-55-6 TRICHLOROETHANE, 1,1,1-
000071-43-2 BENZENE
000072-20-8 ENDRIN
000072-55-9 DDE
000072-43-5 METHOXYCHLOR
000072-54-8 DDD

000074-83-9 BROMOMETHANE
000074-87-3 CHLOROMETHANE / (METHYL CHLORIDE)
000074-95-3 METHYLENE BROMIDE
000074-11-3 CHLOROBENZOIC ACID, P-
000075-35-4 DICHLOROETHYLENE, 1,1-
000075-60-5 CACODYLIC ACID
000075-01-4 VINYL CHLORIDE
000075-21-8 ETHYLENE OXIDE
000075-15-0 CARBON DISULFIDE
000075-86-5 ACETONE CYANOHYDRIN
000075-09-2 METHYLENE CHLORIDE / (DICHLOROMETHANE)
000075-27-4 BROMODICHLOROMETHANE
000075-00-3 ETHYL CHLORIDE
000075-69-4 TRICHLOROFLUOROMETHANE
000075-25-2 BROMOFORM
000075-87-6 CHLORAL
000075-71-8 DICHLORODIFLUOROMETHANE
000075-99-0 DALAPON
000075-05-8 ACETONITRILE
000075-29-6 CHLOROPROPANE, 2-
000075-44-5 PHOSGENE
000075-52-5 NITROMETHANE
000075-34-3 DICHLOROETHANE, 1,1-
000075-56-9 PROPYLENE OXIDE
000076-13-1 TRICHLORO-1,2,2-TRIFLUOROETHANE, 1,1,2-
000076-44-8 HEPTACHLOR
000077-78-1 DIMETHYLSULFATE
000077-47-4 HEXACHLOROCYCLOPENTADIENE
000077-73-6 DICYCLOPENTADIENE
000078-99-9 DICHLOROPROPANE, 1,1-
000078-87-5 DICHLOROPROPANE, 1,2-
000078-86-4 CHLOROBUTANE, 2-
000078-48-8 MERPHOS OXIDE
000078-97-7 LACTONITRILE
000078-83-1 ISOBUTYL ALCOHOL
000078-93-3 METHYL ETHYL KETONE
000078-59-1 ISOPHORONE
000079-06-1 ACRYLAMIDE
000079-20-9 METHYL ACETATE
000079-34-5 TETRACHLOROETHANE, 1,1,2,2-
000079-46-9 NITROPROPANE, 2-
000079-01-6 TRICHLOROETHYLENE
000079-00-5 TRICHLOROETHANE, 1,1,2-
000079-11-8 CHLOROACETIC ACID
000079-10-7 ACRYLIC ACID

000079-22-1 METHYL CHLOROCARBONATE
000080-62-6 METHYL METHACRYLATE
000080-05-7 BISPHENOL A
000081-81-2 WARFARIN
000082-68-8 PENTACHLORONITROBENZENE
000083-32-9 ACENAPHTHENE
000084-66-2 DIETHYL PHTHALATE
000084-74-2 DIBUTYL PHTHALATE
000085-01-8 PHENANTHRENE
000085-68-7 BUTYL BENZYL PHTHALATE, N-
000085-44-9 PHTHALIC ANHYDRIDE
000086-73-7 FLUORENE
000086-30-6 NITROSODIPHENYLAMINE, N-
000086-74-8 CARBAZOLE
000087-68-3 HEXACHLOROBUTADIENE
000087-84-3 PENTABROMO-6-CHLOROCYCLOHEXANE, 1,2,3,4,5-
000087-65-0 DICHLOROPHENOL, 2,6-
000087-86-5 PENTACHLOROPHENOL
000087-82-1 HEXABROMOBENZENE
000088-99-3 PHTHALIC ACID, O-
000088-72-2 NITROTOLUENE, O-
000088-06-2 TRICHLOROPHENOL, 2,4,6-
000088-74-4 NITROANILINE, 2-
000088-73-3 CHLORONITROBENZENE, O-
000088-85-7 DINOSEB
000090-43-7 PHENYLPHENOL, 2-
000091-66-7 DIETHYLANILINE, N,N-
000091-94-1 DICHLOROBENZIDINE, 3,3'-
000091-22-5 QUINOLINE
000091-20-3 NAPHTHALENE
000092-52-4 BIPHENYL, 1,1'
000092-87-5 BENZIDINE
000093-76-5 TRICHLOROPHENOXY ACETIC ACID, 2,4,5-
000093-71-0 ALLIDOCHLOR
000093-72-1 TRICHLOROPHENOXY) PROPIONIC ACID, 2(2,4,5-
000093-65-2 METHYL-4-CHLOROPHENOXY) PROPIONIC ACID, 2-(2-
000094-82-6 DICHLOROPHENOXY) BUTYRIC ACID, 4-(2,4- / (2,4-DB)
000094-75-7 DICHLOROPHENOXY ACETIC ACID, 2,4-
000094-74-6 METHYL-4-CHLOROPHENOXY ACETIC ACID, 2-

000325

7834

000094-81-5 METHYL-4-CHLOROPHENOXY) BUTYRIC ACID, 4-(2-
000095-53-4 METHYLANILINE, 2-
000095-51-2 CHLOROANILINE, 2-
000095-70-5 TOLUENE-2,5-DIAMINE
000095-95-4 TRICHLOROPHENOL, 2,4,5-
000095-50-1 DICHLOROBENZENE, 1,2-
000095-48-7 CRESOL, O- / (2-METHYLPHENOL)
000095-80-7 TOLUENE-2,4-DIAMINE
000095-69-2 CHLORO-2-METHYLANILINE, 4-
000095-87-4 DIMETHYLPHENOL, 2,5-
000095-49-8 CHLOROTOLUENE, O-
000095-47-6 XYLENE, O-
000095-94-3 TETRACHLOROBENZENE, 1,2,4,5-
000095-57-8 CHLOROPHENOL, 2-
000095-54-5 PHENYLENEDIAMINE, O-
000095-77-2 DICHLOROPHENOL, 3,4-
000095-65-8 DIMETHYLPHENOL, 3,4-
000095-68-1 DIMETHYLANILINE, 2,4-
000095-55-6 AMINOPHENOL, O-
000096-45-7 ETHYLENE THIOUREA
000096-48-0 BUTYROLACTONE, GAMMA-
000096-12-8 DIBROMO-3-CHLOROPROPANE, 1,2
000096-19-5 TRICHLOROPROPENE, 1,2,3-
000096-33-3 METHYL ACRYLATE
000096-18-4 TRICHLOROPROPANE, 1,2,3-
000097-63-2 ETHYL METHACRYLATE
000098-87-3 BENZAL CHLORIDE
000098-01-1 FURFURAL
000098-83-9 METHYL STYRENE, ALPHA
000098-95-3 NITROBENZENE
000098-82-8 CUMENE
000098-86-2 ACETOPHENONE
000098-56-6 CHLOROBENZOTRIFLUORIDE, 4-
000098-07-7 BENZOTRICHLORIDE
000099-55-8 METHYL-5-NITROANILINE, 2-
000099-59-2 METHOXY-5-NITROANILINE, 2-
000099-35-4 TRINITROBENZENE, 1,3,5-
000099-65-0 DINITROBENZENE, 1,3-
000099-08-1 NITROTOLUENE, M-
000099-99-0 NITROTOLUENE, P-
000099-09-2 NITROANILINE, M-
000100-52-7 BENZALDEHYDE
000100-51-6 BENZYL ALCOHOL
000100-42-5 STYRENE
000100-00-5 CHLORONITROBENZENE, P-
000100-21-0 TEREPHTHALIC ACID
000100-40-3 VINYL-1-CYCLOHEXENE, 4-
000100-25-4 DINITROBENZENE, 1,4-
000100-44-7 BENZYL CHLORIDE
000100-41-4 ETHYL BENZENE
000100-54-9 NICOTINONITRILE
000100-21-0 PHTHALIC ACID, P-
000100-01-6 NITROANILINE, P-
000101-55-3 BROMOPHENYL PHENYL ETHER, 4-
000101-14-4 METHYLENE-BIS(2-CHLOROANILINE), 4,4'-
000101-68-8 METHYLENEDIPHENYL ISOCYANATE, 4,4- / (DIPHENYLMETHANE DIISOCYANATE)
000101-61-1 METHYLENE-BIS(N,N'-DIMETHYL)ANILIN E, 4,4'-
000103-33-3 AZOBENZENE
000103-69-5 ETHYLANILINE, N-
000105-60-2 CAPROLACTAM
000105-67-9 DIMETHYLPHENOL, 2,4-
000106-48-9 CHLOROPHENOL, 4-
000106-37-6 DIBROMOBENZENE, 1,4-
000106-93-4 DIBROMOETHANE, 1,2-
000106-47-8 CHLOROANILINE, 4-
000106-43-4 CHLOROTOLUENE, P-
000106-44-5 CRESOL, P- / (4-METHYLPHENOL)
000106-89-8 EPICHLOROHYDRIN
000106-46-7 DICHLOROBENZENE, 1,4-
000106-99-0 BUTADIENE, 1,3-
000106-13-8 ETHOXYETHANOL DODECANOATE, 2-
000106-42-3 XYLENE, P-
000106-50-3 PHENYLENEDIAMINE, P-
000106-49-0 TOLUIDINE, P-
000106-74-1 ETHOXYETHANOL ACRYLATE, 2-
000107-02-8 ACROLEIN
000107-30-2 CHLOROMETHYL METHYL ETHER
000107-13-1 ACRYLONITRILE
000107-05-1 ALLYL CHLORIDE
000107-06-2 DICHLOROETHANE, 1,2-
000107-18-6 ALLYL ALCOHOL
000107-21-1 ETHYLENE GLYCOL
000107-15-3 ETHYLENE DIAMINE
000107-12-0 PROPIONITRILE
000107-98-2 PROPYLENE GLYCOL MONOMETHYL ETHER
000107-16-4 FORMALDEHYDE CYANOHYDRIN
000107-20-0 CHLOROACETALDEHYDE
000108-10-1 METHYL ISOBUTYL KETONE
000108-38-3 XYLENE, M-
000108-87-2 METHYLCYCLOHEXANE
000108-95-2 PHENOL
000108-88-3 TOLUENE
000108-98-5 BENZENETHIOL / (THIOPHENOL)
000108-42-9 CHLOROANILINE, 3-
000108-93-0 CYCLOHEXANOL
000108-45-2 PHENYLENEDIAMINE, M-
000108-91-8 CYCLOHEXYLAMINE
000108-39-4 CRESOL, M- / (3-METHYLPHENOL)
000108-41-8 CHLOROTOLUENE, M-
000108-05-4 VINYL ACETATE
000108-31-6 MALEIC ANHYDRIDE
000108-44-1 TOLUIDINE, M-
000108-43-0 CHLOROPHENOL, 3-
000108-90-7 CHLOROBENZENE
000109-86-4 METHOXYETHANOL, 2-
000109-69-3 CHLOROBUTANE, 1-
000109-78-4 ETHYLENE CYANOHYDRIN
000109-66-0 PENTANE, N-
000109-77-3 MALONONITRILE
000110-54-3 HEXANE, N-
000110-86-1 PYRIDINE
000110-61-2 SUCCINONITRILE
000110-49-6 METHOXYETHANOL ACETATE, 2-
000110-80-5 ETHOXYETHANOL, 2-
000110-00-9 FURAN
000111-15-9 ETHOXYETHANOL ACETATE, 2-
000111-90-0 DIETHYLENE GLYCOL MONOETHYL ETHER
000111-76-2 ETHYLENE GLYCOL MONOBUTYL ETHER
000111-44-4 BIS(2-CHLOROETHYL) ETHER
000111-69-3 ADIPONITRILE
000112-34-5 DIETHYLENE GLYCOL MONOBUTYL ETHER
000115-29-7 ENDOSULFAN
000116-06-3 ALDICARB
000117-84-0 DI-N-OCTYL PHTHALATE
000117-81-7 BIS(2-ETHYLHEXYL) PHTHALATE / (DEHP)
000118-75-2 CHLORANIL
000118-96-7 TRINITROTOLUENE, 2,4,6-
000118-74-1 HEXACHLOROBENZENE
000119-90-4 DIMETHOXYBENZIDINE, 3,3'-
000119-93-7 DIMETHYLBENZIDINE, 3,3'-
000120-12-7 ANTHRACENE
000120-36-5 DICHLORPROP
000120-83-2 DICHLOROPHENOL, 2,4-
000120-82-1 TRICHLOROBENZENE, 1,2,4-
000120-61-6 DIMETHYLTEREPHTHALATE
000121-75-5 MALATHION

CHEMICAL NAME AND CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER CROSS REFERENCE
(LISTED BY CAS REGISTRY NUMBER) Continued

March 1994

000121-69-7 DIMETHYLANILINE, N,N-
000121-82-4 RDX / (CYCLONITE)
000121-73-3 CHLORONITROBENZENE, M-
000121-91-5 PHTHALIC ACID, M-
000121-14-2 DINITROTOLUENE, 2,4
000122-34-9 SIMAZINE
000122-39-4 DIPHENYLAMINE, N,N-
000122-66-7 DIPHENYLHYDRAZINE, 1,2-
000123-30-8 AMINOPHENOL, P-
000123-73-9 CROTONALDEHYDE
000123-31-9 HYDROQUINONE
000123-33-1 MALEIC HYDRAZIDE
000123-91-1 DIOXANE, 1,4-
000123-63-7 PARALDEHYDE
000124-48-1 DIBROMOCHLOROMETHANE
000124-09-4 HEXAMETHYLENE DIAMINE
000126-99-8 CHLORO-1,3-BUTADIENE, 2- / (CHLOROPRENE)
000126-98-7 METHACRYLONITRILE
000127-18-4 TETRACHLOROETHYLENE
000129-00-0 PYRENE
000130-15-4 NAPHTHOQUINONE, 1,4-
000131-11-3 DIMETHYLPHTHALATE
000132-64-9 DIBENZOFURAN
000133-06-2 CAPTAN
000133-07-3 FOLPET
000137-26-8 THIRAM
000139-40-2 PROPAZINE
000140-57-8 ARAMITE
000140-88-5 ETHYL ACRYLATE
000141-78-6 ETHYL ACETATE
000142-82-5 HEPTANE, N-
000142-28-9 DICHLOROPROPANE, 1,3-
000143-33-9 SODIUM CYANIDE
000145-73-3 ENDOTHALL
000148-18-5 SODIUM DIETHYLDITHIOCARBAMATE
000150-50-5 MERPHOS
000151-50-8 POTASSIUM CYANIDE
000152-16-9 OCTAMETHYLPYROPHOSPHORAMIDE
000156-59-2 DICHLOROETHYLENE, 1,2-C-
000156-10-5 NITROSODIPHENYLAMINE, P-
000156-60-5 DICHLOROETHYLENE, 1,2-T-
000193-39-5 INDENO[1,2,3-CD]PYRENE
000205-99-2 BENZO[B]FLUORANTHENE
000206-44-0 FLUORANTHENE
000207-08-9 BENZO[K]FLUORANTHENE
000208-96-8 ACENAPTHYLENE
000218-01-9 CHRYSENE
000298-02-2 PHORATE
000298-04-4 DISULFOTON
000298-00-0 METHYL PARATHION
000299-84-3 RONNEL
000302-01-2 HYDRAZINE
000304-61-0 ANTIMONY POTASSIUM TARTRATE
000309-00-2 ALDRIN
000311-45-5 DIETHYL-P-NITROPHENYL PHOSPHATE
000319-84-6 HEXACHLOROCYCLOHEXANE, ALPHA-
000319-85-7 HEXACHLOROCYCLOHEXANE, BETA-
000319-86-8 HEXACHLOROCYCLOHEXANE, DELTA-
000329-71-5 DINITROPHENOL, 2,5-
000330-55-2 LINURON
000333-41-5 DIAZINON
000460-19-5 CYANOGEN
000479-45-8 TRINITROPHENYLMETHYLNITRAMINE
000496-72-0 TOLUENEDIAMINE, 3,4-
000504-24-5 AMINOPYRIDINE, 4-
000506-68-3 CYANOGEN BROMIDE
000506-64-9 SILVER CYANIDE
000506-61-6 POTASSIUM SILVER CYANIDE
000506-77-4 CHLORINE CYANIDE
000507-20-0 BUTYLCHLORIDE, T-
000510-15-6 CHLOROBENZILATE
000512-56-1 TRIMETHYL PHOSPHATE
000526-75-0 DIMETHYLPHENOL, 2,3-
000528-29-0 DINITROBENZENE, 1,2-
000531-82-8 FURIUM
000532-28-5 BENZALDEHYDE CYANOHYDRIN
000534-52-1 DINITRO-O-CRESOL, 4,6-
000540-73-8 DIMETHYLHYDRAZINE, 1,2-
000540-59-0 DICHLOROETHYLENE, 1,2- (MIXED ISOMERS)
000541-73-1 DICHLOROBENZENE, 1,3-
000542-92-7 CYCLOPENTADIENE
000542-62-1 BARIUM CYANIDE
000542-88-1 BIS(CHLOROMETHYL) ETHER
000542-75-6 DICHLOROPROPENE, 1,3- / (TELONE II)
000544-92-3 COPPER CYANIDE
000557-19-7 NICKEL CYANIDE
000557-21-1 ZINC CYANIDE
000563-68-8 THALLIUM (I) ACETATE
000573-56-8 DINITROPHENOL, 2,6-
000576-24-9 DICHLOROPHENOL, 2,3-
000576-26-1 DIMETHYLPHENOL, 2,6-
000583-78-8 DICHLOROPHENOL, 2,5-
000586-11-8 DINITROPHENOL, 3,5-
000591-27-5 AMINOPHENOL, M-
000591-35-5 DICHLOROPHENOL, 3,5-
000591-78-6 HEXANONE, 2-
000592-01-8 CALCIUM CYANIDE
000593-60-2 BROMOETHENE / (VINYL BROMIDE)
000594-20-7 DICHLOROPROPANE, 2,2-
000598-94-7 DIMETHYLUREA, N,N-
000598-31-2 BROMOACETONE
000598-77-6 TRICHLOROPROPANE, 1,1,2-
000602-01-7 DINITROTOLUENE, 2,3-
000606-20-2 DINITROTOLUENE, 2,6-
000608-93-5 PENTACHLOROBENZENE
000608-73-1 HEXACHLOROCYCLOHEXANE-TECHNICAL
000609-19-8 TRICHLOROPHENOL, 3,4,5-
000609-93-8 DINITRO-P-CRESOL, 2,6-
000610-39-9 DINITROTOLUENE, 3,4-
000611-14-3 ETHYLTOLUENE, O-
000615-54-3 TRIBROMOBENZENE, 1,2,4-
000617-84-5 DIETHYLFORMAMIDE
000619-15-8 DINITROTOLUENE, 2,5-
000620-14-4 ETHYLTOLUENE, M-
000621-64-7 NITROSO-DI-N-PROPYLAMINE, N-
000622-96-8 ETHYLTOLUENE, P-
000624-83-9 METHYL ISOCYANATE
000630-05-0 CARBON MONOXIDE
000630-10-4 SELENOUREA
000630-20-6 TETRACHLOROETHANE, 1,1,1,2-
000634-93-5 TRICHLOROANILINE, 2,4,6-
000636-21-5 METHYLANILINE HYDROCHLORIDE, 2-
000684-93-5 NITROSO-N-METHYLUREA, N-
000695-77-2 TETRACHLOROCYCLOPENTADIENE
000759-73-9 NITROSO-N-ETHYLUREA, N-
000759-94-4 EPTC
000764-41-0 DICHLORO-2-BUTENE, 1,4-
000765-34-4 GLYCIDALDEHYDE
000823-40-5 TOLUENE-2,6-DIAMINE
000834-12-8 AMETRYN
000924-16-3 NITROSO-DI-N-BUTYLAMINE, N-
000930-55-2 NITROSOPYRROLIDINE, N-
000933-78-8 TRICHLOROPHENOL, 2,3,5-
000933-75-5 TRICHLOROPHENOL, 2,3,6-
000934-80-5 ETHYL-O-XYLENE, 4-
000935-95-5 TETRACHLOROPHENOL, 2,3,5,6-
000950-10-7 MEPHOSFOLAN
000961-11-5 TETRACHLOROVINPHOS / (STIROPHOS)

000327

1994

001024-57-3 HEPTACHLOR EPOXIDE
001114-71-2 PEBULATE
001116-54-7 NITROSODIETHANOLAMINE, N-
001134-23-2 CYCLOATE
001163-19-5 DECABROMODIPHENYL ETHER
001198-27-2 AMINO-2-NAPHTOL HYDROCHLORIDE, 1-
001309-64-4 ANTIMONY TRIOXIDE
001314-84-7 ZINC PHOSPHIDE
001314-62-1 VANADIUM PENTOXIDE
001314-60-9 ANTIMONY PENTOXIDE
001314-32-5 THALLIC OXIDE
001330-20-7 XYLENE, MIXTURE
001332-81-6 ANTIMONY TETROXIDE
001332-21-4 ASBESTOS
001336-36-3 POLYCHLORINATED BIPHENYLS
001338-23-4 METHYL ETHYL KETONE PEROXIDE
001563-66-2 CARBOFURAN
001582-09-8 TRIFLURALIN
001600-37-9 PENTACHLOROPROPENE, 1,1,2,3,3,-
001615-80-1 DIETHYLHYDRAZINE, 1,2-
001689-84-5 BROMOXYNIL
001689-99-2 BROMOXYNIL OCTANOATE
001746-01-6 TCDD, 2,3,7,8-
001861-40-1 BENEFIN
001861-32-1 DACTHAL
001897-45-6 CHLOROTHALONIL
001912-24-9 ATRAZINE
001918-00-9 DICAMBA
001918-16-7 PROPACHLOR
001929-77-7 VERNAM / (VERNOLATE)
001937-37-7 DIRECT BLACK 38
002008-41-5 BUTYLATE
002014-83-7 TRICHLOROTOLUENE, ALPHA,2,6-
002077-46-5 TRICHLOROTOLUENE, 2,3,6-
002104-96-3 BROMOPHOS
002212-67-1 MOLINATE
002303-16-4 DIALLATE
002303-17-5 TRIALLATE
002370-63-0 ETHOXYETHYL METHACRYLATE, 2-
002385-85-5 MIREX
002425-06-1 CAPTAFOL
002429-74-5 NIAGARA BLUE 4B
002491-38-5 BUSAN 90
002602-46-2 DIRECT BLUE 6
002610-05-1 DIRECT SKY BLUE 6B
002687-25-4 TOLUENEDIAMINE, 2,3-
002834-92-6 AMINO-2-NAPHTHOL, 1-
002921-88-2 CHLORPYRIFOS
003165-93-3 CHLORO-2-METHYLANILINE HYDROCHLORIDE, 4-
003175-23-3 TRICHLOROPROPANE, 1,2,2-
003380-34-5 TRICHLORO-2'-HYDROXYDIPHENYLETHER, 2,2,4'-
003383-96-8 TEMEPHOS
003689-24-5 TETRAETHYL DITHIOPYROPHOSPHATE
004399-55-7 DIRECT LIGHTFAST BLUE
004549-40-0 NITROSOMETHYLVINYLAMINE, N
004901-51-3 TETRACHLOROPHENOL, 2,3,4,5-
005216-25-1 TETRACHLOROTOLUENE, PARA, ALPHA, ALPHA, ALPHA-
005598-13-0 CHLORPYRIFOS METHYL
006108-10-7 HEXACHLOROCYCLOHEXANE, EPSILON-
006533-73-9 THALLIUM (I) CARBONATE
007429-90-5 ALUMINUM
007439-97-6 MERCURY, INORGANIC
007439-98-7 MOLYBDENUM
007439-89-6 IRON
007439-92-1 LEAD
007439-97-6 MERCURY, ELEMENTAL VAPOR
007439-96-5 MANGANESE
007440-39-3 BARIUM
007440-38-2 ARSENIC, INORGANIC
007440-43-9 CADMIUM
007440-66-6 ZINC (METALLIC)
007440-50-8 COPPER
007440-42-8 BORON, ELEMENTAL
007440-22-4 SILVER
007440-41-7 BERYLLIUM
007440-62-2 VANADIUM
007440-02-0 NICKEL (METALLIC)
007440-36-0 ANTIMONY, METALLIC
007440-24-6 STRONTIUM, STABLE
007446-34-6 SELENIUM SULFIDE
007446-09-5 SULFUR DIOXIDE
007446-18-6 THALLIUM (I) SULFATE
007637-07-2 BORON TRIFLUORIDE
007664-41-7 AMMONIA
007664-93-9 SULFURIC ACID
007723-14-0 PHOSPHORUS, WHITE
007782-41-4 FLUORINE / (SOLUBLE FLUORIDE)
007782-49-2 SELENIUM
007783-00-8 SELENIOUS ACID
007783-06-4 HYDROGEN SULFIDE
007789-89-1 TRICHLOROPROPANE, 1,1,1-
007791-12-0 THALLIUM (I) CHLORIDE
007803-51-2 PHOSPHINE
008001-35-2 TOXAPHENE
008001-58-9 CREOSOTE, COAL TAR
008007-45-2 COKE OVEN EMISSIONS
008018-01-7 MANCOZEB
010028-15-6 OZONE
010034-93-2 HYDRAZINE SULFATE
000101-77-9 METHYLENE-BIS(BENZENEAMINE), 4,4- / (METHYLENE DIANILINE, 4,4-)
010102-43-9 NITRIC OXIDE
010102-44-0 NITROGEN DIOXIDE
010102-45-1 THALLIUM (I) NITRATE
010436-39-2 TETRACHLOROPROPENE, 1,1,2,3-
010595-95-6 NITROSOMETHYLETHYLAMINE, N-
010599-90-3 MONOCHLORAMINE
012035-72-2 NICKEL SUBSULFIDE
012039-52-0 THALLIUM SELENITE
012122-67-7 ZINEB
012427-38-2 MANEB
012672-29-6 AROCHLOR 1248
013071-79-9 TERBUFOS
013194-48-4 ETHOPROP
013196-18-4 THIOFANOX
013718-26-8 SODIUM METAVANADATE
014797-65-0 NITRITE
015950-66-0 TRICHLOROPHENOL, 2,3,4-
015972-60-8 ALACHLOR
016065-83-1 CHROMIUM(III)
016071-86-6 DIRECT BROWN 95
016752-77-5 METHOMYL
018540-29-9 CHROMIUM(VI)
020816-12-0 OSMIUM TETROXIDE
020859-73-8 ALUMINUM PHOSPHIDE
021087-64-9 METRIBUZIN
021232-47-3 TETRACHLOROAZOXYBENZENE
021436-96-4 DIMETHYLANILINE HYDROCHLORIDE, 2,4-
021564-17-0 THIOCYANOMETHYLTHIO)BENZOTHIAZOLE, 2-(
021725-46-2 CYANAZINE
022967-92-6 METHYL MERCURY
023950-58-5 PRONAMIDE
025013-15-4 METHYL STYRENE (MIXED ISOMERS)
025329-35-5 PENTACHLOROCYCLOPENTADIENE
026399-36-0 PROFLURALIN
030560-19-1 ACEPHATE

031512-74-0	BUSAN 77
032534-81-9	PENTABROMODIPHENYL ETHER
032536-52-0	OCTABROMODIPHENYL ETHER
033663-50-2	TRICHLOROANILINE HYDROCHLORIDE, 2,4,6-
033820-53-0	ISOPROPALIN
036907-42-3	VANADIUM SULFATE
039638-32-9	BIS(2-CHLOROISOPROPYL) ETHER
040487-42-1	PENDIMETHALIN
041851-50-7	CHLOROCYCLOPENTADIENE
051218-45-2	METOLACHLOR
059756-60-4	FLURIDONE
060238-56-4	CHLORTHIOPHOS
068554-00-7	ETHOXYETHANOL PHOSPHATE, 2-
071753-42-9	TETRACHLOROHYDRAZOBENZENE
077323-84-3	TRICHLOROCYCLOPENTADIENE
NO CASRN	SULFUR OXIDES
NO CASRN	BROMINATED DIBENZO-P-DIOXINS
NO CASRN	BROMOCHLOROETHANES
NO CASRN	BROMINATED DIBENZOFURANS
NO CASRN	TRIMETHYLBENZENES
NO CASRN	PARTICULATE MATTER
NO CASRN	TIN AND COMPOUNDS
NO CASRN	LEAD ALKYLS
NO CASRN	NITROPHENOLS
NO CASRN	NITROGEN OXIDES
NO CASRN	NICKEL REFINERY DUST
NO CASRN	DICHLOROBUTENES
NO CASRN	PHOTOCHEMICAL OXIDANTS
NO CASRN	THALLIUM (IN SOLUBLE SALTS)
NO CASRN	URANIUM, SOLUBLE SALTS
NO CASRN	TRINITROPHENOLS
NO CASRN	POLYBROMINATED BIPHENYLS

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APPENDIX A-IV

IV. EFFECT LEVEL DEFINITIONS

Adverse effect. A biochemical change, functional impairment, or pathologic lesion that either singly or in combination adversely affects the performance of the whole organism, or reduces an organism's ability to respond to an additional environmental challenge.

Frank-effect-level (FEL). The exposure level at which there are statistically or biologically significant increases in frequency or severity of severe effects between the exposed population and its appropriate control group. These severe effects produce an unmistakable adverse health effect (such as severe convulsions or death).

Lowest-observed-adverse-effect level (LOAEL). The lowest exposure level at which there are statistically or biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control group.

Lowest-observed-effect level (LOEL). The lowest exposure level at which there are statistically or biologically significant increases in frequency or severity of any effects between the exposed population and its appropriate control group. The effects that are seen at this level may or may not be considered as adverse.

No-observed-adverse-effect level (NOAEL). An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control; some effects may be produced at this level, but they are not considered to be adverse.

No-observed-effect level (NOEL). An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of any effect between the exposed population and its appropriate control.

Adapted from: U.S. EPA. 1991. Integrated Risk Information System (IRIS). Online. Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH.

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APPENDIX A-V

V. NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

The Clean Air Act requires that National Ambient Air Quality Standards (NAAQS) be set and ultimately met for any air pollutant which, if present in air, may reasonably be anticipated to endanger public health or welfare and whose presence in the air results from numerous or diverse mobile and/or stationary sources. Since the primary NAAQS and the inhalation RfC serve essentially the same function, and the primary NAAQS have extensive data bases rigorously reviewed, the primary NAAQS with annual averaging times should be used *in lieu* of an inhalation RfC, except for lead. In deriving a risk assessment number for lead (Pb), the Integrated Exposure Uptake Biokinetics (IEUBK) model should be used instead of the RfC. Primary standards are designed to protect public health and secondary standards are designed to protect public welfare. Each primary NAAQS has either one or two averaging times depending on the health effects of the chemical. To date, six NAAQS have been established: Carbon Monoxide (CO), Lead (Pb), Nitrogen Dioxide (NO_2), Particulate Matter, less than 10 μm in size, (PM_{10}), Ozone (O_3) and Sulfur Dioxide (SO_2). A table of the most recent NAAQS is provided as Table A-V-1.

The process of establishing and revising the NAAQS is detailed by Padgett and Richmond (Journal of the Air Pollution Control Association, 33:13-16, 1983). The primary NAAQS are solely health based and designed to protect the most sensitive group of individuals (but not necessarily the most sensitive members of that group) against adverse health effects. Thus, by definition, the NAAQS primary standards define allowable pollutant concentrations which can be present in the atmosphere without causing adverse effects, and essentially serve the same function as an inhalation RfC in a risk assessment/risk management decision, except for lead. The data bases supporting each of the NAAQS are extensive. More importantly, the NAAQS are set by the USEPA Administrator as mandated by Congress after numerous reviews and a public comment process.

TABLE A-V-1

NATIONAL AMBIENT AIR QUALITY STANDARDS[a]
(as of December 2, 1991)

Pollutant	Primary Standards[b]	Averaging Time	Secondary Standards[b]
Carbon monoxide (CO)	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	8 hour[c] 1 hour[c]	None
Lead (Pb) (and Lead compounds	1.5 μg/m^3	Quarterly	Same as primary
Nitrogen dioxide (NO_2) (Nitrogen oxide) (Nitric oxide)	0.053 ppm (100 μg/m^3)	Annual	Same as primary
Particulate Matter (PM_{10})	50 μg/m^3 150 μg/m^3	Annual[d] 24 hours[e]	Same as primary
Ozone (O_3)	0.12 ppm (235 μg/m^3)	1 hour[f]	Same as primary
Sulfur dioxide (SO_2) (Sulfur oxide)	0.03 ppm (80 μg/m^3)	Annual	—
	0.14 ppm (365 μg/m^3)	24 hours[c]	—
	—	3 hours[c]	0.5 ppm (1300 μg/m^3)

[a]Source: U.S. EPA 1991. Subchapter C - Air Programs. Part 50 -National Primary and Secondary Ambient Air Quality Standards. Code of Federal Regulations 50: 693-697. Revised 7/1/91.

[b]Primary standards are designed to protect public health; Secondary standards are designed to protect public welfare.

[c]Not to be exceeded more than once per year.

[d]The standard is attained when the expected annual arithmetic mean concentration is less than or equal to 50 μg/m^3.

[e]The standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m^3 is equal to or less than 1.

[f]The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than 1.

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