General

Los Alamos
NATIONAL LABORATORY

Los Alamos National Laboratory/University of California
Risk Reduction & Environmental Stewardship (RRES)
Remediation Services (RS), MS M992
Los Alamos, New Mexico 87545
(505) 667-0808/FAX (505) 665-4747

Date: December 22, 2003
Refer to: ER2003-0786

Sandra Martin
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

SUBJECT: ANNUAL UPDATE AND REVISION OF THE LABORATORY'S ECORISK DATABASE, VERSION 2.0

Dear Ms. Martin:

Enclosed please find the annual update and revision of the Laboratory's ECORISK database. The Risk Reduction and Environmental Stewardship-Remediation Services (RRES-RS) project maintains and updates this database each year as necessary to ensure that the ecological screening levels (ESLs) used to assess potential ecological risk at sites are representative and current. The enclosed CD (version 2.0) incorporates the US Environmental Protection Agency (EPA) Eco-SSL values and the EPA methodology used to calculate Eco-SSLs, where applicable. This modification in the calculation of ESLs takes advantage of multiple studies and data when available and implements EPA's national guidance for calculating screening values. The reports submitted to the Hazardous Waste Bureau by RRES-RS will use the ESLs presented in version 2.0 during the remainder of this fiscal year, i.e., from January 2004 through September 2004.

If you or your staff have any questions please contact Richard Mirenda at (505)665-6953 or e-mail to rmirenda@lanl.gov.

Sincerely,

for DM

David McInroy
Deputy Project Director
Remediation Services

To Review this Database Information, you will need to come into HWB

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DM/RM/dwt

Enclosure: RRES-RS Ecorisk Database, Version 2.0 CD and Environmental Health Associates (EHA) letter dated December 2003.

Cy (w/enc.):
N. Quintana, RRES-RS, MS M992
RRES-RS File, MS M992
IM-5, MS A150
RPF, MS M707

Cy (w/o enc.):
D. McInroy, RRES-RS, MS M992
R. Mirenda, RRES-RS, MS M992

EHA
ENVIRONMENTAL
Health Associates

December, 2003

To Whom It May Concern,

Enclosed is a CD-ROM that contains files for the Los Alamos National Laboratory Risk Reduction and Environmental Stewardship Remediation Services Project Ecorisk Database (Release 2.0), November 2003.

- **ECORDB_R2.0_f2000-XPa.MDB:** Database file for use with MS Office Access 2000 or XP
- **CoverLetterR2.0_f2000-XPa.doc:** The cover letter you are currently reading
- **SummaryOfChanges_R2.0a.doc:** Review of changes made to the database since the last release (R1.5) in September 2002.
- **NM_WQCC_20_6_4_nmac.pdf:** The state of New Mexico standards for interstate and intrastate surface waters. These values may be useful for local risk assessments. Acrobat Reader software is needed to view this file.

Note: These files must be transferred to a computer hard drive with an executable copy of Microsoft Access 2000 or XP. You cannot open the database file directly from the CD-ROM due to the user-level security component of the database structure. Also, once you have copied the file to the computer hard drive, make sure that the read-only file property is NOT checked for the database(.mdb) file.

This database is a work in progress and although we have reviewed the data within it extensively, we still recommend that you verify the data before use by referring to the actual references cited. The project may be able to assist you in getting copies of some of the harder to find documents cited in the database.

Please contact me by email at pnewell@eha-inc.com or by phone at 505-323-4113, if you have any questions/ comments about the database.

We encourage you to provide feedback on the database.

Thank you.

Patricia G. Newell
Toxicologist/ Database Manager
Environmental Health Associates Inc.

ENVIRONMENTAL HEALTH ASSOCIATES INC.
P.O. Box 26164 Albuquerque, NM 87125

November, 2003

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Enclosed is a CD-ROM that contains files for the Los Alamos National Laboratory Risk Reduction And Environmental Stewardship Remediation Services project Ecorisk Database (Release 2.0), November 2003.

- **ECORDB_R2.0_f2000-XP.MDB:** Database file for use with MS Office Access 2000 or XP (2002)
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- **NM_WQCC_20_6_4_nmac.pdf:** The state of New Mexico standards for interstate and intrastate surface waters. These values may be useful for local risk assessments. Acrobat Reader software is needed to view this file.
- **PTSEMethodsDocumentation_11-18-03a.doc:** Draft document of the Primary Toxicity Study Evaluation Methods used to derive Toxicity Reference Values for deriving Ecological Screening Levels.

This database is a work in progress and although we have reviewed the data within it extensively, we still recommend that you verify the data before use by referring to the actual references cited. The project may be able to assist you in getting copies of some of the harder to find documents.

Please contact me by email at pnewell@eha-inc.com or by phone at 505-323-4113, if you have any questions/ comments about the database.

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Thank you.

Patricia G. Newell
Toxicologist/ Database Manager
Environmental Health Associates Inc.

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P.O. Box 26164 Albuquerque, NM 87125

Welcome to the ECORISK DATABASE. This database contains the LOS ALAMOS NATIONAL LABORATORY (LANL) RISK REDUCTION and ENVIRONMENTAL STEWARDSHIP REMEDIATION SERVICES (RRES-RS) project ECOLOGICAL SCREENING LEVELS (ESLs) along with details to support their derivation.

Press the "Menu" button to gain access to LANL ESLs and their supporting information.

Press the "What's New in this Release" button to see highlights of what has changed since the last release.

Press the "Exit" button to exit the database application.

ECORISK DATABASE (Release 2.0) *

November 2003

Prepared for the Los Alamos National Laboratory Risk Reduction and Environmental Stewardship Remediation Services project By:

Environmental Health Associates Inc.

Toxicologist/Database Manager: Patricia G. Newell

ph: 505-323-4113/ fax: 505-323-1042/ e-mail: pnewell@eha-inc.com

Menu What's New in this Releas

Exit

For comments or questions regarding this database contact:

Rich Mirenda, Los Alamos National Laboratory

ph: 505-665-6953/ fax: 505-665-4747/ e-mail: rmirenda@lanl.gov

Or

Alison Dorries, Los Alamos National Laboratory

ph: 505-665-6952/ fax: 505-665-4747/ e-mail: adorries@lanl.gov

IMPORTANT - If you would like to be notified of data quality control or interface usability issues between official database releases or if you would like to be notified of when a new release of the database is due, please send an email to rmirenda@lanl.gov with "Add to Ecorisk Db Distribution List" in the Subject field of the email and you will be added to the database distribution list.

* Los Alamos National Laboratory (LANL), 2003 (Nov). ECORISK Database (Release 2.0), ER package #186. Risk Reduction and Environmental Stewardship Remediation Services project, Los Alamos, NM.

PRIMARY TOXICITY STUDY EVALUATION METHODS

This document details the default values, exceptions, and explanations for data entry in the primary literature review of toxicity studies on terrestrial birds, mammals, invertebrates (earthworms), and plants. Chemicals of concern were assigned each year as designated by the Los Alamos National Laboratory (LANL) Risk Reduction and Environmental Stewardship - Remediation program (RRES-R). Search and retrieval of primary toxicity literature for each organism and chemical combination ensued, and thus began the primary toxicity study evaluation (PTSE) process. The PTSE process consists of four main steps: 1) data extraction, 2) study evaluation, 3) toxicity reference value (TRV) development, and 4) TRV approval. The first three parts each have their own data entry database that is tailored to retrieve and/or evaluate the information needed. The fourth part consists of peer review by the LANL Risk Team for approval of the TRV before it is entered into the latest release of the ECORISK Database.

Before discussing details of each PTSE part, it must be noted that a tiered approach in the TRV development process was developed in 2003. This process envelopes the previous process which employed the first three parts of the PTSE process to develop one critical study (CS) TRV for each chemical and organism. The tiered approach now also obtains TRVs as follows:

Tier I: A nationally accepted TRV such as an EPA Ecological Soil Screening Level (EcoSSL) TRV.

Tier II: A TRV equal to the geometric mean (GMM) of ecologically relevant effect levels derived based on firsthand review of the literature.

Tier III: A critical study (CS) TRV for the most protective ecologically relevant endpoint derived based on firsthand review of the literature.

Tier IV: A CS TRV derived using ecologically relevant values reported by a secondary data source such as ORNL or USEPA Region 6.

If an EPA EcoSSL was available for a contaminant of potential ecological concern (COPEC) at LANL and was used, there was no need to complete Parts 1 and 2 of the PTSE process. If an EcoSSL was not available, and three or more primary toxicity values (PTVs) were available for a chemical and receptor combination, the Part 3 consisted of calculating a geometric mean (GMM) from no observed adverse effect level (NOAEL)-based PTVs. If there were less than 3 PTVs, the Part 3 consisted of selecting a critical study (CS) TRV. In order to determine whether a GMM or CS TRV would be developed, Parts 1 and 2 of the PTSE process were completed. Parts 3 and 4 of the PTSE process were completed at all times regardless of what type of TRV was used.

LITERATURE SEARCH AND RETRIEVAL

If an EPA EcoSSL TRV was available for the chemical and organism of concern, the literature search and retrieval process was skipped. Parts 3 and 4 were completed.

If an EcoSSL TRV was not available, and a GMM or CS TRV was needed, primary toxicity literature was collected for the chemical and organism of concern. Initially, the construction of the ECORISK Database took precedence over performing extensive toxicity data literature retrieval. The initial literature search for bird, mammal, earthworm, and plant toxicity data was limited to reviewing reference citation lists in secondary references plus minimal searches of online literature databases. Each reference was assigned a unique reference identification number for tracking during the literature search, review, and evaluation process. These numbers are referred to as Ref IDs and will be cited as so throughout this methods document. The bibliographies in the following secondary sources were reviewed:

Oak Ridge National Laboratory (ORNL)
- Ref ID 0094 Efroymson et al., 1997b
- Ref ID 0096 Efroymson et al., 1997a
- Ref ID 0344 Sample et al., 1996
- Ref ID 0365 Smith, 1986
- Ref ID 0467 Maxwell and Opresko, 1996
- Ref ID 0469 Talmage and Opresko, 1995a
- Ref ID 0470 Talmage and Opresko, 1996b
- Ref ID 0480 Talmage et al., 1999

Sandia National Laboratory (SNL)
- Ref ID 0092 IT Corporation, 1997

Los Alamos National Laboratory Threatened & Endangered Species (LANL T&E)
- Ref ID 0427 Gallegos et al., 1997

United States Army (US Army)
- Ref ID 0552 Layton et al., 1987

United States Environmental Protection Agency (USEPA) Region 5 Environmental Data Quality Levels (EDQLs)
- Ref ID 0574 PRC Environmental Management, Inc., 1996a

United States Environmental Protection Agency (USEPA) Ecotoxicology (ECOTOX) Database
- Ref ID 1085 USEPA, 1999b

LANL reviewed value based on secondary source
- Ref ID 0095 Efroymson et al., 1997 and LANL ECORISK database, 1998b
- Ref ID 0097 Efroymson et al., 1997 and LANL ECORISK database, 1998a
- Ref ID 0428 Gallegos et al., 1997 and LANL ECORISK database, 1998a
- Ref ID 0575 PRC Environmental Management, Inc., 1996 and LANL ER, 1998

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Online literature search databases were also employed in the literature search process. Examples of databases used were:

- First Search (http://www.oclc.org/firstsearch/)
- PubMed (http://www.ncbi.nlm.nih.gov/PubMed/)
- National Technical Information Service (http://www.ntis.gov)
- LANL Library via internal access

If a title for a reference in the bibliography or from the online literature search results showed that the paper contained toxicity information for terrestrial birds, mammals, earthworms, and plants, the paper was retrieved. The abstracts were then reviewed to determine if the paper was still applicable toward derivation of toxicity reference values (TRVs). This meant scanning the information for measurement endpoints including reproduction, development, survival, weight changes, size changes, and various other endpoints with a more direct link to the fitness of an organism and its contribution toward population health. Only in cases where data was limited and the more relevant endpoints were not available did we include more vague endpoints associated with physiological functions, histopathology, clinical observations, and behavior.

LITERATURE REVIEW

Once a set of references was located for each chemical and organism pair, hard copies were obtained. Each of the papers was then subjected to a literature review process entitled the Primary Toxicity Study Evaluation (PTSE) process. This process was broken down into four main parts:

1) Data Extraction,
2) Study Evaluation,
3) TRV Development, and
4) TRV Approval.

Data entry databases were created for each of the first three parts of the PTSE process to guide the reviewer in extracting, scoring, and evaluating the necessary information. The databases also assisted in maintaining consistency in the way the data was reported and peer reviewed. Users of the ECORISK database can also review the data reported and gain an understanding of the data supporting the TRV. A brief description of each part of the PTSE process is presented below, followed by a more detailed breakdown of the components of each part.

Data Extraction

Data extraction involved reading each primary toxicity paper thoroughly, extracting pertinent pieces of information, and documenting them in the Part 1 PTSE data entry database.

Study Evaluation

During the study evaluation process, information obtained from the Part 1 (data extraction) process was reviewed and scored based on availability of information and

types of information provided. The data was semi-quantitatively scored in the Part 2 data entry database in four areas: study design and documentation, taxonomic relationship of test organism to ecological screening level (ESL) screening receptors, exposure conditions, and measurements and results. Components of each of these areas were scored based on their relevancy toward deriving scientifically defensible TRVs. The score for each criteria was then multiplied by a factor in order to weight it according to its ability to influence the TRV with the least uncertainty.

TRV Development
In Part 3, the number of PTVs available for a chemical and organism pair of concern was determined by counting one for each endpoint category (reproduction/development, survival, and weight/size changes) and experiment. If 3 or more NOAEL-based PTVs existed, a GMM TRV was calculated. If less than 3 PTVs were available, professional judgement was used to select the most applicable study, measurement endpoint, effect level, and primary toxicity value (PTV) to be used as a CS TRV. Uncertainty factors (UFs) were applied to achieve a TRV equivalent to a chronic NOAEL or a No Observed Effects Concentration (NOEC) where necessary. A summary describing the basis for the TRV was written. This discussion describes the importance of the TRV in protection of wildlife, invertebrate, or plant populations, the data set considered for the selection of the TRV, the justification to support this selection, and the aspects of the study or studies that relate it to the environmental concerns for LANL. Also, UF explanations and calculations were noted.

TRV Approval
Once a TRV was prepared for use, whether it is an EPA EcoSSL, GMM TRV, CS TRV, or secondary source TRV, the value and its supporting documentation was peer reviewed by the Risk Team of LANL for approval.

PTSE PART 1 - Data Extraction

Reviewer Initials
Initials of the person who reviewed the primary toxicity study are reported.

Review Beginning and End Date
The date the review was started is reported here. The experiment and effect detail sections each have their own dates as well, and if a change is made in the record, the date of the change supersedes the date the record was created.

Experiment ID
The Experiment ID consists of the reference ID, analyte code, and experiment number in the following format:

Reference ID_Analyte Code_Experiment Number

Examples:
0025_SE_1

0517_CD_2

As mentioned above, the reference ID is a unique identifier assigned to each reference for tracking during the literature search, review, and evaluation process. The analyte code is a unique identifier assigned by the reviewer following guidelines set forth in Ref ID 0576 for each element and compound. The experiment number was arbitrarily assigned by the reviewer and was based on each actual experiment in a study, if there were more than one. Otherwise, the reviewer used his or her own judgement in separating various, unique exposure parameters in the study so that one experiment represented a combination of one chemical administration period, one organism, one chemical, one exposure medium, one exposure route, and one set of exposure concentrations.

Reference Summary

Brief information about the reference and its experiments was written here. This description included the test organism(s), chemical(s), route(s) and medium of exposure, exposure duration(s), and differences between experiments, if there were more than one. Also, if an experiment was not deemed relevant toward TRV development (e.g., the exposure route was injection or one of many chemicals administered in the study was not a chemical of concern for LANL), the reason(s) why was noted at the end of the reference description.

Experiment Purpose

The purpose(s) of the experiment was noted here. Also, since each experiment has its own record in the Part 1 database, a brief description of the test organism, chemical, route and medium of concern, and exposure duration was entered in order for the reviewer to distinguish one experiment from the other.

Organism Name and Type ID

The common name of the test organism was usually provided in the primary sources. In cases where the scientific name was not presented, various references were consulted to find it. This was done to later assess the taxonomic relationship of test species to ecological screening receptor species, especially for birds and mammals. This information was entered into a table (TbTestSpcs) for easy look-up and selection from the data entry databases.

Examples of sources consulted were:

- National Geographic Society. 1987. Field Guide to the Birds of North America. 2nd Edition. Washington, D.C. 464 pp. (Note: there is a 3rd edition available and it may have more updated records on names due to merging or division of species.)
- Burt, W.H., and R.P. Grossenheider. 1980. A Field Guide to the Mammals: North America north of Mexico. Houghton Mifflin Company: New York, NY. 289 pp.
- BIOSIS. Index to Organism Names (http://www.biosis.org/free_resources/ion.html)

The organisms were then classified into the following categories and coded accordingly:

TB Terrestrial Bird
TM Terrestrial Mammal
SLE Soil and/or Litter Earthworm
TP Terrestrial Plant

Author's reason for studying this particular test organism
If it is explicitly stated why the author(s) chose to use a particular species of test organism (e.g., Oldfield mouse species *Peromyscus polionotus*) in their research, the reasons are paraphrased. If it is not clearly stated, but the purpose can be deduced for the use of the general organism type (e.g., mouse, or rodent), the reasons are noted. However, the reviewer clarifies that the reasons noted are assumptions.

Age/Life Stage of organism
Coding for age/life stage adhered to the conventions presented in Table 1:

Table 1. Age categories, codes, and definitions.

Age Category ID	Age Category	Definition
BrA_Unk	Bird Adult	Bird is known to be in reproductive condition or is otherwise mature, but it is not known if it is breeding for the first time or at later stages.
BrA1	Bird Adult 1	Birds reach sexual maturity and breed for the first time.
BrA2	Bird Adult 2	Birds survive to breed at older ages.
BrE	Bird Embryo	Fertilization occurs and embryos develop inside an eggshell to hatching.
BrG	Bird Gamete	Unfertilized egg and sperm
BrJ_Unk	Bird Juvenile	Bird is said to be a juvenile but exact phase is not known.
BrJ1	Bird Juvenile 1	Hatchling, chick, or nestling growing until flight feathers are developed.
BrJ2	Bird Juvenile 2	Sexually immature fledgling or poult that undergoes additional development to breeding condition.
BrLC	Bird Life Cycle	All life stages
EwA_Unk	Earthworm Adult	Earthworm is known to be in reproductive condition or is otherwise mature, but it is not known if it is breeding for the first time or at later stages.
EwA1	Earthworm Adult 1	Sexually mature worms (with clitellum) breed for the first time.
EwA2	Earthworm Adult 2	Earthworms survive to breed at older ages.

Age Category ID	Age Category	Definition
EwE	Earthworm Cocoon or Embryo	External fertilization, cocoon formation, embryo development and worm emergence from cocoon.
EwG	Earthworm Gamete	Unfertilized egg and sperm.
EwJ1	Earthworm Juvenile	Small worms grow until they reach reproductive condition.
EwLC	Earthworm Life Cycle	All life stages
MmA_Unk	Mammal Adult	Mammal is known to be in reproductive condition or is otherwise mature, but it is not known if it is breeding for the first time or at later stages.
MmA1	Mammal Adult 1	Mammals reach sexual maturity and breed for the first time.
MmA2	Mammal Adult 2	Mammals survive to breed at older ages.
MmE	Mammal Embryo or Fetus	*In utero* organism developing from fertilized egg to birth.
MmG	Mammal Gamete	Unfertilized egg and sperm.
MmJ_Unk	Mammal Juvenile	Mammal is said to be a juvenile but exact phase is not known.
MmJ1	Mammal Juvenile 1	Newborn mammal obtaining all or most of its nutrition by nursing until weaning.
MmJ2	Mammal Juvenile 2	Immature mammal growing from weaning to more or less adult size and appearance. The typical “juvenile” stage.
MmJ3	Mammal Juvenile 3	Period of additional development is required or time must pass until the organism may breed (next season). Often independent from parents, "subadult".
MmLC	Mammal Life Cycle	All life stages
Pa_Unk	Plant (Annual) Unknown Age/Stage	Not enough information was provided or found to determine what life stage this plant age represents.
PaA1	Plant (Annual) Flowering and seed set	Plant is fertilized, seeds develop, and are dispersed.
PaE	Plant (Annual) Seed	Embryo inside seeds.
PaG	Plant (Annual) Gamete	Unfertilized ova and pollen
PaM	Plant (Annual) Mature	Plant is known to be at a mature stage but it is not known how else to classify this stage.
PaS_Unk	Plant (Annual) Seedling	Plant is a seedling but it is

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Age Category ID	Age Category	Definition
		uncertain/unknown with regards to whether seedling is closer to a sprouting stage or closer to reproductive stage.
PaS1	Plant (Annual) Seedling	Seed sprouts, grows to emerge from soil, and leaves open or some minimum size is attained.
PaS2	Plant (Annual) Seedling 2	Plant continues to grow until reproductive stage achieved.
Po_Unk	Plant (Other) Unknown Age/Stage	Not enough information was provided or found to determine what life stage this plant age represents.
PoA_Unk	Plant (Other)	Plant is in mature, reproductive condition but it is unknown if it is fertilized for the first time or if it is a larger individual producing seeds.
PoA1	Plant (Other) Flowering and seed set	Plant is fertilized, seeds develop, and are dispersed.
PoA2	Plant (Other) Larger reproducing plant	Larger individuals producing seeds
PoE	Plant (Other) Seed	Embryo inside seed.
PoG	Plant (Other) Gamete	Unfertilized ova and pollen.
PoLC	Plant (Other) Life Cycle	All life stages
PoM	Plant (Other) Mature	Plant is known to be at a mature stage but it is not known how else to classify this stage.
PoS_Unk	Plant (Other) Seedling/Sapling	Plant is a seedling but it is uncertain/unknown with regards to whether seedling is closer to a sprouting stage or closer to reproductive stage.
PoS1	Plant (Other) Seedling/Sapling 1	Seed sprouts, grows to emerge from soil, and leaves open or some minimum size is attained.
PoS2	Plant (Other) Seedling/Sapling 2	Plant continues to grow until reproductive stage achieved.

If the age or life stage of an organism was not provided, but body weight was, an age or life stage was estimated for the organism based on other reference sources containing similar organisms and body weights, and age information. The age coding task became difficult when it came to placing organisms in categories that were borderline juvenile/adult or seedling/adult. If more information was needed, related information was first sought in the existing database toxicity references on hand. For example, if a

primary toxicity reference stated the mouse was 6 weeks old at the time of exposure, but it is difficult to determine whether to code this age as a juvenile or an adult, information in the database was filtered to find similar records containing mice to see if a correlation could be made between ages and life stages. When information such as this could not be found in the existing references, additional references specific to the test organism species or genera were sought, retrieved, and recorded in the database.

Organism Sex and ID

The genders of the test organisms that were directly exposed to the chemical were reported here. This field was not applicable (N/A) for earthworms and plants. If a situation arose where only the females were exposed to the chemical and they were then bred with untreated males, the code F was entered for sex and a note of this arrangement was made in the associated Comment field.

If a study describes chemical exposure to embryos, such as injection into air or yolk sacs of chicken eggs, and the embryos were not sexed, it was assumed both males and females were tested. The code MF was entered into the field.

Organism Source/ Origin

This field was also straightforward. The location of where the test organism was obtained, bred, or collected was noted here.

Dose Rate Parameters

If the exposure levels presented in the study were already in the format of mg chemical/ kg body weight/day for birds and mammals, dose parameters and calculations for a daily dose rate were not needed. Dose rate parameters were not needed for invertebrates or plants because the dose concentration (in mg/kg) was used for the TRV itself. However, if dose rate parameters were provided in the study, values were still recorded in the expectation that they may be used for other studies where the values were not available but were needed for similar organisms.

If the exposure levels were presented as concentrations of mg chemical / kg food, mg / ml water, or mg air / m^3, the body weight (in kg) and food or water ingestion rate (in kg food / d or L / d, respectively) or inhalation rate (in m^3 / d) were needed for calculation of the PTV in mg chemical / kg body weight / day. The aim in obtaining the appropriate dose rate parameters was to use those values from the primary toxicity study when provided, and converting to proper units where necessary, that would lead to a conservative PTV in units of mg chemical / kg food / day.

Body Weight

Table 2 provides scenarios of how body weight may be reported in the primary toxicity reference and how the body weight was reported in this field in the database.

Table 2. Scenarios of body weight information reported in primary toxicity study, and how body weight values are reported in the PTSE data entry field for body weights.

Scenario	**Report:**

Body weight for controls were measured at intervals throughout the study	• Average of all weights throughout study. • If body weights grouped according to male and female organisms - heavier weight.*
Body weight for controls were measured at beginning and at end of study	• Average of the two weights. • If body weights grouped according to male and female organisms - heavier weight.*
Body weight for controls was measured at beginning of study only.	This value
Range of body weight for controls at beginning of study	Heavier end of this range*
No body weight information for controls, only treated organisms	Beginning weight of treated organisms, before chemical exposure began.
No body weights reported at all.	Default value of 999

*The heavier end of the body weight range or the heavier of the male or female organisms was reported because the use of this dose rate parameter in the PTV calculation will lead to a more conservative value.

Occasionally, the body weight dose rate parameter was not needed because the exposure concentration was already presented in units of mg/kg/d. Usually, body weight information provided in the study was still reported, but there were times, especially in the early developmental stages of the database, where it was not and the default value of 999 was used.

Food Ingestion Rate
The food ingestion rate was needed in units of kg food / day or similar. Food ingestion rates or similar data that could not be converted to these units (e.g., g body weight gain/g food consumption/day, or 100 g of commercial bird of prey diet/pair/day) were not reported but the information was still noted in the comment field.

Reporting the food ingestion rate followed similar scenarios as that reported for body weight in Table 2. The only difference was that in cases of food ingestion rates being reported for both males and females or in ranges, the lower food ingestion rate was used in order to provide a more conservative PTV.

Water Ingestion Rate
The water ingestion rate was needed in units of L water / d or similar. If for any reason, the provided water ingestion rates could not be converted to these units, no values were reported but the information was noted in the comment field.

Reporting the water ingestion rate followed similar scenarios as that reported for body weight in Table 2. The only difference was that in cases of water ingestion rates being

reported for both males and females or in ranges, the lower water ingestion rate was used in order to provide a more conservative PTV.

Inhalation Rate
The inhalation rate was needed in units of m^3 / d. It was rare to find inhalation rates reported in the primary toxicity reference for the test organism under study. Most often, the default value of 999 was reported. If inhalation rates were provided in the primary toxicity studies, the reporting would follow that of body weight in Table 2. However, in cases of inhalation rates being reported for both males and females or in ranges, the lower inhalation rate was used in order to provide a more conservative PTV.

Exposure environment
If the study was conducted in a laboratory, a greenhouse, or some other controlled environment, it was marked as a Laboratory study. If the study was a field study under uncontrolled environmental variables, it was noted as a Field study. Physical descriptions of the laboratory or greenhouse environment, what the test organisms were housed in, controlled variables such as temperature and humidity, and other relevant information were noted in the corresponding Comment field.

Test chemical form
If the chemical administered was inorganic, the compound was selected from a master pull-down list of chemicals maintained in a separate Analyte table.

Test chemical description/source
The purity of the chemical and the company it was purchased from were noted in this field. If the chemical was synthesized by the researchers of the study itself, a brief summary of the process was entered.

Exposure medium
The medium in which the chemical was administered was noted here. A brief description of any relevant information pertaining to properties of the exposure medium was noted in the Comment field. In inhalation exposure studies, a brief description of how the vapors were generated was reported in the Comment field as well. Exposure medium codes and descriptions are presented in Table 3.

Table 3. Codes and descriptions for exposure media.

Code	**Description**
A	Air. Used in inhalation exposure studies.
AQS	Aqueous solution. Used in plant studies or as an injection vehicle in bird and mammal studies.
CHM	Chemical only. Used if only the chemical is administered. The chemical is not immersed in solution or oil or any other media.
DW	Drinking water.
DW+F	Drinking water plus food. Drinking water is the primary exposure medium while a background concentration is reported in the food.
F	Food.

F+DW	Food plus drinking water. Food is the primary exposure medium while a background concentration is reported in the drinking water
FLPP	Filter paper. Used in contact tests with earthworms.
MNU	Manure. Used in earthworm studies.
NR	Not Reported.
NSOLN	Nutrient solution. Used in plant studies.
OIL	Oil. Used if the exposure medium is known to be an oil solution but is not specified as to what kind.
OIL_ACHS	Arachis oil.
OIL_CORN	Corn oil.
OIL_O	Other oil. Used if the exposure medium is known to be an oil solution but is a mixture of different types or other types not listed.
OIL_PNT	Peanut oil. Often used as a vehicle in oral gavage or injection studies.
OTHER	Other. Exposure medium was not already listed. Specifics were noted in the corresponding Comment field.
SAND	Sand.
SAND&OM	Sand and organic matter mixture.
SAND_CLTR	Sand culture. A solution is washed through silver sand daily.
SOIL	Soil.
SOIL&MNU	Soil and manure mixture. Manure is usually used as a food source for earthworms.
SOIL&SAND	1:1 Soil and sand mixture.
SOIL&SLDG	Soil and sludge mixture.
SOLN	Solution. Exposure medium is assumed to be a solution but it is not known what kind.
SOLN_AQS	Aqueous solution. Used if the chemical was inorganic and it was assumed the chemical is immersed in an aqueous solution.
SOLN_O	Other solution. Used only if the exposure medium is assumed to be a solution of mixed composition or one not listed.
SOLN_OIL	Oil solution. Assumed.
W	Water.

<u>Exposure medium background data</u>
Any background concentrations of metals in soil, water, or food were noted here. In cases where the authors provide verified concentrations of the chemical in the control medium, this concentration was entered as background data. Compositions of fertilizer added to soil and any other supplemental substances were also noted here.

<u>Exposure route</u>
The exposure route of the chemical was noted here. Any information relevant to the exposure route was noted in the Comment field. For inhalation exposure studies, this Comment field included a description of the inhalation chamber conditions (e.g., temperature, air flow). Exposure route codes and descriptions are presented in Table 4.

Table 4. Codes and descriptions for exposure routes.

Code	Description
ALL	All exposure routes are used for chemical administration
D	Dermal contact (filter paper)
DC_SED	Direct contact in sediment
DC_W	Direct contact in water
INH	Inhalation
INJ_EGG	Injection (egg)
INJ_IP	Injection (intraperitoneal)
INJ_IV	Injection (intravenous)
NR	Not reported
O	Oral
O/D	Oral and Dermal
OC	Oral (capsule)
OD	Oral (diet)
OD+W	Oral (diet) plus exposure in drinking water
OG	Oral (gavage)
OI	Oral (intubation)
OW	Oral (water)
OW+D	Oral (water) plus exposure in food
U	Uptake (not known whether through roots, seed coat, or both)
U_R	Uptake via roots
U_SC	Uptake via seed coat
U_SC+R	Uptake via seed coat and roots

Length of chemical administration

The length of the chemical administration was noted here. If the exposure was intermittent (e.g., 4 hours per day and 5 days per week for 7 weeks), the total length of time over which the chemical was administered is reported (e.g., 7 weeks).

Exposure period categories for birds and mammals are as follows:
Chronic = 91 days or more
Subchronic = 14 to 90 days
Acute = 13 days or less
Single Dose = One time administration

Exposure period categories for invertebrates and plants are as follows:
Chronic = 7 days or more
Subchronic = 3 to 6 days
Acute = 2 days or less
Single Dose = One time administration

Exposure frequency

The frequency of the chemical administration was noted here. For food and drinking water studies, it was often a continuous exposure where the exposure medium was provided throughout (also called *ad libitum*) the study. Exposure was also daily where either the food or water or an injection was provided at one time per day or weekly where injections were provided once per week. In inhalation exposure studies, the exposure frequency was either continuous or intermittent. In intermittent exposures, test organisms inhaled the chemical vapors for a certain number of hours per day and number of days per week for a certain study length (e.g., 4 hours per day, 5 days per week, for 10 weeks).

Control concentration and comment

If a background concentration in the primary exposure medium was reported, this concentration and its units were reported here. If no background concentrations were reported, a value of 0 mg/kg was assumed.

Exposure concentration(s) and comment

The concentrations of the treatment groups are noted here along with their units. If a background concentration was present in the primary exposure medium, this concentration is added to the basal concentration. If nominal (target) and empirical (verified) concentrations are both provided, the verified concentrations are reported in the value field and the target concentrations are noted in the comment field.

Nominal vs. empirical

If it was not explicitly stated whether the concentration was nominal (target) or empirical (verified), the concentration was assumed to be nominal (N). Otherwise, N or E for empirical was noted based upon the information provided in the reference. If both nominal and empirical values were present, the empirical values were preferred over the nominal values and the field was marked with E. There are two fields for this data entry, one each for controls and exposure groups.

Moisture basis, dry vs. wet weight

If the moisture basis of the concentration in medium was not explicitly stated, NR was placed into the field. If the exposure route for mammals or birds was oral by way of gavage, intubation, or capsule, inhalation, or an injection (intravenous or intraperitoneal), N/A was the entry. Otherwise, the moisture basis was noted as WW for wet weight or DW for dry weight. This holds for soil exposure media in earthworm and plant studies as well. Moisture basis was coded as N/A for filter paper, aqueous solution, and nutrient solution exposure routes. If both dry weights and wet weights were available from any study, dry weights were preferred. There are two fields for this data entry, one each for controls and exposure groups.

Number of individuals per group

This is a straightforward data entry field where the number of test organisms in each control and exposure group was noted. There are two fields for this data entry, one each for controls and exposure groups.

Number of sex per group

This is a straightforward data entry field where the number of females and/or males in each control and exposure group was noted. There are two fields for this data entry, one each for controls and exposure groups.

Number of replicates per group

If the number of replicates per control or exposure group was not clearly identified in a study, usually the number of individual organisms or sexual pairs that were caged separately was a suitable substitute. There are two fields for this data entry, one each for controls and exposure groups.

Soil Characteristics (for plant studies)

Soil type

The soil type and content was reported. Any other information not presented in the remaining soil characteristics section is also noted.

> E.g., Phaeosem, 3.85% sand, 74.90% silt, and 21.25% loam, water-holding capacity of 55.5%.
>
> E.g., Ap horizon
>
> E.g., Sterilized shredded peat moss passed through 2-mm soil sieve and white silica sand. Base saturation of 93.9.

Soil organic matter

If provided, the percent of organic matter (OM) content in the soil medium was noted. If total organic carbon (OC), particulate organic carbon, or organic carbon was reported, it was converted to organic matter as follows:

$$OM = 1.72 * OC$$

The notes regarding the conversion are placed directly in the soil organic matter field. If organic matter was not provided in the study but the percent content of sphagnum peat moss was, the percent content of the moss is considered equivalent to organic matter and was reported as so.

Soil cation exchange capacity

If provided in the study, the cation exchange capacity (CEC) in meq/100 g of soil was reported. If not, the default is NR.

Soil pH

If provided, the soil pH is reported here. If not, the default is NR.

Growth Medium Characteristics (for invertebrate studies)

Growth medium type
The soil type and content was reported. Any other information not presented in the remaining soil characteristics section is also noted.

> E.g., Petri dish with 30 g (dry mass) of screened soil mixed with aged horse manure (75% moisture)
>
> E.g., Sand (0.2 to 2 mm particle size) from C horiz. mixed with well decomposed cattle dung (1:2, vol:vol)
>
> E.g., Sandy loam soil with 17% clay, 5.5% $CaCO3$

Growth medium organic carbon
If provided, the percent of organic carbon (OC) content in the soil medium was noted. It was converted to organic matter using the following equation:

$$OM = 1.72 * OC$$

The conversion was noted along with a reference to Ref ID 1295 in the Exposure Medium field.

Growth medium pH
If provided, the growth medium pH was reported here. If not, the default was NR.

Growth medium percent moisture
If provided, the moisture content of the growth medium was reported.

Food
If food for the earthworm was also provided in the soil and it was explicitly noted as such or reasonably deduced, it was reported here. Examples are manure and litter.

<u>Organic Matter ID (for both plant and invertebrate studies)</u>
If the organic matter content in the soil or growth medium was 10% or less, it was coded as Low. If the organic matter was greater than 10%, it was coded as High. Otherwise, it was coded as NR for not reported or N/A if the study at hand focused on birds or mammals.

If organic carbon was reported, it was converted to organic matter if not already done so. If both the organic carbon and the percent content of spaghnum peat moss were reported, the content of the peat moss was used to set the Organic Matter ID.

<u>Measurements and Results</u>
Focus Measurements:
Experiment Effect IDs were created by simply adding an alphabetic identifier to the end of the Experiment ID for each focus measurement. Examples:

0025_SE_1A
0025_SE_1B
0025_SE_2A
0517_CD_2A

Focus measurements that were evaluated in the Part 1 included reproduction, development, weight changes of adult or mature organism, size changes of adult or mature organism, and mortality. Sometimes, "Other" measurements were included. For example, if behavioral measurements were viewed to inhibit reproduction or weight changes in such a way that adverse population effects could be expected, they were also included. Measurements that were vaguer with respect to effects on populations (e.g., tumors, tissue residues, cholesterol level) were not reviewed unless the authors provided a clear correlation with those measurements and effects on reproduction or mortality. A short focus measurement label, often following the authors' naming convention, was provided in the Focus Measurement field. The focus measurements were then coded (Table 5):

Table 5. Codes and descriptions for focus measurements.

Code	**Description**
WC	Weight changes (adult)
NR	Not Reported
O	Other
R/D	Reproduction/Development
S	Survival

There were cases where the measurement obviously involved a reproductive parameter but the relationship of the parameter to effects on population health was not clearly outlined. These measurements were coded as O. Examples included sperm motility, seminiferous tubule diameter, and testicular enzyme activities.

If development or mortality was measured in young organisms but they were exposed to the chemical through parental exposure, the measurement was coded as R/D. This was considered a measurement of the ability of the parents to produce offspring that can develop normally and resist mortality. If the juvenile organism was directly exposed to the chemical, the mortality was coded as S. Growth of a juvenile organism that was directly exposed to the chemical was coded as R/D to account for the developmental aspect.

Focus Measurement Frequency:
The number of times the measurement was recorded was noted here.

Focus Measurement Duration:
If the observation of the focus measurement lasted more than just an instant (e.g., behavioral observations that may take 10 minutes of observation), the length was noted in this field.

Critical Life Stage Category:
A life stage of an organism was considered to be a critical life stage if exposure to a chemical during this life stage was expected to result in a negative impact on population health of that organism. For the purpose of deriving Toxicity Reference Values (TRVs), a critical life stage was defined as a life stage associated with a chemical exposure that occurs during the reproductive cycle of the test organism or during the development of the immature test organism (i.e., reproduction and development). These types of measurements directly reflect effects on the size and character of the next generation of the population. There were other measurements that reflect critical life stages because they occur during the reproductive cycle of adults, during the development phase of juveniles, or during an embryo stage (e.g., maternal body weight or mortality, survival of directly exposed juveniles, mean egg weight, clinical signs, seed weight). However, these types of measurements do not directly reflect effects on the next generation of the population.

If a measurement reflects a critical life stage, the associated effect level may be considered chronic regardless of the actual chemical exposure duration associated with this measurement. The reasoning behind this assumption was as follows: A chronic study was preferred over a single dose, acute, or subchronic chemical exposure study because it was more likely to capture effects that reflect critical life stages that are relevant to population success. Therefore, we assume that any duration of chemical exposure that was associated with a critical life stage measurement has captured potential effects on population success. This effect was then considered to be equivalent to a chronic chemical exposure effect regardless of actual chemical exposure duration. Ultimately, if a measurement was categorized as chronic because of a critical life stage, our certainty of this effect predicting the impact of a particular chemical on population success increases. The exception to this rule of thumb was if the critical life stage effect was of the type that does not directly reflect effects on the size or character of the next generation of the population. In this case, our certainty in predicting the impact of a particular chemical on population success has not increased.

For TRV derivation, a measurement associated with a chronic - critical life stage (C-CL) category was preferred over one with a critical (CL) or non-critical (non-CL) life stage effect.

All reproduction/ development (R/D) measurements were coded as C-CL, regardless of actual chemical exposure duration. A C-CL measurement was treated as a chronic chemical exposure measurement when determining the application of UFs in the TRV derivation process. Note - not all measurements associated with seemingly reproductive/ development functions were coded as R/D. For example, a reproductive effect such as seminiferous tubule diameter in male mammals was not clearly linked with population health, and was coded as an “Other” (O) effect and designated as just CL. Another measurement example following this coding scenario would be seed weight (O and CL).

On the other hand, also note that sometimes a measurement will be coded as survival (S) but labeled as C-CL. This was because the immature organism itself was directly exposed to the chemical and chemical exposure encompassed this immature life stage. This occurs for studies where bird eggs received injections and embryo mortality was measured (e.g., Ref IDs 0666 and 1216). This scenario was also evident where germination of seeds (considered survival) was measured.

Other measurements that were not R/D, but occur at the same time as a critical life stage were labeled as CL. The actual exposure length holds (i.e., single dose remains single dose) when determining the application of UFs in the TRV derivation process. Examples of such measurements include survival for juvenile organisms (who are still undergoing development, a critical life stage), body weight measured for adult organisms in the reproductive cycle, clinical signs, egg length, or maternal body weight.

Measurement scenarios that were not associated with a critical life stage were coded as non-CL. If it cannot be determined at what life stage of organism the measurement occurred, the measurement was coded as not reported (NR).

Further exceptions occur where professional judgement deems the CL coding to not be necessary. Examples include:

- A study where chemical administration occurred for a lengthy amount of time, but measurements of the effects occurred only for part of the chemical administration period. (Ref ID 0010, Experiment 1: Adult rats were exposed to a chemical 90 days before mating and through reproduction for at least another 30 days, and body weight measurements took place only up until the mating period began, this study would be characterized as non-CL. The body weight measurements had not taken place while the rats were subjected to additional stressed of reproduction; therefore, they were not expected to be more susceptible to adverse weight change effects.)
- A study where a critical life stage occurred, but organisms of a certain treatment group died before the critical life stage began. (Ref ID 0016: Adult mink were exposed to 5 ppm methylmercury or 10 ppm mercuric chloride. Authors wished to obtain information on adult body weights, kit body weights, adult mortality, reproductive measurements such as number of females mating and number of kits born alive vs. dead, and clinical signs. All organisms fed 5 ppm methylmercury in the diet died before breeding season. Adult body weights and critical life stage codes for the mink in the 10 ppm mercuric chloride group would be G and CL, respectively. However, for mink in the 5 methylmercury, the codes would be G and non-CL, respectively, because the body weight measurements did not continue through reproduction as the mink died before breeding season.)

Test Period Duration and Category:
The chemical administration plus any additional time before and/or after the exposure was noted here. If the test organisms were quarantined for a period of time before exposure started, or if measurements continued to be recorded after exposure ceased, this length of time was counted in the test period.

Focus Measurement Dose-Response:
First, the table and/or page number from which the results were taken was noted. Notes on which exposure levels resulted in adverse effects for the focus measurement followed. General observations on dose-response trends were also reported. If no statistics were used, a summary of the results sufficed. Basically, entry in this field provided an insight into the results observed at various exposure levels and compares them to results for controls.

Focus Measurement Statistical test and confidence level:
If provided, the statistical test and alpha level used to determine significant adverse effects for the measurement were noted here.

Focus Measurement Comments/ Effect Levels:
This is where the assignment of the effect levels takes place. First, the validity of the focus measurement for use in Part 2 must be determined. If the focus measurement was evaluated and it turns out that the data were not sufficient for TRV derivation and thus, a Part 2 review, "_NoPTSEP2" was attached to the end of the Experiment Effect ID (e.g., 0025_CD_1A_NoPTSEP2). Conditions in which the data were not sufficient for TRV derivation:

- Only trends were mentioned in the text by the investigators and they do not clearly illustrate at which exposure level adverse effects began.
- Numerical data was not available and authors only hint at results.
- Results of the study were too varied and no statistics were applied.

If there is a clear dose-response trend and an exposure concentration at which no adverse effects and/or at which adverse effects were first observed can be noted, the exposure concentration that produced no observed adverse effects will be used for the NOAEL while the exposure concentration at which adverse effects were first observed will be used for the LOAEL.

<u>Author-reported effect levels</u>

If the authors calculated their own effect levels, these were reported in this field. The LC50 (or LD50) or EC50 (or ED50) were most often the effect levels reported.

<u>Experiment comments/Author conclusions:</u>

Any general observations on focus measurements not carried forth to Part 2 reviews may be reported here. Also, an overall summary of the data is presented, along with mention of any other factors that may have contributed to the results (e.g., mortality due to an infection outbreak and not chemical).

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PTSE PART 2 - Study Evaluation

The Part 2 review process is fairly straightforward. Table 6 shows the entry process for the Part 2 fields. Table 6 is followed by a scoring key used for each field. The calculation of the PTVs is then demonstrated. The use of significant digits is also briefly explained, and finally, the mechanism by which the scores are weighted in order to produce confidence ratings for each PTV is outlined.

Table 6. Primary Toxicity Study Evaluation Part 2 Data Entry Guidelines.

Field Name	Guidelines/ Assumptions
Reference ID	Imported from Part 1 data entry database.
Chemical ID	Imported from Part 1 data entry database.
Experiment ID	Imported from Part 1 data entry database.
Experiment Purpose	Imported from Part 1 data entry database.
Effect ID	Imported from Part 1 data entry database.
Focus_Measurement	Imported from Part 1 data entry database.
Review Date	Date the review was started. Can be superseded by the date the record was updated.
Reviewer Initials	Entered or selected from drop down list. Initially, the original reviewer of the record is entered. This can be superseded by the initials of the reviewer who updated the record.
Study Design and Documentation Score	
Control	Was a suitable control present? Was it negative (no toxicant applied, but similar to treatments in all other aspects) or positive (standard such as dieldrin used for comparisons of relative toxicities with other studies)?
Exposure Groups	Was more than one exposure group present? The exposure level(s) are listed.
Test Organism Details	The test organism name, age or life stage, sex, and origin/source are reported, if provided.
Dose Rate Parameters	• For bird and mammal studies: If the exposure concentrations are not reported in mg/kg/d, are body weight, food ingestion rate, and/or water ingestion rate

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Field Name	Guidelines/ Assumptions
	parameters available to convert the provided dose units to mg/kg/d? • For earthworm and plant studies: N/A
Exposure Dose Concentration	Are the exposure concentrations nominal (target) or empirical (verified) concentrations and what is their moisture basis? If the exposure medium is not food or soil, moisture basis was N/A. If chemical administration was already provided as daily dose rates, moisture basis was canceled out and this aspect becomes N/A as well.
Statistics	Are statistics provided and if so, what is the test and p-value or confidence limit? If statistics were not provided, but data were presented in tables in such a way that the reviewer was able to apply his/her own statistics or analysis, a score of 0.5 was entered so the study was not entirely penalized.
Test Organism Score	
Taxonomic Relationship of Test Organism	Enter the screening receptor group that the test organism best represents. Describe how closely the test organism is related to the screening receptor taxonomically and provide the appropriate score.
Basis for Use of Test Organism	Did the investigators of the study provide a reason for using the test organism as opposed to other organisms? If so, report it and enter a score of 1.
Exposure Conditions Score	
Test Environment	Self-explanatory.
Test Exposure Chemical	Note the chemical of potential ecological concern (e.g., cadmium), not the chemical form (e.g., cadmium chloride).
Test Exposure Medium (To Represent Food and Drinking Water TRVs)	For bird and mammal studies: • Note the test exposure medium • Add: "TRVs: food, water; ESLs: sediment, soil, and water". • The rest of the fields are self-explanatory.

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Field Name	Guidelines/ Assumptions
	For earthworm and plant studies: Enter N/A in the Comment(s) fields and the score 0 for food and water in the Point(s) fields.
Test Exposure Medium (To Represent Soil TRV)	For earthworm and plant studies: • Note the test exposure medium. • Add: "TRV: soil; ESL: soil ". • The rest of the fields are self-explanatory. For bird and mammal studies: Enter N/A in the Comment(s) fields and the score 0 for soil in the Point(s) field.
Test Exposure Chemical Interactions	Even if there are chemicals in the exposure medium - they may be naturally occurring and in this case, we would not consider them as interfering (score = 1). Only when chemical or physical properties change during the course of the experiment will we note a score of 0. If it any type of interference (or not) is not reported, note that none is expected.
Test Exposure Route	Note the test exposure route and whether it is similar to the exposure route of concern.
Test Period (including Chemical Administration)	Note the complete test period duration as related to the Test Period Duration and its corresponding ID. Add in what percent of this is chemical administration. (E.g., The test period was 90 days and 100% of this time was chemical administration. OR The test period was 120 days, and chemical administration occurred in the first 90 days and consisted of 75% of the total test period.)
Critical Life Stage	If the chemical administration occurred for a large part during reproduction or development, note so in this field and give it a score of "1".
Test Exposure Frequency	Note how often the test organisms were exposed to the test chemical.
Measurement(s) and Result(s)	

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Field Name	Guidelines/ Assumptions
Focus Measurement Effect Category	Note the focus measurement.
Measurement of Focus Measurement	Self-explanatory.
Focus Measurement Effect Level	Note the effect levels and if a NOAEL/NOEC and LOAEL/LOEC, report the magnitude of difference.
Effect Level ID	Select from drop down list.
Primary Toxicity Value Calculation	
Value, Units	Self-explanatory.
Duration	Enter the test period duration here.
Calculation	Enter relevant daily dose rate, moisture conversion, and unit conversion calculations here.
Notes	Enter notes about where moisture content is obtained, any assumptions about daily dose rates and other calculations, etc.
Parameters	Enter parameters as presented in Part 1. If they were not provided in the study, find most representative values for each parameter, provide a short description of what each value represents and allometric equation if applicable, and report source in Reference ID field. Otherwise, enter N/A when not needed, and 0001 in Reference ID field.

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Scoring Key for Primary Toxicity Study Evaluation Part 2 Data Entries

STUDY DESIGN AND DOCUMENTATION

Control group score:

1 - A control group was included.
0 - A control group was not included.

Exposure group score:

1 - More than one exposure group was used.
0 - Only one exposure group was used.

Organism details score: Up to four pieces of information can be provided about the organism: Name (common and/or scientific), Age, Sex, and Source/Origin. Scoring is as follows:

4 - All information is provided.
3 - Three pieces of information are provided.
2 - Two pieces of information are provided.
1 - Only one piece of information is provided.
0 - No information was available.

Dose rate parameter score: Dose rates can be calculated using two dose rate parameters: body weight and either an ingestion rate (for water or food) or an inhalation rate.

2 - Both dose rate parameters were provided.
1 - One dose rate parameter was provided.
0 - No dose rate parameters were provided.

Dose concentration basis score:

2 - Measured, Dry weight or N/A
1.75 - Measured, Wet (fresh) weight
1.5 - Nominal, Dry weight or N/A
1.25 - Nominal, Wet (fresh) weight
1 - Measured, Unknown
0.75 - Nominal, Unknown
0.5 - Unknown, Dry weight or N/A
0.25 - Unknown, Wet (fresh) weight
0 - Unknown, Unknown

Statistics score:

1 - Statistical test and confidence level are reported.
0.5 - Statistical test or confidence level missing or if neither are reported, data is available for reviewer to run analysis.
0 - The statistical test and confidence level are not reported, and data is not adequate for reviewer to run analysis.

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TEST ORGANISM

Taxonomic relationship score:

2 - The test organism is related to at least one screening receptor at the Order, Family, Genus, or Species level. (Not applicable to plant or invertebrate test organisms.)
1 - The test organism is related to at least one screening receptor at the Class level. (Not applicable to plant or invertebrate test organisms.)
0 - The test organism is not related a screening receptor at the Class or more specific level or is a plant or invertebrate.

Test organism basis score:

1 - The researchers indicated, or it can be reasonably assumed, why the particular test organism was chosen.
0 - It is not known why the test organism was chosen.

EXPOSURE CONDITIONS

Exposure environment score:

1 - The study is based on a field or laboratory study from which a single chemical exposure can be discerned.
0 - The study is NOT based on a field or laboratory study from which a single chemical exposure can be discerned.

FOOD AND DRINKING WATER TRVS (BIRDS AND MAMMALS ONLY)

Food equivalency score:

1 - The test exposure medium is equivalent to food.
0.5 - The test exposure medium is similar to food (capsule, oil, or solid bolus).
0 - The test exposure medium is NOT equivalent or similar to food (drinking water or other).

Drinking water equivalency score:

1 - The test exposure medium is equivalent to drinking water.
0.5 - The test exposure medium is similar to drinking water (aqueous solution or chemical).
0 - The test exposure medium is NOT equivalent or similar to drinking water (food or other).

SOIL TRVS (INVERTEBRATES AND PLANTS ONLY)

Soil equivalency score:

1 - The test exposure medium is equivalent or similar to soil.
0 - The test exposure medium is NOT equivalent or similar to soil.

Chemical interaction score:

1 - Chemicals and properties that could potentially affect the toxicological impact of the test exposure chemical on the test organism are NOT present in the test exposure medium.
0 - Chemicals and properties are present and could potentially affect the toxicological impact of the test exposure chemical on the test organism.

Exposure route score:
1 - The test exposure route is equivalent to the ESL exposure route of concern (for birds and mammals: food, drinking water, or inhalation; invertebrates: oral/dermal; and plants: uptake).
0.5 - The test exposure route is similar to the ESL exposure route of concern (for birds and mammals only, oral intubation or gavage).
0 - The test exposure route is NOT equivalent or similar to the ESL exposure route of concern.

Test and exposure period score: Based on chemical administration period:
3 - Chronic
2 - Subchronic
1 - Acute
0 - Not reported

	Bird or Mammal:	Earthworm or Plant:
Chronic:	> 90 days	>= 7 days
Subchronic:	14 to 90 days	3 to 6 days
Acute:	< 14 days	< 3 days

Critical life stage score:
1 - Chemical administration occurs during a critical life stage.
0 - Chemical administration does not occur during a critical life stage.

Exposure frequency score:
1 - The test exposure frequency is continuous or frequent enough to represent the test exposure duration.
2 - The test exposure frequency is not continuous or frequent enough.

MEASUREMENT(S) AND RESULT(S)

Endpoint category score:
4 - Reproduction or development is the endpoint category.
3 - Survival
2 - Weight change or Size Change
1 - Other

Focus measurement length score:
1 - The focus measurement was measured so that it reflects the entire chemical administration period.

0 - The focus measurement did not reflect the entire chemical administration period.

Effect level score:

6 - NOAEL and LOAEL, NOEL and LOEL, or NOEC and LOEC and values are within a factor of 3.
5 - NOAEL and LOAEL, NOEL and LOEL, or NOEC and LOEC and values are within a factor of 10.
4 - NOAEL and LOAEL, NOEL and LOEL, or NOEC and LOEC and values are not within a factor of 10.
3 - NOAEL, NOEL, or NOEC only.
2 - LOAEL, LOEL, or LOEC only.
1 - LD50, LC50, or EC50 only.

PTV Calculation

In deriving PTVs, the default was to use the effect levels or critical levels provided by the authors of the study. If provided, the information should be found in the Author-reported effect levels field of the PTSE Part 1. The use of these provided values was based upon the assumption that the authors have accounted for background concentrations of the primary exposure media and/or concentrations in other exposure media for the chemical of concern. If the authors did not provide effect levels in mg/kg/d, adjustments were made before calculating the daily dose rate, if necessary. Adjustments were NOT made if:

- Primary medium exposure concentrations were verified and in dry weight (background concentrations were assumed to be included in the verified concentrations), and additional exposure from other, irrelevant media was not present or reported,
- PTV calculations cancelled out wet weight in concentration and food intake, and no background or other media concentrations were present or reported,
- Primary medium exposure concentrations were target (nominal) and moisture basis was unknown, and background concentrations and/or additional exposure from other media was not present or reported (The moisture basis was assumed to be dry weight in order to produce a conservative PTV.),
- Primary medium exposure concentrations were empirical and moisture basis was unknown (The moisture basis was assumed to be dry weight in order to produce a conservative PTV.), and/or
- All exposure concentrations were provided in units of mg/kg for earthworms and plants, or mg/kg/d for birds and mammals.

If the reported concentrations did not fill the above criteria, various types of adjustments were made. They included wet weight to dry weight conversions (for concentrations in the media and for food ingestion rates for birds and mammals), unit conversions, additions of verified background concentrations to target (nominal) exposure concentrations, additions of background exposure concentrations from a medium other

than the primary exposure medium to the primary exposure concentrations, or a combination of the above.

If it was noted that background concentrations were present but the exact amount could not be determined from the data provided in the study without introducing more uncertainty, this was merely noted in the Part 2. The PTV was based upon just the supplemental amount of the chemical, and it was still more conservative than one based on the supplemental amount plus the amount in the basal medium.

If dose rate parameters (i.e., body weight, food or water ingestion rate, and inhalation rate) were not provided in the study, they were obtained from other sources such as EPA's Wildlife Exposure Factors Handbook (Ref ID 0561) and Dunning, 1984, (Body Weights of 686 North American Birds (Ref ID 0086). Often, the body weight was obtained from the other source and then the food or water ingestion rate was allometrically calculated using equations from EPA's Wildlife Exposure Factors Handbook or EPA, 1988 (Recommendations for and Documentation of Biological Values for Use in Risk Assessment; Ref ID 0084). If the dose rate parameters were not in units of kg body weight, kg food/day, kg water/day, or m^3 air/day, the appropriate conversions were run prior to using the values in the PTV calculation.

If exposure concentrations were not in mg/kg, conversions to mg/kg were made before calculation of the daily dose rate.

For example, converting $\frac{\mu g\ chemical}{ml\ water}$ to $\frac{mg\ chemical}{kg\ water}$ would be as follows:

$$\frac{\mu g\ chemical}{ml\ water} * \frac{1000\ ml\ water}{1\ L\ water} * \frac{1\ mg\ chemical}{1000\ \mu g\ chemical} * \frac{1\ L\ water}{1\ kg\ water} = \frac{mg\ chemical}{kg\ water}$$

<u>DAILY DOSE RATE CALCULATION FOR ORAL INGESTION VIA FOOD, FOR MAMMALS AND BIRDS:</u>

If the body weight was provided or obtained from another source (and converted to kg if needed), food ingestion rate was provided in kg/d or similar, and exposure concentrations were provided and converted to mg/kg, the equation used was:

$$PTVi, j = \frac{Ci * FIj}{BWj}$$

Where $PTV_{i,j}$ is the primary toxicity value (mg/kg/d) for chemical i in organism j
C_i is the concentration (mg/kg) of chemical i in food
FI_j is the food intake rate (kg food/day) for organism j
BW_j is the body weight (kg) of organism j

If a body weight was provided and converted to kg, and the exposure concentration was provided in terms of mg/organism/day, the following equation was used:

$$PTVi,j = \frac{Cij}{BWj}$$

Where $PTV_{i,j}$ is the primary toxicity value (mg/kg/d) for chemical i in organism j
C_{ij} is the concentration (mg/organism/d) of chemical i in food for organism j
BW_j is the body weight (kg) of organism j

DAILY DOSE RATE CALCULATION FOR ORAL INGESTION VIA DRINKING WATER, FOR MAMMALS AND BIRDS:

If the body weight was provided or obtained from another source (and converted to kg if needed), water ingestion rate was provided in l/day or similar, and exposure concentrations were provided and converted to mg/l, the equation used was:

$$PTVi,j = \frac{Ci * WIj}{BWj}$$

Where $PTV_{i,j}$ is the primary toxicity value (mg/kg/d) for chemical i in organism j
C_i is the concentration (mg/l) of chemical i in water
WI_j is the water intake rate (l water/day) for organism j
BW_j is the body weight (kg) of organism j

If a body weight was provided and converted to kg, and the exposure concentration was provided in terms of mg/organism/day, the following equation was used:

$$PTVi,j = \frac{Cij}{BWj}$$

Where $PTV_{i,j}$ is the primary toxicity value (mg/kg/d) for chemical i in organism j
C_{ij} is the concentration (mg/organism/d) of chemical i in food for organism j
BW_j is the body weight (kg) of organism j

DAILY DOSE RATE CALCULATION FOR CONTINUOUS AND INTERMITTENT AIR EXPOSURE VIA INHALATION, FOR MAMMALS AND BIRDS:

Continuous and intermittent inhalation exposures

Continuous inhalation means the test organism was exposed continuously to air containing chemical vapors for 24 hours a day, 7 days a week, for however long the study lasted. In this scenario, it is not necessary to figure out the total exposure time as one would with an intermittent study. In an intermittent inhalation exposure study, the total amount of time exposed to the chemical over the total length of the study must be determined. This is shown in the next section for daily dose rate calculation for air exposure via intermittent inhalation.

The general equation used to calculate a daily dose rate for continuous or intermittent inhalation exposure is:

$$PTVi, j = \frac{Ci * WIj}{BWj}$$

Where $PTV_{i,j}$ is the primary toxicity value (mg/kg/d) for chemical i in organism j
C_i is the concentration (mg/m^3) of chemical i in air
IR_j is the inhalation rate (m^3/day) for organism j
BW_j is the body weight (kg) of organism j

However, while this is a simple equation, the concentration of chemical in air often needed to be converted from ppm to mg/m^3. This was done in two steps, the first of which determined the volume of the chemical under standard conditions as governed by the ideal gas law, and the second which used the ideal gas law to solve for mass of the chemical in g.

The ideal gas law is:

$$PV = nRT$$

Where P is standard pressure, or 1 atm
V is standard volume of chemical (analyte) in air, in L
n is the number of moles of chemical, in mol
R is standard gas constant, or 0.0821 L*atm/mol*K
T is standard temperature, or 298 K

The number of moles of chemical is further broken down into:

$$n = \frac{g}{FW}$$

Where n is number of moles of chemical in mol
g is the mass of the chemical in g
FW is the formula weight of chemical in g/mol

In order to determine the air concentration of the chemical in the units of mg/m^3, n in the ideal gas law equation is substituted with g/FW and the equation is modified in order to solve for g, the mass of the analyte. This value is then converted to mg for use in the mg/m^3 concentration value.

First, the volume of the chemical (analyte) under standard conditions must be determined:

$$V_analyte = \frac{ppm(v) * V_reference}{10^6}$$

Where V_analyte is the standard volume of the chemical under standard conditions, in L
ppm(v) is the concentration of the chemical administered in the study, in mg/kg
V_reference is the standard volume of a standard gas, or 1000 L
10^6 is a conversion factor

The mass of the chemical (analyte) is now determined by solving for g in the ideal gas law equation:

$$g = \frac{P * V_analyte * FW}{R * T}$$

The value in g is then multiplied by 1000 to achieve mg and this value is used with the units of mg/m^3 in the PTV calculation along with an inhalation rate either provided in the study or obtained from another source. Often, the inhalation rate is calculated using an allometric equation from Ref ID 0561 and a body weight that was provided in the study or obtained elsewhere.

Additional determinations for Intermittent inhalation exposures:

The conversion of concentrations from units of ppm to mg/m3 follow the steps outlined in the section for determining daily dose rate based on continuous inhalation exposures. However, the inhalation rate must be determined based upon total exposure time and then averaged over the study duration. This is done in a series of steps:

1) The total amount of exposure is determined from adding together the total exposure times throughout the study,
2) The daily inhalation rate for the test organism is either obtained from the study or calculated using an allometric equation,
3) The total amount of exposure is multiplied by this daily inhalation rate in order to determine the total amount of chemical the organism received during the study, and

4) The total amount of chemical the test organism received during the study is divided by the number of days the study in order to determine the average daily dose rate for each day of the study as if it were a continuous exposure.

An example is used to illustrate these steps. In Ref ID 1348, rats were exposed to trichloroethene at a rate of 4 hours per day, 5 days per week, for 5 weeks.

Step 1: Determining total amount of exposure.

$$4\,\frac{\text{hr}}{\text{d}} * 5\,\frac{\text{d}}{\text{wk}} * 5\text{ wk} = 100\text{ hr, or approximately 4.17 days}$$

Step 2: Determining daily inhalation rate of test organism.

The higher end of the body weight range of the rats at the beginning of the study (450 g) was used in an allometric equation for all mammals (Ref ID 0561) to determine the daily inhalation rate for rats (0.29 m^3/day).

$IR = 0.002173(Wt^{0.80})$

Where IR is inhalation rate in m^3/day
Wt is body weight in g

Step 3: Determining the total amount of chemical the test organisms received during the study.

$$4.17\text{ days} * 0.29\,\frac{\text{m}^3}{\text{d}} = 1.21\text{ m}^3$$

Step 4: Determining the daily dose rate for the test organisms throughout the study as if it were a continuous exposure:

$$\frac{1.21\,\text{m}^3}{35\text{ days}} = 0.03\,\frac{\text{m}^3}{\text{day}}$$

The 0.03 m^3/day rate is the final inhalation rate value that is used in the PTV equation.

Occasionally, an intermittent exposure study had two separate periods in which the chemical was administered at different lengths or frequencies each. For example, mice were exposed to a chemical in the first 5 weeks of an 8-week study at a rate of 4 hours per days, 5 days per week, and then were exposed to the chemical for 6 hours per day, 7 days per week for the remainder of the study. In this scenario, the total amount of

exposure and the total amount of chemical the test organism received was calculated for *each* period. Note, Step 2 results in the same value since it is determination of a daily inhalation rate for the test organism. The values from Step 3 were then combined in Step 4.

Significant digits

The rules for significant digits in computations were generally followed in the PTV calculations. In multiplication and division, the product or quotient contains as many significant digits as the number in the operation with the least number of significant digits. In addition and subtraction, the sum or difference is no more precise than the least precise number involved in the operation. When it comes to rounding off non-essential digits, if the last reported digit was followed by a number less than 5, the reported digit was kept as is. If it was followed by a number greater than 5, it was rounded up. Finally, if the last reported digit was followed by a 5, and that 5 was in turn followed by no other digits or zeroes, then the last reported digit was kept as is. On the other hand, if the 5 was followed by an odd number, the reported digit was rounded up one, and if the 5 was followed by an even number, the reported digit was left as is.

After the rules for significant digits were applied, the number that was entered into the PTV field was automatically rendered to scientific notation with two decimal points. This does not denote 3 significant digits but was rather a truncated way of reporting the values.

PTV Confidence Ratings

Each PTV has its own record of information in the Part 2 data entry database. The wealth or lack of information provided by the study are reflected in the scoring of the Part 2 database, and these scores are then weighted according to the ability of each criteria to influence the TRV and uncertainty associated with it. The following is a list of multipliers and how the situations in which they are applied.

1 - There is little to no influence on the TRV. Most studies have already been eliminated based on non-fulfillment of these fields (e.g., a bird study is not going to be used for a mammal study).
2 - There is more influence on the TRV in the way of deciding whether or not to keep the PTV in the TRV data set, but little influence on the actual TRV.
3 - There is a medium influence on the TRV. This weighting scheme can also be used for criteria in which TRVs are defined (e.g., oral in diet or drinking water) or it can be used for those areas where if data is

not provided, other means by the reviewer can be employed (e.g., statistics).

4 - There is a medium high influence on the TRV. If the original score is low, this leads to more uncertainty. This weighting scheme is also used for those criteria defining TRVs (e.g., reproduction/development, chronic, NOAEL).

5 - There is a high influence on TRV where a low original score leads to the most uncertainty and greatest difference in TRVs compared to those criteria derived from extra detail provided in study (e.g., chronic vs. acute).

Table 7 illustrates each criterion, its multiplier, and the justification for use of that multiplier.

Table 7. Weighting schemes for criteria in Part 2 data entry database.

Field that is scored	Multiplier*	Justification
Study Design and Documentation Score		
Control group included	3	Need this for a stronger assessment of effect levels, but unbounded NOAELs and LOAELs can also be derived.
Multiple exposure groups	3	Need this for a stronger assessment of effect levels, but unbounded NOAELs and LOAELs can also be derived.
Test organism details	1	Little influence on TRV. Helps gauge the amount of detail in study.
Dose rate parameters	4	Those parameters that are specifically related to organism and study at hand are best suited for deriving PTV. Parameters can also be attained elsewhere but use of them increases uncertainty although the difference in the TRV vs. one that would be derived from the use of provided dose rate parameters is slight compared to use of uncertainty factors, for example.
Exposure dose concentration	3	Measured concentrations in dry weight preferred. However, if not reported - assumed nominal and dry weight. Little influence on

		TRV unless moisture basis is in wet weight and conversion to dry weight is needed - medium weight.
Statistics	3	Statistics provided in study is preferred and leads to determination of dose-response trends and assignment of effect levels. However, if not provided, data can be analyzed by reviewer. Medium weight because of this, and also because if no statistics or data is provided, quality of effect levels is poor and more uncertain.
Test Organism Score		
Taxonomic relationship of test organism	2	Not as much weight here because the score is bound to be 1 at the least. We choose not to evaluate studies that aren't related to screening receptor by at least class level. However, more certainty results when test organism is more closely related to screening receptor.
Basis for use of test organism	1	Little influence on TRV. Helps in consideration if study is more attuned to test organism itself rather than as a model for human exposure.
Exposure Conditions Score		
Test environment	1	Little influence on TRV.
Test exposure medium similar to food	3	Not as much weight here because the exposure medium is bound to be similar or related to one of the exposure media present here, except for inhalation.
Test exposure medium similar to drinking water	3	Not as much weight here because the exposure medium is bound to be similar or related to one of the exposure media present here, except for inhalation.
Test exposure medium similar to soil	3	Not as much weight here because the exposure medium is bound to

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		be similar or related to one of the exposure media present here, except for inhalation.
Chemical interactions	2	Does not influence TRV much because any study that has chemical interaction is automatically eliminated from data set before Part 1 is started. If other influences are present, they are likely to be of natural conditions.
Test exposure route	3	Little influence on TRV, but it is a preferred criteria in selecting ecologically relevant effect levels.
Test period and chemical administration	5	High weight because assignment of chronic vs. subchronic vs. acute leads to application of UFs which are the leading factor in TRV differences.
Critical life stage	4	High weight because assignment of chronic to subchronic or acute studies leads to elimination of the use of UFs which are the leading factor in TRV differences.
Test exposure frequency	2	Does not influence TRV much but TRV is influenced slightly by the accounting for actual exposure time in the daily dose rate.
Measurement(s) and Result(s)		
Focus measurement category	4	May not influence TRVs as much because studies with "Other" endpoints are eliminated before TRV consideration. However, type of endpoint is still a strong consideration with R/D being the preferred endpoint, followed by survival, and then growth. High weight given because we want more of a spread of the score to be able to distinguish between these endpoints.
Measurement length	1	Little influence on TRV.
Effect level category	5	Most weight because assignment of NOAEL vs. LOAEL vs. other effect level leads to application of

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		UFs which are the leading factor in TRV differences.

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PTSE PART 3 - Toxicity Reference Value Development

The tiered approach used in the TRV development stage determines what Parts of the PTSE process are used. The full 4-step PTSE process is applied only to Tier II and III TRVs, while information for Tier I and IV TRVs is brought out in Parts 3 and 4. Regardless of what type of TRV or what tier of the TRV development approach was used, a Part 3 summary that briefly describes the nature of the TRV was written. For Tier II and III TRVs, graphs were also plotted using their respective PTV data sets. Further details for the Part 3 process for each tier are presented below.

Tier I:
If an EcoSSL TRV for birds, mammals, invertebrates, or plants was available for a COPEC at LANL and it was either an interim final or final value, it was used. This was determined before the PTSE process was started because if an EcoSSL TRV was available, PTSE Parts 1 and 2 did not need to be completed. All supporting information that could be determined about the EcoSSL TRV was summarized in Part 3. Appendix A contains an example of a summary written for an EPA EcoSSL TRV.

Tier II:
If a Tier I TRV was not available or was not at least in interim final status, Parts 1 and 2 were completed for the data set of the chemical and receptor combination (e.g., Aroclor 1260 in mammals). After the Part 2 was completed, the data set for a chemical/organism group/exposure medium combination (e.g., Aroclor 1260, mammal, food) was created by including only those ecologically relevant records. This meant that the PTVs associated with exposure conditions similar to that of the environment were included. In order to create this data set of ecologically relevant PTVs, various records not meeting ecologically relevant criteria had to be eliminated. For all chemical/organism group/exposure medium combinations, PTVs associated with the following were eliminated:

- Unknown exposure medium
- "Other" focus measurement category (i.e., not a reproduction/development, survival, weight change, or size change endpoint)
- Low or Unacceptable confidence rating

Eliminations specific to birds and mammals, invertebrates, and plants are in Table 8

Table 8. PTVs that were eliminated from the GMM TRV data set based on ecologically irrelevant exposure conditions.

Organism group(s)	**Exposure medium**	**Parameter**	**Eliminations**
Birds and Mammals	Food	Exposure medium	Drinking water
			Aqueous solution
		Exposure route	Injections

	Drinking water	Exposure medium	Food
			Peanut oil
			Corn oil
			Other types of oil and oil mixtures
		Exposure route	Injections
Invertebrates	Soil	Exposure medium	Manure
			Soil&Manure
		Exposure route	
		Soil property	Organic matter greater than 10%
			Organic matter not reported
Plants	Soil	Exposure medium	Filter paper
			Nutrient Solution
			Aqueous Solution
		Exposure route	
		Soil property	Organic matter greater than 10%
			Organic matter not reported

After the initial data set was created, the most ecologically relevant and/or sensitive PTV for each ecologically relevant endpoint of each experiment was selected using best professional judgment. For example, if one experiment had 3 reproduction/development endpoints, 2 survival endpoints, and 1 weight change endpoint, the most ecologically relevant reproduction/development and survival endpoints would be used along with the one weight change endpoint. This minimized the possibility of a GMM TRV skewed due to many repetitive values for the same experiment and endpoint categories.

Finally, if at least three ecologically relevant PTVs remained in the data set, a GMM TRV was calculated using NOAEL- or NOEC-based effect levels. If a PTV in the data set represented an effect level other than a NOAEL (e.g., LOAEL or LC50), the appropriate UF was applied to approximate the NOAEL- or NOEC-based effect level used in the GMM TRV calculation. UFs were also applied to approximate chronic NOAEL- or NOEC-based effect levels from subchronic, acute, or single dose NOAEL- or NOEC-based effect levels. See Table 9 for UFs applied.

Table 9. Uncertainty Factors.

	UF applied to derive a TRV that is:	
Type of effect level available	**Chronic NOAEL (NOEC)-based**	**Chronic LOAEL (LOEC)-based**
C-CL or chronic NOAEL (NOEC)	1	N/A
C-CL or chronic LOAEL (LOEC)	10	1
C-CL or chronic LD50 (or LC50)	100	10
C-CL or chronic ED50 (or EC50)	100	10
Subchronic NOAEL (NOEC)	10	N/A
Subchronic LOAEL (LOEC)	100	10
Subchronic LD50 (or LC50)	100	100
Subchronic ED50 (or EC50)	100	100
Acute or Single Dose NOAEL (NOEC)	100	100
Acute or Single Dose LOAEL (LOEC)	100	100
Acute or Single Dose LD50 (or EC50)	100	100
Acute or Single Dose ED50 (or EC50)	100	100

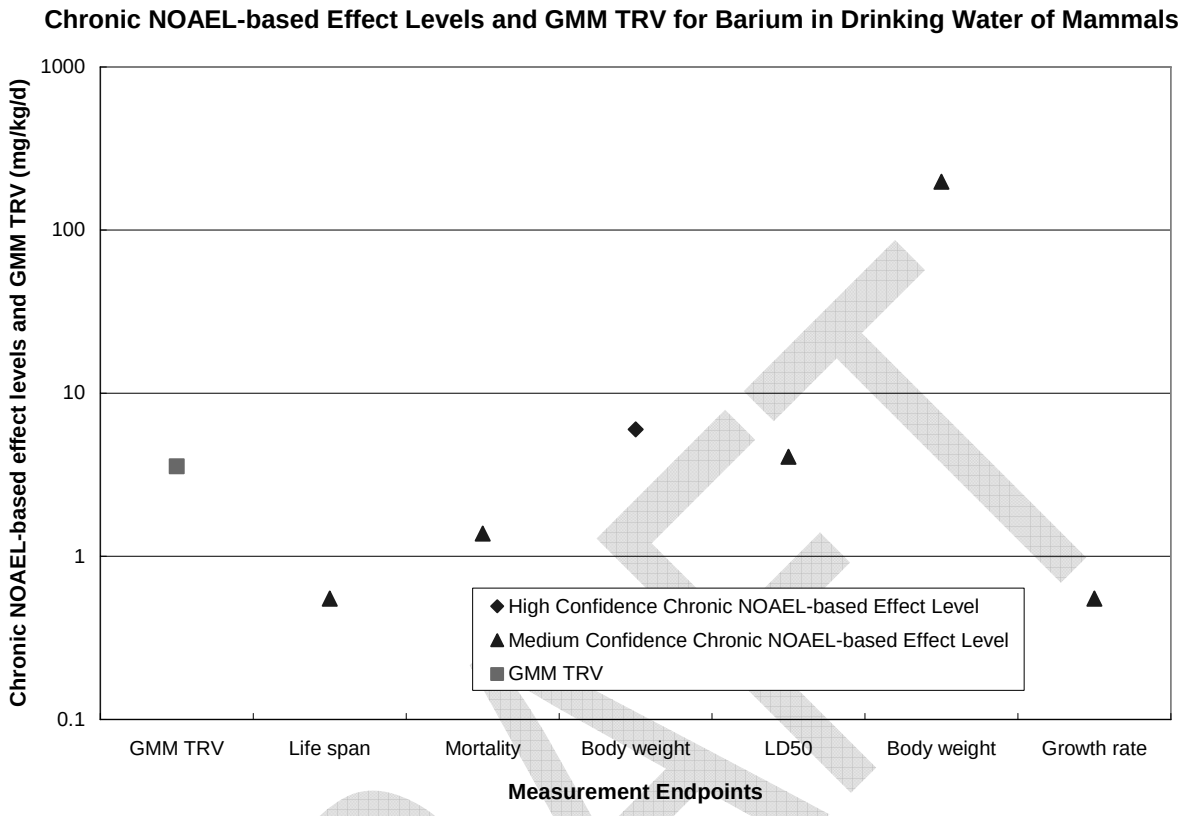
Once all of the PTVs in the data set were normalized to NOAEL- or NOEC-based effect levels, the GMM TRV was calculated as follows:

$$\text{GMM TRV} = \sqrt[n]{PTV_1 * PTV_2 * PTV_3 * \ldots PTV_n}$$

Where n is greater than 3 and each PTV represents a chronic NOAEL- or NOEC-based effect level for an ecologically relevant effect (i.e., reproduction or development, survival, weight change, or size change). The GMM TRV and PTVs are in units of mg/kg/d for birds and mammals and mg/kg for invertebrates and plants.

All of the NOAEL- or NOEC-based effect levels in the GMM TRV data set for a chemical/ organism group/ exposure medium combination were plotted in a log-scale graph. Each point was categorized and labeled according to its confidence rating from Part 2. An example is seen in Figure 1. Blue data points represent PTVs while the pink data point represents the GMM TRV. For the PTVs, a diamond indicates high confidence, a triangle indicates medium confidence, and a circle indicates low confidence. However, graphs presented in the Ecorisk database will not show low confidence PTVs because they have already been eliminated from the data set.

Figure 1. Example of a graph showing the GMM TRV and the PTVs in its data set along with their confidence ratings.



GMM TRV Part 3 Data Entry:

Initials

The initials of the reviewer were entered here. If significant changes were made to a record at a later time, the initials of the new reviewer replaced the original reviewer initials.

Date

The date the record was created or modified was entered here.

Last Updated

If any changes were made to the TRV in the record, the version date of the ECORISK database that these changes will appear in should be entered in this Last Updated field.

Primary Toxicity Paper Reference ID

Because the GMM TRV is usually based on more than one reference, "0001" was entered into this field. The Ref ID of 0001 represents a Not Applicable reference.

P3 Reference

This is the reference ID for the version of the ECORISK database that this new record (TRV) will appear in.

P3 Reference Description

There are various options in the list, but for new Part 3 records for that result in the addition of a new LANL CS TRV to the ECORISK database, the selection read, "LANL derived value based on reviewed primary data."

Organism Name
The organism group representing the organisms in the GMM TRV data set (i.e., Bird, Mammal, Invertebrate, or Plant) was selected from the drop down list.

Organism ID (PTSE P1)
The code for the organism group was selected from the drop down list. The four choices usually selected in new Part 3 records were TB for terrestrial bird, SLE for earthworms, TM for terrestrial mammals, and TP for terrestrial plants. Note that sometimes a bird that is considered an aquatic species was represented in the data set (e.g., mallard duck). The TB code was still used for these organisms. Other aquatic species for mammals, invertebrates, or plants were rejected from the literature set to be used for review, so they should not be encountered this far.

Screening Receptor Group ID
The code for the organism group was selected from the drop down list. The four choices usually selected in new Part 3 records were B for bird, I for invertebrates (earthworms), M for mammals, and P for plants.

Chemical ID
The analyte code for the analyte administered to the organisms in the primary toxicity study was selected from the drop down list.

Chemical ID (surrogate chemical's ID if based on surrogate chemical, otherwise same as chemical ID)
The analyte code for the analyte administered to the organisms in the primary toxicity study was selected from the drop down list. If a surrogate chemical was used, the surrogate chemical's analyte code was selected.

Exposure Route
The primary exposure route represented in the GMM TRV data set was selected from the drop down list.

Exposure Medium
The exposure medium represented in the GMM TRV data set was selected from the drop down list.

ESL Media
For birds and mammals, the ESL media were SOIL, SEDIMENT, and WATER. For plants and earthworms, only one ESL medium of SOIL was used. If the GMM TRV data set represented food exposures for birds and mammals, two records were created: one each for SOIL and SEDIMENT ESLs. If the GMM TRV data set represented drinking

water exposures for birds and mammals, only one record for WATER was created. Only one record (SOIL) was needed for each earthworm or plant and chemical combination.

TRV Type

The final TRV type was noted here. For birds and mammals, Chronic GMM NOAEL was entered. Earthworms and plants have Chronic GMM NOEC. In cases where a GMM TRV was created based on a subset of the original data set, the type was "Chronic subset GMM NOAEL" or "Chronic subset GMM NOEC".

TRV Final Value

The GMM TRV (or subset GMM TRV) was entered here.

TRV Units

For birds and mammals, the Chronic NOAEL was usually presented in units of mg/kg/d (representing mg chemical/kg body weight/day), while earthworms and plants have units of mg/kg (mg chemical/kg soil).

Derivation Notes

Appendix B contains an example of a summary written for a GMM TRV representing barium in drinking water of mammals (used to illustrate Figure 1). This summary includes:

- The chemical and organism group of concern,
- The GMM TRV and its units,
- The number of PTVs in the GMM TRV data set,
- The number of references in the data set,
- The number of experiments in the data set,
- The number of different endpoints in the data set,
- The endpoint categories represented in the data set,
- The form(s) of the chemical,
- The exposure medium,
- A list of the test organisms in the data set,
- A description of the relevance or relationship between test exposure route and exposure route of concern for the particular ESL of concern (i.e., sediment, soil, water),
- A list of the effect levels in the data set,
- A brief evaluation of the distribution of NOAEL- or NOEC-based ELs in the data set and what exposure durations they are based on,
- A table listing the uncertainty factors used,
- The GMM TRV calculation equation,
- A section describing the confidence rating of the GMM TRV,
- A table containing the PTV IDs, original effect level type and value, UF applied, final chronic NOAEL- or NOEC-based EL, and confidence rating of the PTV,
- A bibliography of references cited in the summary, and
- An alphabetized list of acronyms used in the summary.

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In the summary, the effect levels were listed first by exposure duration, and then by pairs before listing singles. The order was as follows:

1) C-CL NOAEL (or NOEC) bound by LOAEL (or LOEC)
2) C-CL NOAEL bound by LOAEL and LD50 (or LC50) or ED50 (or EC50)
3) C-CL NOAEL bound by LD50 or ED50
4) C-CL NOAEL
5) C-CL LOAEL bound by LD50 or ED50
6) C-CL LOAEL
7) Chronic NOAEL bound by LOAEL
8) Chronic NOAEL bound by LOAEL and LD50 or ED50
9) Chronic NOAEL bound by LD50 or ED50
10) Chronic NOAEL
11) Chronic LOAEL bound by LD50 or ED50
12) Chronic LOAEL
13) Subchronic NOAEL bound by LOAEL
14) Subchronic NOAEL bound by LOAEL and LD50 or ED50
15) Subchronic NOAEL bound by LD50 or ED50
16) Subchronic NOAEL
17) Subchronic LOAEL bound by LD50 or ED50
18) Subchronic LOAEL
19) Acute NOAEL bound by LOAEL
20) Acute NOAEL bound by LOAEL and LD50 or ED50
21) Acute NOAEL bound by LD50 or ED50
22) Acute NOAEL
23) Acute LOAEL bound by LD50 or ED50
24) Acute LOAEL
25) Chronic LD50 or ED50
26) Subchronic LD50 or ED50
27) Acute LD50 or ED50
28) Single dose LD50 or ED50

<u>Lowest LOAEL (LOEC) Comparison</u>

The GMM TRV is compared to the lowest chronic LOAEL- or LOEC- based effect level. If a chronic LOAEL or LOEC did not already exist, it was approximated from either the NOAEL (NOEC) or other effect level according to Figure 2.

Figure 2. Flowchart of process for obtaining LOAEL- or LOEC-based effect levels from other available effect levels. (In Development)

<u>Data Set Distribution Comments</u>

The NOAEL- or NOEC-based effect levels are examined visually in the log-scale graph and any values that appear to be outliers are investigated more thoroughly. General observations about distributions (bimodal, patterns with respect to types of endpoints or organisms) are also discussed here.

<u>LANL CS TRV Comparison</u>

The GMM TRV is compared to the LANL CS TRV. It is noted whether it is above or below the LANL CS TRV and by how much. Justification is provided for the continued use of the GMM TRV if it is deemed reasonable. If not, justification is provided for using the LANL CS TRV or an alternative TRV.

ORNL CS TRV Comparison

The GMM TRV is compared to the ORNL CS TRV. It is noted whether it is above or below the ORNL CS TRV and by how much. Justification is provided for the continued use of the GMM TRV if it is deemed reasonable. If not, justification is provided for using the LANL CS TRV or an alternative TRV.

USEPA R6 CS TRV Comparison

The GMM TRV is compared to the USEPA R6 CS TRV. It is noted whether it is above or below the USEPA R6 CS TRV and by how much. Justification is provided for the continued use of the GMM TRV if it is deemed reasonable. If not, justification is provided for using the LANL CS TRV or an alternative TRV.

SNL CS TRV Comparison

The GMM TRV is compared to the SNL CS TRV. It is noted whether it is above or below the SNL CS TRV and by how much. Justification is provided for the continued use of the GMM TRV if it is deemed reasonable. If not, justification is provided for using the LANL CS TRV or an alternative TRV.

LANL T&E CS TRV Comparison

The GMM TRV is compared to the LANL T&E CS TRV. It is noted whether it is above or below the LANL T&E CS TRV and by how much. Justification is provided for the continued use of the GMM TRV if it is deemed reasonable. If not, justification is provided for using the LANL CS TRV or an alternative TRV.

Uncertainty Factor(s)

This field is left blank because UFs should already have been applied to PTVs to approximate NOAEL- or NOEC-based effect levels used in the calculation of the GMM TRV. A table of UFs applied is provided in the Ecorisk database.

Calculations

The calculation for the GMM TRV ($\text{GMM TRV} = \sqrt[n]{PTV_1 * PTV_2 * PTV_3 * \ldots PTV_n}$) was entered here.

Associated References

The P3 Record ID was copied from the main data entry form and pasted into the P3 Record ID form of this new pop-up form for associated references. If references other than the primary toxicity study noted in the Primary Toxicity Paper Reference ID field were noted in the Derivation Notes, Comparisons, EL Distribution, Uncertainty Factor(s), or Calculations fields, the Ref IDs for these were listed in the appropriate spaces. If no other references were mentioned, the fields were left as they were (0001).

Selected TRV
Because Tier I of the TRV development process will already have been considered and no TRVs result, if it came to deriving a LANL GMM TRV, it was usually used. Therefore, YES was almost always entered for this field for LANL GMM TRVs. However, there were exceptions where a LANL CS TRV or other TRV may still be preferred for better ecological protection of sensitive species. In this case, NO was selected. In the future, the use of the LANL GMM TRV can be changed to NO if more data becomes available for the calculation of a more representative LANL GMM TRV or an EPA EcoSSL TRV (Tier I) becomes available. Otherwise, the only time YES was changed to NO was if the GMM TRV was being contested by risk assessors and other, more suitable TRVs were contemplated and/or used.

Tier III:
If there were 2 or less PTVs available in the data set for a chemical and receptor pair, a CS TRV was selected. This entailed a review of the information and selecting the TRV that best represents an environmental exposure scenario (chronic, low-level exposure via oral pathways). However, since only 1 or 2 PTVs were available, the selection was limited.

In some cases, enough PTVs would be available to meet the minimum data set requirements for the calculation of a GMM TRV, but the GMM TRV was still not deemed protective enough for the screening receptors of concern; therefore, the LANL CS TRV was still chosen for use in ESL calculations.

Graphing the PTV data set:
Before making entries into Part 3 records for CS TRVs, a graph of the PTV data set from Part 2 records associated with one chemical and receptor combination was created. An example of a graph is presented in Figure 2 to aid in explanations for each component. Note that this graph is not representative of the Part 3 zinc in plant record in the database. It is also does not represent the typical diversity of values available for consideration in the TRV selection process. The varying effect levels and endpoints were made up for the purposes of illustration.

Figure 2. Example of a graph showing the PTV data set from which the LANL CS TRV was selected.

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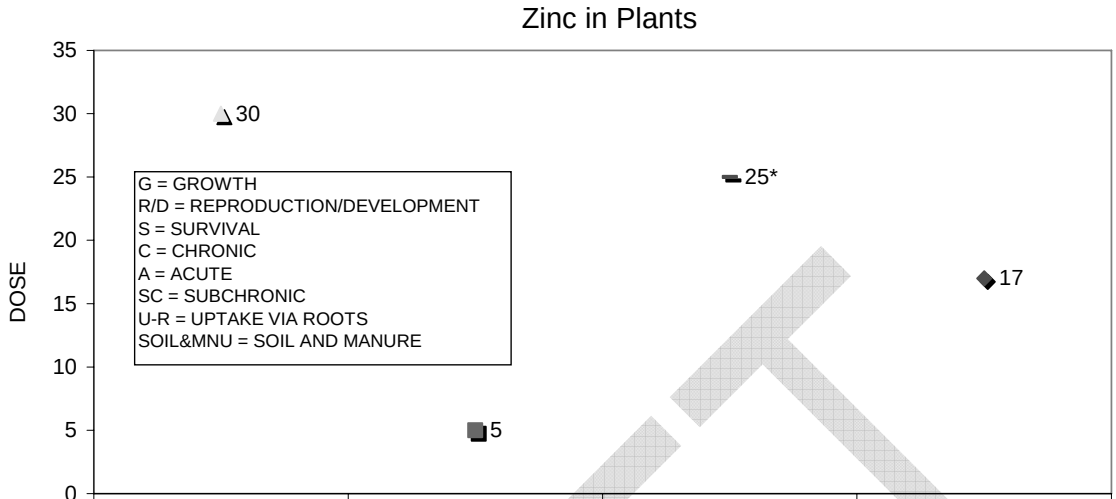

	G_C_U-R_SOIL_0316a	G_C_U-R_SOIL_0316b	R/D_A_U-R_SOIL&MNU_0467	S_SC_U-R+SC_SOIL_0512
NOEC (mg/kg)		5		
LOEC (mg/kg)	30			
LC50 (mg/kg)			25	
EC50 (mg/kg)				17

MEASURED EFFECT, EXPOSURE DURATION, EXPOSURE ROUTE, EXPOSURE MEDIUM, REFERENCE ID

* Effect / Value selected to derive TRV.

First, the graph was titled with the chemical name and the organism group tested. A label was then created for each measurement endpoint, exposure length, exposure route, and reference ID combination. The format was as follows: Focus Measurement ID_Exposure Duration ID_Exposure Route ID_Reference ID. Sometimes if there were similar labels in the same graph, an abbreviated description of the measurement endpoint or the common name of the test organism was inserted in parentheses after the focus measurement ID. An example as illustrated in the above graph was R/D(JuvGrowth)_CCL_OD_989. Each ID was spelled out in a legend inserted into the graph area.

NOAELs and NOECs were marked by dark pink squares, and LOAELs and LOECs by yellow triangles. Hollow squares and hollow triangles mark NOELs and LOELs, respectively. Lethal doses or concentrations were accompanied by a red dash, while effect doses or concentrations were associated with dark green diamonds. The exposure length of the study usually preceded the median or effect dose/concentration label. Units for each effect level followed the effect level acronym.

More than one graph was sometimes created for a chemical and organism combination. Each graph was entered into its own record in the graph data entry form of the Part 3 data entry database. Note that the exposure routes on the graph should be the same and match the exposure route entered in the graph record for that graph. The graph form asks for the Chemical ID (analyte code for the chemical administered in the toxicity

study), Organism Group ID, Selected Study Exposure Media (exposure medium ID), and P3 reference ID (Ref ID representing the version of the ECORISK database that this record will appear in). The graph form also provided a space into which to copy and paste the graph. However, this will not be done yet at this step in the P3 process because a TRV must be selected and labeled on the graph.

Once the graph or all graphs for an organism and chemical combination were created, the PTVs and their accompanying conditions (type of effect level, endpoints, exposure lengths, etc.) were reviewed to determine the most representative one for use in TRV derivation. The process for this is described in further detail below. Once the PTV that best represents the ESL exposure scenario of concern was selected, the value was enhanced in red font with an asterisk. A note was inserted below the X-axis title ("Effect level/value used to derive TRV") to alert the user to the presence of the PTV used for TRV derivation in the graph.

Finally, once the graph was completed, it was copied and pasted from Excel into the graph entry form of the Part 3 data entry database.

Selecting the PTV for use in TRV derivation:
The graphs for each chemical and organism combination were reviewed for the endpoint categories available and their assigned effect level types and values. The overall objective of finding a PTV for use in TRV derivation was to be conservative in protecting the most sensitive ecologically relevant endpoint. Keeping this in mind, the general rule of thumb was to select the highest NOAEL under the lowest LOAEL for similar endpoints. If there was a LOAEL lower than the lowest NOAEL, this was usually selected.

Usually, if NOAELs/NOECs and/or LOAELs/LOECs were available, median lethal concentrations or doses and effect concentrations and doses were eliminated early in the consideration process.

CS TRV Part 3 Data Entry:
<u>Initials</u>
The initials of the reviewer were entered here. If significant changes were made to a record at a later time, the initials of the new reviewer replaced the original reviewer initials.

<u>Date</u>
The date the record was created or modified was entered here.

<u>Last Updated</u>
If any changes were made to the TRV in the record, the version date of the ECORISK database that these changes will appear in should be entered in this Last Updated field.

<u>Primary Toxicity Paper Reference ID</u>

The Reference ID of the primary toxicity study used for derivation of the TRV should be entered here.

P3 Reference
This is the reference ID for the version of the ECORISK database that this new record (TRV) will appear in.

P3 Reference Description
There are various options in the list, but for new Part 3 records for that result in the addition of a new LANL CS TRV to the ECORISK database, the selection read, "LANL derived value based on reviewed primary data."

Organism Name
The common name of the test organism was selected from the drop down list.

Organism ID (PTSE P1)
The code for the organism group was selected from the drop down list. The four choices usually selected in new Part 3 records were TB for terrestrial bird, SLE for earthworms, TM for terrestrial mammals, and TP for terrestrial plants. Note that sometimes a bird that is considered an aquatic species was used (e.g., mallard duck). The TB code was still used for these organisms. Other aquatic species for mammals, invertebrates, or plants were rejected from the literature set to be used for review, so they should not be encountered this far.

Screening Receptor Group ID
The code for the organism group was selected from the drop down list. The four choices usually selected in new Part 3 records were B for bird, I for invertebrates (earthworms), M for mammals, and P for plants.

Chemical ID
The analyte code for the analyte administered to the organisms in the primary toxicity study was selected from the drop down list.

Chemical ID (surrogate chemical's ID if based on surrogate chemical, otherwise same as chemical ID)
The analyte code for the analyte administered to the organisms in the primary toxicity study was selected from the drop down list. If a surrogate chemical was used, the surrogate chemical's analyte code was selected.

Exposure Route
The primary exposure route used in the study was selected from the drop down list.

Exposure Medium
The primary exposure medium used in the study was selected from the drop down list.

ESL Media

For birds and mammals, the ESL media were SOIL, SEDIMENT, and WATER. For plants and earthworms, only one ESL medium of SOIL was used. For birds and mammals, three Part 3 records were created for each ESL media for each chemical and organism combination. Only one record was needed for each earthworm or plant and chemical combination.

TRV Type

The final TRV type was noted here. For birds and mammals, Chronic CS NOAEL was entered. Earthworms and plants have Chronic CS NOEC.

TRV Final Value

The value after all calculations have been completed was presented here. Calculations include those for daily dose rates, moisture conversions, and any others from Part 2 records plus any contributions from UFs to be accounted for in this Part 3 record.

TRV Units

For birds and mammals, the Chronic NOAEL was usually presented in units of mg/kg/d (representing mg chemical/kg body weight/day), while earthworms and plants have units of mg/kg (mg chemical/kg soil).

Derivation Notes

A summary explanation for the selection of the PTV used in the TRV derivation was written here. A Discussion format was followed in order to illustrate the important components of this selection. Appendix C illustrates an example of a summary for a CS TRV. This summary contains the following information:

- Chemical and organism group
- CS TRV
- Number of references, experiments, and endpoints reviewed in the data set
- Reference from which the PTV used to derive the CS TRV was obtained
- Endpoint the CS TRV represents
- Experiment Effect ID(s) used for the CS TRV
- Name, sex, and age or life stage of organism used in study from which PTV was obtained
- Exposure medium, route, and duration of study from which PTV was obtained
- Number of dose levels
- Dose rate parameters (body weight, food or water ingestion rate, and/or inhalation rate) and where obtained
- Moisture basis of exposure concentration (dry weight or wet weight)
- Whether exposure concentration was nominal (target) or empirical (verified/measured)
- Uncertainty factors used, if any
- Relevance or relationship between test exposure route and exposure route of concern for the particular ESL of concern (i.e., sediment, soil, water)
- Reason(s) why the particular PTV was chosen over others for use in CS TRV derivation

- Any other relevant information about the PTV that gives more or less confidence in the CS TRV

The Comparison and EL Distribution sections are not applicable to the CS TRVs. These fields were either left blank or filled with “N/A”.

Uncertainty Factor(s)
Table 9 above shows the UFs applied to approximate TRVs from PTVs.

Calculations

If a UF was applied to the PTV to derive the TRV, this calculation was entered here. E.g., Chronic NOAEL = Chronic LOAEL(0.1)

Associated References
The P3 Record ID was copied from the main data entry form and pasted into the P3 Record ID form of this new pop-up form for associated references. If references other than the primary toxicity study noted in the Primary Toxicity Paper Reference ID field were noted in the Discussion, Uncertainty Factor(s), or Calculations fields, the Ref IDs for these were listed in the appropriate spaces. If no other references were mentioned, the fields were left as they were (0001).

Selected TRV
Because Tier I and II of the TRV development process will already have been considered and no TRVs result, if it came to deriving a LANL CS TRV, it was usually used. Therefore, YES was almost always entered for this field for LANL CS TRVs. In the future, the use of the LANL CS TRV can be changed to NO if more data becomes available for the calculation of A LANL GMM TRV (Tier II) or an EPA EcoSSL TRV (Tier I) becomes available. Otherwise, the only time YES was changed to NO was if the CS TRV was being contested by risk assessors and other, more suitable TRVs were contemplated and/or used.

Tier IV:
If no literature containing ecologically relevant endpoints was identified, or the literature search process was not yet initiated for a chemical, receptor, and exposure medium combination, a secondary CS TRV from another source (e.g., Oak Ridge National Laboratory, Sandia National Laboratory) was used until it was replaced by a TRV from one of the previous tiers.

Appendix D provides an example of a summary for TRVs obtained from secondary sources.

PTSE PART 4 - TRV Approval

After new TRVs were developed, the summary reports and graphs were then sent to the RRES-R Risk Team for review. Based on their areas of knowledge and expertise, Risk

Team members return comments on TRV derivation methods, approximations of effect levels, chemical bioavailability, biological test organism or screening receptor information, etc. Their judgment at times may lead to an exception in the tiered TRV development approach where a Tier III TRV (LANL CS TRV) may be used in spite of the availability of a Tier II LANL (LANL GMM TRV). This is often done if the GMM TRV is not felt to be protective enough of exposure of sensitive organisms to a particular chemical. Other times, Risk Team members may suggest a change from a GMM TRV to a GMM based on subset of the original data set for a particular chemical based on knowledge of the behavior of that chemical on organisms in the wild under certain conditions. The PTSE reviewers consider the Risk Team comments and revise PTSE information as appropriate. Documentation of any deviations from the tiered TRV development approach are provided in the appropriate places in the PTSE process.

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APPENDIX A

PTSE Part 3 - TRV Selection/ Derivation

***P3 Record** CDPEcoSSLSl

Analyte Name: Cadmium **Analyte Code:** CD

ESL Media: SOIL **ESL Receptor Group:** P

Test Chemical Code: CD

Test Organism ID: TP **Test Organism Common Name:** Plant

Final TRV: Chronic GMM MATC 29 mg/kg U

Derivation Notes: The interim final, chronic geometric mean of 29 mg/kg for cadmium in terrestrial plants is based on a geometric mean of 14 MATCs. The GMM data set includes 14 test species (alfalfa, barley, choke cherry, corn, garlic, lettuce, loblolly pine, oats, red oak, ryegrass, tomato, white pine, yellow birch, and yellow poplar). The soil organic matter in the data set ranges from 0.1 to 4.43%, and the pH ranges from 4.2 to 6.9. The GMM represents effects on growth.

Uncertainty: No UFs were applied.

Calculations: N/A

Original Review Date: 04-Nov-03

Last Updated: 04-Nov-03

Reviewer Initials: JP

NMED ConcurrenceDate:

** Refer to the PTSE Part 1 and 2s for this chemical/ organism group combination and to the Part 3 graph for further details on study/ effects/ toxicity values reviewed for this Part 3.*

REFERENCE	Ref ID	Citation
Primary Toxicity Study Reference:	0001	NOT APPLICABLE
TRV reference:	1389	United States Environmental Protection Agency (USEPA), 2003e (Aug.). Ecological Soil Screening Levels for Cadmium, Interim Final. US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.
Additional References:	0001	NOT APPLICABLE
	0001	NOT APPLICABLE
	0001	NOT APPLICABLE

DRAFT

0001 NOT APPLICABLE

0001 NOT APPLICABLE

*** This P3 report allows up to 5 additional references. If a P3 record has one or more additional references that are Ref ID 0001, Citation NOT APPLICABLE, that indicates that there are not any or anymore references associated with the P3*

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APPENDIX B

TRV Summary Report

***TRV Summary ID:** BAMGMMW

LANL TRV: NO **Data Source:** LANL derived value based on reviewed primary data

Analyte Name: Barium **Analyte Code:** BA **Analyte Group:** Inorganic Compound

ESL Receptor Group: M **Functional Group:** ALL **ESL Media:** WATER

Test Chemical Code: BA

Test Organism ID: TM **Test Organism Common Name:** Mammal

Final TRV: Chronic GMM NOAEL 3.56 mg/kg/d OW

Derivation Notes: The GMM TRV for barium in drinking water of mammals is equal to a chronic NOAEL of 3.56 mg/kg/d. This GMM TRV is derived from a data set of 6 PTVs selected from a data set of 3 references, 4 experiments and 5 different endpoints. Endpoint categories included in the data set were development, survival and adult body weight changes. Only oral exposure route studies were included in the PTV data set. Barium was administered orally in drinking water as the acetate or the chloride or in an aqueous solution as the chloride. The test organism included in the data set was the rat for all 4 experiments. Specifically, the Sprague-Dawley derived CD rat was used in 2 experiments (3 PTVs), the Long-Evans (BLU:LE) strain rat in 1 experiment (2 PTVs) and the Long-Evans rat in 1 experiment (1 PTV). The test exposure route is considered equivalent to the exposure route of concern for water ecological screening levels (ESLs), which is oral in the drinking water. The effect levels included in the data set were 2 C-CL NOAELs (6 and 198), 2 chronic NOAELs (0.55 and 0.55), 1 acute NOAEL (138) bound by a LOAEL (198), and 1 acute LD50 (408). Prior to the calculation of the GMM TRV, the PTVs were normalized to chronic NOAEL-based ELs by applying UFs. See Table 1 for UF descriptions and Table 2 for EL details.

Having considered these comparisons, this GMM TRV will not be used in ESL calculations because it is not definitive that it is adequately protective of mortality endpoints in the GMM TRV data set. Normally, the existing LANL CS TRV (0.55) would be used instead. However, the LANL CS TRV also does not seem to be the most appropriate value to use because it is based on the barium acetate endpoints and an unbound NOAEL and therefore may be overly conservative. PTV ID 0164_BA_1B (S - Mortality) is the most appropriate because it is the most sensitive endpoint for a form of barium (chloride) that is more likely to occur in the environment of ESL receptors. The LANL CS TRV will be revised appropriately and used in ESL calculations. Further details are found in the following Comparison and EL Distribution sections.

Uncertainty:

Calculations: GMM TRV = nth root of (EL1 x EL2 x EL3 x …ELn) where n is greater than or equal to 3 and each EL represents a chronic NOAEL-based EL for an oral in diet or diet-like exposure for an ecologically relevant effect (i.e., reproduction or development, survival or adult body weight changes).

Log Kow: **KocVu:** **Foc:**

Text Last Updated On: 18-Nov-03 **Value Last Updated On:** 31-Oct-03

Confidence Rating: Pending **NMED Concurrence Date:**

** Further details on the study/ effects/ toxicity values reviewed for this TRV are provided in the PTSE Part 1 and 2s and in the Part 3 graph.*

Lowest LOAEL (LOEC) Comparison: The GMM TRV is above the lowest chronic LOAEL EL (1.98) in the data set from which it was derived by a factor of 1.8. The lowest chronic LOAEL-based EL is derived from an acute LOAEL for mortality from a 10 day exposure via oral gavage to concentrations of 100, 145, 209, and 300 mg BaCl2/kg. The LOAEL was determined based on the presence of 30% more mortality in the exposed group compared to the control. There is a high level of conservatism built into the extrapolation to a chronic LOAEL-based EL from an acute exposure EL because a UF of 100 is applied. The GMM TRV is also above the two second lowest chronic LOAEL-based ELs (between 1.1 and 2.75) for adult growth rate and lifespan by a factor of 1.3 to 3.2. However, the two second lowest chronic LOAEL-based ELs are extrapolated from NOAELs making them potentially overly conservative estimates. Furthermore, the chemical form used in the experiment that the two second lowest chronic LOAEL-based ELs are based on was acetate, which is a more bioavailable, but less environmentally available form than the chloride used in the other experiments. A more bioavailable form is more likely to cause more toxicity. In this case, this toxicity is not expected in the exposure environment of concern because this highly bioavailable form of the chemical is not likely to occur. The GMM TRV is below the third lowest chronic LOAEL-based EL (>4.08) in the data set by a factor of at least 1.1. The third lowest chronic LOAEL-based EL is based on an acute LD50 derived from an experiment utilizing a single exposure to very high concentrations of barium via oral gavage (60 to 960 mg BaCl2/kg). The GMM TRV is also below the chronic LOAEL-based ELs for R/D endpoints of body weight extrapolated from C-CL NOAELs. One EL is based on a 16 month study and the other is based on a 10 day study and is categorized as a C-CL endpoint because it is an R/D endpoint. Although the GMM TRV may be considered adequate because it minimizes the chance of being over or under conservative due to the potential over conservativeness of the three lowest chronic LOAEL-based ELs, it is still uncertain as to whether it is indeed protective enough of the mortality endpoints.

Data Set Distribution Comments: Evaluation of the NOAEL-based EL distribution of the GMM TRV data set has not taken place yet.

LANL CS TRV Comparison: The GMM TRV is above the LANL CS TRV (0.55) by a factor of 6.5. The GMM TRV data set includes the endpoint the LANL CS TRV is based

on (PTV ID 0173_BA_1B, S - Life span). The difference is due to the inclusion of 5 other ecologically relevant endpoints in the GMM TRV data set. The LANL CS TRV is based on an unbound NOAEL making it potentially an overly conservative estimate. Furthermore, the chemical form used in the experiment the LANL CS TRV is based on was acetate, which is a more bioavailable, but less environmentally available form than the chloride used in the other experiments included in the GMM TRV data set. A more bioavailable form is more likely to show more toxicity. However, in this case, this toxicity is not expected in the exposure environment of concern because this form of the chemical is not likely to occur.

ORNL CS TRV Comparison: The GMM TRV is below the ORNL CS TRV (5.1) by a factor of 1.4. The GMM TRV data set includes the endpoint the ORNL value is based on (PTV ID 0163_BA_1B, R/D - Body weight). The difference in the TRVs is due to the inclusion of 5 other ecologically relevant endpoints in the GMM TRV data set, as well as a difference in the dose rate parameters used to calculate the effect level for the endpoint in common. LANL used a water ingestion rate (0.0187 L/d) and body weight (0.3145 kg) from the experiment while ORNL used a water ingestion rate (0.022 L/d and body weight (0.435 kg) from the experiment. Although information for the dose rate parameters was obtained from the same source, LANL chose to average the body weights and food ingestion rates measured throughout the 16-month study while ORNL opted to use the body weight and ingestion rate measured at the end of the 16 months.

USEPA R6 CS TRV Comparison: The GMM TRV is above the USEPA R6 TRV (0.51) by a factor of 7. The GMM TRV data set includes the reference the USEPA R6 CS TRV is based on, and it is the same reference that the ORNL CS TRV is based on, but documentation is inadequate for determining why differences exist between the values.

SNL CS TRV Comparison: SNL does not have a CS TRV for comparison to the GMM TRV.

REFERENCE LIST	**Ref ID**	**Citation**
Primary Toxicity Study Reference:	0001	NOT APPLICABLE
TRV reference:	1294	Los Alamos National Laboratory (LANL), 2003. ECORISK Database (Release 2.0), RRES-R package #186. Risk Reduction and Environmental Stewardship Remediation Program, Los Alamos National Laboratory, Los Alamos, NM.
Additional References:	1379	Dourson, ML, and JF Stara. 1983. Regulatory History and Experimental Support of Uncertainty (Safety) Factors. Regulatory Toxicology and Pharmacology, 3: 224-238.

0001	NOT APPLICABLE
0001	NOT APPLICABLE
0001	NOT APPLICABLE
0001	NOT APPLICABLE

*** Citations for up to 5 additional references associated with this TRV are listed. If the Ref ID for one or more additional references is 0001 that indicates that there are not any or anymore references associated with the TRV.*

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APPENDIX C

PTSE Part 3 - TRV Selection/ Derivation

***P3 Record**
U_SEDIMENT_B_TB_DuckAmericanBlack_Diet_ChronicNOAEL_0715_0207

Analyte Name: Uranium **Analyte Code:** U

ESL Media: SEDIMENT **ESL Receptor Group:** B

Test Chemical Code: U

Test Organism ID: TB **Test Organism Common Name:** Duck, American Black

Final TRV: Chronic CS NOAEL 78 mg/kg/d OD

Derivation Notes: The derivation of a toxicity reference value (TRV) for ecological risk screening assessments involves selecting the most protective primary toxicity value (PTV) that best represents an ecologically relevant endpoint (reproduction, development, survival or growth), exposure route (oral) and medium (diet or drinking water), exposure period (chronic), and effect level (NOAEL). A TRV based on these characteristics is considered protective of wildlife populations because it is intended to prevent potential adverse impacts of low-level, long-term chemical effects (i.e., adverse effects on ability of individuals to develop into viable organisms, search for mates, breed successfully, and produce live and equally viable offspring).

Data Set Considered for Selection of Value:
The data set that was considered for the selection of a PTV to derive the TRV consisted of 1 reference, 1 experiment, and 2 endpoints. Types of endpoints available for consideration included development (body weight) and mortality. The only test organism available for consideration was the American black duck. The exposure route and medium in this study was oral in diet. Exposure duration categories available for consideration included subchronic and chronic - critical life stage. Effect levels available for consideration included 2 NOAELs.

Justification for Selection of Value:
The PTV from Ref ID 0207 was selected because it represents the desired characteristics of a TRV as best as possible. The PTV selected is a chronic - critical life stage NOAEL of 78 mg/kg/d for development (body weight; Experiment Effect ID 0207_U_1A). Although the other endpoint (mortality) can be considered ecologically relevant, it was eliminated from selection because it represented a measurement that did not directly measure the critical life stage (development) and it continued to be associated with a subchronic exposure duration.

Description of Critical Study:
The study associated with PTV selected to derive the TRV is a chronic (6 weeks and during a critical life stage) study, in which powdered uranium suspended in a 1:99 propylene glycol mix by weight was administered orally in diet to male and female juvenile American black ducks. Four target dose levels ranging from 25 to 1600 ppm were used. The chronic - critical life stage NOAEL derived from this study (PTV chosen

to derive the TRV) corresponds to the highest of these four concentrations tested in this study. The test exposure route is related to the exposure route of concern for sediment ESLs (consumption of plants and/or animals associated with contaminated sediment) because both are oral in diet. Body weights and food ingestion rates were not provided in the study. Therefore, the value of 1.227 kg for mallard duck body weight was obtained from Ref ID 0495 and used in an allometric equation from Ref ID 0561 to derive the dry food ingestion rate of 0.06 kg/d. The moisture basis of the chemical in feed was unknown and assumed to be dry weight in order to be conservative.

Uncertainty: Because the exposure was during a critical life stage (development) and is considered chronic, and because the PTV is based on a no observed adverse effects level, the application of an Uncertainty Factor is unnecessary.

Calculations: N/A

Original Review Date: 09-Oct-02

Last Updated: 30-Sep-03

Reviewer Initials: PN

NMED Concurrence Date:

** Refer to the PTSE Part 1 and 2s for this chemical/ organism group combination and to the Part 3 graph for further details on study/ effects/ toxicity values reviewed for this Part 3.*

REFERENCE	Ref ID	Citation
Primary Toxicity Study Reference:	0207	Haseltine, SD, and L Sileo. 1983. Response of American Black Ducks to Dietary Uranium: A Proposed Substitute for Lead Shot. J Wildli Mgmt, 47:1124-1129.
TRV reference:	0715	Los Alamos National Laboratory (LANL), 1999 (Jun). ECORISK Database (Release 1), ER package #186. Environmental Restoration Project, Los Alamos National Laboratory, Los Alamos, NM.
Additional References:	0495	Smith, GJ and VP Anders. 1989. Toxic Effects of Boron on Mallard Reproduction. Environmental Toxicology and Chemistry, 8:943-950.
	0561	United States Environmental Protection Agency (USEPA). 1993h. Wildlife Exposure Factors Handbook, Vol. I (and first 6 pages of volume II). EPA/600/R-93/187 a & b. United States Environmental Protection Agency.
	0001	NOT APPLICABLE

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*** This P3 report allows up to 5 additional references. If a P3 record has one or more additional references that are Ref ID 0001, Citation NOT APPLICABLE, that indicates that there are not any or anymore references associated with the P3.*

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APPENDIX D

PTSE Part 3 - TRV Selection/ Derivation

***P3 Record** 7905

Analyte Name: Zinc **Analyte Code:** ZN

ESL Media: SOIL **ESL Receptor Group:** P

Test Chemical Code: ZN

Test Organism ID: TP **Test Organism Common Name:** Barley, Spring

Final TRV: Chronic NOAEL 0.9 mg/kg U

Derivation Notes: The chronic NOAEL is based upon a chronic LOAEL of 9 mg/kg.

Uncertainty: UF of 0.1 applied.

Calculations: Chronic NOAEL = 0.1(Chronic LOAEL)

Original Review Date: 17-Sep-02

Last Updated: 30-Jun-99

Reviewer Initials: PN

NMED ConcurrenceDate:

** Refer to the PTSE Part 1 and 2s for this chemical/ organism group combination and to the Part 3 graph for further details on study/ effects/ toxicity values reviewed for this Part 3.*

REFERENCE	Ref ID	Citation
Primary Toxicity Study Reference:	0641	Davis, RD, PHT Beckett, and E Wollan. 1978. Critical Levels of Twenty Potentially Toxic Elements in Young Spring Barley. Plant and Soil, 49:395-408.
TRV reference:	0716	United States Environmental Protection Agency (USEPA). 1999 (August). Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Peer Review Draft. EPA530-D-99-001A (www.epa.gov/osw) Chapters 1, 2, 3, and 5, References, and Appendix C, D, and E.
Additional References:	0001	NOT APPLICABLE
	0001	NOT APPLICABLE

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0001	NOT APPLICABLE
0001	NOT APPLICABLE
0001	NOT APPLICABLE

*** This P3 report allows up to 5 additional references. If a P3 record has one or more additional references that are Ref ID 0001, Citation NOT APPLICABLE, that indicates that there are not any or anymore references associated with the P3.*

DRAFT

Ecorisk Database, Release 2.0
November 2003
Summary of Updates, Additions and Deletions of Data
(*Below is a summary of the major changes to data in the Ecorisk Database R2.0 since R1.5 (September 2002). Specific details of changes can be reviewed from the "What's New" screen within the Ecorisk Database.*)

ESLs
All ESL changes are due to TRV changes.

- 3 new ESLs are available

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Units
NONRAD	INORG	Barium	BA	SOIL	EW	New Value	New EcoSSL TRV.	330	mg/kg
NONRAD	INORG	Beryllium	BE	SOIL	EW	New Value	New EcoSSL TRV.	40	mg/kg
NONRAD	INORG	Antimony	SB	SOIL	EW	New Value	New EcoSSL TRV.	78	mg/kg

- 225 ESLs have been updated

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
NONRAD	PCB	Aroclor-1260	11096-82-5	SEDIMENT	BA(i)	Updated Value	New GMM TRV for non-carnivores.	12	6.3	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	SEDIMENT	VGS(i)	Updated Value	New GMM TRV.	1.1	0.58	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	AK(f)	Updated Value	New GMM TRV.	4.6	2.2	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	AK(fi)	Updated Value	New GMM TRV.	3.7	1.8	mg/kg
NONRAD	PCB	Aroclor-1260	11096-	SOIL	AR(i)	Updated	New GMM	0.88	0.44	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
			82-5			Value	TRV.			
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	AR(ip)	Updated Value	New GMM TRV.	1.7	0.86	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	AR(p)	Updated Value	New GMM TRV.	31	15	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	DC(p)	Updated Value	New GMM TRV for non-carnivores.	1300	660	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	DM(ip)	Updated Value	New GMM TRV for non-carnivores.	20	10	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	RF(f)	Updated Value	Revised TRV for carnivores.	0.14	32	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	VS(i)	Updated Value	New GMM TRV for non-carnivores.	10	5	mg/kg
NONRAD	PCB	Aroclor-1260	11096-82-5	WATER	BA(w)	Updated Value	Revised TRV.	190	43000	µg/L
NONRAD	PCB	Aroclor-1260	11096-82-5	WATER	DC(w)	Updated Value	Revised TRV.	310	71000	µg/L
NONRAD	PCB	Aroclor-1260	11096-82-5	WATER	DM(w)	Updated Value	Revised TRV.	160	36000	µg/L
NONRAD	PCB	Aroclor-1260	11096-82-5	WATER	RF(w)	Updated Value	Revised TRV.	360	80000	µg/L
NONRAD	PCB	Aroclor-1260	11096-82-5	WATER	VS(w)	Updated Value	Revised TRV.	130	30000	µg/L
NONRAD	PCB	Aroclor-1254	11097-69-1	SEDIMENT	BA(i)	Updated Value	New GMM TRV for non-carnivores.	0.56	0.028	mg/kg
NONRAD	PCB	Aroclor-1254	11097-	SOIL	DC(p)	Updated	New GMM	56	2.8	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
			69-1			Value	TRV for non-carnivores.			
NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	DM(ip)	Updated Value	New GMM TRV for non-carnivores.	0.88	0.045	mg/kg
NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	GP	Updated Value	New GMM TRV.	160	10	mg/kg
NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	VS(i)	Updated Value	New GMM TRV for non-carnivores.	0.44	0.022	mg/kg
NONRAD	HE	Trinitrotoluene[2,4,6-]	118-96-7	SOIL	GP	Updated Value	Revised TRV.	80	0.7	mg/kg
NONRAD	HE	RDX	121-82-4	SEDIMENT	BA(i)	Updated Value	New GMM TRV.	39	44	mg/kg
NONRAD	HE	RDX	121-82-4	SOIL	DC(p)	Updated Value	New GMM TRV.	10	11	mg/kg
NONRAD	HE	RDX	121-82-4	SOIL	DM(ip)	Updated Value	New GMM TRV.	8.2	9.2	mg/kg
NONRAD	HE	RDX	121-82-4	SOIL	RF(f)	Updated Value	New GMM TRV.	4400	4900	mg/kg
NONRAD	HE	RDX	121-82-4	SOIL	VS(i)	Updated Value	New GMM TRV.	29	33	mg/kg
NONRAD	PCB	Aroclor-1016	12674-11-2	SEDIMENT	BA(i)	Updated Value	New GMM TRV.	1.3	0.032	mg/kg
NONRAD	PCB	Aroclor-1016	12674-11-2	SOIL	DC(p)	Updated Value	New GMM TRV.	29	0.69	mg/kg
NONRAD	PCB	Aroclor-1016	12674-11-2	SOIL	DM(ip)	Updated Value	New GMM TRV.	2	0.047	mg/kg
NONRAD	PCB	Aroclor-1016	12674-11-2	SOIL	RF(f)	Updated Value	New GMM TRV.	46	1	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
NONRAD	PCB	Aroclor-1016	12674-11-2	SOIL	VS(i)	Updated Value	New GMM TRV.	1	0.025	mg/kg
NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-]	1746-01-6	SEDIMENT	BA(i)	Updated Value	New GMM TRV.	0.00000036	0.00000065	mg/kg
NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-]	1746-01-6	SOIL	DC(p)	Updated Value	New GMM TRV.	0.000072	0.00012	mg/kg
NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-]	1746-01-6	SOIL	DM(ip)	Updated Value	New GMM TRV.	0.00000059	0.000001	mg/kg
NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-]	1746-01-6	SOIL	RF(f)	Updated Value	New GMM TRV.	0.0000012	0.0000022	mg/kg
NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-]	1746-01-6	SOIL	VS(i)	Updated Value	New GMM TRV.	0.00000029	0.00000052	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SEDIMENT	BA(i)	Updated Value	New GMM TRV.	0.89	1.3	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SEDIMENT	VGS(i)	Updated Value	Corrected TRV.	0.11	0.0035	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	AK(f)	Updated Value	Corrected TRV.	0.31	0.0092	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	AK(fi)	Updated Value	Corrected TRV.	0.31	0.0093	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	AR(i)	Updated Value	Corrected TRV.	0.09	0.0026	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	AR(ip)	Updated Value	Corrected TRV.	0.17	0.0052	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	AR(p)	Updated Value	Corrected TRV.	4.1	0.12	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	DC(p)	Updated Value	New GMM TRV.	130	200	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	DM(ip)	Updated Value	New GMM TRV.	1.4	2.1	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	RF(f)	Updated Value	New GMM TRV.	3	4.6	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	VS(i)	Updated Value	New GMM TRV.	0.71	1	mg/kg
NONRAD	PEST	DDT[4,4'-]	50-29-3	WATER	AK(w)	Updated Value	Corrected TRV.	2000	59	µg/L
NONRAD	PEST	DDT[4,4'-]	50-29-3	WATER	AR(w)	Updated Value	Corrected TRV.	1700	50	µg/L
NONRAD	PEST	DDT[4,4'-]	50-29-3	WATER	VGS(w)	Updated Value	Corrected TRV.	990	29	µg/L
NONRAD	PCB	Aroclor-1242	53469-21-9	SEDIMENT	BA(i)	Updated Value	New GMM TRV.	0.48	0.086	mg/kg
NONRAD	PCB	Aroclor-1242	53469-21-9	SOIL	DC(p)	Updated Value	New GMM TRV.	10	1.8	mg/kg
NONRAD	PCB	Aroclor-1242	53469-21-9	SOIL	DM(ip)	Updated Value	New GMM TRV.	0.72	0.12	mg/kg
NONRAD	PCB	Aroclor-1242	53469-21-9	SOIL	RF(f)	Updated Value	New GMM TRV.	16	2.9	mg/kg
NONRAD	PCB	Aroclor-1242	53469-21-9	SOIL	VS(i)	Updated Value	New GMM TRV.	0.38	0.068	mg/kg
NONRAD	PEST	Dieldrin	60-57-1	SEDIMENT	BA(i)	Updated Value	New EcoSSL TRV.	0.039	0.052	mg/kg
NONRAD	PEST	Dieldrin	60-57-1	SOIL	AK(f)	Updated Value	New EcoSSL TRV.	0.96	0.94	mg/kg
NONRAD	PEST	Dieldrin	60-57-1	SOIL	AK(fi)	Updated Value	New EcoSSL TRV.	0.49	0.48	mg/kg
NONRAD	PEST	Dieldrin	60-57-1	SOIL	AR(i)	Updated Value	New EcoSSL TRV.	0.091	0.089	mg/kg
NONRAD	PEST	Dieldrin	60-57-1	SOIL	AR(p)	Updated Value	New EcoSSL TRV.	0.8	0.78	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
NONRAD	PEST	Dieldrin	60-57-1	SOIL	DC(p)	Updated Value	New EcoSSL TRV.	0.83	1.1	mg/kg
NONRAD	PEST	Dieldrin	60-57-1	SOIL	DM(ip)	Updated Value	New EcoSSL TRV.	0.058	0.078	mg/kg
NONRAD	PEST	Dieldrin	60-57-1	SOIL	RF(f)	Updated Value	New EcoSSL TRV.	0.4	0.53	mg/kg
NONRAD	PEST	Dieldrin	60-57-1	SOIL	VS(i)	Updated Value	New EcoSSL TRV.	0.03	0.04	mg/kg
NONRAD	PEST	DDE[4,4'-]	72-55-9	SEDIMENT	VGS(i)	Updated Value	New subset GMM TRV.	0.042	0.0035	mg/kg
NONRAD	PEST	DDE[4,4'-]	72-55-9	SOIL	AK(f)	Updated Value	New subset GMM TRV.	0.09	0.0074	mg/kg
NONRAD	PEST	DDE[4,4'-]	72-55-9	SOIL	AK(fi)	Updated Value	New subset GMM TRV.	0.1	0.0083	mg/kg
NONRAD	PEST	DDE[4,4'-]	72-55-9	SOIL	AR(i)	Updated Value	New subset GMM TRV.	0.032	0.0026	mg/kg
NONRAD	PEST	DDE[4,4'-]	72-55-9	SOIL	AR(ip)	Updated Value	New subset GMM TRV.	0.063	0.0052	mg/kg
NONRAD	PEST	DDE[4,4'-]	72-55-9	SOIL	AR(p)	Updated Value	New subset GMM TRV.	1.5	0.13	mg/kg
NONRAD	PEST	DDE[4,4'-]	72-55-9	WATER	AK(w)	Updated Value	Corrected TRV.	1000	59	µg/L
NONRAD	PEST	DDE[4,4'-]	72-55-9	WATER	AR(w)	Updated Value	Corrected TRV.	920	50	µg/L
NONRAD	PEST	DDE[4,4'-]	72-55-9	WATER	VGS(w)	Updated Value	Corrected TRV.	530	29	µg/L
NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SEDIMENT	BA(i)	Updated Value	New GMM TRV.	3800	1700	mg/kg
NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	DC(p)	Updated Value	New GMM TRV.	40000	18000	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	DM(ip)	Updated Value	New GMM TRV.	5300	2300	mg/kg
NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	GP	Updated Value	New GMM TRV.	160	200	mg/kg
NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	RF(f)	Updated Value	New GMM TRV.	77000	34000	mg/kg
NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	VS(i)	Updated Value	New GMM TRV.	2900	1300	mg/kg
NONRAD	INORG	Aluminum	AL	SOIL	GP	Updated Value	New EcoSSL TRV is based on site soil pH being less than 5.5.		5	mg/kg
NONRAD	INORG	Boron	B	SEDIMENT	VGS(i)	Updated Value	New GMM TRV.	10	200	mg/kg
NONRAD	INORG	Boron	B	SOIL	AK(f)	Updated Value	New GMM TRV.	1400	26000	mg/kg
NONRAD	INORG	Boron	B	SOIL	AK(fi)	Updated Value	New GMM TRV.	56	1000	mg/kg
NONRAD	INORG	Boron	B	SOIL	AR(i)	Updated Value	New GMM TRV.	7.5	130	mg/kg
NONRAD	INORG	Boron	B	SOIL	AR(ip)	Updated Value	New GMM TRV.	3.2	59	mg/kg
NONRAD	INORG	Boron	B	SOIL	AR(p)	Updated Value	New GMM TRV.	2	37	mg/kg
NONRAD	INORG	Boron	B	SOIL	GP	Updated Value	New subset GMM TRV.	36	10	mg/kg
NONRAD	INORG	Barium	BA	SEDIMENT	BA(i)	Updated Value	New EcoSSL TRV.	320	3.4	mg/kg
NONRAD	INORG	Barium	BA	SEDIMENT	VGS(i)	Updated	New GMM	270	340	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
						Value	TRV.			
NONRAD	INORG	Barium	BA	SOIL	AK(f)	Updated Value	New GMM TRV.	36000	46000	mg/kg
NONRAD	INORG	Barium	BA	SOIL	AK(fi)	Updated Value	New GMM TRV.	1400	1700	mg/kg
NONRAD	INORG	Barium	BA	SOIL	AR(i)	Updated Value	New GMM TRV.	190	230	mg/kg
NONRAD	INORG	Barium	BA	SOIL	AR(ip)	Updated Value	New GMM TRV.	300	380	mg/kg
NONRAD	INORG	Barium	BA	SOIL	AR(p)	Updated Value	New GMM TRV.	820	1000	mg/kg
NONRAD	INORG	Barium	BA	SOIL	DC(p)	Updated Value	New EcoSSL TRV.	3300	35	mg/kg
NONRAD	INORG	Barium	BA	SOIL	DM(ip)	Updated Value	New EcoSSL TRV.	440	4.6	mg/kg
NONRAD	INORG	Barium	BA	SOIL	RF(f)	Updated Value	New EcoSSL TRV.	41000	430	mg/kg
NONRAD	INORG	Barium	BA	SOIL	VS(i)	Updated Value	New EcoSSL TRV.	230	2.5	mg/kg
NONRAD	INORG	Barium	BA	WATER	BA(w)	Updated Value	New GMM TRV.	8600	3400	µg/L
NONRAD	INORG	Barium	BA	WATER	DC(w)	Updated Value	New GMM TRV.	14000	5600	µg/L
NONRAD	INORG	Barium	BA	WATER	DM(w)	Updated Value	New GMM TRV.	7200	2800	µg/L
NONRAD	INORG	Barium	BA	WATER	RF(w)	Updated Value	New GMM TRV.	16000	6300	µg/L
NONRAD	INORG	Barium	BA	WATER	VS(w)	Updated Value	New GMM TRV.	6100	2400	µg/L
NONRAD	INORG	Beryllium	BE	SEDIMENT	BA(i)	Updated	New EcoSSL	3.3	4.1	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
						Value	TRV.			
NONRAD	INORG	Beryllium	BE	SOIL	DC(p)	Updated Value	New EcoSSL TRV.	170	210	mg/kg
NONRAD	INORG	Beryllium	BE	SOIL	DM(ip)	Updated Value	New EcoSSL TRV.	5	6.3	mg/kg
NONRAD	INORG	Beryllium	BE	SOIL	RF(f)	Updated Value	New EcoSSL TRV.	410	510	mg/kg
NONRAD	INORG	Beryllium	BE	SOIL	VS(i)	Updated Value	New EcoSSL TRV.	2.4	3	mg/kg
NONRAD	INORG	Cadmium	CD	SEDIMENT	BA(i)	Updated Value	New EcoSSL TRV.	0.84	0.006	mg/kg
NONRAD	INORG	Cadmium	CD	SEDIMENT	VGS(i)	Updated Value	New EcoSSL TRV.	1.1	0.01	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	AK(f)	Updated Value	New EcoSSL TRV.	770	6.9	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	AK(fi)	Updated Value	New EcoSSL TRV.	5.9	0.053	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	AR(i)	Updated Value	New EcoSSL TRV.	0.83	0.0075	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	AR(ip)	Updated Value	New EcoSSL TRV.	1.5	0.013	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	AR(p)	Updated Value	New EcoSSL TRV.	10	0.093	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	DC(p)	Updated Value	New EcoSSL TRV.	22	0.15	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	DM(ip)	Updated Value	New EcoSSL TRV.	1.2	0.0091	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	EW	Updated Value	New EcoSSL TRV.	150	10	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	GP	Updated	New EcoSSL	29	1	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
						Value	TRV.			
NONRAD	INORG	Cadmium	CD	SOIL	RF(f)	Updated Value	New EcoSSL TRV.	570	4	mg/kg
NONRAD	INORG	Cadmium	CD	SOIL	VS(i)	Updated Value	New EcoSSL TRV.	0.67	0.0047	mg/kg
NONRAD	INORG	Cadmium	CD	WATER	AK(w)	Updated Value	New GMM TRV.	12000	120	µg/L
NONRAD	INORG	Cadmium	CD	WATER	AR(w)	Updated Value	New GMM TRV.	10000	100	µg/L
NONRAD	INORG	Cadmium	CD	WATER	BA(w)	Updated Value	New GMM TRV.	6700	34	µg/L
NONRAD	INORG	Cadmium	CD	WATER	DC(w)	Updated Value	New GMM TRV.	11000	56	µg/L
NONRAD	INORG	Cadmium	CD	WATER	DM(w)	Updated Value	New GMM TRV.	5600	28	µg/L
NONRAD	INORG	Cadmium	CD	WATER	RF(w)	Updated Value	New GMM TRV.	12000	63	µg/L
NONRAD	INORG	Cadmium	CD	WATER	VGS(w)	Updated Value	New GMM TRV.	5900	63	µg/L
NONRAD	INORG	Cadmium	CD	WATER	VS(w)	Updated Value	New GMM TRV.	4800	24	µg/L
NONRAD	INORG	Cobalt	CO	SEDIMENT	BA(i)	Updated Value	New EcoSSL TRV.	45	0.12	mg/kg
NONRAD	INORG	Cobalt	CO	SEDIMENT	VGS(i)	Updated Value	New EcoSSL TRV.	28	0.074	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	AK(f)	Updated Value	New EcoSSL TRV.	2300	6	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	AK(fi)	Updated Value	New EcoSSL TRV.	140	0.38	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	AR(i)	Updated	New EcoSSL	19	0.051	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
						Value	TRV.			
NONRAD	INORG	Cobalt	CO	SOIL	AR(ip)	Updated Value	New EcoSSL TRV.	35	0.093	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	AR(p)	Updated Value	New EcoSSL TRV.	170	0.46	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	DC(p)	Updated Value	New EcoSSL TRV.	1800	5	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	DM(ip)	Updated Value	New EcoSSL TRV.	69	0.19	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	GP	Updated Value	New EcoSSL TRV.	13	0.25	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	RF(f)	Updated Value	New EcoSSL TRV.	3900	10	mg/kg
NONRAD	INORG	Cobalt	CO	SOIL	VS(i)	Updated Value	New EcoSSL TRV.	33	0.091	mg/kg
NONRAD	INORG	Copper	CU	SEDIMENT	BA(i)	Updated Value	Corrected TRV.	130	920	mg/kg
NONRAD	INORG	Copper	CU	SOIL	AR(i)	Updated Value	New GMM TRV.	24	25	mg/kg
NONRAD	INORG	Copper	CU	SOIL	AR(p)	Updated Value	New GMM TRV.	16	17	mg/kg
NONRAD	INORG	Copper	CU	SOIL	DC(p)	Updated Value	Corrected TRV.	130	930	mg/kg
NONRAD	INORG	Copper	CU	SOIL	DM(ip)	Updated Value	Corrected TRV.	76	530	mg/kg
NONRAD	INORG	Copper	CU	SOIL	RF(f)	Updated Value	Corrected TRV.	3900	27000	mg/kg
NONRAD	INORG	Copper	CU	SOIL	VS(i)	Updated Value	Corrected TRV.	75	520	mg/kg
NONRAD	INORG	Copper	CU	WATER	BA(w)	Updated	Corrected	32000	220000	µg/L

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
						Value	TRV.			
NONRAD	INORG	Copper	CU	WATER	DC(w)	Updated Value	Corrected TRV.	52000	360000	µg/L
NONRAD	INORG	Copper	CU	WATER	DM(w)	Updated Value	Corrected TRV.	26000	180000	µg/L
NONRAD	INORG	Copper	CU	WATER	RF(w)	Updated Value	Corrected TRV.	59000	410000	µg/L
NONRAD	INORG	Copper	CU	WATER	VS(w)	Updated Value	Corrected TRV.	22000	160000	µg/L
NONRAD	INORG	Mercury (inorganic)	HGI	SEDIMENT	VGS(i)	Updated Value	Revised TRV.	0.29	1.1	mg/kg
NONRAD	INORG	Mercury (inorganic)	HGI	SOIL	AK(f)	Updated Value	Revised TRV.	3.1	12	mg/kg
NONRAD	INORG	Mercury (inorganic)	HGI	SOIL	AK(fi)	Updated Value	Revised TRV.	1.1	4.6	mg/kg
NONRAD	INORG	Mercury (inorganic)	HGI	SOIL	AR(i)	Updated Value	Revised TRV.	0.15	0.61	mg/kg
NONRAD	INORG	Mercury (inorganic)	HGI	SOIL	AR(ip)	Updated Value	Revised TRV.	0.22	0.87	mg/kg
NONRAD	INORG	Mercury (inorganic)	HGI	SOIL	AR(p)	Updated Value	Revised TRV.	0.38	1.4	mg/kg
NONRAD	INORG	Mercury (inorganic)	HGI	WATER	AK(w)	Updated Value	Revised TRV.	150	610	µg/L
NONRAD	INORG	Mercury (inorganic)	HGI	WATER	AQ(w)	Updated Value	Revised TRV.	0.77	1.3	µg/L
NONRAD	INORG	Mercury (inorganic)	HGI	WATER	AR(w)	Updated Value	Revised TRV.	130	520	µg/L
NONRAD	INORG	Mercury (inorganic)	HGI	WATER	VGS(w)	Updated Value	Revised TRV.	78	300	µg/L
NONRAD	INORG	Nickel	NI	SEDIMENT	BA(i)	Updated	New GMM	2200	3.5	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
						Value	TRV.			
NONRAD	INORG	Nickel	NI	SEDIMENT	VGS(i)	Updated Value	New GMM TRV.	680	870	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	AK(f)	Updated Value	New GMM TRV.	10000	13000	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	AK(fi)	Updated Value	New GMM TRV.	2700	3500	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	AR(i)	Updated Value	New GMM TRV.	270	350	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	AR(ip)	Updated Value	New GMM TRV.	340	440	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	AR(p)	Updated Value	New GMM TRV.	460	580	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	DC(p)	Updated Value	New GMM TRV.	8700	13	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	DM(ip)	Updated Value	New GMM TRV.	2300	3.6	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	RF(f)	Updated Value	New GMM TRV.	34000	53	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	VS(i)	Updated Value	New GMM TRV.	980	1.5	mg/kg
NONRAD	INORG	Lead	PB	SEDIMENT	VGS(i)	Updated Value	New EcoSSL TRV.	33	320	mg/kg
NONRAD	INORG	Lead	PB	SOIL	AK(f)	Updated Value	New EcoSSL TRV.	800	7800	mg/kg
NONRAD	INORG	Lead	PB	SOIL	AK(fi)	Updated Value	New EcoSSL TRV.	140	1400	mg/kg
NONRAD	INORG	Lead	PB	SOIL	AR(i)	Updated Value	New EcoSSL TRV.	16	150	mg/kg
NONRAD	INORG	Lead	PB	SOIL	AR(ip)	Updated	New EcoSSL	21	200	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
						Value	TRV.			
NONRAD	INORG	Lead	PB	SOIL	AR(p)	Updated Value	New EcoSSL TRV.	30	300	mg/kg
NONRAD	INORG	Lead	PB	SOIL	EW	Updated Value	New EcoSSL TRV.	1700	2000	mg/kg
NONRAD	INORG	Lead	PB	SOIL	GP	Updated Value	New EcoSSL TRV.	210	520	mg/kg
NONRAD	INORG	Lead	PB	WATER	BA(w)	Updated Value	New GMM TRV.	6100	36000	µg/L
NONRAD	INORG	Lead	PB	WATER	DC(w)	Updated Value	New GMM TRV.	10000	59000	µg/L
NONRAD	INORG	Lead	PB	WATER	DM(w)	Updated Value	New GMM TRV.	5100	30000	µg/L
NONRAD	INORG	Lead	PB	WATER	RF(w)	Updated Value	New GMM TRV.	11000	67000	µg/L
NONRAD	INORG	Lead	PB	WATER	VS(w)	Updated Value	New GMM TRV.	4300	26000	µg/L
NONRAD	INORG	Antimony	SB	SEDIMENT	BA(i)	Updated Value	New EcoSSL TRV.	0.37	0.021	mg/kg
NONRAD	INORG	Antimony	SB	SOIL	DC(p)	Updated Value	New EcoSSL TRV.	2.9	0.17	mg/kg
NONRAD	INORG	Antimony	SB	SOIL	DM(ip)	Updated Value	New EcoSSL TRV.	0.48	0.028	mg/kg
NONRAD	INORG	Antimony	SB	SOIL	RF(f)	Updated Value	New EcoSSL TRV.	46	2.7	mg/kg
NONRAD	INORG	Antimony	SB	SOIL	VS(i)	Updated Value	New EcoSSL TRV.	0.27	0.016	mg/kg
NONRAD	INORG	Antimony	SB	WATER	BA(w)	Updated Value	New GMM TRV.	960	22	µg/L
NONRAD	INORG	Antimony	SB	WATER	DC(w)	Updated	New GMM	1500	36	µg/L

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
						Value	TRV.			
NONRAD	INORG	Antimony	SB	WATER	DM(w)	Updated Value	New GMM TRV.	810	18	µg/L
NONRAD	INORG	Antimony	SB	WATER	RF(w)	Updated Value	New GMM TRV.	1700	40	µg/L
NONRAD	INORG	Antimony	SB	WATER	VS(w)	Updated Value	New GMM TRV.	690	15	µg/L
NONRAD	INORG	Selenium	SE	WATER	AQ(w)	Updated Value	New EPA NRWQC CCC.	5	2	µg/L
NONRAD	INORG	Uranium	U	SEDIMENT	VGS(i)	Updated Value	Corrected TRV.	290	29	mg/kg
NONRAD	INORG	Uranium	U	SOIL	AK(f)	Updated Value	Corrected TRV.	39000	3900	mg/kg
NONRAD	INORG	Uranium	U	SOIL	AK(fi)	Updated Value	Corrected TRV.	1500	150	mg/kg
NONRAD	INORG	Uranium	U	SOIL	AR(i)	Updated Value	Corrected TRV.	200	20	mg/kg
NONRAD	INORG	Uranium	U	SOIL	AR(ip)	Updated Value	Corrected TRV.	360	36	mg/kg
NONRAD	INORG	Uranium	U	SOIL	AR(p)	Updated Value	Corrected TRV.	1900	190	mg/kg
NONRAD	INORG	Uranium	U	WATER	AK(w)	Updated Value	Corrected TRV.	650000	65000	µg/L
NONRAD	INORG	Uranium	U	WATER	AR(w)	Updated Value	Corrected TRV.	550000	55000	µg/L
NONRAD	INORG	Uranium	U	WATER	VGS(w)	Updated Value	Corrected TRV.	320000	32000	µg/L
NONRAD	INORG	Zinc	ZN	SEDIMENT	BA(i)	Updated Value	Corrected TRV.	230	0.25	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
NONRAD	INORG	Zinc	ZN	SEDIMENT	VGS(i)	Updated Value	New GMM TRV.	41	130	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	AK(f)	Updated Value	New GMM TRV.	1500	4900	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	AK(fi)	Updated Value	New GMM TRV.	200	660	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	AR(i)	Updated Value	New GMM TRV.	30	97	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	AR(ip)	Updated Value	New GMM TRV.	42	130	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	AR(p)	Updated Value	New GMM TRV.	67	210	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	DC(p)	Updated Value	Corrected TRV.	910	1	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	DM(ip)	Updated Value	Corrected TRV.	250	0.28	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	EW	Updated Value	New GMM TRV.	190	350	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	RF(f)	Updated Value	Corrected TRV.	11000	12	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	VS(i)	Updated Value	Corrected TRV.	180	0.19	mg/kg
NONRAD	INORG	Zinc	ZN	WATER	BA(w)	Updated Value	Corrected TRV.	790000	860	µg/L
NONRAD	INORG	Zinc	ZN	WATER	DC(w)	Updated Value	Corrected TRV.	1200000	1400	µg/L
NONRAD	INORG	Zinc	ZN	WATER	DM(w)	Updated Value	Corrected TRV.	660000	720	µg/L
NONRAD	INORG	Zinc	ZN	WATER	RF(w)	Updated Value	Corrected TRV.	1400000	1500	µg/L

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New ESL	Previous ESL	Units
NONRAD	INORG	Zinc	ZN	WATER	VS(w)	Updated Value	Corrected TRV.	560000	610	µg/L

- 22 Final ESLs have been updated.

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Designation	Type Of Change	Reason	New Final ESL Screening Receptor	New Final ESL	Previous Final ESL Screening Receptor	Previous Final ESL	Units
NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	FINAL	Decrease	TRV changed.	RF(f)	0.14	AR(i)	0.44	mg/kg
NONRAD	PCB	Aroclor-1254	11097-69-1	SEDIMENT	FINAL	Increase	TRV changed.	AQ(s)	0.031	BA(i)	0.028	mg/kg
NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	FINAL	Increase	TRV changed.	AR(i)	0.041	VS(i)	0.022	mg/kg
NONRAD	HE	Trinitrotoluene[2,4,6-]	118-96-7	SOIL	FINAL	Increase	TRV changed.	AR(p)	5.5	GP	0.7	mg/kg
NONRAD	INORG	Aluminum	AL	SOIL	FINAL	Increase	TRV changed.	VS(i)	8.8	GP	5	mg/kg
NONRAD	INORG	Boron	B	SEDIMENT	FINAL	Decrease	TRV changed.	VGS(i)	10	BA(i)	170	mg/kg
NONRAD	INORG	Boron	B	SOIL	FINAL	Decrease	TRV changed.	AR(p)	2	GP	10	mg/kg
NONRAD	INORG	Barium	BA	SEDIMENT	FINAL	Increase	TRV changed.	AQ(s)	48	BA(i)	3.4	mg/kg
NONRAD	INORG	Barium	BA	SOIL	FINAL	Increase	TRV changed.	GP	100	VS(i)	2.5	mg/kg
NONRAD	INORG	Beryllium	BE	SOIL	FINAL	Decrease	TRV changed.	VS(i)	2.4	GP	2.5	mg/kg
NONRAD	INORG	Cadmium	CD	SEDIMENT	FINAL	Increase	TRV changed.	AQ(s)	0.59	BA(i)	0.006	mg/kg

Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Designation	Type Of Change	Reason	New Final ESL Screening Receptor	New Final ESL	Previous Final ESL Screening Receptor	Previous Final ESL	Units
NONRAD	INORG	Cobalt	CO	SOIL	FINAL	Increase	TRV changed.	GP	13	AR(i)	0.051	mg/kg
NONRAD	INORG	Nickel	NI	SEDIMENT	FINAL	Increase	TRV changed.	AQ(s)	39	BA(i)	3.5	mg/kg
NONRAD	INORG	Nickel	NI	SOIL	FINAL	Increase	TRV changed.	GP	20	VS(i)	1.5	mg/kg
NONRAD	INORG	Lead	PB	SEDIMENT	FINAL	Decrease	TRV changed.	VGS(i)	33	AQ(s)	34	mg/kg
NONRAD	INORG	Lead	PB	SOIL	FINAL	Decrease	TRV changed.	AR(i)	16	VS(i)	100	mg/kg
NONRAD	INORG	Antimony	SB	SOIL	FINAL	Increase	TRV changed.	GP	0.05	VS(i)	0.016	mg/kg
NONRAD	INORG	Antimony	SB	WATER	FINAL	Increase	TRV changed.	AQ(w)	100	VS(w)	15	µg/L
NONRAD	INORG	Uranium	U	SEDIMENT	FINAL	Increase	TRV changed.	BA(i)	38	VGS(i)	29	mg/kg
NONRAD	INORG	Uranium	U	SOIL	FINAL	Increase	TRV changed.	GP	25	AR(i)	20	mg/kg
NONRAD	INORG	Zinc	ZN	SEDIMENT	FINAL	Increase	TRV changed.	VGS(i)	41	BA(i)	0.25	mg/kg
NONRAD	INORG	Zinc	ZN	SOIL	FINAL	Increase	TRV changed.	GP	10	VS(i)	0.19	mg/kg

Toxicity Data

Changes to toxicity data were due to implementation of the new Tiered TRV Development Process. New values are Tier I (Nationally accepted TRVs) or II (Geometric Mean TRV derived from the Primary Toxicity Study Evaluation (PTSE) Process) TRVs that

replaced Tier III (Critical Study TRVs derived using the PTSE Process) or VI TRVs (Secondary Data source TRVs). Tier III and IV TRVs were also updated based on data quality assurance issues or revisions to Critical Study TRV selection methods.

- 86 New TRVs

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Value	Units
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	B	New Value	New GMM TRV.	2.15	mg/kg/d
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SEDIMENT	B	New Value	New GMM TRV.	2.15	mg/kg/d
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SEDIMENT	M	New Value	New GMM TRV for non-carnivores.	13.8	mg/kg/d
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	M	New Value	New GMM TRV for non-carnivores.	13.8	mg/kg/d
NO	NONRAD	PCB	Aroclor-1254	11097-69-1	SEDIMENT	B	New Value	New GMM TRV.	1.44	mg/kg/d
NO	NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	B	New Value	New GMM TRV.	1.44	mg/kg/d
YES	NONRAD	PCB	Aroclor-1254	11097-69-1	SEDIMENT	M	New Value	New GMM TRV for non-carnivores.	0.611	mg/kg/d
YES	NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	M	New Value	New GMM TRV for non-carnivores.	0.611	mg/kg/d
YES	NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	P	New Value	New GMM TRV.	163	mg/kg
YES	NONRAD	HE	RDX	121-82-4	SEDIMENT	M	New Value	New GMM TRV.	8.94	mg/kg/d
YES	NONRAD	HE	RDX	121-82-4	SOIL	M	New Value	New GMM TRV.	8.94	mg/kg/d
NO	NONRAD	PCB	Aroclor-1248	12672-	SEDIMENT	B	New	New GMM	2.93	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Value	Units
				29-6			Value	TRV.		
NO	NONRAD	PCB	Aroclor-1248	12672-29-6	SOIL	B	New Value	New GMM TRV.	2.93	mg/kg/d
YES	NONRAD	PCB	Aroclor-1016	12674-11-2	SEDIMENT	M	New Value	New GMM TRV.	1.49	mg/kg/d
YES	NONRAD	PCB	Aroclor-1016	12674-11-2	SOIL	M	New Value	New GMM TRV.	1.49	mg/kg/d
YES	NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-]	1746-01-6	SEDIMENT	M	New Value	New GMM TRV.	0.000000562	mg/kg/d
YES	NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-]	1746-01-6	SOIL	M	New Value	New GMM TRV.	0.000000562	mg/kg/d
NO	NONRAD	HE	HMX	2691-41-0	SEDIMENT	M	New Value	New GMM TRV.	342	mg/kg/d
NO	NONRAD	HE	HMX	2691-41-0	SOIL	M	New Value	New GMM TRV.	342	mg/kg/d
NO	NONRAD	PEST	DDT[4,4'-]	50-29-3	SEDIMENT	B	New Value	New GMM TRV.	1.68	mg/kg/d
NO	NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	B	New Value	New GMM TRV.	1.68	mg/kg/d
YES	NONRAD	PEST	DDT[4,4'-]	50-29-3	SEDIMENT	M	New Value	New GMM TRV.	1.07	mg/kg/d
YES	NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	M	New Value	New GMM TRV.	1.07	mg/kg/d
YES	NONRAD	PCB	Aroclor-1242	53469-21-9	SEDIMENT	M	New Value	New GMM TRV.	0.532	mg/kg/d
YES	NONRAD	PCB	Aroclor-1242	53469-21-9	SOIL	M	New Value	New GMM TRV.	0.532	mg/kg/d
YES	NONRAD	PEST	Dieldrin	60-57-1	SEDIMENT	M	New Value	New EcoSSL TRV.	0.015	mg/kg/d
YES	NONRAD	PEST	Dieldrin	60-57-1	SOIL	M	New	New EcoSSL	0.015	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Value	Units
							Value	TRV.		
YES	NONRAD	PEST	Dieldrin	60-57-1	SEDIMENT	B	New Value	New EcoSSL TRV.	0.079	mg/kg/d
YES	NONRAD	PEST	Dieldrin	60-57-1	SOIL	B	New Value	New EcoSSL TRV.	0.079	mg/kg/d
YES	NONRAD	PEST	DDE[4,4'-]	72-55-9	SOIL	B	New Value	New subset GMM TRV.	0.086	mg/kg/d
YES	NONRAD	PEST	DDE[4,4'-]	72-55-9	SEDIMENT	B	New Value	New subset GMM TRV.	0.086	mg/kg/d
YES	NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SEDIMENT	M	New Value	New GMM TRV.	1340	mg/kg/d
YES	NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	M	New Value	New GMM TRV.	1340	mg/kg/d
YES	NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	P	New Value	New GMM TRV.	167	mg/kg
YES	NONRAD	INORG	Aluminum	AL	WATER	AQ(w)	New Value	New NRWQC CCC	87	µg/L
YES	NONRAD	INORG	Aluminum	AL	SOIL	P	New Value	New EcoSSL TRV is based on site soil pH being less than 5.5.		mg/kg
NO	NONRAD	INORG	Boron	B	SEDIMENT	B	New Value	New GMM TRV.	2.92	mg/kg/d
NO	NONRAD	INORG	Boron	B	SOIL	B	New Value	New GMM TRV.	2.92	mg/kg/d
YES	NONRAD	INORG	Boron	B	SOIL	P	New Value	New subset GMM TRV.	36.8	mg/kg
YES	NONRAD	INORG	Barium	BA	SEDIMENT	B	New Value	New GMM TRV.	73.5	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Value	Units
YES	NONRAD	INORG	Barium	BA	SOIL	B	New Value	New GMM TRV.	73.5	mg/kg/d
NO	NONRAD	INORG	Barium	BA	WATER	M	New Value	New GMM TRV.	3.56	mg/kg/d
YES	NONRAD	INORG	Barium	BA	SEDIMENT	M	New Value	New EcoSSL TRV.	52	mg/kg/d
YES	NONRAD	INORG	Barium	BA	SOIL	M	New Value	New EcoSSL TRV.	52	mg/kg/d
YES	NONRAD	INORG	Barium	BA	SOIL	I	New Value	New EcoSSL TRV.	330	mg/kg
YES	NONRAD	INORG	Beryllium	BE	SEDIMENT	M	New Value	New EcoSSL TRV.	0.53	mg/kg/d
YES	NONRAD	INORG	Beryllium	BE	SOIL	M	New Value	New EcoSSL TRV.	0.53	mg/kg/d
YES	NONRAD	INORG	Beryllium	BE	SOIL	I	New Value	New EcoSSL TRV.	40	mg/kg
YES	NONRAD	INORG	Cadmium	CD	SOIL	I	New Value	New EcoSSL TRV.	150	mg/kg
YES	NONRAD	INORG	Cadmium	CD	WATER	M	New Value	New GMM TRV.	1.08	mg/kg/d
YES	NONRAD	INORG	Cadmium	CD	SEDIMENT	M	New Value	New EcoSSL TRV.	0.77	mg/kg/d
YES	NONRAD	INORG	Cadmium	CD	SOIL	M	New Value	New EcoSSL TRV.	0.77	mg/kg/d
YES	NONRAD	INORG	Cadmium	CD	SOIL	P	New Value	New EcoSSL TRV.	29	mg/kg
YES	NONRAD	INORG	Cadmium	CD	SEDIMENT	B	New Value	New EcoSSL TRV.	1.7	mg/kg/d
YES	NONRAD	INORG	Cadmium	CD	SOIL	B	New Value	New EcoSSL TRV.	1.7	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Value	Units
YES	NONRAD	INORG	Cyanide (total)	CN(-1)	WATER	AQ(w)	New Value	New NRWQC CCC.	5.2	µg/L
YES	NONRAD	INORG	Cobalt	CO	SOIL	P	New Value	New EcoSSL TRV.	13	mg/kg
YES	NONRAD	INORG	Cobalt	CO	SEDIMENT	M	New Value	New EcoSSL TRV.	7.3	mg/kg/d
YES	NONRAD	INORG	Cobalt	CO	SOIL	M	New Value	New EcoSSL TRV.	7.3	mg/kg/d
YES	NONRAD	INORG	Cobalt	CO	SEDIMENT	B	New Value	New EcoSSL TRV.	7.6	mg/kg/d
YES	NONRAD	INORG	Cobalt	CO	SOIL	B	New Value	New EcoSSL TRV.	7.6	mg/kg/d
YES	NONRAD	INORG	Copper	CU	SEDIMENT	B	New Value	New GMM TRV.	2.98	mg/kg/d
YES	NONRAD	INORG	Copper	CU	SOIL	B	New Value	New GMM TRV.	2.98	mg/kg/d
YES	NONRAD	INORG	Mercury (inorganic)	HGI	WATER	AQ(w)	New Value	New EPA NRWQC CCC.	0.77	µg/L
NO	NONRAD	INORG	Mercury (inorganic)	HGI	SEDIMENT	B	New Value	New GMM TRV.	0.297	mg/kg/d
NO	NONRAD	INORG	Mercury (inorganic)	HGI	SOIL	B	New Value	New GMM TRV.	0.297	mg/kg/d
YES	NONRAD	INORG	Nickel	NI	SOIL	B	New Value	New GMM TRV.	21.9	mg/kg/d
YES	NONRAD	INORG	Nickel	NI	SEDIMENT	B	New Value	New GMM TRV.	21.9	mg/kg/d
YES	NONRAD	INORG	Nickel	NI	SEDIMENT	M	New Value	New GMM TRV.	43.9	mg/kg/d
YES	NONRAD	INORG	Nickel	NI	SOIL	M	New	New GMM	43.9	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Value	Units
							Value	TRV.		
YES	NONRAD	INORG	Lead	PB	SOIL	I	New Value	New EcoSSL TRV.	1700	mg/kg
YES	NONRAD	INORG	Lead	PB	SOIL	P	New Value	New EcoSSL TRV.	210	mg/kg
YES	NONRAD	INORG	Lead	PB	WATER	M	New Value	New GMM TRV.	0.971	mg/kg/d
YES	NONRAD	INORG	Lead	PB	SEDIMENT	M	New Value	New EcoSSL TRV.	5.8	mg/kg/d
YES	NONRAD	INORG	Lead	PB	SOIL	M	New Value	New EcoSSL TRV.	5.8	mg/kg/d
YES	NONRAD	INORG	Lead	PB	SEDIMENT	B	New Value	New EcoSSL TRV.	1.6	mg/kg/d
YES	NONRAD	INORG	Lead	PB	SOIL	B	New Value	New EcoSSL TRV.	1.6	mg/kg/d
YES	NONRAD	INORG	Antimony	SB	SOIL	I	New Value	New EcoSSL TRV.	78	mg/kg
YES	NONRAD	INORG	Antimony	SB	WATER	M	New Value	New GMM TRV.	0.154	mg/kg/d
YES	NONRAD	INORG	Antimony	SB	SEDIMENT	M	New Value	New EcoSSL TRV.	0.06	mg/kg/d
YES	NONRAD	INORG	Antimony	SB	SOIL	M	New Value	New EcoSSL TRV.	0.06	mg/kg/d
YES	NONRAD	INORG	Selenium	SE	WATER	AQ(w)	New Value	New EPA NRWQC CCC.	5	µg/L
YES	NONRAD	INORG	Zinc	ZN	SEDIMENT	B	New Value	New GMM TRV.	37.7	mg/kg/d
YES	NONRAD	INORG	Zinc	ZN	SOIL	B	New Value	New GMM TRV.	37.7	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Value	Units
YES	NONRAD	INORG	Zinc	ZN	SOIL	I	New Value	New GMM TRV.	193	mg/kg
NO	NONRAD	INORG	Zinc	ZN	SOIL	P	New Value	New GMM TRV.	89.4	mg/kg

- 37 Updated TRVs

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
NO	NONRAD	PCB	Aroclor-1260	11096-82-5	SEDIMENT	M	Updated Value	Revision. Changed TRV to Aroclor 1254 TRV of 0.031 because this value was considered to be more protective of reproduction in carnivores.	6.9	0.031	mg/kg/d
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	M	Updated Value for carnivores.	Revision. Changed TRV to Aroclor 1254 TRV of 0.031 because this value was considered to be more protective of reproduction in carnivores.	6.9	0.031	mg/kg/d
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	WATER	M	Updated Value	Revision. Changed TRV to Aroclor 1254 TRV of 0.031 because this value was considered to be more protective of	6.9	0.031	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
								reproduction in carnivores.			
YES	NONRAD	HE	Trinitrotoluene[2,4,6-]	118-96-7	SOIL	P	Updated Value	Revision. The study the previous TRV was based on, the toxicity of TNT in the exposure medium was confounded by the presence of other chemicals. This study was removed, and only one other study remained and now represents the TRV.	0.7	80	mg/kg
N/A	NONRAD	HE	Trinitrotoluene[2,4,6-]	118-96-7	SOIL	I	Deleted Value	Revision. Only one study available and in this study the toxicity of TNT in the exposure medium was confounded by the presence of other chemicals, so the TRV was withdrawn.	0.7		mg/kg
NO	NONRAD	VOC	Xylene (Total)	1330-20-7	SEDIMENT	B	Updated Value	Data quality assurance. Corrected UF application error. UF applied is 0.01, not 0.1.	0.777	0.0777	mg/kg/d
NO	NONRAD	VOC	Xylene (Total)	1330-20-7	SOIL	B	Updated Value	Data quality assurance. Corrected UF application error.	0.777	0.0777	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
								UF applied is 0.01, not 0.1.			
NO	NONRAD	VOC	Xylene (Total)	1330-20-7	WATER	B	Updated Value	Data quality assurance. Corrected UF application error. UF applied is 0.01, not 0.1.	0.777	0.0777	mg/kg/d
YES	NONRAD	PEST	DDT[4,4'-]	50-29-3	SEDIMENT	B	Updated Value	Data quality assurance. Corrected dose rate parameters used to calculate TRV.	0.0071	0.24	mg/kg/d
YES	NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	B	Updated Value	Data quality assurance. Corrected dose rate parameters used to calculate TRV.	0.0071	0.24	mg/kg/d
YES	NONRAD	PEST	DDT[4,4'-]	50-29-3	WATER	B	Updated Value	Data quality assurance. Corrected dose rate parameters used to calculate TRV.	0.0071	0.24	mg/kg/d
NO	NONRAD	PEST	DDE[4,4'-]	72-55-9	SEDIMENT	B	Updated Value	Data quality assurance. Corrected dose rate parameters used to calculate TRV.	0.0071	0.13	mg/kg/d
NO	NONRAD	PEST	DDE[4,4'-]	72-55-9	SOIL	B	Updated Value	Data quality assurance. Corrected dose rate parameters used to calculate	0.0071	0.13	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
								TRV.			
YES	NONRAD	PEST	DDE[4,4'-]	72-55-9	WATER	B	Updated Value	Data quality assurance. Corrected dose rate parameters used to calculate TRV.	0.0071	0.13	mg/kg/d
NO	NONRAD	INORG	Aluminum	AL	SEDIMENT	B	Updated Value	Data quality assurance. Corrected data entry error from source document (Ref ID 0716).	1.65	100	mg/kg/d
NO	NONRAD	INORG	Aluminum	AL	SOIL	B	Updated Value	Data quality assurance. Corrected data entry error from source document (Ref ID 0716).	1.65	100	mg/kg/d
NO	NONRAD	INORG	Barium	BA	SEDIMENT	M	Updated Value	Revision. Change was based on using a different endpoint more representative of the form of barium found in the environment to represent the TRV.	0.55	1.38	mg/kg/d
NO	NONRAD	INORG	Barium	BA	SOIL	M	Updated Value	Revision. Change was based on using a different endpoint more representative of the form of barium found in the environment to	0.55	1.38	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
								represent the TRV.			
YES	NONRAD	INORG	Barium	BA	WATER	M	Updated Value	Revision. Change was based on using a different endpoint more representative of the form of barium found in the environment to represent the TRV.	0.55	1.38	mg/kg/d
NO	NONRAD	INORG	Cadmium	CD	SEDIMENT	B	Updated Value	Data quality assurance. Corrected previous misinterpretation of statistics for one endpoint. As a result of this correction a different endpoint was selected to represent the TRV.	0.0153	1.45	mg/kg/d
NO	NONRAD	INORG	Cadmium	CD	SOIL	B	Updated Value	Data quality assurance. Corrected previous misinterpretation of statistics for one endpoint. As a result of this correction a different endpoint was selected to represent the TRV.	0.0153	1.45	mg/kg/d
YES	NONRAD	INORG	Cadmium	CD	WATER	B	Updated Value	Data quality assurance. Corrected	0.0153	1.45	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
								previous misinterpretation of statistics for one endpoint. As a result of this correction a different endpoint was selected to represent the TRV.			
YES	NONRAD	INORG	Copper	CU	SEDIMENT	M	Updated Value	Data quality assurance. Corrected assignment of effect level and dose rate parameter.	35.7	5.127	mg/kg/d
YES	NONRAD	INORG	Copper	CU	SOIL	M	Updated Value	Data quality assurance. Corrected assignment of effect level and dose rate parameter.	35.7	5.127	mg/kg/d
YES	NONRAD	INORG	Copper	CU	WATER	M	Updated Value	Data quality assurance. Corrected assignment of effect level and dose rate parameter.	35.7	5.127	mg/kg/d
YES	NONRAD	INORG	Mercury (inorganic)	HGI	SEDIMENT	B	Updated Value	Revision. Change was based on using a different, more protective endpoint to represent the TRV.	0.074	0.019	mg/kg/d
YES	NONRAD	INORG	Mercury (inorganic)	HGI	SOIL	B	Updated Value	Revision. Change was based on using a different, more	0.074	0.019	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
								protective endpoint to represent the TRV.			
YES	NONRAD	INORG	Mercury (inorganic)	HGI	WATER	B	Updated Value	Revision. Change was based on using a different, more protective endpoint to represent the TRV.	0.074	0.019	mg/kg/d
NO	NONRAD	INORG	Antimony	SB	SEDIMENT	M	Updated Value	Data quality assurance. Corrected previous miscalculation of dose parameter used to calculate the effect level. As a result of this correction a different effect level was selected from the data set to represent the TRV.	0.0035	0.03	mg/kg/d
NO	NONRAD	INORG	Antimony	SB	SOIL	M	Updated Value	Data quality assurance. Corrected previous miscalculation of dose parameter used to calculate the effect level. As a result of this correction a different effect level was selected from the data set to represent the TRV.	0.0035	0.03	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
NO	NONRAD	INORG	Antimony	SB	WATER	M	Updated Value	Data quality assurance. Corrected previous miscalculation of dose parameter used to calculate the effect level. As a result of this correction a different effect level was selected from the data set to represent the TRV.	0.0035	0.03	mg/kg/d
YES	NONRAD	INORG	Uranium	U	SEDIMENT	B	Updated Value	Data quality assurance. Corrected UF applied from 0.1 to none.	7.8	78	mg/kg/d
YES	NONRAD	INORG	Uranium	U	SOIL	B	Updated Value	Data quality assurance. Corrected UF applied from 0.1 to none.	7.8	78	mg/kg/d
YES	NONRAD	INORG	Uranium	U	WATER	B	Updated Value	Data quality assurance. Corrected UF applied from 0.1 to none.	7.8	78	mg/kg/d
YES	NONRAD	INORG	Zinc	ZN	SEDIMENT	M	Updated Value	Data quality assurance. Corrected previous misinterpretation of dose rate calculation.	0.1375	126	mg/kg/d
YES	NONRAD	INORG	Zinc	ZN	SOIL	M	Updated Value	Data quality assurance. Corrected	0.1375	126	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor Group	Type Of Change	Reason	Previous Value	New Value	Units
								previous misinterpretation of dose rate calculation.			
YES	NONRAD	INORG	Zinc	ZN	WATER	M	Updated Value	Data quality assurance. Corrected previous misinterpretation of dose rate calculation.	0.1375	126	mg/kg/d

- 51 New PTSE Derived TRVs

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	TRV Type	New PTSE TRV	Units
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SEDIMENT	B	Chronic GMM NOAEL	2.15	mg/kg/d
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SEDIMENT	M	Chronic GMM NOAEL	13.8	mg/kg/d
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	B	Chronic GMM NOAEL	2.15	mg/kg/d
YES	NONRAD	PCB	Aroclor-1260	11096-82-5	SOIL	M	Chronic GMM NOAEL	13.8	mg/kg/d
NO	NONRAD	PCB	Aroclor-1254	11097-69-1	SEDIMENT	B	Chronic GMM NOAEL	1.44	mg/kg/d
YES	NONRAD	PCB	Aroclor-1254	11097-69-1	SEDIMENT	M	Chronic GMM	0.611	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	TRV Type	New PTSE TRV	Units
							NOAEL		
NO	NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	B	Chronic GMM NOAEL	1.44	mg/kg/d
YES	NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	M	Chronic GMM NOAEL	0.611	mg/kg/d
YES	NONRAD	PCB	Aroclor-1254	11097-69-1	SOIL	P	Chronic GMM NOEC	163	mg/kg
YES	NONRAD	HE	RDX	121-82-4	SEDIMENT	M	Chronic GMM NOAEL	8.94	mg/kg/d
YES	NONRAD	HE	RDX	121-82-4	SOIL	M	Chronic GMM NOAEL	8.94	mg/kg/d
NO	NONRAD	PCB	Aroclor-1248	12672-29-6	SEDIMENT	B	Chronic GMM NOAEL	2.93	mg/kg/d
NO	NONRAD	PCB	Aroclor-1248	12672-29-6	SOIL	B	Chronic GMM NOAEL	2.93	mg/kg/d
YES	NONRAD	PCB	Aroclor-1016	12674-11-2	SEDIMENT	M	Chronic GMM NOAEL	1.49	mg/kg/d
YES	NONRAD	PCB	Aroclor-1016	12674-11-2	SOIL	M	Chronic GMM NOAEL	1.49	mg/kg/d
YES	NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-]	1746-01-6	SEDIMENT	M	Chronic GMM NOAEL	0.000000562	mg/kg/d
YES	NONRAD	D/F	Tetrachlorodibenzodioxin[2,3,7,8-	1746-01-	SOIL	M	Chronic	0.000000562	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	TRV Type	New PTSE TRV	Units
			]	6			GMM NOAEL		
NO	NONRAD	HE	HMX	2691-41-0	SEDIMENT	M	Chronic GMM NOAEL	342	mg/kg/d
NO	NONRAD	HE	HMX	2691-41-0	SOIL	M	Chronic GMM NOAEL	342	mg/kg/d
NO	NONRAD	PEST	DDT[4,4'-]	50-29-3	SEDIMENT	B	Chronic GMM NOAEL	1.68	mg/kg/d
YES	NONRAD	PEST	DDT[4,4'-]	50-29-3	SEDIMENT	M	Chronic GMM NOAEL	1.07	mg/kg/d
NO	NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	B	Chronic GMM NOAEL	1.68	mg/kg/d
YES	NONRAD	PEST	DDT[4,4'-]	50-29-3	SOIL	M	Chronic GMM NOAEL	1.07	mg/kg/d
YES	NONRAD	PCB	Aroclor-1242	53469-21-9	SEDIMENT	M	Chronic GMM NOAEL	0.532	mg/kg/d
YES	NONRAD	PCB	Aroclor-1242	53469-21-9	SOIL	M	Chronic GMM NOAEL	0.532	mg/kg/d
YES	NONRAD	PEST	DDE[4,4'-]	72-55-9	SEDIMENT	B	Chronic subset GMM NOAEL	0.086	mg/kg/d
YES	NONRAD	PEST	DDE[4,4'-]	72-55-9	SOIL	B	Chronic subset GMM	0.086	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	TRV Type	New PTSE TRV	Units
							NOAEL		
YES	NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SEDIMENT	M	Chronic GMM NOAEL	1340	mg/kg/d
YES	NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	M	Chronic GMM NOAEL	1340	mg/kg/d
YES	NONRAD	SVOC	Di-n-Butyl Phthalate	84-74-2	SOIL	P	Chronic GMM NOEC	167	mg/kg
YES	NONRAD	INORG	Boron	B	SEDIMENT	B	Chronic GMM NOAEL	2.92	mg/kg/d
YES	NONRAD	INORG	Boron	B	SOIL	B	Chronic GMM NOAEL	2.92	mg/kg/d
YES	NONRAD	INORG	Boron	B	SOIL	P	Chronic subset GMM NOEC	36.8	mg/kg
YES	NONRAD	INORG	Barium	BA	SEDIMENT	B	Chronic GMM NOAEL	73.5	mg/kg/d
YES	NONRAD	INORG	Barium	BA	SOIL	B	Chronic GMM NOAEL	73.5	mg/kg/d
NO	NONRAD	INORG	Barium	BA	WATER	M	Chronic GMM NOAEL	3.56	mg/kg/d
YES	NONRAD	INORG	Cadmium	CD	WATER	M	Chronic GMM NOAEL	1.08	mg/kg/d
YES	NONRAD	INORG	Copper	CU	SEDIMENT	B	Chronic	2.98	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	TRV Type	New PTSE TRV	Units
							GMM NOAEL		
YES	NONRAD	INORG	Copper	CU	SOIL	B	Chronic GMM NOAEL	2.98	mg/kg/d
NO	NONRAD	INORG	Mercury (inorganic)	HGI	SEDIMENT	B	Chronic GMM NOAEL	0.297	mg/kg/d
NO	NONRAD	INORG	Mercury (inorganic)	HGI	SOIL	B	Chronic GMM NOAEL	0.297	mg/kg/d
YES	NONRAD	INORG	Nickel	NI	SEDIMENT	B	Chronic GMM NOAEL	21.9	mg/kg/d
YES	NONRAD	INORG	Nickel	NI	SEDIMENT	M	Chronic GMM NOAEL	43.9	mg/kg/d
YES	NONRAD	INORG	Nickel	NI	SOIL	B	Chronic GMM NOAEL	21.9	mg/kg/d
YES	NONRAD	INORG	Nickel	NI	SOIL	M	Chronic GMM NOAEL	43.9	mg/kg/d
YES	NONRAD	INORG	Lead	PB	WATER	M	Chronic GMM NOAEL	0.971	mg/kg/d
YES	NONRAD	INORG	Antimony	SB	WATER	M	Chronic GMM NOAEL	0.154	mg/kg/d
YES	NONRAD	INORG	Zinc	ZN	SEDIMENT	B	Chronic GMM	37.7	mg/kg/d

TRV Selected For Use	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	TRV Type	New PTSE TRV	Units
							NOAEL		
YES	NONRAD	INORG	Zinc	ZN	SOIL	B	Chronic GMM NOAEL	37.7	mg/kg/d
YES	NONRAD	INORG	Zinc	ZN	SOIL	I	Chronic GMM NOEC	193	mg/kg
NO	NONRAD	INORG	Zinc	ZN	SOIL	P	Chronic GMM NOEC	89.4	mg/kg

Other Changes

- Minor ESL equation Parameter changes, not affecting ESL.

ESL Parameter Or Equation	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Data	Previous Data
ESL Model Equation	N/A	N/A	N/A	N/A	SEDIMENT	BA(i)	Updated Equation	Revision. Omitted unnecessary parentheses around TRV parameter.	ESL = TRV/ (I_food_dw * (fi * TF_invert_dw))	ESL = (TRV)/ (I_food_dw * (fi * TF_invert_dw))
ESL Model Equation	N/A	N/A	N/A	N/A	SEDIMENT	VGS(i)	Updated Equation	Revision. Omitted unnecessary parentheses around TRV parameter.	ESL = TRV/ (I_food_dw * (fi * TF_invert_dw))	ESL = (TRV)/ (I_food_dw * (fi * TF_invert_dw))
ESL Model Equation	N/A	N/A	N/A	N/A	SOIL	AK(f)	Updated Equation	Revision. Omitted unnecessary	ESL = TRV/ (I_food_dw * (fs + (ff * TF_flesh_dw)))	ESL = (TRV)/ (I_food_dw * (fs + (ff * TF_flesh_dw)))

ESL Parameter Or Equation	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Data	Previous Data
								parentheses around TRV parameter.		
ESL Model Equation	N/A	N/A	N/A	N/A	SOIL	AK(fi)	Updated Equation	Revision. Omitted unnecessary parentheses around TRV parameter.	ESL = TRV/ (I_food_dw * (fs + ((ff * TF_flesh_dw) + (fi * TF_invert_dw))))	ESL = (TRV)/ (I_food_dw * (fs + ((ff * TF_flesh_dw) + (fi * TF_invert_dw))))
ESL Model Equation	N/A	N/A	N/A	N/A	SOIL	RF(f)	Updated Equation	Revision. Omitted unnecessary parentheses around TRV parameter.	ESL = TRV/ (I_food_dw * (fs + (ff * TF_flesh_dw)))	ESL = (TRV)/ (I_food_dw * (fs + (ff * TF_flesh_dw)))
TF_blood	RAD	RAD	Americium-241	AM-241	WATER	DC(w)	Updated Value	Revision. Change based on recalculation of parameter.	0.00000436	0.00000437
TF_blood	RAD	RAD	Cobalt-60	CO-60	SEDIMENT	BA(i)	Updated Value	Revision. Change based on recalculation of parameter.	0.0000718	0.0000717
TF_blood	RAD	RAD	Europium-152	EU-152	SEDIMENT	BA(i)	Updated Value	Revision. Change based on recalculation of parameter.	0.00000718	0.00000717
TF_blood	RAD	RAD	Neptunium-	NP-237	WATER	VS(w)	Updated	Revision.	0.00000334	0.00000335

ESL Parameter Or Equation	Analyte Category	Analyte Group	Analyte Name	Analyte Code	ESL Medium	ESL Screening Receptor	Type Of Change	Reason	New Data	Previous Data
			237				Value	Change based on recalculation of parameter.		
TF_blood	RAD	RAD	Radium-226	RA-226	WATER	VS(w)	Updated Value	Revision. Change based on recalculation of parameter.	0.00000334	0.00000335
TF_blood	RAD	RAD	Radium-228	RA-228	WATER	VS(w)	Updated Value	Revision. Change based on recalculation of parameter.	0.00000334	0.00000335
TF_blood	RAD	RAD	Tritium	H-3	SEDIMENT	BA(i)	Updated Value	Revision. Change based on recalculation of parameter.	0.000043	0.0000431