Frequently Asked Questions (November 2013)

pdf version

This page presents many questions asked by site users and the applicable responses. Please search this page for answers to your questions prior to contacting technical support staff. Researching the questions and answers posted here will greatly reduce the time it takes for you to solve many problems that arise from calculating and using this SL site.

To simplify the process of finding a relevant FAQ, the following categories are provided. Simply click the category and you will be taken to list of relevant questions.

Background/history of RSLs

General Use Questions

Exposure Questions

General Toxicity Value Issues

Chemical-specific Issues

Background/history of RSLs

- What are SLs?
- Why are SLs used?
- How do SLs differ from cleanup standards?
- How often do you update the SL Table?
- Can I get a copy of a previous SL table?
- Does my region recommend the use of the tables where THQ=1.0 or THQ=0.1? What table do I use and when do I use it?

General Use Questions

- How can I get the calculator results or the other web pages to print on one page?
- Where can I find out about WATER9, CHEMDAT8, and CHEM9?
- Do the fish tissue and/or soil SLs apply to wet-weight or dry-weight data?
- Why do some of the numbers on the SL Table exceed a million parts per million (1E+06 mg/kg)? That's not possible!
- What is the preferred citation for information taken from this website?
- How do I freeze the header row with the column names so it always is visible when I view the tables in a spreadsheet?
- How do I print the tables in black and white so the gray scale doesn't show up?
- Why do the contaminant names no longer appear in the first column in the tables?
- Are the tapwater RSLs based on total (unfiltered) or dissolved (filtered) concentrations?

Exposure Questions

- The exposure variables table in the SL background document lists the averaging time for non-carcinogens as "ED*365." What does that mean?
- What populations and what exposures are considered in each type of RSL?
- Do the RSLs factor inhalation from vapor intrusion?

General Toxicity Value Issues

- Where else can I go for toxicity studies (values) not on this site?
- I can't find the chemical that I am interested in. Why isn't it in your database? Are there other places where I should look to find the information that I need?
- Can the oral RfDs in the SL Table be applied to dermal exposure?
- Why isn't oral/inhalation route-to-route extrapolation used to generate toxicity factors on the Screening Table?
- Previous Regional Tables used Inhalation Reference Doses (RfDi) and Slope Factors (SFI). Why does the new table use RfCs and IURs?
- What are the sources of toxicity values used on this site?
- How do I convert $(mg/m^3)^{-1}$ to $(\mu g/m^3)^{-1}$?
- How do I convert ATSDR inhalation MRLs in parts per million (ppm) to mg/m^3?
- Why do Tapwater RSLs differ from IRIS drinking water concentrations when both are based on a target cancer risk of 1E-06?
- Why do air RSLs differ from IRIS inhalation unit risk values when both are based on a target cancer risk of 1E-06?

Chemical-specific Issues (sorted alphabetically by chemical)

- [Benzene] The slope factors for benzene are actually ranges, yet the SL table shows only a single number. Which number was chosen and why?
- [Cadmium] The cadmium numbers are labeled "food" and "water." Which do I use if I have another medium, such as soil?
- [Chlordane] Is the CAS number for Chlordane really for Technical Chlordane and what should I use for screening?
- [Chromium] How were the toxicity values provided in IRIS on chromium used to calculate chromium screening levels?
- [Chromium] Why are the screening levels for Cr(VI) significantly lower than previous values?
- [Copper]How was the copper RfD derived?
- [2,4/2,6-dinitrotoluene] 2,4/2,6-dinitrotoluene mixture has a cancer slop factor, why don't the individual isomers use the same slope factor?
- [Lead] Where did the inorganic lead SL value in the Table come from?
- [Manganese] For manganese, IRIS shows an oral RfD of 0.14 mg/kg-day, but the SL Table uses 0.024 mg/kg-day. Why?
- [Mercury] Why is there no oral RfD for mercury? How should I handle mercury?
- [PAHs] Where did the CSFs for carcinogenic PAHs come from?
- [Perchlorate] Why is the tapwater screening level for Perchlorate of 11 µg/L different from the preliminary remedial goal (PRG) of 15 µg/L calculated by the Office of Solid Waste and Emergency Response in its January 8, 2009, guidance (help/documents/perchlorate_memo_01_08_09.pdf)?
- [PCBs] Since an earlier FAQ said that route to route extrapolations were not used by the RSLs to develop toxicity values, how were the inhalation unit risks derived for Polychlorinated biphenyls (PCBs)?
- [TCDD] Why was the TCDD (Dioxin) oral slope factor of 130,000 $(mg/kg\text{-}day)^{-1}$ (or 1.3E-04 $(pg/kg\text{-}day)^{-1}$)chosen?
- [TCE] What toxicity values are used for TCE?
- [Trihalomethane] How do I apply the trihalomethane MCLs?
- [vinyl chloride] IRIS presents 2 types of toxicity values for vinyl chloride yet the SL table shows only a single number. Which number was chosen and why?
- [Xylene] Where do the RfDs and RfCs for the xylene congeners come from?

The list of questions presented below is not in the same order as the questions listed in the five above categories.

1. **What are SLs?**

The screening levels (SLs) presented on this site are developed using risk assessment guidance from the EPA Superfund program and can be used for Superfund sites. They are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. SLs are considered by the Agency to be protective for humans (including sensitive groups) over a lifetime; however, SLs are not always applicable to a particular site and do not address non-human health endpoints, such as ecological impacts. The SLs contained in the SL table are generic; they are calculated without site-specific information. They may be re-calculated using site-specific data.

2. **Why are SLs used?**

   They are used for site "screening" and as initial cleanup goals, if applicable. SLs are not de facto cleanup standards and should not be applied as such. The SL's role in site "screening" is to help identify areas, contaminants, and conditions that require further federal attention at a particular site. Generally, at sites where contaminant concentrations fall below SLs, no further action or study is warranted under the Superfund program, so long as the exposure assumptions at a site match those taken into account by the SL calculations. Chemical concentrations above the SL would not automatically designate a site as "dirty" or trigger a response action; however, exceeding a SL suggests that further evaluation of the potential risks by site contaminants is appropriate. SLs are also useful tools for identifying initial cleanup goals at a site. In this role, SLs provide long-term targets to use during the analysis of different remedial alternatives. By developing SLs early in the decision-making process, design staff may be able to streamline the consideration of remedial alternatives.

3. **How do SLs differ from cleanup standards?**

   SLs are generic screening values, not de facto cleanup standards. Once the Baseline Risk Assessment (BLRA) is completed, site-specific risk-based remediation goals can be derived using the BLRA results. The selection of final cleanup goals may also include (Applicable or Relevant and Appropriate Requirements (ARARs) and to be considered guidance (TBCs), as well as site-specific risk-based goals.

   In the Superfund program, this evaluation is carried out as part of the nine criteria for remedy selection outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Once the nine-criteria analysis is completed, the SL may be retained as is or modified (based on site-specific information) prior to becoming established as a cleanup standard. This site-specific cleanup level is then documented in the Record of Decision.

4. **How often do you update the SL Table?**

   It is anticipated that the SLs will be updated approximately semiannually in the Fall and Spring. Please take note of the "What's New" page to identify when toxicity values are updated.

5. **Can I get a copy of a previous SL table?**

   We do not distribute outdated copies of the SL table. Each new version of the table supersedes all previous versions. If you wish to maintain previous versions of the SLs for a long-term project, you can download the entire table and save multiple versions with a time-stamp.

6. **How can I get the calculator results or the other web pages to print on one page?**

   First, under your browser print options, rotate the page into the landscape position. Next, make sure the margins are as small as possible. Also, it may be possible to change your browser settings to make the viewable print size smaller. You can also cut and paste the results into a spreadsheet or database for further formatting or use the Output to File Option from the search page and format the results. A PDF file is provided at the top of each page that is compressed to fit on standard paper. To watch a brief video that explains how to get results into a spreadsheet. click here (large file) or here for smaller file.

7. **Where else can I go for toxicity studies (values) not on this site?**

The EPA toxicity value hierarchy is explained in the User's Guide of this website. For chemicals not listed in the hierarchy, toxicity information may be obtained by contacting the U.S. EPA Superfund Health Risk Technical Support Center at (513) 569-7300 or the Agency for Toxic Substances and Disease Registry (ATSDR) Information Center at 1-888-422-8737. Consult with your regional risk assessor when considering toxicity values not listed on these tables. For occupational exposure standards, try NIOSH, WHO, or OSHA. For information on nerve agents, contact DENIX.

8. **Where can I find out about WATER9, CHEMDAT8, and CHEM9?**

   These programs help estimate various chemical-specific parameters such as diffusivity in air and water. WATER9 is an analytical model for estimating compound-specific air emissions from wastewater collection & treatment systems. CHEMDAT8 is a Lotus 1-2-3 spreadsheet that includes analytical models for estimating VOC emissions from treatment, storage and disposal facility (TSDF) processes. CHEM9 is a compound properties processor that is based upon an EPA compound database of over 1000 compounds. It provides the capability to estimate compound properties that are not available in the database, including the compound volatility and the theoretical recovery (fraction measured (Fm)) for EPA test methods 25D and 305.

9. **I can't find the chemical in which I am interested. Why isn't it in your database? Are there other places where I should look to find the information that I need?**

   The Generic Tables are not completely alphabetical. Some chemicals are listed together under a broader chemical group.

   If you are trying to locate various PAHs or PCBs, they are listed in the table under Polynuclear Aromatic Hydrocarbons and Polychlorinated Biphenyls, respectively. Also, dioxin congeners may be compared with the SL for congener 2,3,7,8-TCDD, once the appropriate Toxicity Equivalence Factors have been applied.

   Chemical groups are in bold type in the tables and chemicals in those groups are indented. Your chemical may be listed in one of the following chemical groups:

   - Cyanides
   - Dioxins
   - Furans
   - Lead Compounds
   - Mercury Compounds
   - Perchlorates
   - Phosphates, Inorganic
   - Phthalates
   - Polychlorinated Biphenyls (PCBs)
   - Polynuclear Aromatic Hydrocarbons (PAHs)

   If you still cannot find the chemical in the database, it means that we have no EPA toxicity value for it. The SL table only includes chemical species for which we have toxicity values or MCLs.

   Consult with your regional risk assessor when searching for toxicity values not listed on these tables.

   There are many other useful toxicological/risk assessment sites on the internet. In many cases, data may be available but will require a literature search.

   The calculator allows the user to calculate SLs for a chemical not in our database. Select "Test Chemical" in the pick list and one can enter chemical-specific information for any chemical not already listed.

RSL Chemical Name	Synonym
Ethyl Chloride	Chloroethane

Picramic Acid	2-Amino-4,6-dinitrophenol
Stirofos	Tetrachlorovinphos
Tertyl	Trinitrophenylmethylnitramine
o-cresol	2-methylphenol
m-cresol	3-methylphenol
p-cresol	4-methylphenol
Methylene Chloride	Dichloromethane
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX
Hexachlorocyclohexane, Gamma	Lindane

10. **For manganese, IRIS shows an oral RfD of 0.14 mg/kg-day, but the SL Table uses 0.024 mg/kg-day. Why?**

    The IRIS RfD includes manganese from all sources, including diet. The explanatory text in IRIS recommends using a modifying factor of 3 when calculating risks associated with non-food sources, and the SL table follows this recommendation. IRIS also recommends subtracting dietary exposure (default assumption in this case is 5 mg). Thus, the IRIS RfD has been lowered by a factor of 2 x 3, or 6. The table now reflects manganese for "non-food" sources.

11. **Can the oral RfDs in the SL Table be applied to dermal exposure?**

    Not directly. Oral RfDs are usually based on administered dose and therefore tacitly include a GI absorption factor. Thus, any use of oral RfDs (or CSFs) in dermal risk calculations should involve removing this absorption factor. Consult the Risk Assessment Guidance for Superfund, Part A, Appendix A, for further details on how to do this. (See also RAGS Part E.)

    Note that the SL table displays the GIABS used in dermal SL calculations.

12. **The exposure variables table in the SL background document lists the averaging time for non-carcinogens as "ED*365." What does that mean?**

    ED is exposure duration, in years, and * is the computer-ese symbol for multiplication. Multiplying ED by 365 simply converts the duration to days. In fact, the ED term is included in both the numerator and denominator of the SL algorithms for non-cancer risk, canceling it altogether. See RAGS for more information.

13. **Where did the inorganic lead SL value in the Table come from?**

    EPA has no consensus RfD or CSF for inorganic lead, so it is not possible to calculate SLs as we have done for other chemicals. EPA considers lead to be a special case because of the difficulty in identifying the classic "threshold" needed to develop an RfD.

    EPA therefore evaluates lead exposure by using blood-lead modeling, such as the Integrated Exposure-Uptake Biokinetic Model (IEUBK). The EPA Office of Solid Waste has also released a detailed directive on risk assessment and cleanup of residential soil lead. The directive recommends that soil lead levels less than 400 mg/kg are generally safe for residential use. Above that level, the document suggests collecting data and modeling blood-lead levels with the IEUBK model. For the purposes of screening, therefore, 400 mg/kg is recommended for residential soils. For water, we suggest 15 µg/L (the EPA Action Level in water), and for air, the National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

    However, caution should be used when both water and soil are being assessed. The IEUBK model shows that if the average soil concentration is 400 mg/kg, an average tap water concentration above 5 µg/L would yield more

than than a 5% probability of exceeding a 10 µg/L/dL blood-lead level for a typical child. If the average tap water concentration is 15 µg/L, an average soil concentration greater than 250 mg/kg would yield more than a 5% probability of exceeding a 10 µg/L/dL blood-lead level for a typical child.

For more information see Addressing Lead At Superfund Sites.

14. **Where did the cancer toxicity values for carcinogenic PAHs come from?**

    The PAH SFOs are all calculated relative to benzo[a]pyrene, which has an IRIS slope factor. The relative factors for the other PAHs can be found in *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*. The Toxicity Equivalency Factors (TEFs) are listed in Section 2.3.5 of the User's Guide. The PAH IURs are all from California EPA.

15. **Why is there no oral RfD for mercury? How should I handle mercury?**

    IRIS gives oral RfDs for mercuric chloride and for methylmercury, but not for elemental mercury. Therefore, the SL Table follows suit. Consult your toxicologist to determine which of the available mercury numbers is suitable for the conditions at your site (e.g., whether mercury is likely to be organic or inorganic.)

16. **The cadmium numbers are labeled "food" and "water." Which do I use if I have another medium, such as soil?**

    "Food" is for food and soil use; "water" is for water only. Further, the cadmium RfDs on IRIS are based on the same study. The food RfD incorporates a 2.5% absorption adjustment; the water RfD incorporates a 5% absorption adjustment. For another medium such as soil, the risk assessor should choose the number whose absorption factor most closely matches the expected conditions at the site. For example, if the expected absorption of cadmium from soil is 3%, the food-based number would be a good approximation. In most cases, the expected absorption is unknown and the RfD for food should be used for soil screening without making any changes to the value.

17. **The slope factors for benzene are actually ranges, yet the SL table shows only a single number. Which number was chosen and why?**

    The upper end of the slope factor range was chosen. This is because the SL Table is a screening tool, and the consequences of screening out a chemical that could pose a significant risk are more serious than the consequences of carrying the chemical through to the next step of the risk assessment. (At each step of the risk assessment, the risk is further refined using site-specific analysis. Chemicals can always be eliminated from the risk assessment at a later step than the initial screening, if appropriate.)

18. **What toxicity values are used for TCE?**

    IRIS has recently released a Toxicity Assessment for TCE. IRIS suggests that the kidney risk be assessed using the mutagenic equations and the liver and non-Hodgkin lymphoma (NHL) be addressed using the standard cancer equations. In order to generate cancer-based RSLs for land uses involving multiple age receptors using the RSL calculator, multiple steps need to be performed.

    1. Run the RSL calculator with the mutagenic option switched on to incorporate the ADAF (Age-Dependent Adjustment Factor) and estimate a TCE concentration based on kidney mutagenic endpoint (IUR of 1E-06 $(\mu g/m^3)^{-1}$ and oral slope factor of 9.3E-03 $(mg/kg\text{-}day)^{-1}$). The first page of the calculator should look like this if calculating residential soil, air and tapwater RSLs. Then, make the following changes to the toxicity values and the properties (VOC?, Mutagen? and EPD?). The soil, air and tapwater results are then displayed for the mutagenic RSLs.
    2. Run the RSL calculator with the mutagenic option switched off and estimate a TCE concentration based on non-kidney (NHL/liver) cancer endpoint (IUR of 3.1E-06 $(\mu g/m^3)^{-1}$ and oral slope factor of 3.7E-02 -1

(mg/kg-day)). The first page of the calculator should look like this if calculating residential soil, air and tapwater RSLs. Then, make the following changes to the toxicity values and the properties (VOC?, Mutagen? and EPD?). The soil, air and tapwater results are then displayed for the mutagenic RSLs.

3. For each environmental media, take the reciprocal of the two resulting TCE RSL concentrations, and add them together (1/conc_mutagen + 1/conc_cancer) before inverting back to a final RSL concentration. (1/(1/conc_mutagen + 1/conc_cancer). The detailed equations for resident soil, air and tapwater are presented.

An RSL spreadsheet has been developed that calculates the RSLs for land uses involving children following the above steps. Note the exposure parameter values for the recreator do not represent any EPA guidance but are for demonstration only.

A Risk spreadsheet has been developed that calculates chronic daily intakes (CDIs) and cancer risk for land uses involving children following similar steps to the above. Note the exposure parameter values for the recreator do not represent any EPA guidance but are for demonstration only.

The calculator, if run in default mode, will produce accurate RSLs for the land uses that do not include multiple age receptors (i.e. the worker land uses). For example, the industrial soil and industrial air supporting tables, which assume only adult exposures, show the IRIS toxicity values used in those scenarios for TCE. Adult only cancer toxicity values include the inhalation unit risk of 4.1E-06 $(\mu g/m^3)^{-1}$ and oral slope factor of 4.6E-02 $(mg/kg\text{-}day)^{-1}$). The noncancer toxicity values used for all land use scenarios are oral reference dose of 5E-04 mg/kg-day and inhalation reference concentration of 2E-03 mg/m^3.

19. **IRIS presents 2 types of toxicity values for vinyl chloride yet the SL table shows only a single number. Which number was chosen and why?**

The vinyl chloride calculations were based on the examples given in the Toxicological Review for vinyl chloride, which appears on IRIS. IRIS presents "continuous lifetime exposure during adulthood" and "continuous lifetime exposure from birth" slope factors and inhalation unit risks. Because the equations used on this website show the individual lifetime segments, the "continuous lifetime exposure during adulthood" toxicity values are chosen.

The examples in the Toxicological Review indicate that, during childhood, both pro-rated and non-pro-rated risks should be generated using the lower slope factor or IUR. When estimating the risk using this method and considering the lifetime segments during childhood and adulthood, it is clear that the cancer risks early in life are higher than those that would be generated if the typical pro-rated risks were simply generated using the lifetime CSF or IUR. This finding is consistent with the IRIS assessment's statements that cancer risk is increased during early life.

Over the course of a 70-year lifetime, the risk generated using the pro-rated and non-pro-rated segments, along with the lower CSF or IUR, generally exceeds the risk generated using only pro-rated exposure and the lifetime CSF or IUR. However, the former risk estimates trend closer and closer to the latter as life advances, and converge at about the 70-year mark.

20. **2,4/2,6-dinitrotoluene mixture has a cancer slope factor, why don't the individual isomers use the same slope factor?**

It was determined for this website that the IRIS toxicological profile did not adequately address this issue.

21. **Do the fish tissue and/or soil SLs apply to wet-weight or dry-weight data?**

The fish SLs represent the concentration that can be consumed at the rate indicated in the Technical Background Document. Therefore, wet or dry weight is not an inherent assumption of the SL numbers. Rather, users of the Table should consider whether their population of interest is more likely to consume the fish using a preparation

method that is better simulated by a wet or dry weight. (For example, consumption of raw or fried fish would be more likely represented by wet weight, whereas consumption of smoked or dried fish might be better represented by dry weight.) In other words, the use of a site-specific sample as wet or dry weight should be governed by its representativeness for the population of interest.

When applying the RSL for soil to a soil sample, consult the Quality Assurance Project Plan for the sampling regime and analysis. For example, inorganic compounds in soils are dried prior to the extraction process for analysis while VOCs are not. As always, please consult your Regional risk assessor when applying the RSLs to site - specific data.

22. **Why do some of the numbers on the SL Table exceed a million parts per million (1E+06 mg/kg)? That's not possible!**

For certain low-toxicity chemicals, the SLs exceed possible concentrations at the target risks. Many years ago, these SLs were rounded to the highest possible concentration, or 1.0E+06 ppm. This type of truncation has been discontinued so that Table users can adjust the SLs to a different target risk whenever necessary. For example, when screening chemicals at a target HQ of 0.1, noncarcinogenic SLs may simply be divided by 10. Such scaling is not possible when SLs are rounded. Users who are interested in truncation can also consult the Soil Screening Guidance for a discussion of "Csat," the saturation concentration, which reflects physical limits on soil concentrations.

SLs may also exceed a non-risk based 'ceiling limit' concentration of 1.0E+05 mg/kg ('max') for relatively less toxic inorganic and semivolatile contaminants. The ceiling limit of 1.0E+05 mg/kg is equivalent to a chemical representing 10% by weight of the soil sample. At this contaminant concentration (and higher), the assumptions for soil contact may be violated (for example, soil adherence and wind-borne dispersion assumptions) due to the presence of the foreign substance itself.

The calculator, if operated in site-specific mode, will give the option to apply the C_{sat} substitution rule as well as the option to apply the theoretical ceiling limit.

23. **Why isn't oral/inhalation route-to-route extrapolation used to generate toxicity factors on the Screening Table?**

Previous versions of regional screening tables did contain some route-to-route extrapolation, because of the scarcity of inhalation toxicity factors. However, this was not optimal due to the uncertainty associated with making such adjustments (e.g., point-of-entry, first-pass, and route-specific effects may not be adequately considered by simple extrapolations). With the increasing availability of Tier III toxicity values, generic route-to-route extrapolation has been discontinued. Chemical-specific route-to-route extrapolation may be used by Tier I, II, or III sources after thorough consideration of the chemical-specific issues.

24. **Previous Regional Tables used Inhalation Reference Doses (RfDi) and Slope Factors (SFI). Why does the new table use RfCs and IURs?**

In the past, some regional tables converted RfCs to RfDs and IURs to SFIs for inhalation. This was initially done because risk equations once relied upon RfDs and SFIs in units of mg/kg/day and 1/mg/kg/day, respectively. However, as the inhalation guidance has evolved, RfCs and IURs, in units of mg/m^3 and $m^3/\mu g/L$ respectively, have become the recommended toxicity factors. Please see Methods for Derivation of Inhalation Reference Concentrations (RfCs) and Application of Inhalation Dosimetry or (PDF) for more information. Also please see the FAQ concerning route-to-route extrapolation.

25. **How were the toxicity values provided in IRIS on chromium used to calculate chromium screening levels?**

Beginning in the Fall 2009, we are more strongly encouraging the collection of valent-specific data when chromium is likely to be a COC at the site, and we are no longer calculating default screening levels for total

chromium. We are instead calculating screening levels for Cr(III) using toxicity values derived for Cr(III) and using toxicity values derived for Cr(VI) for Cr(VI) screening levels. IRIS Provides two RfC values (8E-6 mg/m^3 for chromic acid mists and Cr(VI) aerosols and 1E-4 mg/m^3 for Cr(VI) particulates). Our default screening levels use the RfC of 1E-4 mg/m^3 for particulates. Review of site specific information may warrant the use of the RfC of 8E-6 mg/m^3 when chromic acid mists or dissolved Cr(VI) aerosols are being assessed. All of the toxicity values used for Cr(III) and Cr(VI) come from IRIS, except (as noted in the following FAQ) the oral slope factor for Cr(VI) which was originally derived by New Jersey Department of Environmental Protection scientists.

In the RSL Table, the Cr(VI) specific value (assuming 100% Cr(VI)) is derived by multiplying the IRIS Cr(VI) Inhalation Unit Risk value by 7. This is considered to be a health-protective assumption, and is also consistent with the State of California's interpretation of the Mancuso study that forms the basis of Cr(VI)'s estimated cancer potency.

If you are working on a chromium site, you may want to contact the appropriate regulatory officials in your region to determine what their position is on this issue.

The Maximum Contaminant Level (MCL) of 100 µg/L for "Chromium (total)", from the EPA's MCL listing is shown on the total chromium line in the tables.

For more information see User Guide Section on Chromium.

26. **Why are the screening levels for Cr(VI) significantly lower than previous values?**

The New Jersey Department of Environmental Protection (NJDEP) recently determined that Cr(VI) by ingestion is likely to be carcinogenic in humans. NJDEP and derived a new oral cancer slope factor, based on cancer bioassays conducted by the National Toxicology Program (http://www.state.nj.us/dep/dsr/chromium/soil-cleanup-derivation.pdf). In addition, EPA's Office of Pesticide Programs (OPP) has concluded that the weight-of-evidence supports that Cr(VI) may act through a mutagenic mode of action following administration via drinking water and has also recommended that Age-Dependent Adjustment Factors (ADAFs) be applied when assessing cancer risks from early-life exposure (< 16 years of age).

Both of these assessments are considered Tier 3 sources and were used to derive the screening levels for Cr(VI). We applied ADAFs for early life exposure via ingestion and inhalation because OPP's proposed mutagenic mode of action for Cr(VI) occurs in all cells, regardless of type. Application of ADAFs for all exposure pathways results in more health-protective screening levels.

For more information see User Guide Section on Chromium.

27. **What are the sources of toxicity values used on this site?**

In 2003, EPA's Superfund program revised its hierarchy of human health toxicity values, providing three tiers of toxicity values (http://www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf). Three tier 3 sources were identified in that guidance, but it was acknowledged that additional tier 3 sources may exist. The 2003 guidance did not attempt to rank or put the identified tier 3 sources into a hierarchy of their own. However, when developing the screening tables and calculator presented on this website, EPA needed to establish a hierarchy among the tier 3 sources. The toxicity values used as "defaults" in these tables and calculator are consistent with the 2003 guidance. Toxicity values from the following sources in the order in which they are presented below are used as the defaults in these tables and calculator.

1. EPA's Integrated Risk Information System (IRIS)
2. The Provisional Peer Reviewed Toxicity Values (PPRTVs) derived by EPA's Superfund Health Risk Technical Support Center (STSC) for the EPA Superfund program.

3. The Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels (MRLs)

4. The California Environmental Protection Agency (OEHHA) Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels (RELS) from December 18, 2008 and the Cancer Potency Values from December 17, 2008.

5. In the Fall 2009, this new source of toxicity values used was added: screening toxicity values in an appendix to certain PPRTV assessments. While we have less confidence in a screening toxicity value than in a PPRTV, we put these ahead of HEAST toxicity values because these appendix screening toxicity values are more recent and use current EPA methodologies in the derivation, and because the PPRTV appendix screening toxicity values also receive external peer review.

6. The EPA Superfund program's Health Effects Assessment Summary Table. (Note that the HEAST website of toxicity values for chemical contaminants is not open to users outside of EPA, but values can be obtained for use on Superfund sites by contacting Michele Burgess at Burgess.Michele@epamail.epa.gov).

   Users of these screening tables and calculator wishing to consider using other toxicity values, including toxicity values from additional sources, may find the discussions and seven preferences on selecting toxicity values in the attached Environmental Council of States paper useful for this purpose (ECOS website), (ECOS paper).

   When using toxicity values, users are encouraged to carefully review the basis for the value and to document the basis of toxicity values used on a CERCLA site.

   Please contact a Superfund risk assessor in your Region for help with chemicals that lack toxicity values in the sources outlined above.

28. **Why is the tapwater screening level for Perchlorate of 11 µg/L different from the preliminary remedial goal (PRG) of 15 µg/L calculated by the Office of Solid Waste and Emergency Response in its January 8, 2009, guidance (help/documents/perchlorate_memo_01_08_09.pdf)?**

    As described in the OSWER memorandum, the Agency has now issued an Interim Drinking Water Health Advisory (Interim Health Advisory) for exposure to perchlorate of 15 µg/L in water. A health advisory provides technical guidance to federal, state, and other public health officials on health effects, analytical methods and treatment technologies associated with drinking water contamination. The Interim Health Advisory for perchlorate was developed using EPA's RfD of of 7E-04 mg/kg-day and representative body weight, as well as 90th percentile drinking water and national food exposure data for pregnant women in order to protect the most sensitive population identified by the National Research Council (NRC) (i.e., the fetuses of pregnant women who might have hypothyroidism or iodide deficiency).

    The NCP (40 CFR 300.430(e)(2)(A)(1)) provides that when establishing acceptable exposure levels for use as remediation goals (for a Superfund site), consideration must be given to concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effects over a lifetime or part of a lifetime, incorporating an adequate margin of safety. As a result of the publication of the Interim Health Advisory for perchlorate, OSWER recommends that where no federal or state applicable or relevant and appropriate (ARAR) requirements exist under federal or state laws, 15 µg/L (or 15 ppb) is recommended as the PRG for perchlorate when making CERCLA site-specific cleanup decisions where there is an actual or potential drinking water exposure pathway. However, where State regulations qualify as ARARs for perchlorate, the remediation goals established shall be developed considering the State regulations that qualify as ARARs, as well as other factors cited in the NCP (see 40 CFR 300.430(e)(2)(i)(ff)). Final remediation goals and remedy decisions are made in accordance with 40 CFR300.430 (e) and (f) and associated provisions.

    Preliminary remediation goals are the starting points in the development of final cleanup levels at sites. As at all sites addressed under the NCP, these goals may be modified, depending on physical characteristics of a site,

State laws and guidance, and other site specific factors, such as additional exposure routes.

One can derive a Drinking Water Equivalent Level of 11 µg/L using EPA's reference dose (RfD) of 7E-04 mg/kg-day and an assumption that all exposure to perchlorate comes from groundwater.

29. **What is the preferred citation for information taken from this website?**

United States Environmental Protection Agency Regions 3, 6, and 9. (Insert date accessed). Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

30. **How was the copper RfD derived?**

Currently the RfD is 0.04 mg/kg-day with a reference of HEAST. Actually, HEAST presents a concentration in drinking water screening level of 1.3 mg/L. In order to use the value to assess oral exposures to other media, we "back out" the adult exposure assumptions (e.g. body weight of 70 kg, ingestion rate of 2 L/day) that go into the calculation of a drinking water screening level.

31. **Where do the RfDs and RfCs for the xylene congeners come from?**

The IRIS RfD and RfC values for "xylene, mixture" are used as surrogate values for the individual congeners. The earlier RfD values for some xylene isomers were withdrawn from our electronic version of HEAST. The IRIS RfC value replaces values from Cal EPA.

32. **How do I freeze the header row with the column names so it always is visible when I view the tables in a spreadsheet?**

There are times when you have many rows of data in a spreadsheet program. On the top of the page are labels but when you scroll down for more data, the labels go away. One way to prevent this from happening is to freeze panes, so when you scroll down, the labels won't move. Click your cursor into the row BELOW the column headers. In the Main Menu of Excel go to "Window" and select "Freeze Pane". For newer versions of Excel, click on the "View" tab and click the Freeze Panes" icon. Columns can also be frozen in a similar manner.

33. **Why do the contaminant names no longer appear in the first column in the tables?**

There is a lot of information provided in the lines in the table which causes the print to be quite small. Many users make the print larger on their screen, but when they do this and scroll over to the columns on the right it is hard to determine which line pertains to your contaminant of interest, because the contaminant name no longer appears on the screen. The contaminant names and their CASRNs were moved to the middle of the lines so that the contaminant name would nearly always be visible on your screen.

34. **What populations and what exposures are considered in each type of RSL?**

The following table lists the land uses addressed, media addressed and the age of the receptor utilized in the RSL table.

		Exposure Routes (Cancer)			Exposure Routes (Noncancer)		
Land use	Media	Oral	Dermal	Inhalation	Oral	Dermal	Inhalation
Resident	Soil	Adult + Child	Adult + Child	Both	Child	Child	Both
	Tapwater	Adult + Child	Adult + Child	Both	Child	Child	Both
	Air	NA	NA	Both	NA	NA	Both
Composite Worker	Soil	Adult	Adult	Adult	Adult	Adult	Adult
	Air	NA	NA	Adult	NA	NA	Adult

Soil to Groundwater	Soil	Adult + Child	Adult + Child	Both	Both	Child	Child

NA = Not Applicable

The following table lists the land uses addressed, media addressed and the age of the receptor utilized in the RSL calculator.

		Exposure Routes (Cancer)			Exposure Routes (Noncancer)		
Land use	Media	Oral	Dermal	Inhalation	Oral	Dermal	Inhalation
Resident	Soil	Adult + Child	Adult + Child	Both	Both	Both	Both
	Tapwater	Adult + Child	Adult + Child	Both	Both	Both	Both
	Air	NA	NA	Both	NA	NA	Both
Recreator	Soil/Sediment	Adult + Child	Adult + Child	Both	Both	Both	Both
	Surface Water	Adult + Child	Adult + Child	NA	Both	Both	NA
Outdoor Worker	Soil	Adult	Adult	Adult	Adult	Adult	Adult
	Air	NA	NA	Adult	NA	NA	Adult
Indoor Worker	Soil	Adult	NA	Adult	Adult	NA	Adult
	Air	NA	NA	Adult	NA	NA	Adult
Composite Worker	Soil	Adult	Adult	Adult	Adult	Adult	Adult
	Air	NA	NA	Adult	NA	NA	Adult
Construction Worker	Soil	Adult	Adult	Adult	Adult	Adult	Adult
	Air	NA	NA	NA	NA	NA	NA
Fish	Fish	Adult	NA	NA	Adult	NA	NA
Soil to Groundwater	Soil	Adult + Child	Adult + Child	Both	Both	Both	Both

NA = Not Applicable

35. **Do the RSLs factor inhalation from vapor intrusion?**

Air RSLs represent screening levels for indoor or outdoor air. There are no RSLs specific to the vapor intrusion pathway, i.e., for subsurface sources that may contribute to indoor air contamination. To estimate indoor air concentrations from subsurface or other sources, consult with regional experts in vapor intrusion.

. For links to guidance on vapor intrusion, see http://www.epa.gov/oswer/vaporintrusion/. The EPA 2002 interim draft Vapor Intrusion Guidance can be found there.

The residential and industrial air regional screening values can be used to screen chemicals that are detected in the air (e.g., indoor and outdoor) from a variety of sources.

36. **How do I apply the trihalomethane MCLs?**

The individual trihalomethanes (bromodichloromethane; bromoform; dibromochloromethane, chloroform) all have the MCL of 80 µg/L listed in the RSL table. However, 80 µg/L is the MCL for Total Trihalomethanes.

37. **Since an earlier FAQ said that route to route extrapolations were not used by the RSLs to develop toxicity values, how were the inhalation unit risks derived for Polychlorinated biphenyls (PCBs)?**

Although it is true that route to route extrapolations (oral to inhalation or inhalation to oral) of toxicity values are not used by the RSLs, support for these inhalation unit risk values for PCBs is found in the IRIS assessment on

PCBs. IRIS presents the oral slope factors for high, low and lowest risk in section II.B.3. of the IRIS Assessment . The IRIS high risk oral slope factor (SFO) is 2; low risk is 0.4; and lowest is 0.07 $(mg/kg\text{-}d)^{-1}$. IRIS states, *"For inhalation of evaporated congeners, the middle-tier slope factor can be converted to a unit risk estimate and ambient air concentrations associated with specified risk levels."* and *"For inhalation of an aerosol or dust contaminated with PCBs, the slope factor for "high risk and persistence" should be used instead."* So, take the "middle tier" SFO of 0.4 and divide by body weight over inhalation rate (70 kg/20 m^3) and divide by 1000 $\mu g/m^3$ and you get 1.E-04 $(\mu g/m^3)^{-1}$ IUR for low risk IUR. For the high risk take the SFO of 2 and divide by body weight over inhalation rate (70 kg/20 m^3) and divide by 1000 $\mu g/m^3$ and you get 5.7E-04 $(\mu g/m^3)^{-1}$ for high risk IUR. For the lowest risk take the SFO of 0.07 and divide by body weight over inhalation rate (70 kg/20 m^3) and divide by 1000 $\mu g/m^3$ and you get 2E-05 $(\mu g/m^3)^{-1}$ for lowest risk IUR.

Aroclor 1016 is considered to be in the lowest risk tier and the other Aroclors on the RSL table are considered to be in the high risk tier.

38. **How do I convert $(mg/m^3)^{-1}$ to $(\mu g/m^3)^{-1}$?**

Vanadium Pentoxide has an inhalation unit risk (IUR) of 8.3 $(mg/m^3)^{-1}$ presented in a PPRTV however, the RSL equations and database require IURs to be in $(\mu g/m^3)^{-1}$. For the conversion to be correct, the superscript of -1 must be addressed. The IUR could be presented as 8.3 (m^3/mg) without the superscript. From this point, multiply by 1mg/1000µg and the mg will cancel leaving 8.3E-03 $(m^3/\mu g)$. Now flip the units to give 8.3E-03 $(\mu g/m^3)^{-1}$.

39. **How do I convert ATSDR inhalation MRLs in parts per million (ppm) to mg/m^3?**

ATSDR lists the chronic inhalation MRL for acetone as 13 ppm. To convert to mg/m^3, multiply the ppm value by the molecular weight in grams/mole then divide by 24.45. For example: (13ppm * 58.08 g/mole)/24.45 = 30.88 mg/m^3 which is rounded to 3.1E+01 mg/m^3 in the RSL tables. The number 24.45 in the equation above is the volume (liters) of a mole (gram molecular weight) of a gas or vapor when the pressure is at 1 atmosphere (760 torr or 760 mm Hg) and at 25°C.

40. **How do I print the tables in black and white so the gray scale doesn't show up?**

If you need the tables printed in black and white you can quickly remove the color in Excel by clicking the select all button and then checking the "No Fill" box in the Font Group. After these two steps you can print in black and white. In Adobe one can print in gray scale but not in pure black and white.

41. **Why do Tapwater RSLs differ from IRIS drinking water concentrations when both are based on a target cancer risk of 1E-06?**

There are three reasons: 1) IRIS calculations include only exposure to tap water due to ingestion, while the RSLs also include dermal and inhalation exposures. 2) For ingestion and dermal exposure routes the RSL cancer equations age-adjust the intake rates between the child and the adult based on body weight and exposure duration while IRIS only considers the adult intake. 3) The RSL equations also time-adjusts the lifetime intake of 70 years over a 30 year exposure period at 350/365 days a year while IRIS does not time adjust for exposure duration or days per year.

To see an example calculation click here.

42. **Why do air RSLs differ from IRIS air concentrations derived from the same inhalation unit risk values when both are based on a target cancer risk of 1E-06?**

The RSL equation time-adjusts the lifetime of 70 years over a 30 year exposure period at 350/365 days a year

while IRIS does not time adjust for exposure duration or days per year.

To see an example calculation click here.

43. **Does my region recommend the use of the tables where THQ=1.0 or THQ=0.1? What table do I use and when do I use it?**

Generally, if you are screening only one contaminant, the THQ=1.0 table can be used. Generally, if you are screening multiple chemicals it is preferred, to use the THQ=0.1 tables.

The rationale for using THQ=0.1 for screening is that when multiple contaminants of concern are present at a site or one or more are present in multiple exposure media, the total hazard index could exceed 1.0 if each were screened at the HQ of 1.0. If you are unclear as to which set of tables (THQ=1.0 or THQ=0.1) to use at a site, consult an EPA risk assessor in your region.

44. **[TCDD] Why was the TCDD (Dioxin) oral slope factor of 130,000 (mg/kg-day)$^{-1}$ (or 1.3E-04 (pg/kg-day)$^{-1}$) chosen?**

Several Tier 3 sources were available that contained oral slope factors for TCDD. In the RSL hierarchy, the CalEPA is the first Tier 3 source to have an oral slope factor, so it was selected. Below are tier 3 oral slope factor sources that can be considered:

- EPA's Office of Health and Environmental Assessment (EPA 1985) developed an oral cancer slope factor of 1.56E-04 (pg/kg-day)$^{-1}$. This was based on the combined incidence of lung, palate, and nasal carcinomas, and liver hyperplastic nodules or carcinomas in female rats in the study by Kociba et al. (1978).
- EPA (1997a) (EPA's Health Effects Assessment Summary Table, or HEAST) included an oral CSF of 1.5E-04 (pg/kg-day)$^{-1}$. The citation for the CSF in HEAST lists EPA (1985) as one of the sources for the HEAST value.
- California (CalEPA) (1986, 2002) developed an oral cancer slope factor of 1.3E-04 (pg/kg-day)$^{-1}$. This is based on the occurrence of hepatocellular adenomas and carcinomas in male mice in a study by the National Toxicology Program (NTP 1982).
- Michigan (MDEQ 1998) utilizes an oral cancer slope factor of 7.5E-05 (pg/kg-day)$^{-1}$, which is based on a re-analysis of the histological slides of livers from female rats from the Kociba et al. (1978) study using the liver tumor classification scheme proposed by NTP in 1986 (Maronpot et al. 1986, EPA 1990).
- Minnesota (MNDOH 2003) uses an oral cancer slope factor of 1.4E-03 (pg/kg-day)$^{-1}$, which is based on the draft re-evaluation of the exposure-response data for liver cancer in female rats reported in the draft EPA (2003b) dioxin reassessment.

45. **[Chlordane] Is the CAS number for Chlordane really for Technical Chlordane and what should I use for screening?**

The CAS number provided for Chlordane in the RSL table is the CAS number provided in IRIS for Technical Chlordane. The RSLs strive to use IRIS chemical names and CAS numbers however, in this case our other databases (ATSDR, CalEPA, EPI, etc) have previously used the 57-74-9 CAS number as a catchall for all types of Chlordane.

For screening, the RSL values should be suitable for Chlordane and Technical Chlordane as they are both mixtures of 100s of chemicals and Technical Chlordane production methods can produce different percent mixtures of components. See below for a discussion from IRIS:

> The U.S. EPA (1979) considers technical chlordane (CAS No. 12789-03-6) to be composed of 60% octachloro-4,7-methanotetrahydroindane (the cis and trans isomers) and 40% related compounds.

The term chlordane in association with CAS No.57-74-9 refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components. For example, the mixture used by the National Cancer Institute (NCI) in its 1977 bioassay was described as 94.8% chlordane (cis [or alpha]-chlordane, 71.7%; trans [or gamma]-chlordane, 23.1%) with heptachlor, 0.3%; trans-nonachlor, 1.1%; cis-nonachlor, 0.6%; chlordene isomers, 0.25%; 3% other compounds, and hexachlorocyclopentadiene, 0.25% (NCI, 1977).

Technical chlordane, CAS No. 12789-03-6, is a mixture of chlordane and chlordane related compounds having a lower percentage of the cis and trans isomers and a larger percentage of other compounds relative to mixtures with the above CAS number. Dearth and Hites (1991) identified 147 different compounds in a preparation of technical chlordane. The identity and percent of total for the 12 most abundant compounds were: cis-chlordane, 15%; trans-chlordane, 15%; trans-nonachlor, 9.7%; octachlordane, 3.9%; heptachlor, 3.8%; cis-nonachlor, 2.7%; “compound K,” 2.6%; dihydrochlordene, 2.2%; nonachlor III, 2%; and three stereoisomeric dihydroheptachlors totaling 10.2%. These 12 compounds comprise 67% of the mixture, and the remaining 33% of the mixture consists of 135 other compounds. Infante et al. (1978) reported another production sample of technical chlordane to have a composition of 38 to 48% cis- and trans-chlordane, 3 to 7 or 7 to 13% heptachlor, 5 to 11% nonachlor, 17 to 25% other chlordane isomers, and a small amount of other compounds. Unless otherwise indicated all studies described in this document were carried out with technical grade chlordane.

If the RSLs were to hold strictly to the CAS numbers and provide separate screening values for Chlordane and Technical Chlordane, the Chlordane toxicity values would come from ATSDR and the Technical Chlordane values would come from IRIS, However, identical chemical-specific parameters would be used from EPI Suite. In fact, the ATSDR switches between both CAS numbers for Chlordane.

46. **Are the tapwater RSLs based on total (unfiltered) or dissolved (filtered) concentrations?**

The tapwater RSLs do not address total vs dissolved components in the drinking water; this is a sampling issue. The tapwater RSLs are for the concentration in the water at the tap regardless of how the water gets there or is sampled. The decision about whether to use total or dissolved data in a risk assessment is a site-specific one; consult your regional risk assessor.