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From: <Ramaly.Todd@epamail.epa.gov>
To: MMaxwell@weaverboos.com; LiuA@ipcb.state.il.us
Date: 5/6/2008 10:31:24 AM
Subject: DRAS issues

Alisa, I couldn't remember if I sent you a copy of the DRAS User Alert so here it is (the pdf) along with a few other items requested by Mike. Mike, here also are the spreadsheet and word document regarding the toxicity reference value updates.

(See attached file: EPA-HQ-RCRA-2006-0984-0032.pdf)(See attached file: COCsWupdates0206.xls)(See attached file: DRAS_Tox Data - R5.doc)

Mike, I will also be looking into the support document to double-check the SI DAFs. Please contact me with any additional questions. Let me know if either of you require an Agency reperesentative at the hearing.

Thanks,

Todd D. Ramaly
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User Alert for DRAS Version 2

In using Delisting Risk Assessment Software (DRAS) version 2, EPA has identified certain problems and is currently developing version 3 to address these known problems. The model can still be used for its intended purpose by user over-rides to the input variables and in some cases, performing necessary correction calculations by hand. However, EPA would like users to be aware of the following:

(1) Incorrect Landfill Dilution and Attenuation Factors for 13 constituents:

Constituent	DRAS ver. 1.1 DAF	DRAS ver. 2.0 DAF	Correct DAF
Cobalt	10	0	10
Iron	10	0	10
Magnesium	10	0	10
Manganese	10	0	10
Molybdenum	10	0	10
Tin	10	0	10
Allyl chloride	10	0	18
Chloro-1,3 butadiene, 2-chloropropene	10	0	18
methyl chloride (chloromethane)	10	0	18
2-nitropropane	10	0	18
1,1-dichloroethane	1	1	18
1,2-dichloroethane	1	1	18
dimethyl phthalate	1	1	18

(2) When selecting chemicals of concern (COCs) in steps 4 and 5, COCs with both carcinogenic and noncarcinogenic effects need to be entered twice. After doing so, you must scroll to the right along the row of that COC's properties until you get to a drop-down menu near the end that allows you to select *noncarcinogen* or *carcinogen*. Make sure there is one of each for COCs with both effects. Also note that the default for this drop down box is *noncarcinogen*, so in the case of something like dioxin (where we only have toxicological data for carcinogenic effects) you must correct the selection to *carcinogen*.

(3) The backward calculations are not working for the fish ingestion and air volatiles pathways. Since the limiting pathways screen is based on the backward calculations, do not use the limiting

pathways screen. Instead, review the pathways listed on the hazard quotient and risk results screens instead of relying on the limiting pathways screen. If the fish ingestion or air volatiles pathways are represented as part of the calculated hazard quotient or risk, use the following technique to calculate the delisting level corresponding to the forward calculations:

> The observed concentration's relationship to the DRAS-calculated hazard quotient or risk level is the same as the "allowable level" concentration's relationship to the target hazard quotient or risk level. Thus, a simple ratio relationship exists, as shown in the equation on the next page. Solving for the unknown allowable level means multiplying the target hazard quotient or risk level by the observed concentration, and then dividing by the DRAS-forward-calculated hazard quotient or risk level, as follows:

$$\frac{\textit{Observed Concentration}}{\textit{DRAS Estimated Risk or Hazard Quotient}} = \frac{\textit{Allowable Delisting Level}}{\textit{Target Cancer Risk or Hazard Quotient}}$$

$$\textit{Allowable Delisting Level} = \textit{Target Cancer Risk or Hazard Quotient} \times \frac{\textit{Observed Concentration}}{\textit{DRAS Estimated Risk or Hazard Quotient}}$$

(5) A unit conversion error occurred in the air volatiles pathway equations.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

MEMORANDUM

DATE: February 3, 2006

SUBJECT: Updates to DRAS Toxicity Values

FROM: Mario Mangino, PhD, Toxicologist
Todd D. Ramaly, Environmental Scientist
Waste Management Branch (DW-8J)
U.S. EPA Region5

TO: Regional Delisting Staff

In keeping with our attempt to produce an updated Version 3 of the Delisting Risk Assessment Software (DRAS), we've reviewed all of the toxicity reference data in the current version of DRAS for outdated or errant values. To do so, we downloaded the 2004 version of the Region 9 Preliminary Remediation Goals (PRGs) and compared the toxicity reference values to those in DRAS. We also reviewed IRIS for any other changes which may have occurred after the 2004 PRG table was prepared.

Some of the updates were straightforward such as an unambiguous revision to IRIS. Other discrepancies required the review of a toxicologist. Dr. Mario Mangino reviewed the information and, based on his observations, we submit the following recommendations for your consideration. Our goal is to achieve as great a degree of consensus on these values so that the default references loaded into DRAS represent the majority of EPA users. This will hopefully limit the need for region-specific changes and promote consistency. The comparison was carried out within Excel and was further subdivided into several tables defined by various categories (excel file attached). The Excel spreadsheet is attached. Please note that we followed the *Memorandum from Michael B. Cook, Director, Office of Superfund Remediation and Technology Innovation (OSRTI) to Superfund National Policy Managers, Regions 1 - 10, OSWER Directive 9285.7-53, December 2003* pertaining to toxicity data hierarchy as did Region 9 in developing the 2004 PRG list.

Evaluation and Recommendations on the Attachments:

Table 1 - Where DRAS v2 and R9 data match and the toxicity data is based on IRIS, PPRTV, HEAST, or NCEA, the values will be kept in DRAS. These instances are summarized in Table 1 - Constituents with No Change

Evaluation and Recommendations: No toxicology review is necessary.

Table 2 - Where DRAS v2 differed from R9 and the R9 data was based on IRIS, PPRTV, HEAST, or NCEA, U.S. EPA will update DRAS v2 accordingly. These instances are summarized in Table 2 - Updates to DRAS based on IRIS, PPRTV, NCEA, and HEAST.

Evaluation and Recommendations: No toxicology review is necessary.

Table 3 - Many R9 toxicity values are based on route-to-route extrapolation. These may or may not be appropriate for a screening scenario like DRAS where constituents may have been detected in waste, but not in the environment. These instances are referred to U.S. EPA toxicologists for review and are summarized in Table 3 - R9 Route to Route Extrapolations.

Evaluation and Recommendations:

To get a handle on this rather complicated issue, we first reviewed several e-mail responses from other Agency personnel to inquiries on this subject (memos attached).

Based on the responses from Becky Cuthbertson (OSW) and Dr. Rob Dewoskin (RTP), it is apparent that there is no EPA policy recommending that this practice should never be used. It looks like the Agency has used the procedure in some analyses that were performed to support regulatory determinations for specific constituents. In those cases, the Agency apparently evaluated chemical-specific factors which would justify using the practice.

As mentioned by Dr. Dewoskin, the only formal Agency guidance which appears to directly address this issue is a document titled: "Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry" (ORD 1994). This document has a section titled: "Route-to-Route Extrapolation." It explains that route-to-route extrapolation is often conducted when the database for toxicity of a chemical by inhalation is inadequate, but significant data from another pathway (usually the oral route) are available. But there are often so many uncertainties involved in making a valid comparison of a chemical's fate and action by the two of routes that the practice is not justified. Toxicity data from the oral route are the most common data available to use as a surrogate to derive inhalation parameters. The guidance document states that oral route data should not be employed for route-to-route extrapolation in the following cases:

Oral toxicity data are the most common data available as alternatives to inhalation data. Oral data should not be used for route-to-route extrapolation in the following instances:

(1) when groups of chemicals are expected to have different toxicity by the two routes; for example, metals, irritants, and sensitizers;

(2) when a first-pass effect by the respiratory tract is expected;

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(3) when a first-pass effect by the liver is expected;

(4) when a respiratory tract effect is established, but dosimetry comparison cannot be clearly established between the two routes;

(5) when the respiratory tract was not adequately studied in the oral studies; and

(6) when short-term inhalation studies, dermal irritation, in vitro studies, or characteristics of the chemical indicate potential for portal-of-entry effects at the respiratory tract, but studies themselves are not adequate for an RfC development.

From the above caveats, we believe the easiest to evaluate for a large group of chemicals are probably # (1) and # (6). These criteria involve the likelihood that a chemical acts on the lung or respiratory tissue because it is an irritant or sensitizer, or because it enters the lung as a

particulate (many metals and metal compounds); or the chemical exhibits significant acute toxicity by inhalation.

Dr. Mangino evaluated all of the chemicals in Table 3 for evidence that one or more of the characteristics described in caveats #(1) and #(6) above would apply. In particular, he looked for information on which chemicals possessed acute inhalation exposure criteria or "short-term" emergency exposure criteria in ambient air which would identify them as respiratory irritants, sensitizers, debilitaters, or as acute toxins.

He used the following databases for the evaluation:

(a) EPA's database for chemicals determined to be extremely hazardous substances after release to ambient air. These include chemicals assigned an EPA Level of Concern (LOC) as found in the document: "Technical Guidance for Hazards Analysis: Emergency Planning for Extremely Hazardous Substances" (OSWER; 1987).

(b) Emergency Planning Response Guideline (ERPG) values for protection of the general public from the acute toxic and/or debilitating effects of chemicals in ambient air. ERPGs are developed by the American Industrial Hygiene Association (http://www.orau.gov/emi/scapa/erpgdefinitions.htm)

(c) U.S. DOE Temporary Emergency Exposure Limit (TEEL) values for protection of Federal workers and contractors at DOE facilities from the acute toxic and/or debilitating effects of chemicals in ambient air. TEELs are developed by methodologies similar to the ERPGs but include more chemicals (http://www.orau.gov/emi/scapa/teels.htm)

(d) NIOSH Recommended Exposure Limit (REL) values for work place exposure. This would encompass chemicals that have been assigned a specific time-concentration exposure limit in ambient air because they are documented to be respiratory irritants (even for a healthy worker) in ambient air in the absence of exposure protection. (<www.cdc.gov/**niosh**/92-100.html>)

Table 3 chemicals found in (a):

Acrylamide; Aldrin; Benzyl Chloride; o-Cresol; Endosulfan; Endrin; Disulfoton; Furan; N-Nitrosodimethylamine; Parathion; Pentachlorophenol; Phenylmercuric acetate; Phorate;

Table 3 chemicals found in (b):

Allyl chloride; Benzyl Chloride; Carbon tetrachloride; Methanol; Phenol; Trichloroethane (-1,1,1 and -1,1,2); Hexachlorobutadiene

Table 3 chemicals found in (c):

Acrylamide; allyl chloride; aniline; benzo[a]pyrene; 2,4-dinitrophenol; dibenzo[a,h]anthracene; strychnine; hexachloroethane; hexachlorophene; chloromethane; tribromomethane; methanol; heptachlor; 1,2-dichloropropane; 1,1,2-trichloroethane; 1,1,2,2-tetrachloroethane; 1,1,1,2-tetrachloroethane; pentachloronitrobenzene; diethylphthalate; dibutylphthalate; pentachlorophenol; 2-chloronaphthalene; 3,3'-dichlorobenzidene; o-cresol; p-cresol; m-cresol; o-toluidene; 2-chlorophenol; 1,2,4,5-tetrachlorobenzene; 2,4,5-trichlorophenol; 1,3,5-trinitrobenzene; 1,3-dinitrobenzene; p-chloroaniline; pyridine; hexachlorobenzene; hexachlorobutadiene; 3,3'-dimethoxybenzidine; 2,4-dichlorophenol; pentachlorobenzene; DDE;

Table 3 chemicals found in (d):

Acetone - nose and throat irritant
Acetonitrile - nose and throat irritant

Bromoform - respiratory irritant
Dichlorobenzenes (all isomers) - upper respiratory irritants
Dichloroethylenes (all isomers) - mucous membrane irritants; narcosis;
Dimethylphthalate - upper respiratory irritant
Ethyl acetate - respiratory and eye irritant
Methyl acetate - upper respiratory irritant
Pentachlorophenol - upper respiratory irritant
Phenylenediamine - bronchial irritant and asthma inducer
Strychnine - convulsions
Trichloropropane - mucous membrane irritant; narcosis;

Consequently, for the above chemical constituents, we recommended against using route-to-route extrapolation from oral route data to derive inhalation toxicity factors.

For the remainder of the chemicals in Table 3, the use of the route-to-route extrapolation in DRAS could be adopted on the basis that direct exposure effects of the remaining chemicals on the lung or respiratory system (of humans or animals) could not be identified. However, there could still be some significant uncertainties in the reliability of inhalation toxicity factors derived in this way. The primary uncertainty would probably be due to the rate of metabolism of a given chemical in the liver or lung and how that factor affects the ultimate level of absorption and transport to target organs. In the event that one of these route-to-route values becomes the basis for potentially denying a delisting petition, Region 5 recommends that the reference value be further investigated to reduce this uncertainty. In order to carry on the evaluation further, published literature studies on the metabolism or pharmacology of the individual chemicals would need to be located and reviewed.

The discussion above covers the concept of using route-to-route extrapolation from oral route data to derive inhalation toxicity factors. In Table 3, there are also some instances where DRAS lists oral toxicity factors that were apparently derived from IRIS verified inhalation toxicity factors. The use of this extrapolation procedure would also be subject to uncertainty. But, for the purposes of making an expedited screening level evaluation, we propose the following caveat: the route-to-route extrapolation from inhalation to oral should only be used when there is well documented evidence that exposure via the inhalation route results in adverse effects at organs or organ systems that are distant from the lung and respiratory tract (e.g., liver, kidney, thyroid, sex organs). The evaluation based on applying the above caveat is shown below:

RfDo for Acetonitrile: IRIS reports health effects distant from the lung, therefore the route-to-route extrapolation is satisfactory.

RfDo for Benzyl chloride: R9 lists an RfC referenced to NCEA. Until we are able to verify the health effects reported in this reference, we recommend not using the route to route extrapolation.

RfDo for Chlorodifluoromethane: IRIS reports health effects distant from the lung, therefore the route-to-route extrapolation is satisfactory.

RfDo for Chloromethane: Because IRIS states that exposure to chloromethane can essentially occur only through the vapor phase, derivation of an oral toxicity factor is not necessary.

RfDo for 3-Chloropropene (Allyl chloride): IRIS reports peripheral neurological effects in humans and liver and kidney degenerative effects in lab animals; under the assumption that oral exposure could occur to Allyl Chloride, the route-to-route extrapolation is satisfactory;

RfDo for 1,2-Dichloropropane: IRIS reports that the observed adverse effects were seen only in the nasal tissue and respiratory epithelium; therefore, route-to-route extrapolation should not be used;

RfDo for 2-Nitropropane: IRIS reports development of focal hepatocellular nodules and focal liver necrosis in lab animals with no significant effects on the respiratory tract; under the assumption that oral exposure could occur to Nitropropane, the route-to-route extrapolation is satisfactory;

Table 4 - Approximately 26 potential waste constituents have provisional toxicity data, multiple CAS identification numbers, valence states, or toxicity data based on a mixture of compounds and are submitted to U.S. EPA toxicologists for review. These constituents are summarized in Table 4 - Constituents Requiring Toxicologist Review.

Evaluation and Recommendations:

The following acronyms and conversion algorithms are used in the evaluation:

CSFo - Oral Cancer Slope Factor
CSFi - Inhalation Cancer Slope Factor
IUR – Inhalation Unit Risk (cancer)

RfDo – Oral Reference Dose
RfDi – Inhalation Reference Dose
RfC – Inhalation Reference Concentration

CalEPA – California EPA

Conversion of RfC to RfDi :

RfDi (mg/kg-day) = RfC (mg/m^3) x (20 m^3/day) x (1/70 kg)

Conversion of IUR to CSFi :

CSFi = IUR $(ug/m^3)^{-1}$ x (1 day/20 m^3) x (70 kg) x (1000 ug/mg)

Acrylonitrile

1) There is a single listed CAS number – therefore no problem

2) The listed DRAS CSFo is found in IRIS – therefore retain

3) An IUR value of 6.8E-05 $(ug/m^3)^{-1}$ is found in IRIS – should use this value to calculate CSFi;

Then calculated CSFi is 0.238 $(mg/kg\text{-}day)^{-1}$; same as listed DRAS value – therefore retain

4) An RfC value of 0.002 mg/m^3 is found in IRIS – should use this value to calculate RfDi;

Then calculated RfDi is 0.00057 mg/kg-day; therefore change listed DRAS value;

Arsenic

1) The listed DRAS values for CSFo and RfDo are correct values based on IRIS;

2) An IUR value of 4.3E-03 $(ug/m^3)^{-1}$ is found in IRIS – should use this value to calculate CSFi. Then calculated CSFi is 15.05 $(mg/kg\text{-}day)^{-1}$; same as listed DRAS value – therefore retain;

3) Note: IRIS has only one set of toxicity factors for Arsenic; these should be applied to analytical data for Ar(III), Ar (V), or "Total" Arsenic. For purposes of evaluating arsenic risk, EPA generally evaluates arsenic risk as "Total arsenic" unless a specific regulation spells out how arsenic should be analyzed and reported. If the DRAS program directs Responsible Parties to report results for Ar(III) and Ar (V), there is still only one set of toxicity factors available.

4) Don't need to use CalEPA values.

Benzo(k)fluoranthene

1) The listed DRAS CSFo value of 0.073 $(mg/kg\text{-}day)^{-1}$ is correct based on use of the TEF factor approach based on the CSFo for Benzo(a)pyrene.

2) The listed DRAS CSFi of 0.031 $(mg/kg\text{-}day)^{-1}$ is the result of applying the TEF factor approach based on the EPA-Region 4 finding of a published inhalation exposure study for Benzo(a)pyrene in hamsters as reported by NCEA. This approach is more specific than just assuming route-to-route extrapolation from oral-to-inhalation exposure and therefore acceptable. This approach may be superseded when the Agency publishes a new IRIS file for PAHs (if ever).

Benzo(a)anthracene

The currently listed DRAS values are correct. [The listed CSFi of 0.31 $(mg/kg\text{-}day)^{-1}$ is acceptable based on the same rationale used above for Benzo(k)fluoranthene.]

Benzo(b)fluoranthene

The currently listed DRAS values are correct. [The listed CSFi of 0.31 $(mg/kg\text{-}day)^{-1}$ is acceptable based on the same rationale used above for Benzo(k)fluoranthene.]

Benzo(a)pyrene

The currently listed DRAS values are correct. [The listed CSFi of 3.1 $(mg/kg\text{-}day)^{-1}$ is acceptable based on the same rationale used above for Benzo(k)fluoranthene.]

Chlordane

1) The listed DRAS CSFo and CSFi values are the same as IRIS values – therefore retain;

2) An RfC value of 0.0007 mg/m^3 is found in IRIS – should use this value to calculate RfDi;

   Then calculated RfDi is 0.0002 mg/kg-day; therefore change listed DRAS value;

3) IRIS states that the toxicology studies used to derive the toxicity factors were performed by administering "Technical grade" Chlordane to animals for both the oral and inhalation exposure routes. IRIS gives a definition of Technical grade Chlordane. Therefore, if the Responsible Party performs an analysis for Technical grade Chlordane or some other form of Chlordane, there is only one set of toxicity factors.

Chloroethane (Ethyl Chloride)

1) An RfC value of 10 mg/m^3 is found in IRIS – should use this value to calculate RfDi;

Then calculated RfDi is 2.86 mg/kg-day; therefore change listed DRAS value;

2) The other listed DRAS toxicity values are correct.

3) The oral cancer slope factor could not be verified and a superseded document from NCEA did not match with R9's estimates of the inhalation slope factor, therefore we do not recommend that the carcinogenic toxicity factors be left blank at this time.

Chloroform

1) When the IRIS file for chloroform was revised (Oct. 2001), EPA made a significant change in its interpretation of the toxicological evidence. In particular, IRIS determined that ingested chloroform acts by non-linear Mode of Action - chloroform must induce cytotoxicity as a prerequisite for the induction of tumors in rodents. In addition, at dose levels below the oral RfD, chloroform does not induce the level of cytotoxicity and regenerative hyperplasia needed to induce the tumorigenic response. Therefore, the RfD was determined to be an adequate dose benchmark for cancer prevention. The following is the explanation found in the IRIS file:

In the case of chloroform, the mode of action of carcinogenicity is reasonably well understood. Available data indicate that chloroform is not strongly mutagenic and chloroform is not expected to produce rodent tumors via a mutagenic mode of action (ILSI, 1997). Rather, there is good evidence that carcinogenic responses observed in animals are associated with regenerative hyperplasia that occurs in response to cytolethality (ILSI, 1997; U.S. EPA, 1998a,b). Because cytolethality occurs only at exposure levels above some critical dose level, a nonlinear approach is considered the most appropriate method for characterizing the cancer risk from chloroform.

The Proposed Guidelines for Carcinogenic Risk Assessment (U.S. EPA, 1996) state that when the mode-of-action analysis based on available data indicates that "the carcinogenic response is secondary to another toxicity that has a threshold, the margin-of-exposure analysis performed for toxicity is the same as is done for a noncancer endpoint, and an RfD for that toxicity may be considered in the cancer assessment." For chloroform, available evidence indicates that chloroform-induced carcinogenicity is secondary to cytotoxicity and regenerative hyperplasia; hence, the Agency relies on a nonlinear dose-response approach and the use of a margin-of-exposure analysis for cancer risk. The Agency has also chosen not to rely on a mathematical model to estimate a point of departure for cancer risk estimate, because the mode of action indicates that cytotoxicity is the critical effect and the reference dose value is considered protective for this effect.

For more discussion of margin of exposure (MOE), see the Toxicological Review for Chloroform. Based on the kidney tumor of the drinking water study (Jorgenson et al., 1985), a point of departure (Pdp or LED10) of 23 mg/kg/day can be calculated using quantitative modeling of tumor dose-response data. Comparing the Pdp to the RfD of 0.01 mg/kg/day leads to a MOE of 2,000, which is considered large. Thus, in this case, the RfD for noncancer effect is also considered adequately protective of public health for cancer effects by the oral route, on the basis of the nonlinear dose response for chloroform and the mode of action for both cancer and noncancer effects having a common link through cytotoxicity.

Conclusion: DRAS should delete the existing CSFo for chloroform; and the Cal EPA cancer slope factor should not be adopted.

2) The listed DRAS CSFi value should be rounded off to 0.081 $(mg/kg\text{-}day)^{-1}$.

3) The listed DRAS RfDo value from IRIS is acceptable to use.

4) Since the NCEA value for the RfC is 0.049 mg/m^3, the RfDi should be listed as 0.014 mg/kg-day.

Chromium

1) For Cr(III), IRIS states that the following factors cannot be developed: RfC (RfDi), CSFo, and IUR (CSFi); therefore delete those values from DRAS; for Cr(III), DRAS should list only an RfDo of 1.5 mg/kg-day.

2) For Cr (VI), the listed DRAS RfDo is correct;

3) Since the IRIS RfC is 8E-06 mg/m^3, the DRAS RfDi should be 2.3E-06 mg/kg-day; This RfDi would be for Cr(VI) mists and aerosols (e.g., chromium plating operations). If the potential exposure is more likely to be from Cr(VI) particulates, IRIS suggests that an RfC of 1E-04 mg/m^3 should be used, and the corresponding RfDi is 2.9E-05 mg/kg-day.

4) For Cr (VI), the IRIS IUR is 1.2E-02 $(ug/m^3)^{-1}$; then the calculated CSFi is 42 $(mg/kg\text{-}day)^{-1}$; As stated in IRIS, industrial worker exposure was known to be from Cr(VI)-Cr(III) mixtures, so there is some uncertainty in the actual slope factor that would be due to Cr(VI) alone; the Cr(VI):Cr(III) ratio was assumed to be at least 1:6 for development of the slope factor; therefore, the highest possible CSFi would be: 7 x 42 = 294 $(mg/kg\text{-}day)^{-1}$; Therefore, DRAS can use this latter value if exposure needs to be modeled as due to Cr(VI) alone; if the suspected exposure would be due to a mixture of valences, we suggest using the 42 $(mg/kg\text{-}day)^{-1}$ value.

Chrysene

The currently listed DRAS values are correct. [The listed CSFi of 0.0031 $(mg/kg\text{-}day)^{-1}$ is acceptable based on the same rationale used above for Benzo(k)fluoranthene.]

Cumene

1) The listed DRAS RfDo is correct.

2) Since the IRIS RfC is 0.385 mg/m^3, the calculated RfDi should be 0.11 mg/kg-day

Dibenz(a,h)anthracene

The currently listed DRAS values are correct. [The listed CSFi of 3.1 $(mg/kg\text{-}day)^{-1}$ is acceptable based on the same rationale used above for Benzo(k)fluoranthene.]

1,2-Dibromo-3-chloropropane

1) Since the IRIS RfC value is 0.0002 mg/m^3, the calculated DRAS RfDi should be 5.71E-05 mg/kg-day;

2) In this case, we feel it is reasonable to use route-to-route extrapolation to adopt an RfDo value of 5.71E-05 mg/kg-day from the RfDi. This is because multiple studies of inhalation exposure to lab animals showed toxic effects and/or morphological alterations at sites distant from the lung (mainly in testis and kidney).

3) In this case, we feel it is reasonable to adopt the CalEPA cancer slope factors to replace the HEAST factor. In particular, CalEPA used the data from a Hazelton Lab study of diet exposure to CD-1 mice to derive a CSFo of 6.6 $(mg/kg\text{-}day)^{-1}$. Then CalEPA used route-to-route extrapolation to adopt the CSFi of 6.6 $(mg/kg\text{-}day)^{-1}$. The extrapolation is reasonable because CalEPA found other studies (i.e., U.S. NTP) showing that this chemical caused cancer in lab animals at sites distant from the lung after exposure by the inhalation route.

1,1-Dichloroethane

1) The listed HEAST RfC value of 0.5 mg/m^3 is correct and is the only provisional toxicity factor available until the IRIS file is revised. Therefore, the calculated RfDi value should be 0.143 mg/kg-day in DRAS;

2) We could not find adequate information to support the conclusion that this chemical would cause systemic toxicity distant from the lung and respiratory system after inhalation exposure; using a route-to-route extrapolation to assume that an RfDo value should be derived from the RfDi value is not valid; so delete the listed DRAS RfDo of 0.1 mg/kg-day that is attributed to HEAST.

3) There are no acceptable cancer slope factors available for this chemical; We suggest not using the CalEPA listed slope factors that were derived from an NCI 1977 study in rats. The EPA IRIS program re-evaluated this study and determined that it contained too many confounding results to use for deriving a CSFo value.

Dichloropropane (cis-, trans-, mixture)

1) In the "mixture" heading, all of the listed DRAS values are correct except for the RfDi; since the IRIS RfC value is 0.02 mg/m^3 , the calculated DRAS RfDi should be 0.00571 mg/kg-day;

2) For the cis- and trans- isomers, DRAS has an additional value of 0.175 (mg/kg-day) $^{-1}$ for the CSFo; We could not determine where it came from and do not think it should be used;

Dintrotoluene (2,4-; 2,6-; mixture)

2,4-DNT: The current DRAS RfDo is correct; It should be acceptable to use the CSFo listed for the "mixture" since it is found on IRIS; we could not determine the origin of the values listed for RfDi and RfC – so we suggest not using;

2,6-DNT: The CSFo value listed for the mixture is the only available toxicity factor that we believe is appropriate; The HEAST RfDo should not be used because the IRIS file is more recent and it does not derive an RfDo value for this isomer. We could not determine the origin of the values listed for RfDi and RfC – so suggest not using;

Mixture-DNT: The CSFo value listed for the mixture is the only available toxicity factor that we think is appropriate to use.

Epichlorohydrin

1) The current listed DRAS CSFo value of 0.0099 (mg/kg-day) $^{-1}$ is correct;

2) Since the listed IRIS IUR value is 1.2E-06 (ug/m^3) $^{-1}$, the calculated DRAS CSFi should be 0.0042 (and the "h" designation can be changed to an "i");

3) Since the IRIS RfC is 0.001 mg/m^3 , the calculated DRAS RfDi should be 0.00029 mg/kg-day;

4) IRIS has withdrawn the original RfDo value; the IRIS evaluation should have taken into account the data used by HEAST; since the HEAST value pre-dates the 1992 IRIS file, the HEAST RfDo should longer be used;

HCH and Lindane

1) The currently listed DRAS values appear to be correct;

2) For the missing DRAS RfDo value under "beta-" and "alpha-" – use the NCEA provisional values shown under the PRG column;

3) For "gamma-" use a CSFi value of 1.3 $(mg/kg\text{-}day)^{-1}$ [because IRIS used a route-to-route extrapolation for alpha- and beta- to derive a CSFi from the CSFo]

4) For the RfDi, assume that route-to-route extrapolation from oral exposure is valid, and use the values listed in the PRG column as the values to adopt for DRAS.

Hexahydro-trinitro-triazene (RDX)

1) The listed DRAS values for CSFo and RfDo are correct;

2) We recommend using the CSFi value and RfDi value obtained from route-to-route extrapolation (Reason - we were not able to find information showing that RDX is a sensitizer, irritant, or is acutely toxic by the inhalation route.)

Indeno(1,2,3-cd)pyrene

The currently listed DRAS values are correct. [The listed CSFi of 0.31 $(mg/kg\text{-}day)^{-1}$ is acceptable based on the same rationale used above for Benzo(k)fluoranthene.]

Lead

There are no IRIS cancer slope factors or Reference Doses for lead. EPA basis the protective media concentration on an uptake-absorption model in children up to 7 years old in the child model; and for a pregnant woman in the adult model (to provide protection to the adult and the unborn child).

The general cleanup program policies are: lead releases to residential soil should not cause total soil lead concentration to exceed 400 mg/kg; lead releases to industrial/commercial use soil (i.e., adult only exposure) should not cause total soil concentration to exceed 800 mg/kg;

Therefore, the maximum predicted increase to soil lead concentration from the contaminated source should be added to the background soil lead concentration. Default background soil lead concentrations can be used. We need to confirm whether DRAS is currently calculating total lead delisting levels based on an additional 400 mg/kg of lead in soils or if a background soil lead concentration was used to start.

Mercury

1) the CASRN of 7439-97-6 means Hg(0) or elemental mercury; the listed DRAS RfDi value and RfC value are correct; but there is no RfDo value for Hg(0); so it is not appropriate to use the value from methyl mercury

2) Mercury and compounds – this for the inorganic Hg valence states above zero, including Hg(II), such as $HgCl_2$ and HgO; The only available toxicity factor is the RfDo of 0.0003 mg/kg-day.

3) Methylmercury – this is for organic mercury that has accumulated and bioconcentrated in organic tissues (e.g., fish, wildlife). The only available toxicity factor is the RfDo of 0.0001 mg/kg-day. This constituent is not easy to measure accurately in tissues. So the default assumption is that all mercury detectable in organic tissues is methylmercury.

4) DRAS currently uses the RfDo for methyl mercury because the fish ingestion endpoint is always the limiting pathway. Thus, even though other elemental mercury ingestion pathways are incorrectly using the methyl mercury RfDo, fish ingestion is always limiting. DRAS converts from elemental to methyl mercury by using an altered BAF for elemental mercury. It is the methyl mercury BAF multiplied by 15% to account for the maximum water column mercury that could become methylated. We also do not generally assume mercury could be present in the oxidized state (mercuric chloride for example). We are seeking suggestions for revising the approach to mercury. One option is to delete the mercury RfDo for elemental and carrying out the methyl mercury manually by instructing users to enter 15% of the total mercury concentration in a special methyl mercury COC entry which will only calculate the fish ingestion pathway.

Naphthalene

1) The listed DRAS RfDo is correct; since the IRIS RfC is 0.003 mg/m^3 , the DRAS RfDi should be 8.6E-04 mg/kg-day;

2) Should DRAS use a provisional Cancer Slope Factor for Naphthalene? In this case, we recommend that we do, even though the final decision has not yet been published in IRIS. The peer review draft of the Toxicological Review document (2004) states EPA's finding that Naphthalene should be regarded as a probable human carcinogen by the inhalation route. The proposed IUR is 1E-04 $(ug/m^3)^{-1}$; then the calculated provisional CSFi would be 0.35 $(mg/kg\text{-}day)^{-1}$

3) It would not be appropriate to use route-to-route extrapolation to derive a CSFo from the provisional CSFi; the document mentioned in #2) above specifically states that the data on oral exposure were inadequate to support derivation of a CSFo.

Nickel

1) The CASRN of 7440-02-0 is for nickel salts or nickel compounds; the listed DRAS RfDo of 0.02 mg/kg-day should be used for ingestion of all forms of nickel except #3) below.

2) Use the listed R9 CSFi of 0.84 $(mg/kg\text{-}day)^{-1}$ for inhalation of all forms of nickel except #3) below; do not assume route-to-route extrapolation to derive a CSFo value;

3) Nickel Subsulfide – if this actually needs to be retained as a DRAS constituent because of a specific industrial process, then you can use the listed R9 CSFi value of 1.7 $(mg/kg\text{-}day)^{-1}$ as the DRAS value for CSFi; do not assume route-to-route extrapolation to derive a CSFo value;

Polychlorinated biphenyls (PCBs) (Aroclors)

In most PCB analyses performed by the historical EPA method, the results are presented as an amount of total Aroclors and/or amounts of specific Aroclors (1254, 1260, 1248, etc.). This gives very little information about the actual level of chlorination in the mixture. So when Aroclor

analysis is performed, assume that the mixture is highly chlorinated and use the "high risk" slope factors: CSFo = 2 (mg/kg-day) $^{-1}$; and CSFi = 2 (mg/kg-day) $^{-1}$

For non-cancer hazard, assume that the mixture is composed of the most hazardous Aroclor (1254) and use the RfDo = 0.00002 mg/kg-day. In this case, it is acceptable to use route-to-route extrapolation and apply an RfDi value of 0.00002 mg/kg-day (because of evidence that inhalation exposure of PCBs can result in adverse effects at distant sites from the lung).

To apply the "low risk" toxicity factors, the Responsible Party needs to perform a more refined sample analysis. For example: to obtain evidence for a low risk mixture, GC-MS analysis needs to be performed to accomplish an isomer group analysis that will report the results as mono- through deca- PCB homologs. This will yield more specific data about the chlorine content of the mixture. Then IRIS states that the mixture should be assumed to be low risk only if: "congener or isomer analyses verify that congeners with more than 4 chlorines comprise < 0.5% of the total PCBs." And by analogy, only apply the highest RfDo of 0.00007 mg/kg-day if analysis shows that the chlorine content is very low or if the mixture can be verified to be composed of only Aroclor 1016.

TCDD – 2,3,7,8

The listed DRAS CSFo and CSFi are correct. (The only available source of toxicity factors is HEAST until the EPA finalizes the Dioxin Reassessment.)

Tetrachloroethylene (PCE)

The CalEPA values are acceptable as the most recent data from an approved tertiary source of reference data according to the Cook memo.

The CalEPA provisional toxicity factors are: CSFo = 0.54 (mg/kg-day) $^{-1}$;
CSFi = 0.021 (mg/kg-day) $^{-1}$ [based on an IUR of 5.9E-06 (ug/m^3) $^{-1}$]
Chronic Inhalation REL = 35 μg/m3
thus, RfC = 0.035 mg/m3, RfDi is 0.035 times 20 m3/day divided by 70 kg = 0.01 mg/kg-day

The listed IRIS RfDo is 0.01 mg/kg-day; in this case, it is acceptable to apply route-to-route extrapolation since studies of inhalation exposure in mice showed that exposure by this route resulted in liver toxicity and liver tumors. Then the RfDi is 0.01 mg/kg-day;

Trichloroethylene (TCE)

There is a recent EPA risk assessment which received external peer review (*Trichloroethylene Health Risk Assessment: Synthesis and Characterization*; ORD 2001). This document recommended some toxicity factors, in particular, a new cancer slope factor. However, EPA decided not to move ahead and finalize the RA document or the new IRIS file because of internal and external disagreement over some of the data analysis in the RA document. EPA has since initiated a consultation with the National Academy of Science to review parts of the RA document. When the review is complete, EPA will finalize the RA document and the IRIS file. But this will take some time – probably into 2006 or longer. Meanwhile, NCEA has been reluctant to support the proposed new cancer slope factor or recommend using it as the provisional value. Therefore, as with PCE, the CalEPA values are acceptable as the most recent data from an approved tertiary source of reference data according to the Cook memo.

The CalEPA provisional toxicity values are:

CSFo = 0.013 (mg/kg-day) $^{-1}$
CSFi = 0.007 (mg/kg-day) $^{-1}$
Chronic Inhalation REL = 600 μg/m3
thus, RfC = 0.600 mg/m3, RfDi is 0.600 times 20 m3/day divided by 70 kg = 0.17 mg/kg-day

The only existing RfDo is 0.006 mg/kg-day originally provided by NCEA. The 2001 document with the new CSF also includes a new RfDo which is also under review. We specifically request comment on whether we should use the really old value, despite its age, the new value, or not specify an RfDo.

Trichlorophenol 2,4,6-

1) DRAS should use the listed IRIS values for CSFo and CSFi [CSFo = 0.011 (mg/kg-day)$^{-1}$ and CSFi = 0.011 (mg/kg-day)$^{-1}$]

2) DRAS should use the NCEA provisional value for RfDo; also use route-to-route extrapolation of the NCEA RfDo to obtain the RfDi (because IRIS used route-to-route extrapolation to obtain the IUR from the CSFo)

Vinyl Chloride

DRAS should use all the listed IRIS toxicity factors which are:

CSFo = 1.4 (mg/kg-day) $^{-1}$
CSFi = 0.031 (mg/kg-day) $^{-1}$ [based on IUR = 8.8E-06 (ug/m^3) $^{-1}$]

RfDo = 0.003 mg/kg-day
RfDi = 0.0286 mg/kg-day [based on RfC = 0.1 mg/m^3]

Table 5 - A small number of constituents have toxicological data in DRAS v2, but no values in the 2004 R9 PRG table. These instances will also require review by a toxicologist and are summarized in Table 5 - Constituents without R9 PRG Data.

Evaluation and Recommendations:

Acetaldehyde

1) The listed IRIS RfC is 0.009 mg/m^3 ; therefore, the RfDi should be 0.0026 mg/kg-day;

2) The listed IRIS IUR is 2.2E-06 (ug/m^3) $^{-1}$; therefore, the CSFi should be 0.0077 (mg/kg-day) $^{-1}$

3) Do not use route-to-route extrapolation to derive a DRAS CSFo because this chemical could have direct acute exposure effects in the lung or respiratory system;

Acetophenone

The listed IRIS RfDo is 0.1 mg/kg-day

Bis(2-chloroisopropyl)ether

The listed IRIS RfDo is 0.04 mg/kg-day;

We could not determine the origin of the listed DRAS cancer slope factors; do not use;

Bromophenyl phenylether

We could not verify any useable toxicity factors including from HEAST or CalEPA; The original source listed in DRAS as a reference, the 1997 Region 3 RBCs, no longer lists this COC. This constituent should become "factorless"

Chloromethane

IRIS gives an RfC from which an RfDi can also be calculated. No cancer data was given and oral pathways were specifically discouraged by IRIS because chloromethane is primarily a gas.

Chlorophenyl phenylether

I could not verify any useable toxicity factors including from HEAST or CalEPA; we think that this constituent should become "factorless"

Dichloroethylene - 1,1

1) IRIS withdrew the CSFo and the IUR because a formal review concluded that the existing data do not support the development of cancer slope factors; this constituent should be treated as a non-carcinogen.

2) The RfDo should be 0.05 mg/kg-day;

3) Since the IRIS RfC is 0.2 mg/m^3, the DRAS RfDi should be 0.057 mg/kg-day;

Dimethylbenz[a,h]anthracene

Because CalEPA has developed an oral cancer slope, the CalEPA value can be used in place of the HEAST value.

The CalEPA CSFo is 250 $(mg/kg\text{-}day)^{-1}$

Ethyl methanesulfonate

It would be acceptable to use the listed HEAST value; however, we could not find this value in the 1997 HEAST table; perhaps this would be a constituent to cross-check in that Oak Ridge database.

3-Methylcholanthrene

Because CalEPA has developed an oral cancer slope, the CalEPA value can be used in place of the HEAST value.

The CalEPA CSFo is 22 $(mg/kg\text{-}day)^{-1}$

4-Nitrophenol

I could not verify any useable toxicity factors including from HEAST or CalEPA; ; The original source listed in DRAS as a reference, the 1997 Region 3 RBCs, no longer lists this COC. This constituent should become "factorless"

N-Nitrosopiperidine

I could not verify any toxicity factors in IRIS or HEAST;

Because CalEPA has developed an oral cancer slope, the CalEPA value can be used;

The CalEPA CSFo is 9.4 $(mg/kg\text{-}day)^{-1}$

Tris(dibromopropyl)phosphate

I could not verify any toxicity factors in IRIS or HEAST;

Because CalEPA has developed an oral cancer slope, the CalEPA value can be used;

The CalEPA CSFo is 2.3 $(mg/kg\text{-}day)^{-1}$

Table 6 - includes constituents with new IRIS data, subsequent to the R9 2004 annual review. A toxicologist will also be consulted.

Evaluation and Recommendations:

Ethylene Dibromide CASRN 106-93-4

The toxicity factors currently available in IRIS are:

CSFo = 2 $(mg/kg\text{-}day)^{-1}$
IUR = 0.006 $(ug/m^3)^{-1}$
Therefore, the DRAS CSFi should be 2.1 $(mg/kg\text{-}day)^{-1}$

RfDo = 0.009 mg/kg-day
RfC = 0.009 mg/m^3
Therefore, the DRAS RfDi should be 0.0026 mg/kg-day

Toluene CASRN 108-88-3

The revised toxicity factors currently available in IRIS are:

RfDo = 0.08 mg/kg-day
RfC = 5 mg/m^3
Therefore, the DRAS RfDi should be 1.4286 mg/kg-day

Barium CASRN 7440-39-3

The revised toxicity factor currently available in IRIS is:

RfDo = 0.2 mg/kg-day

TABLE 1 - Constituents with no change

	CAS ID#	Oral Cancer Slope Factor 1/(mg/kg-d)		Inhalation Cancer Slope Factor 1/(mg/kg-d)		Oral Reference Dose (mg/kg-d)		Inhalation Reference Dose (mg/kg-d)		Inhalation Reference Concentration (mg/m3)
		DRAS v2	R9 PRG	DRAS v2	R9 PRG	DRAS v2	R9 PRG	DRAS v2	R9 PRG	
Acenapthylene	208-96-8									
Antimony	7440-36-0					0.0004	0.0004			
Benzo (ghi) perylene	191-24-2									
Bis (2-Chloroethoxy) methane	111-91-1									
Bis(2-chloroethyl)ether	111-44-4	1.1	1.1	1.1	1.1					
Cadmium	7440-43-9			6.3	6.3	0.0005	0.0005			
Chloro-1,3-butadiene 2-(Chloroprer	126-99-8					0.02	0.02	0.002	0.002	0.007
Chloro-3-methylphenol 4-	59-50-7									
Copper	7440-50-8					0.04	0.04			
Cyanide	57-12-5					0.02	0.02			
Dichlorophenol 2,6-	87-65-0									
Ethylbenzene	100-41-4					0.1	0.1	0.286	0.29	1.015
Formaldehyde	50-00-0			0.046	0.0455	0.15	0.15			
Hexachloropropene	1888-71-7									
Iron	7439-89-6					0.3	0.3			
Methylene Chloride (Dichlorometha	75-09-2	0.0075	0.0075	0.00164	0.001645	0.06	0.06	0.857	0.85714	3
Methylnapthalene 2-	91-57-6									
Molybdenum	7439-98-7					0.005	0.005			
Naphthaquinone 1,4-	130-15-4									
Naphthylamine, 2-	91-59-8									
Nitrophenol 2-	88-75-5									
Nitroquinoline-1-oxide 4-	56-67-5									
Nitrosodiethylamine N-	55-18-5	150	150	150	150.5					
Nitroso-di-n-butylamine N-	924-16-3	5.4	5.4	5.6	5.6					
Nitrosomorpholine N-	59-89-2									
Pentachloroethane	76-01-7									
Phenacetin	62-44-2									
Phenanthrene	85-01-8									
Picoline a-	109-06-8									
SAFROLE	94-59-7									
Selenium	7782-49-2					0.005	0.005			
Silver	7440-22-4					0.005	0.005			
Thionazin	297-97-2									
Tin	7440-31-5					0.6	0.6			
Toxaphene (chlorinated camphene:	8001-35-2	1.1	1.1	1.1	1.12					
Trichloro-1,2,2-trifluoro-ethane 1,1,:	76-13-1					30	30	8.57	8.57	29.995
Trichlorofluoromethane (Freon 11)	75-69-4					0.3	0.3	0.2	0.2	0.7
Triethylphosphorothiate o,o,o-	126-68-1									
Zinc	7440-66-6					0.3	0.3			
		5		7		16		5		33

TABLE 2 - Updates to DRAS based on IRIS, PPRTV, NCEA and HEAST

CHEMNAME	CAS ID#	Oral Cancer Slope Factor 1/(mg/kg-d)			Inhalation Cancer Slope Factor 1/(mg/kg-d)			Oral Reference Dose (mg/kg-d)			Inhalation Reference Dose (mg/kg-d)			Inhalation Reference Concentration (mg/m3) for DRAS v3
		DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	
Acetaldehyde [Ethanal]	75-07-0	0.0077		check reference		0.0077	i				0.009	0.002571	i	0.009
Acetone (2-propanone)	67-64-1							0.1	0.9	i				
Acetonitrile (methyl cyanide)	75-05-8										0.06	0.017143	i	0.06
Acetophenone	98-86-2							0.1		check reference				
Acrolein	107-02-8							0.02	0.0005	i	0.00002	0.000008	i	0.00002
Acrylamide	79-06-1	4.5	4.5	i		4.5	i							
Aniline (benzeneamine)	62-53-3	0.0057	0.0057	i		0.0057	r	0.007	0.007	p		0.000286	i	0.001
Barium	7440-39-3							0.07	0.07	i	0.0005	0.000143	h	0.0005
Benzene	71-43-2	0.029	0.055	i	0.029	0.027	i	0.001	0.004	i	0.009	0.008600	i	0.0301
Benzyl chloride	100-44-7	0.17	0.17	i		0.17	r		0.0029	r		0.002900	n	0.01015
Beryllium	7440-41-7				8.4	8.4	i	0.002	0.002	i	0.00002	0.000006	i	1.999E-05
Bis(2-chloroisopropyl)ether	39638-32-9	0.07		check referen	0.04		check referei	0.04		check reference				
Bromomethane	74-83-9							0.0014	0.0014	i	0.005	0.001429	i	0.005
Bromophenyl-phenyl ether 4-	101-55-3							0.058		check reference				
Butanol n-	71-36-3							0.1	0.1	i		0.002600	n	0.0091
Carbon disulfide	75-15-0							0.1	0.1	i	0.7	0.200000	i	0.7
Chlorine	7782-50-5							0.1	0.1	i	0.0002	0.000057	n	0.0001999
Chlorobenzene	108-90-7							0.02	0.02	i	0.06	0.017000	n	0.0595
Chlorodifluoromethane	75-45-6								14	r	0.5	14.000000	i	49
Chloromethane	74-87-3	0.013		check ref	0.013		check ref		0.026	r	0.3	0.026000	i	0.091
Chlorophenyl-phenyl ether 4-	7005-72-3							0.005		check reference				
Chloropropene 3- (Allyl Chloride)	107-05-1							0.05	0.000286	r	0.001	0.000286	i	0.001
Cobalt	7440-48-4					9.8	p	0.06	0.02	p		0.000006	p	1.995E-05
Dibenzofuran	132-64-9							0.004	0.002	n		0.002000	r	0.007
Dichlorobenzene 1,2-	95-50-1							0.09	0.09	i	0.2	0.057143	h	0.2
Dichlorobenzene 1,3-	541-73-1								0.03	n	0.0002	0.030000	r	0.105
Dichlorobenzene 1,4-	106-46-7	0.024	0.024	h	0.024	0.022	n		0.03	n	0.8	0.230000	i	0.805
Dichlorodifluoromethane (Freon 12)	75-71-8							0.2	0.2	i	0.2	0.057143	h	0.2
Dichloroethane 1,2-	107-06-2	0.091	0.091	i	0.091	0.091	i		0.02	n		0.001400	n	0.0049
Dichloroethylene 1,1-	75-35-4	0.6		check referen	0.175		check referei	0.009	0.05	i		0.057000	i	0.1995
Dichloropropane 1,2-	78-87-5	0.068	0.068	h		0.068	r		0.0011	r	0.004	0.001143	i	0.004
Dichlorvos	62-73-7	0.29	0.29	i		0.29	r	0.0005	0.0005	i	0.0005	0.000143	i	0.0005005
Dimethylbenz{a}anthracene 7,12-	57-97-6	25		check reference										
Dimethylbenzidine 3,3'-	119-93-7	92	23	p		2.3	r							
Di-n-octyl phthalate	117-84-0							0.02	0.04	p		0.040000	r	0.14
Diphenylhydrazine 1,2-	122-66-7	0.8	0.8	i	0.77	0.8	i							
Ethoxyethanol 2-	110-80-5								0.4	h	0.2	0.057143	i	0.2
Ethyl methanesulfonate	62-50-0	293		check reference										
Fluorine (soluble fluoride) (PRG only	16984-48-8								0.06	i				
Formic acid	64-18-6							2	2	h		0.000880	p	0.00301
Hexachloro-1,3-butadiene	87-68-3	0.078	0.078	i	0.078	0.078	i	0.0002	0.0043	n		0.000300	r	0.00105
Hexachlorocyclopentadiene	77-47-4							0.006	0.006	i	0.00007	0.000057	i	0.0001995
Kepone	143-50-0	16	8	p		8	r		0.0002	p		0.000200	r	0.0007
Manganese	7439-96-5							0.14	0.024	i	0.00005	0.000014	i	0.000049
Methacrylonitrile	126-98-7							0.0001	0.0001	i	0.0007	0.000200	h	0.0007
Methyl ethyl ketone	78-93-3							0.6	0.6	i	1	1.400000	i	4.9
Methyl isobutyl ketone	108-10-1							0.08	0.08	h		0.860000	i	3.01
Methyl methacrylate	80-62-6							1.4	1.4	i	0.7	0.200000	i	0.7
Methylcholanthrene 3-	56-49-5	26		check reference										
nitroaniline 2-	88-74-4								0.003	p	0.0002	0.000030	p	0.000105
Nitroaniline 3-	99-09-2		0.021	p		0.021	r	0.003	0.0003	p		0.000300	p	0.00105
Nitroaniline 4-	100-01-6		0.021	p		0.021	r	0.003	0.003	p		0.001000	p	0.0035
Nitrobenzene	98-95-3							0.0005	0.0005	i		0.000571	h	0.002
Nitrophenol 4-	100-02-7							0.062		check reference				
Nitropropane 2-	79-46-9		9.4	r	9.4	9.4	h		0.005714	r	0.02	0.005714	i	0.02
Nitrosodimethylamine N-	62-75-9	51	51	i	49	49	i		0.000008	p		0.000008	r	0.000028
Nitrosodiphenylamine N-	86-30-6	0.0049	0.0049	i		0.0049	r		0.02	p		0.020000	r	0.07
Nitrosopiperidine N-	100-75-4	38		check reference										

Nitrosopyrrolidine N-	930-55-2	2.1	2.1	i	2135	if								
Phenol	108-95-2						0.6	0.3	if			0.300000	r	1.05
Styrene	100-42-5						0.2	0.2	i	1	0.280000	if		1.015
Thallium	7440-28-0						0.00008	0.000066	if					
Toluene	108-88-3						0.2	0.2	i			0.110000	if	0.385
Trichlorobenzene 1,2,4-	120-82-1						0.01	0.01	i	0.057	0.010000	p		0.0035
Trichloroethane 1,1,1-	71-55-6						0.035	0.28	if	0.286	0.630000	c		2.205
Trichloropropane 1,2,3-	96-18-4	7	2	m	2	r	0.006	0.006	i		0.001400	m		0.0049
Tris(2,3-dibromopropyl)phosphate	126-72-7	9.8	check reference											
Vanadium	7440-62-2						0.007	0.001	m					
Vinyl acetate	108-05-4						1	1	h	0.2	0.057143	if		0.2
Xylenes (total)	1330-20-7						2	0.2	if		0.020000	if		0.1015

i = IRIS
p = PPRTV
check reference = constituent did not have a R9 value or was not in the R9 PRG table

TABLE 4 - Constituents Requiring Toxicologist Review

CHEMNAME	DRAS CAS ID#	R9 PRG CAS ID#	Oral Cancer Slope Factor 1/(mg/kg-d)			Inhalation Cancer Slope Factor 1/(mg/kg-d)			Oral Reference Dose (mg/kg-d)			Inhalation Reference Dose (mg/kg-d)			Inhalation Reference Concentration (mg/m3) for DRAS v3
			DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	
Acrylonitrile	107-13-1	107-13-1	0.54	0.54	i	0.238	0.238	i	0.001	0.001	h	0.002	0.00057	i	0.002
Acrylonitrile	107-13-1	107-13-1		1	F		1	e							
Arsenic (III)	22569-72-8		1.5			15.1			0.0003						
Arsenic (V)	17428-41-0		1.5			15.1			0.0003						
Arsenic (PRG only)		7440-38-2		1.5	i		15.05	i		0.0003	i				
Arsenic (CAL modified-PRG only)		7440-38-2		0.5	e		12	e							
Benzo(k)fluoranthene	207-08-9	207-08-9	0.073	0.073	n	0.031	0.073	F							
Benzo(k)fluoranthene	207-08-9	207-08-9		1.2	e		0.39	e							
Chlordane (technical) (PRG only)		12789-03-6		0.35	i		0.35	i		0.0005	i		0.0002	i	0.0007
Chlordane	57-74-9		0.35			0.35			0.0005			0.0007			
Chloroethane [Ethyl chloride]	75-00-3	75-00-3	0.0029	0.0029	n		0.0029	F	0.4	0.4	n	10	2.85714	i	10
Chloroethane [Ethyl chloride]	75-00-3	75-00-3		0.0029	n		0.0029	F		0.4	n		2.85714	i	10
Chloroform	67-66-3	67-66-3	0.0061			0.0805	0.081	i	0.01	0.01	i		0.014	n	0.049
Chloroform	67-66-3	67-66-3		0.031	e		0.019	e							
Chromium (III) (Chromic Ion)	16065-83-1	16065-83-1				41			0.003	1.5	i	0.0001			
Chromium (VI)	18540-29-9	18540-29-9				41	294	i	0.003	0.003	i	0.0001	2.9E-05	ii	0.00001
Total Chromium (1:6 ratio Cr VI:Cr III - PRG only)		7440-47-3					42	i							
Chrysene	218-01-9	218-01-9	0.0073	0.0073	n	0.0031	0.0073	F							
Chrysene	218-01-9	218-01-9		0.12	e		0.039	e							
Cumene	98-82-8	98-82-8													
Cumene	98-82-8	98-82-8							0.1	0.1	i	0.4	0.11	i	0.385
Dibromo-3-chloropropane 1,2-	96-12-8	96-12-8	1.4	1.4	h	0.00242	0.0024	x		5.7E-05	r	0.0002	5.7E-05	i	0.0002
Dibromo-3-chloropropane 1,2-	96-12-8	96-12-8		7	c		7	c							
Dichloroethane 1,1-	75-34-3	75-34-3							0.1	0.1	h	0.5	0.14286	h	0.5
Dichloroethane 1,1-	75-34-3	75-34-3		0.0057	e		0.0057	e							
Dichloropropene 1,3-(mixture of isomers)	542-75-6	542-75-6	0.1	0.1	i	0.014	0.014	i	0.03	0.03	i	0.02	0.00571	i	0.02
Dichloropropene cis-1,3-	10061-01-5		0.175												
Dichloropropene trans-1,3-	10061-02-6		0.175												
Dinitrotoluene 2,4-	121-14-2	121-14-2	0.68						0.002	0.002	i		0.002	F	0.007
Dinitrotoluene 2,6-	606-20-2	606-20-2	0.68						0.001	0.001	h		0.001	F	0.0035
Dinitrotoluene mixture (PRG only-we use #)		25321-14-6		0.68	i		0.68	F							
Epichlorohydrin	106-89-8	106-89-8	0.0099	0.0099	i	0.0042	0.0042	i	0.002	0.002	h	0.001	0.00029	i	0.001
Epichlorohydrin	106-89-8	106-89-8		0.08	F		0.08	e							
HCH beta-	319-85-7	319-85-7	1.8	1.8	i	1.8	1.8	i		0.0002	n		0.0002	r	0.0007
HCH (Lindane) gamma-	58-89-9	58-89-9	1.3	1.3	h		1.3	r	0.0003	0.0003	i		0.0003	r	0.00105
HCH alpha-	319-84-6	319-84-6	6.3	6.3	i	6.3	6.3	i		0.0005	n		0.0005	r	0.00175
HCH-technical (PRG only)		608-73-1		1.8	i		1.785	i							
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	121-82-4	0.11	0.11	i		0.11	r	0.003	0.003	i		0.003	r	0.0105
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	121-82-4		0.11	i		0.11	r		0.003	i		0.003	r	0.0105
Lead	7439-92-1	7439-92-1a.gov/superfund/programs/lead/ieubk.htm													
Lead	7439-92-1	7439-92-1:.ca.gov/ScienceTechnology/ledspred.html													

Table 5 - Constituents w/DRAS v2 data and no R9 PRG data

CHEMNAME	CHEMCAS DRAS	CSFO 1/(mg/kg-d)	CSFI 1/(mg/kg-d)	ORDO (mg/kg-d)	ORDI (mg/kg-d)	RfC mg/m3		
Acetaldehyde [Ethanal]	75-07-0	0.0077					IRIS - June-December 2001	no change since then, but Oral is route to route extrapolation
Acetophenone	98-86-2			0.1			IRIS - June-December 2001	no change
Bis(2-chloroisopropyl)ether	39638-32-9	0.07	0.04	0.04			IRIS - June-December 2001	no change for RfD, but slope factors NA in IRIS
Bromophenyl-phenyl ether 4-	101-55-3			0.058			R3 RBCs - June 1997	not available in IRIS
Chloromethane	74-87-3	0.013			0.3		WATER8 -Air Emissions Models Wastewater Treatment ver. 4.0 QAQPS RTP, May 1	not available in IRIS
			0.0063				HEAST 1995	not available in IRIS
					2.57E-02	9.00E-02	IRIS	
Chlorophenyl-phenyl ether 4-	7005-72-3			0.005			?	not in IRIS
Dichloroethylene 1,1-	75-35-4	0.6					IRIS - June-December 2001	now NA, IRIS 2002
			0.175				HEAST 1997	not in IRIS
Dimethylbenz(a)anthracene 7,12-	57-97-6	250		now a CalEPA number			HEAST 1997	not in IRIS
Ethyl methanesulfonate	62-50-0	293					HEAST 1995	not in IRIS
Methylcholanthrene 3-	56-49-5	22		now a CalEPA number			HEAST 1997	not in IRIS
Nitrophenol 4-	100-02-7			0.062			R3 RBCs - June 1997	all inadequate in IRIS
Nitrosopiperidine N-	100-75-4	9.4		now a CalEPA number			IRIS - June-December 2001	not in IRIS
Tris(2,3-dibromopropyl)phosphat	126-72-7	2.3		now a CalEPA number			IRIS - June-December 2001	not in IRIS

TABLE 6 - New IRIS data

CHEMNAME	CAS ID#	Oral Cancer Slope Factor 1/(mg/kg-d)			Inhalation Cancer Slope Factor 1/(mg/kg-d)			Oral Reference Dose (mg/kg-d)			Inhalation Reference Dose (mg/kg-d)			Inhalation Reference Concentration (mg/m3) for DRAS v3
		DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	
Ethylene dibromide (1,2-Dibromoethane)	106-93-4	85	2	1	0.77	2.1	1		0.009	1	0.0002	0.002600	1	0.0091
Toluene	108-88-3							~~0.2~~	0.08	1	~~0.35~~	1.4285714	1	5
Barium	7440-39-3							~~0.07~~	0.2	1				

TABLE OF ALL CONSTITUENTS

IN ADDITION TO TABLES 1 – 6

ARE INCLUDED A MICROSOFT EXCEL FILE

AND IS AVAILABLE THROUGH THE CLERK'S OFFICE.

Filename: COCsWupdates0206.xls

TABLE 3 - R9 Route to Route Extrapolations

CHEMNAME	CHEMCAS DRAS	Oral Cancer Slope Factor 1/(mg/kg-d)			Inhalation Cancer Slope Factor 1/(mg/kg-d)			Oral Reference Dose (mg/kg-d)			Inhalation Reference Dose (mg/kg-d)			RfC	
		DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference	DRAS v2	R9 PRG	Reference		
Acenaphthene	83-32-9							0.06	0.06	i					
Acetone (2-propanone)	67-64-1													3.15	
Acetonitrile (methyl cyanide)	75-05-8														
Acrylamide	79-06-1	4.5	4.5	i		4.5	i	0.0002	0.0002	i				~~0.0007~~	
Aldrin	309-00-2	17	17	i	17	17.15	i	0.00003	0.00003	i				~~0.000105~~	no need, DRAS value is just the RfC version of the RfDi
Aniline (benzeneamine)	62-53-3	0.0057	0.0057	i											
Anthracene	120-12-7							0.3	0.3	i					
Aramite	140-57-8	0.025	0.025	i	0.025	0.02485	i	0.05	0.05	h					no need, DRAS value is just the RfC version of the RfDi
Atrazine	1912-24-9	0.22	0.222	h				0.035	0.035	i					
Benz(a)anthracene	56-55-3	0.731	0.73	n		~~0.73~~	F								note: original DRAS 2 Inhalation CSF is from R6 screening tables where it refers to NCEA - R4 RAGS bulletin Region 4 uses a TEF approach from B(a)P
Benzaldehyde	100-52-7							0.101	0.1	i					
Benzidine	92-87-5	230	230	i	230	230	i	0.003	0.003	i					
Benzo(a)pyrene	50-32-8	7.3	7.3	i										check referen	note: original DRAS 2 Inhalation CSF is from R6 screening tables where it refers to NCEA - R4 RAGS bulletin
Benzo(b)fluoranthene	205-99-2	0.73	0.73	n		~~0.73~~	F								note: original DRAS 2 Inhalation CSF is from R6 screening tables where it refers to NCEA - R4 RAGS bulletin
Benzoic acid	65-85-0							4	4	i					
Benzyl alcohol	100-51-6							0.3	0.3	h					
Benzyl chloride	100-44-7	0.17	0.17	i											
Bis(2-ethylhexyl)phthalate	117-81-7	0.014	0.014	i				0.02	0.02	i					
Bromodichloromethane	75-27-4	0.062	0.062	i				0.02	0.02	i					
Butyl benzyl phthalate	85-68-7							0.2	0.2	i					
Butyl-4,6-dinitrophenol,2-sec-(Dinoseb)	88-85-7							0.001	0.001	i					
Carbon tetrachloride	56-23-5	0.13	0.13	i	0.0525	0.0525	i	0.0007	0.0007	i					
Chloroaniline p-	106-47-8							0.004	0.004	i					
Chlorobenzilate	510-15-6	0.27	0.27	h	0.27	0.27	h	0.02	0.02	i					
Chlorodibromomethane	124-48-1	0.084	0.084	i				0.02	0.02	i					
Chlorodifluoromethane	75-45-6														
Chloromethane	74-87-3	0.013		check ref	0.0063		check ref				0.3	0.026	i	0.091	
chloronaphthalene 2-	91-58-7							0.08	0.08	i					
Chlorophenol 2-	95-57-8							0.005	0.005	i					
Chloropropene 3- (Allyl Chloride)	107-05-1										0.001	0.00029	i	0.001	0.05 was a HEAST number WITHDRAWN by NCEA
Cresol m-	108-39-4							0.05	0.05	i					
Cresol o-	95-48-7							0.05	0.05	i					
Cresol p-	106-44-5							0.005	0.005	h				~~0.0175~~	
Cyclotetramethylene-tetranitramine	2691-41-0							0.05	0.05	i					
DDD	72-54-8	0.24	0.24	i											
DDE	72-55-9	0.34	0.34	i											
DDT p,p'-	50-29-3	0.34	0.34	i	0.34	0.3395	i	0.0005	0.0005	i					
Diallate	2303-16-4	0.061	0.061	h											
Diazinon	333-41-5							0.0009	0.0009	h					
Dibenz(a,h)anthracene	53-70-3	7.3	7.3	n											note: original DRAS 2 Inhalation CSF is from R6 screening tables where it refers to NCEA - R4 RAGS bulletin
Dibenzofuran	132-64-9							0.004	0.002	n					
Dichlorobenzene 1,3-	541-73-1								0.03	n				~~0.105~~	DRAS reference says R6: R6 says 0.0023 (NCEA) not 0.0002: However, NCEA has no number now (according to RAIS)
Dichlorobenzidine 3,3'-	91-94-1	0.45	0.45	i											
Dichloroethylene cis-1,2-	156-59-2							0.01	0.01	p					
Dichloroethylene trans-1,2-	156-60-5							0.02	0.02	i					
Dichlorophenol 2,4-	120-83-2							0.003	0.003	i					
Dichlorophenoxyacetic acid 2,4-(2,4-D)	94-75-7							0.01	0.01	i					
Dichloropropane 1,2-	78-87-5	0.068	0.068	h							0.004	0.00114	i	0.004	
Dichlorvos	62-73-7	0.29	0.29	i				0.0005	0.0005	i	0.0005	0.00014	i	0.0005005	
Dieldrin	60-57-1	16	16	i	16	16.1	i	0.00005	0.00005	i					
Diethyl phthalate	84-66-2							0.8	0.8	i					
Diethylstilbestrol	56-53-1	4700	4700	h											

Dimethoate	60-51-5							0.0002	0.0002	i						
Dimethoxybenzidine 3,3'-	119-90-4	0.014	0.014	h												
Dimethyl phthalate	131-11-3							10	10	h					35	
Dimethylbenzidine 3,3'-	119-93-7	9.2	2.3	p												
Dimethylphenol, 2,4-	105-67-9							0.02	0.02	i						
Di-n-butyl phthalate	84-74-2							0.1	0.1	i						
Dinitrobenzene 1,3-	99-65-0							0.0001	0.0001	i						
Dinitromethylphenol, 4,6-,2-	534-52-1							0.0001	0.0001	p						
Dinitrophenol 2,4-	51-28-5							0.002	0.002	i						
Di-n-octyl phthalate	117-84-0							0.02	0.04	p						
Dioxane 1,4-	123-91-1	0.011	0.011	i												
Diphenylamine	122-39-4							0.025	0.025	i						
Disulfoton	298-04-4							0.00004	0.00004	i						
Endosulfan (Endosulfan I and II,mixture)	115-29-7							0.006	0.006	i						
Endrin	72-20-8							0.0003	0.0003	i						
Ethyl acetate	141-78-6							0.9	0.9	i						
Ethyl ether	60-29-7							0.2	0.2	i						
Ethyl methacrylate	97-63-2							0.09	0.09	h						
Ethylene thiourea	96-45-7	0.11	0.11	h				0.00008	0.00008	i						
Fluoranthene	206-44-0							0.04	0.04	i						
Fluorene	86-73-7							0.04	0.04	i						
Furan	110-00-9							0.001	0.001	i						
Heptachlor	76-44-8	4.5	4.5	i	4.55	4.55	i	0.0005	0.0005	i						
Heptachlor epoxide	1024-57-3	9.1	9.1	i	9.1	9.1	i	0.000013	1.3E-05	i						
Hexachloro-1,3-butadiene	87-68-3	0.078	0.078	i	0.078	0.078	i	0.0002	0.0003	n					~~0.00105~~	
Hexachlorobenzene	118-74-1	1.6	1.6	i	1.61	1.61	i	0.0008	0.0008	i						
Hexachloroethane	67-72-1	0.014	0.014	i	0.014	0.014	i	0.001	0.001	i						
Hexachlorophene	70-30-4							0.0003	0.0003	i						
Indeno(1,2,3-cd)pyrene	193-39-5	0.73	0.73	n		~~0.73~~	~~i~~									
Isobutyl alcohol	78-83-1							0.3	0.3	i						
Isophorone	78-59-1	0.00095	0.001	i				0.2	0.2	i						
Kepone	143-50-0	18	8	p					0.0002	p						
Malathion	121-75-5							0.02	0.02	i						
Methanol	67-56-1							0.5	0.5	i						
Methoxychlor	72-43-5							0.005	0.005	i						
Methyl acetate	79-20-9							1	1	h					3.5	
Methyl parathion	298-00-0							0.00025	0.00025	i						
Methylene bromide (Dibromomethane)	74-95-3							0.01	0.01	h						
Nitroaniline 3-	99-09-2		0.021	p				0.003	0.0003	p		0.0003	p		0.00105	
Nitroaniline 4-	100-01-6		0.021	p				0.003	0.003	p		0.001	p		0.0035	
Nitro-o-toluidine, 5-	99-55-8	0.033	0.033	h												
Nitropropane 2-	79-46-9				9.4	9.4	h				0.02	0.00571	i		0.02	
Nitrosodimethylamine N-	62-75-9	51	51	i	49	49	i		8E-06	p					0.000028	
Nitroso-di-n-propylamine N-	621-64-7	7	7	i												
Nitrosodiphenylamine N-	86-30-6	0.0049	0.0049	i					0.02	p						
Nitrosomethylethylamine N-	10595-95-6	22	22	i												
Octamethyl pyrophosphoramide	152-16-9							0.002	0.002	h						
Parathion (ethyl)	56-38-2							0.006	0.006	h					~~0.021~~	
Pentachlorobenzene	608-93-5							0.0008	0.0008	i						
Pentachloronitrobenzene (PCNB)	82-68-8	0.26	0.26	h				0.003	0.003	i					~~0.0105~~	
Pentachlorophenol	87-86-5	0.12	0.12	i				0.03	0.03	i					~~0.105~~	
Phenol	108-95-2							0.6	0.3	i					~~1.05~~	
Phenyl mercuric acetate	62-38-4							0.00008	0.00008	i						
Phenylenediamine 1,3-	108-45-2							0.006	0.006	i						
Phorate	298-02-2							0.0002	0.0002	h					~~0.0007~~	
Pronamide	23950-58-5							0.075	0.075	i						
Pyrene	129-00-0							0.03	0.03	i						
Pyridine	110-86-1							0.001	0.001	i						
Strychnine and salts	57-24-9							0.0003	0.0003	i						
Tetrachlorobenzene 1,2,4,5-	95-94-3							0.0003	0.0003	i						

note: original DRAS 2 Inhalation CSF is from R6 screening tables where it refers to NCEA - R4 RAGS bulletin

Tetrachloroethane 1,1,1,2-	630-20-6	0.026	0.026	i	0.026	0.0259	i	0.03	0.03	i			
Tetrachloroethane 1,1,2,2-	79-34-5	0.2	0.2	i	0.2	0.203	i	0.06	0.06	p			
Tetrachlorophenol 2,3,4,6-	58-90-2							0.03	0.03	i			
Tetraethyl dithiopyrophosphate (Sulfotep)	3689-24-5							0.0005	0.0005	i			
Toluenediamine 2,4-	95-80-7	3.2	3.2	h									
Toluidine o-	95-53-4	0.24	0.24	h									
Toluidine p-	106-49-0	0.19	0.19	i									
Tribromomethane (Bromoform)	75-25-2	0.0079	0.0079	i	0.00385	0.00385	i	0.02	0.02	i			
Trichloroethane 1,1,2-	79-00-5	0.057	0.057	i	0.056	0.056	i	0.004	0.004	i			
Trichlorophenol 2,4,5-	95-95-4							0.1	0.1	i			
Trichlorophenoxy)propionic acid 2-(2,4,5- (Silv	93-72-1							0.008	0.008	i			
Trichlorophenoxyacetic acid 2,4,5-	93-76-5							0.01	0.01	i			
Trichloropropane 1,2,3-	96-18-4	7	2	n				0.006	0.006	i	0.0014	n	0.0049
Trinitrobenzene (Trinitrobenzene 1,3,5-) sym-	99-35-4							0.03	0.03	i			
Trinitrotoluene 2,4,6-	118-96-7	0.03	0.03	i				0.0005	0.0005	i			

i = IRIS
p = PPRTV
r = route to route extrapolation
check reference = constituent did not have a R9 value or was not in the R9 PRG table

77 changes