

**Maine CDC**  
**Ambient Air Guideline 2010 Update**



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## Ambient Air Guidelines 2010 Update

This update summarizes changes to the Ambient Air Guidelines (AAGs) associated with the 2010 update. This update is organized into three sections based on the type of change to the AAG that occurred: (1) changes due to errors noted in the 2006 AAGs; (2) changes due to updates to the toxicity value that served as the basis for the 2006 AAG; and (3) changes due to the selection of a different basis for the AAG due to the publication of a more recent/defensible toxicity value from a different source than that used for the 2006 AAG. The 2010 AAGs provided on the website and discussed in this memorandum are based on an Incremental Lifetime Cancer Risk of 1 in 100,000 for cancer-causing agents and a Hazard Index of 1 for effects other than cancer. A table accompanies this update and provides a quick-view format for the AAG changes.

### Correction of Errors in 2006 AAG Table

Corrections were made to the 2006 AAGs for seven compounds, based on errors noted during the 2010 update. The errors and how they were corrected are described below:

- The basis for the acetonitrile AAG was listed as “IRIS RfC/10” on the 2006 AAG table, though the mathematical derivation of the AAG for this compound did not include the application of a 10-fold uncertainty factor on the IRIS RfC for potential carcinogenicity. Acetonitrile is classified into Group D and no other evidence of potential carcinogenicity could be located. Therefore, the numerical value of the AAG for this compound has not changed, though the basis has been revised to read “IRIS RfC”.
- For antimony hydride, no ppm to mg/m<sup>3</sup> conversion had been provided on the 2006 AAG table even though the TLV for this compound is listed in units of ppm in the ACGIH 2009 TLV document. The ppm to mg/m<sup>3</sup> conversion factor has been added to the table ( $124.78/24.45 = 5.1$ ), as well as the chronic AAG in ppm. The numerical value of the AAG in mg/m<sup>3</sup> and ug/m<sup>3</sup> has not changed, but an AAG in ppm has been added to the table.
- For bromodichloromethane and dibromochloromethane, the 2006 AAG was based on a conversion of the oral slope factor to an inhalation unit risk using an assumed body weight of 70 kg and an inhalation rate of 20 m<sup>3</sup>. When the conversion was performed, no adjustment was made to convert the calculated unit risk in (mg/m<sup>3</sup>)<sup>-1</sup> to (ug/m<sup>3</sup>)<sup>-1</sup> (the actual unit that was needed for the table). Therefore, the AAGs presented on the 2006 table were 1000-fold too low. This error has been corrected with the resulting AAG for each of these compounds being increased by a factor of 1000.
- An incorrect link was noted for 1,2-dibromoethane. On the 2006 AAG table, the chronic AAG in units of ug/m<sup>3</sup> was correct and has not been changed. However, the conversion of that value to an AAG in mg/m<sup>3</sup> and ppm resulted in incorrect values due to a linkage error. This linkage error has been corrected along with the values of the AAG in units of mg/m<sup>3</sup> and ppm.

- For formaldehyde, the 2006 chronic AAG in ppm was rounded to 7E-04 instead of 6E-04, due to hand entry of the value rather than using a formula to create the value. This rounding error has been corrected.
- The value of the 2006 AAG in ppm for trichlorofluoromethane was incorrectly entered, resulting in a listed value of 3E-05 rather than the correct value of 2. This value is now calculated with a formula rather than being a hand-entered value, and correctly displays as 2 ppm.

#### AAG Changes Due to an Existing Toxicity Value Being Updated

Though the basis for the AAG has not changed, the AAGs have changed for two compounds because the values that served as the basis for the AAGs has been revised since the last AAG update. The compounds include:

- Toluene for which IRIS posted a revised RfC (change from 0.4 to 5 mg/m<sup>3</sup>) in September 2005 based on a 2000 study. The IRIS RfC continues to be the most defensible and up-to-date toxicity value of the available values. Based on this change, the AAG for toluene has changed from 400 ug/m<sup>3</sup> to 5000 ug/m<sup>3</sup>.
- Tetrahydrofuran whose TLV was decreased by approximately a factor of 2 by ACGIH in 2002. The TLV continues to be the only available guidance value for this compound. Based on this change, the AAG for tetrahydrofuran has changed from 1000 ug/m<sup>3</sup> to 400 ug/m<sup>3</sup>.

#### AAG Changes Due to a Change in Basis of the AAG

The AAGs have changed for an additional 8 compounds, based on a new selected basis for the AAG. Me-CDC has compiled a database of available toxicity values from nationally-recognized sources (USEPA, ATSDR, CA-OEHHA, etc.) using procedures outlined in the MEDEP 2009 *Guidance for Human Health Risk Assessment for Hazardous Substances Sites*. The database of toxicity values is periodically updated such that the most current information is available at the time of guideline development. To determine which of the available toxicity value should be selected for use, the bases of the available toxicity values are reviewed following the hierarchy described in the *Guidance for Human Health Risk Assessment for Hazardous Substances Sites*. The most current and scientifically defensible value from among the available values is selected for use in AAG development. The changes are for the 8 compounds are detailed below:

- Acrolein: The 2006 AAG for this compound was based on the 2003 IRIS RfC which was derived from a 1978 study. In 2008, CA-OEHHA published a revised chronic REL based on a 2008 study. Both studies were performed in rats exposed for 6 hours per day, 5 days per week, for 13 weeks, and both studies examined histopathological effects in the respiratory tract. Exposure doses in the 1978 study ranged from 0.4 to 4.9 ppm while the range of exposures doses for the 2008 study was 0.02 to 1.8 ppm, with the intent of establishing a NOAEL. A NOAEL was not established in 1978 (the lowest dose, 0.4 ppm, was the LOAEL in 1978). A LOAEL of 0.2 ppm was established in 2008. The IRIS RfC was developed by applying a 1000-fold cumulative uncertainty factor to the LOAEL, while the chronic REL was established through the use of a 200-fold uncertainty factor on

- the NOAEL. The chronic REL is selected as the better evaluation on which to base the chronic AAG resulting in an increase in the AAG from 0.02 ug/m<sup>3</sup> to 0.4 ug/m<sup>3</sup>.
- Arsenic: The 2006 AAG for this compound was based on the 1998 IRIS unit risk which was derived from a 1983 study. In 2002, CA-OEHHA published a unit risk for arsenic based on a 1987 study. Both the 1983 and 1987 studies were performed by the same research group and reported on lung tumor incidence in occupationally-exposed humans. The 1987 study reported on data collected during a follow-up period subsequent to the publication of the 1983 study. Therefore, the CA-OEHHA unit risk is selected to serve as the basis for the AAG due to the expanded database used to develop the toxicity value. Due to the change in basis, the AAG for arsenic has changed from 0.002 ug/m<sup>3</sup> to 0.003 ug/m<sup>3</sup>.
  - Ethylbenzene: The 2006 AAG for this compound was based on the 1991 IRIS RfC which was derived from two 1981 studies. At that time (1991), EPA classified ethylbenzene into carcinogen Class D. In 2007, CA-OEHHA published a unit risk for this compound based on a 1999 NTP study. EPA has not officially updated their cancer assessment for this compound, though they have adopted the CA-OEHHA unit risk for use in developing screening levels and in site-specific risk assessments. In the 1999 NTP study, rats and mice were exposed via inhalation for 104 weeks. Male rats displayed clear evidence of tumor formation in kidneys and testes while female rats and male and female mice displayed some evidence of increased tumor formation of the lung and liver. Therefore, the CA-OEHHA REL is selected as the basis for the chronic AAG resulting in a change in the AAG from 1000 ug/m<sup>3</sup> to 4 ug/m<sup>3</sup>.
  - Fluorides: The 2006 AAG for this compound was based on the ACGIH TLV. In 2003, CA-OEHHA developed a chronic REL for fluoride compounds based on a 1963 study in which skeletal fluorosis was noted in occupationally-exposed humans. Workers were exposed for 8 hours per day, 5 days per week, for an average of 14 years (range of 4.5 to 25.9 years). Since the protocol for developing AAGs places CA-OEHHA higher in the hierarchy than ACGIH TLVs, the CA-OEHHA chronic REL is selected to serve as the basis for the chronic AAG. Based on this change, the AAG for fluoride has changed from 6 ug/m<sup>3</sup> to 10 ug/m<sup>3</sup>.
  - 2-Hexanone: The 2006 AAG for this compound was based on the ACGIH TLV. In 2009, IRIS published a chronic RfC for this compound based on a 1977 study in which monkeys exposed to 2-hexanone via inhalation for 10 months exhibited decreases in motor nerve conduction. Since the protocol for developing AAGs places IRIS higher in the hierarchy than ACGIH TLVs, the IRIS chronic RfC is selected to serve as the basis for the chronic AAG. Based on this change, the AAG for 2-hexanone has changed from 50 ug/m<sup>3</sup> to 30 ug/m<sup>3</sup>.
  - Methyl isobutyl ketone: The 2006 AAG for this compound was based on the ACGIH TLV. In 2003, IRIS published a chronic RfC for this compound based on a 1987 study in which rats and mice exposed to methyl isobutyl ketone via inhalation during gestation exhibited skeletal variations and increased fetal death. Since the protocol for developing AAGs places IRIS higher in the hierarchy than

ACGIH TLVs, the IRIS chronic RfC is selected to serve as the basis for the chronic AAG. Based on this change, the AAG for methyl isobutyl ketone has changed from 500 ug/m<sup>3</sup> to 3000 ug/m<sup>3</sup>.

- Naphthalene: The 2006 AAG for this compound was based on the 1998 IRIS RfC which was derived from a 1982 NTP study. At that time (1998), EPA classified naphthalene into carcinogen Class C, and an additional uncertainty factor of 10 was applied to the RfC in the development of the chronic AAG. In 2005, CA-OEHHA published a unit risk for this compound based on a 2000 NTP study. EPA has not officially updated their cancer assessment for this compound, though they have adopted the CA-OEHHA unit risk for use in developing screening levels and in site-specific risk assessments. In the 2000 NTP study, rats were exposed via inhalation for 105 weeks. Clear evidence of carcinogenicity was evident by an increased incidence of rare tumors (respiratory epithelial adenomas and olfactory epithelial neuroblastomas) in both sexes. Therefore, the CA-OEHHA is selected as the basis for the chronic AAG. It should be noted that the AAG has not changed as the AAG based on the CA-OEHHA unit risk calculates to be the same value as one based on the IRIS RfC/10.
- 1,1,1-Trichloroethane: The 2006 AAG for this compound was based on the current CA-OEHHA chronic REL, the derivation of which could not be located, but predates 2003. In 2007, IRIS published a revised chronic RfC based on a 1988 study. The study was performed in rats exposed for 6 hours per day, 5 days per week, for 2 years, and noted liver histopathological changes. The IRIS RfC is selected as the better evaluation on which to base the chronic AAG, primarily because it is most current and no documentation of the CA-OEHHA REL could be located. Based on this change, the AAG for 1,1,1-trichloroethane has changed from 1000 ug/m<sup>3</sup> to 5000 ug/m<sup>3</sup>.

Changes to AAGs - 2006 vs. 2010

Chemical	CASRN	2006 AAGs							2010 AAGs						
		AAG Status	Chronic AAG (ppm)	Conversion Factor (from ppm to mg/m3)	Chronic AAG (mg/m3)	Chronic AAG (ug/m3)	Toxicity Endpoint	Basis for AAG	AAG Status	Chronic AAG (ppm)	Conversion Factor (from ppm to mg/m3)	Chronic AAG (mg/m3)	Chronic AAG (ug/m3)	Toxicity Endpoint	Basis for AAG
Acetonitrile	75-05-8	final	4.E-02	1.7	6.E-02	6.E+01	NC	IRIS RfC/10	final	4.E-02	1.7	6.E-02	6.E+01	NC	IRIS RfC
Acrolein	107-02-8	final	9.E-06	2.3	2.E-05	2.E-02	NC	IRIS RfC	final	2.E-04	2.3	4.E-04	4.E-01	NC	CA-OEHHA REL
Antimony hydride	7803-52-3	interim	NA	NA	1.E-03	1.E+00	NC	ACGIH TLV	interim	2.E-04	5.1	1.E-03	1.E+00	NC	ACGIH TLV
Arsenic (inorganic)	7440-38-2	final	NA	NA	2.E-06	2.E-03	C	IRIS unit risk	final	NA	NA	3.E-06	3.E-03	C	CA-OEHHA unit risk
Bromodichloromethane	75-27-4	interim	8.E-08	6.7	6.E-07	6.E-04	C	adjusted IRIS slope factor	interim	8.E-05	6.7	6.E-04	6.E-01	C	adjusted IRIS slope factor
Dibromochloromethane	124-48-1	interim	4.E-08	10.3	4.E-07	4.E-04	C	adjusted IRIS slope factor	interim	4.E-05	10.3	4.E-04	4.E-01	C	adjusted IRIS slope factor
Dibromoethane, 1,2-	106-93-4	final	1.E-03	7.8	9.E-03	2.E-02	C	IRIS unit risk	final	2.E-06	7.8	2.E-05	2.E-02	C	IRIS unit risk
Ethyl benzene	100-41-4	final	2.E-01	4.3	1.E+00	1.E+03	NC	IRIS RfC	final	9.E-04	4.3	4.E-03	4.E+00	C	CA-OEHHA unit risk
Fluorides (as F)	NA	interim	NA	NA	6.E-03	6.E+00	NC	ACGIH TLV	final	NA	NA	1.E-02	1.E+01	NC	CA-OEHHA REL
Formaldehyde	50-00-0	final	7.E-04	1.2	8.E-04	8.E-01	C	IRIS unit risk	final	6.E-04	1.2	8.E-04	8.E-01	C	IRIS unit risk
Hexanone, 2-	591-78-6	interim	1.E-02	4.0	5.E-02	5.E+01	NC	ACGIH TLV	final	8.E-03	4.0	3.E-02	3.E+01	NC	IRIS RfC
Methyl isobutyl ketone	108-10-1	interim	1.E-01	4.1	5.E-01	5.E+02	NC	ACGIH TLV	final	7.E-01	4.1	3.E+00	3.E+03	NC	IRIS RfC
Naphthalene	91-20-3	final	6.E-05	5.2	3.E-04	3.E-01	NC	IRIS RfC/10	final	6.E-05	5.2	3.E-04	3.E-01	C	CA-OEHHA unit risk
Tetrahydrofuran	109-99-9	interim	5.E-01	2.9	1.E+00	1.E+03	NC	ACGIH TLV	interim	1.E-01	2.9	4.E-01	4.E+02	NC	ACGIH TLV
Toluene	108-88-3	final	1.E-01	3.8	4.E-01	4.E+02	NC	IRIS RfC	final	1.E+00	3.8	5.E+00	5.E+03	NC	IRIS RfC
Trichloroethane, 1,1,1-	71-55-6	final	2.E-01	5.5	1.E+00	1.E+03	NC	CA-OEHHA REL	final	9.E-01	5.5	5.E+00	5.E+03	NC	IRIS RfC
Trichlorofluoromethane	75-69-4	interim	3.E-05	5.6	1.E+01	1.E+04	NC	ACGIH TLV	interim	2.E+00	5.6	1.E+01	1.E+04	NC	ACGIH TLV

Key to Abbreviations:

AAG = Ambient Air Guideline

ACGIH TLV = American Conference of Governmental Industrial Hygienists Threshold Limit Value - Time Weighted Average

ATSDR MRL = Agency for Toxic Substance and Disease Registry Minimal Risk Level

C = Carcinogenic Effects

CA-OEHHA REL = California Office of Environmental Health Hazard Assessment Reference Exposure Level

CA-OEHHA Unit Risk = California Office of Environmental Health Hazard Assessment Unit Risk

CASRN = Chemical Abstracts System Registration Number

IRIS RfC = USEPA Integrated Risk Information System Reference Concentration

IRIS Unit Risk = USEPA Integrated Risk Information System Unit Risk

NA = Not available

NC = Noncarcinogenic Effects

Shaded cells are those that have changed between 2006 and 2010.