



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

**BAAQMD**  
**Air Toxics NSR Program**  
**Health Risk Screening Analysis**  
**(HRSA) Guidelines**

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**BAY AREA AIR QUALITY MANAGEMENT DISTRICT**  
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**BAAQMD Air Toxics NSR Program**  
**Health Risk Screening Analysis (HRSA) Guidelines**

## **1. INTRODUCTION**

This document describes the Bay Area Air Quality Management District's guidelines for conducting health risk screening analyses. Any health risk screening analysis (HRSA) that is required pursuant to Regulation 2 Permits, Rule 1 General Requirements or Rule 5 New Source Review of Toxic Air Contaminants shall be conducted in accordance with these guidelines.

In accordance with Regulation 2-5-402, these guidelines generally conform to the Health Risk Assessment Guidelines adopted by Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA) for use in the Air Toxics Hot Spots Program. In addition, these guidelines are in accordance with State risk assessment and risk management policies and guidelines in effect as of **June 1, 2009 2005**. Through the District's rule development process, these guidelines will periodically be updated to clarify procedures, amend health effects data, or incorporate other revisions to regulatory guidelines.

## **2. PROCEDURES**

The procedures described below constitute the Regulation 2-5-603 Health Risk Screening Analysis Procedures. Any HRSA shall be completed by following the procedures described in the OEHHA Health Risk Assessment Guidelines for the Air Toxics Hot Spots Program that were adopted by OEHHA on October 3, 2003 and any State risk assessment and risk management policies and guidelines in effect as of **June 1, 2009 2005**.

The OEHHA Health Risk Assessment Guidelines contain several sections which identify (a) the overall methodology, (b) the exposure assessment assumptions and procedures, and (c) the health effects data (cancer potency factors, chronic reference exposure levels, and acute reference exposure levels).

A summary of OEHHA's Health Risk Assessment Guidelines and an index of the relevant documents are located at:

[http://www.oehha.ca.gov/air/hot\\_spots/index.html](http://www.oehha.ca.gov/air/hot_spots/index.html)

OEHHA's risk assessment methodology is located at:

[http://www.oehha.ca.gov/air/risk\\_assess/index.html](http://www.oehha.ca.gov/air/risk_assess/index.html)

The exposure assessment and stochastic technical support document (Part IV of OEHHA's Risk Assessment Guidelines) is located at:

[http://www.oehha.ca.gov/air/exposure\\_assess/index.html](http://www.oehha.ca.gov/air/exposure_assess/index.html)

The Technical Support Document for Cancer Potency Factors: Methodologies for Derivation, Listing of Available Values, and Adjustments to Allow for Early Life Stage Exposures (May 2009) is located at:

[http://www.oehha.ca.gov/air/hot\\_spots/tsd052909.html](http://www.oehha.ca.gov/air/hot_spots/tsd052909.html)

The cancer potency factors for carcinogenic compounds (Part II of OEHHA's Risk Assessment Guidelines) are located at:

[http://www.oehha.ca.gov/air/cancer\\_guide/hasca2.html](http://www.oehha.ca.gov/air/cancer_guide/hasca2.html)

The Technical Support Document for the Derivation of Noncancer Reference Exposure Levels is located at:

[http://www.oehha.ca.gov/air/hot\\_spots/rels\\_dec2008.html](http://www.oehha.ca.gov/air/hot_spots/rels_dec2008.html)

The chronic reference exposure levels (RELs), which are Part III of OEHHA's Risk Assessment Guideline, are located at:

[http://www.oehha.ca.gov/air/chronic\\_rels/index.html](http://www.oehha.ca.gov/air/chronic_rels/index.html)

The acute reference exposure levels (RELs), which are Part I of OEHHA's Risk Assessment Guideline, are located at:

[http://www.oehha.ca.gov/air/acute\\_rels/index.html](http://www.oehha.ca.gov/air/acute_rels/index.html)

Sections 2.1 through 2.3 below clarify and highlight some of the exposure assessment procedures including exposure assumptions (e.g., breathing rate and exposure duration) and health effect values to be used for conducting HRSAs.

## 2.1 Clarifications of Exposure Assessment Procedures

This section clarifies and highlights some of the exposure assessment procedures that should be followed when conducting an HRSA. Please note that OEHHA is currently revising the Technical Support Document (TSD) for Exposure Assessment. When the revised TSD for Exposure Assessment is finalized and adopted, the District will revise the HRSA Guidelines accordingly.

### 2.1.1 Breathing Rate

On October 9, 2003, a statewide interim Risk Management Policy for inhalation-based residential cancer risk was adopted by the California Air Resources Board (ARB) and Cal/EPA's OEHHA (<http://www.arb.ca.gov/toxics/rmpolicy.pdf>). For the HRSA methodology used in the Air Toxics NSR Program, the District has conformed with these State guidelines and adopted the interim exposure assessment recommendations made by ARB and OEHHA. The interim policy recommends where a single cancer risk value for a residential receptor is needed or prudent for risk management decision-making, the potential cancer risk estimate for the inhalation exposure pathway be based on the breathing rate representing the 80<sup>th</sup> percentile value of the breathing rate range of values (302 L/kg-day).

To assess potential inhalation exposure to offsite workers, OEHHA recommends assuming a breathing rate of 149 L/kg-day. This value corresponds to a 70 kg worker breathing 1.3 m<sup>3</sup>/hour (breathing rate recommended by USEPA as an hourly average for outdoor workers) for an eight-hour day. For children, OEHHA recommends assuming a breathing rate of 581 L/kg-day to assess potential risk via the inhalation exposure pathway. This value represents the upper 95% percentile of daily breathing rates for children.

### 2.1.2 Exposure Time and Frequency

Based on OEHHA recommendations, the District will estimate cancer risk to residential receptors assuming exposure occurs 24 hours per day for 350 days per year. For a worker receptor, exposure is assumed to occur 8 hours per day for 245 days per year. However, for some professions (e.g., teachers) a different schedule may be more appropriate. For children at school sites, exposure is assumed to occur 10 hours per day for 180 days (or 36 weeks) per year.

### 2.1.3 Exposure Duration

Based on OEHHA recommendations, the District will estimate cancer risk to residential receptors based on a 70-year lifetime exposure. Although 9-year and 30-year exposure scenarios may be presented for information purposes, risk management decisions will be made based on 70-year exposure duration for residential receptors. For worker receptors, risk management decisions will be made based on OEHHA's recommended exposure duration of 40 years. Cancer risk estimates for children at school sites will be calculated based on a 9 year exposure duration.

## 2.2 Health Effects Values

Chemical-specific health effects values have been consolidated and are presented in Table 2-5-1 for use in conducting HRSAs. Toxicity criteria summarized in Table 2-5-

1 represent health effects values that were adopted by OEHHA/ARB as of June January 1, 2009 2005. Although 8-hour RELs for six chemicals were adopted in December 2008, these 8-hour RELs will not be used in conducting HRSA's until OEHHA finalizes and adopts the revised TSD for Exposure Assessment. Prior to use in Regulation 2, Rule 5, any new or revised health effects values adopted by OEHHA/ARB after June January 1, 2009 2005 will be reviewed by the District through a rule development process. The District will evaluate the new criteria for implementation, enforcement, and feasibility of compliance with the project risk limits.

## 2.3 Cancer Risk Calculations

In accordance with OEHHA's revised health risk assessment guidelines (specifically, OEHHA's Technical Support Document (TSD) for Cancer Potency Factors, adopted June 1, 2009), calculation of cancer risk estimates should incorporate age sensitivity factors (ASFs).

The revised TSD for Cancer Potency Factors provides updated calculation procedures used to consider the increased susceptibility of infants and children compared to adults to carcinogens. The updated calculation procedure includes the use of age-specific weighting factors in calculating cancer risks from exposures of infants, children and adolescents, to reflect their anticipated special sensitivity to carcinogens. OEHHA recommends weighting cancer risk by a factor of 10 for exposures that occur from the third trimester of pregnancy to 2 years of age, and by a factor of 3 for exposures that occur from 2 years through 15 years of age. These weighting factors should be applied to all carcinogens. For estimating cancer risk for residential receptors, the incorporation of the ASFs results in a cancer risk adjustment factor of 1.7. For estimating cancer risk for student receptors, a cancer risk adjustment factor of 3 should be applied. For estimating cancer risk for worker receptors, a cancer risk adjustment factor of 1 should be applied.

The cancer risk adjustment factors were developed based on the following:

<u>Receptor</u>	<u>Age Bins</u>	<u>ASF</u>	<u>Duration</u>	<u>Cancer Risk Adjustment Factor</u>
Resident	Third trimester to age 2 years	10	2.25/70	0.32
	Age 2 to age 16 years	3	14/70	0.6
	Age 16 to 70 years	1	54/70	0.77
				<b>1.7</b>
Student	Age 2 to age 16 years	3	9 years	<b>3</b>
Worker	Age 16 to 70 years	1	40 years	<b>1</b>

Since the exposure duration for a student receptor (9 years), and worker receptor (40 years), falls within a single age bin, the student cancer risk adjustment factor is 3 and the worker cancer risk adjustment factor is 1.

Cancer risk adjustment factors should be used to calculate all cancer risk estimates. Please note that these ASFs represent default values. In cases where there are adequate data for a specific carcinogen potency by age, OEHHA will recommend chemical-specific adjustments to cancer risk estimates. In addition, OEHHA is currently revising the TSD for Exposure Assessment. When the revised TSD for Exposure Assessment is finalized and adopted, the District will revise the HRSA Guidelines accordingly.

Below is the equation for calculating cancer risk estimates:

$$\text{Cancer Risk} = \text{Dose} * \text{Cancer Risk Adjustment Factor} * \text{Cancer Potency Factor}$$

## 2.4 Stochastic Risk Assessment

For a stochastic, multipathway risk assessment, the potential cancer risk should be reported for the full distribution of exposure from all exposure pathways included in the risk assessment. For risk management decisions, the potential cancer risk from a stochastic, multipathway risk assessment should be based on the 95<sup>th</sup> percentile cancer risk.

## 3. Assessment of Acrolein Emissions

Currently, CARB does not have certified emission factors or an analytical test method for acrolein. Therefore, since the appropriate tools needed to implement and enforce acrolein emission limits are not available, the District will not conduct a HRSA for emissions of acrolein. In addition, due to the significant uncertainty in the derivation, OEHHA is currently re-evaluating the acute REL for acrolein. When the necessary tools are developed, the District will re-evaluate this specific evaluation procedure and the HRSA guidelines will be revised.

### References

- 1 "Air Toxics "Hot Spots" Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, ", OEHHA, August 2003
- 2 "Air Toxics "Hot Spots" Program Risk Assessment Guidelines, Part IV. Technical Support Document for Exposure Assessment and Stochastic Analysis", OEHHA, September 2000

- 3 *“Air Toxics “Hot Spots” Program Risk Assessment Guideline, Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures”, OEHHA, May, 2009.*
- ~~3 *“Air Toxics “Hot Spots” Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors”, OEHHA, updated December, 2002.*~~
- 4 *“Air Toxics “Hot Spots” Program Risk Assessment Guidelines Technical Support Document for the Determination of Noncancer Reference Exposure Levels”, OEHHA, June 2008.*
- ~~4 *“Air Toxics “Hot Spots” Program Risk Assessment Guidelines, Part III, Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels”, OEHHA, April 2000.*~~
- ~~5 *“Air Toxics “Hot Spots” Program Risk Assessment Guidelines, Part I, Technical Support Document for the Determination of Acute Reference Exposure Levels for Airborne Toxicants”, OEHHA, March 1999.*~~
- 5 *“Guidance for School Site Risk Assessment Pursuant to Health and Safety Code Section 901(f): Guidance for Assessing Exposures and Health Risks at Existing and Proposed School Sites: Final Report”, Integrated Risk Assessment Section, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, February, 2004.*
- 6 *“Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values”, California Air Resources Board, updated February, 2009.*