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***Hot Spots Exposure Assessment and  
Stochastic Analysis Document***

**Toxicology and Risk Assessment Section**

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# Acknowledgements

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# What is the Air Toxics Hot Spots Program?

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- ◆ **Stationary sources in CA are prioritized by Districts based on reported emissions, distance to nearest receptor, information on potency of toxicant**
- ◆ **High concern facilities must conduct risk assessment using OEHHA risk assessment guidelines**
- ◆ **OEHHA revised guidelines after passage of SB 25 requiring more explicit consideration of infants and children**
- ◆ **Today we are discussing response to SRP comments on the Exposure Assessment Guidelines**



# Hot Spots Exposure Guidelines Need to be:

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- ◆ **Practical to apply yet as comprehensive as possible.**
- ◆ **Adaptable to many different scenarios and types of facilities.**
- ◆ **Useful to compare potential health impacts/risks across facilities.**
- ◆ **Protective of public health.**



# Revisions to Document in Response to April SRP Meeting

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## For all chapters:

- ◆ Moved recommendations from the back to the front
- ◆ Present both dose and cancer risk equations separately in each chapter:
  - ◆ Clarifies why dose & risk assessed for different age groups (e.g., 3<sup>rd</sup> trimester, 0<2 yrs, 2<16 yrs, 16-70 yrs, etc.)
  - ◆ Clarifies application of different Age Sensitivity Factors for cancer risk (e.g., 10 for 3<sup>rd</sup> tri - 2 yrs, 3 for 2 – 16 yrs, 1 for adults)



# Chapter 1 (Introduction) Revisions

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## Revisions clarify that:

- ◆ **All facilities are required to conduct a Tier 1 point estimate risk assessment using OEHHAs recommended exposure variates**
- ◆ **Facilities may choose to also conduct a stochastic assessment of exposure (and risk) (Tier 3) using OEHHAs distributions to provide more information to the risk managers and the public.**
- ◆ **Facilities may choose to use site-specific point estimates (Tier 2) or site-specific distributions (Tier 4) provided they are justified.**



# Chapter 2 Revisions

## Air Dispersion Modeling

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- ◆ **Revisions clarify modeling adjustments for daily 8-hr cancer risk**
  - ◆ **For non-continuous sources, use an adjustment factor (or model post-processing) to estimate daily air concentrations from annual averages**
  - ◆ **Use 8-hr breathing rates to estimate dose to worker (because long-term breathing rates include sleeping)**
- ◆ **Revisions clarify modeling adjustments for noncancer hazards (8-hr RELs)**
  - ◆ **Want to know: Is there a daily 8-hr period in which the 8-hr REL is exceeded?**
  - ◆ **For non-continuous sources, use an adjustment factor (or model post-processing) to estimate daily 8-hr air concentrations from annual averages**



# Chapter 2 Revisions

## Air Dispersion Modeling

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- ◆ Clarified what the model does, and what ARB can do, in case of excessive hours of “calms” in meteorological data for air dispersion modeling
- ◆ Chapter now states that deposition of emitted particles can be estimated using the AERMOD air deposition model



# Chapter 3 Revisions

## Breathing Rates

- ◆ **New breathing rates for women in 3<sup>rd</sup> trimester estimated from individual data in doubly-labeled water and CSFII (Continuing Survey of Food Intake of Individuals) databases**

	3 <sup>rd</sup> Trimester	16<30 years
	<b>L/kg-day</b>	
Mean	225	210
95th Percentile	361	335
	<b>m<sup>3</sup>/day</b>	
Mean	15.3	15.0
95th Percentile	23.4	23.5



# Chapter 3 Revisions

## Breathing Rates

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**Concern about combining breathing rates of males and females**

- ◆ **OEHHA uses breathing rates normalized to body weight in our dose algorithms.**
- ◆ **In our previous version of the Exposure Document, we found in evaluating measured breathing rates in Adams (1993) that when normalized to body weight, there is little difference in breathing rate for men and women doing specific tasks.**



# Chapter 3 Revisions

## Breathing Rates

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**Panel member comment: OEHHA should be able to find hospital data for VQs (ratio of the volume of air to the volume of oxygen breathed) of infants <11 months of age.**

- ◆ **OEHHA looked into available data for VQs in healthy infants:**
  - ◆ **Neonates have extremely variable breathing rates; need large study for reliable estimates**
  - ◆ **VQ data on infants often measured during hospitalization for illness, and are not representative**
  - ◆ **Many studies evaluated volumes during mechanical ventilation, not spontaneous breathing**



# Chapter 5 Revisions

## Mother's Milk Pathway

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- ◆ **Clarified Equation 5-5 to show that multipathway exposure to the mother is considered for determining concentration in milk.**
  - ◆ **Will add sentence regarding which pathways always considered and which are site-specific.**
- ◆ **Added Equation 5-7, to clarify use of chemical-specific transfer coefficients (Tcos)**
  - ◆ **use ingestion Tco for pathways subject to first-pass metabolism - food, water and soil ingestion pathways**
  - ◆ **use inhalation Tco for inhalation and dermal pathways**



# Chapter 6 Revisions

## Dermal Exposure to Soil

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Per request from Panel:

- ◆ Added discussion of Kissel paper (in App F)
  - ◆ In most cases, OEHHA developed fractional absorption (ABS) values based on soil-bound chemical applied to skin
  - ◆ Chemicals applied neat only applies to 3 Hot Spots chemicals; potential mismeasure discussed for each
- ◆ Added discussion of air-to-skin transdermal pathway for semi-volatile chemicals
  - ◆ This pathway is inherent in whole-body inhalation toxicology or epidemiology studies on which nearly all risk values are based; thus RELs and CPFs based on air concentration inherently include this exposure route.



# Chapter 6 Revisions

## Dermal Exposure to Soil

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- ◆ Panel member asked to substantiate the statement “Clothing is expected to at least drastically reduce exposure to the covered skin area from contaminated soil”.
- ◆ Two studies added that show protective effect of clothing (Kissel et al., 1998; Dor et al., 2000)



# Chapter 6 Revisions

## Dermal Exposure to Soil

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Panel member commented that dermal absorption factor (ABS) for inorganic metals have a range of 0.2-4%. OEHHA use of 1% as default ABS appears low.

- ◆ **Default ABS needed for 3 metals (Be, fluoride, Se). We took average of derived ABS values for metals, including semi-metal As, and revised default ABS to 3%.**



# Chapter 6 Revisions

## Dermal Exposure to Soil

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Panel member asked how we came up with the annual dermal load (ADL) for the 0<2 yr age group, noting that it is lower than the 2<9 yr group.

- ◆ Reasoning discussed in Section 6.4.4. Main factor is that the 1<2 year age group had lower soil mass on skin than older children in a daycare study
- ◆ Although one study observed infants remain mostly indoors and are given little opportunity for direct contact with outdoor soil, we assume 0<1 yr old infants have same soil exposure as 1<2 yr old children.



# Chapter 7 Revisions

## Home Produced Food Exposure

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- ◆ **At the request of ARB, we clarified the use of recommended meat, milk and egg transfer factors for Hg, dioxins and furans, and PCBs presented in Tables 7.16 and 7.17**
- ◆ **These clarified recommendations also applied in App. K where we derive the meat, milk, and egg transfer coefficients**



# Chapter 8 Revisions

## Drinking Water

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- ◆ **OEHHA clarified that the recommendation for drinking water intake for pregnant women in the third trimester is that of combined adult males and females, as these values were slightly more health protective than the values derived for pregnant women by U.S. EPA.**
  - ◆ **Disadvantage of US EPA data is that includes all pregnant women, not just 3<sup>rd</sup> trimester.**



# Chapter 9 Revisions

## Fish Consumption

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- ◆ In response to comment about separating body weights for males and females for the fish consumption and soil ingestion estimates, we decided for simplicity sake to keep body weights of combined genders (practical, yet comprehensive)
  - ◆ Fish consumption pathway is rarely invoked in the Hot Spots risk assessments (1 out of about 850 risk assessments we have reviewed).
  - ◆ Fish consumption normalized to body weight reduced gender differences
  - ◆ Soil ingestion rates are relatively rough estimates



# Chapter 11 Revisions

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- ◆ **Chapter contains information on a variety of topics, including:**
  1. **Residential exposure duration.**
  2. **Time at home for residents.**
  3. **Job tenure for offsite workers.**
  4. **Individual vs. population risk.**
- ◆ **Added introduction to tie these disparate yet related topics together.**



# Chapter 11 Revisions

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- ◆ **Panel member expressed concern that data on residence times (also discussed in App L) is inherently truncated because it is retrospective.**
  - ◆ **These data on residence times are the best data we have to work with. OEHHA realizes it may underestimate residence times in some instances.**



# Appendix E Revisions

## Determination of Chemicals for Multipathway Analysis

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In response to Panel comment, Appendix E updated to include the K<sub>oa</sub> model (absorption model) using the octanol-water coefficient as a means of determining gas-particle partitioning.

- ◆ If either K<sub>oa</sub> model or Junge-Pankow model (adsorption model) show a chemical as  $\geq 0.5\%$  particle-bound, we will include it for multipathway assessment.

Chemical	%Particulate (Junge model)	%Particulate (K <sub>OA</sub> model)
Benzo[a]pyrene	87.9	60.2
PCBs	0.86	0.142

