



Calculating Missouri Risk-Based Corrective Action (MRBCA) Risk-Based Target Levels (RBTLs)

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DHSS Role

Missouri Department of Health and Senior Services (DHSS), Bureau of Environmental Epidemiology (BEE)

DHSS has primary responsibility for safeguarding the health of the people of Missouri. BEE has specific responsibility for the investigation and prevention of illnesses and medical conditions related to the environment.

Health and Risk Assessment Program (HRAP)

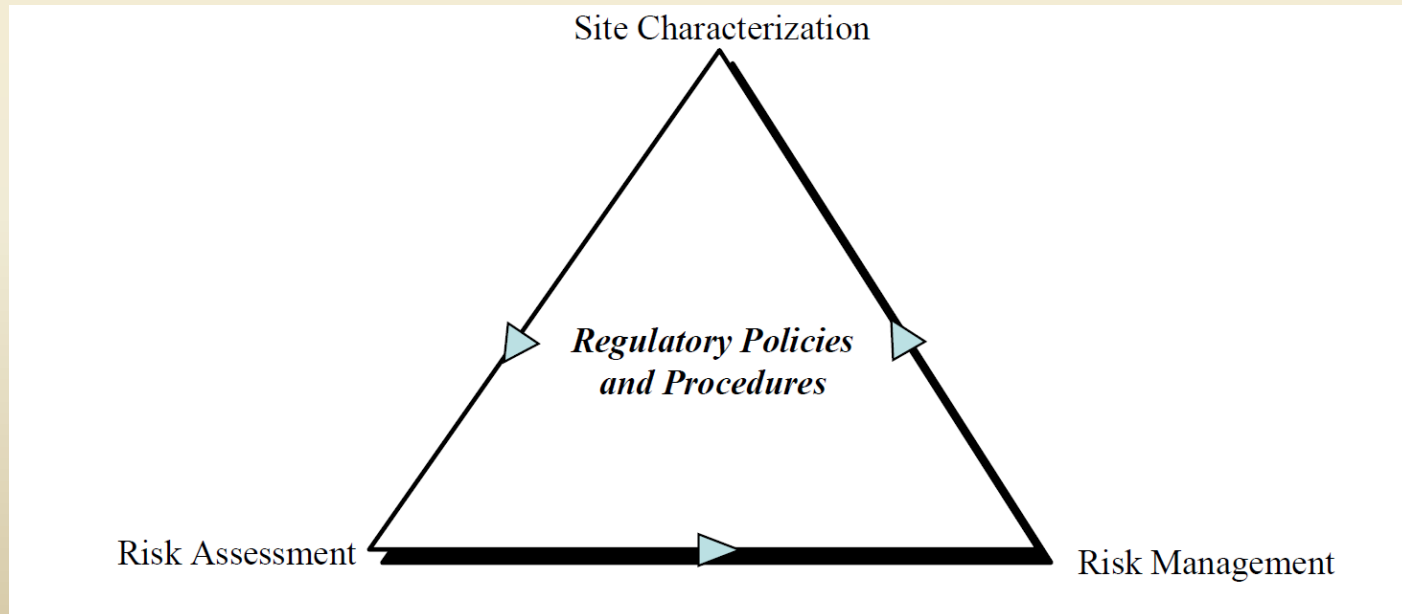
HRAP is responsible for evaluating human exposure to hazardous substances in the environment and for making health-protective recommendations regarding actions needed.

MRBCA Update



Risk-Based Corrective Action

Risk-based corrective action (RBCA) incorporates the process of site characterization, risk assessment, and risk management, providing a streamlined framework for making remediation decisions at contaminated sites.



MRBCA

Tiered Risk Assessment Process

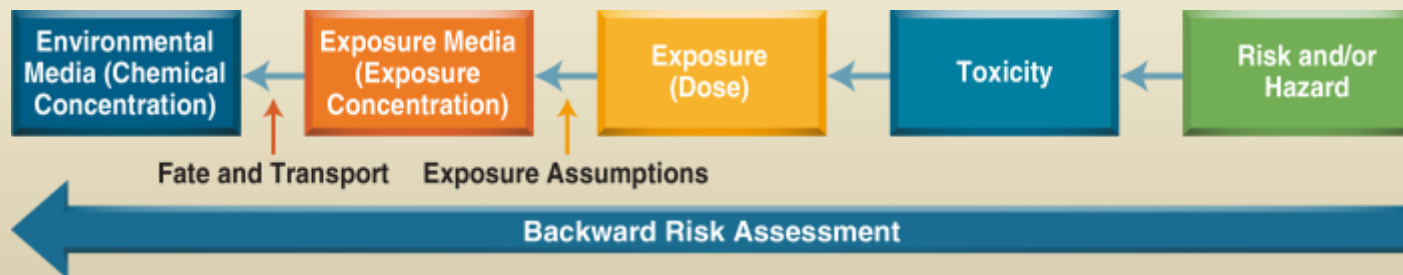
DTL Default Target Level	Tier 1	Tier 2	Tier 3
Lowest of all RBTLs	Default models and inputs	Semi site-specific evaluation using default or alternate fate and transport models and site-specific data	Detailed, site-specific evaluation allowing possible use of alternative models, current chemical inputs, and site-specific data and exposure factors
Allows unrestricted use of property	Land Use Dependent		
Max Concentrations	Representative Concentrations		

Risk Assessment & RBTLs

Calculating Cancer Risk/Non-Cancer Hazard



Calculating Risk-Based Target Levels



Source: ITRC 2015

Target Level Development Process

Target Risk Levels (Cancer and Non-Cancer Effects)



Standard Models/Equations



Inputs:

- Exposure Factors
- Chemical Toxicity Values
- Physical and Chemical Properties
- Fate and Transport Parameters



Tier 1 RBTLs

(Residential, Non-Residential, Construction Workers)



DTLs (Lowest of all Tier 1 RBTLs)

MRBCA RBTLs – Need for Update

MRBCA should provide a scientifically defensible and consistent framework to make decisions related to site characterization, risk assessment, and risk management, and a predictable regulatory process for property owners and developers.

Changes focus on:

1. scientific defensibility
2. consistency

MRBCA RBTLs - Update Approach

The Tier 1 RBTLs were modified to:

- Incorporate current U.S. Environmental Protection Agency (EPA) risk assessment guidance.
- Be generally consistent with EPA's Regional Screening Levels (RSLs).

The update follows the same general approach outlined in the 2006 MRBCA guidance.

MRBCA RBTLs - Update Details

	2006	Proposed
Total Chemicals	280	>700
Models/Equations	Various Sources	EPA
Exposure Factors	Various Sources	EPA defaults
Toxicity Values	Various Sources	EPA hierarchy
Physical & Chemical Properties	Various Sources	EPA hierarchy
Fate & Transport Parameters	Various Sources	EPA defaults

MRBCA RBTLs - Models/Equations Update

Equations used to develop Tier 1 RBTLs were updated to be based on current scientific methodology.

Changes are recommended for:

- Equations derived from ASTM (American Society for Testing and Materials)
- Vapor Intrusion Equations
- Inhalation Equations for all scenarios
- Construction Worker Inhalation Equations
- Mutagenic Equations

MRBCA RBTLs – Exposure Factors Update

Exposure factors used to develop Tier 1 RBTLs were updated to be based on the most recent EPA recommended default exposure factors.

Changes are recommended for:

- Non-standard exposure factors currently in MRBCA and updating of previous default factors to be based on current defaults.

MRBCA RBTLs – Toxicity Values Update

Toxicity values used to develop Tier 1 RBTLs were updated to reflect current science.

Changes are recommended for:

- Toxicity Value Hierarchy
- Dermal Toxicity Values
- Toxicity Values based on Route-to-Route Extrapolation

MRBCA RBTLs – Physical & Chemical Properties Update

Chemical-specific parameters used to develop Tier 1 RBTLs were updated to be consistent with the hierarchy of sources used for the EPA RSLs.

Changes are recommended for:

- Physical and Chemical Properties Hierarchy
- Chemical-Specific Parameters Hierarchy for Dermal Exposure Pathways
- Definition of Volatiles

MRBCA RBTLs – Fate & Transport Parameters Update

Fate and transport parameters used to calculate Tier 1 RBTLs were updated to be consistent with EPA default values.

Changes are recommended for:

- Modifying defaults used for certain parameters.
- MRBCA parameters used in equations that are no longer recommended.
- Incorporation of additional fate and transport parameters for new equations incorporated into MRBCA.

MRBCA RBTLs – Special Case Chemicals

Lead

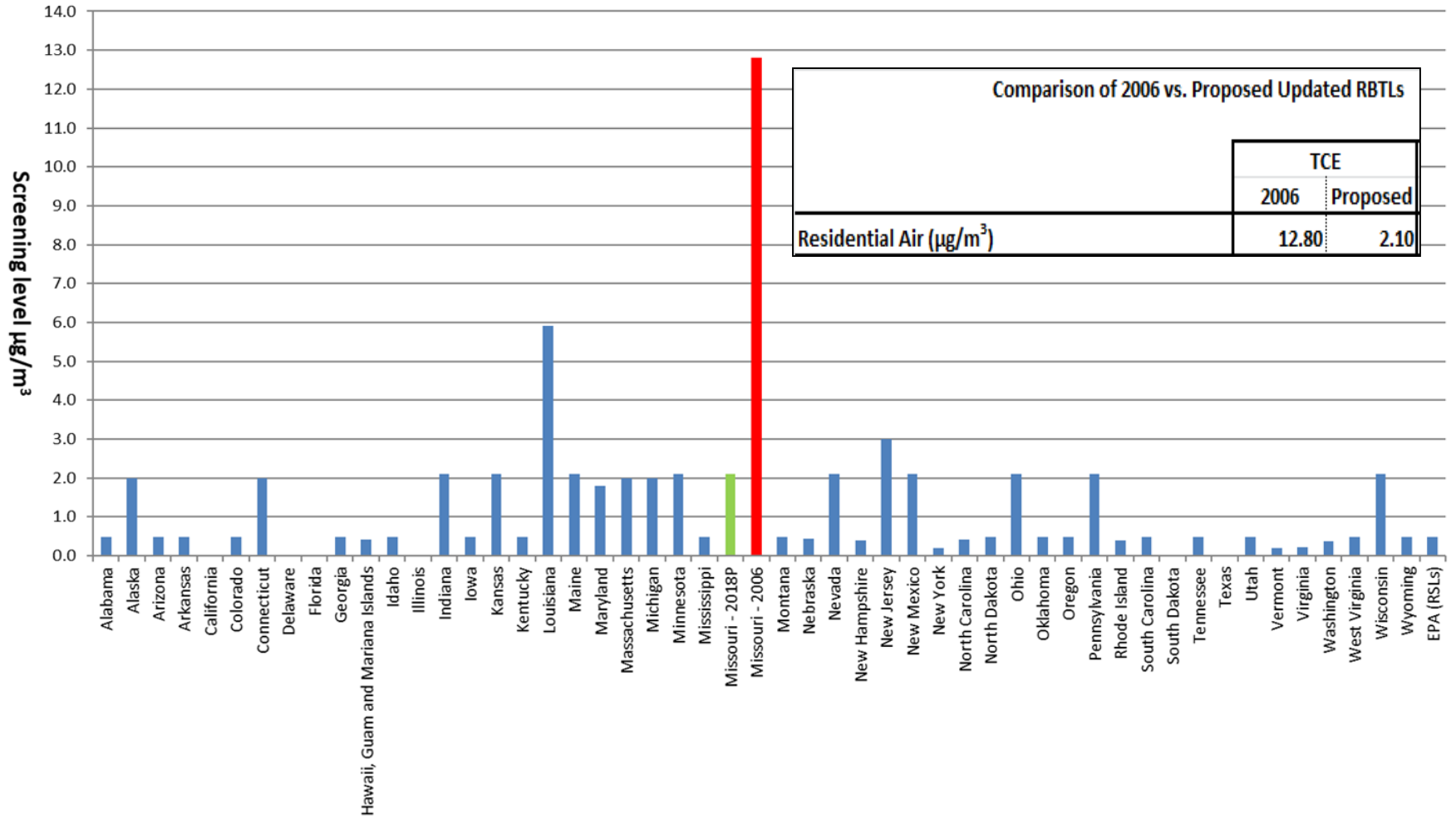
- RBTLs were calculated using EPA's Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) and the Adult Lead Model (ALM).

Total Petroleum Hydrocarbons (TPH)

- RBTLs were calculated using a weighting approach applied to toxicity values based on an assumed percent composition of the various fractions.
 - TPH-GRO (Gasoline-Range Organics): Aliphatics C5-C8, C9-C18, and Aromatics C9-16
 - TPH-DRO (Diesel-Range Organics): Aliphatics C5-C8, C9-18, C19+, and Aromatics C9-16
 - TPH-ORO (Oil-Range Organics): Aliphatics C19+ and Aromatics C9-16

Trichloroethylene (TCE)

Residential Indoor Air Screening Level in $\mu\text{g}/\text{m}^3$



RBTL Comparison

COMPARISON OF 2006 vs. PROPOSED UPDATED RBTLs

Analyte	Resident Air RBTL ($\mu\text{g}/\text{m}^3$)		
	2006	Proposed	Difference
Benzene	5	3.6	↓
Carbon Disulfide	418	730	↑
Carbon Tetrachloride	1.7	4.7	↑
Chloroform	1.1	1.2	↑
1,1-Dichloroethylene	119	209	↑
Ethylbenzene	606	11.2	↓
Naphthalene	0.7	0.8	↑
Tetrachloroethylene	4.3	41.7	↑
Trichloroethylene	12.8	2.1	↓
Vinyl Chloride	2.9	1.7	↓

↑ Increase from 2006 to Proposed Update (less conservative)

↓ Decrease from 2006 to Proposed Update (more conservative)

RBTL Comparison

COMPARISON OF 2006 vs. PROPOSED UPDATED RBTLs

Analyte	Resident Soil RBTL (mg/kg)		
	2006	Proposed	Difference
Aldrin	0.3	0.4	↑
Anthracene	15700	17900	↑
Aroclor 1254	1.1	1.2	↑
Arsenic	3.9	6.8	↑
Benzo[a]pyrene	0.6	1.2	↑
Cadmium	16.8	71.1	↑
Dibenzofuran	137	73	↓
Dieldrin	0.30	0.33	↑
Manganese	9680	1830	↓
Pentachlorophenol	30	10	↓

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QUESTIONS

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