

ACKNOWLEDGEMENTS

The Missouri Department of Natural Resources (department) acknowledges the extensive assistance from the many members of the Risk-Based Remediation Rule Workgroup. These public and private partners have provided invaluable assistance over several years and in many aspects of preparing this guidance.

Because of the tremendous interest in the development of risk-based corrective action, the department worked with a formal stakeholder process - the Risk-Based Remediation Rule Workgroup – to complete this guidance. Members represented industry; private contractors and consultants; citizen organizations; and state, federal and local agencies. They were very active in the development of both policy and technical guidance. We are grateful for the many hours that they spent in meetings and discussions and in providing input to and reviewing policy and technical content.

We also thank RAM Group, Inc. for its assistance. It ranged from writing the preliminary Process Document, a summary of policy choices made at various stakeholder meetings, to facilitating some tough technical discussions, being on call for many issues and discussions as they arose, and calculating the risk-based values found in this guidance.

History of Risk-Based Corrective Action in Missouri

In 1995, the General Assembly passed H.B. 251, which, in 319.109 RSMo, directed the Clean Water Commission (CWC) to use risk-based corrective standards to remediate underground storage tank sites. The CWC adopted 10 CSR 20-19.068 to implement this statute. In 1999, the General Assembly passed S.B. 334, which, in 644.143 RSMo, directed the CWC and staff to determine if risk-based remediation of groundwater was appropriate for any particular site. Although separate actions, both directives aimed to facilitate risk-based remediation decisions within the department's Water Protection Program. A Groundwater Remediation Rule Workgroup was formed to implement 644.143 RSMo. This group met periodically with stakeholders in preparing the general groundwater remediation rule for consideration by the CWC.

In addition, in 1998, Cleanup Levels for Missouri (CALM) Guidance was adopted by the Hazardous Waste Program (HWP) for voluntary cleanup of contaminated sites. CALM guidance established a risk-based procedure for site remediation.

In February 2002, the Clean Water Commission published a rule in the *Missouri Register* to codify the allowances and limitations for risk-based groundwater cleanup projects. In effect, it established a procedure to establish alternative cleanup levels, based upon an assessment of risk, for groundwater in addition to the maximum contaminant levels (MCLs) historically mandated.

The general reaction to the proposed rule was that the draft, although a good start, needed more work to become a productive procedure. Therefore, the CWC withdrew the proposed rule on May 1, 2002, and directed its staff to develop an alternative rule. A

new, more inclusive workgroup was formed, called the Risk-Based Remediation Rule Workgroup (Workgroup). External stakeholders in this group represented 15 key sectors of Missouri's citizenry.

This Workgroup held its first meeting on June 13, 2002. From dealing solely with groundwater, the rule evolved to address all environmental media, covering surface and ground water and soil. Before finalizing a rule, the Workgroup decided to first develop a policy approach and technical guidance.

After several years of use, the Hazardous Waste Program began to refine the CALM document. Although a separate action at the time, this work and the direction of the Workgroup were similar and the CALM document served as input to this MRBCA technical guidance.

In May 2004, the Governor signed S.B 901. This bill gave regulatory authority for tanks, including authority for risk-based remediation rules, to the Hazardous Waste Management Commission.

The Workgroup continued to meet through 2004 and refined its earlier product, the preliminary draft Process Document. Two separate technical guides have been written. One covers petroleum storage tanks only (Missouri Risk-Based Corrective Action Process for Petroleum Storage Tanks), and the second applies to all other risk-based cleanups (Departmental Missouri Risk-Based Corrective Action Technical Guidance).

This departmental guidance, which ultimately will lead to new rules, is the result of this history and the work of many individuals. Many thanks to everyone.

Linda Vogt
Project Coordinator

LIST OF ABBREVIATIONS

ALM	Adult Lead Methodology
AQL	Aquatic Life
ASTM	American Society for Testing and Materials
AUL	Activity and Use Limitation
bgs	Below Ground Surface
B/VCP	Brownfields/Voluntary Cleanup Program
CALM	Cleanup Levels for Missouri
CDF	Cold Water Fishery
cfs	Cubic Feet per Second
COC	Chemical of Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLF	Cool Water Fishery
CMS	Corrective Measure Study
CSR	Code of State Regulations
DAF	Dilution Attenuation Factor
DCE	cis-1,2-Dichloroethene
DED	Department of Economic Development
DEQ	Division of Environmental Quality
DGLS	Division of Geology and Land Survey
DHSS	Department of Health and Senior Services
DNAPL	Dense Non-Aqueous Phase Liquid
DOD	Department of Defense
DOE	Department of Energy
DTL	Default Target Level
DWS	Drinking Water Supply
ESP	Environmental Services Program
ET	Ecotox Threshold
FFCA	Federal Facility Compliance Act
ft	Feet
GW	Groundwater
HEAST	Health Effect Assessment Summary Tables
HHF	Human Health Protection-Fish Consumption
HI	Hazard Index
HQ	Hazard Quotient
HRS	Hazard Ranking System
HSWA	Hazardous and Solid Waste Amendments
IDEQ	Idaho Department of Environmental Quality
IELCR	Individual Excess Lifetime Cancer Risk
IEUBK	Integrated Exposure Uptake Biokinetic
IND	Industrial
IRR	Irrigation
IRIS	Integrated Risk Information System

LNAPL	Light Non-Aqueous Phase Liquid
LOC	Letter of Completion
LTS	Long-Term Stewardship
LWW	Livestock & Wildlife Watering
MCL	Maximum Contaminant Level
MEGA	Missouri Environmental Geology Atlas
MRBCA	Missouri Risk-Based Corrective Action
MW	Molecular Weight
NAPL	Non-Aqueous Phase Liquid
NCEA	National Center for Environmental Assessment
NFA	No Further Action
NFRAP	No Further Response Action Planned
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OEHHA	Office of Environmental Health Hazard Assessments
ORNL	Oak Ridge National Laboratory
OSWER	Office of Solid Waste and Emergency Response
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene
P.E.	Professional Engineer
PID	Photoionization Detector
POD	Point of Demonstration
POE	Point of Exposure
PQL	Practical Quantitation Limit
PRG	Preliminary Remediation Goal
PVC	Polyvinyl Chloride
PPRTV	Provisional Peer Reviewed Toxicity Value
PST	Petroleum Storage Tank
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QMP	Quality Management Plan
R.G.	Registered Geologist
RAGS	Risk Assessment Guidance for Superfund
RBTL	Risk-Based Target Level
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfD	Reference Dose
RFI	RCRA Facility Investigation
RMP	Risk Management Plan
ROE	Route of Exposure
RSMo	Revised Statutes of the State of Missouri
SARA	Superfund Amendments and Reauthorization Act
SCR	Secondary Contact Recreation
SF	Slope Factor

SQuiRTS	Screening Quick Reference Table
SSTL	Site-Specific Target Level
SWMP	Solid Waste Management Program
TCE	Trichloroethylene
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TIC	Tentatively Identified Compound
TPH	Total Petroleum Hydrocarbon
TRRP	Texas Risk Reduction Program
TSD	Treatment, Storage and Disposal
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WBR	Whole Body Recreation
Workgroup	Risk-Based Remediation Rule Workgroup
WPP	Water Protection Program
WQC	Water Quality Criteria
WQS	Water Quality Standards
XRF	X-Ray Fluorescence

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