



DEPARTMENT OF
ECOLOGY
State of Washington

Preliminary Review of Method A Cleanup Levels for Groundwater and Soil

Discussion Materials
Prepared for the MTCA/SMS Advisory Group
March 2010

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Summary

Ecology developed the initial MTCA Method A ground water and soil cleanup levels when the initial cleanup standards were published in 1991. Ecology reviewed the Method A cleanup levels during the 2001 rule revision process and made several revisions to incorporate new scientific and regulatory information.

Since the 2001 rule revisions, there have been numerous scientific and regulatory developments applicable to one or more of the substances on the Method A tables. Ecology is now evaluating this information. Ecology will use the evaluation results to help answer the following regulatory question:

What changes do we need to make to the MTCA cleanup standards requirements given:

- *New toxicological values published since the 2001 rule amendments*
- *New state and federal standards published since the 2001 rule amendments*
- *New EPA guidance on risk assessment issues (e.g., March 2005 cancer risk guidelines)*
- *Updated information on analytical limits and/or background levels*
- *New information on cross-media transfer (e.g., vapor intrusion).*

Ecology has reached several initial conclusions after reviewing the new scientific and regulatory information:

- The majority of the current Method A cleanup levels will not need to be revised based on new scientific and regulatory information unless Ecology makes significant changes to the overall methods and policies.
- The Method A ground water and soil cleanup levels for ethylene dibromide (EDB) should be increased based on the updated cancer slope factor published by EPA.
- There are several risk assessment issues that will need to be evaluated/resolved before deciding whether and how to revise the Method A cleanup levels for eight substances. These issues are also directly relevant to the methods and policies for establishing Method B and C cleanup levels.

Substance-Specific Issues Raised by New Scientific and Regulatory Information	
Substance	
Benzo[a]pyrene	Early life stage adjustments; concurrent soil exposure pathways; background concentrations
Chromium VI	Hierarchy of toxicity values/Use of New Jersey Department of Environmental Protection values
Ethylbenzene	Definition of carcinogen; Hierarchy of toxicity values; Vapor intrusion pathway; EPA inhalation risk assessment guidelines
Lead	New scientific and regulatory information
Naphthalene	Definition of carcinogen; Hierarchy of toxicity values; Vapor intrusion pathway; EPA inhalation risk assessment guidelines
Tetrachloroethylene	Hierarchy of toxicity values; Vapor intrusion pathway; EPA inhalation risk assessment guidelines
Trichloroethylene	Hierarchy of toxicity values; Vapor intrusion pathway; EPA inhalation risk assessment guidelines; Background
Vinyl chloride	Early life stage adjustments; Vapor intrusion pathway; EPA inhalation risk assessment guidelines

- There are several risk assessment issues associated with updating the MTCA Cleanup Regulation. Many of these issues are applicable to all environmental media and to cleanup levels established using Methods A, B and C. However, Ecology believes that the review of the Method A cleanup tables provides a mechanism for discussing the scientific, policy and practical implications of those issues. When reviewing these materials, Ecology would like committee members to consider the following questions/issues:
 1. Ecology is currently not planning changes for the majority of the substances on the Method A lists. Do you agree or disagree with these initial conclusions? If not, do you know of additional information that would assist Ecology evaluate the substances that you believe require further review?
 2. When available, Ecology uses toxicity values published in the IRIS database to establish risk-based cleanup levels. When toxicity values are not available, the MTCA rule identifies additional information sources of toxicity values.
 - Do you believe the Oak Ridge National Laboratory (ORNL/EPA website provides a reasonable source to toxicity parameters when IRIS values are available?
 - If not, how should Ecology select toxicity values when IRIS values are not available? Are there any substantive criteria that Ecology should consider when making these decisions?
 - Do you have any suggestions on the process/procedures when using values from the ORNL/EPA website or other sources (e.g., consultation with DOH, EPA, scientificpanel)?
 3. Ecology is often faced with decisions during rulemaking or periodic reviews of cleanup actions on how to deal with new scientific information indicating that a higher or lower cleanup level is appropriate. How big of a change in a risk-based cleanup level warrants revisions to the Method A Tables?
 4. Ecology has identified five risk assessment issues associated with updating the Method A cleanup levels for one or more of the hazardous substances. Do you agree that these issues should be addressed when updating the Method A cleanup levels? Do you have opinions on the relative priority for addressing these issues during the current rulemaking process? Are there other risk assessment issues that you would recommend Ecology consider when updating the cleanup levels for one or more substances?

1. Definition of Carcinogen: How should Ecology deal with chemicals that have been identified as carcinogens by other scientific groups (IARC/NTP) when those classifications are not reflected in the IRIS database? This is a key issue underlying decisions on whether and how to update the Method A values for naphthalene and ethylbenzene.
2. Early Life Stage Adjustment: How should Ecology take into account scientific information and EPA regulatory guidance on early life susceptibility to carcinogens? This is a key issue for benzo[a]pyrene and will be discussed on March 22nd. The approach used for other carcinogens will be discussed after Ecology reviews the committee feedback on BaP.
3. Vapor Intrusion Pathway: How should Ecology evaluate the VI pathway? Should the Method A table values be revised to incorporate cleanup levels based on this pathway?
4. Concurrent Soil Pathways: Should Ecology consider concurrent soil exposure pathways (e.g., soil ingestion and dermal contact) when updating the Method A soil cleanup levels. This is an issue for BaP, DDT and PCBs.
5. EPA Inhalation Risk Assessment Guidance: Given EPA's updated guidance on inhalation risk assessment, should Ecology review the assumptions on inhalation risks resulting from volatilization during domestic water use when updating the Method A ground water cleanup levels for volatile chemicals?

Glossary of Acronyms Used in This Document

ATSDR	Agency for Toxic Substances and Disease Registry
CalEPA	California Environmental Protection Agency
BaP	Benzo[a]pyrene
CPF	Cancer Potency Factor (Cancer Slope Factor)
CPAH	Carcinogenic Polycyclic Aromatic Hydrocarbons
DOH	Washington Department of Health
EDB	Ethylene dibromide
EPA	U.S. Environmental Protection Agency
HEAST	Health Effects Assessment Summary Tables
IARC	International Agency for Research on Cancer
INH	Inhalation Correction Factor
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MTCA	Model Toxics Control Act
NTP	National Toxicology Program
OEHHA	Office of Environmental Health Hazard Assessment
ORNL	Oak Ridge National Laboratory
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCE	Perchloroethylene/Tetrachloroethylene
PHG	California Public Health Goal for Drinking Water

PPRTV	Provisional Peer-Reviewed Toxicity Values
PQL	Practical Quantitation Limit
RfC	Reference Concentration
RfDi	Reference Dose (inhalation pathway)
RME	Reasonable Maximum Exposure
SAB	Model Toxics Control Act Science Advisory Board
SMS	Sediment Management Standards (Chapter 173-204 WAC)
TCE	Trichloroethylene
TSCA	Toxic Substances Control Act
WHO	World Health Organization

1. Introduction

Purpose of the Discussion Materials

There are a wide range of risk assessment issues that could be discussed during the current rulemaking process. The purpose of this document is three-fold:

- Promote review and discussion of potential revisions to the current Method A cleanup levels;
- Help prioritize discussions on key risk assessment issues for the current rule process
- Facilitate early identification of implementation issues.

Regulatory Question

Ecology developed the MTCA Method A ground water and soil cleanup levels when the initial cleanup standards were published in 1991. Ecology reviewed the Method A values during the 2001 rule revision process and made several revisions based on new scientific and regulatory information.

Since the 2001 rule revisions, there have been numerous scientific and regulatory developments applicable to one or more of the substances included in the Method A tables. Ecology is now evaluating this information. Ecology will use the evaluation results to help answer the following regulatory question:

What changes do we need to make to the MTCA cleanup standards given:

- *New toxicological values published since the 2001 rule amendments*
- *New state and federal standards published since the 2001 rule amendments (e.g., new drinking water standards)*
- *New EPA guidance on risk assessment issues (e.g., March 2005 cancer risk guidelines)*
- *Updated information on analytical limits and/or background levels*
- *New information on cross-media transfer (e.g., vapor intrusion).*

Overview of MTCA Cleanup Standards

Under the current MTCA rules, there are three methods (Methods A, B and C) for establishing cleanup levels.

- *Method A* can be used to establish cleanup levels at relatively small sites that involve few contaminants. Method A includes cleanup level tables for ground water, soils and industrial soils. The cleanup levels were developed using the Method B policies and equations.
- *Method B* can be used to establish cleanup levels at any site. Method B includes a series of policies and risk equations for establishing site cleanup levels.
- *Method C* can be used to establish cleanup levels in limited situations—typically for soil cleanup levels for industrial land uses. Method C includes a series of policies and risk equations for establishing site cleanup levels in limited situations.

Organization of the Discussion Materials

The rest of this document is organized into three main sections:

- Preliminary Review of the Method A Ground Water Cleanup Levels: Section 2 summarizes Ecology's conclusions on the need for revisions and/or additional discussions on Method A ground water cleanup levels.
- Preliminary Review of the Method A Soil Cleanup Levels: Section 3 summarizes Ecology's conclusions on the need for revisions and/or additional discussions on Method A soil cleanup levels for residential properties and other unrestricted land uses.
- Preliminary Review of the Method A Industrial Soil Cleanup Levels: Section 4 summarizes Ecology's conclusions on the need for revisions and/or additional discussions on Method A industrial soil cleanup levels.

The document also includes several technical appendices that summarize information on toxicological parameters and initial risk calculations.

2. Preliminary Review of Method A Potable Ground Water Cleanup Levels

Summary of Key Requirements for MTCA Cleanup Levels (Potable Ground Water)

WAC 173-340-720 establishes the methods and policies for establishing ground water cleanup levels. Ecology used these methods and policies to establish the Method A ground water cleanup levels in the current rule. Ground water cleanup levels for potable ground water must meet the following requirements:

- Applicable state and federal laws. Ground water cleanup levels must be at least as stringent as the Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for non-carcinogens included in the state and federal drinking water regulations. The MTCA rule requires downward adjustment of these concentrations if they correspond to a hazard quotient greater than one (1) or an excess cancer risk greater than one-in-one hundred thousand (1×10^{-5}).
- Human health protection. Ground water cleanup levels must generally¹ be at least as stringent as the risk-based concentrations calculated using the equations and parameters specified in the MTCA rule (Equations 720-1 and 720-2). For non-carcinogenic health risks, cleanup levels are based on a hazard quotient of 1. For known or suspected carcinogens, cleanup levels are based on an excess cancer risk of one in one million (1×10^{-6}).
- Protection of other environmental media. Ground water cleanup levels must be established at concentrations that prevent violations of surface water, sediments, soil, or air cleanup standards.
- Analytical considerations. The MTCA rule specifies that the ground water cleanup levels shall not be set at concentrations below the practical quantitation limit (PQL).
- Natural background concentrations. The MTCA rule specifies that ground water cleanup levels shall not be set at levels below natural background concentrations.

The MTCA rule also specifies that the total site risk for carcinogens cannot exceed one-in-one hundred thousand (10^{-5}). Non-cancer total site risk cannot exceed a hazard quotient of one. The MTCA rule require that the cleanup levels established for individual substances be adjusted downward if the total site risk exceeds either of these limits. Total site risk includes consideration of multiple hazardous substances and multiple pathways of exposure.

Review Process

1. Toxicological information: Ecology reviewed the Integrated Risk Information System (IRIS) database and the information compiled by the Oakridge National Laboratory

¹ Cleanup levels are based on applicable state and federal laws when those requirements are sufficiently protective (i.e., hazard quotient less than one (1) or an excess cancer risk less than one-in-one hundred thousand (1×10^{-5}))

and the Environmental Protection Agency. Ecology used those sources to identify cancer slope factors and reference doses that had been developed or updated since the 2001 rule revisions.

- Regional Screening Levels for Chemical Contaminants at Superfund Sites. December 2009. http://www.epa.gov/reg3hscd/risk/human/rb-concentration_table/index.htm
 - Integrated Risk Information System. December 2009. <http://www.epa.gov/iris/>
2. Applicable State and Federal Laws: Ecology reviewed the current state (WAC 246-290-310) and federal 40 C.F.R. 141.61) drinking water standards. Ecology used this information to identify maximum contaminant levels (MCLs) or maximum contaminant levels goals (MCLGs) that have been developed since the 2001 rule revisions.
 3. Vapor Intrusion Pathway: Ecology reviewed the ground water vapor intrusion screening levels included in the draft Ecology guidance for public review during 2009.² Ecology used this information to identify substances that may pose a vapor intrusion risk at ground water concentrations below the cleanup levels that are based on the drinking water pathway.
 4. Analytical Limits: For purposes of this evaluation, Ecology used the practical quantitation limits compiled when preparing the 2001 rule revisions.³ In general, these values appear to be representative of current analytical capabilities.
 5. Initial Evaluation: Ecology used the information described above to recalculate the cleanup levels based on the drinking water exposure pathway. This provided the basis for making an initial determination on whether revisions to particular Method A levels might be necessary.

Summary of Preliminary Evaluation

Table 720-1 includes Method A ground water cleanup levels for 27 substances and 5 petroleum mixtures.⁴ New toxicological parameters, applicable guidance and/or drinking water standards have been developed for at least 16 of those substances since the 2001 MTCA rule revisions. Preliminary review of the new information indicates the following:

² Draft Guidance for Evaluating Vapor Intrusion at Washington Sites: Investigations and Remedial Actions. (October 2009) <http://www.ecy.wa.gov/programs/tcp/policies/VaporIntrusion/vig.html>

³ Concise Explanatory Statement for 2001 Rule Amendments. Appendix D. Calculations for Method A Cleanup Levels. http://www.ecy.wa.gov/programs/tcp/regs/Appendix_D.pdf

⁴ EPA has revised several of the reference doses used for various TPH fractions since the 2001 rule revisions. Ecology plans to review information to determine whether revisions to the Method A values for petroleum mixtures is appropriate. This will be coordinated with the review of toxicological information for benzene, ethylbenzene, naphthalene, toluene and xylenes.

- No changes planned. Based on available data, it appears that the majority of the current Method A ground water cleanup levels will not require revisions unless MTCA/SMS Advisory Group discussions, MTCA Science Panel review or public review result in significant revisions to the MTCA methods and policies.
 - “Sufficiently Protective” Applicable Requirements: The majority of the current Method A ground water cleanup levels are based on the maximum contaminant levels (MCLs) for those substances. Based on a review of new toxicological information, the MCLs for most of those substances appear to remain sufficiently protective (i.e., cancer risks less than one-in-one hundred thousand (10^{-5}) and a hazard quotient less than one). Those substances are identified in Table 2.2.
 - Arsenic: The current Method A ground water cleanup level for arsenic is based on natural background concentrations. EPA published a new MCL (10 ug/L) for arsenic in 2001. However, the MCL corresponds to a cancer risk greater than 10^{-4} and would not be considered sufficiently protective. Given the current MTCA policies, Ecology plans to maintain the current Method A value. However, some individuals have asked Ecology to review the wide variability in natural arsenic concentrations to determine if 5 ug/L is an appropriate estimate of natural background levels. Ecology is currently reviewing available ground water data from the United States Geological Service and the Washington Department of Health.
 - DDT: The current Method A ground water cleanup level was calculated using Equation 720-2 (cancer risks). EPA has not revised the toxicological parameters used to establish the current Method A ground water cleanup level.
 - MTBE: The current Method A ground water cleanup level is based on a 1997 EPA Drinking Water Advisory. Since the 2001 rule revisions, the California EPA has published an oral cancer slope factor for MTBE. This is included in the ORNL/EPA tables. Ecology has calculated MTCA ground water cleanup levels using the CalEPA cancer slope factor and equation 720-2. The calculated values range from 16 to 24 ug/L depending on the assumptions used to estimate inhalation risks. The cleanup levels based on cancer risks are similar to the current Method A value.
- Increase being considered. The current federal and state MCL for ethylene dibromide (EDB) is 0.05 ug/L. When preparing the 2001 rule revisions, Ecology determined that the cancer risks at the MCL exceeded one-in-one hundred thousand (10^{-5}). Given this calculation, Ecology set the Method A ground water level at 0.01 ug/L. However, EPA has lowered the oral cancer slope factor for ethylene dibromide (EDB) from 85 to $2 \text{ (mg/kg/day)}^{-1}$. Given the updated slope factor, the cancer risks at the MCL are less than 10^{-5} . Under the current MTCA policies, the Method A ground water cleanup level would be based on the MCL.
- Substance-specific issues that require further review/discussion. There are several substances where new toxicity information, new regulatory guidelines and/or consideration of the vapor intrusion pathway could justify revising the current Method A cleanup level. The issues associated with these substances are listed in Table 2.1 below.

Table 2.1: Risk Issues Associated with Updating the Method A Ground Water Cleanup Levels	
Substance	Rulemaking Issues
Benzo[a]pyrene	<ul style="list-style-type: none"> Should Ecology adjust the current Method A ground water cleanup levels for benzo[a]pyrene consistent with EPA guidance on early life stage considerations? How should Ecology take into account background levels of BaP when updating the Method A cleanup levels?
Chromium VI	<ul style="list-style-type: none"> Does the cancer slope factor developed by the New Jersey Department of Environmental Protection provide a sufficient basis for establishing MTCA cleanup levels?
Ethylbenzene	<ul style="list-style-type: none"> Should Ecology establish cleanup levels for ethylbenzene based on cancer risks? If yes, what methods and parameters should Ecology use to establish cleanup levels for ethylbenzene based on cancer risks? How should Ecology take into account the vapor intrusion (VI) pathway when updating the current Method A cleanup level? What changes (if any) are needed to the inhalation correction factor given the current EPA inhalation risk assessment guidance?
Lead	<ul style="list-style-type: none"> Should Ecology consider revisions to the current Method A ground water level for lead given the scientific and regulatory developments since the 2001 rule revisions? If yes, what methods and policies should Ecology use to revise the current value?
Naphthalene	<ul style="list-style-type: none"> Should Ecology establish cleanup levels for naphthalene based on cancer risks? If yes, what methods and parameters should Ecology use to establish cleanup levels for naphthalene based on cancer risks? How should Ecology take into account the VI pathway when updating the Method A cleanup levels? What changes (if any) are needed to the inhalation correction factor given the current EPA inhalation risk assessment guidance?
Tetrachloroethylene	<ul style="list-style-type: none"> What cancer slope factor should be used to review the current Method A cleanup level in the absence of a final IRIS value? How should Ecology take into account the VI pathway when updating Method A cleanup levels? What changes (if any) are needed to the inhalation correction factor given the current EPA inhalation risk assessment guidance?
Trichloroethylene	<ul style="list-style-type: none"> How should Ecology take into account the VI pathway when updating the Method A cleanup level? What changes (if any) are needed to the inhalation correction factor given the current EPA inhalation risk assessment guidance? How should Ecology take into account background levels of TCE when updating the Method A cleanup levels?
Vinyl chloride	<ul style="list-style-type: none"> Should Ecology adjust the current Method A ground water cleanup levels for vinyl chloride consistent with EPA guidance on early life stage considerations? How should Ecology take into account the VI pathway when updating the Method A cleanup level? What changes (if any) are needed to the inhalation correction factor given the current EPA inhalation risk assessment guidance?

**Table 2.2: Method A Ground Water Cleanup Levels (excluding TPH Values)
Current Method A Values and Basis for Considering Revisions**

	Rule Value	Basis for Current Method A Value	Draft Value	Basis for Considering Revisions	Change
Arsenic	5 ug/L	Cleanup level based on background concentrations for state of Washington.	5 ug/L	<ul style="list-style-type: none"> EPA lowered the MCL for arsenic from 50 ug/L to 10 ug/l in January 2001. EPA recently published draft revisions to the IRIS cancer slope factor. The draft revisions include a significant increase in the oral cancer slope factor (current = 1.5; draft = 25 for females/16 for males). More recent sampling data indicates natural background levels in some parts of Washington are higher than 5 ug/L. 	No Change Planned (Pending further review)
Benzene	5 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61)	5 ug/L	<p>Ecology does not currently plan to revise the Method A value for benzene.</p> <ul style="list-style-type: none"> EPA revised the cancer slope factor in the IRIS database in late 2000 after Ecology had published the proposed MTCA rule amendments. The risk-based GW cleanup level calculated using the updated slope factor (0.8 ug/L) is lower than the cleanup level calculated using the previous slope factor (1.5 ug/L). Method A cleanup level will continue to be based on the state and federal drinking water standard (5 ug/L) since the risk-based value falls below a 10^{-5} risk level. The current Method A value is also similar to the draft ground water screening level for vapor intrusion (2.4 ug/L) that was distributed for public review in late 2009. This value is based on VAF of 0.001. 	No Change Planned
Benz[a]pyrene	0.1 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61), adjusted to a 1×10^{-5} risk. If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).	???	<p>Ecology is evaluating new scientific information to determine whether revisions to the Method A value for BaP are warranted. The main issues:</p> <ul style="list-style-type: none"> Should Ecology apply early life stage adjustments to BaP when calculating MTCA cleanup levels? If yes, what does that mean for the Method A value? <p>[SEPARATE DISCUSSION MATERIALS]</p>	Discuss with Advisory Group

	Rule Value	Basis for Current Method A Value Published in 2001	Draft Value	Basis for Considering Revisions	Change
Cadmium	5 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.62).	5 ug/L	Ecology does not currently plan to revise the Method A value for cadmium. Since 2001, EPA has not updated the IRIS toxicological parameters for cadmium or revised the federal drinking water standard. The Department of Health has not revised the state drinking water standard for cadmium.	No Change Planned
Chromium (Total)	50 ug/L	Cleanup level based on concentration derived using Equation 720-1 for hexavalent chromium. This is a total value for chromium III and chromium VI. If just chromium III is present at the site, a cleanup level of 100 ug/l may be used (based on WAC 246-290-310 and 40 C.F.R. 141.62).	???	Chromium VI. The December 2009 update to the ORNL/EPA Table includes an oral cancer slope factor for chromium VI that was developed by the New Jersey Department of Environmental Protection. Ecology does not plan to revise the Method A value for chromium VI without further evaluation.	Further review
			100 ug/L	Chromium III. Ecology does not currently plan to revise the Method A value applicable to chromium III. Since 2001, EPA has not updated the IRIS toxicological parameters for chromium III. Neither EPA nor DOH have revised the federal drinking water standard for total chromium (100 ug/L).	No Change Planned
DDT	0.3 ug/L	Cleanup level based on concentration derived using Equation 720-2.	0.3 ug/L	Ecology does not currently plan to revise the Method A value for DDT. EPA has not revised the toxicological parameters for DDT since the 2001 MTCA rule amendments. Neither EPA nor DOH has established a drinking water standard for DDT.	No Change Planned
1,2 Dichloroethane (EDC)	5 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).	5 ug/L	<p>Ecology does not currently plan to revise the Method A cleanup level for EDC.</p> <ul style="list-style-type: none"> • Since 2001, EPA has updated the oral RfD in the IRIS database. The risk-based cleanup level calculated using that value is 160 ug/L. • The risk-based value based on non-cancer effects is much higher than the MCL (5 ug/L) and risk-based cleanup level based on cancer (0.5 ug/L). • The MCL and cancer slope factor have not been revised since the 2001 MTCA rule amendments. 	No Change Planned

	Rule Value	Basis for Current Method A Value Published in 2001	Draft Value	Basis for Considering Revisions	Change
Ethylbenzene	700 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61)	???	<p>Ecology is currently evaluating new scientific information to determine whether revisions to the Method A value for ethylbenzene are warranted. The two main issues:</p> <ul style="list-style-type: none"> • <u>Should Ecology classify ethylbenzene as a carcinogen?</u> IARC has classified ethylbenzene as possibly carcinogenic to humans (2B). California EPA and Oregon DEQ regulate ethylbenzene as a carcinogen. Several other states appear to be regulating ethylbenzene based on non-cancer effects. • <u>If yes, how should Ecology revise the Method A value for ethylbenzene?</u> The ORNL/EPA tables include cancer slope factor (0.11) for ethylbenzene developed by Cal EPA. Use of Cal EPA slope factor would result in a Method B cleanup level of 4 ug/L. This is above the PQL (1 ug/L). 	Discuss with Advisory Group
Ethylene Dibromide	0.01 ug/L	Cleanup level based on concentration derived using Equation 720-2, adjusted for the practical quantitation limit.	0.05 ug/L	<p>Ecology is currently considering whether to revise the Method A value for EDB.</p> <ul style="list-style-type: none"> • EPA has lowered the cancer slope factor for EDB from 85 to 2 (mg/kgday)⁻¹. • The risk-based ground water cleanup level using the new slope factor is 0.02 ug/L. • The current MCL is 0.05 ug/L which corresponds to a cancer risk of 2 - 3 x 10⁻⁶. 	Change to MCL
Gross Alpha Particle Activity	15 pCi/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15)	15 pCi/L	Ecology does not plan to revise the Method A cleanup level for gross alpha particle activity. Since the 2001 MTCA rule amendments, neither EPA nor DOH has revised the drinking water standards for gross alpha particle activity.	No Change Planned
Gross Beta Particle Activity	4 mrem/yr	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15)	4 mrem/yr	Ecology does not plan to revise the Method A cleanup level for gross beta particle activity. Since the 2001 MTCA rule amendments, neither EPA nor DOH has revised the drinking water standards for gross beta particle activity.	No Change Planned
Lead	15 ug/L	Cleanup level based on applicable state and federal law (40 C.F.R. 141.80)	15 ug/L	Ecology is currently considering whether to modify the Method A value for lead based on new scientific information. Ecology's evaluation is currently focused on the soil cleanup levels. Eventually, Ecology will also need to consider how risk-based standards compare to the MCL (15 ug/L), background concentrations (5 ug/L) and the current PQL for lead in water? (2 ug/L – SW7421).	Discuss with Advisory Group

	Rule Value	Basis for Current Method A Value Published in 2001	Draft Value	Basis for Considering Revisions	Change
Lindane	0.2 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61)	0.2 ug/L	Ecology does not currently plan to revise the Method A value for lindane. Since 2001, EPA has not updated the IRIS toxicity parameters for lindane. Neither EPA nor DOH has revised the drinking water standard for lindane.	No Change Planned
Methylene chloride	5 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61)	5 ug/L	Ecology does not currently plan to revise the Method A value for methylene chloride. Since 2001, EPA has not updated the IRIS toxicity values for methylene chloride. Neither EPA nor DOH has revised the drinking water standard.	No Change Planned
Mercury (inorganic)	2 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.62)	2 ug/L	Ecology does not currently plan to revise the Method A value for mercury. Since 2001, EPA has not updated the IRIS toxicity parameters for mercury. Neither EPA nor DOH has revised the drinking water standard for mercury.	No Change Planned
MTBE	20 ug/L	Cleanup level based on federal drinking water advisory level (EPA-822-F-97-009, December 1997)	20 ug/L	<p>Ecology does not currently plan to revise the Method A cleanup level for MTBE.</p> <ul style="list-style-type: none"> The CalEPA has published a cancer slope factor for MTBE (0.0018 (mg/kg/day)⁻¹). The risk-based cleanup level calculated using Equation 720-2 is 24 ug/L. This is similar to the current Method A level. The ORNL/Regional EPA Table indicates that inhalation exposure is about 2 times higher than ingestion (consistent with an INH of 3). The Method B level using equation 720-1 and an INH of 3 is 16 ug/L. 	No Change Planned
Naphthalenes	160 ug/L	Cleanup level based on concentration derived using Equation 720-1. This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene	???	<p>Ecology is evaluating new scientific information to determine whether revisions to the Method A value for naphthalene are warranted. The two main issues:</p> <ul style="list-style-type: none"> <u>Should ECY classify naphthalene as a carcinogen?</u> IARC classifies as possibly carcinogenic to humans (2B). NTP classifies as reasonably anticipated to be a human carcinogen. EPA is updating toxicity assessment. CalEPA/Oregon DEQ both regulate naphthalene as a carcinogen. <u>If yes, how should ECY revise the Method A value?</u> The ORNL/EPA tables include a CalEPA IUR for naphthalene (3.4E-05). Method B cleanup level = 0.1 ug/L. The ORNL/EPA tables also include a PPTRV slope factor for 1-methyl-naphthalene (0.029). Method B level equals 1.5 ug/L 	Discuss with Advisory Group

	Rule Value	Basis for Current Method A Value Published in 2001	Draft Value	Basis for Considering Revisions	Change
PAHs					
PCB Mixtures	0.1 ug/L	Cleanup level based on concentration derived using Equation 720-2, adjusted for the practical quantitation limit. This cleanup level is a total value for all PCBs.	0.1 ug/L	Ecology does not currently plan to revise the Method A cleanup level for PCBs. Since 2001, EPA has not updated the IRIS toxicological parameters for PCBs or revised the federal drinking water standard. The Department of Health has not revised the state drinking water standard for PCBs.	No Change Planned
Radium 226 and 228	5 pCi/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15)	5 pCi/L	Ecology does not currently plan to revise the Method A values for Radium 226 and 228. Since the 2001 MTCA rule revisions, neither EPA nor DOH have revised the drinking water standards for Radium 226 and 228	No Change Planned
Radium 226	3 pCi/L	Cleanup level based on applicable state and federal law (WAC 246-290-310)	3 pCi/L	Ecology does not currently plan to revise the Method A value for Radium 226. Since the 2001 MTCA rule revisions, neither EPA nor DOH have revised the drinking water standards for Radium 226.	No Change Planned
Tetrachloroethylene (PCE)	5 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).	???	Ecology is considering whether and how to revise the Method A cleanup level for perchloroethylene. EPA has not updated the IRIS database or revised the federal drinking water standard since the 2001 rule revisions. The NRC recently completed a review of draft revisions to the IRIS toxicity values for PCE. The range of cancer slope factors the draft document differ by an order of magnitude. The HEAST value $(0.051 \text{ (mg/kg/day)}^{-1})$ used for the 2001 rule revisions fall within the draft range. The California EPA value $(0.54 \text{ (mg/kg/day)}^{-1})$ currently being used by Ecology and other agencies falls slightly above the range of draft values. It now appears that EPA will conduct additional evaluations before revising the IRIS database. Ecology has developed a draft GW screening level for the vapor intrusion pathway (1 ug/L).	Discuss with Advisory Group
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	Rule Value	Basis for Current Method A Value Published in 2001	Draft Value	Basis for Considering Revisions	Change
Toluene	1000 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61)	1000 ug/L	Ecology does not currently plan to revise the Method A value for toluene. Since the 2001 MTCA rule amendments, EPA has updated the oral reference dose for toluene. The ground water cleanup level calculated using Equation 720-1 and the updated RfD is 640 ug/L. However, the ONRL/EPA Tables indicate that it would be appropriate to use an INH less than 2. This would result in Method B level close to 1000 ug/L. Both the calculated value and the current drinking water standards are below the draft ground water screening levels in various vapor intrusion guidance materials.	No Change Planned
1,1,1 Trichloroethane	200 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61)	200 ug/L	Ecology does not currently plan to revise the Method A value for 1,1,1 trichloroethane. Since 2001, EPA has raised the oral RfD to 2 mg/kg/day (previous value was 0.9 mg/kg/day). The Method B value calculated using the new RfD would be 16,000 ug/L. The state and federal drinking water standards remain 200 ug/L.	No Change Planned
TCE	5 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61)		Ecology is considering whether and how to revise the Method A cleanup level for trichloroethylene. EPA has not updated the IRIS database or revised the federal drinking water standard since the 2001 rule revisions. However, there have been several interim cancer slope factor published since 2001. The most recent ORNL/EPA tables include an oral cancer slope factor of $(0.0059 \text{ mg/kg/day})^{-1}$. However, EPA proposed a new IRIS $(0.05 \text{ (mg/kg/day)}^{-1})$ in November 2009.	Discuss with Advisory Group
Vinyl chloride	0.2 ug/L	Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61), adjusted to a 1×10^{-5} risk	0.2 ug/L	Ecology is considering whether and how to revise the Method A cleanup level for vinyl chloride. Specifically, Ecology considering whether to apply early life stage adjustments when calculating MTCA cleanup levels. EPA has published early life stage guidance that is applicable to VC. The Method B cleanup level with early life stage adjustment would be 0.02 ug/L. The CLARC database includes adjustments for early life stage exposure that reflect an earlier version of the EPA guidance. The ground water cleanup level based on the CLARC database procedures is 0.03 ug/L. Both of the calculated values are lower than the current MCL (2 ug/L), the current PQL (0.2 ug/L) and the ground water vapor intrusion screening level (0.35 ug/L).	Discuss with Advisory Group

	Rule Value	Basis for Current Method A Value Published in 2001	Draft Value	Basis for Considering Revisions	Change
Xylenes	1,000 ug/L	Cleanup level based on xylene not exceeding the maximum allowed cleanup level in this table for total petroleum hydrocarbons and on prevention of adverse aesthetic characteristics. This is a total value for all xylenes	1,000 ug/L	<p>Ecology does not currently plan to revise the Method A value for xylenes. EPA has published an oral reference dose (0.2 mg/kg/day) that is applicable to xylene mixtures and m-, o- and p-xylene isomers. The Method B ground water cleanup level based on the IRIS oral RfD is 1600 ug/L.</p> <p>However, the ORNL/EPA tables include a risk-based concentration for total xylenes of 200 ug/L. This is driven by the inhalation pathway which is derived from the IRIS RfC (0.1 mg/m³) CalEPA has published RfCs for the 3 xylene isomers that are 7 times less stringent than the IRIS value. The ORNL/EPA table includes RBCs (1200 ug/L) for the three xylene isomers that are based on the Cal EPA values.</p> <p>The current Method A value is more stringent than the drinking water standard for xylene mixtures (MCL = 10,000 ug/L). The GW vapor intrusion screening value ranges from 310 ug/L to 3100 ug/L depending on whether one assumes an additional 10-fold attenuation due to biodegradation.</p>	<p>No Change Planned</p> <p>Pending Review of inhalation risk issues</p>

3. Preliminary Review of Method A Soil Cleanup Levels-- Unrestricted Land Uses

Summary of Key Requirements for MTCA Soil Cleanup Levels – Unrestricted

WAC 173-340-740 includes methods and policies for establishing soil cleanup levels for residential properties and other unrestricted land uses (e.g., schools, parks, etc.). Ecology used these methods and policies to establish the Method A soil cleanup levels in the current rule. Soil cleanup levels must meet the following requirements:

- Applicable state and federal laws. MTCA requires that cleanup levels must be at least as stringent as requirements in other applicable state and federal laws and regulations. Soil cleanup levels must be at least as stringent as the PCB requirements under the Toxics Substances Control Act (TSCA). The MTCA rule requires downward adjustment of these concentrations if they correspond to a hazard quotient greater than one (1) or an excess cancer risk greater than one-in-one hundred thousand (1×10^{-5}).
- Environmental protection. Soil cleanup levels must be at least as stringent as concentrations that are estimated to result in no adverse effects on the protection and propagation of aquatic life and no significant adverse effects on terrestrial ecological receptors using the procedures in WAC 173-340-7490 through WAC 173-340-7493.
- Human health protection. Soil cleanup must protect human health based on a consideration of the following exposure pathways:
 - Ground water protection. Soil cleanup levels must be established at concentrations that prevent exceedances of ground water cleanup standards established under WAC 173-340-720.
 - Soil direct contact. Soil cleanup levels must generally be at least as stringent as the risk-based concentrations calculated using the equations and parameters specified in the MTCA rule (Equations 740-1 and 740-2 or Equations 740-4 and 740-5). For non-carcinogenic health risks, cleanup levels are based on a hazard quotient of 1. For known or suspected carcinogens, cleanup levels are based on an excess cancer risk of one in one million (1×10^{-6}).
 - Soil vapors. Soil cleanup levels must be established at levels that prevent accumulation of hazardous substances inside buildings at concentrations above the MTCA air cleanup levels.
- Analytical considerations. The MTCA rule specifies that soil cleanup levels shall not be set at concentrations below the practical quantitation limit (PQL).
- Natural background concentrations. The MTCA rule specifies that soil cleanup levels shall not be set at levels below natural background concentrations.

The MTCA rule also specifies that the total site risk for carcinogens cannot exceed one-in-one hundred thousand (10^{-5}). Non-cancer total site risk cannot exceed a hazard quotient of one. The MTCA rule require that the cleanup levels established for individual substances be

adjusted downward if the total site risk exceeds either of these limits. Total site risk includes consideration of multiple hazardous substances and multiple pathways of exposure.

Review Process

1. Toxicological information. Ecology reviewed the Integrated Risk Information System (IRIS) database and the information compiled by the Oakridge National Laboratory and the Environmental Protection Agency. Ecology used those sources to identify cancer slope factors and reference doses that had been developed or updated since the 2001 rule revisions.
2. Potential revisions to ground water cleanup standards. Most of the Method A soil cleanup levels are based on preventing ground water contamination. As part of this evaluation, Ecology considered the results of the initial review of the ground water cleanup levels.
3. Analytical limits. For purposes of this evaluation, Ecology used the practical quantitation limits considered when preparing the 2001 rule revisions. In general, these values appear to be representative of current analytical capabilities.
4. Initial evaluation. Ecology used the information described above to recalculate the cleanup levels based on the direct contact pathway and ground water protection. This provided the basis for making an initial determination on whether revisions to particular Method A levels might be necessary. Please note that this review did not consider ecological risks.

Summary of Preliminary Evaluation

Table 740-1 includes Method A soil cleanup levels for 22 substances and 5 petroleum mixtures. New toxicological parameters and/or applicable guidance have been developed for at least 14 of those substances since the 2001 MTCA rule revisions. Preliminary review of the new information indicates the following:

- Soil cleanup levels based on ground water protection. Based on available data, it appears that the majority of the current Method A soil cleanup levels will not require revisions. This is largely due to the fact that many of the current Method A soil cleanup levels are based on ground water protection. Since many of the current Method A ground water cleanup levels do not appear to require changes, Method A soil cleanup levels for those substances will also not need to be revised. These substances are identified in Table 3.2. As noted in Section 2, these preliminary conclusions may need to be revisited if the MTCA/SMS Advisory Group discussions, MTCA Science Panel review or public review result in significant revisions to the current MTCA methods and policies.
- Increase being considered. Ecology is considering increasing the ground water cleanup level for ethylene dibromide (EDB) to 0.05 ug/L based on the updated cancer slope factor for this substance. The Method A soil cleanup level is currently based on ground water protection. If Ecology increased the ground water cleanup level, the soil cleanup level would also be modified.

- Substance-Specific Issues That Require Further Review/Discussion. There are several substances where new toxicity information, new regulatory guidelines and/or consideration of the vapor intrusion pathway could justify revising the current Method A cleanup level.

Substance	Rulemaking Issues
Benzo[a]pyrene	<ul style="list-style-type: none"> • Should Ecology adjust the current Method A soil cleanup levels for benzo[a]pyrene consistent with EPA guidance on early life stage considerations? • Should Ecology consider concurrent soil exposure pathways (e.g., soil ingestion and dermal contact) when updating the Method A soil cleanup levels? • How should Ecology take into account background levels of BaP when updating the Method A cleanup levels? • What are the implications of revisions (if any) to the Method A ground water cleanup level for BaP?
Chromium VI	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
DDT	<ul style="list-style-type: none"> • Should Ecology consider concurrent soil exposure pathways (e.g., soil ingestion and dermal contact) when updating the Method A soil cleanup levels?
Ethylbenzene	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
Lead	<ul style="list-style-type: none"> • Should Ecology consider revisions to the current Method A soil cleanup level for lead given the scientific and regulatory developments since the 2001 rule revisions? • If yes, what methods and policies should Ecology use to revise the current value?
Naphthalene	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
PCBs	<ul style="list-style-type: none"> • Should Ecology consider concurrent soil exposure pathways (e.g., soil ingestion and dermal contact) when updating the Method A soil cleanup levels? • If yes, does the PCB criterion established under the Toxics Substance Control Act (TSCA) remain sufficiently protective (i.e., cancer risk below 10^{-5})?
Tetrachloroethylene	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
Trichloroethylene	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
Vinyl chloride	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?

Table 3.2: Method A Soil Cleanup Levels – Unrestricted (excluding TPH Values)
Current Method A Values and Basis for Considering Revisions

	Rule Value	Basis for Current Method A Value	Draft Value	Basis for Considering Revisions	Change
Arsenic	20 mg/kg	Cleanup level based on direct contact using Equation 740-2 and protection of ground water for drinking water use using the procedures in WAC 173-340-747(4), adjusted for natural background for soil.	20 mg/kg	When preparing the 2001 rule revisions, Ecology made a risk management decision to continue to use 20 mg/kg to characterize natural background concentrations of arsenic in Washington soils. The soil sampling report completed by the USGS (1994) indicate that the 90 th percentile values for arsenic in background soils range from 5 to 11 mg/kg. At this point in the rulemaking process, Ecology does not plan to revisit this risk management decision.	No Change Planned
Benzene	0.03 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures in WAC 173-340-747(4) and (6).	0.03 mg/kg	The current Method A value is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for benzene. Consequently, Ecology does not plan to revise the Method A soil cleanup level.	No Change Planned
Benzo[a]pyrene	0.1 mg/kg	Cleanup level based on direct contact using Equation 740-2. If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).		<ul style="list-style-type: none"> Should Ecology apply early life stage adjustments to BaP when calculating MTCA cleanup levels? If yes, what does that mean for the Method A value? Should Ecology consider concurrent exposure pathways when updating the Method A value? <p>[SEPARATE DISCUSSION MATERIALS]</p>	Discuss with Advisory Group
Cadmium	2 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit for soil.	2 mg/kg	The current Method A soil cleanup level for cadmium is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for cadmium. Consequently, Ecology does not plan to revise the Method A soil cleanup level. The PQL used to adjust the 2001 value continues to appear reasonable.	No Change Planned
Chromium VI	19 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	19 mg/kg		Further review

	Rule Value	Basis for Current Method A Value	Draft Value	Basis for Considering Revisions	Change
Chromium III	2000 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). Chromium VI must also be tested for and the cleanup level met when present at a site.	2000 mg/kg	Chromium III. The current Method A soil cleanup level for chromium III is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for chromium III. Consequently, Ecology does not plan to revise the Method A soil cleanup level.	No Change Planned
DDT	3 mg/kg	Cleanup level based on direct contact using Equation 740-2.	3 mg/kg	Ecology does not currently plan to revise the Method A value for DDT. EPA has not revised the toxicological parameters for DDT since the 2001 MTCA rule amendments. The difference between the risk-based soil cleanup level based on soil ingestion (2.9 mg/kg) and the risk-based level based on soil ingestion and dermal contact (2.7 mg/kg) is not large enough to require a revision to the soil cleanup value.	No Change Planned
Ethylbenzene	6 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	???	The Method A soil cleanup level for ethylbenzene is based on ground water protection. Ecology is considering whether to revise the ground water cleanup level for ethylbenzene based on new scientific information. Specifically, Ecology is evaluating whether ethylbenzene should be regulated as a carcinogen under MTCA. [SEPARATE DISCUSSION MATERIALS FOR FUTURE MEETING]	Discuss with Advisory Group
Ethylene Dibromide (EDB)	0.005 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	0.02 mg/kg	The current Method A soil cleanup level for EDB is based on ground water protection. Ecology currently plans to revise the ground water cleanup level for EDB because EPA lowered the cancer slope factor from 85 to 2 (mg/kgday) ⁻¹ . Consequently, Ecology plans to adjust the Method A soil cleanup level for EDB using the procedures in WAC 173-340-747(4).	Change Based on New Cancer Slope Value
Lead	250 mg/kg	Cleanup level based on preventing unacceptable blood lead levels.	???	Ecology is currently considering whether to modify the Method A lead cleanup level based on new scientific information. [SEPARATE DISCUSSION MATERIALS]	Discuss With Advisory Group
Lindane	0.01 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit	0.01 mg/kg	The current Method A soil cleanup level for lindane is based on ground water protection. Ecology does not plan to revise the ground water cleanup level for lindane. Consequently, Ecology does not plan to revise the Method A soil cleanup level. The PQL used to adjust the 2001 value continues to appear reasonable.	No Change Planned

	Rule Value	Basis for Current Method A Value	Draft Value	Basis for Considering Revisions	Change
Methylene chloride	0.02 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	0.02 mg/kg	The current Method A soil cleanup level for methylene chloride is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for methylene chloride. Consequently, Ecology does not plan to revise the Method A soil cleanup level.	No Change Planned
Mercury (inorganic)	2 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	2 mg/kg	The current Method A soil cleanup level for mercury is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for mercury. Consequently, Ecology does not plan to revise the Method A soil cleanup level.	No Change Planned
MTBE	0.1 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	0.1 mg/kg	The current Method A soil cleanup level for MTBE is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for MTBE. Consequently, Ecology does not plan to revise the Method A soil cleanup level.	No Change Planned
Naphthalenes	5 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene	???	The Method A soil cleanup level for naphthalenes is based on ground water protection. Ecology is considering whether to revise the ground water cleanup level for naphthalenes based on new scientific information. Specifically, Ecology is evaluating whether naphthalenes should be regulated as carcinogens under MTCA. [SEPARATE DISCUSSION MATERIALS FOR FUTURE MEETING]	Discuss with Advisory Group
PAHs		See Benzo[a]pyrene			
PCB Mixtures	1 mg/kg	Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs	1 mg/kg	Ecology does not currently plan to revise the Method A cleanup level for PCBs. Since 2001, EPA has not updated the IRIS toxicological parameters for PCBs or revised the TSCA standard. The cancer risks at a soil concentration of 1 mg/kg are less than one-in-one hundred thousand when calculated using equations 740-2 (soil ingestion) and 740-5 (soil ingestion and dermal contact).	No Change Planned
Tetrachloroethylene (PCE)	0.05 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	???	The current Method A soil cleanup level for perchloroethylene is based on ground water protection. Ecology will review the soil cleanup level after deciding how to update the ground water cleanup level for PCE.	Discuss with Advisory Group

	Rule Value	Basis for Current Method A Value Published in 2001	Draft Value	Basis for Considering Revisions	Change
Toluene	7 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	7 mg/kg	The current Method A soil cleanup level for toluene is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for toluene. Consequently, Ecology does not plan to revise the Method A soil cleanup level.	No Change Planned
1,1,1 Trichloroethane	2 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	2 mg/kg	The current Method A soil cleanup level for 1,1,1 trichloroethane is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for 1,1,1 trichloro-ethane. Consequently, Ecology does not plan to revise the Method A soil cleanup level.	No Change Planned
TCE	0.03 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	???	The current Method A soil cleanup level for trichloroethylene is based on ground water protection. Ecology will review the soil cleanup level after deciding how to update the ground water cleanup level for TCE.	Discuss with Advisory Group
Xylenes	9 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for all xylenes.	1,000 ug/L	<ul style="list-style-type: none"> EPA has published an oral reference dose (0.2 mg/kg/day) and inhalation reference concentration (0.1 mg/m³) that are applicable to xylene mixtures and m-, o- and p- xylene isomers. Method B ground water cleanup level based on the IRIS oral RfD is 1600 ug/L. ORNL/EPA tables include a RBC for total xylenes of 200 ug/L. This is driven by the inhalation pathway which is derived from the IRIS RfDi value. CalEPA has published RfCs for the 3 xylene isomers that is 7 times less stringent than the IRIS value. The ORNL/EPA table uses the Cal EPA values to develop RBCs (1,200 ug/L) for the three xylene isomers Drinking water standard for xylene mixtures (MCL = 10,000 ug/L) GW vapor intrusion screening value is 310 ug/L (3100 ug/L if assume additional 10 fold attenuation due to biodegradation). 	No Change Planned (Pending Inhalation Risk Revisions)

4. Preliminary Review of Method A Industrial Soil Cleanup Levels

Summary of Key Requirements for MTCA Industrial Soil Cleanup Levels

WAC 173-340-745 establishes the methods and policies for establishing soil cleanup levels for industrial properties. Ecology used these methods and policies to establish the Method A industrial soil cleanup levels in the current rule. Industrial soil cleanup levels must meet the following requirements:

- Applicable state and federal laws. MTCA requires that cleanup levels must be at least as stringent as requirements in other applicable state and federal laws and regulations. Soil cleanup levels must be at least as stringent as the PCB requirements under the Toxics Substances Control Act (TSCA). The MTCA rule requires downward adjustment of these concentrations if they correspond to a hazard quotient greater than one (1) or an excess cancer risk greater than one-in-one hundred thousand (1×10^{-5}).
- Environmental protection. Soil cleanup levels must be at least as stringent as concentrations that are estimated to result in no adverse effects on the protection and propagation of wildlife using the procedures in WAC 173-340-7490 through WAC 173-340-7493.
- Human health protection. Soil cleanup must protect human health based on a consideration of the following exposure pathways:
 - Ground water protection. Soil cleanup levels must be established at concentrations that prevent exceedances of ground water cleanup standards established under WAC 173-340-720.
 - Soil direct contact. Soil cleanup levels must generally be at least as stringent as the risk-based concentrations calculated using the equations and parameters specified in the MTCA rule (Equations 745-1 and 745-2 or Equations 745-4 and 745-5). For non-carcinogenic health risks, cleanup levels are based on a hazard quotient of 1. For known or suspected carcinogens, cleanup levels are based on an excess cancer risk of one in one million (1×10^{-5}).
 - Soil vapors. Soil cleanup levels must be established at levels that prevent accumulation of hazardous substances inside buildings at concentrations above the MTCA air cleanup levels.
- Analytical considerations. The MTCA rule specifies that soil cleanup levels shall not be set at concentrations below the practical quantitation limit (PQL).
- Natural background concentrations. The MTCA rule specifies that soil cleanup levels shall not be set at levels below natural background concentrations.

The MTCA rule also specifies that the total site risk for carcinogens cannot exceed one-in-one hundred thousand (10^{-5}). Non-cancer total site risk cannot exceed a hazard quotient of one. The MTCA rule require that the cleanup levels established for individual substances be adjusted downward if the total risk exceeds either of these limits. Total site risk includes consideration of multiple hazardous substances and multiple pathways of exposure.

Review Process

1. Toxicological information. Ecology reviewed the Integrated Risk Information System (IRIS) database and the information compiled by the Oakridge National Laboratory and the Environmental Protection Agency. Ecology used those sources to identify cancer slope factors and reference doses that had been developed or updated since the 2001 rule revisions.
2. Potential revisions to ground water cleanup standards. Most of the Method A soil cleanup levels are based on preventing ground water contamination. As part of this evaluation, Ecology considered the results of the initial review of the ground water cleanup levels.
3. Analytical limit. For purposes of this evaluation, Ecology used the practical quantitation limits used to prepare the 2001 rule revisions. In general, these values appear to be representative of current analytical capabilities.
4. Initial evaluation. Ecology used the information described above to recalculate the cleanup levels based on the direct contact pathway and ground water protection. This provided the basis for making an initial determination on whether revisions to particular Method A levels might be necessary. Please note that this review did not consider ecological risks.

Summary of Preliminary Evaluation

Table 745-1 includes Method A soil cleanup levels for 22 substances and 5 petroleum mixtures. New toxicological parameters and/or applicable guidance have been developed for at least 14 of those substances since the 2001 MTCA rule revisions. Preliminary review of the new information indicates the following:

- Soil Cleanup Levels Based on Ground Water Protection: Based on available data, it appears that the majority of the current Method A soil cleanup levels will not require revisions. This is largely due to the fact that many of the current Method A soil cleanup levels are based on ground water protection. Since many of the current Method A ground water cleanup levels do not appear to require changes, Method A soil cleanup levels for those substances will also not need to be revised. These substances are identified in Table 4.2. As noted in Section 2, these preliminary conclusions may need to be revisited if the MTCA/SMS Advisory Group discussions, MTCA Science Panel review or public review result in significant revisions to the current MTCA methods and policies.
- Increase Being Considered: Ecology is considering increasing the ground water cleanup level for ethylene dibromide (EDB) to 0.05 ug/L based on the updated cancer slope factor for this substance. The Method A soil cleanup level is currently based on ground water protection. If Ecology increased the ground water cleanup level, the soil cleanup level would also need to be modified.
- Substance-Specific Issues That Require Further Review/Discussion: There are several substances where new toxicity information, new regulatory guidelines and/or

consideration of the vapor intrusion pathway could justify revising the current Method A cleanup level.

Table 3.1: Issues Associated with Updating the Method A Soil Cleanup Levels	
Substance	Rulemaking Issues
Benzo[a]pyrene	<ul style="list-style-type: none"> • Should Ecology adjust the current Method A soil cleanup levels for benzo[a]pyrene consistent with EPA guidance on early life stage considerations? • How should Ecology take into account background levels of BaP when updating the Method A cleanup levels? • What are the implications of revisions (if any) to the Method A ground water cleanup level for BaP?
Chromium VI	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
DDT	<ul style="list-style-type: none"> • Should Ecology consider concurrent soil exposure pathways (e.g., soil ingestion and dermal contact) when updating the Method A soil cleanup levels?
Ethylbenzene	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
Lead	<ul style="list-style-type: none"> • Should Ecology consider revisions to the current Method A soil cleanup level for lead given the scientific and regulatory developments since the 2001 rule revisions? • If yes, what methods and policies should Ecology use to revise the current value?
Naphthalene	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
PCBs	<ul style="list-style-type: none"> • Should Ecology consider concurrent soil exposure pathways (e.g., soil ingestion and dermal contact) when updating the Method A soil cleanup levels? • If yes, does the PCB criterion established under the Toxics Substance Control Act (TSCA) remain sufficiently protective (i.e., cancer risk below 10^{-5})?
Tetrachloroethylene	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
Trichloroethylene	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?
Vinyl chloride	<ul style="list-style-type: none"> • What changes are needed if Ecology decides to modify the ground water cleanup level?

Table 4.1: Method A Industrial Soil Cleanup Levels (excluding TPH Values)
Current Method A Values and Basis for Considering Revisions

	Rule Value	Basis for Current Method A Value	Draft Value	Basis for Considering Revisions	Change
Arsenic	20 mg/kg	Cleanup level based on direct contact using Equation 740-2 and protection of ground water for drinking water use using the procedures in WAC 173-340-747(4), adjusted for natural background for soil.	20 mg/kg	See Table 3.2.	No Change Planned
Benzene	0.03 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures in WAC 173-340-747(4) and (6).	0.03 mg/kg	See Table 3.2.	No Change Planned
Benzo[a]pyrene	2 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures in WAC 173-340-747(4) and (6). If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).		See Table 3.2.	Discuss with Advisory Group
Cadmium	2 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit for soil.	2 mg/kg	See Table 3.2.	No Change Planned
Chromium VI	19 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	19 mg/kg	See Table 3.2.	
Chromium III	2000 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). Chromium VI must also be tested for and the cleanup level met when present at a site.	2000 mg/kg	See Table 3.2.	No Change Planned

	Rule Value	Basis for Current Method A Value	Draft Value	Basis for Considering Revisions	Change
DDT	4 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	4 mg/kg	The current Method A soil cleanup level for DDT is based on ground water protection. Ecology does not currently plan to revise the ground water cleanup level for DDT. Consequently, Ecology does not plan to revise the Method A soil value.	No Change Planned
Ethylbenzene	6 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	???	See Table 3.2.	Discuss with Advisory Group
Ethylene Dibromide (EDB)	0.005 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	0.02 mg/kg	See Table 3.2.	Change Based on New Cancer Slope Value
Lead	1000 mg/kg	Cleanup level based on direct contact.	???	Ecology is currently considering whether to modify the Method A lead cleanup level based on new scientific information. [SEPARATE DISCUSSION MATERIALS]	Discuss With Advisory Group
Lindane	0.01 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit	0.01 mg/kg	See Table 3.2.	No Change Planned
Methylene Chloride	0.02 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	0.02 mg/kg	See Table 3.2.	No Change Planned
Mercury (inorganic)	2 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	2 mg/kg	See Table 3.2.	No Change Planned
MTBE	0.1 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).	0.1 mg/kg	See Table 3.2.	No Change Planned

	Rule Value	Basis for Current Method A Value Published in 2001	Draft Value	Basis for Considering Revisions	Change
Naphthalenes	5 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.	???	See Table 3.1.	Discuss with Advisory Group
PAHs		See Benzo[a]pyrene			
PCB Mixtures	10 mg/kg	Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs	10 mg/kg	Ecology does not currently plan to revise the Method A cleanup level for PCBs. Since 2001, EPA has not updated the IRIS toxicological parameters for PCBs or revised the TSCA standard. The cancer risks at a soil concentration of 10 mg/kg are less than one-in-one hundred thousand when calculated using equations 745-2 (soil ingestion) and 745-5 (soil ingestion and dermal contact).	No Change Planned
Tetrachloroethylene (PCE)	0.05 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	???	See Table 3.2.	Discuss with Advisory Group
Toluene	7 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	7 mg/kg	See Table 3.2.	No Change Planned
1,1,1 Trichloroethane	2 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	2 mg/kg	See Table 3.2.	No Change Planned
TCE	0.03 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4)	???	See Table 3.2.	Discuss with Advisory Group
Xylenes	9 mg/kg	Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for all xylenes.	1,000 ug/L	See Table 3.2.	No Change Planned (Pending Inhalation Risk Revisions)

5. Discussion Questions for March 22 & Future Meetings

There are several risk assessment issues associated with updating the MTCA Cleanup Regulation. Review of the Method A cleanup tables provides a mechanism for discussing both the scientific, policy and practical implications of those issues. When reviewing these materials, Ecology would like committee members to consider the following questions/issues:

1. Priorities for Further Review: Ecology is not planning changes for the majority of the substances on the Method A lists.
 - Do you agree or disagree with these initial conclusions?
 - If not, do you know of additional information that would assist Ecology to evaluate those substances that you believe require further review?
2. Hierarchy of Toxicological Information: When available, Ecology uses toxicity values published in the IRIS database to establish risk-based cleanup levels. When toxicity values are not available, the MTCA rule identifies additional information sources of toxicity values (see Figure 5.1 below).

There are several substances in the Method A tables that do not have IRIS toxicity values for cancer and/or non-cancer health effects (e.g., tetrachloroethylene). When evaluating the need for revisions, Ecology has used the “Regional Screening Levels for Chemical Contaminants at Superfund Sites” as a source of toxicity parameters. This website was developed by the Oakridge National Laboratory under an interagency agreement with EPA. ORNL works with EPA to update the website on a quarterly basis. The ORNL/EPA website is similar to the MTCA rule provisions in that it reflects a hierarchy or preference for certain sources of toxicological information. However, there are several important differences that are summarized in Figure 5.2.

- Do you believe the ORNL/EPA website provides a reasonable source of toxicological parameters when such values are not included in the IRIS database?
- If not, how should Ecology select toxicity parameters when values are not included in the IRIS database? Are there any substantive criteria (e.g., publication date, peer review) that you believe would help guide Ecology when making these decisions?
- The ORNL/EPA does not provide the same opportunities for peer and public review that EPA provides when preparing IRIS values? Do you have any suggestions on the process/procedures that Ecology might use when using values from the ORNL/EPA website or other sources (e.g., consultation with DOH, EPA, scientific review panel)?

Figure 5.1 MTCA Data Hierarchy Provisions for Reference Doses/Reference

Concentrations (WAC 173-340-708(7))

- The MTCA rule states a preference for using reference doses/reference concentrations available through the "Integrated Risk Information System" (IRIS) data base to establish cleanup levels/remediation levels.
- When a reference dose/ reference concentration is not available through the IRIS data base, the MTCA rule states that reference doses/reference concentrations from the U.S. EPA Health Effects Assessment Summary Table ("HEAST") database may be used. Alternatively, values published by the National Center for Environmental Assessment ("NCEA") can be used.
- The MTCA rule includes a strong preference for using values from the three identified sources. These values must be used unless the department determines that there is clear and convincing scientific data which demonstrates that the use of a particular value is inappropriate.
- When establishing a reference dose on a case-by-case basis (alternate value), Ecology must use the methods described in "Reference Dose (RfD): Description and Use in Health Risk Assessment: Background Document 1A", USEPA, March 15, 1993.
- When developing alternate values, Ecology shall, as appropriate, consult with the Science Advisory Board, the Department of Health, and the United States Environmental Protection Agency. Ecology must demonstrate that the alternate value is consistent with the quality of information requirements in WAC 173-340-702 (14), (15) and (16).
- Ecology must generally summarize the scientific rationale for alternate values in the cleanup action plan and provide an opportunity for public review and comment.

Figure 5.2 Comparison of MTCA Data Hierarchy and Oakridge National Laboratory/EPA Website

- ORNL/EPA scientists generally give preference to values available through the IRIS database.
- ORNL/EPA scientists consider a wider range of information sources when updating the website. In particular, the website includes toxicological values published by the Agency for Toxic Substances and Disease Registry (ATSDR) and various state agencies (such as the California Environmental Protection Agency).
- ORNL/EPA website is updated on a quarterly basis and consider newer toxicological values. This is a key difference because EPA no longer updates the Health Effects Assessment Summary Tables (HEAST). In many cases, the HEAST values are inconsistent with current scientific information and regulatory guidelines.
- Values in the ORNL/EPA website are reviewed and discussed by scientific review teams prior to publication. However, the general public is not provided an opportunity to review draft values prior to inclusion on the ORNL/EPA website

3. Magnitude of Changes: Ecology is often faced with decisions during rulemaking and/or periodic reviews of cleanup actions on how to deal with new scientific information that indicates that a higher or lower cleanup level is appropriate.
 - How big of a change in a risk-based cleanup level warrants revisions to the Method A Tables?
4. Need and Priority for Addressing Risk Assessment Issues: Ecology has identified several risk assessment issues associated with updating the Method A cleanup levels for one or more of the hazardous substances (See Figure 5.3).
 - Do you agree that these issues should be addressed when updating the Method A cleanup levels?
 - Do you have opinions on the relative priority for addressing these issues during the current rulemaking process? For example, how do some of these issues compare (priority-wise) with issues surrounding fish consumption rates and bioaccumulation factors (BAFs) and biota-sediment accumulation factors (BSAFs)?
 - Are there other risk assessment issues that you would recommend that Ecology consider when updating the Method A cleanup levels for one or more substances?

Figure 5.3: General Risk Assessment Issues Applicable to Updating One or More Method A Cleanup Levels and Establishing Method B and C Cleanup Levels

- Definition of Carcinogen: How should Ecology deal with chemicals that have been identified as carcinogens by other scientific groups (IARC/NTP) when those classifications are not reflected in the IRIS database? This is a key issue underlying decisions on whether and how to update the Method A values for naphthalene and ethylbenzene.
- Early Life Stage Adjustment: How should Ecology take into account scientific information and EPA regulatory guidance on early life susceptibility to carcinogens? This is a key issue for benzo[a]pyrene and will be discussed at the March 22nd. The approach used for other carcinogens will be discussed after Ecology reviews the committee feedback on BaP.
- Vapor Intrusion Pathway: Some chemicals are highly volatile (e.g. vinyl chloride, TCE) and may pose VI risks at ground water concentrations below cleanup levels based on the drinking water pathway. How should Ecology evaluate the VI pathway? Should the Method A table values be revised to incorporate cleanup levels based on this pathway?
- Concurrent Soil Pathways: Should Ecology consider concurrent soil exposure pathways (e.g., soil ingestion and dermal contact) when updating the Method A soil cleanup levels. This is an issue for BaP, DDT and PCBs. It also could also impact industrial soil cleanup levels for several other substances (e.g. pentachlorophenol).
- EPA Inhalation Risk Assessment Guidance: When calculating risk-based ground water cleanup levels, Ecology assumes that inhalation risks associated with volatile chemicals is equal the risks associated with ingestion of drinking water and cooking. Given EPA's updated guidance on inhalation risk assessment, should Ecology review the assumptions on inhalation risks when updating the Method A ground water cleanup levels for volatile chemicals?

New Oral Reference Doses and Cancer Slope Factors Considered By Ecology (Source: ORNL/EPA - December 2009)						
Chemical	CAS	RfD (oral)	Source	CSF (oral)	Source	Comments
Arsenic	7440-38-2					EPA published a revised MCL (10 ug/L) in January 2010.
Benzene	71-43-2	4.0E-03	IRIS	5.5E-02	IRIS	
Benzo[a]pyrene	50-32-2					EPA published guidance on early life stage considerations that apply to benzo[a]pyrene.
Chromium VI	7440-47-3			5.0E-01	NJDEP	Oregon DEQ uses ORNL/EPA values to update their screening levels. Oral CSF for Cr+6 not included.
1,2 Dichloroethane (EDC)	107-06-2	2.0E-02	IRIS			
Ethylbenzene	100-41-4			1.1E-02	CalEPA	
Ethylene dibromide (EDB)	107-06-2	9.0E-03	IRIS	2.0E+00	IRIS	
MTBE	1634-04-4			1.8E-03	CalEPA	
Naphthalenes	91-20-3					Inhalation Unit Risk = 3.4E-05 from CalEPA
Methylnaphthalene, 1	90-12-0	7.0E-02	ATSDR	2.9E-02	PPTRV	
Methylnaphthalene, 2	91-57-6	4.0E-03	IRIS			
PCB mixtures		1.0E-04	IRIS			Cleanup levels still based on cancer endpoint
Tetrachloroethylene	127-18-4			5.4E-01	CalEPA	EPA Draft IRIS report includes range of 0.01 to 0.1. EPA considering NRC review results.
Toluene	108-88-3	8.0E-02	IRIS			
1,1,1-Trichloroethane	71-55-6	2.0E+00	IRIS			
Trichloroethylene	79-01-6			5.9-03	Draft	EPA published peer review draft in 11/09. ORNL/EPA lists oral CSF = 0.0059 (CalEPA)
Vinyl chloride	75-01-4					EPA published guidance on early life stage considerations that apply to vinyl chloride.
Xylenes	1330-20-7	2.0E-01	IRIS			

**MTCA Ground Water Cleanup Level Calculations Based on New Toxicity Values
(without Early Life Stage Considerations)**

Chemical	CAS	RfD oral (1)	CPF oral (1)	INH (2)	Method B - Non-Cancer	Method B - Cancer	MCL (1)	PQL (3)	VI GW Screening Level (4)	Current Method A (5)
Arsenic	7440-38-2	3.0E-04	1.5E+00	1	5	0.06	10	2		5
Benzene	71-43-2	4.0E-03	5.5E-02	2	32	0.8	5	1	2.4	5
Benzo[a]pyrene	50-32-2	NA	7.3E+00	1	NA	0.01	0.2	0.02		0.1
Cadmium	7440-43-9	5.0E-04	NA	1	8		5	0.1		5
Chromium (total)	7440-47-3	3.0E-03	NA	1	48		100	5		50
DDT	50-29-3	5.0E-04	3.4E-01	1	8	0.3	NA	0.1		0.3
1,2-Dichloroethane (EDC)	107-06-2	0.02	9.1E-02	2	160	0.5	5	1	4.2	5
Ethylbenzene	100-41-4	1.0E-01	1.1E-02	2	800	4	700	1	2800	700
Ethylene dibromide (EDB)	107-06-2	9.0E-03	2.0E+00	2	72	0.02	0.05	0.01	0.74	0.01
Gross Alpha Particle Activity										15
Gross Beta Particle Activity										4
Lead	7439-92-1	NA	NA	1	NA	NA	15	2		15
Lindane	58-89-9	3.0E-04	1.1E+00	1	5	0.08	0.2	0.1		0.2
Mercury	7439-97-6	3.0E-04	NA	1	5	NA	2	0.1	0.89	2
Methylene chloride	75-09-2	6.0E-02	7.5E-03	2	480	6	5	1	94	5
MTBE	1634-04-4	NA	1.8E-03	2	NA	24		1	610	20
Naphthalenes	91-20-3	2.0E-02		2	160			1	170	160
Methylnaphthalene, 1	90-12-0	0.07	2.9E-02	2	560	2				

Methylnaphthalene, 2	91-57-6	0.004		2	32					
PAHs (carcinogenic)								0.02		
PCB mixtures		0.0001	2.0E+00	1	2	0.04	0.5	0.1		0.1
Radium 226 and 228							5 pCi/L			5 pCi/L
Radium 226							3 pCi/L			3 pCi/L
Tetrachloroethylene	127-18-4	1.0E-02	5.4E-01	2	80	0.08	5	1	1	5
Toluene	108-88-3	8.0E-02		2	640		1000	1	15000	1000
1,1,1-Trichloroethane	71-55-6	9.0E-01		2	7200		200	1	11000	200
Trichloroethylene	79-01-6	NA	5.9E-03	2	NA	7	5	1	2.5	5
Vinyl chloride	75-01-4	3.0E-03	7.2E-01	2	24	0.06	0.2	0.01	0.35	0.2
Xylenes	1330-20-7	2.0E-01		2	1600			3	310	1000

New Toxicity Values are shown in yellow highlight

1. New toxicity values and MCLs obtained from Regional Screening Levels for Chemical Contaminants at Superfund Sites. December 2009. http://www.epa.gov/reg3hscd/risk/human/rb-concentration_table/index.htm
2. Inhalation Correction Factors (INH) were obtained from the Cleanup Levels and Risk Calculation (CLARC) database. <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>
3. Practical Quantitation Limits obtained from Concise Explanatory Statement for 2001 Rule Amendments. Appendix D. Calculations for Method A Cleanup Levels. http://www.ecy.wa.gov/programs/tcp/regs/Appendix_D.pdf
4. Vapor Intrusion Ground Water Screening Levels obtained from Draft Guidance for Evaluating Vapor Intrusion at Washington Sites: Investigations and Remedial Actions. (October 2009) <http://www.ecy.wa.gov/programs/tcp/policies/VaporIntrusion/vig.html>
5. Current Method A Ground Water Cleanup Levels are listed in Table 720-1 of the MTCA Cleanup Regulation.