NOVA SCOTIA

ENVIRONMENTAL QUALITY STANDARDS FOR CONTAMINATED SITES

RATIONALE AND GUIDANCE DOCUMENT

April 2014

Acknowledgement

Nova Scotia Environment (NSE) wishes to thank the members of the Nova Scotia Environment Numerical Standards and Site Assessment Methodologies Working Group and their respective organizations for their significant contributions and assistance. This group was formed and tasked during 2009 to provide support and advice in the initial scientific information and processes referenced in this guidance document. Working Group Members included the following (with original affiliation):

Mr. Don Carey	Stantec Consulting Ltd.
Mr. Gordon Check	Nova Scotia Environment
Mr. Paul Currie	Nova Scotia Environment
Mr. Murray Hartwell	Maxxam Analytics Inc.
Mr. John Henderson	Stantec Consulting Ltd.
Dr. Bryan Leece	Dillon Consulting
Ms. Rita Mroz	Environment Canada
Ms. Michelle Phillips	Health Canada
Ms. Sylvia Tremblay	Nova Scotia Environment (Administrative Support)
Mr. Rob Willis	Intrinsik Environmental Sciences Inc.

In addition, Mr. John Henderson and Mr. Rob Willis of the Working Group are specifically acknowledged as co-authors who prepared a report in 2011 summarizing the work which forms much of the basis for this document.

This Rationale and Guidance document includes revisions and technical updates to the 2011 report by members of Nova Scotia Environment's Contaminated Sites staff.

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LIST OF ABBREVIATIONS AND ACRONYMS

AENV	Alberta Environment
ASTM	American Society for Testing and Materials
Atlantic PIRI	Atlantic Partnership in RBCA Implementation
BCMOE	British Columbia Ministry of Environment
BEDS	Biological Effects Database for Sediments
BTEX	Benzene, Toluene, Ethyl-benzene and Xylenes
CASRN	Chemical Abstracts Service Registry Number
CCME	Canadian Council of Ministers of the Environment
CoC	Contaminant of Concern
EQS	Environmental Quality Standard
HC	Health Canada
ISQG	Interim Sediment Quality Guidelines
NOAA	National Oceanic and Atmospheric Administration
NSSAM	Numerical Standards and Site Assessment Methodologies Working Group
NSTP	National Status and Trends Program
NSE	Nova Scotia Environment
PEL	Probable Effects Level
OMOE	Ontario Ministry of the Environment
PAH	Polycyclic Aromatic Hydrocarbons
PHC	Petroleum Hydrocarbons
PSS	Pathway-specific Standard
RBCA	Risk-Based Corrective Action
RBSL	Risk-Based Screening Level
TEL	Threshold Effects Level
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound(s)

1.0 INTRODUCTION

Nova Scotia Environment (NSE) administers the *Contaminated Sites Regulations*, pursuant to the *Environment Act*. The *Contaminated Sites Regulations* make reference to a number of Ministerial Protocols which include Numerical Environmental Quality Standards (EQS). This guidance document provides the detailed reference information and rationale that was used to develop the NSE Tier 1 Environmental Quality Standards and the NSE Tier 2 Pathway-Specific Standards tables. These tables are provided in the relevant Ministerial Protocols and include the Tier 1 Environmental Quality Standards (Tier 1 EQS) contained within the Notification of Contamination Protocol (PRO-100), and Tier 2 Pathway-Specific Standards (Tier 2 PSS) contained within the Remediation Levels Protocol (PRO-500). These are the regulatory numerical standards used in Nova Scotia for notification, assessment and remediation of contaminated sites.

This is a supporting document only and should be read in conjunction with the *Contaminated Sites Regulations* and Ministerial Protocols. Any wording, information or requirements contained in the *Contaminated Sites Regulations* or Ministerial Protocols takes precedence over this guidance document.

1.1 BACKGROUND

In 2009, NSE formed a Numerical Standards and Site Assessment Methodologies Working Group (NSSAM Working Group), which included a number of scientific experts, to advise NSE on the process of developing numerical environmental quality standards to support contaminated site regulations. The NSSAM Working Group completed significant research related to sources of existing environmental quality standards, relevant environmental media, and typical receptors/exposure pathways. Following the work and advice of the NSSAM working group, NSE commissioned a report in 2011 which forms much of the rationale and background for this document.

1.2 OBJECTIVE

The objectives of this document are as follows:

- to provide the basis and rationale for the development and subsequent adoption of environmental quality standards for application to contaminated sites in Nova Scotia;
- to provide site professionals and others with an understanding of the hierarchy of jurisdictional sources used and the source references for environmental quality standards used in the Nova Scotia Tier 1 EQS and Tier 2 PSS tables; and
- to provide site professionals with guidance in applying the environmental quality standards in conjunction with the *Contaminated Sites Regulations*.

2.0 Development of Environmental Quality Standards

The development of numerical environmental quality standards for the notification, assessment, and remediation of contaminated sites in Nova Scotia is based on a number of important factors.

These factors include;

- relevant media
- potential contaminants of concern
- land use classification, usage and activities incorporating assumptions concerning receptors
- soil texture
- exposure pathways

A discussion of these factors and the jurisdictional hierarchy used in the selection and development of the numerical standards follows.

2.1 APPLICABLE ENVIRONMENTAL MEDIA

The numerical environmental quality standards have been developed for all relevant environmental media which are typically evaluated at contaminated sites in Nova Scotia.

These media include:

- Soil
- Groundwater
- Surface Water (both fresh and marine)
- Sediment

2.2 POTENTIAL CONTAMINANTS OF CONCERN

A master list of potential contaminants of concern (CoC) for all media of interest has been developed. The master list is based on experience at contaminated sites in Nova Scotia and considers environmental quality benchmarks available from other Canadian and US jurisdictions. It is meant to form the basis for the compilation of environmental quality standards for use at contaminated sites within the context of this guidance document and in support of the *Contaminated Sites Regulations*. This list of CoC's is not meant to be used as an analytical screening tool for potential notification under the *Contaminated Sites Regulations.* Each site and situation may warrant a specific evaluation and assessment to determine which, if any, of the potential contaminants of concern may be present. This is important in the context of regulatory requirements.

The master list of CoC's is provided in the Table 2-1, along with their corresponding Chemical Abstracts Service Registry Number (CASRN), where available and applicable. The CASRN for

each substance listed in Table 2-1 is simply an identification number published by the Chemical Abstracts Service, a division of the American Chemical Society.

For consistency, the complete master list of CoC's is used in the Nova Scotia Tier 1 and Tier 2 numerical environmental quality standards regulatory tables found in the *Contaminated Sites Regulations* Ministerial Protocols. For some exposure pathways in the Tier 1 or Tier 2 tables, there may be no chemical guideline or standard available. In such cases, the absence of an applicable standard is also indicated in the tables.

Table 2-1 Master List of Potential Contaminants of Concern

Master List of Potential Contaminants of Concern	
Inorganics	**CASRN**
Aluminum	7429-90-5
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Beryllium	7440-41-7
Boron (total)	7440-42-8
Boron (hot water soluble)	7440-42-8
Cadmium	7440-43-9
Chromium (hexavalent)	18540-29-9
Chromium (total)	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Cyanide	57-12-5
Iron	7439-89-6
Lead	7439-92-1
Manganese	7439-96-5
Mercury (total)	7439-97-6
Methylmercury	22967-92-6
Molybdenum	7439-98-7
Nickel	7440-01-0
Selenium	7782-49-2
Silver	7440-22-4
Strontium	7440-24-6
Thallium	7440-28-0
Tin	7440-31-5
Uranium	7440-61-1
Vanadium	7440-62-2
Zinc	7440-66-6
Petroleum Hydrocarbons (PHC)	**CASRN**
Benzene	71-43-2
Toluene	108-88-3

Master List of Potential Contaminants of Concern	
Ethylbenzene	100-41-4
Xylenes	Various
Modified Total Petroleum Hydrocarbons (Gasoline)	Various
Modified Total Petroleum Hydrocarbons (Fuel Oil)	Various
Modified Total Petroleum Hydrocarbons (Lube Oil)	Various
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4
Polycyclic Aromatic Hydrocarbons (PAH)	**CASRN**
Naphthalene	91-20-3
1 – Methylnaphthalene	90-12-0
2 – Methylnaphthalene	91-57-6
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Anthracene	120-12-7
Fluoranthene	120-12-7
Fluorene	206-44-0
Phenanthrene	86-73-7
Pyrene	129-00-0
Carcinogenic PAH Compounds	**CASRN**
Benzo[a]pyrene (BaP) Total Potency Equivalents (Human Health))	-
Benz[a]anthracene (Ecological)	56-55-3
Benzo[a]pyrene (Ecological)	50-32-8
Benzo[b,j,k]fluoranthene isomers (Ecological)	205-99-2;205-82-3; 207-08-9
Benzo[g,h,i]perylene (Ecological)	191-24-2
Chrysene (Ecological)	218-01-9
Dibenz[a.h]anthracene (Ecological)	53-70-3
Indeno[1,2,3-c,d]pyrene (Ecological)	193-39-5
Volatile Organic Compounds (VOC)	**CASRN**
Bromodichloromethane	75-27-4
Bromoform	75-25-2
Bromomethane	74-83-9
Carbon Tetrachloride (Tetrachloromethane)	56-23-5
Chlorobenzene	108-90-7
Chloroethane	75-00-3
Chloroform	67-66-3
Chloromethane	74-87-3
Dibromochloromethane	124-48-1
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethylene	75-35-4
cis-1,2-Dichloroethylene	156-59-2
trans-1,2-Dichloroethylene	156-60-5

Master List of Potential Contaminants of Concern	
1,2-Dichloropropane	78-87-5
1,3-Dichloropropene	10061-01-5
Ethylene Dibromide	106-93-4
Methylene Chloride (Dichloromethane)	75-09-2
Styrene	100-42-5
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethylene	127-18-4
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethylene	79-01-6
Vinyl Chloride	75-01-4
Pesticides	**CASRN**
Aldicarb	116-06-3
Aldrin	309-00-2
Atrazine	1912-24-9
Azinphos-methyl	86-50-0
Bendiocarb	22781-23-3
Bromoxynil	1689-84-5
Carbaryl	63-25-2
Carbofuran	1563-66-2
Chlorothalonil	1897-45-6
Chlorpyrifos	2921-88-2
Cyanazine	21725-46-2
2,4-D	94-75-7
DDT	50-29-3
Diazinon	333-41-5
Dicamba	1918-00-9
Dichlorfop-methyl	51338-27-3
Dieldrin	60-57-1
Dimethoate	60-51-5
Dinoseb	88-85-7
Diquat	85-00-7
Diuron	330-54-1
Endosulfan	115-29-7
Endrin	72-20-8
Glyphosate	1071-83-6
Heptachlor	76-44-8
Lindane	58-89-9
Linuron	330-55-2
Malathion	121-75-5
MCPA	94-74-6
Methoxychlor	72-43-5
Metolachlor	51218-45-2

Master List of Potential Contaminants of Concern	
Metribuzin	21087-64-9
Paraquat	4685-14-7
Parathion	56-38-2
Phorate	298-02-2
Picloram	1918-02-1
Simazine	122-34-9
Tebuthiuron	34014-18-1
Terbufos	13071-79-9
Toxaphene	8001-35-2
Triallate	2303-17-5
Trifluralin	1582-09-8
Other Parameters	**CASRN**
Polychlorinated Biphenyls (Total PCB)	Various
Dioxins and Furans (TEQ)	Various
Pentachlorophenol (PCP)	87-86-5
Organotins – Tributyltin	688-73-3
Ethylene Glycol	107-21-1
Propylene Glycol	57-55-6
Phenol	108-95-2

Notes: CASRN is a Registered Trademark of the American Chemical Society.
"-"indicates no CASRN is available or applicable as parameter is not a specific chemical substance.
"*Various*" indicates that a CASRN is not applicable as the parameter is a complex and variable mixture of individual substances.

2.3 LAND USE CLASSIFICATIONS

The exposure frequency, duration and intensity for human and ecological receptors at a contaminated site are related to the nature of the land use, the activities inherent to that land use and the ease of access to site media (CCME, 2006).Therefore, land use is an important factor in the assessment and remediation of contaminated sites.

The Canadian Council of Ministers of the Environment (CCME) uses four land uses in the development of generic CCME Canadian Soil Quality Guidelines.

The four CCME land use categories are as follows;

- Agricultural
- Residential/Parkland
- Commercial
- Industrial

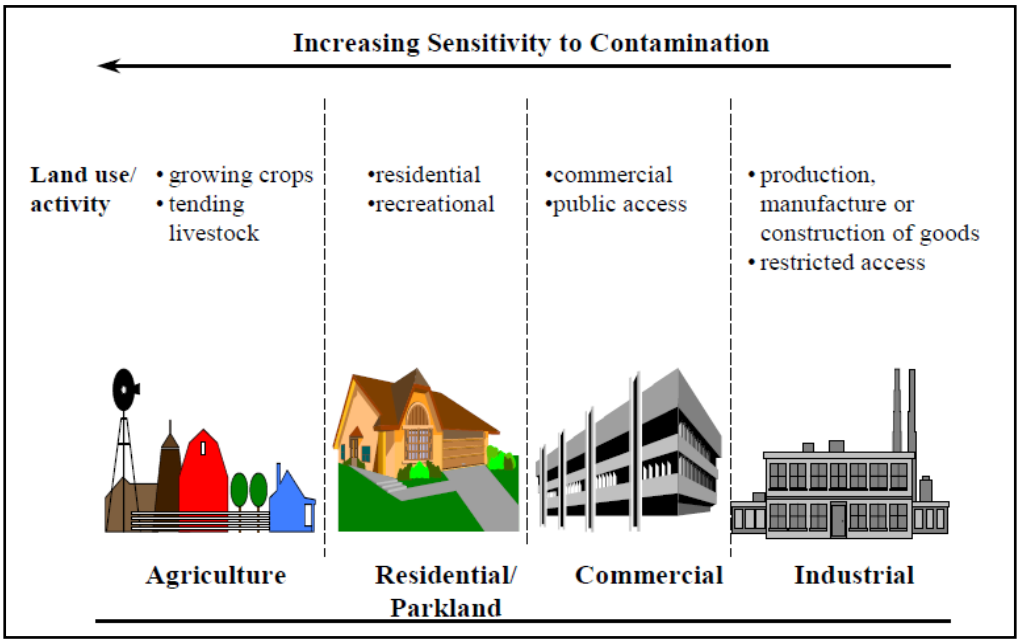
NSE has adopted these land use classifications in the development of Tier 1 EQS and Tier 2 PSS for contaminated sites. In applying the Tier 1 EQS and Tier 2 PSS in accordance with the *Contaminated Sites Regulations* and Ministerial Protocols, the land use category that is most

consistent with, or applicable to, the current site land use and activities (and/or future land use where applicable) must be considered.

It should be noted that not all of the environmental media or exposure pathways are included within specific land use categories. For example, Nova Scotia has not included the soil ecological pathway in the industrial, commercial and residential/parkland land use categories

Potential sensitivity to contamination increases among ecological and human health receptors as a function of the land use/activities that occur on the land as shown in Figure 2-1 below.

Figure 2-1 Sensitivity to Contamination by Land Use/Activity (from CCME, 2006)



The CCME definition of each land use incorporates generic conditions and places boundaries on the receptors and exposure pathways considered in the derivation of the standard for that land use. Details of receptor characteristics and exposure assumptions for each land-use category are provided in CCME (2006).

The four land use categories generally described by CCME (2006) are as follows.

2.3.1 Agricultural

The primary land use/activity is growing crops or tending livestock. This category also includes agricultural lands that provide habitat for resident and transitory wildlife and native flora. Agricultural land may also include a farm residence.

Agricultural land encompasses a wide range of activities including dairy, livestock and/or crop production. Most farms include a homestead; therefore, the possible presence of an on-site

residence (similar to those for residential/parkland sites specified below) is considered in the default scenario. Agricultural lands are generally accessible by the farmer and family members, including children, who represent the more sensitive human receptor category.

The agricultural land-use Tier 1 Environmental Quality Standards for soils in PRO-100 are the only land use categories that include direct ecological soil pathways in addition to human health exposure pathways in the derivation of criteria at the Tier 1 EQS level.

For the purposes of the *Contaminated Sites Regulations* and the Notification of Contamination Protocol (PRO-100), undeveloped, wild or natural land uses that are not otherwise zoned as residential/parkland, commercial or industrial use should follow agricultural land use criteria.

2.3.2 Residential/Parkland

The primary land use/activity is residential or recreational activity. This category assumes parkland can be a buffer between areas of human residency and includes campgrounds but does not include undeveloped wild lands—such as, national or provincial parks.

The generic residential property assumed for this category is a typical detached, single family home with a backyard where children, particularly toddlers, play. For the purposes of the Contaminated Sites Regulations and the Notification of Contamination protocol (PRO-100), recreational parks where children play along with other family activities are also included in this category. In addition, Long-term-care institutional facilities may be considered as residential land uses depending on site specific circumstances.

2.3.3 Commercial

The primary land use/activity is commercial—e.g., shopping malls and offices. Commercial land-use properties span a wide variety of activities with varying degrees of access to human and ecological receptors. For the purposes of deriving environmental quality benchmarks, it is commonly assumed that a generic commercial property contains a day care facility; however, this land-use category may also include schools, hospitals, and religious facilities. Operations where food is grown would be excluded from this category.

2.3.4 Industrial

The primary land use/activity involves the production, manufacture or construction of goods. Industrial properties span a wide variety of land uses and activities but generally do not permit direct public access, (except workers). Thus, children would not be expected to access these properties to any significant extent. Access to industrial properties is often limited for ecological receptors as well.

2.4 SOIL TEXTURE CLASSIFICATIONS

For some combinations of land uses and chemical parameters, regulatory agencies (including, OMOE, AENV, BCMOE and others) have developed separate soil and/or groundwater quality benchmarks on the basis of two main soil textures—i.e., coarse and fine soils. CCME and Atlantic PIRI have a similar approach. Soil texture is a physical parameter used in the NSE

EQS determination tables and should be considered when conducting site assessments, providing notification and determining remediation levels within the context of the *Contaminated Sites Regulations*. Generally, coarse-grained soil numerical EQS are lower. As required within the Notification of Contamination and Remediation Levels Protocols, the choice of fine-grained soil numerical standards must be supported with data from a sieve analysis from the appropriate soil zone. The soil texture categories defined according to ASTM (2011) and adopted by NSE are shown in the following sections.

2.4.1 Fine-grained Soil

A fine-grained soil is defined as material having greater than 50% (by dry weight) particles equal to or less than 75 microns (200 mesh) in diameter.

2.4.2 Coarse-grained Soil

A coarse-grained soil is defined as material having greater than 50% (by dry weight) particles equal to or greater than 75 microns (200 mesh) in diameter.

2.5 EXPOSURE PATHWAYS

CCME provides guidelines for exposure pathways which cover most of the range of potential exposures found at contaminated sites. In the Nova Scotia *Contaminated Sites Regulations* and Ministerial Protocols numerical environmental quality standards tables, certain exposure pathways have been linked to land use categories at the Tier 1 EQS and Tier 2 PSS levels as described later in Section 6.0.

Should other relevant pathways exist at a given site that are not captured by CCME exposure pathways as presented here, a more detailed Tier 2 site-specific evaluation may be warranted. This may involve the use of numerical environmental quality standards for specific pathways that have been derived by other jurisdictions, the development of site-specific standards for a given pathway or the use of site-specific risk assessment approaches. More information on Tier 2 PSS and a discussion of Tier 2 site-specific approaches is provided in Section 6.2.

2.5.1 Human Exposure Pathways

Table 2-2 presents the relevant human exposure pathways that were considered in the selection of the Nova Scotia EQS.

Table 2-2 Applicable Human Exposure Pathways for Nova Scotia

Media	Exposure Pathways
Soil	• Direct Contact (Ingestion and/or Dermal Exposure) • Vapour Migration (Inhalation of Indoor Air) • Dust Inhalation (Inhalation of Outdoor/Indoor Air) • Soil Leaching for Protection of Potable Groundwater (Water Ingestion) • Off-site Migration

Media	Exposure Pathways
Sediment	• May be evaluated in similar manner as soil under certain conditions (See section 3.3.1)
Surface Water	• Ingestion as Drinking Water or Incidental Water Ingestion
Groundwater	• Ingestion as Drinking Water • Vapour Migration (Inhalation of Indoor Air)

2.5.2 Ecological Exposure Pathways

Table 2-3 presents the relevant ecological exposure pathways (along with the target receptor groups for each pathway) that were considered in the selection of the Nova Scotia numerical environmental quality standards where ecological exposures are applied.

Table 2-3 Applicable Ecological Exposure Pathways for Nova Scotia

Media	Exposure Pathway Receptor Group)
Soil (Agricultural land uses only)	• Soil Contact (Plants and Soil Invertebrates) • Soil and Food Ingestion (Livestock or Wildlife) • Nutrient and Energy Cycling
Sediment	• Direct Contact with Sediments (Freshwater and Marine Benthic Aquatic Life)[a]
Surface Water	• Direct Contact with Surface Water (Freshwater and Marine Pelagic Aquatic Life)[b]
Groundwater	• Migration of Groundwater Contaminants to Surface Water (Aquatic life)[c]

Notes:

a) Includes direct contact of gills and other respiratory surfaces with sediments; ingestion of sediment (including sediment pore water ingestion); ingestion of aquatic prey species and other food items—i.e., detritus, plants, phytoplankton, zooplankton, macroinvertebrate fauna, and fish; and root contact with sediment for aquatic plants.

b) Includes direct contact of gills and other respiratory surfaces with water; ingestion of water; ingestion of aquatic prey species and other food items—i.e., detritus, plants, phytoplankton, zooplankton, macroinvertebrate fauna, and fish; and foliar contact with water for aquatic plants.

c) Includes migration to a freshwater or marine surface water body such that aquatic organisms may become exposed to what was originally a groundwater contaminant.

2.6 GENERAL HIERARCHY OF ENVIRONMENTAL QUALITY STANDARD SOURCES

In reviewing the requirements for selecting numerical environmental quality standards for use in Nova Scotia, it was determined by the NSSAM working group that a range of appropriate guidelines are available from CCME and other Canadian and international jurisdictions and that *de novo* derivation or development of specific Provincial standards was not warranted. For the purposes of establishing environmental quality standards for Nova Scotia, preference was given

to CCME environmental quality guidelines where they exist. For petroleum hydrocarbon numerical standards, preference was given to criteria developed in conjunction with the Atlantic Partnership in Risk Based Corrective Action, (Atlantic PIRI). In the absence of CCME guidelines for a given substance, guidelines or other types of benchmarks from other Canadian or American agencies were identified and adopted. If a guideline for a particular CoC or pathway was not provided, the next jurisdiction in the hierarchy was referenced until an appropriate environmental quality standard could be established. The general hierarchy used to select environmental quality standards for use in Nova Scotia is outlined below:

1. Canadian Council of Ministers of the Environment (CCME): Canadian Environmental Quality Guidelines (CCME, 1999, and various updates up to and including 2010).
2. Health Canada (Guidelines for Canadian Drinking Water Quality, 2012).
3. Atlantic RBCA Version 3 Guidance (Atlantic PIRI, 2012).
4. Sources from other Canadian Jurisdictions (i.e. Alberta, Ontario, British Columbia, in order of preference).
5. United States Environmental Protection Agency (USEPA).
6. Other U.S. and International Jurisdictions (as deemed necessary).

In general, review of these benchmarks and guidelines by the NSSAM Working Group determined that all are adequately conservative and protective in nature and are thereby considered appropriate for use as EQS in Nova Scotia. Furthermore, the adoption of such guidelines into regulatory standards follows what is considered to be common industry practice currently in place in Nova Scotia.

In some cases, the guidelines or benchmarks from other agencies were developed with some modifications to suit specific Nova Scotia policies and practices or to make the values more consistent with those developed by CCME and/or Canadian Provincial jurisdictions. The types of modifications are briefly described in Section 3.0 and Section 4.0 where relevant. Specific modifications for any given chemical parameter in any of the media considered are described in the referenced tables of Appendix A where relevant.

It should be noted that the assumptions and models used in the development of the various adopted standards are not discussed in detail within this document. References for the relevant sources of the Nova Scotia EQS and specific hierarchies for EQS selection are described in Sections 3.0 and 4.0. It is important that Site professionals and other users of the Nova Scotia EQS consult the relevant source documents to understand the underlying scientific principles and assumptions for the application of the EQS.

For details related to the development of specific guidelines that were adopted as EQS, the applicable source documents should be referenced directly.

3.0 Standards for Protection of Human Health

3.1 INTRODUCTION

CCME generic guidelines often consider both ecological and human health effects. Where both values are available, the CCME selects the lower value as the final recommended guideline. A similar process occurs in other Canadian jurisdictions including Alberta Environment (AENV, 2010) and the Ontario Ministry of the Environment (OMOE, 2011).

Since this section of the rationale document deals with human health, the environmental quality standards discussed herein are those that are based only on human health effects.

3.2 ADJUSTMENT OF TARGET RISK LEVEL FOR EXPOSURE TO CARCINOGENS

For the purposes of development of the EQS, Nova Scotia has incorporated a target carcinogenic risk level of $1E^{-05}$ (1 in 100,000). This is consistent with Atlantic PIRI and Health Canada (HC, 2004) science policy for sites under the four Atlantic Canada Provinces' jurisdictions. In cases where original guidelines from other jurisdictions are based on a target cancer risk level of $1E^{-06}$ (1 in 1,000,000), these values have been adjusted to reflect a target risk level of $1E^{-05}$.

3.3 HUMAN HEALTH-BASED STANDARDS FOR SOIL

Human receptors can be exposed to soil through a number of pathways including ingestion, dermal contact, vapour migration to indoor air and dust inhalation in outdoor air. The hierarchy used for the selection of human health-based EQS for soil is as follows:

1. Canadian Soil Quality Guidelines for the Protection of Human Health (CCME, 2007b with various updates up to and including 2010) for all substances in the master list excluding BTEX and petroleum hydrocarbons; Canadian Soil Quality Guidelines for the Protection of Human Health for Polycyclic Aromatic Hydrocarbons (CCME, 2010);
2. Atlantic PIRI (2012) Tier 1 Risk Based Screening Levels (RBSLs) V 3.0 (for BTEX and total petroleum hydrocarbons)
3. Alberta Environment Tier 1 Soil and Groundwater Remediation Guidelines (AENV, 2010);
4. Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act. Ontario Ministry of the Environment. (OMOE, 2011)
5. United States Environmental Protection Agency (USEPA) Regional Screening Levels (USEPA Region 3, 2010).

The above reference sources of human health-based EQS for soils generally consider the same four land uses and the same soil descriptions (coarse and fine grained) used herein.
The Atlantic PIRI Risk Based Corrective Action (RBCA) process has been developed by Atlantic Canadian regulatory agencies for use in assessing petroleum hydrocarbons at contaminated

sites. This process provides Tier 1 screening levels for total petroleum hydrocarbon (TPH) compounds and benzene, toluene, ethylbenzene and xylene (BTEX). Tier 1 EQS for TPH and BTEX are derived from this process for most pathways. This methodology includes consideration of many assumptions contained within the CCME Canada-Wide Standard for Petroleum Hydrocarbons in soil and is considered an equivalent approach for the assessment of petroleum hydrocarbons.

With respect to the U.S. EPA Region III Risk-Based Human Health Screening Guidelines for non-carcinogens, the original U.S. EPA values have been divided by a factor of 5. This was done because the U.S. EPA utilizes a target hazard quotient of 1.0 in their derivation process, whereas the standard approach within CCME and other Canadian jurisdictions is to use a default hazard quotient of 0.2 (or 20%) in the development of human health-based soil quality guidelines.

The reference sources used to determine human health-based EQS provide for evaluation of both direct and some indirect (or secondary) exposure pathways (see Table 2-2).

3.3.1 Human Exposures to Sediment

At this time, there are no human health-based guidelines for sediment exposure although it is recognized that Health Canada is presently exploring the potential need for human health-based sediment quality guidelines and possible derivation approaches. At most sites however, sediment contamination is largely an ecological concern. Given the absence of human health-based guidelines for sediment, human health-based standards for soil (ingestion pathway only) can be used to identify potential CoC's in sediment based on the judgment of a site professional. However, this should only be considered valid if there is a relatively high potential for direct oral and/or dermal contact with contaminated sediment. Soil quality guidelines for pathways other than direct oral and dermal contact are considered inappropriate and not applicable for use as "surrogate" human health-based sediment quality guidelines.

3.4 HUMAN HEALTH-BASED STANDARDS FOR SURFACE WATER

Concern about surface-water quality typically focuses on protection of freshwater or marine aquatic life rather than human health. However, Health and Welfare Canada does provide Recreational Water Quality Guidelines (HWC, 1992) that may be used as guidance in assessing surface-water quality for such human activities as swimming, water sports and so on. In addition, in situations where surface water is used as a drinking water source or where there is believed to be a high potential for incidental ingestion of surface water, the Guidelines for Canadian Drinking Water Quality (Health Canada, 2012) are recommended for use.
The Nova Scotia EQS do not include specific human health-based standards for surface water quality.

3.5 HUMAN HEALTH-BASED STANDARDS FOR GROUNDWATER

Human receptors can be exposed to contaminants in groundwater primarily through direct ingestion and through vapour migration from groundwater to indoor air. The hierarchy for the selection of human health-based EQS for groundwater is as follows:

1. Guidelines for Canadian Drinking Water Quality (Health Canada, 2012);
2. Atlantic RBCA Version 3 Guidance - Tier 1 Risk Based Screening Levels (RBSLs) (Atlantic PIRI, 2012);
3. Alberta Environment Tier 1 Soil and Groundwater Remediation Guidelines (AENV, 2010);
4. Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act. Ontario Ministry of the Environment. (OMOE, 2011); and,
5. United States Environmental Protection Agency (USEPA) Regional Screening Tables (USEPA Region 3, 2010).

3.5.1 Potable Groundwater Standards

Water, including groundwater, is an important public resource in Nova Scotia. Groundwater has many beneficial uses and plays an important role in drinking water, the economy and the support of healthy aquatic ecosystems. Approximately 50 percent of Nova Scotia's population depends on groundwater for their drinking water supply. Groundwater is also used in a wide variety of industrial and commercial activities. Groundwater discharges into surface water bodies—such as rivers, wetlands and supporting aquatic ecosystems. Because groundwater and surface water are integrally connected, groundwater cannot be managed in isolation from surface water and aquatic ecosystems.

In the protection of groundwater quality, the strongest emphasis is placed on preventing groundwater resources from becoming contaminated. Where contamination of this valuable public resource has resulted in an impairment of the water quality, it is vital to remediate or manage any impacts adequately to ensure on-going protection of human health and the environment and the restoration of beneficial uses.

As part of a contaminated site characterization process, potential impacts to site groundwater need to be assessed. In general, at the Tier 1 EQS level, groundwater should initially be considered to be a potential potable drinking water resource at all sites in Nova Scotia. However, the groundwater potability must be confirmed in order to appropriately apply the relevant Tier 1 EQS.

In the Notification of Contamination Protocol (PRO-100), NSE provides a flowchart (Figure 3) in order to determine groundwater potability. This flowchart must be used by a site professional to determine if potable or non-potable EQS are to be used at a contaminated site. There are a series of steps within this flowchart that are important to understand in determining the potability of a site. Several of these are explained as follows;

- Availability of *municipal water* on the site:

This is meant to determine whether a municipal drinking water supply is available at the site in question. Municipal drinking water supplies are normally centrally distributed and managed using underground pipe networks from a central surface water or groundwater well-field. The service boundaries for such municipal water service areas should be checked and known when determining groundwater potability. Local municipal units or local water utilities are normally responsible for such systems and can provide information for site professionals.

- *Source water protection areas:*

Source water protection areas for municipal drinking water protection are determined by municipal units and water utilities as part of a multiple barrier approach for maintaining clean safe drinking water. In areas where source water protection plans are in place, a key component involves the delineation of the *boundary* of the source water supply area, which may be a surface water or groundwater supply. Site professionals need to determine whether the site in question is located *within or outside* of such source water protection areas in determining groundwater potability. It is therefore very important to understand and know the boundaries of source water protection areas where source water protection plans are in place.

4.0 Standards for Protection of Ecological Health

This section of the rationale document deals with ecological health, and the EQS discussed herein are those that are based only on ecological health effects.

Consideration of ecological health protection is included in the Nova Scotia environmental quality standards in the following land uses and environmental media:

- Soil (Agricultural Land Use)
- Sediment (Freshwater and Marine)
- Surface Water (Freshwater and Marine)
- Groundwater (Tier 2 Pathway-specific Standards only for discharge to Surface Water Pathway)

4.1 ECOLOGICAL HEALTH-BASED STANDARDS FOR SOIL

The hierarchy used for the selection of ecological health-based EQS for soil is as follows:

1. Canadian Soil Quality Guidelines for the Protection of Environmental Health (CCME, 2007b with various updates up to and including 2010) for all substances in the master list except PAHs and petroleum hydrocarbons; Canadian Soil Quality Guidelines for the Protection of Environmental Health for Polycyclic Aromatic Hydrocarbons (CCME, 2010); CCME (2008) Canada Wide Standards for Petroleum Hydrocarbons.
2. Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AENV, 2010)
3. BCMOE. 2010. Environmental Management Act, Contaminated Sites Regulation, Schedule 5. B.C. Reg. 375/96, as amended October 4, 2010
4. OMOE. 2011. Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act. Ontario Ministry of the Environment.

All sources of ecological health-based EQS for soil provide guidelines for all land uses considered herein and for both coarse-grained and fine-grained soils where appropriate.
The reference sources used to determine ecological health-based EQS provide for evaluation of both direct and some indirect (or secondary) exposure pathways (see Table 2-3).

4.2 ECOLOGICAL HEALTH-BASED STANDARDS FOR SEDIMENT

The hierarchy used for the selection of ecological health-based EQS for sediments (freshwater and marine) is as follows:

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME, 2002).
2. Atlantic PIRI, 2012, Risk-Based Corrective Action, User Guidance. Reference Documentation for Petroleum Impacted Sites in Atlantic Canada. Version 3.0
   - Appendix 2 Ecological Screening Protocol Tier 1 Sediment Ecological Screening Levels.
3. BCMOE Approved and Working Sediment Quality Guidelines (various documents—refer to Appendix Tables).
4. OMOE. 2008. Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario: An Integrated Approach.
5. United States jurisdictions including: USEPA (2008) and others as necessary.

Where sediment quality guidelines beyond CCME were considered, preference was given to identifying jurisdictions that use similar approaches in guideline derivation. For example, the majority of existing regulatory sediment quality guidelines (including those derived by CCME and OMOE) are based on co-occurrence data—i.e., correlations or co-incidence of benthic impacts with measured sediment chemical concentrations. While there are a number of different approaches to deriving co-occurrence-based benchmarks, most have a number of similarities such that it is considered appropriate to adopt these types of benchmarks without modification even though different substances have benchmarks that were derived with different approaches. There are however some substances (mostly organics including petroleum hydrocarbons) for which existing sediment quality benchmarks are not based on co-occurrence approaches. Rather, the most common derivation approach for such substances is equilibrium partitioning (EqP). In brief, the EqP approach assumes that pore water exposure is the major exposure pathway and that benthic organisms have a sensitivity that is similar to pelagic organisms as the EqP approach involves extrapolating a water quality guideline to a bulk sediment concentration using chemical-specific Koc (organic carbon partitioning coefficient) and default or site-specific sediment organic carbon content. Further details on the EqP approach may be found in USEPA (2008).

The Atlantic PIRI 2012 Ecological Screening Protocol documentation also utilizes an EqP approach for petroleum hydrocarbon sediment benchmarks. For all co-occurrence-based sediment benchmarks, only probable effect level (PEL) types of benchmarks are considered. The reason for this is that PELs sediment-quality benchmarks can be considered population-level benchmarks. This is because they rely primarily on the modified National Status and Trends Program (NSTP) approach (or similar approaches such as the Screening Level Concentration) which in turn rely heavily on field data that demonstrates associations between co-occurring chemical concentrations and biological effects as indicated by the occurrence of benthic infaunal species (CCME, 1996; OMOE, 2008). In the NSTP approach, for example, information relating to sediment concentrations and biological effects is compiled from numerous geographical locations throughout North America for many different species and biological end points. Much of the information compiled is field-collected data that considers complex mixtures of chemicals (and thus their interactive effects); various sediment types—i.e., with different particle sizes and concentrations of substances; and varying conditions of

bioavailability. These data are entered into a Biological Effects Database for Sediments (BEDS). Sediment quality guidelines are then statistically derived from the BEDS. For example, the PEL is calculated as the square root of the product—i.e., the geometric mean—of the 50th percentile concentration of the effect data set and the 85th percentile concentration of the no-effect data set. The PEL represents the lower limit of the range of chemical concentrations that is usually associated with adverse biological effects (CCME, 1996).

It has become well established in the past ten or more years that low-effect level or no-effect level sediment benchmarks are highly conservative, and their exceedance often does not correlate well with other endpoints that are commonly evaluated in aquatic risk assessments—e.g., sediment bioassay results and benthic community parameters. In practice, exceedance of the PEL (and similar benchmarks) is the more realistic indicator of a potential for population-level adverse effects. This is supported by a study by Long et al. (1998) who examined the predictive ability of marine sediment quality guidelines and noted that PELs are considerably better at predicting the likelihood for toxicity than the Threshold Effects Level (TEL) or similar guideline values—such as, Interim Sediment Quality Guidelines (ISQGs). NOAA (1999) notes that effects-range median values are better indicators of adverse effects than effects-range low values. Similarly, Quebec MDEP 2006 states that there is no evidence of significant risk of harm to benthic organisms when sediment concentrations are below probable-effect levels.

The Environmental Quality Standards (EQS) for modified TPH in sediment as presented in Table 2 of the Notification of Contamination Protocol, are derived directly from Version 3 of the Atlantic RBCA User Guidance (2012)- (Appendix 2 - Table 4 Tier 1 Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life). Site professionals are encouraged to review this Table carefully. In particular, the standards vary based on the fraction of organic compounds (foc) present and the type of sediment.

The following guidance is provided to acknowledge that the Tier 1 EQS values are based on an assumed sediment foc = 0.01, and that the Tier 1 sediment levels are subject to change proportionally with site specific foc.

1) In the absence of site specific sediment foc data, the Tier 1 EQS for modified TPH in sediment as presented in Table 2 must be used.
2) In cases where appropriate site specific foc data has been collected and is available for reference, the standards change proportionately to foc. For example, where foc= 0.04, the values may be increased by 4-fold. Management limits do apply (max. TPH) as described by Atlantic RBCA. (Refer to Atlantic RBCA Guidance noted above.)

4.3 ECOLOGICAL HEALTH-BASED STANDARDS FOR SURFACE WATER

The hierarchy used for the selection of ecological health-based EQS for surface water (for the protection of freshwater and marine aquatic life) is as follows:

1. Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2007a and various updates up to and including 2010) for all substances in master list except BTEX and petroleum hydrocarbons.
2. Atlantic PIRI, 2012, Risk-Based Corrective Action, User Guidance. Reference Documentation for Petroleum Impacted Sites in Atlantic Canada. Version 3.0. Appendix

2 Ecological Screening Protocol Tier 1 Surface Water and Groundwater Ecological Screening Levels
3. BCMOE Approved and Working Water Quality Guidelines (various documents – Refer to Appendix C Tables)
4. Alberta Environment. 1999. Surface Water Quality Guidelines for Use in Alberta.
5. OMOE (1999).Provincial Water Quality Objectives.
6. MENVQ (2013) Ministère de l'Environnement du Québec. On-line updates to Critères de qualité de l'eau de surface au Québec.USEPA. 2009. National Recommended Water Quality Criteria.
7. Individual states in USA (included RI, OR, NY, NH, MI)
8. NOAA (2009) Screening Quick Reference Tables.

Where surface water quality guidelines beyond CCME were considered, preference was given to identifying jurisdictions that use similar approaches to guideline derivation.

There were some deviations from the above hierarchy if the available values from a source higher in the hierarchy were considered inappropriate or of weaker scientific basis relative to that available elsewhere.

Where individual United States water quality guidelines were considered, there was no particular hierarchy. Rather, to locate values for parameters not available from sources higher in the hierarchy, efforts were made to identify jurisdictions that use similar approaches to develop water quality benchmarks—such as, CCME, OMOE, BC MOE, etc.

As mentioned, the ecological health-based EQS for surface water are only for freshwater and marine aquatic life protection. As previously indicated in Table 2-3, there are other potential ecological surface water exposure pathways—such as, plant contact from use of irrigation water, livestock and/or wildlife ingestion of surface water. At this time, it is recommended that existing guidelines from CCME and BCMOE for these pathways be considered if they merit evaluation at a contaminated site in Nova Scotia.

4.4 ECOLOGICAL HEALTH-BASED STANDARDS FOR GROUNDWATER

In Nova Scotia, ecological standards for groundwater are not provided at the Tier 1 EQS level in relation to notification of contamination, but are provided for information and use in the Tier 2 Pathway-specific Standards (PSS) tables. These groundwater ecological standards are solely based on providing criteria for groundwater that discharges to surface water. Professional judgment is required in the screening and application of these standards on a site specific basis in relation to potential groundwater discharges to surface water. The standards employ assumed groundwater attenuation factors, and they specifically provide for freshwater and marine aquatic life protection at the point of groundwater discharge. Further information related to their use is provided in section 4.4.1 below.

4.4.1 Groundwater Standards for Protection of Freshwater and Marine Aquatic Life

In the case of ecological health-based standards for groundwater in the Tier 2 PSS tables, a 10X attenuation factor has generally been applied to the surface water EQS values (similar methods are used by OMOE, BCMOE and MDEP) with the exception of petroleum

hydrocarbons as noted below. The 10X factor is considered by these reference sources to be a general, conservative order of magnitude factor for the dilution and attenuation of contaminant concentrations that occur during groundwater flow. These adjusted values can be used for screening groundwater quality at locations greater than 10 meters from a freshwater body or marine-water body. Surface freshwater or marine water quality guidelines should be applied directly (or unadjusted) when evaluating groundwater quality at locations within 10 meters of a freshwater or marine-surface-water body.

For petroleum hydrocarbons, Atlantic PIRI (2012) provides distance-gradated groundwater ecological screening levels based on contaminant modelling for locations between 10 metres and 200 metres from a freshwater or marine-water body. These may be used in Nova Scotia at the Tier 2 PSS level but may have site management and closure mechanism implications.
There are other potential ecological exposure pathways by which terrestrial ecological receptors could also become exposed to groundwater contaminants including: use of groundwater for irrigation water; plant root contact with shallow groundwater and livestock and wildlife ingestion of groundwater (from wells and springs). However, these pathways are not considered in the Nova Scotia Tier 2 PSS for groundwater.

At this time, should any of these other groundwater exposure pathways merit evaluation at a contaminated site in Nova Scotia at a Tier 2 PSS level, it is recommended that existing guidelines from CCME and BCMOE (referred to in Section 4.3) as well as relevant ecological groundwater contact guidelines from AENV, 2010, be utilized.

5.0 Consideration of Background Environmental Conditions

Some substances that occur naturally in the environment and are not the result of human activity can exceed Tier 1 EQS. In addition, historical practices or activities such as, fires, atmospheric emissions or even general urbanization may have resulted in concentrations of substances that exceed Tier 1 EQS over localized or widespread areas. The Notification of Contamination Protocol, PRO-100, provides information on the approach used to assess such background occurrences in Nova Scotia with respect to the *Contaminated Sites Regulations*.

Sometimes, in the context of complex contaminated-site studies, more detailed information on background substances may be necessary. Additional data may also be required in instances where sites are determined to have combined impacts from background substances and contamination from a point source or sources. In such cases, a local background value for a substance for the purposes of remediation levels determination may be required. In Nova Scotia, there currently are no available databases of representative background environmental conditions at the local level. Thus, site-specific, local or regional environmental determinations of soil and water quality may need to be conducted by site professionals on a case-by-case basis if necessary.

6.0 Nova Scotia Environmental Quality Standards

The Nova Scotia Environmental Quality Standards are based on the assessment and consistent management of risks posed to human, ecological receptors and environmental processes under four common land uses—i.e., agricultural, residential/parkland, commercial, and industrial. The basic EQS may be considered in two tiers, Tier 1 (generic) and Tier 2 (pathway-specific) EQS which incorporate different amounts of site-specific information. An additional determination at the Tier 2 level may involve calculation of site-specific cleanup target levels (through the application of environmental risk assessment methods) otherwise known as Tier 2 SSTL's.

Environmental and human health protection goals are equivalently considered between the Tiers. The Tier 1 EQS and Tier 2 PSS are designed to achieve the same degree of human health and ecological protection regardless of which option is used. The two options differ in the amount of site-specific information used to determine the criteria and the differences in site management which include land use or contaminant exposure management controls that may result.

The Remediation Levels Protocol PRO-500 provides detailed information and requirements in developing and applying remediation levels for a contaminated site and should be thoroughly reviewed by site professionals.

6.1 TIER 1 ENVIRONMENTAL QUALITY STANDARDS

The Tier 1 EQS are simple tabular values that require minimal site information for their use. Conservative assumptions have been used in their development to protect sites likely to be sensitive to contamination. Tier 1 EQS present the lowest of the pathway-specific human health/ecological EQS where applied for each of the four land use categories and two soil texture categories. As noted earlier, ecological soil exposure pathways have only been included for agricultural land uses.

Use of the Tier 1 EQS assumes that **ALL** potential exposure pathways and receptors relevant to a particular land use as indicated in the Notification of Contamination Protocol PRO-100 and Remediation Levels Protocol PRO-500 are present. Tier 1 EQS can be used directly with no calculations required. However, some EQS are pH specific while others can be adjusted based on parameters such as hardness, or foc as in the case of petroleum in sediment. An evaluation of site information is also needed to ensure that site conditions meet the assumptions required for the use of the Tier 1 EQS as outlined in the Remediation Levels Protocol PRO-500. Those sites with conditions that are significantly different are more appropriately dealt with using a site-specific or Tier 2 PSS approach.

As stated earlier, the Tier 1 EQS represent the lowest criteria of one or more pathways in the pathway-specific tables which have been determined to be applicable at the Tier 1 level for soil, sediment, surface water and groundwater. The Tier 1 EQS for soils are shown for potable and non-potable conditions, four land uses and two soil types—i.e., fine grained and coarse grained. Reference sources for all EQS were determined as noted previously in Sections 2, 3 and 4. The Reference Tables for Nova Scotia Pathway-specific Standards showing source references for

all soil, sediment, surface water and groundwater criteria are presented in Tables A1 to A4 (A,B,C and D) in Appendix A.

Note that any numerical values, wording, information or requirements in the *Contaminated Sites Regulations*, including Tier 1 EQS tables in the Ministerial Protocols, take precedence over information provided in this guidance document.

6.2 TIER 2 PATHWAY-SPECIFIC STANDARDS

If site concentrations exceed the Tier 1 EQS, they may be compared to the Tier 2 Pathway-specific Standards (PSS) with consideration of additional requirements imposed by the *Contaminated Sites Regulations*. The use of the Tier 2 PSS allows certain pathways to be either excluded or otherwise managed provided there is proper site management and supporting documentation to do so.

It should be noted that exposure pathways or pathway-receptor combinations may be excluded only if they are not operable at a given site. On the other hand, management of exposure pathways to remove risk, while permissible, results in requirements for long-term land and/or water-use restrictions. Detailed justification should be provided for either the exclusion or management of any exposure pathway. Any sites that rely on either the exclusion or management of exposure pathways may be subject to additional regulatory requirements as outlined in the *Contaminated Sites Regulations* and Ministerial Protocols.

The Remediation Levels Protocol PRO-500 provides information on the options within the Tier 2 PSS approaches and the effects the choice of these have on file closure.

The reference sources for Tier 2 PSS were determined as noted previously in Sections 2, 3 and 4. The Reference Tables for Nova Scotia Pathway-specific Standards showing source references for all soil, sediment, surface water and groundwater criteria are presented in Tables A1 to A4 (A,B,C and D) in Appendix A.

Note that any numerical values, wording, information or requirements in the *Contaminated Sites Regulations*, including Tier 2 PSS tables in the Ministerial Protocols, take precedence over information provided in this guidance document.

7.0 REFERENCES FOR THE ENVIRONMENTAL QUALITY STANDARDS AND GUIDANCE DOCUMENT

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ERRATA TABLE

1. **Table A2- *References for Pathway Specific Standards for Surface Water*.** *Phenol* is a listed parameter with a value of 4,000 ug/l for f*resh water.* The *correct value* for Phenol in this case is 4.0 ug/l. *(Reference,CCME,2007a)*

   Note:

   This parameter is also present in Table 3 of the Tier 1 Environmental Quality Standards for Surface Water-PRO-100, *Notification of Contamination Protocol*. The *correct value* for phenol in this case is 4.0 ug/l.

   Similarly, phenol is also listed in Table 3 of the Pathway Specific Standards for Groundwater-PRO 500, *Remediation Levels Protocol.* The *correct value* for phenol in groundwater discharging to surface water in relation to this table is 4.0 ug/l within 10m and 40.0 ug/l >10m from surface water bodies, respectively.

2. **Table A3- *References for Pathway Specific Standards for Groundwater.***

   Phenol is a listed parameter with a value of 4000 ug/l for groundwater discharging to surface water within 10m and 40,000 ug/l for groundwater discharging to surface water at distances >10m.

   The *correct value* for phenol in groundwater in relation to this table is 4.0 ug/l within 10m and 40.0 ug/l >10m from surface water bodies, respectively.

   Modified TPH (Lube) is a listed parameter with a corresponding standard of 100 ug/l for groundwater discharging to surface water >10 m from a surface water body- (freshwater and marine). The *correct value is* 480 ug/l. (*Reference- Ecological Screening Protocol, Atlantic RBCA V3, Appendix 2, 2012)*

   Note:

   This parameter is also present in Table 3- Pathway Specific Standards for Groundwater-PRO 500, Remediation Levels Protocol. The *correct value* for modified TPH (lube) for groundwater discharging to surface water >10m from a surface water body in this table is 480 ug/l.

3. **Appendix B- Substances Potentially Considered as Background Occurrences.** Polycyclic Aromatic Hydrocarbon (PAH) are listed parameters. *Naphthalene (*CASRN 91-20-3) should be included as a listed parameter

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APPENDIX A

Reference Tables for Nova Scotia Pathway-Specific Standards

Table A1 Reference Tables for Pathway Specific Standards - Sediment (mg/kg)

Land Use / Receptor		Sediment Environment [1]			
Pathway		Freshwater Sediment		Marine Sediment	
Parameter	Units	Value	Reference	Value	Reference
Metals (Available)					
Aluminum	mg/kg	-	-	-	-
Antimony	mg/kg	25	NY DEC 1999	-	-
Arsenic	mg/kg	17	CCME, 2002	41.6	CCME, 2002
Barium	mg/kg	-	-	-	-
Beryllium	mg/kg	-	-	-	-
Boron (Total)	mg/kg	-	-	-	-
Cadmium	mg/kg	3.5	CCME, 2002	4.2	CCME, 2002
Chromium (hexavalent)	mg/kg	-	-	-	-
Chromium (total)	mg/kg	90	CCME, 2002	160	CCME, 2002
Cobalt	mg/kg	-	-	-	-
Copper	mg/kg	197	CCME, 2002	108	CCME, 2002
Cyanide	mg/kg	-	-	-	-
Iron	mg/kg	43,766	BC MOE, 2006	-	-
Lead	mg/kg	91.3	CCME, 2002	112	CCME, 2002
Manganese	mg/kg	1,100	MOE 2008	-	-
Mercury (total)	mg/kg	0.486	CCME, 2002	0.7	CCME, 2002
Methylmercury	mg/kg	-	-	-	-
Molybdenum	mg/kg	-	-	-	-
Nickel	mg/kg	75	BC MOE, 2006	-	BC MOE, 2006
Selenium	mg/kg	2	BC MOE, 2006	-	-
Silver	mg/kg	1	CCME 2013	2.2	BC MOE, 2006
Strontium	mg/kg	-	-	-	-
Thallium	mg/kg	-	-	-	-
Tin	mg/kg	-	-	-	-
Uranium	mg/kg	-	-	-	-
Vanadium	mg/kg	-	-	-	-
Zinc	mg/kg	315	CCME, 2002	271	CCME, 2002
Petroleum Hydrocarbons (PHC) Parameters					
Benzene	mg/kg	1.2	APIRI, 2012	1.2	APIRI, 2012
Toluene	mg/kg	1.4	APIRI, 2012	1.4	APIRI, 2012
Ethylbenzene	mg/kg	1.2	APIRI, 2012	1.2	APIRI, 2012
Xylene	mg/kg	1.3	APIRI, 2012	1.3	APIRI, 2012
Modified TPH (Gas)	mg/kg	15	APIRI, 2012	15	APIRI, 2012
Modified TPH (Fuel)	mg/kg	25	APIRI, 2012	25	APIRI, 2012
Modified TPH (Lube)	mg/kg	43	APIRI, 2012	43	APIRI, 2012
MTBE	mg/kg	-	-	-	-
Total TPH	mg/kg	500	APIRI, 2012	500	APIRI, 2012
Polycyclic Aromatic Hydrocarbons (PAH) Parameters					
PAH Compounds					
Naphthalene	mg/kg	0.391	CCME, 2002	0.391	CCME, 2002
1 - Methylnaphthalene	mg/kg	0.201	CCME, 2002	0.201	CCME, 2002
2 - Methylnaphthalene	mg/kg	0.201	CCME, 2002	0.201	CCME, 2002
Acenapthene	mg/kg	0.0889	CCME, 2002	0.0889	CCME, 2002
Acenapthylene	mg/kg	0.128	CCME, 2002	0.128	CCME, 2002
Anthracene	mg/kg	0.245	CCME, 2002	0.245	CCME, 2002
Fluoranthene	mg/kg	2.355	CCME, 2002	1.494	CCME, 2002
Fluorene	mg/kg	0.144	CCME, 2002	0.144	CCME, 2002
Phenanthrene	mg/kg	0.515	CCME, 2002	0.544	CCME, 2002
Pyrene	mg/kg	0.875	CCME, 2002	1.398	CCME, 2002
Carcinogenic PAHCompounds					
BaP Total Potency Equivalents	-	-	-	-	-
Benz[a]anthracene	mg/kg	0.385	CCME, 2002	0.693	CCME, 2002

Table A1 Reference Tables for Pathway Specific Standards - Sediment (mg/kg)

Land Use / Receptor		Sediment Environment [1]			
Pathway		Freshwater Sediment		Marine Sediment	
Parameter	Units	Value	Reference	Value	Reference
Benzo[a]pyrene	mg/kg	0.782	CCME, 2002	0.763	CCME, 2002
Benzo[b,j,k]fluoranthene isomers	mg/kg	13.4	BCMOE 2006	4.50	BCMOE 2006
Benzo[g,h,i]perylene	mg/kg	3.2	BC MOE 2006	3.20	BC MOE 2006
Chrysene	mg/kg	0.862	CCME, 2002	0.846	CCME, 2002
Dibenz[a.h]anthracene	mg/kg	0.135	CCME, 2002	0.135	CCME, 2002
Indeno[1,2,3-c,d]pyrene	mg/kg	3.2	BC MOE 2006	0.88	BC MOE 2006
Volatile Organic Compound (VOC) Parameters					
Bromodichloromethane	mg/kg	-	-	-	-
Bromoform	mg/kg	0.65	USEPA, 2008	0.65	NOAA, 2008
Bromomethane	mg/kg	-	-	-	-
Carbon Tetrachloride (Tetrachloromethane)	mg/kg	1.2	USEPA, 2008	1.2	NOAA, 2008
Chlorobenzene	mg/kg	0.41	USEPA, 2008	-	-
Chloroethane	mg/kg	-	-	-	-
Chloroform	mg/kg	-	-	-	-
Chloromethane	mg/kg	-	-	-	-
Dibromochloromethane	mg/kg	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.05	CCME 2013	0.05	CCME 2013
1,3-Dichlorobenzene	mg/kg	0.05	CCME 2013	0.05	CCME 2013
1,4-Dichlorobenzene	mg/kg	0.09	BC MOE 2006	0.09	BC MOE 2006
1,1-Dichloroethane	mg/kg	-	-	-	-
1,2-Dichloroethane	mg/kg	-	-	-	-
1,1-Dichloroethylene	mg/kg	-	-	-	-
cis-1,2-Dichloroethylene	mg/kg	-	-	-	-
trans-1,2-Dichloroethylene	mg/kg	-	-	-	-
1,2-Dichloropropane	mg/kg	-	-	-	-
1,3-Dichloropropene	mg/kg	-	-	-	-
Ethylene Dibromide	mg/kg	-	-	-	-
Methylene Chloride (Dichloromethane)	mg/kg	-	-	-	-
Styrene	mg/kg	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/kg	1.4	USEPA, 2008	-	-
Tetrachloroethylene	mg/kg	0.41	USEPA, 2008	0.53	NOAA, 2008
1,1,1-Trichloroethane	mg/kg	0.03	USEPA, 2008	0.17	NOAA, 2008
1,1,2-Trichloroethane	mg/kg	0.03	USEPA, 2008	0.17	NOAA, 2008
Trichloroethylene	mg/kg	0.22	USEPA, 2008	1.6	NOAA, 2008
Vinyl Chloride	mg/kg	-	-	-	-
Pesticides					
Aldicarb	mg/kg	-	-	-	-
Aldrin	mg/kg	0.08	BC MOE 2006	0.01	CCME 2013
Atrazine	mg/kg	-	-	-	-
Azinphos-methyl	mg/kg	-	-	-	-
Bendiocarb	mg/kg	-	-	-	-
Bromoxynil	mg/kg	-	-	-	-
Carbaryl	mg/kg	-	-	-	-
Carbofuran	mg/kg	-	-	-	-
Chlorothalonil	mg/kg	-	-	-	-
Chlorpyrifos	mg/kg	-	-	-	-
Cyanazine	mg/kg	-	-	-	-
2,4-D	mg/kg	-	-	-	-
DDT	mg/kg	0.00477	CCME, 2002	0.00477	CCME, 2002
Diazinon	mg/kg	2.2	AENV 2010 (soil)	2.2	AENV 2010 (soil)
Dicamba	mg/kg	-	-	-	-
Dichlorfop-methyl	mg/kg	-	-	-	-
Dieldrin	mg/kg	0.00667	CCME, 2002	0.0043	CCME, 2002

Table A1 Reference Tables for Pathway Specific Standards - Sediment (mg/kg)

Land Use / Receptor		Sediment Environment [1]			
Pathway		Freshwater Sediment		Marine Sediment	
Parameter	Units	Value	Reference	Value	Reference
Dimethoate	mg/kg	-	-	-	-
Dinoseb	mg/kg	-	-	-	-
Diquat	mg/kg	-	-	-	-
Diuron	mg/kg	-	-	-	-
Endosulfan	mg/kg	0.01	CCME 2013	-	-
Endrin	mg/kg	0.0624	CCME, 2002	0.0624	CCME, 2002
Glyphosate	mg/kg	-	-	-	-
Heptachlor	mg/kg	0.05	CCME 2013	0.05	CCME 2013
Lindane	mg/kg	0.00138	CCME, 2002	0.00099	CCME, 2002
Linuron	mg/kg	-	-	-	-
Malathion	mg/kg	0.82	AENV 2010 (soil)	0.82	AENV 2010 (soil)
MCPA	mg/kg	-	-	-	-
Methoxychlor	mg/kg	0.05	CCME 2013	-	-
Metolachlor	mg/kg	-	-	-	-
Metribuzin	mg/kg	-	-	-	-
Paraquat	mg/kg	-	-	-	-
Parathion	mg/kg	-	-	-	-
Phorate	mg/kg	-	-	-	-
Picloram	mg/kg	-	-	-	-
Simazine	mg/kg	-	-	-	-
Tebuthiuron	mg/kg	-	-	-	-
Terbufos	mg/kg	-	-	-	-
Toxaphene	mg/kg	0.005	CCME 2013	0.005	CCME 2013
Triallate	mg/kg	-	-	-	-
Trifluralin	mg/kg	-	-	-	-
Other Parameters					
Polychlorinated Biphenyl (Total PCB)	mg/kg	0.277	CCME, 2002	0.189	CCME, 2002
Dioxins and Furans (TEQ)	ng.TEQ/kg	21.5	CCME, 2002	21.5	CCME, 2002
Pentachlorophenol (PCP)	mg/kg	0.1	CCME 2013	0.1	CCME 2013
Organotins - Tributyltin	-	-	-	-	-
Ethylene Glycol	-	-	-	-	-
Propylene Glycol	-	-	-	-	-
Phenol	-	-	-	-	-

Notes:

[1] Human exposure to sediment may be assessed using Tier 2 Pathway Specific Standards for the soil contact/ingestion pathway

[2] All values in mg/kg, except as shown (dry weight bulk sediment concentration)

[3] "-" = No guideline available or no guideline required

[4] Dioxins and Furans TEQ, Toxic Equivalents, are to be calculated following methodology shown in " Canadian Council of Ministers of the Environment. 2002. Canadian soil quality guidelines for the protection of environmental and human health: Dioxins and Furans"

[5] for BCMOE SedQGs, the values are for a typical site, rather than a sensitive site, where this distinction is made.

[6] All SedQGs for organic parameters where partitioning to organic carbon is important to consider, assume a default OC content iof 1% (or Foc = 0.01).

[7] For USEPA 2008 values, used the lower of conventional or narcosis-based benchmarks, where both types of values were derived.

Table A2 References for Pathway Specific Standards for Surface Water (ug/L)

Land Use / Receptor		Surface Water			
Pathway		Fresh Water		Marine Water	
Parameter	Units	Value	Reference	Value	Reference
Inorganic Parameters		**Value**	**Source**	**Value**	Source
Aluminum	ug/L	5	CCME, 2007a	-	-
Antimony	ug/L	20	MOE, 1999	500	NOAA, 2009
Arsenic	ug/L	5.0	CCME, 2007a	12.5	CCME, 2007a
Barium	ug/L	1000	BCMOE 2006	500	BCMOE 2006
Beryllium	ug/L	5.3	BCMOE, 2006	100	BCMOE 2006
Boron	ug/L	1,200	BCMOE, 2003a	1,200	BCMOE, 2003a
Cadmium	ug/L	0.01	CCME, 2007a	0.12	CCME, 2007a
Chromium (hexavalent)	ug/L	1.0	CCME, 2007a	1.5	CCME, 2007a
Chromium (total)	ug/L	-	-	-	-
Cobalt	ug/L	10	CCME 2013	-	-
Copper	ug/L	2	CCME, 2007a	2	BCMOE, 1987a
Cyanide	ug/L	5	CCME, 2007a	1	BCMOE 1986
Iron	ug/L	300	CCME, 2007a	-	-
Lead	ug/L	1	CCME, 2007a	2	BCMOE, 1987b
Manganese	ug/L	820	BCMOE, 2001a	-	-
Mercury (total)	ug/L	0.026	CCME, 2007a	0.016	CCME, 2007a
Methylmercury	ug/L	0.004	CCME, 2007a	0.004	CCME, 2007a
Molybdenum	ug/L	73	CCME, 2007a	-	-
Nickel	ug/L	25	CCME, 2007a	8.3	BC MOE 2006
Selenium	ug/L	1.0	CCME, 2007a	2	BCMOE, 2001b
Silver	ug/L	0.1	CCME, 2007a	1.5	BCMOE 1996
Strontium	ug/L	21,000	MDEQ, 2007	-	-
Thallium	ug/L	0.8	CCME, 2007a	21.3	NHDES, 2009
Tin	ug/L	-	-	-	-
Uranium	ug/L	300	BCMOE 2006	100	BCMOE 2006

Table A2 References for Pathway Specific Standards for Surface Water (ug/L)

Land Use / Receptor		Surface Water			
Pathway		Fresh Water		Marine Water	
Parameter	Units	Value	Reference	Value	Reference
Vanadium	ug/L	6	BCMOE 2006	50	BCMOE 2006
Zinc	ug/L	30	CCME, 2007a	10	BCMOE, 1999
Petroleum Hydrocarbons (PHC) Parameters					
Benzene	ug/L	2,100	APIRI, 2012	2,100	APIRI, 2012
Toluene	ug/L	770	APIRI, 2012	770	APIRI, 2012
Ethylbenzene	ug/L	320	APIRI, 2012	320	APIRI, 2012
Xylene	ug/L	330	APIRI, 2012	330	APIRI, 2012
Modified TPH (Gas)	ug/L	1,500	APIRI, 2012 [8]	1,500	APIRI, 2012 [8]
Modified TPH (Fuel)	ug/L	100	APIRI, 2012 [8]	100	APIRI, 2012 [8]
Modified TPH (Lube)	ug/L	100	APIRI, 2012 [8]	100	APIRI, 2012 [8]
MTBE	ug/L	10,000	CCME, 2007a	5,000	CCME, 2007a
Polycyclic Aromatic Hydrocarbons (PAH) Parameters					
PAH Compounds					
Naphthalene	ug/L	1.1	CCME, 2007a	1.4	CCME, 2007a
1 - Methylnaphthalene	ug/L	2	MOE, 1999	1	BCMOE, 1993
2 - Methylnaphthalene	ug/L	2	MOE, 1999	2	CCME 2013
Acenapthene	ug/L	5.8	CCME, 2007a	6	BCMOE, 1993
Acenapthylene	ug/L	4.6	AENV, 2010	6	BCMOE, 1993
Anthracene	ug/L	0.012	CCME, 2007a	-	-
Fluoranthene	ug/L	0.04	CCME, 2007a	11	NOAA, 2009
Fluorene	ug/L	3	CCME, 2007a	12	BCMOE, 1993
Phenanthrene	ug/L	0.4	CCME, 2007a	4.6	NOAA, 2009
Pyrene	ug/L	0.025	CCME, 2007a	0.02	BCMOE, 1993
Carcinogenic PAHCompounds					
BaP Total Potency Equivalents	ug/L	-	-	-	-
Benz[a]anthracene	ug/L	0.018	CCME, 2007a	-	-
Benzo[a]pyrene	ug/L	0.015	CCME, 2007a	0.01	BCMOE, 1993

Table A2 References for Pathway Specific Standards for Surface Water (ug/L)

Land Use / Receptor		Surface Water			
Pathway		Fresh Water		Marine Water	
Parameter	Units	Value	Reference	Value	Reference
Benzo[b,j,k]fluoranthene isomers	ug/L	0.48	AENV, 2010	-	-
Benzo[g,h,i]perylene	ug/L	0.17	AENV, 2010	-	-
Chrysene	ug/L	1.4	AENV, 2010	0.1	BCMOE, 1993
Dibenz[a.h]anthracene	ug/L	0.26	AENV, 2010	-	-
Indeno[1,2,3-c,d]pyrene	ug/L	0.21	AENV, 2010	-	-
Volatile Organic Compound (VOC) Parameters					
Bromodichloromethane	ug/L	200	MOE, 1999	6,400	NHDES, 2009
Bromoform	ug/L	60	MOE, 1999	6,400	NHDES, 2009
Bromomethane	ug/L	0.9	MOE, 1999	6,400	NHDES, 2009
Carbon Tetrachloride (Tetrachloromethane)	ug/L	13.3	CCME, 2007a	500	NHDES, 2009
Chlorobenzene	ug/L	1.3	CCME, 2007a	25	CCME, 2007a
Chloroethane	ug/L	1,100	MDEQ, 2007	-	-
Chloroform	ug/L	1.8	CCME, 2007a	6,400	NHDES, 2009
Chloromethane	ug/L	700	MOE, 1999	6,400	NHDES, 2009
Dibromochloromethane	ug/L	40	MOE, 1999	6,400	NHDES, 2009
1,2-Dichlorobenzene	ug/L	0.7	CCME, 2007a	42	CCME, 2007a
1,3-Dichlorobenzene	ug/L	150	CCME, 2007a	19.7	NHDES, 2009
1,4-Dichlorobenzene	ug/L	26	CCME, 2007a	19.7	NHDES, 2009
1,1-Dichloroethane	ug/L	200	MOE, 1999	1,130	NHDES, 2009
1,2-Dichloroethane	ug/L	100	CCME, 2007a	1,130	NHDES, 2009
1,1-Dichloroethylene	ug/L	40	MOE, 1999	2,240	NHDES, 2009
cis-1,2-Dichloroethylene	ug/L	200	MOE, 1999	2,240	NHDES, 2009
trans-1,2-Dichloroethylene	ug/L	200	MOE, 1999	2,240	NHDES, 2009
1,2-Dichloropropane	ug/L	0.7	MOE, 1999	3,040	NHDES, 2009
1,3-Dichloropropene	ug/L	7	MOE, 1999	7.9	NHDES, 2009
Ethylene Dibromide	ug/L	5	MOE, 1999	-	-

Table A2 References for Pathway Specific Standards for Surface Water (ug/L)

Land Use / Receptor		Surface Water			
Pathway		Fresh Water		Marine Water	
Parameter	Units	Value	Reference	Value	Reference
Methylene Chloride (Dichloromethane)	ug/L	98.1	CCME, 2007a	6,400	NHDES, 2009
Styrene	ug/L	72	CCME, 2007a	-	-
1,1,2,2-Tetrachloroethane	ug/L	70	MOE, 1999	90.2	NHDES, 2009
Tetrachloroethylene	ug/L	111	CCME, 2007a	450	NHDES, 2009
1,1,1-Trichloroethane	ug/L	10	MOE, 1999	312	NHDES, 2009
1,1,2-Trichloroethane	ug/L	800	MOE, 1999	312	NHDES, 2009
Trichloroethylene	ug/L	21	CCME, 2007a	20	NHDES, 2009
Vinyl Chloride	ug/L	600	MOE, 1999	-	-
Pesticides					
Aldicarb	ug/L	1	CCME, 2007a	0.15	CCME, 2007a
Aldrin	ug/L	0.01	CCME 2013	1.3	USEPA, 2009
Atrazine	ug/L	1.8	CCME, 2007a	12.5	CCME, 2007a
Azinphos-methyl	ug/L	0.01	AENV, 2010	0.01	Multiple agencies including: ODEQ 1996; NHDES 2009; NYDEC 1999; USEPA 2008; MENVQ 2013
Bendiocarb	ug/L	-	-	-	-
Bromoxynil	ug/L	5	CCME, 2007a	-	-
Carbaryl	ug/L	0.2	CCME, 2007a	0.32	CCME, 2007a
Carbofuran	ug/L	1.8	CCME, 2007a	-	-
Chlorothalonil	ug/L	0.18	CCME, 2007a	0.36	CCME, 2007a
Chlorpyrifos	ug/L	0.0035	CCME, 2007a	0.003	CCME 2013
Cyanazine	ug/L	2	CCME, 2007a	-	-
2,4-D	ug/L	4	BCMOE 2006	-	-
DDT	ug/L	0.02	CCME 2013	0.02	CCME 2013
Diazinon	ug/L	0.08	BCMOE 2006	-	-
Dicamba	ug/L	10	CCME, 2007a	-	-

Table A2 References for Pathway Specific Standards for Surface Water (ug/L)

Land Use / Receptor		Surface Water			
Pathway		Fresh Water		Marine Water	
Parameter	Units	Value	Reference	Value	Reference
Dichlorfop-methyl	ug/L	6.1	CCME, 2007a	-	-
Dieldrin	ug/L	0.02	CCME 2013	0.02	CCME 2013
Dimethoate	ug/L	6.2	CCME, 2007a	-	-
Dinoseb	ug/L	0.05	CCME, 2007a	-	-
Diquat	ug/L	0.5	MOE, 1999	-	-
Diuron	ug/L	1.6	MOE, 1999	-	-
Endosulfan	ug/L	0.02	CCME, 2007a	0.0087	USEPA, 1980
Endrin	ug/L	0.02	CCME 2013	0.02	CCME 2013
Glyphosate	ug/L	65	CCME, 2007a	-	-
Heptachlor	ug/L	0.002	CCME 2013	0.0036	USEPA, 2009
Lindane	ug/L	0.01	CCME, 2007a	-	-
Linuron	ug/L	7	CCME, 2007a	-	-
Malathion	ug/L	0.1	MOE, 1999	-	-
MCPA	ug/L	2.6	CCME, 2007a	4.2	CCME, 2007a
Methoxychlor	ug/L	0.05	CCME 2013	0.05	CCME 2013
Metolachlor	ug/L	7.8	CCME, 2007a	-	-
Metribuzin	ug/L	1	CCME, 2007a	-	-
Paraquat	ug/L	16	MDEQ, 1997	-	-
Parathion	ug/L	0.008	MOE, 1999	-	-
Phorate	ug/L	-	-	-	-
Picloram	ug/L	29	CCME, 2007a	-	-
Simazine	ug/L	10	CCME, 2007a	-	-
Tebuthiuron	ug/L	1.6	CCME, 2007a	-	-
Terbufos	ug/L	-	-	-	-
Toxaphene	ug/L	0.05	CCME 2013	0.05	CCME 2013
Triallate	ug/L	0.24	CCME, 2007a	-	-

Table A2 References for Pathway Specific Standards for Surface Water (ug/L)

Land Use / Receptor		Surface Water			
Pathway		Fresh Water		Marine Water	
Parameter	Units	Value	Reference	Value	Reference
Trifluralin	ug/L	0.2	CCME, 2007a	-	-
Other Parameters					
Polychlorinated Biphenyl (Total PCB)	ug/L	-	-	-	-
Dioxins and Furans (TEQ)	ug/L	-	-	-	-
Pentachlorophenol (PCP)	ug/L	0.5	CCME, 2007a	7.9	USEPA, 2009
Organotins - Tributyltin	ug/L	0.008	CCME, 2007a	0.001	CCME, 2007a
Ethylene Glycol	ug/L	192,000	CCME, 2007a	-	CCME, 2007a
Propylene Glycol	ug/L	500,000	CCME, 2007a	-	CCME, 2007a
Phenol	ug/L	4,000	CCME, 2007a	-	CCME, 2007a

Notes:

[1] All values in µg/L

[2] "-" = No guideline available or no guideline required .

[3] All criteria presented in this table are for aquatic life protection only. For human exposure to surface water via drinking water, refer to the potable groundwater tables

Table A3 References for Pathway Specific Standards for Groundwater (ug/L)

Parameter	Groundwater Receptor Pathways																	
	Potable Groundwater Drinking Water		Vapour Migration from Groundwater to Indoor Air							Groundwater Discharge to Surface Water								
										0-10 metres from Surface Water Body				> 10 metres from Surface Water Body				
	All Land Uses		Agricultural / Residential Land Use		Commercial Land Use		Industrial Land Use			Using Tier 1 EQS for Surface Water				Ground Water = 10X Tier 1 EQS SW Values or Atlantic RBCA				
	Soil Type		Soil Type															
	Fine/Coarse	Source	Fine	Coarse	Fine	Coarse	Fine	Coarse	Reference	Discharge to Fresh Water	Reference	Discharge to Marine Water	Reference	Discharge to Fresh Water	Comments	Discharge to Marine Water	Comments	
Inorganic Parameters			Value	Value	Value	Value	Value	Value	Source	Value	Source	Value	Source	Value	Notes	Value	Notes	
Aluminum	100	HC, 2012 (OG)	-	-	-	-	-	-	-	5	CCME, 2007a	-	-	50	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Antimony	6	HC, 2012	-	-	-	-	-	-	-	20	MOE, 1999	500	NOAA, 2009	200	10 X Surface Fresh Water value	5,000	10 X Surface Marine Water value	
Arsenic	10	HC, 2012	-	-	-	-	-	-	-	5.0	CCME, 2007a	12.5	CCME, 2007a	50	10 X Surface Fresh Water value	125	10 X Surface Marine Water value	
Barium	1000	HC, 2012	-	-	-	-	-	-	-	1000	BCMOE 2006	500	BCMOE 2006	10,000	10 X Surface Fresh Water value	5,000	10 X Surface Marine Water value	
Beryllium	4	OMOE, 2011	-	-	-	-	-	-	-	5.3	BCMOE, 2006	100	BCMOE 2006	53	10 X Surface Fresh Water value	1,000	10 X Surface Marine Water value	
Boron	5000	HC, 2012 *	-	-	-	-	-	-	-	1,200	BCMOE, 2003a	1,200	BCMOE, 2003a	12,000	10 X Surface Fresh Water value	12,000	10 X Surface Marine Water value	
Cadmium	5	HC, 2012	-	-	-	-	-	-	-	0.01	CCME, 2007a	0.12	CCME, 2007a	0.1	10 X Surface Fresh Water value	1.2	10 X Surface Marine Water value	
Chromium (hexavalent)	25	OMOE, 2011	-	-	-	-	-	-	-	1.0	CCME, 2007a	1.5	CCME, 2007a	10	10 X Surface Fresh Water value	15	10 X Surface Marine Water value	
Chromium (total)	50	HC, 2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cobalt	10	CCME 2013	-	-	-	-	-	-	-	10	CCME 2013	-	-	100	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Copper	1000	HC, 2012 (AO)	-	-	-	-	-	-	-	2	CCME, 2007a	2	BCMOE, 1987a	20	10 X Surface Fresh Water value	20	10 X Surface Marine Water value	
Cyanide	200	HC, 2012	-	-	-	-	-	-	-	5	CCME, 2007a	1	BCMOE 1986	50	10 X Surface Fresh Water value	10	10 X Surface Marine Water value	
Iron	300	HC, 2012 (AO)	-	-	-	-	-	-	-	300	CCME, 2007a	-	-	3,000	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Lead	10	HC, 2012	-	-	-	-	-	-	-	1	CCME, 2007a	2	BCMOE, 1987b	10	10 X Surface Fresh Water value	20	10 X Surface Marine Water value	
Manganese	50	HC, 2012 (AO)	-	-	-	-	-	-	-	820	BCMOE, 2001a	-	-	8,200	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Mercury (total)	1	HC, 2012	-	-	-	-	-	-	-	0.026	CCME, 2007a	0.016	CCME, 2007a	0.26	10 X Surface Fresh Water value	0.16	10 X Surface Marine Water value	
Methylmercury	0.3	OMOE, 2011	-	-	-	-	-	-	-	0.004	CCME, 2007a	0.004	CCME, 2007a	0.04	10 X Surface Fresh Water value	0.04	10 X Surface Marine Water value	
Molybdenum	70	OMOE, 2011	-	-	-	-	-	-	-	73	CCME, 2007a	-	-	730	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Nickel	100	OMOE, 2011	-	-	-	-	-	-	-	25	CCME, 2007a	8.3	BC MOE 2006	250	10 X Surface Fresh Water value	83	10 X Surface Marine Water value	
Selenium	10	HC, 2012	-	-	-	-	-	-	-	1.0	CCME, 2007a	2	BCMOE, 2001b	10	10 X Surface Fresh Water value	20	10 X Surface Marine Water value	
Silver	100	OMOE, 2011	-	-	-	-	-	-	-	0.1	CCME, 2007a	1.5	BCMOE 1996	1	10 X Surface Fresh Water value	15	10 X Surface Marine Water value	
Strontium	4400	USEPA, 2010 [5]	-	-	-	-	-	-	-	21,000	MDEQ, 2007	-	-	210,000	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Thallium	2	OMOE, 2011	-	-	-	-	-	-	-	0.8	CCME, 2007a	21.3	NHDES, 2009	8	10 X Surface Fresh Water value	213	10 X Surface Marine Water value	
Tin	4400	USEPA, 2010 [5]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Uranium	20	HC, 2012 *	-	-	-	-	-	-	-	300	BCMOE 2006	100	BCMOE 2006	3,000	10 X Surface Fresh Water value	1,000	10 X Surface Marine Water value	
Vanadium	6.2	OMOE, 2011	-	-	-	-	-	-	-	6	BCMOE 2006	50	BCMOE 2006	60	10 X Surface Fresh Water value	500	10 X Surface Marine Water value	
Zinc	5000	HC, 2012 (AO)	-	-	-	-	-	-	-	30	CCME, 2007a	10	BCMOE, 1999	300	10 X Surface Fresh Water value	100	10 X Surface Marine Water value	
General Chemistry Parameters																		
Chloride	250000	HC, 2012 (AO)	-	-	-	-	-	-	-	1,500,000	BC MOE, 2003b	No more than a 10% change in ambient sea water salinity (as NaCl).	BC MOE 2003b	15,000,000	10 X Surface Fresh Water value	No more than a 10% change in ambient sea water salinity (as NaCl).	-	
Sodium	200000	HC, 2012 (AO)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Petroleum Hydrocarbons (PHC) Parameters																		
Benzene	5	APIRI, 2012	13,000	2,600	150,000	30,000	150,000	30,000	APIRI, 2012	2,100	APIRI, 2012	2,100	APIRI, 2012	4,600	Eco-screening Protocol, APIRI	4,600	Eco-screening Protocol, APIRI	
Toluene	24	APIRI, 2012	>Sol	>Sol	>Sol	>Sol	>Sol	>Sol	APIRI, 2012	770	APIRI, 2012	770	APIRI, 2012	4,200	Eco-screening Protocol, APIRI	4,200	Eco-screening Protocol, APIRI	
Ethylbenzene	2.4	APIRI, 2012	>Sol	>Sol	>Sol	>Sol	>Sol	>Sol	APIRI, 2012	320	APIRI, 2012	320	APIRI, 2012	3,200	Eco-screening Protocol, APIRI	3,200	Eco-screening Protocol, APIRI	
Xylene	300	APIRI, 2012	330,000	68,000	>Sol	390,000	>Sol	390,000	APIRI, 2012	330	APIRI, 2012	330	APIRI, 2012	2,800	Eco-screening Protocol, APIRI	2,800	Eco-screening Protocol, APIRI	
Modified TPH (Gas)	4400	APIRI, 2012	2,100,000	34,000	> Sol	3,700,000	> Sol	3,700,000	APIRI, 2012	1,500	APIRI, 2012 [8]	1,500	APIRI, 2012 [8]	13,000	Eco-screening Protocol, APIRI	13,000	Eco-screening Protocol, APIRI	
Modified TPH (Fuel)	3200	APIRI, 2012	30,000,000	200,000	> Sol	39,000,000	> Sol	39,000,000	APIRI, 2012	100	APIRI, 2012 [8]	100	APIRI, 2012 [8]	840	Eco-screening Protocol, APIRI	840	Eco-screening Protocol, APIRI	
Modified TPH (Lube)	7800	APIRI, 2012	> Sol	1,100,000	> Sol	> Sol	> Sol	> Sol	APIRI, 2012	100	APIRI, 2012 [8]	100	APIRI, 2012 [8]	100	Eco-screening Protocol, APIRI	100	Eco-screening Protocol, APIRI	
MTBE	15	HC, 2012 (AO)	6,100	340	40000	4300	40000	4300	AENV, 2010	10,000	CCME, 2007a	5,000	CCME, 2007a	100,000	-	50,000	-	
Polycyclic Aromatic Hydrocarbons (PAH) Parameters																		
PAH Compounds																		
Naphthalene	470	AENV, 2010	14000	600	-	7000	-	7000	AENV, 2010	1.1	CCME, 2007a	1.4	CCME, 2007a	11	10 X Surface Fresh Water value	14	10 X Surface Marine Water value	
1 - Methylnaphthalene	12	OMOE, 2011	35000	6200	150000	38000	150000	38000	OMOE, 2011	2	MOE, 1999	1	BCMOE, 1993	20	10 X Surface Fresh Water value	10	10 X Surface Marine Water value	
2 - Methylnaphthalene	12	OMOE, 2011	35000	6200	150000	38000	150000	38000	OMOE, 2011	2	MOE, 1999	2	CCME 2013	20	10 X Surface Fresh Water value	20	10 X Surface Marine Water value	
Acenapthene	1400	AENV, 2010	-	-	-	-	-	-	AENV, 2010	5.8	CCME, 2007a	6	BCMOE, 1993	58	10 X Surface Fresh Water value	60	10 X Surface Marine Water value	
Acenapthylene	4.5	OMOE, 2011 [4]	120	36	1700	750	1700	750	OMOE, 2011	4.6	AENV, 2010	6	BCMOE, 1993	46	10 X Surface Fresh Water value	60	10 X Surface Marine Water value	
Anthracene	-	AENV, 2010	-	-	-	-	-	-	AENV, 2010	0.012	CCME, 2007a	-	-	0.12	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Fluoranthene	-	AENV, 2010	-	-	-	-	-	-	AENV, 2010	0.04	CCME, 2007a	11	NOAA, 2009	0.4	10 X Surface Fresh Water value	110	10 X Surface Marine Water value	
Fluorene	940	AENV, 2010	-	-	-	-	-	-	AENV, 2010	3	CCME, 2007a	12	BCMOE, 1993	30	10 X Surface Fresh Water value	120	10 X Surface Marine Water value	
Phenanthrene	-	AENV, 2010	-	-	-	-	-	-	AENV, 2010	0.4	CCME, 2007a	4.6	NOAA, 2009	4	10 X Surface Fresh Water value	46	10 X Surface Marine Water value	
Pyrene	710	AENV, 2010	-	-	-	-	-	-	AENV, 2010	0.025	CCME, 2007a	0.02	BCMOE, 1993	0.25	10 X Surface Fresh Water value	0.2	10 X Surface Marine Water value	
Carcinogenic PAHCompounds																		
BaP Total Potency Equivalents	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benz[a]anthracene	-	-	-	-	-	-	-	-	-	0.018	CCME, 2007a	-	-	0.18	10 X Surface Fresh Water value	-	-	
Benzo[a]pyrene	0.01	HC, 2012	-	-	-	-	-	-	-	0.015	CCME, 2007a	0.01	BCMOE, 1993	0.15	10 X Surface Fresh Water value	0.1	10 X Surface Marine Water value	
Benzo[b,j,k]fluoranthene isomers	-	-	-	-	-	-	-	-	-	0.48	AENV, 2010	-	-	4.8	10 X Surface Fresh Water value	-	-	
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-	-	0.17	AENV, 2010	-	-	1.7	10 X Surface Fresh Water value	-	-	
Chrysene	-	-	-	-	-	-	-	-	-	1.4	AENV, 2010	0.1	BCMOE, 1993	14	10 X Surface Fresh Water value	1	10 X Surface Marine Water value	
Dibenz[a.h]anthracene	-	-	-	-	-	-	-	-	-	0.26	AENV, 2010	-	-	2.6	10 X Surface Fresh Water value	-	-	
Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	-	-	-	0.21	AENV, 2010	-	-	2.1	10 X Surface Fresh Water value	-	-	

Table A3 References for Pathway Specific Standards for Groundwater (ug/L)

Parameter	Groundwater Receptor Pathways																	
	Potable Groundwater Drinking Water		Vapour Migration from Groundwater to Indoor Air							Groundwater Discharge to Surface Water								
										0-10 metres from Surface Water Body				> 10 metres from Surface Water Body				
	All Land Uses		Agricultural / Residential Land Use		Commercial Land Use		Industrial Land Use			Using Tier 1 EQS for Surface Water				Ground Water = 10X Tier 1 EQS SW Values or Atlantic RBCA				
	Soil Type		Soil Type															
	Fine/Coarse	Source	Fine	Coarse	Fine	Coarse	Fine	Coarse	Reference	Discharge to Fresh Water	Reference	Discharge to Marine Water	Reference	Discharge to Fresh Water	Comments	Discharge to Marine Water	Comments	
Volatile Organic Compound (VOC) Parameters																		
Bromodichloromethane	100	HC, 2012	-	-	-	-	-	-	-	200	MOE, 1999	6,400	NHDES, 2009	2,000	10 X Surface Fresh Water value	64,000	10 X Surface Marine Water value	
Bromoform	100	HC, 2012	7700	3800	130000	84000	130000	84000	OMOE, 2011[5]	60	MOE, 1999	6,400	NHDES, 2009	600	10 X Surface Fresh Water value	64,000	10 X Surface Marine Water value	
Bromomethane	0.89	OMOE, 2011	56	5.6	230	33	230	33	OMOE, 2011	0.9	MOE, 1999	6,400	NHDES, 2009	9	10 X Surface Fresh Water value	64,000	10 X Surface Marine Water value	
Carbon Tetrachloride (Tetrachloromethane)	2	HC, 2012	11	0.56	78	6.8	78	6.8	AENV, 2010	13.3	CCME, 2007a	500	NHDES, 2009	133	10 X Surface Fresh Water value	5,000	10 X Surface Marine Water value	
Chlorobenzene	30	AENV, 2010	300	14	2200	180	2200	180	AENV, 2010	1.3	CCME, 2007a	25	CCME, 2007a	13	10 X Surface Fresh Water value	250	10 X Surface Marine Water value	
Chloroethane	-	-	-	-	-	-	-	-	-	1,100	MDEQ, 2007	-	-	11,000	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Chloroform	100	HC, 2012	50	3	350	40	350	40	AENV, 2010	1.8	CCME, 2007a	6,400	NHDES, 2009	18	10 X Surface Fresh Water value	64,000	10 X Surface Marine Water value	
Chloromethane	38	USEPA, 2010 [5]	-	-	-	-	-	-	-	700	MOE, 1999	6,400	NHDES, 2009	7,000	10 X Surface Fresh Water value	64,000	10 X Surface Marine Water value	
Dibromochloromethane	100	HC, 2012	26000	1100	250000	10000	250000	10000	AENV, 2010	40	MOE, 1999	6,400	NHDES, 2009	400	10 X Surface Fresh Water value	64,000	10 X Surface Marine Water value	
1,2-Dichlorobenzene	200	HC, 2012	116000	5400	-	64000	-	64000	AENV, 2010	0.7	CCME, 2007a	42	CCME, 2007a	7	10 X Surface Fresh Water value	420	10 X Surface Marine Water value	
1,3-Dichlorobenzene	59	OMOE, 2011	-	-	-	-	-	-	-	150	CCME, 2007a	19.7	NHDES, 2009	1,500	10 X Surface Fresh Water value	197	10 X Surface Marine Water value	
1,4-Dichlorobenzene	5	HC, 2012	4600	220	32000	2600	32000	2600	AENV, 2010	26	CCME, 2007a	19.7	NHDES, 2009	260	10 X Surface Fresh Water value	197	10 X Surface Marine Water value	
1,1-Dichloroethane	5	OMOE, 2011	3100	320	45000	6600	45000	6600	OMOE, 2011	200	MOE, 1999	1,130	NHDES, 2009	2,000	10 X Surface Fresh Water value	11,300	10 X Surface Marine Water value	
1,2-Dichloroethane	5	HC, 2012 *	120	16	1600	300	1600	300	OMOE, 2011[5]	100	CCME, 2007a	1,130	NHDES, 2009	1,000	10 X Surface Fresh Water value	11,300	10 X Surface Marine Water value	
1,1-Dichloroethylene	14	HC, 2012	680	39	4500	490	4500	490	AENV, 2010	40	MOE, 1999	2,240	NHDES, 2009	400	10 X Surface Fresh Water value	22,400	10 X Surface Marine Water value	
cis-1,2-Dichloroethylene	20	OMOE, 2011	17	1.6	230	30	230	30	OMOE, 2011	200	MOE, 1999	2,240	NHDES, 2009	2,000	10 X Surface Fresh Water value	22,400	10 X Surface Marine Water value	
trans-1,2-Dichloroethylene	20	OMOE, 2011	17	1.6	230	30	230	30	OMOE, 2011	200	MOE, 1999	2,240	NHDES, 2009	2,000	10 X Surface Fresh Water value	22,400	10 X Surface Marine Water value	
1,2-Dichloropropane	5	OMOE, 2011	140	16	2000	330	2000	330	OMOE, 2011	0.7	MOE, 1999	3,040	NHDES, 2009	7	10 X Surface Fresh Water value	30,400	10 X Surface Marine Water value	
1,3-Dichloropropene	0.5	OMOE, 2011	45	5.2	610	100	610	100	OMOE, 2011	7	MOE, 1999	7.9	NHDES, 2009	70	10 X Surface Fresh Water value	79	10 X Surface Marine Water value	
Ethylene Dibromide	0.2	CCME 2013	8.3	2.5	120	51	120	51	OMOE, 2011[5]	5	MOE, 1999	-	-	50	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Methylene Chloride (Dichloromethane)	50	HC, 2012	61000	3400	410000	43000	410000	43000	AENV, 2010	98.1	CCME, 2007a	6,400	NHDES, 2009	981	10 X Surface Fresh Water value	64,000	10 X Surface Marine Water value	
Styrene	100	OMOE, 2011	11000	1300	160000	26000	160000	26000	OMOE, 2011	72	CCME, 2007a	-	-	720	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
1,1,2,2-Tetrachloroethane	1	OMOE, 2011	150	32	2100	630	2100	630	OMOE, 2011[5]	70	MOE, 1999	90.2	NHDES, 2009	700	10 X Surface Fresh Water value	902	10 X Surface Marine Water value	
Tetrachloroethylene	30	HC, 2012	2300	110	16000	1300	16000	1300	AENV, 2010	111	CCME, 2007a	450	NHDES, 2009	1,110	10 X Surface Fresh Water value	4,500	10 X Surface Marine Water value	
1,1,1-Trichloroethane	200	OMOE, 2011	6700	640	95000	13000	95000	13000	OMOE, 2011	10	MOE, 1999	312	NHDES, 2009	100	10 X Surface Fresh Water value	3,120	10 X Surface Marine Water value	
1,1,2-Trichloroethane	5	OMOE, 2011	300	47	4100	910	4100	910	OMOE, 2011[5]	800	MOE, 1999	312	NHDES, 2009	8,000	10 X Surface Fresh Water value	3,120	10 X Surface Marine Water value	
Trichloroethylene	5	HC, 2012	410	20	2800	250	2800	250	AENV, 2010	21	CCME, 2007a	20	NHDES, 2009	210	10 X Surface Fresh Water value	200	10 X Surface Marine Water value	
Vinyl Chloride	2	HC, 2012	18	1.1	120	13	120	13	AENV, 2010	600	MOE, 1999	-	-	6,000	10 X Surface Fresh Water value	-	-	
Pesticides																		
Aldicarb	9	HC, 2008	-	-	-	-	-	-	-	1	CCME, 2007a	0.15	CCME, 2007a	10	10 X Surface Fresh Water value	1.5	10 X Surface Marine Water value	
Aldrin	0.7	HC, 2008	-	-	-	-	-	-	-	0.01	CCME 2013	1.3	USEPA, 2009	0.1	10 X Surface Fresh Water value	13	10 X Surface Marine Water value	
Atrazine	5	HC, 2012	-	-	-	-	-	-	-	1.8	CCME, 2007a	12.5	CCME, 2007a	18	10 X Surface Fresh Water value	125	10 X Surface Marine Water value	
Azinphos-methyl	20	HC, 2012	-	-	-	-	-	-	-	0.01	AENV, 2010	0.01	Multiple agencies including: ODEQ 1996; NHDES 2009; NYDEC 1999; USEPA 2008; MENVQ 2013	0.1	10 X Surface Fresh Water value	0.1	10 X Surface Marine Water value	
Bendiocarb	40	AENV, 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Bromoxynil	5	HC, 2012	-	-	-	-	-	-	-	5	CCME, 2007a	-	-	50	10 X Surface Fresh Water value	-	-	
Carbaryl	90	HC, 2012	-	-	-	-	-	-	-	0.2	CCME, 2007a	0.32	CCME, 2007a	2	10 X Surface Fresh Water value	3.2	10 X Surface Marine Water value	
Carbofuran	90	HC, 2012	-	-	-	-	-	-	-	1.8	CCME, 2007a	-	-	18	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Chlorothalonil	140	AENV, 2010	-	-	-	-	-	-	-	0.18	CCME, 2007a	0.36	CCME, 2007a	1.8	10 X Surface Fresh Water value	3.6	10 X Surface Marine Water value	
Chlorpyrifos	90	HC, 2012	-	-	-	-	-	-	-	0.0035	CCME, 2007a	0.003	CCME 2013	0.035	10 X Surface Fresh Water value	0.03	10 X Surface Marine Water value	
Cyanazine	10	AENV, 2010	-	-	-	-	-	-	-	2	CCME, 2007a	-	-	20	10 X Surface Fresh Water value	-	-	
2,4-D	100	HC, 2012	-	-	-	-	-	-	-	4	BCMOE 2006	-	-	40	10 X Surface Fresh Water value	-	-	
DDT	93	AENV, 2010	-	-	-	-	-	-	-	0.02	CCME 2013	0.02	CCME 2013	0.2	10 X Surface Fresh Water value	0.2	10 X Surface Marine Water value	
Diazinon	20	HC, 2012	-	-	-	-	-	-	-	0.08	BCMOE 2006	-	-	0.8	10 X Surface Fresh Water value	-	-	
Dicamba	120	HC, 2012	-	-	-	-	-	-	-	10	CCME, 2007a	-	-	100	10 X Surface Fresh Water value	-	-	
Dichlorfop-methyl	9	HC, 2012	-	-	-	-	-	-	-	6.1	CCME, 2007a	-	-	61	10 X Surface Fresh Water value	-	-	
Dieldrin	0.7	HC, 2008	-	-	-	-	-	-	-	0.02	CCME 2013	0.02	CCME 2013	0.2	10 X Surface Fresh Water value	0.2	10 X Surface Marine Water value	
Dimethoate	20	HC, 2012 *	-	-	-	-	-	-	-	6.2	CCME, 2007a	-	-	62	10 X Surface Fresh Water value	-	-	
Dinoseb	10	HC, 2008	-	-	-	-	-	-	-	0.05	CCME, 2007a	-	-	0.5	10 X Surface Fresh Water value	-	-	
Diquat	70	HC, 2012	-	-	-	-	-	-	-	0.5	MOE, 1999	-	-	5	10 X Surface Fresh Water value	-	-	
Diuron	150	HC, 2012	-	-	-	-	-	-	-	1.6	MOE, 1999	-	-	16	10 X Surface Fresh Water value	-	-	
Endosulfan	57	AENV, 2010	-	-	-	-	-	-	-	0.02	CCME, 2007a	0.0087	USEPA, 1980	0.2	10 X Surface Fresh Water value	0.087	10 X Surface Marine Water value	
Endrin	2.8	AENV, 2010	-	-	-	-	-	-	-	0.02	CCME 2013	0.02	CCME 2013	0.2	10 X Surface Fresh Water value	0.2	10 X Surface Marine Water value	
Glyphosate	280	HC, 2012 *	-	-	-	-	-	-	-	65	CCME, 2007a	-	-	650	10 X Surface Fresh Water value	-	10 X Surface Marine Water value	
Heptachlor	50	HC, 2008	4.3	0.24	51	2	51	2	AENV, 2010	0.002	CCME 2013	0.0036	USEPA, 2009	0.02	10 X Surface Fresh Water value	0.036	10 X Surface Marine Water value	
Lindane	2.8	AENV, 2010	-	-	-	-	-	-	-	0.01	CCME, 2007a	-	-	0.1	10 X Surface Fresh Water value	-	-	
Linuron	19	AENV, 2010	-	-	-	-	-	-	-	7	CCME, 2007a	-	-	70	10 X Surface Fresh Water value	-	-	
Malathion	190	HC, 2012	-	-	-	-	-	-	-	0.1	MOE, 1999	-	-	1	10 X Surface Fresh Water value	-	-	
MCPA	100	HC, 2012	-	-	-	-	-	-	-	2.6	CCME, 2007a	4.2	CCME, 2007a	26	10 X Surface Fresh Water value	42	10 X Surface Marine Water value	
Methoxychlor	900	HC, 2008	-	-	-	-	-	-	-	0.05	CCME 2013	0.05	CCME 2013	0.5	10 X Surface Fresh Water value	0.5	10 X Surface Marine Water value	

Table A3 References for Pathway Specific Standards for Groundwater (ug/L)

Parameter	Groundwater Receptor Pathways																	
	Potable Groundwater Drinking Water		Vapour Migration from Groundwater to Indoor Air							Groundwater Discharge to Surface Water								
										0-10 metres from Surface Water Body Using Tier 1 EQS for Surface Water				> 10 metres from Surface Water Body Ground Water = 10X Tier 1 EQS SW Values or Atlantic RBCA				
	All Land Uses		Agricultural / Residential Land Use		Commercial Land Use		Industrial Land Use											
	Soil Type		Soil Type															
	Fine/Coarse	Source	Fine	Coarse	Fine	Coarse	Fine	Coarse	Reference	Discharge to Fresh Water	Reference	Discharge to Marine Water	Reference	Discharge to Fresh Water	Comments	Discharge to Marine Water	Comments
Metolachlor	50	HC,2008 *	-	-	-	-	-	-	-	7.8	CCME, 2007a	-	-	78	10 X Surface Fresh Water value	-	-
Metribuzin	80	HC, 2008	-	-	-	-	-	-	-	1	CCME, 2007a	-	-	10	10 X Surface Fresh Water value	-	-
Paraquat	10	HC, 2012 *	-	-	-	-	-	-	-	16	MDEQ, 1997	-	-	160	10 X Surface Fresh Water value	-	-
Parathion	50	HC, 2008	-	-	-	-	-	-	-	0.008	MOE, 1999	-	-	0.08	10 X Surface Fresh Water value	-	-
Phorate	2	HC, 2012	-	-	-	-	-	-	-	-	-	-	-	-	10 X Surface Fresh Water value	-	-
Picloram	190	HC, 2012 *	-	-	-	-	-	-	-	29	CCME, 2007a	-	-	290	10 X Surface Fresh Water value	-	-
Simazine	10	HC, 2012 *	-	-	-	-	-	-	-	10	CCME, 2007a	-	-	100	10 X Surface Fresh Water value	-	-
Tebuthiuron	660	AENV, 2010	-	-	-	-	-	-	-	1.6	CCME, 2007a	-	-	16	10 X Surface Fresh Water value	-	-
Terbufos	1	HC, 2012 *	-	-	-	-	-	-	-	-	-	-	-	-	10 X Surface Fresh Water value	-	-
Toxaphene	0.43	AENV, 2010	6400	310	75000	2900	75000	2900	AENV, 2010	0.05	CCME 2013	0.05	CCME 2013	0.5	10 X Surface Fresh Water value	0.05	10 X Surface Marine Water value
Triallate	120	AENV, 2010	-	-	-	-	-	-	-	0.24	CCME, 2007a	-	-	2.4	10 X Surface Fresh Water value	-	-
Trifluralin	45	HC, 2012 *	-	-	-	-	-	-	-	0.2	CCME, 2007a	-	-	2	10 X Surface Fresh Water value	-	-
Other Parameters																	
Polychlorinated Biphenyl (Total PCB)	9.4	AENV, 2010	15	7.8	250	180	250	180	OMOE, 2009	-	-	-	-	-	-	-	-
Dioxins and Furans (TEQ)	1.20E-04	AENV, 2010	0.023	0.014	0.45	0.37	0.45	0.37	OMOE, 2009	-	-	-	-	-	-	-	-
Pentachlorophenol (PCP)	30	AENV, 2010	-	-	-	-	-	-	-	0.5	CCME, 2007a	7.9	USEPA, 2009	5	10 X Surface Fresh Water value	79	10 X Surface Marine Water value
Organotins - Tributyltin	2200	USEPA, 2010 [5]	-	-	-	-	-	-	-	0.008	CCME, 2007a	0.001	CCME, 2007a	0.08	10 X Surface Fresh Water value	0.01	10 X Surface Marine Water value
Ethylene Glycol	31	AENV, 2010	-	-	-	-	-	-	AENV, 2010	192,000	CCME, 2007a	-	CCME, 2007a	1,920,000	10 X Surface Fresh Water value	-	-
Propylene Glycol	-	-	-	-	-	-	-	-	-	500,000	CCME, 2007a	-	CCME, 2007a	5,000,000	10 X Surface Fresh Water value	-	-
Phenol	0.8	CCME 2013	73000	3700	-	45000	-	45000	AENV, 2010	4,000	CCME, 2007a	-	CCME, 2007a	40,000	10 X Surface Fresh Water value	-	-

Notes:

[1] All values in µg/L

[2] "-" = No guideline available or no guideline required, ">SOL" = means no criteria are shown as theoretical aqueous solubilities may be exceeded

[3] Health Canada MAC (Maximum Acceptable Concentration), IMAC (* Interim MAC), AO (Aesthetic Objectives) and OG (Operational Guidance) criteria are shown in the Potable Groundwater Drinking Water pathway here, in addition to other jurisdictional data for several parameters. In the Tier 1 EQS table, the Health Canada AO and OG values are excluded.

[4] Value has been adjusted to reflect 10-05 Target Risk

[5] Original Agency Value has been divided by 5

[6] Groundwater discharging to a watercourse should be assessed and compared to the Groundwater Discharging to Surface Water pathways. These values are protective of ecological aquatic life only. The values are based on applying a 10X factor to the Tier 1 EQS for Surface Water - Fresh Water and Marine Water.

[7] Groundwater quality from 0-10 m of a Surface Water body (watercourse) are to be assessed against Tier 1 Surface Water criteria directly (as shown). Groundwater quality at distances greater than (>) 10 metres from a watercourse can also be assessed in that table as indicated

[8] For petroleum hydrocarbons, the Atlantic RBCA User Guidance additionally has a table of gradational groundwater values that may be used for determining criteria protective of surface water at distances between 10 m and 200 m.

[9] The vapour migration from groundwater to indoor air pathway assumes having a residence on site for both agricultural and residential settings. For commercial/industrial settings exposure is based on typical worker occupancy

[10] In the Tier 1 EQS Groundwater tables, the Upper Concentration Limit (UCL) of 20,000 ug/L in water is applied to any petroleum hydrocarbon value that is >SOL (solubility) or exceeds 20,000 ug/L, following Atlantic RBCA 2012.

[11] Dioxins and Furans TEQ, Toxic Equivalents, are to be calculated following methodology shown in " Canadian Council of Ministers of the Environment. 2002. Canadian soil quality guidelines for the protection of environmental and human health: Dioxins and Furans"

Table A4-A References for Pathway Specific Standards - Agricultural Soil (mg/kg)

Land Use / Receptor	Agricultural Land Use Human Receptor Pathways									Agricultural Land Use Ecological Receptors Pathways						
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater				Soil Contact			Soil and Food Ingestion		Nutrient/ Energy Cycling	
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference		Fine	Coarse	Reference	Fine/Coarse	Reference	Fine/Coarse	Reference
Inorganic Parameters																
Aluminum	15,400	USEPA, 2010 [5]	-	-	-	-	-	-		-	-	-	-	-	-	-
Antimony	7.5	OMOE, 2011	-	-	-	-	-	-		20	20	AENV, 2010	-	-	-	-
Arsenic	31	CCME 2007b [4]	-	-	-	-	-	-		17	17	CCME 2007b	380	CCME 2007b	-	-
Barium	10,000	AENV, 2010	-	-	-	-	-	-		750	750	AENV, 2010	400	BCMOE, 2010	-	-
Beryllium	38	OMOE, 2011	-	-	-	-	-	-		5	5	AENV, 2010	-	-	-	-
Boron (Total)	4300	OMOE, 2011	-	-	-	-	-	-		-	-	-	-	-	-	-
Boron (Hot Water Soluble)	-	-	-	-	-	-	-	-		2	2	AENV, 2010	-	-	-	-
Cadmium	1.4	CCME 2007b	-	-	-	-	-	-		10	10	CCME 2007b	3.8	CCME 2007b	54	CCME 2007b
Chromium (hexavalent)	160	OMOE, 2011	-	-	-	-	-	-		0.4	0.4	AENV, 2010	150	BCMOE, 2010	-	-
Chromium (total)	220	CCME 2007b	-	-	-	-	-	-		64	64	CCME 2007b	-	-	52	CCME 2007b
Cobalt	22	OMOE, 2011	-	-	-	-	-	-		20	20	AENV, 2010	-	-	-	-
Copper	1,100	CCME 2007b	-	-	-	-	-	-		63	63	CCME 2007b	300	CCME 2007b	350	CCME 2007b
Cyanide	29	CCME 2007b	-	-	-	-	-	-		0.9	0.9	CCME 2007b	11	CCME 2007b	-	-
Iron	11,000	USEPA, 2010 [5]	-	-	-	-	-	-		-	-	-	-	-	-	-
Lead	140	CCME 2007b	-	-	-	-	-	-		300	300	CCME 2007b	70	CCME 2007b	723	CCME 2007b
Manganese	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-
Mercury (total)	6.6	CCME 2007b	-	-	-	-	-	-		12	12	CCME 2007b	-	-	20	CCME 2007b
Methylmercury	1.6	USEPA, 2010	-	-	-	-	-	-		1	0.8	OMOE, 2011	-	-	-	-
Molybdenum	110	OMOE, 2011	-	-	-	-	-	-		40	40	AENV, 2010	-	-	-	-
Nickel	330	OMOE, 2011	-	-	-	-	-	-		50	50	CCME 2007b	355	CCME 2007b	146	CCME 2007b
Selenium	80	CCME 2007b	-	-	-	-	-	-		1	1	CCME 2007b	4.5	CCME 2007b	-	-
Silver	77	OMOE, 2011	-	-	-	-	-	-		20	20	AENV, 2010	-	-	-	-
Strontium	9,400	USEPA, 2010 [5]	-	-	-	-	-	-		-	-	-	-	-	-	-
Thallium	1	CCME 2007b	-	-	-	-	-	-		1.4	1.4	CCME 2007b	1	CCME 2007b	-	-
Tin	9,400	USEPA, 2010 [5]	-	-	-	-	-	-		5	5	BCMOE, 2010	-	-	-	-
Uranium	23	CCME 2007b	-	-	-	-	-	-		500	500	CCME 2007b	33	CCME 2007b	-	-
Vanadium	39	OMOE, 2011	-	-	-	-	-	-		130	130	CCME 2007b	-	-	255	CCME 2007b
Zinc	5,600	OMOE, 2011	-	-	-	-	-	-		200	200	CCME 2007b	640	CCME 2007b	200	CCME 2007b
Petroleum Hydrocarbons (PHC) Parameters																
Benzene	66	APIRI, 2012	2.3	0.099	APIRI, 2012	0.094	0.042	APIRI, 2012		60	31	APIRI, 2012	-	-	-	-
Toluene	20,000	APIRI, 2012	>RES	77	APIRI, 2012	0.74	0.35	APIRI, 2012		110	75	APIRI, 2012	-	-	-	-
Ethylbenzene	9,300	APIRI, 2012	>RES	30	APIRI, 2012	0.13	0.065	APIRI, 2012		120	55	APIRI, 2012	-	-	-	-
Xylene	140,000	APIRI, 2012	210	8.8	APIRI, 2012	22	11	APIRI, 2012		65	95	APIRI, 2012	-	-	-	-
Modified TPH (Gas)	15,000	APIRI, 2012	2,100	74	APIRI, 2012	1,900	940	APIRI, 2012		210	210	APIRI, 2012	-	-	-	-
Modified TPH (Fuel)	8,600	APIRI, 2012	10,000	270	APIRI, 2012	4,700	1,800	APIRI, 2012		150	150	APIRI, 2012	-	-	-	-
Modified TPH (Lube)	14,000	APIRI, 2012	60,000	1,100	APIRI, 2012	>RES	15,000	APIRI, 2012		1,300	300	APIRI, 2012	-	-	-	-
MTBE	380	AENV, 2010	1.1	0.05	AENV, 2010/CCME 2013	0.05	0.062	CCME 2013/AENV, 2010		31	25	OMOE, 2011	-	-	-	-
Polycyclic Aromatic Hydrocarbons (PAH) Parameters																
Non-Carcinogenic PAH Compounds																
Naphthalene	1,800	AENV, 2010	51	2.2	AENV, 2010	28	53	AENV, 2010		0.75	0.6	OMOE, 2011	8.8	CCME, 2010	-	-
1 - Methylnaphthalene	72	OMOE, 2011	-	-	OMOE, 2011	42	30	OMOE, 2011		-	-	-	-	-	-	-
2 - Methylnaphthalene	72	OMOE, 2011	-	-	OMOE, 2011	42	30	OMOE, 2011		-	-	-	-	-	-	-
Acenapthene	5,300	AENV, 2010	99,000	3,900	AENV, 2010	-	-	AENV, 2010		-	-	-	21.5	CCME, 2010	-	-
Acenapthylene	78	OMOE, 2011 [4]	33	4.5	OMOE, 2011 [4]	32	23	OMOE, 2011 [4]		-	-	-	-	-	-	-
Anthracene	24,000	AENV, 2010	-	670,000	AENV, 2010	-	-	AENV, 2010		2.5	2.5	CCME, 2010	61.5	CCME, 2010	-	-
Fluoranthene	3,500	AENV, 2010	-	480,000	AENV, 2010	-	-	AENV, 2010		50	50	CCME, 2010	15.4	CCME, 2010	-	-
Fluorene	2,700	AENV, 2010	220,000	8,600	AENV, 2010	-	-	AENV, 2010		-	-	-	15.4	CCME, 2010	-	-
Phenanthrene	-	-	-	-	-	17	17	OMOE, 2011		7.8	6.2	OMOE, 2011	43	CCME, 2010	-	-
Pyrene	2,100	AENV, 2010	-	730,000	AENV, 2010	-	-	AENV, 2010		-	-	-	7.7	CCME, 2010	-	-

Table A4-A References for Pathway Specific Standards - Agricultural Soil (mg/kg)

Land Use / Receptor	Agricultural Land Use Human Receptor Pathways								Agricultural Land Use Ecological Receptors Pathways						
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater			Soil Contact			Soil and Food Ingestion		Nutrient/ Energy Cycling	
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference	Fine/Coarse	Reference	Fine/Coarse	Reference
Carcinogenic PAH Compounds															
BaP Total Potency Equivalents	5.3	CCME, 2010	-	-	AENV, 2010	IACR<1	IACR<1	CCME, 2010	-	-	-	-	-	-	-
Benz[a]anthracene	-	-	-	-	-	-	-	-	0.63	0.5	OMOE, 2011	6.2	CCME, 2010	-	-
Benzo[a]pyrene	-	-	-	-	-	-	-	-	20	20	CCME, 2010	0.6	CCME, 2010	-	-
Benzo[b,j,k]fluoranthene isomers	-	-	-	-	-	-	-	-	9.5	7.6	OMOE, 2011	6.2	CCME, 2010	-	-
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-	8.3	6.6	OMOE, 2011	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-	8.8	7	OMOE, 2011	6.2	CCME, 2010	-	-
Dibenz[a.h]anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	-	-	0.48	0.38	OMOE, 2011	-	-	-	-
Parameters															
Bromodichloromethane	130	OMOE, 2011 [4]	-	-	-	1.9	1.5	OMOE, 2011	-	-	-	-	-	-	-
Bromoform	1,000	OMOE, 2011 [4]	2.6	2.7	OMOE, 2011 [4]	2.9	2.3	OMOE, 2011	-	-	-	-	-	-	-
Bromomethane	6.3	OMOE, 2011	0.05	0.05	CCME 2013	0.1	0.097	OMOE, 2011	-	-	-	-	-	-	-
Carbon Tetrachloride (Tetrachloromethane)	27	AENV, 2010	0.05	0.05	CCME 2013	0.092	0.16	AENV, 2010	7.3	5.8	OMOE, 2011	-	-	-	-
Chlorobenzene	16,000	AENV, 2010	0.39	0.05	AENV, 2010/CCME 2013	0.61	1.1	AENV, 2010	7.5	6	OMOE, 2011	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	220	AENV, 2010	0.05	0.05	CCME 2013	0.05	0.05	CCME 2013	43	34	OMOE, 2011	-	-	-	-
Chloromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	760	AENV, 2010	7.8	0.27	AENV, 2010	0.91	1.5	AENV, 2010	-	-	-	-	-	-	-
1,2-Dichlorobenzene	16,000	AENV, 2010	230	10	AENV, 2010	0.097	0.18	AENV, 2010	4.3	3.4	OMOE, 2011	-	-	-	-
1,3-Dichlorobenzene	420	OMOE, 2011	-	-	OMOE, 2011	34	24	OMOE, 2011	6	4.8	OMOE, 2011	-	-	-	-
1,4-Dichlorobenzene	4,200	AENV, 2010	14	0.67	AENV, 2010	0.051	0.098	AENV, 2010	4.5	3.6	OMOE, 2011	-	-	-	-
1,1-Dichloroethane	840	OMOE, 2011	31	3.5	OMOE, 2011	0.6	0.47	OMOE, 2011	11	8.4	OMOE, 2011	-	-	-	-
1,2-Dichloroethane	2,800	AENV, 2010	0.055	0.05	AENV, 2010/CCME 2013	0.05	0.05	CCME 2013	60	48	OMOE, 2011	-	-	-	-
1,1-Dichloroethylene	1,900	AENV, 2010	0.46	0.05	AENV, 2010/CCME 2013	0.15	0.24	AENV, 2010	63	50	OMOE, 2011	-	-	-	-
cis-1,2-Dichloroethylene	630	OMOE, 2011	30	3.4	OMOE, 2011	2.5	1.9	OMOE, 2011	-	-	-	-	-	-	-
trans-1,2-Dichloroethylene	420	OMOE, 2011	0.75	0.084	OMOE, 2011	2.5	1.9	OMOE, 2011	-	-	-	-	-	-	-
1,2-Dichloropropane	220	OMOE, 2011 [4]	0.085	0.05	OMOE, 2011/CCME 2013	0.74	0.54	OMOE, 2011	31	25	OMOE, 2011	-	-	-	-
1,3-Dichloropropene	1.7	USEPA, 2010 [5]	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylene Dibromide	2.2	OMOE, 2011 [4]	0.05	0.05	CCME 2013	0.05	0.05	CCME 2013	-	-	-	-	-	-	-
Methylene Chloride (Dichloromethane)	990	AENV, 2010	16	0.71	AENV, 2010	0.21	0.32	AENV, 2010	0.98	0.78	OMOE, 2011	-	-	-	-
Styrene	2,500	OMOE, 2011	19	16	OMOE, 2011	66	47	OMOE, 2011	22	17	OMOE, 2011	-	-	-	-
1,1,2,2-Tetrachloroethane	40	OMOE, 2011 [4]	0.096	0.05	OMOE, 2011 [4]/CCME 2013	0.19	0.14	OMOE, 2011	-	-	-	-	-	-	-
Tetrachloroethylene	530	AENV, 2010	3.7	0.16	AENV, 2010	1.6	1.6	CCME 2007b	0.1	0.1	BCMOE, 2010	-	-	-	-
1,1,1-Trichloroethane	42,000	OMOE, 2011	3.4	0.38	OMOE, 2011	27	20	OMOE, 2011	22	18	OMOE, 2011	-	-	-	-
1,1,2-Trichloroethane	140	OMOE, 2011 [4]	0.18	0.3	OMOE, 2011 [4]	0.73	0.54	OMOE, 2011	100	80	OMOE, 2011	-	-	-	-
Trichloroethylene	28	CCME 2007b	3.7	0.36	CCME 2007b	0.01	0.01	CCME 2007b	3	3	CCME 2007b	-	-	-	-
Vinyl Chloride	71	AENV, 2010	0.02	0.02	CCME 2013	0.02	0.02	CCME 2013/AENV, 2010	4.3	3.4	OMOE, 2011	-	-	-	-
Pesticides															
Aldicarb	22	AENV, 2010	-	-	-	0.041	0.065	AENV, 2010	-	-	-	-	-	-	-
Aldrin	3.4	AENV, 2010	-	-	-	0.59	11	AENV, 2010	0.055	0.044	OMOE, 2011	-	-	-	-
Atrazine	11	AENV, 2010	-	-	-	0.1	0.19	AENV, 2010	-	-	-	-	-	-	-
Azinphos-methyl	55	AENV, 2010	-	-	-	0.41	0.75	AENV, 2010	-	-	-	-	-	-	-
Bendiocarb	89	AENV, 2010	-	-	-	0.14	0.21	AENV, 2010	-	-	-	-	-	-	-
Bromoxynil	11	AENV, 2010	-	-	-	0.18	0.35	AENV, 2010	-	-	-	-	-	-	-
Carbaryl	220	AENV, 2010	-	-	-	1.9	3.6	AENV, 2010	-	-	-	-	-	-	-
Carbofuran	220	AENV, 2010	-	-	-	0.68	1.2	AENV, 2010	-	-	-	-	-	-	-
Chlorothalonil	330	AENV, 2010	-	-	-	27	53	AENV, 2010	-	-	-	-	-	-	-
Chlorpyrifos	220	AENV, 2010	-	-	-	49	95	AENV, 2010	-	-	-	-	-	-	-
Cyanazine	29	AENV, 2010	-	-	-	0.12	0.21	AENV, 2010	-	-	-	-	-	-	-

Table A4-A References for Pathway Specific Standards - Agricultural Soil (mg/kg)

Land Use / Receptor	Agricultural Land Use Human Receptor Pathways								Agricultural Land Use Ecological Receptors Pathways						
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater			Soil Contact			Soil and Food Ingestion		Nutrient/ Energy Cycling	
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference	Fine/Coarse	Reference	Fine/Coarse	Reference
2,4-D	220	AENV, 2010	-	-	-	0.43	0.67	AENV, 2010	-	-	-	-	-	-	-
DDT	220	AENV, 2010	-	-	-	5,900	11,000	AENV, 2010	12	12	CCME 2007b	0.7	AENV, 2010	547	CCME 2007b
Diazinon	44	AENV, 2010	-	-	-	2.2	4.2	AENV, 2010	-	-	-	-	-	-	-
Dicamba	280	AENV, 2010	-	-	-	0.5	0.79	AENV, 2010	-	-	-	-	-	-	-
Dichlorfop-methyl	22	AENV, 2010	-	-	-	12	24	AENV, 2010	-	-	-	-	-	-	-
Dieldrin	3.4	AENV, 2010	-	-	-	0.59	1.1	AENV, 2010	0.055	0.044	OMOE, 2011	-	-	-	-
Dimethoate	44	AENV, 2010	-	-	-	0.077	0.12	AENV, 2010	-	-	-	-	-	-	-
Dinoseb	22	AENV, 2010	-	-	-	2.8	5.5	AENV, 2010	-	-	-	-	-	-	-
Diquat	180	AENV, 2010	-	-	-	11	21	AENV, 2010	-	-	-	-	-	-	-
Diuron	350	AENV, 2010	-	-	-	1.9	3.5	AENV, 2010	-	-	-	-	-	-	-
Endosulfan	210	AENV, 2010	-	-	-	99	190	AENV, 2010	0.19	0.15	OMOE, 2011	-	-	-	-
Endrin	10	AENV, 2010	-	-	-	2.4	4.7	AENV, 2010	0.024	0.019	OMOE, 2011	-	-	-	-
Glyphosate	670	AENV, 2010	-	-	-	0.95	1.4	AENV, 2010	-	-	-	-	-	-	-
Heptachlor	0.46	AENV, 2010	0.31	0.21	AENV, 2010	0.05	0.076	CCME 2013/AENV, 2010	0.25	0.2	OMOE, 2011	-	-	-	-
Lindane	6.7	AENV, 2010	-	-	-	0.31	0.6	AENV, 2010	-	-	-	-	-	-	-
Linuron	44	AENV, 2010	-	-	-	0.56	1.1	AENV, 2010	-	-	-	-	-	-	-
Malathion	440	AENV, 2010	-	-	-	0.82	1.3	AENV, 2010	-	-	-	-	-	-	-
MCPA	11	AENV, 2010	-	-	-	0.02	0.32	AENV, 2010	-	-	-	-	-	-	-
Methoxychlor	3,500	AENV, 2010	-	-	-	5,700	11,000	AENV, 2010	-	-	-	-	-	-	-
Metolachlor	110	AENV, 2010	-	-	-	1.3	2.4	AENV, 2010	-	-	-	-	-	-	-
Metribuzin	180	AENV, 2010	-	-	-	7.8	15	AENV, 2010	-	-	-	-	-	-	-
Paraquat	22	AENV, 2010	-	-	-	1.1	2.2	AENV, 2010	-	-	-	-	-	-	-
Parathion	110	AENV, 2010	-	-	-	7.2	14	AENV, 2010	-	-	-	-	-	-	-
Phorate	4.4	AENV, 2010	-	-	-	0.075	0.14	AENV, 2010	-	-	-	-	-	-	-
Picloram	440	AENV, 2010	-	-	-	0.64	0.94	AENV, 2010	-	-	-	-	-	-	-
Simazine	29	AENV, 2010	-	-	-	0.14	0.25	AENV, 2010	-	-	-	-	-	-	-
Tebuthiuron	1,600	AENV, 2010	-	-	-	2.5	3.7	AENV, 2010	-	-	-	-	-	-	-
Terbufos	1.1	AENV, 2010	-	-	-	0.08	0.15	AENV, 2010	-	-	-	-	-	-	-
Toxaphene	4.8	AENV, 2010	-	-	-	3.3	6.3	AENV, 2010	-	-	-	-	-	-	-
Triallate	290	AENV, 2010	-	-	-	16	31	AENV, 2010	-	-	-	-	-	-	-
Trifluralin	110	AENV, 2010	-	-	-	35	67	AENV, 2010	-	-	-	-	-	-	-
Other Parameters															
Polychlorinated Biphenyl (Total PCB)	22	AENV, 2010	190	31	OMOE, 2011 [4]	1100	770	OMOE, 2011	33	33	CCME 2007b	1.3	CCME 2007b	-	-
Dioxins and Furans (TEQ) (mg TEQ/kg)	0.000004	CCME 2007b	0.017	0.0028	OMOE, 2011	0.0026	0.0018	OMOE, 2011	0.00001	0.00001	BCMOE, 2010	0.00025	CCME 2007b	-	-
Pentachlorophenol (PCP)	93	CCME 2007b	66,000	66,000	CCME 2007b	7.6	7.6	CCME 2007b	11	11	CCME 2007b	-	-	-	-
Organotins - Tributyltin	3.6	USEPA, 2010 [5]	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylene Glycol	73,000	AENV, 2010	-	86,000	AENV, 2010	60	68	AENV, 2010	1,100	1,100	AENV, 2010	-	-	1700	AENV, 2010
Propylene Glycol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol	1,900	CCME, 1997	500	500	CCME, 1997	3.8	3.8	CCME, 1997	20	20	CCME, 1997	-	-	-	-

Notes:

[1] All values in mg/kg

[2] "-" = No guideline available or no guideline required; >RES means no soil criteria are shown as residual soil saturation limits may be exceeded; IACR means the Index of Additive Cancer Risk

[3] For the purposes of screening human health effects from exposure to sediment, dry weight values should be evaluated against the soil quality standards for Soil Contact/Ingestion only.

[4] Value has been adjusted to reflect 10-05 Target Risk

[5] Original Agency Value has been divided by 5

[6] Benzo(a)pyrene, BaP, Total Potency Equivalents are to be calculated following methodology shown in "Canadian Council of Ministers of the Environment, 2010 Canadian soil quality guidelines for the protection of environmental and human health: Carcinogenic and Other PAHs."

[7] Dioxins and Furans TEQ, Toxic Equivalents, are to be calculated following methodology shown in " Canadian Council of Ministers of the Environment. 2002. Canadian soil quality guidelines for the protection of environmental and human health: Dioxins and Furans"

Table A4-B References for Pathway Specific Standards - Residential Soil (mg/kg)

Land Use / Receptor	Residential Land Use								
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater		
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference
Inorganic Parameters								
Aluminum	15,400	USEPA, 2010 [5]	-	-	-	-	-	-
Antimony	7.5	OMOE, 2011	-	-	-	-	-	-
Arsenic	31	CCME 2007b [4]	-	-	-	-	-	-
Barium	10,000	AENV, 2010	-	-	-	-	-	-
Beryllium	38	OMOE, 2011	-	-	-	-	-	-
Boron (Total)	4,300	OMOE, 2011	-	-	-	-	-	-
Boron (Hot Water Soluble)	-	-	-	-	-	-	-	-
Cadmium	14	CCME 2007b	-	-	-	-	-	-
Chromium (hexavalent)	160	OMOE, 2011	-	-	-	-	-	-
Chromium (total)	220	CCME 2007b	-	-	-	-	-	-
Cobalt	22	OMOE, 2011	-	-	-	-	-	-
Copper	1,100	CCME 2007b	-	-	-	-	-	-
Cyanide	29	CCME 2007b	-	-	-	-	-	-
Iron	11,000	USEPA, 2010 [5]	-	-	-	-	-	-
Lead	140	CCME 2007b	-	-	-	-	-	-
Manganese	-	-	-	-	-	-	-	-
Mercury (total)	6.6	CCME 2007b	-	-	-	-	-	-
Methylmercury	1.6	USEPA, 2010 [5]	-	-	-	-	-	-
Molybdenum	110	OMOE, 2011	-	-	-	-	-	-
Nickel	330	OMOE, 2011	-	-	-	-	-	-
Selenium	80	CCME 2007b	-	-	-	-	-	-
Silver	77	OMOE, 2011	-	-	-	-	-	-
Strontium	9,400	USEPA, 2010 [5]	-	-	-	-	-	-
Thallium	1	CCME 2007b	-	-	-	-	-	-
Tin	9,400	USEPA, 2010 [5]	-	-	-	-	-	-
Uranium	23	CCME 2007b	-	-	-	-	-	-
Vanadium	39	OMOE, 2011	-	-	-	-	-	-
Zinc	5,600	OMOE, 2011	-	-	-	-	-	-
Petroleum Hydrocarbons (PHC) Parameters								
Benzene	66	APIRI, 2012	2.3	0.099	APIRI, 2012	0.094	0.042	APIRI, 2012
Toluene	20,000	APIRI, 2012	>RES	77	APIRI, 2012	0.74	0.35	APIRI, 2012
Ethylbenzene	9,300	APIRI, 2012	>RES	30	APIRI, 2012	0.13	0.065	APIRI, 2012
Xylene	140,000	APIRI, 2012	210	8.8	APIRI, 2012	22	11	APIRI, 2012
Modified TPH (Gas)	15,000	APIRI, 2012	2,100	74	APIRI, 2012	1,900	940	APIRI, 2012
Modified TPH (Fuel)	8,600	APIRI, 2012	10,000	270	APIRI, 2012	4,700	1,800	APIRI, 2012
Modified TPH (Lube)	14,000	APIRI, 2012	60,000	1,100	APIRI, 2012	>RES	15,000	APIRI, 2012
MTBE	380	AENV, 2010	1.1	0.05	AENV 2010/CCME 2013	0.05	0.062	CCME 2013/AENV 2010
Polycyclic Aromatic Hydrocarbons (PAH) Parameters								
Non-Carcinogenic PAH Compounds								
Naphthalene	1,800	AENV, 2010	51	2.2	AENV, 2010	28	53	AENV, 2010
1 - Methylnaphthalene	72	OMOE, 2011	-	-	OMOE, 2011	42	30	OMOE, 2011
2 - Methylnaphthalene	72	OMOE, 2011	-	-	OMOE, 2011	42	30	OMOE, 2011
Acenapthene	5,300	AENV, 2010	99,000	3,900	AENV, 2010	-	-	AENV, 2010
Acenapthylene	78	OMOE, 2011 [4]	33	4.5	OMOE, 2011 [4]	32	23	OMOE, 2011 [4]
Anthracene	24,000	AENV, 2010	-	670,000	AENV, 2010	-	-	AENV, 2010
Fluoranthene	3,500	AENV, 2010	-	480,000	AENV, 2010	-	-	AENV, 2010
Fluorene	2,700	AENV, 2010	220,000	8,600	AENV, 2010	-	-	AENV, 2010
Phenanthrene	-	-	-	-	-	17	17	OMOE, 2009
Pyrene	2,100	AENV, 2010	-	730,000	AENV, 2010	-	-	AENV, 2010
Carcinogenic PAH Compounds								
BaP Total Potency Equivalents	5.3	CCME, 2010	-	-	AENV, 2010	IACR<1	IACR<1	CCME, 2010
Benz[a]anthracene	-	-	-	-	-	-	-	-
Benzo[a]pyrene	-	-	-	-	-	-	-	-
Benzo[b,j,k]fluoranthene isomers	-	-	-	-	-	-	-	-
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-
Dibenz[a.h]anthracene	-	-	-	-	-	-	-	-
Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	-	-
Volatile Organic Compound (VOC) Parameters								
Bromodichloromethane	130	OMOE, 2011 [4]	-	-	-	1.9	1.5	OMOE, 2011
Bromoform	1,000	OMOE, 2011 [4]	2.6	2.7	OMOE, 2011 [4]	2.9	2.3	OMOE, 2011
Bromomethane	6.3	OMOE, 2011	0.05	0.05	CCME 2013	0.1	0.097	OMOE, 2011
Carbon Tetrachloride (Tetrachloromethane)	27	AENV, 2010	0.05	0.05	CCME 2013	0.092	0.16	AENV, 2010
Chlorobenzene	16,000	AENV, 2010	0.39	0.05	AENV, 2010/CCME 2013	0.61	1.1	AENV, 2010
Chloroethane	-	-	-	-	-	-	-	-
Chloroform	220	AENV, 2010	0.05	0.05	CCME 2013	0.05	0.05	CCME 2013

Table A4-B References for Pathway Specific Standards - Residential Soil (mg/kg)

Land Use / Receptor	Residential Land Use							
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater		
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference
Chloromethane	-	-	-	-	-	-	-	-
Dibromochloromethane	760	AENV, 2010	7.8	0.27	AENV, 2010	0.91	1.5	AENV, 2010
1,2-Dichlorobenzene	16,000	AENV, 2010	230	10	AENV, 2010	0.097	0.18	AENV, 2010
1,3-Dichlorobenzene	420	OMOE, 2011	-	-	OMOE, 2011	34	24	OMOE, 2011
1,4-Dichlorobenzene	4,200	AENV, 2010	14	0.67	AENV, 2010	0.051	0.098	AENV, 2010
1,1-Dichloroethane	840	OMOE, 2011	31	3.5	OMOE, 2011	0.6	0.47	OMOE, 2011
1,2-Dichloroethane	2,800	AENV, 2010	0.055	0.05	AENV, 2010/CCME 2013	0.05	0.05	CCME 2013
1,1-Dichloroethylene	1,900	AENV, 2010	0.46	0.05	AENV, 2010/CCME 2013	0.15	0.24	AENV, 2010
cis-1,2-Dichloroethylene	630	OMOE, 2011	30	3.4	OMOE, 2011	2.5	1.9	OMOE, 2011
trans-1,2-Dichloroethylene	420	OMOE, 2011	0.75	0.084	OMOE, 2011	2.5	1.9	OMOE, 2011
1,2-Dichloropropane	220	OMOE, 2011 [4]	0.085	0.05	OMOE, 2011/CCME 2013	0.74	0.54	OMOE, 2011
1,3-Dichloropropene	1.7	USEPA, 2010 [5]	-	-	-	-	-	-
Ethylene Dibromide	2.2	OMOE, 2011 [4]	0.05	0.05	CCME 2013	0.05	0.05	CCME 2013
Methylene Chloride (Dichloromethane)	990	AENV, 2010	16	0.71	AENV, 2010	0.21	0.32	AENV, 2010
Styrene	2,500	OMOE, 2011	19	16	OMOE, 2011	66	47	OMOE, 2011
1,1,2,2-Tetrachloroethane	40	OMOE, 2011 [4]	0.096	0.05	OMOE, 2011 1/CCME 2013	0.19	0.14	OMOE, 2011
Tetrachloroethylene	530	AENV, 2010	3.7	0.16	AENV, 2010	1.6	1.6	CCME 2007b
1,1,1-Trichloroethane	42,000	OMOE, 2011	3.4	0.38	OMOE, 2011	27	20	OMOE, 2011
1,1,2-Trichloroethane	140	OMOE, 2011 [4]	0.18	0.3	OMOE, 2011 [4]	0.73	0.54	OMOE, 2011
Trichloroethylene	28	CCME 2007b	3.7	0.36	CCME 2007b	0.01	0.01	CCME 2007b
Vinyl Chloride	71	AENV, 2010	0.02	0.02	CCME 2013	0.02	0.02	CCME 2013/AENV, 2010
Pesticides								
Aldicarb	22	AENV, 2010	-	-	-	0.041	0.065	AENV, 2010
Aldrin	3.4	AENV, 2010	-	-	-	0.59	11	AENV, 2010
Atrazine	11	AENV, 2010	-	-	-	0.1	0.19	AENV, 2010
Azinphos-methyl	55	AENV, 2010	-	-	-	0.41	0.75	AENV, 2010
Bendiocarb	89	AENV, 2010	-	-	-	0.14	0.21	AENV, 2010
Bromoxynil	11	AENV, 2010	-	-	-	0.18	0.35	AENV, 2010
Carbaryl	220	AENV, 2010	-	-	-	1.9	3.6	AENV, 2010
Carbofuran	220	AENV, 2010	-	-	-	0.68	1.2	AENV, 2010
Chlorothalonil	330	AENV, 2010	-	-	-	27	53	AENV, 2010
Chlorpyrifos	220	AENV, 2010	-	-	-	49	95	AENV, 2010
Cyanazine	29	AENV, 2010	-	-	-	0.12	0.21	AENV, 2010
2,4-D	220	AENV, 2010	-	-	-	0.43	0.67	AENV, 2010
DDT	220	AENV, 2010	-	-	-	5,900	11,000	AENV, 2010
Diazinon	44	AENV, 2010	-	-	-	2.2	4.2	AENV, 2010
Dicamba	280	AENV, 2010	-	-	-	0.5	0.79	AENV, 2010
Dichlorfop-methyl	22	AENV, 2010	-	-	-	12	24	AENV, 2010
Dieldrin	3.4	AENV, 2010	-	-	-	0.59	1.1	AENV, 2010
Dimethoate	44	AENV, 2010	-	-	-	0.077	0.12	AENV, 2010
Dinoseb	22	AENV, 2010	-	-	-	2.8	5.5	AENV, 2010
Diquat	180	AENV, 2010	-	-	-	11	21	AENV, 2010
Diuron	350	AENV, 2010	-	-	-	1.9	3.5	AENV, 2010
Endosulfan	210	AENV, 2010	-	-	-	99	190	AENV, 2010
Endrin	10	AENV, 2010	-	-	-	2.4	4.7	AENV, 2010
Glyphosate	670	AENV, 2010	-	-	-	0.95	1.4	AENV, 2010
Heptachlor	0.46	AENV, 2010	0.31	0.21	AENV, 2010	0.05	0.076	CCME 2013/AENV, 2010
Lindane	6.7	AENV, 2010	-	-	-	0.31	0.6	AENV, 2010
Linuron	44	AENV, 2010	-	-	-	0.56	1.1	AENV, 2010
Malathion	440	AENV, 2010	-	-	-	0.82	1.3	AENV, 2010
MCPA	11	AENV, 2010	-	-	-	0.02	0.32	AENV, 2010
Methoxychlor	3,500	AENV, 2010	-	-	-	5,700	11,000	AENV, 2010
Metolachlor	110	AENV, 2010	-	-	-	1.3	2.4	AENV, 2010
Metribuzin	180	AENV, 2010	-	-	-	7.8	15	AENV, 2010
Paraquat	22	AENV, 2010	-	-	-	1.1	2.2	AENV, 2010
Parathion	110	AENV, 2010	-	-	-	7.2	14	AENV, 2010
Phorate	4.4	AENV, 2010	-	-	-	0.075	0.14	AENV, 2010
Picloram	440	AENV, 2010	-	-	-	0.64	0.94	AENV, 2010
Simazine	29	AENV, 2010	-	-	-	0.14	0.25	AENV, 2010
Tebuthiuron	1,600	AENV, 2010	-	-	-	2.5	3.7	AENV, 2010
Terbufos	1.1	AENV, 2010	-	-	-	0.08	0.15	AENV, 2010
Toxaphene	4.8	AENV, 2010	-	-	-	3.3	6.3	AENV, 2010
Triallate	290	AENV, 2010	-	-	-	16	31	AENV, 2010
Trifluralin	110	AENV, 2010	-	-	-	35	67	AENV, 2010
Other Parameters								
Polychlorinated Biphenyl (Total PCB)	22	AENV, 2010	190	31	OMOE, 2011 [4]	1,100	770	OMOE, 2011
Dioxins and Furans (TEQ) (mg TEQ/kg)	0.000004	CCME 2007b	0.017	0.0028	OMOE, 2011	0.0026	0.0018	OMOE, 2011

Table A4-B References for Pathway Specific Standards - Residential Soil (mg/kg)

Land Use / Receptor	Residential Land Use							
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater		
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference
Pentachlorophenol (PCP)	93	CCME 2007b	66,000	66,000	CCME 2007b	7.6	7.6	CCME 2007b
Organotins - Tributyltin	3.6	USEPA, 2010 [5]	-	-	-	-	-	-
Ethylene Glycol	73,000	AENV, 2010	-	86,000	AENV, 2010	60	68	AENV, 2010
Propylene Glycol	-	-	-	-	-	-	-	-
Phenol	1,900	CCME, 1997	500	500	CCME, 1997	3.8	3.8	CCME, 1997

Notes:

[1] All values in mg/kg

[2] "-" = No guideline available or no guideline required; >RES means no soil criteria are shown as residual soil saturation limits may be exceeded; IACR means the Index of Additive Cancer Risk

[3] For the purposes of screening human health effects from exposure to sediment, dry weight values should be evaluated against the soil quality standards for Soil Contact/Ingestion only.

[4] Value has been adjusted to reflect 10-05 Target Risk

[5] Original Agency Value has been divided by 5

[6] Benzo(a)pyrene, BaP, Total Potency Equivalents are to be calculated following methodology shown in "Canadian Council of Ministers of the Environment, 2010 Canadian soil quality guidelines for the protection of environmental and human health: Carcinogenic and Other PAHs."

[7] Dioxins and Furans TEQ, Toxic Equivalents, are to be calculated following methodology shown in " Canadian Council of Ministers of the Environment. 2002. Canadian soil quality guidelines for the protection of environmental and human health: Dioxins and Furans"

Table A4-C References for Pathway Specific Standards - Commercial Soil (mg/kg)

Land Use / Receptor	Commercial Land Use								
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater		
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference
Inorganic Parameters								
Aluminum	15,400	USEPA, 2010 [5]	-	-	-	-	-	-
Antimony	63	OMOE, 2011	-	-	-	-	-	-
Arsenic	31	CCME 2007b [4]	-	-	-	-	-	-
Barium	15,000	AENV, 2010	-	-	-	-	-	-
Beryllium	320	OMOE, 2011	-	-	-	-	-	-
Boron (Total)	24,000	OMOE, 2011	-	-	-	-	-	-
Boron (Hot Water Soluble)	-	-	-	-	-	-	-	-
Cadmium	49	CCME 2007b	-	-	-	-	-	-
Chromium (hexavalent)	1,300	OMOE, 2011	-	-	-	-	-	-
Chromium (total)	630	CCME 2007b	-	-	-	-	-	-
Cobalt	250	OMOE, 2011	-	-	-	-	-	-
Copper	4,000	CCME 2007b	-	-	-	-	-	-
Cyanide	110	CCME 2007b	-	-	-	-	-	-
Iron	11,000	USEPA, 2010 [5]	-	-	-	-	-	-
Lead	260	CCME 2007b	-	-	-	-	-	-
Manganese	-	-	-	-	-	-	-	-
Mercury (total)	24	CCME 2007b	-	-	-	-	-	-
Methylmercury	1.6	USEPA, 2010 [5]	-	-	-	-	-	-
Molybdenum	1,200	OMOE, 2011	-	-	-	-	-	-
Nickel	2,200	OMOE, 2011	-	-	-	-	-	-
Selenium	125	CCME, 2009	-	-	-	-	-	-
Silver	490	OMOE, 1911	-	-	-	-	-	-
Strontium	9,400	USEPA, 2010 [5]	-	-	-	-	-	-
Thallium	1	CCME 2007b	-	-	-	-	-	-
Tin	9,400	USEPA, 2010 [5]	-	-	-	-	-	-
Uranium	33	CCME 2007b	-	-	-	-	-	-
Vanadium	160	OMOE, 2011	-	-	-	-	-	-
Zinc	47,000	OMOE, 2011	-	-	-	-	-	-
Petroleum Hydrocarbons (PHC) Parameters								
Benzene	360	APIRI, 2012	33	2.5	APIRI, 2012	0.094	0.042	APIRI, 2012
Toluene	31,000	APIRI, 2012	>RES	>RES	APIRI, 2012	0.74	0.35	APIRI, 2012
Ethylbenzene	14,000	APIRI, 2012	>RES	>RES	APIRI, 2012	0.13	0.065	APIRI, 2012
Xylene	210,000	APIRI, 2012	>RES	110	APIRI, 2012	22	11	APIRI, 2012
Modified TPH (Gas)	22,000	APIRI, 2012	78,000	870	APIRI, 2012	1,900	940	APIRI, 2012
Modified TPH (Fuel)	13,000	APIRI, 2012	>RES	4,000	APIRI, 2012	4,700	1,800	APIRI, 2012
Modified TPH (Lube)	21,000	APIRI, 2012	>RES	23,000	APIRI, 2012	>RES	15,000	APIRI, 2012
MTBE	580	AENV, 2010	7.4	0.57	AENV, 2010	0.05	0.062	CCME 2013/AENV, 2010
Polycyclic Aromatic Hydrocarbons (PAH) Parameters								
Non-Carcinogenic PAH Compounds								
Naphthalene	2,800	AENV, 2010	370	25	AENV, 2010	28	53	AENV, 2010
1 - Methylnaphthalene	560	OMOE, 2011	-	-	OMOE, 2011	42	30	OMOE, 2011
2 - Methylnaphthalene	560	OMOE, 2011	-	-	OMOE, 2011	42	30	OMOE, 2011
Acenapthene	8,000	AENV, 2010	770,000	43,000	AENV, 2010	-	-	AENV, 2010
Acenapthylene	96	OMOE, 2011 [4]	390	66	OMOE, 2011 [4]	32	23	OMOE, 2011 [4]
Anthracene	37,000	AENV, 2010	-	-	AENV, 2010	-	-	AENV, 2010
Fluoranthene	5,300	AENV, 2010	-	-	AENV, 2010	-	-	AENV, 2010
Fluorene	4,100	AENV, 2010	-	91,000	AENV, 2010	-	-	AENV, 2010
Phenanthrene	-	-	-	-	-	24	17	OMOE, 2011
Pyrene	3,200	AENV, 2010	-	-	AENV, 2010	-	-	AENV, 2010
Carcinogenic PAH Compounds								
BaP Total Potency Equivalents	5.3	CCME, 2010	-	-	AENV, 2010	IACR<1	IACR<1	CCME, 2010
Benz[a]anthracene	-	-	-	-	-	-	-	-
Benzo[a]pyrene	-	-	-	-	-	-	-	-
Benzo[b,j,k]fluoranthene isomers	-	-	-	-	-	-	-	-
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-
Dibenz[a.h]anthracene	-	-	-	-	-	-	-	-
Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	-	-
Volatile Organic Compound (VOC) Parameters								
Bromodichloromethane	180	OMOE, 2011 [4]	-	-	-	1.9	1.5	OMOE, 2011
Bromoform	1,400	OMOE, 2011 [4]	17	6.1	OMOE, 2011 [4]	2.9	2.3	OMOE, 2011
Bromomethane	66	OMOE, 2011	0.1	0.05	OMOE, 2011/CCME 2013	0.1	0.097	OMOE, 2011
Carbon Tetrachloride (Tetrachloromethane)	260	AENV, 2010	0.09	0.05	AENV, 2010/CCME 2013	0.092	0.16	AENV, 2010
Chlorobenzene	300,000	AENV, 2010	2.7	0.22	AENV, 2010	0.61	1.1	AENV, 2010
Chloroethane	-	-	-	-	-	-	-	-
Chloroform	4,400	AENV, 2010	0.15	0.05	AENV, 2010/CCME 2013	0.62	1	AENV, 2010
Chloromethane	-	-	-	-	-	-	-	-
Dibromochloromethane	14,000	AENV, 2010	76	2.5	AENV, 2010	0.91	1.5	AENV, 2010
1,2-Dichlorobenzene	25,000	AENV, 2010	1,700	130	AENV, 2010	0.097	0.18	AENV, 2010
1,3-Dichlorobenzene	4,400	OMOE, 2011	-	-	-	34	24	OMOE, 2011
1,4-Dichlorobenzene	6,200	AENV, 2010	100	8	AENV, 2010	0.051	0.098	AENV, 2010
1,1-Dichloroethane	8,800	OMOE, 2011	39	56	OMOE, 2011	0.6	0.47	OMOE, 2011
1,2-Dichloroethane	4,200	AENV, 2010	0.37	0.05	AENV, 2010/CCME 2013	0.05	0.05	CCME 2013
1,1-Dichloroethylene	2,900	AENV, 2010	3.1	0.27	AENV, 2010	0.15	0.24	AENV, 2010
cis-1,2-Dichloroethylene	6,600	OMOE, 2011	37	55	OMOE, 2011	2.5	1.9	OMOE, 2011
trans-1,2-Dichloroethylene	4,400	OMOE, 2011	9.3	1.3	OMOE, 2011	2.5	1.9	OMOE, 2011
1,2-Dichloropropane	310	OMOE, 2011 [4]	0.68	0.16	OMOE, 2009	0.74	0.54	OMOE, 2011
1,3-Dichloropropene	1.7	USEPA, 2010	-	-	-	-	-	-
Ethylene Dibromide	3.1	OMOE, 2011 [4]	0.05	0.05	CCME 2013	0.05	0.05	CCME 2013
Methylene Chloride (Dichloromethane)	1,500	AENV, 2010	110	9	AENV, 2010	0.21	0.32	AENV, 2010
Styrene	26,000	OMOE, 2011	170	42	OMOE, 2011	66	47	OMOE, 2011
1,1,2,2-Tetrachloroethane	55	OMOE, 2011 [4]	0.94	0.19	OMOE, 2011 [4]	0.19	0.14	OMOE, 2011
Tetrachloroethylene	9,600	AENV, 2010	26	2	AENV, 2010	1.6	1.6	CCME 2007b
1,1,1-Trichloroethane	440,000	OMOE, 2011	42	6.1	OMOE, 2011	27	20	OMOE, 2011
1,1,2-Trichloroethane	190	OMOE, 2011 [4]	9.1	0.42	OMOE, 2011 [4]	0.73	0.54	OMOE, 2011
Trichloroethylene	1,700	CCME 2007b	9.2	1.1	CCME, 2007b	0.01	0.01	CCME 2007b
Vinyl Chloride	110	AENV, 2010	0.055	0.02	AENV, 2010/CCME 2013	0.02	0.02	CCME 2013/AENV, 2010
Pesticides								
Aldicarb	34	AENV, 2010	-	-	-	0.041	0.065	AENV, 2010
Aldrin	5.1	AENV, 2010	-	-	-	0.59	11	AENV, 2010

Table A4-C References for Pathway Specific Standards - Commercial Soil (mg/kg)

Land Use / Receptor	Commercial Land Use							
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater		
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference
Atrazine	17	AENV, 2010	-	-	-	0.1	0.19	AENV, 2010
Azinphos-methyl	84	AENV, 2010	-	-	-	0.41	0.75	AENV, 2010
Bendiocarb	130	AENV, 2010	-	-	-	0.14	0.21	AENV, 2010
Bromoxynil	17	AENV, 2010	-	-	-	0.18	0.35	AENV, 2010
Carbaryl	340	AENV, 2010	-	-	-	1.9	3.6	AENV, 2010
Carbofuran	340	AENV, 2010	-	-	-	0.68	1.2	AENV, 2010
Chlorothalonil	500	AENV, 2010	-	-	-	27	53	AENV, 2010
Chlorpyrifos	340	AENV, 2010	-	-	-	49	95	AENV, 2010
Cyanazine	44	AENV, 2010	-	-	-	0.12	0.21	AENV, 2010
2,4-D	340	AENV, 2010	-	-	-	0.43	0.67	AENV, 2010
DDT	340	AENV, 2010	-	-	-	5,900	11,000	AENV, 2010
Diazinon	67	AENV, 2010	-	-	-	2.2	4.2	AENV, 2010
Dicamba	420	AENV, 2010	-	-	-	0.5	0.79	AENV, 2010
Dichlorfop-methyl	34	AENV, 2010	-	-	-	12	24	AENV, 2010
Dieldrin	5.1	AENV, 2010	-	-	-	0.59	1.1	AENV, 2010
Dimethoate	67	AENV, 2010	-	-	-	0.077	0.12	AENV, 2010
Dinoseb	34	AENV, 2010	-	-	-	2.8	5.5	AENV, 2010
Diquat	270	AENV, 2010	-	-	-	11	21	AENV, 2010
Diuron	520	AENV, 2010	-	-	-	1.9	3.5	AENV, 2010
Endosulfan	320	AENV, 2010	-	-	-	99	190	AENV, 2010
Endrin	15	AENV, 2010	-	-	-	2.4	4.7	AENV, 2010
Glyphosate	1,000	AENV, 2010	-	-	-	0.95	1.4	AENV, 2010
Heptachlor	0.69	AENV, 2010	2.4	0.094	AENV, 2010	0.05	0.076	CCME 2013/AENV, 2010
Lindane	10	AENV, 2010	-	-	-	0.31	0.6	AENV, 2010
Linuron	67	AENV, 2010	-	-	-	0.56	1.1	AENV, 2010
Malathion	670	AENV, 2010	-	-	-	0.82	1.3	AENV, 2010
MCPA	17	AENV, 2010	-	-	-	0.02	0.32	AENV, 2010
Methoxychlor	5,300	AENV, 2010	-	-	-	5,700	11,000	AENV, 2010
Metolachlor	170	AENV, 2010	-	-	-	1.3	2.4	AENV, 2010
Metribuzin	280	AENV, 2010	-	-	-	7.8	15	AENV, 2010
Paraquat	34	AENV, 2010	-	-	-	1.1	2.2	AENV, 2010
Parathion	170	AENV, 2010	-	-	-	7.2	14	AENV, 2010
Phorate	6.7	AENV, 2010	-	-	-	0.075	0.14	AENV, 2010
Picloram	670	AENV, 2010	-	-	-	0.64	0.94	AENV, 2010
Simazine	44	AENV, 2010	-	-	-	0.14	0.25	AENV, 2010
Tebuthiuron	2,400	AENV, 2010	-	-	-	2.5	3.7	AENV, 2010
Terbufos	1.7	AENV, 2010	-	-	-	0.08	0.15	AENV, 2010
Toxaphene	7.3	AENV, 2010	-	-	-	3.3	6.3	AENV, 2010
Triallate	440	AENV, 2010	-	-	-	16	31	AENV, 2010
Trifluralin	160	AENV, 2010	-	-	-	35	67	AENV, 2010
Other Parameters								
Polychlorinated Biphenyl (Total PCB)	33	AENV, 2010	230	45	OMOE, 2011	1,100	770	OMOE, 2011
Dioxins and Furans (TEQ) (mg TEQ/kg)	0.000004	CCME 2007b	0.21	0.043	OMOE, 2011	0.0026	0.0018	OMOE, 2011
Pentachlorophenol (PCP)	340	CCME 2007b	240,000	240,000	CCME 2007b	7.6	7.6	CCME 2007b
Organotins - Tributyltin	3.6	USEPA, 2010 [5]	-	-	-	-	-	-
Ethylene Glycol	110,000	AENV, 2010	-	-	AENV, 2010	60	68	AENV, 2010
Propylene Glycol	-	-	-	-	-	-	-	-
Phenol	7,000	CCME, 1997	1,800	1,800	CCME, 1997	3.8	3.8	CCME, 1997

Notes:

[1] All values in mg/kg

[2] "-" = No guideline available or no guideline required; >RES means no soil criteria are shown as residual soil saturation limits may be exceeded; IACR means the Index of Additive Cancer Risk

[3] For the purposes of screening human health effects from exposure to sediment, dry weight values should be evaluated against the soil quality standards for Soil Contact/Ingestion only.

[4] Value has been adjusted to reflect 10-05 Target Risk

[5] Original Agency Value has been divided by 5

[6] Benzo(a)pyrene, BaP, Total Potency Equivalents are to be calculated following methodology shown in "Canadian Council of Ministers of the Environment, 2010 Canadian soil quality guidelines for the protection of environmental and human health: Carcinogenic and Other PAHs."

[7] Dioxins and Furans TEQ, Toxic Equivalents, are to be calculated following methodology shown in " Canadian Council of Ministers of the Environment. 2002. Canadian soil quality guidelines for the protection of environmental and human health: Dioxins and Furans"

Table A4-D References for Pathway Specific Standards - Industrial Soil (mg/kg)

Land Use / Receptor	Industrial Land Use							
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater		
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference
Inorganic Parameters								
Aluminum	198,000	USEPA, 2010 [5]	-	-	-	-	-	-
Antimony	63	OMOE, 2011	-	-	-	-	-	-
Arsenic	31	CCME 2007b [4]	-	-	-	-	-	-
Barium	140,000	AENV, 2010	-	-	-	-	-	-
Beryllium	320	OMOE, 2011	-	-	-	-	-	-
Boron (Total)	24,000	OMOE, 2011	-	-	-	-	-	-
Boron (Hot Water Soluble)	-	-	-	-	-	-	-	-
Cadmium	2,090	CCME 2007b	-	-	-	-	-	-
Chromium (hexavalent)	1,300	OMOE, 2011	-	-	-	-	-	-
Chromium (total)	6,700	CCME 2007b	-	-	-	-	-	-
Cobalt	250	OMOE, 2011	-	-	-	-	-	-
Copper	20,000	CCME 2007b	-	-	-	-	-	-
Cyanide	2,300	CCME 2007b	-	-	-	-	-	-
Iron	144,000	USEPA, 2010 [5]	-	-	-	-	-	-
Lead	8,200	CCME 2007b	-	-	-	-	-	-
Manganese	-	-	-	-	-	-	-	-
Mercury (total)	690	CCME 2007b	-	-	-	-	-	-
Methylmercury	20	USEPA, 2010 [5]	-	-	-	-	-	-
Molybdenum	1,200	OMOE, 2011	-	-	-	-	-	-
Nickel	2,200	OMOE, 2011	-	-	-	-	-	-
Selenium	4,050	CCME, 2009	-	-	-	-	-	-
Silver	490	OMOE, 1911	-	-	-	-	-	-
Strontium	122,000	USEPA, 2010 [5]	-	-	-	-	-	-
Thallium	1	CCME 2007b	-	-	-	-	-	-
Tin	122,000	USEPA, 2010 [5]	-	-	-	-	-	-
Uranium	510	CCME 2007b	-	-	-	-	-	-
Vanadium	160	OMOE, 2011	-	-	-	-	-	-
Zinc	47,000	OMOE, 2011	-	-	-	-	-	-
Petroleum Hydrocarbons (PHC) Parameters								
Benzene	360	APIRI, 2012	33	2.5	APIRI, 2012	0.094	0.042	APIRI, 2012
Toluene	110,000	APIRI, 2012	>RES	>RES	APIRI, 2012	0.74	0.35	APIRI, 2012
Ethylbenzene	49,000	APIRI, 2012	>RES	>RES	APIRI, 2012	0.13	0.065	APIRI, 2012
Xylene	730,000	APIRI, 2012	>RES	110	APIRI, 2012	22	11	APIRI, 2012
Modified TPH (Gas)	77,000	APIRI, 2012	78,000	870	APIRI, 2012	1,900	940	APIRI, 2012
Modified TPH (Fuel)	47,000	APIRI, 2012	>RES	4,000	APIRI, 2012	4,700	1,800	APIRI, 2012
Modified TPH (Lube)	74,000	APIRI, 2012	>RES	23,000	APIRI, 2012	>RES	15,000	APIRI, 2012
MTBE	6,800	AENV, 2010	7.4	0.57	AENV, 2010	0.05	0.062	CCME 2013/AENV, 2010
Polycyclic Aromatic Hydrocarbons (PAH) Parameters								
Non-Carcinogenic PAH Compounds								
Naphthalene	2,800	AENV, 2010	370	25	AENV, 2010	28	53	AENV, 2010
1 - Methylnaphthalene	560	OMOE, 2011	-	-	OMOE, 2011	42	30	OMOE, 2011
2 - Methylnaphthalene	560	OMOE, 2011	-	-	OMOE, 2011	42	30	OMOE, 2011
Acenapthene	8,000	AENV, 2010	770,000	43,000	AENV, 2010	-	-	AENV, 2010
Acenapthylene	96	OMOE, 2011 [4]	390	66	OMOE, 2011 [4]	32	23	OMOE, 2011 [4]
Anthracene	37,000	AENV, 2010	-	-	AENV, 2010	-	-	AENV, 2010
Fluoranthene	5,300	AENV, 2010	-	-	AENV, 2010	-	-	AENV, 2010
Fluorene	4,100	AENV, 2010	-	91000	AENV, 2010	-	-	AENV, 2010
Phenanthrene	-	-	-	-	-	24	17	OMOE, 2011
Pyrene	3,200	AENV, 2010	-	-	AENV, 2010	-	-	AENV, 2010
Carcinogenic PAH Compounds								
BaP Total Potency Equivalents	5.3	CCME, 2010	-	-	AENV, 2010	IACR<1	IACR<1	CCME, 2010
Benz[a]anthracene	-	-	-	-	-	-	-	-
Benzo[a]pyrene	-	-	-	-	-	-	-	-
Benzo[b,j,k]fluoranthene isomers	-	-	-	-	-	-	-	-
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-
Dibenz[a.h]anthracene	-	-	-	-	-	-	-	-
Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	-	-
Volatile Organic Compound (VOC) Parameters								
Bromodichloromethane	180	OMOE, 2011 [4]	-	-	-	1.9	1.5	OMOE, 2011
Bromoform	1,400	OMOE, 2011 [4]	17	6.1	OMOE, 2011 [4]	2.9	2.3	OMOE, 2011
Bromomethane	66	OMOE, 2011	0.1	0.05	OMOE, 2011/CCME 2013	0.1	0.097	OMOE, 2011
Carbon Tetrachloride (Tetrachloromethane)	260	AENV, 2010	0.09	0.05	AENV, 2010/CCME 2013	0.092	0.16	AENV, 2010
Chlorobenzene	300,000	AENV, 2010	2.7	0.22	AENV, 2010	0.61	1.1	AENV, 2010
Chloroethane	-	-	-	-	-	-	-	-
Chloroform	4,400	AENV, 2010	0.15	0.05	AENV, 2010/CCME 2013	0.62	1	AENV, 2010
Chloromethane	-	-	-	-	-	-	-	-
Dibromochloromethane	14,000	AENV, 2010	76	2.5	AENV, 2010	0.91	1.5	AENV, 2010
1,2-Dichlorobenzene	300,000	AENV, 2010	1,700	130	AENV, 2010	0.097	0.18	AENV, 2010
1,3-Dichlorobenzene	4,400	OMOE, 2011	-	-	-	34	24	OMOE, 2011
1,4-Dichlorobenzene	74,000	AENV, 2010	100	8	AENV, 2010	0.051	0.098	AENV, 2010
1,1-Dichloroethane	8,800	OMOE, 2011	39	56	OMOE, 2011	0.6	0.47	OMOE, 2011
1,2-Dichloroethane	4,200	AENV, 2010	0.37	0.05	AENV, 2010/CCME 2013	0.05	0.05	CCME 2013
1,1-Dichloroethylene	34,000	AENV, 2010	3.1	0.27	AENV, 2010	0.15	0.24	AENV, 2010
cis-1,2-Dichloroethylene	6,600	OMOE, 2011	37	55	OMOE, 2011	2.5	1.9	OMOE, 2011
trans-1,2-Dichloroethylene	4,400	OMOE, 2011	9.3	1.3	OMOE, 2011	2.5	1.9	OMOE, 2011
1,2-Dichloropropane	310	OMOE, 2011 [4]	0.68	0.16	OMOE, 2009	0.74	0.54	OMOE, 2011
1,3-Dichloropropene	8.1	USEPA, 2010 [5]	-	-	-	-	-	-
Ethylene Dibromide	3.1	OMOE, 2011 [4]	0.05	0.05	CCME 2013	0.05	0.05	CCME 2013
Methylene Chloride (Dichloromethane)	7,300	AENV, 2010	110	9	AENV, 2010	0.21	0.32	AENV, 2010
Styrene	26,000	OMOE, 2011	170	42	OMOE, 2011	66	47	OMOE, 2011
1,1,2,2-Tetrachloroethane	55	OMOE, 2011 [4]	0.94	0.19	OMOE, 2011 [4]	0.19	0.14	OMOE, 2011
Tetrachloroethylene	9,600	AENV, 2010	26	2	AENV, 2010	1.6	1.6	CCME 2007b
1,1,1-Trichloroethane	440,000	OMOE, 2011	42	6.1	OMOE, 2011	27	20	OMOE, 2011
1,1,2-Trichloroethane	190	OMOE, 2011 [4]	9.1	0.42	OMOE, 2011 [4]	0.73	0.54	OMOE, 2011
Trichloroethylene	1,700	CCME 2007b	9.2	1.1	CCME 2007b	0.01	0.01	CCME 2007b
Vinyl Chloride	110	AENV, 2010	0.055	0.02	AENV, 2010/CCME 2013	0.02	0.02	CCME 2013/AENV, 2010
Pesticides								

Table A4-D References for Pathway Specific Standards - Industrial Soil (mg/kg)

Land Use / Receptor	Industrial Land Use							
Pathway	Soil Contact / Ingestion		Inhalation of Indoor Air			Leaching to Potable Groundwater		
Parameter	Coarse / Fine	Reference	Fine	Coarse	Reference	Fine	Coarse	Reference
Aldicarb	160	AENV, 2010	-	-	-	0.041	0.065	AENV, 2010
Aldrin	44	AENV, 2010	-	-	-	0.59	11	AENV, 2010
Atrazine	80	AENV, 2010	-	-	-	0.1	0.19	AENV, 2010
Azinphos-methyl	400	AENV, 2010	-	-	-	0.41	0.75	AENV, 2010
Bendiocarb	640	AENV, 2010	-	-	-	0.14	0.21	AENV, 2010
Bromoxynil	80	AENV, 2010	-	-	-	0.18	0.35	AENV, 2010
Carbaryl	1,600	AENV, 2010	-	-	-	1.9	3.6	AENV, 2010
Carbofuran	1,600	AENV, 2010	-	-	-	0.68	1.2	AENV, 2010
Chlorothalonil	2,400	AENV, 2010	-	-	-	27	53	AENV, 2010
Chlorpyrifos	1,600	AENV, 2010	-	-	-	49	95	AENV, 2010
Cyanazine	210	AENV, 2010	-	-	-	0.12	0.21	AENV, 2010
2,4-D	1,600	AENV, 2010	-	-	-	0.43	0.67	AENV, 2010
DDT	1,600	AENV, 2010	-	-	-	5,900	11,000	AENV, 2010
Diazinon	320	AENV, 2010	-	-	-	2.2	4.2	AENV, 2010
Dicamba	2,000	AENV, 2010	-	-	-	0.5	0.79	AENV, 2010
Dichlorfop-methyl	160	AENV, 2010	-	-	-	12	24	AENV, 2010
Dieldrin	44	AENV, 2010	-	-	-	0.59	1.1	AENV, 2010
Dimethoate	320	AENV, 2010	-	-	-	0.077	0.12	AENV, 2010
Dinoseb	160	AENV, 2010	-	-	-	2.8	5.5	AENV, 2010
Diquat	1,300	AENV, 2010	-	-	-	11	21	AENV, 2010
Diuron	2,500	AENV, 2010	-	-	-	1.9	3.5	AENV, 2010
Endosulfan	3,000	AENV, 2010	-	-	-	99	190	AENV, 2010
Endrin	130	AENV, 2010	-	-	-	2.4	4.7	AENV, 2010
Glyphosate	4,800	AENV, 2010	-	-	-	0.95	1.4	AENV, 2010
Heptachlor	2.8	AENV, 2010	2.4	0.094	AENV, 2010	0.05	0.076	CCME 2013/AENV, 2010
Lindane	48	AENV, 2010	-	-	-	0.31	0.6	AENV, 2010
Linuron	320	AENV, 2010	-	-	-	0.56	1.1	AENV, 2010
Malathion	3,200	AENV, 2010	-	-	-	0.82	1.3	AENV, 2010
MCPA	80	AENV, 2010	-	-	-	0.02	0.32	AENV, 2010
Methoxychlor	50,000	AENV, 2010	-	-	-	5,700	11,000	AENV, 2010
Metolachlor	800	AENV, 2010	-	-	-	1.3	2.4	AENV, 2010
Metribuzin	1,300	AENV, 2010	-	-	-	7.8	15	AENV, 2010
Paraquat	160	AENV, 2010	-	-	-	1.1	2.2	AENV, 2010
Parathion	800	AENV, 2010	-	-	-	7.2	14	AENV, 2010
Phorate	32	AENV, 2010	-	-	-	0.075	0.14	AENV, 2010
Picloram	3,200	AENV, 2010	-	-	-	0.64	0.94	AENV, 2010
Simazine	210	AENV, 2010	-	-	-	0.14	0.25	AENV, 2010
Tebuthiuron	11,000	AENV, 2010	-	-	-	2.5	3.7	AENV, 2010
Terbufos	8	AENV, 2010	-	-	-	0.08	0.15	AENV, 2010
Toxaphene	7.3	AENV, 2010	-	-	-	3.3	6.3	AENV, 2010
Triallate	2,100	AENV, 2010	-	-	-	16	31	AENV, 2010
Trifluralin	770	AENV, 2010	-	-	-	35	67	AENV, 2010
Other Parameters								
Polychlorinated Biphenyl (Total PCB)	33	CCME 2007	230	45	OMOE, 2011	1,100	770	OMOE, 2011
Dioxins and Furans (TEQ) (mg TEQ/kg)	0.000175	CCME 2007b	0.21	0.043	OMOE, 2011	0.0026	0.0018	OMOE, 2011
Pentachlorophenol (PCP)	7500	CCME 2007b	280,000	280,000	CCME 2007b	7.6	7.6	CCME 2007b
Organotins - Tributyltin	36	USEPA, 2010 [5]	-	-	-	-	-	-
Ethylene Glycol	110,000	AENV, 2010	-	-	AENV, 2010	60	68	AENV, 2010
Propylene Glycol	-	-	-	-	-	-	-	-
Phenol	150,000	CCME, 1997	2,100	2,100	CCME, 1997	3.8	3.8	CCME, 1997

Notes:

[1] All values in mg/kg

[2] "-" = No guideline available or no guideline required; >RES means no soil criteria are shown as residual soil saturation limits may be exceeded; IACR means the Index of Additive Cancer Risk

[3] For the purposes of screening human health effects from exposure to sediment, dry weight values should be evaluated against the soil quality standards for Soil Contact/Ingestion only.

[4] Value has been adjusted to reflect 10-05 Target Risk

[5] Original Agency Value has been divided by 5

[6] Benzo(a)pyrene, BaP, Total Potency Equivalents are to be calculated following methodology shown in "Canadian Council of Ministers of the Environment, 2010 Canadian soil quality guidelines for the protection of environmental and human health: Carcinogenic and Other PAHs."

[7] Dioxins and Furans TEQ, Toxic Equivalents, are to be calculated following methodology shown in " Canadian Council of Ministers of the Environment. 2002. Canadian soil quality guidelines for the protection of environmental and human health: Dioxins and Furans"

Table A5 List of Reference Sources for All Tables

Table Notation	Reference Source
AENV, 1999	Alberta Environment, 1999. Surface Water Quality Guidelines for Use in Alberta. Environmental Assurance Division, Science and Standards Branch. Alberta Environment. November, 1999.
AENV, 2010	Alberta Environment, 2010. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Alberta Environment, Climate Change, Air, and Land Policy Branch, Environmental Assurance Division, Edmonton, Alberta.
APIRI, 2012	Atlantic PIRI, 2012 Risk-Based Corrective Action, User Guidance. Reference Documentation for Petroleum Impacted Sites in Atlantic Canada. Version 3.0. July 2012
BCMOE, 1986	British Columbia Ministry of the Environment. 1986. Water Quality Criteria for Cyanide: Overview Report. http://www.env.gov.bc.ca/wat/wq/BCguidelines/cyanide/cyanide.html
BCMOE, 1987	British Columbia Ministry of the Environment 1987. Water Quality Criteria for Copper: Overview. http://www.env.gov.bc.ca/wat/wq/BCguidelines/copper/copper.html
BCMOE, 1990	British Columbia Ministry of the Environment 1990. Ambient Water Quality Criteria for Fluoride: Overview. http://www.env.gov.bc.ca/wat/wq/BCguidelines/fluoride/fluoride.html
BCMOE, 1993	British Columbia Ministry of the Environment 1993. Ambient Water Quality Criteria for Polycyclic Aromatic Hydrocarbons (PAHs): Overview Report. http://www.env.gov.bc.ca/wat/wq/BCguidelines/pahs/pahs_over.html
BCMOE, 1999	British Columbia Ministry of the Environment 1999. Ambient Water Quality Guidelines for Zinc: Overview. http://www.env.gov.bc.ca/wat/wq/BCguidelines/zinc/zinc.html
BCMOE, 2000	British Columbia Ministry of the Environment 2000. Ambient Water Quality Guidelines for Sulphate: Overview. http://www.env.gov.bc.ca/wat/wq/BCguidelines/sulphate/sulphate.html
BCMOE, 2001	British Columbia Ministry of the Environment 2001. Ambient Water Quality Criteria for Ammonia to Protect Marine Aquatic Life: Overview. http://www.env.gov.bc.ca/wat/wq/BCguidelines/ammonia.html
BCMOE, 2003a	British Columbia Ministry of the Environment 2003a Moss, S.A., N.K. Nagpal. 2003. Ambient Water Quality Guidelines for Boron: overview. http://www.env.gov.bc.ca/wat/wq/BCguidelines/boron/boron.html
BCMOE, 2003b	British Columbia Ministry of the Environment 2003b Nagpal, N.K., D.A. Levy, and D.D. MacDonald. 2003. Ambient Water Quality Guidelines for Chloride: Overview. http://www.env.gov.bc.ca/wat/wq/BCguidelines/chloride/chloride.html
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BCMOE, 2006	British Columbia Ministry of the Environment 2006. Nagpal, N.K., L.W. Pommen, and L.G. Swain. 2006. A Compendium of Working Water Quality Guidelines for British Columbia. Science and Information Branch, Ministry of Environment. URL: http://www.env.gov.bc.ca/wat/wq/BCguidelines/working.html.
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NOVA SCOTIA

APPENDIX B

Substances Potentially Considered As Background Occurrences

Table B1 Substances Potentially Considered as Background Occurrences

Potential Background Substances	
Parameter	**CAS #**
Inorganic Parameters	
Aluminum	7429-90-5
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Beryllium	7440-41-7
Boron (Total)	7440-42-8
Cadmium	7440-43-9
Chromium (hexavalent)	7440-47-3
Chromium (total)	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Cyanide	57-12-5
Iron	7439-89-6
Lead	7439-92-1
Manganese	7439-96-5
Mercury (total)	7439-97-6
Methylmercury	22967-92-6
Molybdenum	7439-98-7
Nickel	7440-02-0
Selenium	7782-49-2
Silver	7440-22-4
Strontium	7440-24-6
Thallium	7440-28-0
Tin	7440-31-5
Uranium	7440-61-1
Vanadium	7440-62-2
Zinc	7440-66-6
Polycyclic Aromatic Hydrocarbons (PAH) Parameters	
PAH Compounds	
1 - Methylnaphthalene	90-12-0
2 - Methylnaphthalene	91-57-6
Acenapthene	83-32-9
Acenapthylene	208-96-8
Anthracene	120-12-7
Fluoranthene	206-44-0
Fluorene	86-73-7
Phenanthrene	85-01-8
Pyrene	129-00-0
Carcinogenic PAH Compounds	
BaP Total Potency Equivalents	-
Benz[a]anthracene	56-55-3
Benzo[a]pyrene	50-32-8
Benzo[b,j,k]fluoranthene isomers	207-08-9
Benzo[g,h,i]perylene	191-24-2
Chrysene	218-01-9
Dibenz[a.h]anthracene	53-70-3
Indeno[1,2,3-c,d]pyrene	193-39-5
Volatile Organic Compound (VOC) Parameters	
Chloroform	67-66-3
Dioxins and Furans (TEQ)	various

Notes:

[1] Refer to Section 5.2.4 of protocol PRO-100, Notification of Contamination Protocol for additional information on how to determine background