Title : Dewatering Management Plan

Client : City of Ottawa

Project : TRILLIUM LINE EXPANSION PROJECT

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Project Director

Revision				Notes
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1.0 Preface

This document presents the Dewatering Management Plan (DMP) that has been developed specifically for the Ottawa Trillium Line Project. The document describes the environmental requirements, standards and procedures that shall be followed by SNC-Lavalin personnel, and its Sub-contractors to minimize, reduce or eliminate potential environmental impacts from construction (including early works) phase of project development.

1.1 LIST OF ACRONYMS

- BOD: Biological Oxygen Demand
- BMP: Best Management Practices
- CCME: Canadian Council of Ministers of the Environment
- COD: Chemical Oxygen Demand
- COO: City of Ottawa
- DMP: Dewatering Management Plan
- EC: Environmental Coordinator
- ECA: Environmental Compliance Approval
- EI: Environmental Inspector
- EMP: Environmental Management Plan
- EPA: Environmental Protection Act
- ER: Environmental Representative
- ERRIS: Effluent Regulatory Reporting Information System
- EM: Environmental Manager
- HWIN: Hazardous Waste Information Network
- MSF: Maintenance and Storage Facility
- PHC: Petroleum Hydrocarbons
- PPOC: Potential Parameters of Concern
- PTTW: Permit to Take Water
- ROPEC: Robert O. Pickard Environmental Center
- SSA: Sanitary Sewer Agreement
- SUP: Sewer Use Program – City of Ottawa
- TSS : Total Suspended Solids

- WSER: Wastewater Systems Effluent Regulations
- QP: Qualified Person

1.2 DEFINITIONS

For the purposes of this DMP, the following definitions apply:

Environmental Manager: As defined in Section 3.2 of Schedule 17 of the Project Agreement

Environmental Coordinator: As defined in Section 3.3 of Schedule 17 of the Project Agreement

Environmental Inspector: As defined in Section 3.6 of Schedule 17 of the Project Agreement

Contaminant: Any solid, liquid, gas or combination of any of them that causes or may cause an adverse effect.

Emergency: As defined under the Emergency Management and Civil Protection Act as "a situation or an impending situation that constitutes a danger of major proportions that could result in serious harm to persons or substantial damage to property and that is caused by the forces of nature, a disease or other health risk, an accident, or an act whether intentional or otherwise."

Project: The Trillium Line Expansion.

Ministry: The Ontario Ministry of the Environment, Conservation and Parks (MECP), formally knowns as The Ministry of the Environment and Climate Change (MOECC), and The Ministry of Environment and Energy (MOEE).

2.0 Introduction

The Dewatering Management Plan (DMP) is a key component of the overall Environmental Management Plan (EMP) which strives to achieve an environmentally sustainable project by integrating engineering design, environmental protection measures and environmental mitigation procedures.

2.1 PURPOSE

The purpose of this plan is to:

- Identify planning, processes and contingency measures that will be implemented to mitigate dewatering risks, such as exceedances of Sanitary Sewer Use by-laws, or other environmental incidents such as non-compliant surface discharges;
- Identify controls to be performed to confirm dewatering is done in compliance with all current Environmental Laws, Municipal By-Laws and permit conditions;
- List procedures for addressing any complaints received related to groundwater activities;
- Facilitate effective response to environmental emergencies such as non-compliant discharges to sanitary or the natural environment as a result of dewatering activities; and
- Outline the responsibilities of SNC-Lavalin personnel and subcontractors that may be involved in dewatering management.

2.2 REVIEW AND UPDATE

As with all environmental management plans, the DMP will be a 'Living Document' that will be updated as the project progresses through the various stages of design and construction to confirm information is relevant to current site activities and operations.

It will be reviewed through each stage and may be updated on an as-required basis, and in compliance with the requirements outlined in Schedule 17 of the Project Agreement.

2.3 SCOPE AND ORGANIZATION OF THE PLAN

Key elements of the plan include:

- List of legal requirements, standards and guidelines;
- Roles and responsibilities, key contacts and phone numbers;
- General construction considerations;
- Permitting and approvals;
- Identifying potential parameters of concern;
- Dewatering from contaminated and non-contaminated areas;
- Managing contaminated groundwater;
- Contingency planning and emergency shut-down procedures;
- Maintenance frequency;
- Effluent monitoring and reporting procedures;
- Dewatering system design;
- Contingency planning and preventive measures to mitigate the risk of environmental incidents; and
- Addressing complaints related to dewatering activities.

SNC-Lavalin's (and its subcontractors') responsibilities during construction include implementing, monitoring and maintaining all dewatering measures (as outlined in the DMP) in accordance with regulatory and institutional requirements relating to the Ontario Water Resources Act, Sanitary Sewer Agreements and Sewer Use By-law No. 2003-514 requirements.

2.4 LIST OF LEGAL REQUIREMENTS, STANDARDS AND GUIDELINES

- Project Agreement, Schedule 17, Section 4.8
- City of Ottawa, Sewer Use By-law 2003-514.
- City of Ottawa, Drainage By-law.

- Ontario Ministry of Environment and Energy, Water Management Policies Guidelines – Provincial Water Quality Objectives, 1999.
- Ontario Provincial Standard Specifications, Construction, OPSS 518 Control of Water from Dewatering Operations.
- Ontario Water Resources Act, R.S.O. 1990 c. O.40.
- Ontario Environmental Protection Act (EPA), R.S.O. 1990 c. E.19.
- MECP O.Reg 387/04: Water Taking and Transfer. December 2004.
- MECP O.Reg 63/16: Water Taking. May 2016.
- MECP Conditions of the Environmental Activity and Sector Registry (EASR) for Water Taking for Construction Site Dewatering.
- MECP Conditions of a Permit to Take Water (PTTW).
- CCME Water Quality Guidelines for the Protection of Aquatic Life.
- CCME Sediment Quality Guidelines for the Protection of Aquatic Life.
- Fisheries Act, R.S., 1985 c. F-14.
- Federal Wastewater Systems Effluent Regulations, SOR/2012-139.
- O. Reg. 174/06 – Rideau Valley Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses.
- O. Reg. 170/06 – South Nation River Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses.

3.0 Roles and Responsibilities

3.1 ENVIRONMENTAL MANAGER

The SNC-Lavalin Environmental Manager will have final signing authority for changes to this plan.

3.2 ENVIRONMENTAL COORDINATOR

The SNC-Lavalin Environmental Coordinators (EC) will confirm that the responsibilities for dewatering are understood by all personnel, subcontractors and suppliers in their respective areas. The EC will also confirm that the necessary dewatering measures are in place to minimize the risk associated with non-conforming discharges through periodic work site inspections. The EC is also responsible for obtaining the required dewatering permits, including water taking permits and discharge agreements as requested by the construction teams.

3.3ENVIRONMENTAL INSPECTOR

The SNC-Lavalin Environmental Inspector (EI) is responsible for inspecting the work sites to maintain conformance with this plan, permits and all other applicable rules and regulations. Dewatering systems will be monitored by SNC-Lavalin personnel or subcontractors, with periodic inspections by the EC and EI. The EI will work in conjunction with the EC for each segment to resolve any identified issue or deficiencies with the work being performed by either SNC-Lavalin personnel or its subcontractors. The EC and EI will identify deficiency items, record them and work together to find solutions using best management practices. The logging and subsequent close up of dewatering based issues will be done via SNC-Lavalin's site inspections.

3.4 OPERATIONAL PERSONNEL

3.4.1Dewatering Sites

Onsite monitoring of dewatering systems located on further project sites will be conducted by an SNC-Lavalin EI or EC. The following table comprises a list of the Environmental team contact info:

Table 1 : SNC-Lavalin HSE Contact Info

Name	Title	Contact Number	Email Address
Cory van Hoof	Environmental Manager	613-314-0469	Cory.vanhoof@snclavalin.com
Dwayne Samoyloff	Health & Safety Manager	343-553-5503	Dwayne.Samoyloff@snclavalin.com
Arundeep Taduri	Environmental Coordinator	343-573-7170	Arundeep.Taduri@snclavalin.com
Joseph Adesina	Environmental Inspector	613-297-8985	Joseph.Adesina@snclavalin.com
Sarah McFadden	Environmental Permits & Approvals Coordinator	343-574-2922	Sarah.McFadden@snclavalin.com

3.5 SUBCONTRACTORS

All subcontractors are required to produce their own DMP which outlines the following, or agree to follow SNC-Lavalin's existing plans:

- Dewatering management;
- Procedures for water testing, containment, classification, treatment, and disposal / discharge;

- Procedures to confirm water management is performed in compliance with Environmental Laws, Regulations, and Municipal By-Laws;
- Reporting procedures to document how dewatering management activities and best management practices have been implemented; and
- Periodic review of plan.

All dewatering operations must be approved by SNC-Lavalin Environment prior to discharging or after any modifications made to dewatering systems.

4.0 Dewatering Management

4.1 GENERAL CONSTRUCTION CONSIDERATIONS

Water requiring disposal can be expected from several sources, including:

- Bedrock inflows during caisson drilling,
- Daylighting and utility clearing;
- Geotechnical and environmental drilling;
- Excavations which lie below the water table;
- Low lying areas after rainfall events;
- Saw cutting and coring;
- Water main flushes following relocation;
- Water trucks with sprayers and sweepers to provide dust control during dry conditions; and
- Water used for cleaning equipment post concrete pours.

SNC-Lavalin anticipates dewatering activities in the following areas: Dow's Lake tunnel, utility or station excavations, sumps, swales, retention ponds, wetlands and other low lying areas.

It is important to note the Trillium Line route passes through areas of known contamination and that the water requiring disposal may vary in quality and shall (in some cases) require laboratory analyses prior to disposal. Possible contaminants of concern may include: suspended solids (sediment), acidity, alkalinity, cyanide, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), oil and grease, nutrients, hydrocarbons, volatile organic compounds (VOC), polyfluoroalkyl substances (PFAS), heavy metals, herbicides and pesticides, and acid rock drainage.

Dewatering facilities shall be provided (where required) to confirm that any and all water that is discharged to the City's storm or combined sewer system is in compliance with the applicable water quality guidelines outlined in Schedule A of the Sewer Use By-law (2003-514).

Discharge to any City storm sewer must be compliant to Table 2- City of Ottawa, Limits for Storm Sewer Discharge.

In addition, since the Trillium Extension Project passes through and in very close proximity to a number of Federal lands, any discharges there must also be compliant with the Wastewater System Effluent Regulations SOR/2012-139 under the Fisheries Act.

Construction dewatering is required south-east of Leitrim Station, the dewatering activity has been reviewed by a Qualified Person (QP) and a Site Specific Dewatering Plan has been created for this location (Document# 660373-0000-003-4EAG-0024).

4.1.1 Dow's Lake Tunnel

A water infiltration management plan will be prepared to address the 22 existing expansion joints in the Tunnel. The plan will include the means and methods of managing water infiltration at the expansion joints and will incorporate the following requirements.

- Water from the expansion joint shall not be allowed to leak onto the Track, ballast, ballast curbs and Emergency walkway.
- Water from the expansion joints shall not drip onto Tunnel equipment, conduits, piping, lighting and any other system components in the Tunnel.
- Water shall not be allowed to freeze in the joint and the joint shall be kept free of debris.

4.2 PERMITS

In most cases, SNC-Lavalin will obtain the necessary permits for dewatering activities related to the construction of the Trillium Line. However, in some cases subcontractors may be responsible for obtaining these permits in which case SNC-Lavalin Environmental Coordinators are responsible to verify the required permits are in place prior to work beginning. Permits which may be required include permits to take water (PTTW) or posting on the Environmental Activity and Section Registry (EASR), Agreements under the Sewer Use Program (Sanitary or Storm), or dewatering facility Environmental Compliance Approvals (ECAs), as well as permits for development, interference with wetlands and alterations to shorelines and watercourses.

All permits and conditions will be tracked in SNC-Lavalin's Permits, Licenses, Approvals and Authorization ledger (PLAA).

4.2.1 The Ministry – Permit to Take Water / Environmental Activity and Section Registry

A PTTW or posting on the EASR must be obtained, based on the requirements under the provincial Water Act. In general, an EASR is obtained for construction dewatering between 50,000 - 400,000 litres/day and discharged to an approved waste management system, sewage works, municipal sanitary sewer, or to land (i.e. >30 meters from any watercourse) and have minimal environmental effects. Where discharge to land is to occur, additional criteria are given to test and meet water quality requirements including the preparation of a discharge plan by a

QP that includes erosion and sedimentation control measures, monitoring, and mitigation measures. A statement from a qualified hydrologist, hydrogeologist or engineer is required with the application providing an opinion that the impacts from the proposed water taking are minimal. A qualified person must provide written confirmation that there is only a low risk of an environmental impact. Presumably where an impact is thought likely, the proponent should apply for a PTTW instead. Determining if a PTTW or an EASR is required is the responsibility of SNC-Lavalin.

Any PTTW obtained will specify maximum specific volume allowances and any pumping in excess of the maximum volume requires special permission from the regulatory authority (Ministry). Approvals may also include site specific requirements as may be stated in the permit.

Both the PTTW and EASR require that a record of all water takings must be kept including the dates of water takings and amounts of water taken for each day under the permit. All water takings will be uploaded to the MECP Water Taking Reporting System (WTRS) annually by March 31st.

4.2.2 The Ministry – Environmental Compliance Approval

In order to discharge treated water to the natural environment (e.g. streams, creeks, rivers), an ECA for industrial sewage works is required via the MECP. This disposal of water will typically be done via the City's storm sewer infrastructure and thus will also require municipal authorization.

4.2.3 City of Ottawa Sewer Use By-law (2003-514) – Storm or Sanitary Sewer Agreement

SNC-Lavalin will require approvals under the Sewer Use By-law to discharge its treated water to the City of Ottawa's sanitary or storm sewer systems. SNC-Lavalin will liaise and coordinate with the City of Ottawa Compliance Officer to acquire the necessary Agreements.

4.2.4 Federal Government Wastewater Systems Effluent Regulations (SOR/2012-139)

Under the Fisheries Act any wastewater treatment system that discharges on a continuous or intermittent basis and collects average daily volumes of 100 m3 (100,000 Liters) or more of influent, will have to abide by the Wastewater Systems Effluent Regulations (SOR/2012-139). SNC-Lavalin will submit an identification report to meet the Wastewater Systems Effluent Regulations (WSER) authorization requirements. In the identification report, SNC-Lavalin will establish the average daily volume of effluents to be deposited through measurements or estimates based on accepted engineering practices. The WSER also requires a number of monitoring reports to be submitted throughout the operational period.

4.2.5 Conservation Authorities permits and clearances

Construction and dewatering operations on the Trillium Line have the potential to interfere with regulated areas (including floodplains, steep slopes, wetlands and watercourses that exist at different locations of the Project). In accordance with O. Reg. 174/06 and O. Reg. 170/06, SNC-Lavalin will have to obtain permits from the two conservation authorities that share jurisdiction along the project's length; The Rideau Valley Conservation

Authority (RVCA) and South Nation Conservation (SNC). In addition, the Conservation Authorities will have to issue clearances for stormwater management works within the project, as well as assist in identifying source water protection areas that might be threatened due to dewatering activities. Clearances from conservation Authorities are also required to obtain a Ministry ECA.

4.3 DEWATERING – DETERMINING WATER QUALITY

Prior to or at the start of any dewatering activities in a "new" area, SNC-Lavalin will sample and analyze the water to confirm its quality in relation to the relevant discharge criteria (Schedule A or B from the COO Sewer Use Bylaw No. 2003-514). This will serve to confirm water quality and the steps outlined below are to be completed to allow the water to be discharged in compliance with the bylaw.

The following steps will be undertaken to evaluate unknown groundwater conditions:

- Review available groundwater reports for the applicable area;
- Dig test pit(s) to groundwater table to collect grab sample(s) or collect samples from nearby wells and submit them to an accredited laboratory for analysis, if deemed necessary to verify the presence or determine the level of contamination (If possible, these test are to be completed prior to the start of any construction activities);

Analysis should focus on contaminants observed in prior groundwater studies and sewer use by-law parameters. Table 2 summarizes the general sampling procedures for potential parameters of concern (PPOCs).

Sampling Procedures	
Parameter	Sampling Procedure [(based on MISA (1999) and Ministry (2011)]
Total Suspended Solids (TSS)	Unfiltered, unpreserved sample. Bottle is PET, Glass or HDPE, typically 500 mL in volume. Store at room temperature. Holding time is 7 days.
pH	Unfiltered, unpreserved sample. Bottle is PET, Glass or HDPE, typically 500 mL volume. Store at 5±3 °C. Analyses should be conducted as quickly as possible.
Volatile Organic Compounds (VOCs, including BTEX)	Unfiltered sample preserved with NaHSO4 or HCl to a pH < 2. Bottles are 40 mL to 60 mL glass vials (minimum of 2) and must be completely filled without headspace/bubbles to prevent loss of volatiles. Do not overfill or preservative will be lost. Store at 5±3 °C. Holding time is 14 days.
Petroleum Hydrocarbons (PHCs), including Oil and	Unfiltered sample, may be preserved with HCl or

Sampling Procedures	
Parameter	Sampling Procedure [(based on MISA (1999) and Ministry (2011)]
Grease	unpreserved (if preservative cause's effervescence/degassing, rinse preservative out three times with sample and submit to the laboratory as unpreserved). Bottle is 1L amber glass with Teflon lined lid. Do not fill past the neck of the bottle or bottle may burst. Do not overfill or preservative will be lost. Store at 5±3 °C. Holding time is 40 days preserved and 7 days unpreserved.
Metals	Unfiltered sample, preserved with HNO3 to pH < 2. Bottle is HDPE or Teflon, typically 500 ml. Do not overfill or preservative will be lost. Use only new bottles to prevent possible false detections of metals leached from the bottle. Store at room temperature. Holding time is 60 days.
Polycyclic aromatic hydrocarbons (PAHs)	Unfiltered, unpreserved sample. Bottle is 1L amber glass with Teflon lined lid. Do not fill past the neck of the bottle or bottle may burst. Store at 5±3 °C. Holding time is 14 days.
Semi-Volatile Organic Compounds (SVOCs)	Unfiltered, unpreserved sample. Bottle is 1L amber glass and must be completely filled without headspace/bubbles to prevent loss of volatiles. Store at 5±3 °C. Holding time is 14 days.

Table 2 : Sampling Procedures for PPOCs

- If groundwater is contaminated, design and install an appropriate and economically feasible treatment system to remove contaminants (e.g. dewatering plant, geotube, mobile pump and treat system, etc.) or confirm the usage of a vacuum truck to dispose of any contaminated water.
- If groundwater contains unacceptable levels of TSS, install appropriate erosion and sedimentation control measures that would enable effluent to meet sanitary sewer discharge (e.g. rock check dams, silt fencing, geotube, settling tank etc.)
- Confirmatory samples are to be collected prior to initial discharge to demonstrate compliance with respect to the discharge location (e.g. sanitary sewer or storm sewer).
- Once the discharge operation is ongoing, confirmatory sampling will be required as per the permit(s) conditions.

4.4 MANAGING PROCESS WATER AND CONTAMINATED GROUNDWATER

4.4.1 Process Water

Any contaminated process water generated from saw cutting, coring, concrete washout from cement truck chutes must be contained and prevented from entering the natural environment and will be collected and disposed of using the following industry BMP's:

- Use of an "enviro-bin" attached to the end of the cement truck chute to collect concrete wash water and transfer it back into the drum, to be taken off-site for disposal at the concrete batch plant.
- Use of a plastic line containment to collect all concrete wash water. Once the sediment has dropped out, excess water would be pumped into a treatment system or removed via licensed hauler. Hardened concrete can then be broken by SNC-Lavalin or subcontractors and removed offsite to a location where it can be taken and recycled.

Contaminated process water and concrete washout entering the natural environment are considered spills and must be managed as stated in SNC-Lavalin's Spill Prevention and Emergency Response Plan (Document# 660373-0000-003-4EAG-0009).

4.5 CONTAMINATED GROUNDWATER

All dewatered groundwater in areas of known or suspected contamination should be sampled for PPOCs. Depending on the results, the water may require treatment by on-site treatment facility or if necessary, removed by a licensed Ministry waste hauler for disposal at an appropriate facility. Water removed by a licensed waste hauler must be registered and manifested as per the requirements of hazardous and liquid waste disposal (www.hwin.ca).

SNC-Lavalin will follow all best management practices, applicable laws, regulations and municipal By-Laws in order to prevent the migration of contamination or distribution through the dewatering process and construction activities. Moreover, spills will be managed as indicated in the latest revision of the Spill Prevention Response Plan. Finally, all groundwater contamination discoveries will be managed via the same steps and procedures identified in the SPRP.

4.6 EFFLUENT MONITORING

SNC-Lavalin monitoring and sampling program will include a combination of sample analysis completed by an accredited laboratory and where necessary, treatment facilities to confirm compliance with applicable laws and permitting requirements. The inlet and outlet water qualities will be monitored regularly for parameters such as turbidity, pH and the presence of a sheen or odour where required.

Samples collected are subsequently submitted to an accredited laboratory for analysis per the requirements outlined in the respective ECA, PTTW, SSA and in accordance with the City of Ottawa's Sewer Use By-law No. 2003-514 (as required). Typical SSA requirements includes monthly sampling collected at the discharge location. All Certificates of Analyses (lab results) will be received within 24 hours, which is the fastest turn-around-time available in order to confirm ongoing compliance. If an operational upset occurs with respect to field screening

and a discharge to sanitary has occurred, an effluent sample shall be collected at the discharge location for due diligence.

The following general procedures will be followed for all water sampling:

- Sampler will wear clean, non-contaminating, chemical resistant gloves (e.g. nitrile, or equivalent) and eye protection.
- All sample containers will be supplied with preservatives, if applicable, by the laboratory conducting the analyses.
- Samples will be stored out of the light and in ice.
- All samples will be submitted under Chain of Custody (forms provided by the laboratory).

Water sampling will be conducted by SNC-Lavalin personnel, EIs / ECs or by an auto-sampling unit, as required. Effluent monitoring must meet the following discharge criteria with respect to Sewer Use Bylaw No. 2003-514, outlined in Appendix A.

In cases where treated water is being discharged into a surface water body, the effluent quality will be tested against the Ministry Provincial Water Quality Objectives (July 1994) outlined in Appendix B. Monitoring reports will be sent according to the requirements stipulated by the Environmental Compliance Approval (ECA) issued by the Ministry.

Finally, in any situation where discharge is occurring on Federal lands, both effluent quantity and quality will have to be measured and tested against the SOR/2012-139 Wastewater Systems Effluent Regulations (WSER) goals. Quarterly or annual reports depending on the frequency of discharges will have to be submitted using the Effluent Regulatory Reporting Information System (ERRIS).

All laboratory analysis will be done by an accredited Ottawa-based laboratory such as the following:

Paracel Laboratories Ltd
2319 St. Laurent Blvd., Unit 300
Ottawa ON, K1G 4J8
Tel: 613-731-9577
Toll Free: 1-800-749-1947

Exova
146 Colonnade Road, Unit 8
Ottawa ON, Y1K2E 7
Tel: 613-727-5692

ALS Laboratory Group
190 Colonnade Rd S,
Nepean, ON, K2E 7J6
Tel: 613-225-8279

4.7 DISCHARGING DEWATERING EFFLUENT

If water is being discharged directly to the natural environment (i.e. watercourse), the water from the dewatering operations shall be directed to a sediment control device or natural attenuation area (well vegetated stable area) prior to discharge to any ditch or watercourse. If a natural attenuation area is used, a minimum 30 m setback shall be maintained from the receiving watercourse or storm sewer inlet.

When water is discharged to a watercourse, the water discharged shall be done in a manner that does not cause erosion or other damage to adjacent lands. This activity shall only be carried under a relevant Ministry approvals, with the authorization of the Environmental Manager (EM) and under the direct supervision of the environmental representative for the appropriate Project segment. The flow of water shall never be directed across or over pavements or sidewalks. Flows will be monitored with a hard pipe flow meter. Influent and effluent flows will be monitored daily.

Note: Refer to the Erosion and Sediment Control Plan for a more detailed discussion of mitigation measures and controls.

4.8 CONTINGENCY PLANS

By monitoring the inlet water quality, SNC-Lavalin will be able to anticipate changed conditions and address them prior to discharge or treatment. Some of the contingency measures that SNC-Lavalin can employ include, but are not limited to:

- Decreasing the inlet flow rate to allow for longer settling time.
- The addition of a flocculent to accelerate sediment settlement.
- Adjusting the pH by injecting CO2, sulphuric or citric acid.
- Provide supplementary sediment filtering systems such as bag or sand filters.
- The addition of activated carbon filters for removal of hydrocarbons and select volatile organic compounds (VOCs).

In the event that the discharge threshold criteria is triggered, water discharge will cease. If required, a local licensed hauler (e.g. Clean Water Works) will be called to remove contaminated water from the site. The licensed hauler will have an ECA with the appropriate waste class being hauled off-site at the time of pumping, and the HWIN waste class will be registered in advance of the removal if it has not been previously registered.

Thresholds to enact contingency plans are as follows:

- Any exceedances of the applicable Sewer's Use Bylaw criteria (as per Schedule A of the COO Sewer Use Bylaw)
- The presence of a sheen on the water
- pH levels below 5.7 or in excess of 10.8 at the discharge location

If an exceedance of one of the regulated parameters in the SSA occurs the SUP Compliance Officer will be notified by the EC without delay via telephone or by e-mail. A substance release report will also be provided to the Sewer Use Department and the City of Ottawa within 5 days of the incident and will include the following information:

- The cause of the exceedance
- Corrective actions taken to bring the discharge or treatment system into compliance
- Preventative measures to minimize risk of exceedances of regulated parameters in the SSA

SNC-Lavalin will adhere to the following sampling schedule at each site following any instance of an exceedance of one of the regulated monthly sampling parameters in the SSA:

- Daily water sampling for first seven (5) days of operation[1]
- Weekly water sampling for the next 3 weeks
- Monthly thereafter

Where possible, excess water that cannot be managed under existing infrastructure will be pumped via vacuum truck and transported to ROPEC or a hazardous waste disposal facility via a Ministry licensed hauler. In emergency situations (e.g. extreme weather events such as flooding, or a health and safety emergency for site personnel and/or the public, SNC-Lavalin may request permission to bypass to sanitary and obtain permission from SUP in advance of dewatering. If a bypass to storm is required, the Ministry of the Environment Spills Action Center will also be contacted to inform them of the notification of bypass (i.e. spill). These volumes discharged would be estimated using pump curves and discharge durations, and a spill report will be submitted to the appropriate regulatory bodies (i.e. Ministry, SUP). An incident specific sampling plan will be developed in any such instance to verify that the quality of the discharge is documented appropriately.

Site specific information including dewatering and contingency plans will be made available for project dewatering sites specific to the water treatment process (if required). These plans will be included with the sanitary sewer discharge application sent to the SUP.

In the event of an exceedance identified by laboratory analyses, SNC-Lavalin or its subcontractor will not resume discharging to a sewer without confirmation from the SUP.

4.9 REPORTING

Dewatering logs will be kept for all dewatering activities as required by each sanitary sewer agreement, and made available to the City representative at any time, upon request.

In general, reporting requirements are stipulated in each Sanitary Sewer Agreement.

Additional reporting requirements might be specified by the Ministry issued ECA. It is the responsibility of SNC-Lavalin and its subcontractors to sample and test effluent discharges in order to be compliant with the Provincial Water Quality Objectives (July, 1994).

If a wastewater system is setup on federal lands then effluent quality, quantity and record keeping in accordance with the WSER requirements begins. The first identification report is due within 45 days after the wastewater system comes into operation or when there is any change to the system. Depending on the frequency and volumes of discharges identified or estimated, the project might be subjected to quarterly or annual reporting

[1] Must be consecutive and without incident.

requirements. In addition, annual reports will be submitted describing the location and the duration of any combined sewer overflow incidents.

SNC-Lavalin will prepare and submit a Dewatering Report to the City in accordance with Schedule 10, prior to Substantial Completion that summarizes how all groundwater control management activities have been implemented during the Works and summarizes their outcomes.

4.10 COMPLAINT PROCEDURES

In the event complaints arise from Project dewatering activities, all complaints will primarily be addressed via the Trillium Complaint Protocol (660373-0000-003-30AG-0004). In conjunction, the Health, Safety and Environment (HSE) team will inspect all dewatering complaints and immediately address any deficiencies or negative impacts caused by the dewatering operations.

Any concern or complaint that is received that indicates an incident or situation which could pose a threat to the health and well-being of workers or members of the public will be managed through a streamlined process. This will consist of immediate contact to the TransitNEXT Communications Lead and/or Design Build Director with a request for immediate action.

Appendix A

City of Ottawa Sewer Use Bylaw Limits (Sewer Use By-law No. 2003-514)

Table 1. Limits for Sanitary and Combined Sewers Discharge

Parameter	Limit (mg/L)	Parameter	Limit (mg/L)
Biochemical Oxygen Demand	300	1,4-Dichlorobenzene / p	0.017
Cyanide (total)	2	1,1-Dichloroethane	0.2
Fluoride	10	1,2-Dichloroethane	0.21
Total Kjeldahl Nitrogen	100	1,1-Dichloroethylene	0.04
Oil & Grease . Animal & Vegetable	150	cis-1,2-dichloroethylene	0.2
Oil & Grease . Mineral & Synthetic	15	trans-1,2-dichloroethylene	0.2
Phenolics (4AAP)	1	1, 2-Dichloropropane	0.85
Phosphorous (total)	10	cis-1,3-Dichloropropylene	0.07
Sulphates	1500	trans-1,3-Dichloropropylene	0.07
Sulphides	2	Ethylbenzene	0.057
Suspended Solids (total)	350	Methylene Chloride	0.211
Aluminum (total)	50	Styrene	0.04
Antimony (total)	5	1,1,2,2-Tetrachloroethane	0.04
Arsenic (total)	1	Tetrachloroethylene	0.05
Bismuth (total)	5	Toluene	0.08
Boron (total)	25	1,1,1-Trichloroethane	0.054
Cadmium (total)	0.02	1,1,2-Trichloroethane	0.8
Chromium (total)	5	Trichloroethylene	0.054
Cobalt (total)	5	Trichlorofluoromethane	0.02
Copper (total)	3	1,3,5-Trimethylbenzene	0.003
Lead (total)	5	Vinyl Chloride	0.4
Manganese (total)	5	Xylene (total)	0.32
Mercury (total)	0.001	Bis(2-chloroethoxy)methane	0.036
Molybdenum (total)	5	Bis(2-ethylehexyl)phthalate	0.28
Nickel (total)	3	Benzylbutylphthalate	0.017
Selenium (total)	5	Diethylphthalate	0.2
Silver (total)	5	Di-n-butylphthalate	0.057
Tin (total)	5	Di-n-octylphthalate	0.03
Titanium (total)	5	Fluorene	0.059
Vanadium	5	Indole	0.05
Zinc (total)	3	1-Methylnaphthalene	0.032
Benzene	0.01	2-Methylnaphthalene	0.022
Bromodichloromethane	0.35	Naphthalene	0.059
Bromoform	0.63	Total PAHs	0.015
Bromomethane	0.11	2,4-Dichlorophenol	0.044
Carbon Tetrachloride	0.057	Dioxins and Furans (total)	0.00072
Chlorobenzene	0.057	Formaldehyde	0.3
Chloroethane	0.27	Hexachlorobenzene	0.0001
Chloroform	0.08	N-Nitrosodimethylamine	0.4
Chloromethane	0.19	Nonylphenols	0.0025
Dibromochloromethane	0.057	Nonylphenol ethoxylates	0.025
1,2 Dibromoethane	0.028	Temperature	60 °C
1,2.Dichlorobenzene / o	0.088	pH	5.5 - 11
1,3.Dichlorobenzene / m	0.036		

Table 2. Limits for Storm Sewer Discharge

Parameter	Limit (mg/L)	Parameter	Limit (mg/L)
Biochemical Oxygen Demand	25	1,4-dichlorobenzene	0.0068
Cyanide (total)	0.02	Cis-1,2-dichloroethylene	0.0056
Phenolics (4AAP)	0.008	Trans-1,3-dichloropropylene	0.0056
Phosphorous (total)	0.4	Ethylbenzene	0.002
Suspended Solids (total)	15	Methylene chloride	0.0052
Arsenic (total)	0.02	1,1,2,2-tetrachloroethane	0.017
Cadmium (total)	0.008	Tetrachloroethylene	0.0044
Chromium (total)	0.08	Toluene	0.002
Copper (total)	0.04	Trichloroethylene	0.0076
Lead (total)	0.12	Xylene (total)	0.0044
Manganese (total)	0.05	Naphthalene	0.0064
Mercury (total)	0.0004	Hexachlorobenzene	0.00004
Nickel (total)	0.08	Nonylphenols	0.001
Selenium (total)	0.02	Nonylphenol ethoxylates	0.01
Silver (total)	0.12	PCBs	0.0004
Zinc (total)	0.04	Total PAHs	0.006
Benzene	0.002	Temperature	40 °C
Chloroform	0.002	pH	06-Sep
1,2-dichlorobenzene	0.0056		

Appendix B

Provincial Water Quality Objectives (July 1994)

TABLE 2 - Table of PWQOs and Interim PWQOs

Acetamide, N-(2-Hydroxyphenyl) CAS No. 614-80-2	**30 μg/L (Interim PWQO)[a]**
Acetanilide CAS No. 103-84-4	**100 μg/L (Interim PWQO)[a]**
Acrolein CAS No. 107-02-8	**0.03 μg/L (Interim PWQO)[a]**
Aesthetics CAS No. NA	**PWQO[1]:** **Water used for swimming, bathing and other recreational activities should be aesthetically pleasing. The water should be devoid of debris, oil, scum and any substance which would produce an objectionable deposit, colour, odour, taste or turbidity.**
Aldrin/Dieldrin CAS No. aldrin 309-00-2; dieldrin 60-57-1	**0.001 μg/L (PWQO)[1]** • PWQO is for the sum of the concentrations of aldrin and dieldrin in water.
Alkalinity CAS No. NA	**PWQO[1]:** **Alkalinity should not be decreased by more than 25% of the natural concentration.**
Aluminum CAS No. 7429-90-5	**Interim PWQO[4]:** ***• At pH 4.5 to 5.5 the Interim PWQO is 15 μg/L based on inorganic monomeric aluminum measured in clay-free samples.** **• At pH >5.5 to 6.5, no condition should be permitted which would increase the acid soluble inorganic aluminum concentration in clay-free samples to more than 10% above natural background concentrations for waters representative of that geological area of the Province that are unaffected by man-made inputs.** ***• At pH >6.5 to 9.0, the Interim PWQO is 75 μg/L based on total aluminum measured in clay-free samples.** *** If natural background aluminum concentrations in water bodies unaffected by man-made inputs are greater than the numerical Interim PWQO (above), no condition is permitted that would increase the aluminum concentration in clay-free samples by more than 10% of the natural background level.** **Note: pH values of <6.5 and >8.5 are outside the range considered acceptable by the PWQO for pH.** See the *Scientific Criteria Document for Development of Provincial Water Quality Objectives and Guidelines - Aluminum* for a discussion of analytical procedures.
Aminoazobenzene, 4- CAS No. 60-09-3	**0.8 μg/L (Interim PWQO)[a]**
Aminoethyl piperazine CAS No. 140-31-8	**2400 μg/L (Interim PWQO)[a]**

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Ammonia (un-ionized) 20 μg/L (PWQO)[1]

CAS No. 7664-41-7

- The percentages of un-ionized ammonia (NH_3) in aqueous ammonia solution for different temperature and pH conditions are listed in the table below. For example, at 20°C and pH of 8.0, a total ammonia concentration of 500 μg/L would give an un-ionized ammonia concentration of 500 x 3.8/100 = 19 μg/L which is less than the un-ionized ammonia Objective of 20 μg/L.

The table below is taken from Emerson *et al.* 1975[11] but percentages are rounded to two significant figures. The equations given by Emerson *et al.* may be used to interpolate values between those given in the table:

$f = 1/(10^{pKa-pH} + 1)$, where f is the fraction of NH_3

pKa = 0.09018 + 2729.92/T, where T = ambient water temperature in Kelvin (K = °C + 273.16)

Results should be converted to percent and rounded to two significant figures. Extrapolations should not be made beyond the ranges of the table.

Note: Under certain temperature and pH conditions, the total ammonia criteria for the protection of aquatic life may be less stringent than the criteria for other beneficial uses (e.g. public water supply).

Percent NH_3 in aqueous ammonia solutions for 0-30 °C and pH 6-10

Temp.	pH								
°C	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
0	.0083	.026	.083	.26	.82	2.6	7.6	21.	45.
1	.0090	.028	.090	.28	.89	2.8	8.3	22.	47.
2	.0098	.031	.098	.31	.97	3.0	8.9	24.	49.
3	.011	.034	.11	.34	1.1	3.3	9.6	25.	52.
4	.012	.036	.12	.36	1.1	3.5	10.	27.	54.
5	.013	.040	.13	.39	1.2	3.8	11.	28.	56.
6	.014	.043	.14	.43	1.3	4.1	12.	30.	58.
7	.015	.046	.15	.46	1.5	4.4	13.	32.	60.
8	.016	.050	.16	.50	1.6	4.8	14.	34.	61.
9	.017	.054	.17	.54	1.7	5.2	15.	35.	63.
10	.019	.059	.19	.59	1.8	5.6	16.	37.	65.
11	.020	.064	.20	.63	2.0	6.0	17.	39.	67.
12	.022	.069	.22	.68	2.1	6.4	18.	41.	69.
13	.024	.074	.24	.74	2.3	6.9	19.	43.	70.
14	.025	.080	.25	.80	2.5	7.4	20.	45.	72.
15	.027	.087	.27	.86	2.7	8.0	22.	46.	73.
16	.030	.093	.29	.93	2.9	8.5	23.	48.	75.
17	.032	.10	.32	1.0	3.1	9.1	24.	50.	76.
18	.034	.11	.34	1.1	3.3	9.8	26.	52.	77.
19	.037	.11	.37	1.2	3.6	11.	27.	54.	79.
20	.040	.13	.40	1.2	3.8	11.	28.	56.	80.
21	.043	.14	.43	1.3	4.1	12.	30.	58.	81.
22	.046	.15	.46	1.4	4.4	13.	32.	59.	82.
23	.049	.16	.49	1.5	4.7	14.	33.	61.	83.
24	.053	.17	.53	1.7	5.0	14.	35.	63.	84.
25	.057	.18	.57	1.8	5.4	15.	36.	64.	85.
26	.061	.19	.61	1.9	5.8	16.	38.	66.	86.
27	.065	.21	.65	2.0	6.2	17.	40.	67.	87.
28	.070	.22	.70	2.2	6.6	18.	41.	69.	88.
29	.075	.24	.75	2.3	7.0	19.	43.	70.	88.
30	.081	.25	.80	2.5	7.5	20.	45.	72.	89.

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Aniline CAS No. 62-53-3	**2 μg/L (Interim PWQO)[15]**
Anthracene CAS No. 120-12-7	**0.0008 μg/L (Interim PWQO)[a]**
Antimony CAS No. 7440-36-0	**20 μg/L (Interim PWQO)[14]**
Arsenic CAS No. 7440-38-2	**100 μg/L (PWQO)[1]**
Arsenic (revised) *CAS No. 7440-38-2*	***5 μg/L (Interim PWQO)[b]*** *(See Section 1.10 - Where both a PWQO and an Interim PWQO exist)*
Bacteria	**See *Escherichia coli***
Benzaldehyde CAS No. 100-52-7	**0.09 μg/L (Interim PWQO)[a]**
Benz[a]anthracene CAS No. 56-55-3	**0.0004 μg/L (Interim PWQO)[a]**
Benzene CAS No. 71-43-2	**100 μg/L (Interim PWQO)[b]**
Benzidine CAS No. 92-87-5	**20 μg/L (Interim PWQO)[a]**
Benzothiazole CAS No. 95-16-9	**100 μg/L (Interim PWQO)[a]**
Benzo[g,h,i]perylene CAS No. 191-24-2	**0.00002 μg/L (Interim PWQO)[a]**
Benzo[k]fluoranthene CAS No. 207-08-9	**0.0002 μg/L (Interim PWQO)[a]**
Benzyl alcohol CAS No. 100-51-6	**8 μg/L (Interim PWQO)[a]**
Beryllium CAS No. 7440-41-7	**PWQO[1]:**

Hardness as $CaCO_3$ (mg/L)	PWQO (μg/L)
< 75	11
> 75	1100

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Biphenyl CAS No. 92-52-4	**0.2 μg/L (Interim PWQO)[a]**
Bisphenol A CAS No. 80-05-7	**5 μg/L (Interim PWQO)[a]** • synonym - 4,4'-isopropylidenediphenol
Bis(2-chloroethyl) ether CAS No. 111-44-4	**200 μg/L (Interim PWQO)[a]**
Boron CAS No. 7440-42-8	**200 μg/L (Interim PWQO)[a]**
Bromodichloro-methane CAS No. 75-27-4	**200 μg/L (Interim PWQO)[a]**
Bromoform CAS No. 75-25-2	**60 μg/L (Interim PWQO)[a]**
Bromomethane CAS No. 74-83-9	**0.9 μg/L (Interim PWQO)[a]** • synonym - methyl bromide
Bromophenyl phenyl ether, 4- CAS No. 101-55-3	**0.05 μg/L (Interim PWQO)[a]**
Butanal CAS No. 123-72-8	**10 μg/L (Interim PWQO)[a]**
Butyl benzyl phthalate CAS No. 85-68-7	**0.2 μg/L (Interim PWQO)[a]**
Cadmium CAS No. 7440-43-9	**0.2 μg/L (PWQO)**
Cadmium (revised) *CAS No. 7440-43-9*	***Interim PWQO[b]:*** *(See Section 1.10 - Where both a PWQO and an Interim PWQO exist)*

Hardness as $CaCO_3$ (mg/L)	*Interim PWQO (μg/L)*
0 - 100	*0.1*
> 100	*0.5*

Camphene CAS No. 79-92-5	**2 μg/L (Interim PWQO)[a]**
Carbaryl CAS No. 63-25-2	**0.2 μg/L (PWQO)[18]** • adopted Canadian Water Quality Guideline

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Chlordane CAS No. 57-74-9	**0.06 μg/L (PWQO)[1]**
Chlorine CAS No. 7782-50-5	**2 μg/L (PWQO)[1]** • Total residual chlorine, as measured by the amperometric (or equivalent) method.
Chlorobenzene CAS No. 108-90-7	**15 μg/L (PWQO)[2]** • common synonym monochlorobenzene
Chlorodibromo-methane CAS No. 124-48-1	**40 μg/L (Interim PWQO)[a]**
Chloromethane CAS No. 74-87-3	**700 μg/L (Interim PWQO)[a]** • synonym - methyl chloride
Chloronaphthalene, 1- CAS No. 90-13-1	**0.1 μg/L (Interim PWQO)[a]**
Chloronaphthalene, 2- CAS No. 91-58-7	**0.2 μg/L (Interim PWQO)[a]**
Chlorophenyl phenyl ether, 4- CAS No. 7005-72-3	**0.05 μg/L (Interim PWQO)[a]**
Chlorpyrifos CAS No. 2921-88-2	**0.001 μg/L (PWQO)[1]** • common synonym - Dursban
Chloro-3-methyl phenol, 4- CAS No. 59-50-7	**3 μg/L (Interim PWQO)[a]**
Chromium CAS No. 7440-47-3	**1 μg/L (PWQO)[18] for hexavalent chromium (Cr VI)** **8.9 μg/L (PWQO)[18] for trivalent chromium (Cr III)** • adopted Canadian Water Quality Guidelines
Chrysene CAS No. 218-01-9	**0.0001 μg/L (Interim PWQO)[a]**
Cineole CAS No. 470-82-6	**100 μg/L (Interim PWQO)[a]**
Cobalt CAS No. 7440-48-4	**0.9 μg/L (PWQO)[16]**
Copper CAS No. 7440-50-8	**5 μg/L (PWQO)[1]**

copper revised - see next page

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Copper (revised) *CAS No. 7440-50-8*	***Interim PWQO[b]:*** *(See Section 1.10 - Where both a PWQO and an Interim PWQO exist)*

Hardness as $CaCO_3$ (mg/L)	*Interim PWQO (μg/L)*
0 - 20	*1*
> 20	*5*

Cresol, ***m-*** CAS No. 108-39-4 ***o-*** CAS No. 95-48-7 ***p-*** CAS No. 106-44-5	**1 μg/L (Interim PWQO)[b]** • can be applied to all three isomers • common synonym - methylphenol
Cyanide CAS No. 57-12-5	**5 μg/L (PWQO)[1]** • PWQO is for free cyanide in an unfiltered water sample.
Cyclohexanamine CAS No. 108-91-8	**50 μg/L (Interim PWQO)[a]** • common synonym - cyclohexylamine
Cyclohexanol CAS No. 108-93-0	**1000 μg/L (Interim PWQO)[a]**
2,4-D (BEE) CAS No. 1929-73-3	**4 μg/L (PWQO)[1]** • chemical name 2,4-dichlorophenoxyacetic acid - (2-butoxyethyl) ester
Dalapon CAS No. 75-99-0	**110 μg/L (PWQO)[1]**
DDT & metabolites CAS No. 50-29-3	**0.003 μg/L (PWQO)[1]** • PWQO is for the sum of DDT, DDD (CAS No. 72-54-8) and DDE (CAS No. 72-55-9)
Dehydroabietic acid (DHA) CAS No. 1740-19-8	**Interim PWQO[5]: See Resin Acids**
Diazinon CAS No. 333-41-5	**0.08 μg/L (PWQO)[1]**
Dibenzofuran CAS No. 132-64-9	**0.3 μg/L (Interim PWQO)[a]**
Dibenz[a,h]anthracene CAS No. 53-70-3	**0.002 μg/L (Interim PWQO)[a]**
Dibutylamine CAS No. 111-92-2	**8 μg/L (Interim PWQO)[a]**
Dibutylphthalate CAS No. 84-74-2	**4 μg/L (PWQO)[1]** • common synonym - di-*n*-butylphthalate

[a] See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

[b] See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

[1-21] References for criteria development documents - see last page of Table 2.

Dicamba CAS No. 1918-00-9	**200 μg/L (PWQO)[1]**
Dichlorobenzene, 1,2- CAS No. 95-50-1	**2.5 μg/L (PWQO)[2]**
Dichlorobenzene, 1,3- CAS No. 541-73-1	**2.5 μg/L (PWQO)[2]**
Dichlorobenzene, 1,4- CAS No. 106-46-7	**4 μg/L (PWQO)[2]**
Dichlorobenzidine, 3,3'- CAS No. 91-94-1	**0.6 μg/L (Interim PWQO)[a]**
Dichlorobut-3-ene, 1,2- CAS No. 760-23-6	**10 μg/L (Interim PWQO)[a]**
Dichloroethane, 1,1- CAS No. 75-34-3	**200 μg/L (Interim PWQO)[6]**
Dichloroethane, 1,2- CAS No. 107-06-2	**100 μg/L (Interim PWQO)[6]**
Dichloroethylene, 1,1- CAS No. 75-35-4	**40 μg/L (Interim PWQO)[6]**
Dichloroethylene, 1,2- CAS No. cis - 156-59-2, trans - 156-60-5	**200 μg/L (Interim PWQO)[6]** • Interim PWQO applies to both the cis & trans 1,2-dichloroethylene.
Dichloroguaiacol, 4,5- CAS No. 2460-49-3	**6 μg/L (Interim PWQO)[a]**
Dichlorophenols CAS No. various	**0.2 μg/L (PWQO)[3]** • PWQO can be applied to all 6 isomers: 2,3-, 2,4-, 2,5-, 2,6-, 3,4-, 3,5-dichlorophenol
Dichloropropane, 1,2- CAS No. 78-87-5	**0.7 μg/L (Interim PWQO)[a]**
Dichloropropylene, trans-1,3 CAS No. 10061-02-6	**7 μg/L (Interim PWQO)[a]**
Dieldrin/Aldrin	**See Aldrin/Dieldrin**
Diethylene glycol CAS No. 111-46-6	**11000 μg/L (Interim PWQO)[a]**

[a] See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

[b] See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

[1-21] References for criteria development documents - see last page of Table 2.

Diethylhexylphthalate CAS No. 117-81-7	**0.6 μg/L (PWQO)[1]** • common synonyms bis-2-ethylhexylphthalate, dioctylphthalate
Diethyl-*m*-toluamide, N,N- CAS No. 134-62-3	**200 μg/L (Interim PWQO)[a]** • synonym - DEET
Dimethyl disulphide CAS No. 624-92-0	**0.2 μg/L (Interim PWQO)[a]**
Dimethylamine CAS No. 124-40-3	**3 μg/L (Interim PWQO)[a]**
Dimethylbenzylamine CAS No. 103-83-3	**40 μg/L (Interim PWQO)[a]**
Dimethylformamide, N,N- CAS No. 68-12-2	**5000 μg/L (Interim PWQO)[a]**
Dimethylnaphthalene, 1,3- CAS No.575-41-7	**0.09 μg/L (Interim PWQO)[b]** • When a mixture of dimethylnaphthalenes is found, the most restrictive Interim PWQO of 0.02 μg/L should apply.
Dimethylnaphthalene, 2,6- CAS No. 581-42-0	**0.02 μg/L (Interim PWQO)[b]**
Dimethylphenol, 2,4- CAS No. 105-67-9	**10 μg/L (Interim PWQO)[b]**
Dimethylphenol, 2,6- CAS No. 576-26-1	**8 μg/L (Interim PWQO)[b]**
Dimethylphenol, 3,4- CAS No. 95-65-8	**20 μg/L (Interim PWQO)[b]**
Dinitrobenzene, *m*- CAS No. 99-65-0	**1 μg/L (Interim PWQO)[b]**
Dinitrobenzene, *o*- CAS No. 528-29-0	**1 μg/L (Interim PWQO)[b]**
Dinitrobenzene, *p*- CAS No. 100-25-4	**2 μg/L (Interim PWQO)[b]**
Dinitrotoluene, 2,4- CAS No. 121-14-2	**4 μg/L (Interim PWQO)[17]**
Dinitrotoluene, 2,6- CAS No. 606-20-2	**6 μg/L (Interim PWQO)[17]**

[a] See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

[b] See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

[1-21] References for criteria development documents - see last page of Table 2.

Dinitro-*o*-cresol, 4,6- CAS No. 534-52-1	**0.2 μg/L (Interim PWQO)[b]**
Dioxane, 1,4- CAS No. 123-91-1	**20 μg/L (Interim PWQO)[a]**
Diphenyl ether CAS No. 101-84-8	**0.03 μg/L (Interim PWQO)[a]**
Diphenylamine CAS No. 122-39-4	**3 μg/L (Interim PWQO)[a]** • synonym - N,N-diphenylamine
Diphenylhydrazine, 1,2- CAS No. 122-66-7	**0.3 μg/L (Interim PWQO)[a]** • synonym - hydrazobenzene
Diquat CAS No. 2764-72-9	**0.5 μg/L (PWQO)[1]**
Dissolved gases CAS No. NA	**PWQO[1]:** **To protect aquatic organisms, the total dissolved gas concentrations in water should not exceed 110 percent of the saturation value for gases at the existing atmospheric and hydrostatic pressures.**
Dissolved oxygen CAS No. NA	**PWQO[1]:** **Dissolved oxygen concentrations should not be less than the values specified below for cold water biota (e.g. salmonid fish communities) and warm water biota (e.g. centrarchid fish communities):**

Dissolved Oxygen Concentration				
Temperature	Cold Water Biota		Warm Water Biota	
°C	% Saturation	mg/L	% Saturation	mg/L
0	54	8	47	7
5	54	7	47	6
10	54	6	47	5
15	54	6	47	5
20	57	5	47	4
25	63	5	48	4

In waters inhabited by sensitive biological communities, or in situations where additional physical or chemical stressors are operating, more stringent criteria may be required. For example, a sensitive species such as lake trout may require more specific water quality objectives.

In some hypolimnetic waters, dissolved oxygen is naturally lower than the concentrations specified in the above table. Such a condition should not be altered by adding oxygen-demanding materials causing a depletion of oxygen.

Diuron CAS No. 330-54-1	**1.6 μg/L (PWQO)[1]**
Divinyl benzene CAS No. 1321-74-0	**8 μg/L (Interim PWQO)[a]**
Di-*n*-butylamine CAS No. 111-92-2	**8 μg/L (Interim PWQO)[a]**

[a] See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

[b] See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

[1-21] References for criteria development documents - see last page of Table 2.

Di-*n*-butyltin CAS No. 683-18-1	**0.08 μg/L (Interim PWQO)[12]**
Di-*t*-butyl-4-methylphenol, 2,6- CAS No. 128-37-0	**0.2 μg/L (Interim PWQO)[a]**
Endosulfan CAS No. 115-29-7	**0.003 μg/L (PWQO)[1]** • PWQO is for the sum of two isomers - alpha Endosulfan (I) and beta Endosulfan (II)
Endrin CAS No. 72-20-8	**0.002 μg/L (PWQO)[1]**
Escherichia coli CAS No. NA	**100 *E. coli* per 100 mL** (based on a geometric mean of at least 5 samples) • Based on a recreational water quality guideline published by the Ontario Ministry of Health in 1992. This Ministry of Health guideline was specifically intended for application by the local Medical Officer of Health to swimming and bathing beaches. It is based upon a geometric mean of levels of *E. coli* determined from a minimum of 5 samples per site taken within a given swimming area and collected within a one month period. If the geometric mean *E. coli* level for the sample series at a given site exceeds 100 per 100 mL, the site should be considered unsuitable for swimming and bathing. *E. coli* was selected for the guideline because studies have determined that, among bacteria of the coliform group, *E. coli* is the most suitable and specific indicator of fecal contamination. An analytical test with a high degree of specificity for *E. coli* regardless of water sample source, requiring no confirmation procedures, and which produces results in 21 hours has been developed and adopted by both the Ministry of Health, and Ministry of Environment and Energy laboratories. Where testing indicates sewage or fecal contamination, a site-specific judgement must be made as to the severity of the problem and the appropriate course of action. As of May 1, 1994, MOEE staff have been advised to base all **new** compliance, enforcement and monitoring activities on the *E. coli* test. Some water managers may find it necessary to continue testing for fecal coliforms or total coliforms. For example, where testing at a long term water quality monitoring station requires a continuous record of results using either the fecal or total coliform test to monitor trends in water quality. As a benchmark for the long term monitoring results, the former objectives for fecal coliforms and total coliforms are referenced for your information. For fecal coliforms the objective was a 100 counts per 100 ml (based on a geometric mean density for a series of water samples). For total coliforms the objective was 1000 counts per 100 ml (based on a geometric mean density for a series of water samples).
Ethanolamine CAS No. 141-43-5	**200 μg/L (Interim PWQO)[a]** • synonym - 2-aminoethanol
Ethylbenzene CAS No. 100-41-4	**8 μg/L (Interim PWQO)[9]**
Ethylene diamine CAS No. 107-15-3	**0.1 μg/L (Interim PWQO)[a]**
Ethylene dibromide CAS No. 106-93-4	**5 μg/L (Interim PWQO)[a]**

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Ethylene glycol CAS No. 107-21-1	**2000 μg/L (Interim PWQO)[a]**
Ethylene thiourea CAS No. 96-45-7	**60 μg/L (Interim PWQO)[a]**
Eugenol CAS No. 97-53-0	**30 μg/L (Interim PWQO)[a]**
Fenthion CAS No. 55-38-9	**0.006 μg/L (PWQO)[1]**
Fluoranthene CAS No. 206-44-0	**0.0008 μg/L (Interim PWQO)[a]**
Fluorene CAS No. 86-73-7	**0.2 μg/L (Interim PWQO)[a]**
Formaldehyde CAS No. 50-00-0	**0.8 μg/L (Interim PWQO)[a]**
Furfuryl alcohol CAS No. 98-00-0	**1 μg/L (Interim PWQO)[a]**
Guaiacol CAS No. 90-05-1	**1 μg/L (Interim PWQO)[a]** • synonym - 2-methoxyphenol
Guthion CAS No. 86-50-0	**0.005 μg/L (PWQO)[1]**
Heptachlor & CAS No. 76-44-8 **Heptachlor epoxide** CAS No. 1024-57-3	**0.001 μg/L (PWQO)[1]** • sum of heptachlor and heptachlor epoxide
Hexachlorobenzene CAS No. 118-74-1	**0.0065 μg/L (PWQO)[2]**
Hexachlorobutadiene CAS No. 87-68-3	**0.009 μg/L (Interim PWQO)[b]**
Hexachlorocyclo-pentadiene CAS No. 77-47-4	**0.06 μg/L (Interim PWQO)**
Hexachloroethane CAS No. 67-72-1	**1 μg/L (Interim PWQO)[b]**
Hydrogen sulphide CAS No. 7783-06-4	**2 μg/L (PWQO)[1]** • **undissociated hydrogen sulphide**
Hydroxybiphenyl, 2- CAS No. 90-43-7	**6 μg/L (Interim PWQO)[a]**

[a] See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

[b] See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

[1-21] References for criteria development documents - see last page of Table 2.

Iodine
CAS No. 7553-56-2

100 μg/L (Interim PWQO)[a]

Iron
CAS No. 7439-89-6

300 μg/L (PWQO)[1]

Isopropyl alcohol
CAS No. 67-63-0

300 μg/L (Interim PWQO)[a]

Lead
CAS No. 7439-92-1

PWQO[1]:

Alkalinity as $CaCO_3$ (mg/L)	PWQO (μg/L)
< 20	5
20 to 40	10
40 to 80	20
> 80	25

Lead (revised)
CAS No. 7439-92-1

Interim PWQO[b]: *(See Section 1.10 - Where both a PWQO and an Interim PWQO exist)*

Hardness as $CaCO_3$ (mg/L)	*Interim PWQO (μg/L)*
< 30	*1*
30 to 80	*3*
> 80	*5*

Limonene
CAS No. 138-86-3

4 μg/L (Interim PWQO)[a]

Lindane
CAS No. 58-89-9

0.01 μg/L (PWQO)[1]
- chemical name: gamma - 1,2,3,4,5,6-hexachlorocyclohexane

Malathion
CAS No. 121-75-5

0.1 μg/L (PWQO)[1]

Mercury
CAS No. 7439-97-6

0.2 μg/L (PWQO)[1]
- **in a filtered water sample**

Methanol
CAS No. 67-56-1

200 μg/L (Interim PWQO)[a]

Methoxychlor
CAS No. 74-43-5

0.04 μg/L (PWQO)[1]

Methyl ethyl ketone
CAS No. 78-93-3

400 μg/L (Interim PWQO)[a]

Methylene chloride
CAS No. 75-09-2

100 μg/L (Interim PWQO)[a]
- common synonym - dichloromethane

[a] See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

[b] See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

[1-21] References for criteria development documents - see last page of Table 2.

Methylnaphthalene, 1- CAS No. 90-12-0	**2 μg/L (Interim PWQO)[b]**
Methylnaphthalene, 2- CAS No. 91-57-6	**2 μg/L (Interim PWQO)[b]**
Methyl-2-pentanol, 4- CAS No. 108-11-2	**600 μg/L (Interim PWQO)[a]**
Methyl-*t*-butyl ether (MTBE) CAS No. 1634-04-4	**200 μg/L (Interim PWQO)[a]**
Metolachlor CAS No. 51218-45-2	**3 μg/L (Interim PWQO)[a]**
Microbiology CAS No. NA	**See *Escherichia coli***
Mirex (Dechlorane) CAS No. 2385-85-5	**0.001 μg/L (PWQO)[1]**
Molybdenum CAS No. 7439-98-7	**40 μg/L (Interim PWQO)[19]**
Monochlorophenols CAS No. 25167-80-0	**7 μg/L (PWQO)[3]** • PWQO can be applied to all 3 individual isomers: 2-, 3-, and 4-chlorophenol
Monomethylamine CAS No. 74-89-5	**50 μg/L (PWQO)[a]**
Morpholine CAS No. 110-91-8	**4 μg/L (Interim PWQO)[a]**
Naphthalene CAS No. 91-20-3	**7 μg/L (Interim PWQO)[a]**
Nickel CAS No. 7440-02-0	**25 μg/L (PWQO)[1]**
Nitrobenzene CAS No. 98-95-3	**0.02 μg/L (Interim PWQO)[b]**
Nitronaphthalene, 1- CAS No. 86-57-7	**4 μg/L (Interim PWQO)[a]**
Nitrophenol, 2- CAS No. 88-75-5	**0.5 μg/L (Interim PWQO)[b]**
Nitrophenol, 3- CAS No. 554-84-7	**20 μg/L (Interim PWQO)[b]**

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Nitrophenol, 4- CAS No. 100-02-7	**50 μg/L (Interim PWQO)[b]**
Nitrosodimethylamine, N- CAS No. 62-75-9	**15 μg/L (Interim PWQO)[21]** • NDMA
Nitrosodiphenylamine, N- CAS No. 86-30-6	**7 μg/L (Interim PWQO)[a]**
Nitrosomorpholine, N- CAS No. 59-89-2	**0.9 μg/L (Interim PWQO)[a]** • synonym - 4-nitrosomorpholine
Nonyl phenol CAS No. 25154-52-3	**0.04 μg/L (Interim PWQO)[a]**
Oil & Grease CAS No. NA	**PWQO[1]:** **Oil or petrochemicals should not be present in concentrations that:** **- can be detected as a visible film, sheen, or discolouration on the surface;** **- can be detected by odour;** **- can cause tainting of edible aquatic organisms;** **- can form deposits on shorelines and bottom sediments that are detectable by sight or odour, or are deleterious to resident aquatic organisms.**
Oleic acid CAS No. 112-80-1	**1 μg/L (Interim PWQO)[a]**
Parathion CAS No. 56-38-2	**0.008 μg/L (PWQO)[1]**
Pentachlorobenzene CAS No. 608-93-5	**0.03 μg/L (PWQO)[2]**
Pentachlorophenol CAS No. 87-86-5	**0.5 μg/L (PWQO)[3]**
Perylene CAS No. 198-55-0	**0.00007 μg/L (Interim PWQO)[a]**
pH CAS No. NA	**PWQO[1]:** **The pH should be maintained within the range of 6.5 - 8.5** • **to protect aquatic life; and** • **both alkaline and acid waters may cause irritation to anyone using the water for recreational purposes.**
Phenanthrene CAS No. 85-01-8	**0.03 μg/L (Interim PWQO)[a]**
Phenol CAS No. 108-95-2	**5 μg/L (Interim PWQO)[b]** • common synonym - monohydroxybenzene

[a] See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

[b] See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

[1-21] References for criteria development documents - see last page of Table 2.

Phenols CAS No. 64743-03-9	**1 μg/L (PWQO)[1]** • Determined by the total reactive phenols test - the 4-AAP (4-amino-antipyrine) test. • This objective should be used primarily as a screening tool. • The isomer specific PWQOs for various phenolics should be employed where possible.
Phenylxylylethane CAS No. 6196-95-8	**0.02 μg/L (Interim PWQO)[a]**
Phosphorus, total CAS No. 7723-14-0	**Interim PWQO[1]:** **Current scientific evidence is insufficient to develop a firm Objective at this time. Accordingly, the following phosphorus concentrations should be considered as general guidelines which should be supplemented by site-specific studies:** **To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 μg/L;** **A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 μg/L or less. This should apply to all lakes naturally below this value;** **Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 30 μg/L.**
Phthalates, other CAS No. various	**0.2 μg/L (PWQO)[1]** • some other phthalates included are: diethylphthalate (DEP - CAS No. 84-66-2), dimethylphthalate (CAS No. 131-11-3) • see PWQOs for dibutylphthalate and diethylhexylphthalate
Polychlorinated biphenyls (Total PCBs) CAS No. various	**0.001 μg/L (PWQO)[1]** Includes: Aroclor 1016 - (CAS No.) 12674-11-2; Aroclor 1221 - 11104-28-2; Aroclor 1232 - 11141-16-5; Aroclor 1242 - 53469-21-9; Aroclor 1248 - 12672-29-6; Aroclor 1254 - 11097-69-1; Aroclor 1260 - 11096-82-5
Polychlorinated naphthalenes CAS No. various	**0.0002 μg/L (Interim PWQO)[a]**
Propyl diphenyl CAS No. 25640-78-2	**0.1 μg/L (Interim PWQO)[a]**
Propylene glycol, 1,2- CAS No. 57-55-6	**44000 μg/L (Interim PWQO)[a]**
Propylene glycol, 1,3- CAS No. 504-63-2	**10000 μg/L (Interim PWQO)[a]**
Public health considerations	**See *Escherichia coli***
Pyrethrum CAS No. 8003-34-7	**0.01 μg/L (PWQO)[1]**
Quinoline CAS No. 91-22-5	**10 μg/L (Interim PWQO)[a]**

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Radionuclides

CAS No. various

PWQO[8]:

Radiation exposure should be kept as low as reasonably achievable, economic and social factors being taken into account.

The Provincial Water Quality Objectives for radionuclides are based on drinking water requirements, which are derived from dose-response relationships as recommended by the International Commission on Radiological Protection (ICRP) in Publication 26.

The Objectives are as follows:

Radionuclide**	Provincial Water Quality Objective*** (Becquerels/Litre)
^{137}Cesium	50
^{131}Iodine	10
^{226}Radium	1
^{90}Strontium	10
Tritium	7000

* **The radionuclide objectives are based on the total concentration in an unfiltered water sample.**

** **If two or more radionuclides affecting the same organ or tissue are found to be present, the following relationship based on ICRP Publication 26 should be satisfied:**

$$\frac{c_1}{C_1} + \frac{c_2}{C_2} + \ldots \frac{c_i}{C_i} \leq 1$$

where c_1, c_2 and c_i are the observed concentrations, and C_1, C_2 and C_i are the maximum acceptable concentrations for each contributing radionuclide.

*** **Radionuclide concentrations that exceed the maximum acceptable concentrations may be tolerated for a short duration, provided that the annual average concentrations remain below this level and meet the restriction for multiple radionuclides.**

Note: For further information on the radionuclide objectives as related to potable water supplies, consult the publication *Ontario Drinking Water Objectives* (Revised, 1994).

Resin Acids (Dehydroabietic Acid and Total Resin Acids)

dehydroabietic acid (DHA) - CAS No. 1740-19-8

Total Resin Acids - includes: abietic acid CAS No. 514-10-3; sandaracopimaric acid CAS No. NA; isopimaric acid CAS No. 5835-26-7; levopimaric acid CAS No. 79-54-9; neoabietic acid CAS No. 471-77-2; palustric acid CAS No. 1945-53-5; pimaric acid CAS No. 127-27-5;

Interim PWQOs[5]:

Interim PWQOs for Dehydroabietic Acid (DHA) and Total Resin Acids are pH dependent as shown below:

	Interim PWQO	
Receiving water pH	DHA (μg/L)	Total Resin Acids (μg/L)
5*	1	1
5.5*	2	3
6*	2	4
6.5	4	9
7	8	25
7.5	12	45
8	13	52
8.5	14	60
9*	14	62

*** - pH is outside the range of the PWQO for pH**

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Selenium CAS No. 7782-49-2	**100 μg/L (PWQO)[1]**
Silver CAS No. 7440-22-4	**0.1 μg/L (PWQO)[1]**
Simazine CAS No. 122-34-9	**10 μg/L (PWQO)[1]**
Styrene CAS No. 100-42-5	**4 μg/L (Interim PWQO)[b]**
Swimming & bathing	**See *Escherichia coli***
Temperature CAS No. NA	**PWQO[1]:** **1) General** **The natural thermal regime of any body of water shall not be altered so as to impair the quality of the natural environment. In particular, the diversity, distribution and abundance of plant and animal life shall not be significantly changed.** **2) Waste Heat Discharge** **(a) Ambient Temperature Changes** **The temperature at the edge of a mixing zone shall not exceed the natural ambient water temperature at a representative control location by more than 10C° (18F°). However, in special circumstances, local conditions may require a significantly lower temperature difference than 10C° (18F°). Potential dischargers are to apply to the MOEE for guidance as to the allowable temperature rise for each thermal discharge. This ministry will also specify the nature of the mixing zone and the procedure for the establishment of a representative control location for temperature recording on a case-by-case basis.** **(b) Discharge Temperature Permitted** **The maximum temperature of the receiving body of water, at any point in the thermal plume outside a mixing zone, shall not exceed 30°C (86°F) or the temperature of a representative control location plus 10C° (18F°) or the allowed temperature difference, which ever is the lesser temperature. These maximum temperatures are to be measured on a mean daily basis from continuous records.** **(c) Taking and Discharging of Cooling Water** **Users of cooling water shall meet both the Objectives for temperature outlined above and the "Procedures for the Taking and Discharge of Cooling Water" as outlined in the MOEE publication *Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters* (1994).**
Tetrachlorobenzene, 1,2,3,4- CAS No. 634-66-2	**0.1 μg/L (PWQO)[2]**
Tetrachlorobenzene, 1,2,3,5- CAS No. 634-90-2	**0.1 μg/L (PWQO)[2]**

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Tetrachlorobenzene, 1,2,4,5- CAS No. 95-94-3	**0.15 μg/L (PWQO)[2]**
Tetrachloroethane, 1,1,1,2- CAS No. 630-20-6	**20 μg/L (Interim PWQO)[a]**
Tetrachloroethane, 1,1,2,2- CAS No. 79-34-5	**70 μg/L (Interim PWQO)[6]**
Tetrachloroethylene CAS No. 127-18-4	**50 μg/L (Interim PWQO)[6]** • synonym - perchloroethylene or perc
Tetrachloroguaiacol CAS No. 2539-17-5	**0.009 μg/L (Interim PWQO)[a]**
Tetrachlorophenols CAS No. 25167-83-3	**1 μg/L (PWQO)[3]** • PWQO can be applied to 3 individual isomers which were assessed: 2,3,4,5-, 2,3,4,6-, and 2,3,5,6-tetrachlorophenol
Tetraethyl lead CAS No. 78-00-2	**0.0007 μg/L (Interim PWQO)[7]**
Tetramethyl lead CAS No. 75-74-1	**0.006 μg/L (Interim PWQO)[7]**
Thallium CAS No. 7440-28-0	**0.3 μg/L (Interim PWQO)[b]**
Toluene CAS No. 108-88-3	**0.8 μg/L (Interim PWQO)[10]**
Tolyltriazole CAS No. 29385-43-1	**3 μg/L (Interim PWQO)[a]**
Toxaphene CAS No. 8001-35-2	**0.008 μg/L (PWQO)[1]**
Tributyl phosphate CAS No. 126-73-8	**0.6 μg/L (Interim PWQO)[a]**
Tributyltin CAS No. various	**0.000005 μg/L (Interim PWQO)[12]**
Trichlorobenzene, 1,2,3- CAS No. 87-61-6	**0.9 μg/L (PWQO)[2]**

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Trichlorobenzene, 1,2,4- CAS No. 120-82-1	**0.5 μg/L (PWQO)[2]**
Trichlorobenzene, 1,3,5- CAS No. 108-70-3	**0.65 μg/L (PWQO)[2]**
Trichloroethane, 1,1,1- CAS No. 71-55-6	**10 μg/L (Interim PWQO)[a]**
Trichloroethane, 1,1,2- CAS No. 79-00-5	**800 μg/L (Interim PWQO)[6]**
Trichloroethylene CAS No. 79-01-6	**20 μg/L (Interim PWQO)[6]**
Trichloroguaiacol, 3,4,5- CAS No. 57057-83-7	**0.1 μg/L (Interim PWQO)[a]**
Trichloroguaiacol, 4,5,6- CAS No. 2668-24-8	**0.8 μg/L (Interim PWQO)[a]**
Trichlorophenols CAS No. 25167-82-2	**18 μg/L (PWQO)[3]** • PWQO can be applied to all 6 individual isomers: 2,3,4-,(CAS No. 15950-66-0) 2,3,5- (CAS No. 933-78-8), 2,3,6- (CAS No. 933-75-5) 2,4,5- (CAS No. 95-95-4), 2,4,6- (CAS No. 88-06-2), and 3,4,5-trichlorophenol (CAS No. 609-19-8)
Triethyl lead CAS No. 1067-14-7	**0.4 μg/L (Interim PWQO)[7]**
Triethyltin CAS No. 994-31-0	**0.4 μg/L (Interim PWQO)[12]**
Trimethylbenzenes CAS No. 25551-13-7	**3 μg/L (Interim PWQO)[a]**
Triphenyltin CAS No. 76-87-9	**0.002 μg/L (Interim PWQO)[12]**
Tungsten CAS No. 7440-33-7	**30 μg/L (Interim PWQO)[a]**
Turbidity CAS No. NA	**PWQO[1]:** **Suspended matter should not be added to surface water in concentrations that will change the natural Secchi disc reading by more than 10 percent.**

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

Uranium CAS No. 7440-61-1	**5 μg/L (Interim PWQO)[a]**	
Vanadium CAS No. 7440-62-2	**6 μg/L (Interim PWQO)[20]**	
Vinyl chloride CAS No. 75-01-4	**600 μg/L (Interim PWQO)[a]** • common synonym - chloroethylene	
Water clarity CAS No. NA	**PWQO[1]:**	**The water in swimming areas should be sufficiently clear to estimate depth or to see submerged swimmers who may require assistance. To achieve this degree of safety, water clarity should be such that, if the bottom of the bathing area is not visible, the water should have a Secchi disc transparency of at least 1.2 m.**
Xylene, *m-* CAS No. 108-38-3	**2 μg/L (Interim PWQO)[b]**	
Xylene, *o-* CAS No. 95-47-6	**40 μg/L (Interim PWQO)[b]**	
Xylene, *p-* CAS No. 106-42-3	**30 μg/L (Interim PWQO)[b]**	
Zinc CAS No. 7440-66-6	**30 μg/L (PWQO)[1]**	
Zinc (revised) *CAS No. 7440-66-6*	***20 μg/L (Interim PWQO)[b]***	*(See Section 1.10 - Where both a PWQO and an Interim PWQO exist)*
Zirconium CAS No. 7440-67-7	**4 μg/L (Interim PWQO)[a]**	

Notes for Table 2:

- All PWQOs are for the for the protection of aquatic life, unless otherwise noted.
- The PWQOs are based on the total concentration of an unfiltered sample, unless otherwise noted.
- The "CAS No." is the number assigned by the American Chemical Society's Chemical Abstracts Services.

REFERENCES FOR TABLE 2

1. MOE. 1979. Rationale for the Establishment of Ontario's Water Quality Objectives. 236 pp.

2. MOE. 1984. Scientific Criteria Document for Standard Development - Chlorinated Benzenes in the Aquatic Environment. 197 pp.

3. MOE. 1984. Scientific Criteria Document for Standard Development - Chlorinated Phenols in the Aquatic Environment. 180 pp.

a See Section 1.2.3. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.

b See Section 1.2.2. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.

1-21 References for criteria development documents - see last page of Table 2.

4. MOE. 1988. Scientific Criteria Document for the Development of Provincial Water Quality Objectives and Guidelines - Aluminum. 81 pp.

5. MOE. 1988. Scientific Criteria Document for the Development of Provincial Water Quality Objectives and Guidelines - Resin Acids. 60 pp.

6. MOEE. 1993. Scientific Criteria Document for the Development of Provincial Water Quality Guidelines for Chlorinated Ethanes & Chlorinated Ethylenes. PIBS 2603, 111 pp.

7. MOEE. 1994. Scientific Criteria Document for the Development of Provincial Water Quality Guidelines for Alkylleads. PIBS 3160, 50 pp.

8. MOEE. 1994. Ontario Drinking Water Objectives (Revised 1994). 68 pp.

9. MOEE. 1994. Scientific Criteria Document for the Development of a Provincial Water Quality Guideline for Ethylbenzene. PIBS 3231e, 32 pp.

10. MOEE. 1994. Scientific Criteria Document for the Development of a Provincial Water Quality Guideline for Toluene. PIBS 3232e, 43 pp.

11. Emerson, K., R.C. Russo, R.E. Lund and R.V. Thurston. 1975. Aqueous ammonia equilibrium calculations: Effect of pH and temperature. J. Fish. Res. Board Can. 32: 2379-2383.

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