Guidance for Evaluating Human Health Impacts in Environmental Assessment:

Drinking and Recreational Water Quality

DRAFT

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Canada

Health Canada is the federal department responsible for helping Canadians maintain and improve their health. *We assess the safety of drugs and many consumer products, help improve the safety of food, and provide information to Canadians to help them make healthy decisions. We provide health services to First Nations people and to Inuit communities. We work with the provinces to ensure our health care system serves the needs of Canadians.*

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Guidance for Evaluating Human Health Impacts in Environmental Assessment Series

- The Basics
- Drinking and Recreational Water Quality
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- Human Health Risk Assessment
- Air Quality

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PREFACE

This guidance is intended to provide assistance to stakeholders on specific information requirements to facilitate the preparation and review of environmental assessments in a consistent and effective manner. Alternative approaches to the principles and practices described in this document may be acceptable provided they are supported with adequate scientific justification. Please note that Health Canada may need additional information, not specifically described in this guidance when providing advice on human health impacts for a specific project.

This guidance is intended to be advisory in nature and will be updated periodically based on revisions to current expertise, applicable standards and recommendations received from stakeholders. Readers are advised to ensure that they are using the most recent version available on the Health Canada website and that the use of human health risk assessments in an environmental assessment is reflective of current and best practices. This document is not to be considered a substitute for the guidance of a qualified professional practitioner.

Health Canada encourages questions, comments or recommendations for improvements to this document, which may be directed to the following:

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1 ACRONYMS

Acronym	Meaning
CEAA or the Act	*Canadian Environmental Assessment Act*
DOC	dissolved organic carbon
DWTF	drinking water treatment facility
FA	federal authority
GCDWQ	Guidelines for Canadian Drinking Water Quality
GCRWQ	Guidelines for Canadian Recreational Water Quality
HHRA	human health risk assessment
INAC	Indian and Northern Affairs Canada
RA	responsible authority
TDS	total dissolved solids
TOC	total organic carbon
VOCs	volatile organic compounds
WHO	World Health Organization

2 PURPOSE OF THIS DOCUMENT

The purpose of this document is to guide stakeholders in their evaluation of human health effects related to drinking and recreational water quality in an environmental assessment (EA) and to facilitate understanding of comments made by Health Canada in the EA process.

The *Canadian Environmental Assessment Act* (*CEAA* or the Act), aims to ensure that projects are considered carefully before federal departments/agencies take action in connection with them in order to ensure that such projects do not cause significant adverse environmental effects. The Act also aims to encourage departments that are the responsible authorities (RAs) to take actions that promote sustainable development and thereby achieve or maintain a healthy environment and a healthy economy. RAs are most commonly federal departments that provide funding, land, permits, licences or approvals for a proposed project. Federal departments may become RAs for physical works that they undertake (e.g. Health Canada constructing a new health care facility on a reserve).

As defined in the Act, environmental effects include any effects of environmental changes caused by a project, including effects on human health. Health Canada's role as a federal authority (FA) under the Act is to provide, upon request, scientific and technical advice on issues related to human health. FAs are most commonly federal departments or agencies that have expertise or a mandate relevant to a proposed project. This expertise, relating to human exposure to contaminants or other hazards (noise, radiation, etc.), is provided to assist RAs and/or provincial or territorial authorities in determining the significance of potential project-related human health effects.

Health Canada can provide human health expertise concerning the following:

- air quality effects
- contamination of country foods (fish, wild game, garden produce, berries, etc.)
- drinking and recreational water quality
- radiological effects
- electric and magnetic fields effects
- noise effects
- human health risk assessment (HHRA) and risk management
- federal air, water and soil quality guidelines/standards used in HHRAs
- toxicology (multimedia - air, water and soil)
- First Nations and Inuit health
- contaminated sites

Health Canada does not possess expertise on modelling emissions and deposition, environmental fate and/or contaminant uptake by plants or wildlife.

More information on Health Canada's role in Environmental Assessment can be found on Health Canada's website: http://www.hc-sc.gc.ca/ewh-semt/eval/index-eng.php

3 INTRODUCTION AND CONTEXT

Health Canada considers that a change in drinking and/or recreational water quality that may impact human health be assessed as per the definition of an "environmental effect" provided in *CEAA*. However, Health Canada does not make decisions on the significance of these effects. This decision-making role rests with the RA or provincial/territorial authority. Health Canada's role is limited to providing advice on the human health effects of changes to drinking and/or recreational water quality based on well-accepted scientific evidence establishing a relationship between water quality and human health.

The human health endpoints associated with drinking and recreational water contamination are dependant on contaminant type(s), pathways and receptors. Microbial contaminants, including bacterial waterborne pathogens (such as pathogenic *E. coli*), protozoa (*Giardia* and *Cryptosporidium*) and enteric viruses, may cause acute and chronic waterborne disease. Cyanobacteria (blue-green algae) may produce toxins that can cause liver and neurological damage in humans (for in-depth information visit Health Canada's water quality reports and publications website at: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php).

Chemical contaminants may have a broad range of human health effects (including cancer) depending on the nature of the substance and the dose. The only human health effect considered for radiological contaminants is cancer (see: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/radiological_para-radiologiques/index-eng.php).

This guidance reviews Health Canada's role in assessments of water quality and discusses common related human health impacts. The assessment of these impacts and technical considerations in presenting information on water quality are discussed in detail. Appendix A contains a checklist that may be used to verify that the main components of a water quality assessment are completed and to identify where this information can be found within an EA.

4 ROLES AND RESPONSIBILITIES WITH DRINKING AND RECREATIONAL WATER QUALITY

In Canada, the responsibility for providing potable drinking water is shared between the federal, provincial, territorial, and municipal governments. However, the regulatory enforcement activities undertaken to ensure safe drinking water for the public generally rest with the provinces and territories.

Recreational water quality generally falls under provincial and territorial jurisdiction. However, the management of recreational waters ultimately rests with the beach operators or service providers who oversee the day-to-day operations of recreational water areas.

4.1 Federal role

Health Canada's role with respect to drinking water is one of leadership in science and research. Its mandate and expertise lie in protecting the health of all Canadians by developing the Guidelines for Canadian Drinking Water Quality (GCDWQ) in partnership with the provinces and territories. These guidelines are the basis for provincial and territorial drinking water quality requirements. Guidelines are developed for substances and parameters that meet established criteria (such as toxicity). When a specific substance or parameter doesn't meet these criteria (such as turbidity), the Federal-Provincial-Territorial Committee on Drinking Water may issue guidance document related to this parameter or substance.

Provincial and territorial standards may differ from the GCDWQ depending on local considerations. When a difference occurs and a drinking water treatment facility (DWTF) is under provincial or territorial jurisdiction, the standards of the provincial or territorial jurisdiction are enforceable and as such, predicted water quality should be compared to these standards. Health Canada will provide scientific and technical advice to a federal department, a province or a territory upon request on matters including the development of a drinking water guidance value.

The Government of Canada has full or shared responsibility for ensuring the safety of drinking water supplies on federal lands, in federal facilities and in First Nations communities. Specific requirements are established in federal acts and regulations, primarily under the *Canada Labour Code*.

In First Nations communities located south of the 60th parallel, responsibility for drinking water is shared between First Nations band councils, Health Canada and Indian and Northern Affairs Canada (INAC). Band councils are generally responsible for ensuring that DWTFs are designed, constructed, maintained and operated in accordance with established federal or provincial standards. INAC provides funding for constructing and upgrading these water treatment facilities, and covers a portion of the operation and maintenance costs. In some cases, INAC provides funding to First Nations communities to share services with neighbouring municipalities. Health Canada ensures that water quality monitoring programs are in place in First Nations communities.

In First Nations communities located north of the 60th parallel, responsibility for drinking water generally rests with the territorial governments.

For more information, please refer to Health Canada's publication entitled "Water Talk – Drinking Water Quality in Canada" at the following URL:

http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/drink-potab-eng.pdf

Health Canada has worked with provincial and territorial partners to develop the Guidelines for Canadian Recreational Water Quality (GCRWQ). The primary goal of these guidelines is the protection of public health and safety. The GCRWGs address the factors that can interfere with the safety of recreational waters from a human health perspective. They recommend the adoption of a preventive risk management strategy focused on the identification and control of hazards prior to exposure to the recreational water user.

4.2 Provincial and territorial roles

Drinking water quality is primarily a provincial and territorial responsibility. Each province and territory has legislation and/or policies to protect the quality of drinking water from source to tap. All jurisdictions base their requirements on the GCDWQ but customize these requirements to address their own needs, including how they choose to adopt and/or implement them. Since the characteristics of source water used for drinking water vary greatly across the country, provincial and territorial authorities are best able to determine which guidelines need to be met locally.

In British Columbia and New Brunswick, responsibility for drinking water quality rests with the provincial departments of health. In the other provinces, this responsibility rests primarily with the provincial departments of the environment, who collaborate closely with their counterparts in the provincial health departments when a concern about the safety of a drinking water supply is raised.

Territorial governments are responsible for ensuring safe drinking water in the territories, including in First Nations and Inuit communities. Responsibility for drinking water quality monitoring and boil water advisories in the territories is shared between the territorial governments and INAC.

Regulations on recreational water quality are a provincial and territorial responsibility. Health Canada worked with officials in these areas to develop and publish national guidelines for recreational water quality (GCRWQ). Some provinces customized these guidelines to address their own needs. For example, the province of Quebec has introduced its own Water Policy in 2002 that implements watershed-based management of this resource. Quebec also conducts a provincial program called Environnement-Plage, where public beaches are tested for bacterial contamination and their rating posted on Environment Ministry's (Developpement durable, Environnement et Parcs) web site.

4.3 Municipal roles

In most Canadian communities, drinking water is treated, stored and delivered to homes and businesses by municipal governments. These governments manage the day-to-day operation, maintenance and monitoring of DWTFs and distribution systems to ensure that the water reaching consumers meets provincial or territorial drinking water quality standards. Municipalities are also in charge of testing the surface water quality at public beaches and other recreational facilities within their territory and informing the public about the results of this testing. Municipalities can force operators to close facilities that don't meet established provincial recreational water quality standards.

5 ADDRESSING THE POTENTIAL CONTAMINATION OF DRINKING AND RECREATIONAL WATER IN ENVIRONMENTAL ASSESSMENTS

Generally, the risk of potential contamination of drinking or recreational water can be assessed through a human health risk assessment (HHRA). An HHRA takes into consideration levels of contaminants in drinking water or recreational water and exposure of humans to these contaminants to estimate the potential effects of the intake of these contaminants on human health. However, a complete HHRA may not be necessary in an EA if applicable guidelines and standards are met, as extensive HHRAs have been performed to establish these guidelines and standards.

Usually, a water quality assessment would be performed as a part of the EA. If it is demonstrated that a project will not result in any exceedances of applicable water quality guidelines or standards at the point of human consumption or exposure, it is reasonable to conclude that negative impacts on human health are not expected from exposure to drinking or recreational water.

If groundwater is consumed directly without treatment, Health Canada advises that its water quality parameters be compared to applicable limits. When water is treated before consumption, it is advised that the water quality assessment related to a project examine whether the technology and capacity of the DWTF are sufficient to ensure that the treated water will be of adequate quality. It is not necessary for source water to meet guidelines or standards before treatment; however, this does NOT mean that it is permissible for source water to be contaminated up to the guideline or standard. Health Canada advises that the steps taken to minimize impacts of contamination on source water quality be demonstrated.

Health Canada suggests that water quality assessments consider that several water quality parameters (total dissolved solids (TDS), turbidity, pH, temperature, ammonia, total organic carbon (TOC), dissolved organic carbon (DOC) and bromide) may have a large impact on drinking water treatment. Health Canada advises that surface water never be consumed without treatment and that groundwater under the direct influence of surface water (in cases like seepage of surface water through well casing or fractured rock) be considered to be surface water.

Regulating the treatment of drinking water is a provincial and territorial responsibility except on First Nations reserves in federal facilities and federally owned lands. RAs for projects assessed under *CEAA* may have limited mitigation or monitoring abilities with respect to DWTFs. However, if a facility may be impacted by a project and rendered unable to treat water to meet drinking water guidelines or standards, Health Canada advises that this fact be considered in a water quality assessment, especially as it may take several years to upgrade an existing water treatment facility.

5.1 Assessing potential impacts on drinking water quality

When undertaking a HHRA due to changes in drinking water quality, Health Canada is flexible on the format and presentation of data and results; however, Health Canada suggests including the components described below:

1. identification of sources used for drinking water
2. determination of potential changes to source and well water quality
3. determination of impacts of changes in water quality
4. monitoring and mitigation
5. assessment of residual risk
6. references

Health Canada advises that only knowledgeable professionals with suitable experience complete HHRAs.

5.1.1 Identification of sources used for drinking water

Health Canada suggests that all sources of drinking water in the area that may be influenced by the project be identified and described. These sources include source water intakes for DWTFs, sources that are consumed directly (e.g. private wells) and sources used by workers on-site. It is useful to include a statement indicating that all sources have been listed in the water quality assessment.

Health Canada advises considering the potential spread of contamination through the local watershed when deciding which drinking water sources may be influenced by a project. If a DWTF is present in the area of project's influence, it is advised that the treatment technology used be identified (chlorination, filtration, ozonation, etc.) and that intake and output water monitoring information from this facility be provided as much as possible in the water quality assessment. If no sources of drinking water exist in the project area, no assessment with respect to drinking water is suggested by Health Canada.

5.1.2 Determination of potential changes to source and well water quality

Health Canada advises that the potential for changes in the quality of identified drinking water sources to occur due to any project activity (including spills or accidents) be determined. As well, it is advised that basic information on the local watershed, the geographical/hydrological relationship of drinking water supplies with the project and potential human exposure pathways be provided in the water quality assessment. Modeling may be used to estimate contaminant levels in water after the project proceeds. Health Canada suggests that any models used be documented and ideally approved by agencies such as Environment Canada and/or the United States Environmental Protection Agency. It is also suggested that models be selected on a site-by-site basis and that contaminant concentration estimates be conservative in nature.

Health Canada does not have the expertise to verify predictions of concentrations of contaminants in water, including any modeling, and relies on other federal experts such as Environment Canada to complete this task.

If a potential impact on water quality has been identified, it is advised that a comprehensive list of potential organic and inorganic contaminants and their physical characteristics (turbidity, pH, temperature, total dissolved solids, total organic carbon and dissolved organic carbon) be provided in the water quality assessment. To properly identify these contaminants such factors as the nature of the project, the effluents, materials and chemicals present, excavation and construction issues, potential flooding, rerouting of waterways, landscape changes and waste management should be considered. It is also advised to take into account sources of contamination that are naturally occurring in the project area (e.g. found in soils and/or water) or that remain from previous industrial activities and could be released by project activities. Examples of potential contaminants are metals, pesticides, pathogens, hydrocarbons and volatile organic compounds (VOCs). A change in physical characteristics as well as in levels of ammonia or bromide can impact water treatment. For example, increased turbidity may reduce the disinfection capacity of chlorination or cause an increase in the amount of disinfection by-products produced during treatment. If no water quality changes are expected to occur in the source water of nearby DWTFs or in untreated well water, it is suggested that a statement with proper justification indicating this fact be included in the water quality assessment.

5.1.3 Determination of impacts of changes in water quality

If any changes to source or well water quality are predicted, Health Canada advises discussing the potential impacts of these changes in the water quality assessment. In the case of untreated well water or any other untreated drinking water source, it is advised that predicted water quality be compared to the GCDWQ[1] or other applicable provincial or territorial standards. Health Canada advises that the potential risk to human health caused by contaminants for which no Canadian human-health-based guidelines or standards exist be assessed on a case-by-case basis. If there are potential guidelines or standard exceedances, Health Canada suggests that monitoring and mitigation be discussed in the water quality assessment.

If source water will be treated, Health Canada suggests including a discussion in the water quality assessment to determine whether the type of treatment used and/or the capacity of the facility will be able to address the predicted or possible changes in water quality. If the facility is provincially or territorially regulated, it is advised to consult with the appropriate authorities and/or facility operators to confirm the expected adequacy of the facility. If the facility is located on a First Nations reserve, this confirmation may be obtained through INAC or Health Canada's First Nations and Inuit Health Branch (FNIHB). If the facility is located on federally owned lands (such as federal parks or prisons), this confirmation can be obtained through the appropriate department.

[1] It is suggested that these guidelines be confirmed with Health Canada for each study since the values can change as new toxicological data become available.

5.1.4 Monitoring and mitigation

If a risk of impact from a project on a drinking water source that cannot be eliminated by treatment is identified, it is advised that the measures that will be taken to manage this risk be described in the water quality assessment. Additionally, implementing low-cost mitigation measures that further reduce small impacts is encouraged. It is suggested that all recommendations, including any projected mitigation and monitoring plans, be listed and described.

5.1.4.1 Monitoring

The periodic monitoring of drinking water parameters can be used to verify water quality predictions. If there is uncertainty as to whether water quality will meet applicable guidelines or standards, either due to predicted concentrations being near guideline or standard concentrations or high uncertainty in predicted values, Health Canada may suggest that a commitment be made to undertake some monitoring.

In general, it is advised that monitoring of drinking water quality be done in accordance with provincial and territorial regulations. The following factors may be of assistance in planning monitoring studies:

- information on contaminants typically of concern related to similar development projects and similar sites
- discussion with local residents
- consultation with local health and/or environmental health officials
- previous studies conducted in the project area

Health Canada does not have expertise specific to the development of site-specific sampling plans but may provide expertise with respect to HHRAs that may be performed after monitoring data is obtained.

Health Canada advises that baseline drinking water quality data be collected prior to the project. These data can then be compared to predicted changes in water quality due to project activities as well as water quality data after the project begins to determine the impact of the project. Baseline data may be obtained from DWTFs and nearby wells that may be influenced by the project.

If no monitoring is to be undertaken, Health Canada advises including a justification for such an advice in the water quality assessment.

5.1.4.2 Mitigation

If an impact on drinking water sources is either predicted or possible a mitigation plan should be included in the water quality assessment. Possible mitigation measures include the following:

- measures to reduce predicted changes in water quality
- improved treatment technology or capacity in DWTFs
- the implementation of water treatment where it was previously absent
- the provision of an alternative drinking water source

If a DWTF's source water quality could potentially be affected by a project, Health Canada suggests that the owners/operators of the facility be notified and that information on this notification and how it will be done be included in the water quality assessment. It is also suggested that private well owners impacted by a project be notified of potential changes in their water quality.

Health Canada suggests clarifying whether the possible monitoring, mitigation or other management measures described in the water quality assessment will be undertaken conditionally or unconditionally. If the measures are conditional, it is advised that the circumstances under which they will be implemented be clearly described.

5.1.5 Assessment of residual risk

The final step in the water quality assessment is to provide a discussion of potential impacts on drinking water quality after all proposed mitigation and management measures have been applied. This discussion should include human health risks in cases of accidents or spills and if water quality at any stage of the project is found to be different than what was predicted. If there is a possibility of exposure to contamination in drinking water that is above applicable guidelines or standards, it is advised that risk to the health of nearby residents be estimated using methods appropriate for the contaminant in question.

Health Canada advises that the GCDWQ related to some contaminants such as *E. coli*, which are potentially pathogenic micro-organisms, are very clear and should never be exceeded because people may become sick soon after being exposed to these contaminants. Other guidelines, many of them chemical, are based on the best available science and give a good indication of human health effects that might be seen if levels exceed the GCDWQ over a lifetime. However, some guidelines are aesthetic and exceeding them would not present a human health risk. Finally, some guidelines are risk-managed (for example, due to limitations in analytical methods and treatment technologies) and some risks may be present to human health even below GCDWQ levels. More information on the assessment of risk associated with short-term guideline exceedances can be found in the GCDWQ technical documents (http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php). Health Canada suggests that a rationale be provided in the water quality assessment as to why certain expected risks are found to be acceptable.

5.2 Assessing potential impacts on recreational water quality

Recreational water is any natural fresh, marine or estuarine body of water used by people for leisure. Recreational water use is any activity involving intentional or incidental immersion in natural waters, such as swimming, wading, surfing, waterskiing, whitewater canoeing, rafting or kayaking, windsurfing, sub-surface diving, rowing, sailing, canoe touring and fishing.

Local health authorities are responsible for monitoring the water quality at public beaches on a regular basis throughout the bathing season. They are also responsible for investigating any illnesses or injuries resulting from bathing at public beaches and temporarily closing them to the public. In some cases, such as an outbreak of illness, tests for disease-causing organisms, like viruses and bacteria, are conducted.

If the quality of recreational waters does not meet the GCRWQ (or provincial or territorial standards if different) due to project activities, Health Canada suggests that a water quality assessment similar to what is described above for drinking water be undertaken. It is advised that the authority responsible for the recreational water in question be consulted as part of the assessment.

Considerations specific to the risk assessment of recreational water quality include the following:

- Contaminated sediments may be a potential issue.
- Potential human exposure pathways include ingestion, inhalation and direct contact with the skin and mucous membranes. Health Canada suggests that the assessments include a description of the types of activities practiced on or in the waters in order to identify potential exposure pathways.
- GCRWQs include guidelines for fecal indicators and select physical and aesthetic parameters. They do not include guidelines for specific chemical parameters. In the case of chemical contamination, it is advised that the GCDWQ be used when performing the assessment. If there are guideline exceedances, an HHRA for recreational exposures may need to be completed.
- Natural recreational waters are not subject to treatment. Similar to the case of untreated source water quality, mitigation of the impact of a project on recreational water quality and related predicted changes (including possible spills and accidents) would involve implementing measures to reduce this impact and monitor the recovery.

If recreational water quality could potentially be altered by a project, it is suggested that the appropriate authorities be notified and measures be taken to inform recreational users.

6 ASSESSMENT OF CUMULATIVE EFFECTS

Under *CEAA*, an EA must also assess cumulative effects. In the case of drinking and recreational water quality, Health Canada suggests that an assessment of cumulative effects include the following:

- Changes in levels of contaminants in drinking and recreational water resulting from all past, present or known future projects and activities (i.e. change in exposure).
- Whether future projects could result in new access to recreational and drinking water sources that may be contaminated and that were previously inaccessible (e.g. a new road or bridge providing access to water, or modified water flow as a result of a project making previously un-navigable watercourses navigable).

Guidance on how to assess cumulative effects in EAs is available from the Canadian Environmental Assessment Agency's *Operational Policy Statement: Follow-up Programs under the* Canadian Environmental Assessment Act (2007a), *Cumulative Effects Assessment Practitioners Guide* (1999) and *A Reference Guide for the* Canadian Environmental Assessment Act*: Addressing Cumulative Environmental Effects* (1994).

If the assessment of cumulative effects identifies water quality effects that exceed project-only effects, Health Canada advises considering implementing further monitoring, mitigation and/or a follow-up program.

7 FOLLOW-UP

Under *CEAA*, a follow-up program is used to:

- verify predictions of environmental effects identified in the EA
- determine the effectiveness of mitigation measures in order to modify or implement new measures as required
- support the implementation of adaptive management measures to address previously unanticipated adverse environmental effects
- provide information on environmental effects and mitigation that can be used to improve and/or support future EAs, including cumulative environmental effects assessments
- support systems used to manage the environmental effects of projects

It may be appropriate to consider a follow-up program for water quality (drinking and recreational) if one of the following applies:

- there is uncertainty about the modeling of contaminant emission, release, mobilization, deposition or modification in the environment and uptake into groundwater or surface water sources
- there is uncertainty about the capacity of the DWTF to respond adequately to changes in source water quality
- there is a possibility that a novel substance may be introduced into water bodies as a result of project activities
- it is uncertain whether proposed mitigation measures will be effective (e.g. the use of novel technology or complex systems)
- there is unexpected contamination of water sources (e.g. sudden release of untreated effluent)

Guidance on follow-up programs under *CEAA* is available from the Canadian Environmental Assessment Agency's *Operational Policy Statement: Follow-up Programs under the* Canadian Environmental Assessment Act (2007).

8 REFERENCES

8.1 Environmental assessment

Canadian Environmental Assessment Agency. (2007a). *Operational Policy Statement*: *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act*. Retrieved from http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=1F77F3C2-1

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The Cumulative Effects Assessment Working Group and Axys Environmental Consulting Ltd. for the Canadian Environmental Assessment Agency. (1999). *Cumulative Effects Assessment – Practitioners Guide*. Retrieved from http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=43952694-1&offset=&toc=hide

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8.2 World Health Organization (WHO) Guidelines

WHO. (2008). *Guidelines for Drinking-water Quality. Second Addendum to Third Edition. Volume 1, Recommendations.* Geneva, Switzerland. Retrieved from http://www.who.int/water_sanitation_health/dwq/secondaddendum20081119.pdf

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8.3 Canadian Water Quality Guidelines

Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. (2010). *Guidelines for Canadian Drinking Water Quality – Summary Table.* Ottawa, Ontario. Health Canada. Retrieved from http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2010-sum_guide-res_recom/index-eng.php

Federal-Provincial-Territorial Working Group on Recreational Water Quality of the Federal-Provincial-Territorial Committee on Health and the Environment. (2010). *Guidelines for Canadian Recreational Water Quality*. Ottawa, Ontario. Health Canada. Retrieved from http://www.hc-sc.gc.ca/ewh-semt/consult/_2009/water_rec-eau/draft-ebauche-eng.php

Health Canada reports and publications on water quality in relation to radiological, chemical/physical, bacteriological and microbiological parameters can be found at the following link: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php

APPENDIX A WATER QUALITY IN EA CHECKLIST

This checklist may be used to verify that the main components of a water quality assessment are completed. It would be useful to include this checklist as an index in an EA to identify the locations of the key components of a water quality assessment, especially if they are in multiple sections of the EA.

Overall (throughout the EA)		
✓	**Item**	
	1. Worked examples are included for calculations if a quantitative risk assessment was completed.	
	2. Units are clearly stated and consistent (or conversion calculations are included as appropriate).	
	3. Assumptions are clearly stated and justified (modeling of worst-case scenarios, etc.).	
	4. Principles of minimizing impacts are considered (e.g. not polluting up to guidelines). This concept includes identifying mitigation measures to minimize increases in concentrations of contaminants as a result of project activities.	
Drinking Water Sources		
✓	**Item**	**Section in EA**
	5. All sources used for drinking water are identified in the EA study areas (project, local and regional) including: • source water intakes for DWTFs and/or sources from which water is consumed directly (e.g. wells) and their distance from the project. • whether or not all sources of drinking water have been identified. • the responsibility/jurisdiction for the DWTFs in the EA study area (municipal/provincial/territorial/federal).	
	6. Information is included on whether there are potential or probable changes to source water quality due to project activities (including spills and accidents as appropriate). If so, the following is included:	
	a. a comprehensive list (including quantitative information) of potential organic, inorganic and microbial contaminants, as well as their physical characteristics	
	b. a comparison of predicted changes in individual parameters to appropriate guidelines or standards (provincial/territorial standards when they exist, GCDWQ otherwise and on federal lands and First Nation reserves south of the 60th parallel)	
	c. a conclusion with respect to the DWTF's ability to address the predicted or possible changes in water quality	
	d. information on how the DWTF(s) will be informed of any predicted or measured changes in its source water quality	
	e. if the province or territory is responsible for managing the DWTF, confirmation from the appropriate authority on the conclusions about the effects of changes to source water parameters on drinking water treatment protocol	
Private wells		
✓	**Item**	**Section in EA**
	7. Information is included on whether there are any private wells in the EA study area. If so, a discussion is included on whether any changes to the quality of the well water are likely due to project activities (including spills and accidents).	
	8. If changes to well water quality are predicted or possible as a result of project activities, the following is included:	
	a. a comprehensive list (including quantitative information) of potential, organic, inorganic and microbial contaminants, as well as their physical characteristics	
	b. a comparison of individual parameters with appropriate guidelines or standards (provincial/territorial standards when they exist, GCDWQ otherwise and on federal lands and First Nation reserves south of the 60th parallel)	
	c. details on how well owners will be notified of potential changes in water quality	

Recreational Water Quality	
Item	**Section in EA**
9. All water bodies are identified that may be used for recreational purposes and affected by project activities, and a characterization is included of recreational activities in affected water bodies (swimming, canoeing, fishing, etc.).	
10. Information is included on whether there are potential or probable changes to recreational water quality due to project activities (including spills and accidents as appropriate). If so, the following is included:	
a. a comprehensive list (including quantitative information) of potential microbial, organic, and inorganic contaminants, as well as their physical characteristics	
b. a comparison of predicted changes in individual parameters to appropriate guidelines or standards (provincial/territorial standards when they exist, GCRWQ otherwise and on federal lands and First Nation reserves south of the 60th parallel)	
c. as the GCRWQ do not include guidelines for specific chemical parameters, in the case of chemical contamination a comparison of predicted changes in individual parameters to appropriate guidelines or standards, such as GCDWQ.	
Need for an HHRA	
Item	**Section in EA**
11. Are there predicted exceedances of any provincial or territorial standards or federal guidelines after the application of mitigation measures? If so, it is suggested that an HHRA for the drinking or recreational water pathway be completed for contaminants.	