Environmental Risk-Based Approaches for Managing Municipal Wastewater Effluent (MWWE)

Report Prepared for:

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EXECUTIVE SUMMARY

The objective of this project was to conduct a comprehensive review and analysis of current approaches to environmental risk assessment for municipal wastewater effluents (MWWE) that are in practice within Canada and internationally. This study augmented a previous survey that was conducted by the Canadian Council of Ministers of the Environment, which summarized the regulatory requirements and implementation mechanisms currently in place for regulating MWWE discharges in Canada. Canadian jurisdictions were approached again to obtain additional information regarding current regulatory practises and, specifically, those that take into account some aspect(s) of the receiving environment. In addition, surveys were sent to and received back from contacts within regulatory agencies in the United States (Florida, Ohio, New Jersey, Washington) and overseas (Australia, England, Finland, Germany, New Zealand, Sweden).

A variety of regulatory approaches are presently utilized in Canada for managing MWWE, ranging from a strictly technology-based (generic effluent limits) approach (Newfoundland) to an environmental risk-based approach involving derivation of site-specific discharge limits for protecting specific water uses (Quebec). The majority of Canadian jurisdictions have adopted a hybrid approach, with generic guidelines or regulatory limits for a limited suite of conventional parameters (e.g., biochemical oxygen demand- BOD_5 or carbonaceous biochemical oxygen demand-$CBOD_5$, total suspended solids-TSS, fecal coliforms), and mechanisms for imposing more stringent limits or more parameters on a site-specific basis at the discretion of the regulatory authority. In some cases, environmental risk is considered in a limited way (e.g., generic discharge criteria within broad categories reflecting receiving environment type and/or dilution/mixing characteristics). Several provinces have policies, guidelines, and/or formalized procedures for deriving site-specific effluent limits for ammonia and other parameters, but they are not necessarily universally applied among treatment facilities.

Where utilized, site-specific discharge criteria are typically developed by back calculation from water quality standards, objectives, or guidelines for protecting uses of the receiving water. In Quebec, this has been adopted as the preferred approach for derivation of effluent limits, although it has been relying to date on voluntary compliance because it lacks a regulatory mechanism for enforcement. Alberta and Ontario may apply either a site-specific or a generic criterion, typically whichever is more stringent. Other Canadian jurisdictions have only rarely derived site-specific limits for municipal facilities, most often for newer and larger facilities than for older, smaller facilities.

Internationally, the United States is the only jurisdiction of those surveyed that formally regulates MWWE using an environmental risk-based approach. There, most receiving waters, or portions thereof, are formally designated as having one or more beneficial uses (aquatic life, recreation, drinking water, etc.), although the use designations (categories) vary from state to state. The most stringent of the applicable quality criteria (pertaining to the various applicable beneficial uses) is then applied to each receiver and effluent limits for all dischargers to the receiver are back-calculated from the criteria to ensure that the criteria can be met in the receiver.

U.S. jurisdictions also use toxicity tests for managing MWWE, whereby laboratory tests of effluent toxicity are expected to demonstrate that toxicity does not occur at concentrations occurring in the receiver. In some U.S. jurisdictions, assessments of indigenous receiving water biota are also required to verify that aquatic life is adequately protected. Although the specifics of the approaches differ, this is analogous to the Environmental Effects Monitoring requirements currently specified in the Canadian *Fisheries Act* regulations respecting metal mines and pulp and paper mills.

While several Canadian jurisdictions utilize environmental risk-based approaches for MWWE that are similar to those used in the U.S., the U.S. approaches are nationally more widely and consistently applied, and more extensively documented (e.g., more formal procedures and specific guidance). This reflects the fact that MWWE have been actively regulated in most states for decades, and all facilities have been expected to comply.

None of the European countries surveyed formally employ environmental risk-based approaches for MWWE regulation. Finland has the flexibility to impose site-specific limits but there is no formalized policy or approach for doing so.

Environmental risk-based guidelines exist in Australia and New Zealand but these are not consistently applied. The basis for establishing limits is left to the discretion of the responsible regulatory authorities. Like the approach used by the U.S. and some Canadian provinces, the guidelines generally involve back calculation to achieve criteria that protect beneficial uses of the receiving environments.

None of the jurisdictions surveyed uses environmental risk-based approaches for management of combined (sanitary and stormwater) sewer overflows (CSOs).

In summary, the majority of jurisdictions in Canada and internationally presently emphasize a technology-based approach for managing MWWE, with some jurisdictions (e.g., U.S., Alberta) also using environmental risk-based approaches to establish more

stringent limits or set effluent limits for non-conventional parameters. Each of the various technology-based and environmental risk-based approaches are associated with advantages and disadvantages, which will need to be taken into account during the development of a national strategy for Canada (Table 3.11). The technology-based approaches employed in Canada generally accept varying degrees of treatment, with limits established based on the level of performance that can be expected from such treatment technologies. In contrast, the U.S. has established secondary treatment as the minimum acceptable standard, reflecting a value judgement that it is unacceptable to pollute when there is adequate technology to reduce pollutant loadings. The main advantage to an environmental risk-based approach is that MWWE treatment is geared specifically toward site-specific conditions and costs are thus proportionally allocated to sites that will likely demonstrate the greatest measurable improvement.

With respect to environmental risk-based approaches, there are three general approaches that have been adopted among the various jurisdictions surveyed, each with its own benefits and limitations:

1. Derivation of site-specific effluent limits based on back calculation from water quality criteria developed to protect specific beneficial uses of the receiver (e.g., protection of aquatic life, recreation, drinking water etc.).
2. Deriviation of site-specific effluent limits based on protection against whole effluent toxicity (i.e., toxicity must not occur at concentrations exceeding the available dilution).
3. Surveys of receiving water biota to assess the efficacy of the established MWWE limits in terms of protecting such biota.

Consideration should be given to the use of any or all of the above as part of a potential framework for regulating MWWE in Canada.

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1.0 INTRODUCTION

1.1 Background

The Canadian Council of Ministers of the Environment (CCME) has formed a Development Committee (DC) to develop a national strategy for the management of municipal wastewater effluent (MWWE). MWWE is defined as wastewater discharged to surface water from a municipal/community collection or treatment system, including end-of-pipe discharges and overflows but not separate storm water discharges. The strategy will be based on three cornerstones:

- Harmonization of the regulatory framework;
- Coordinated science and research; and
- Use of an environmental risk management model.

The strategy will also take into account the implementation and on-going operational costs to Canadian municipalities by allowing for flexibility in phasing in the approach (CCME 2004b).

Regulatory agencies in Canada and around the world are currently using a wide variety of approaches for managing MWWE, ranging from very limited requirements to very stringent and complex regulation and monitoring. Some approaches are based on source reduction and the type of effluent quality that can be achieved given the currently available technology (technology-based approach). Other approaches take into account some measure(s) of environmental risk (environmental risk-based approach). One of the mandates of the DC is to develop an Environmental Risk Management Model that integrates a list of pollutants, achievable/desirable performance standards and characteristics of the receiving environment (CCME 2004b).

1.2 Project Objectives

The objective of this project was to conduct a comprehensive review and analysis of current approaches to environmental risk assessment for MWWE that are in practice within Canada and internationally. This allows the CCME to avail itself of the experience already gained by other jurisdictions in developing a Canadian framework.

1.3 Approach

This study augmented a previous survey that was conducted by the CCME, which summarized the regulatory requirements and implementation mechanisms currently in

place for regulating MWWE discharges (CCME 2004a). Minnow Environmental Inc. (Minnow) followed up with each Canadian jurisdiction to request clarification of a number of aspects of the regulatory practises, again using a survey format. Details of the approach are presented in Section 2.0. The same survey was also sent to the regulatory agencies in jurisdictions in the United States (Florida, Illinois, New Jersey, New York, Ohio, Washington) and overseas (Australia, England, Finland, Germany, Netherlands, New Zealand, Sweden). Repeated follow-up contacts were made to obtain additional information and/or clarification in many cases. Surveys were not returned by Illinois, New York or the Netherlands. The information was summarized into tables to facilitate comparisons of the approaches used and the findings are discussed in detail (Section 3.0). Follow-up options have been presented for the CCME's consideration (Section 4.0). References cited throughout the document are also presented (Section 5.0). All the surveys, which identify the contact details for the individuals who completed the surveys, are included as appendices to this report (Appendix A).

2.0 APPROACH AND METHODS

In general the approach was to identify appropriate contact persons within each jurisdiction, send the survey and request its return within 2-3 weeks, make any necessary follow-up contacts to fill information gaps or investigate other suggested jurisdictions once the surveys were returned, tabulate and analyze the results, and then prepare a report of the results. These steps are described in more detail below.

2.1 Identification of Contacts

Contact details for representatives from each of the Canadian jurisdictions were obtained from the CCME website (www.ccme.ca/initiatives/water.html?category_id=83). Once contacted, those individuals sometimes directed Minnow to other individuals. Contacts were also identified for each of the international jurisdictions by searching the internet to find the name and phone number of the regulatory agency most likely to be responsible for regulating MWWE. Each agency was contacted to obtain the contact details for an appropriate individual involved in managing/regulating MWWE.

2.2 Completing the Surveys

Each of the jurisdictional representatives were initially contacted by telephone, although in some cases only a voice mail message was left explaining that they were being asked to assist the Canadian government by completing a survey of regulatory practises respecting MWWE. The surveys were then sent out by email with a request to have them filled out and returned as soon as possible. For the Canadian jurisdictions, Minnow filled out relevant portions of the surveys with the information obtained in the previous CCME survey (CCME 2004a) to acknowledge that such information was already provided to the CCME and to facilitate a quicker response time. The survey was also sent to the regulatory agencies in jurisdictions in the United States (Florida, Illinois, New Jersey, New York, Ohio, Washington) and overseas (Australia, England, Finland, Germany, Netherlands, New Zealand, Sweden). Most Canadian surveys were returned by the end of January 2005, and most international surveys were received by mid-February. Surveys were not returned by Illinois, New York or the Netherlands, despite repeated requests by email and telephone.

2.3 Information Assessment and Reporting

All pertinent information was organized into table formats suitable for the amount and type of information received. The objective was to facilitate identification of key

commonalities and differences among jurisdictions, as well as identify progressive approaches that may be suitable for adoption or adaptation with the Canadian regulatory framework. Notes were made to elaborate on the approaches employed in each jurisdiction and these are provided, along with the tables, in Section 3.0 of this document.

The information provided by the jurisdictions was analyzed with respect to what approaches have been successfully implemented and, where possible, what the perceived issues/benefits are of the strategies in place among jurisdictions. Information gaps that are apparent from this study have been identified in the form of recommendations for future study.

3.0 RESULTS AND DISCUSSION

General approaches for regulating MWWE in Canada and Internationally are presented in the sections below with specific discussion of those jurisdictions that employ some type of environmental risk-based approach.

3.1 Canadian Approaches

3.1.1 Alberta

Overview

All municipal wastewater treatment systems in Alberta are owned and operated by municipalities. MWWE is managed according to the "Standards and Guidelines for Municipal Waste Waterworks and Storm Drainange Systems" (the guidelines; Alberta Environmental Protection 1997b) referred to in the Wastewater and Storm Drainage Regulation under the *Environmental Enhancement and Protection Act*. The 1997 guidelines supercede standards and guidelines that were previously established in 1988. The newer (1997) guidelines are applied to all new or expanded facilities but any facilities built prior to that year that have not required expansion are still regulated under the older (1988) guidelines. Alberta Environmental Protection (AEP) is responsible for issuing approvals to discharge and monitoring compliance with the requirements.

The 1997 guidelines prescribe generic limits for treatment facilities based on population size (≤ or ≥ 20,000) and treatment technology (secondary, aerated lagoon). There are no limits for wastewater lagoons. Limits have been set for carbonaceous biochemical oxygen demand ($CBOD_5$) and total suspended solids (TSS) for populations < 20,000 and for $CBOD_5$, TSS, total phosphorus, total coliforms, fecal coliforms and ammonia for populations > 20,000 (Table 3.1).

The province of Alberta uses both a technology-based approach for setting effluent limits (above, which are based on the use of established and proven treatment technologies) and a water quality impact approach (where effluent limits are based on the ability of the water body to receive the effluent while still maintaining instream water quality objectives (Alberta Environmental Protection 1997a). The quality of effluent that is acceptable for discharge to a receiving water body is determined based on a two-step process:

- First AEP determines the effluent criteria based on the use of established and proven treatment technology (Best Practicable Technology – BPT) and this represents the minimum quality requirement.

Table 3.1: Comparison of Generic Discharge Criteria for MWWE in Canada. (Criteria are not necessarily universally applied to all facilities in each jurisdiction/category. See text for details)

Jurisdiction	Source	Category	Discharge Limits or Guidelines														
			BOD_5	CBOD	Suspended Solids	Dissolved Solids	Total Coliforms	Fecal Coliforms	Total Phosphorus	Phosphate (total as P_2O_5)	Ammonia	Total Nitrogen	Total Residual Chlorine	pH range	Oils (ether extract)	Floating Debris, Oil & Grease	Toxicity Test
			mg/L	mg/L	mg/L	mg/L	#/100 mL	#/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	
Alberta	Alberta Environmental Protection (1997b)	populations < 20,000	-	25	25[a]	-	-	-	-	-	-	-	-	-	-	-	-
		populations > 20,000	-	20	20[a]	-	1,000	200	1.0	-	-	-	-	-	-	-	-
		wastewater lagoons	no defined limits														
British Columbia	Waste Management Act Municipal Sewage Regulation 1999	streams/rivers (≥40:1 dilution), lakes (≥100 ha), marine	45/130[b]	-	45/130[b]	-	-	2.2-200[c]	1.0[d,e]	1.0[d,e]	-	-	1.0[d,e]	6-9	-	-	biological test method using rainbow trout[e]
		streams/rivers (≥10:1 dilution)	10	-	10	-	-		0.5[d,e]	0.5[d,e]	-	-	1.0[d,e]	6-9	-	-	
Canada (federal facilities)	Environment Canada (1976)	-	20	-	25	-	-	400	1.0[e]	-	-	-	0.5-1.0[e]	6-9	-	none visible	-
Manitoba	Manitoba Conservation (2002)	-	30	-	30	-	-	200	1-2[e]	-	-	10[e]	-	-	-	-	biological test method using rainbow trout[e]
New Brunswick		Class I - aerated or facultative lagoon	20	20[e]	-	-	-	200	-	-	-	-	0.3-0.7[e]	-	-	-	-
		Class II - complex lagoon or smaller mechanical	20	20[e]	-	-	-	200	-	-	-	-	0.3-0.7[e]	-	-	-	-
		Class III - larger, more complex mechanical plant	20	20[e]	-	-	-	200	-	-	-	-	0.3-0.7[e]	-	-	-	-
Newfoundland and Labrador	Newfoundland and Labrador Regulation 65/03, Environmental Control Water and Sewage Regulations 2003	-	20[e]	-	30[e]	1000[e]	5000[e]	1000[e]	0.0005[e]	1[e]	2[e]	-	1[e]	5.5-9.0[e]	15[e]	none visible[e]	-
Northwest Territories	NWT Water Board (1992)	-	see Table 3.2	-	see Table 3.2	-	-	see Table 3.2	see Table 3.2	-	-	-	-	6-9	-	< 5.0	biological test method using fish[e]
Nova Scotia	Environment Canada (2000)	fresh, limited dilution	5.0	-	5.0	-	-	200	-	-	-	-	-	-	-	-	-
		fresh, with dilution	10	-	10	-	-	200	-	-	-	-	-	-	-	-	-
		brackish waters or resitricted bays	20	-	20	-	-	1000	-	-	-	-	-	-	-	-	-
		open ocean	30	-	30	-	-	5000	-	-	-	-	-	-	-	-	-
Nunavut	Nunavut Water Board (2000)	-	see Table 3.3	-	see Table 3.3	-	-	see Table 3.3	-	-	-	-	-	6-9	-	< 5.0	-
Ontario	Ontario Ministry of Environment and Energy (1994b)	facilities other than lagoons	25	-	25	-	-	200[e,f]	1[e]	-	-	-	0.5[e]	6-9.5[e]	-	-	-
		seasonal lagoons	30	-	40	-	-	-	1.0	-	-	-	-	-	-	-	-
Prince Edward Island	-	-	25	-	25	-	-	200	-	-	-	-	-	-	-	-	-
Quebec		aerated lagoon (annual average)	20-30[g]	-	-	-	-	1000-20000[h]	1.0	-	-	-	-	-	-	-	-
		activated sludge (annual average)	20	-	20	-	-	-	0.8-1.0[g]	-	-	-	-	-	-	-	-
		activated sludge plus tertiary treatment	15	-	15	-	-	-	0.4-0.5[g]	-	-	-	-	-	-	-	-
Saskatchewan	Saskatchewan Environment (2002)	-	30	-	30	-	see Table 3.4	-	see Table 3.4	-	-	see Table 3.4	-	-	-	-	-
Yukon	Yukon Waters Act 1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] - mechanical secondary or teritary facilities only
[b] - latter value permitted under defined wet weather conditions
[c] - dependent on receiving water use: shellfish waters 14 and 43/100mL (median and maximum); recreation 200/100mL; domestic use 2.2 and 14/100mL (median and maximum)
[d] - except open marine waters, which have no limit
[e] - if required
[f] - *E.coli*
[g] - based on facility size

- Second, the municipality undertakes a receiving water assessment to evaluate the water quality impacts of the various contaminants in the effluent that results from the use of proven treatment technology. AEP validates these assessments and sets effluent criteria to protect the receiving water quality.

For a given site, the effluent criteria based on technology and water quality impact are compared and the owner is required to comply with the more stringent of the two limits. Effluent criteria may be concentration and/or loading-based, with the latter determined based on concentration multiplied by daily average design flow. The technology-based minimum requirements apply only to secondary treatment facilities and aerated lagoons (Table 3.1).

Environmental Risk-Based Approach(es)

Potential water quality impacts are assessed relative to Alberta's surface water quality objectives (CCME or U.S. Environmental Protection Agency [EPA] guidelines may be used where an Alberta criterion is lacking). A water quality based standard is derived by calculating how much of a given contaminant can be discharged under certain restrictive (worst-case) conditions while still maintaining instream objectives. This is generally done by:

- Statistically characterizing (e.g., mean, maximum and variability) effluent parameters of concerns, such as ammonia, phosphorus, chlorine (if used) and possibly metals;
- Calculation of expected receiver concentrations downstream of a discharge[1], taking into account effluent concentrations and flow as well as background concentrations and receiver flow (see Section 3.7 for additional details);
- If there is reasonable potential to exceed the water quality criterion for a substance, a waste load allocation is calculated, representing the maximum amount of the substance that can be assimilated and also ensure maintenance of the water quality criterion;
- End-of-pipe limits can then be derived to ensure the waste load allocation is not exceeded based on calculation of a long-term average, and average monthly and daily maximum limits.

[1] Implicit assumption is that receiving environments are flowing (e.g., streams, rivers).

The above steps are described in more detail in a Water Quality Based Effluent Limits Procedures Manual (Alberta Environmental Protection 1995), which closely follows guidance development by the United States Environmental Protection Agency (USEPA; see Section 3.2). A mixing zone may be allowed depending on downstream water use.

3.1.2 British Columbia

Municipal wastewater is regulated by the Ministry of Water, Land and Air Protection according to the Municipal Sewage Regulation (MSR) or via an operating certificate under a Liquid Waste Management Plan (LWMP), both falling under the province's *Environmental Management Act*.

The MSR sets the long-term goal of achieving secondary treatment and commensurate performance standards at all facilities and a LWMP allows time to achieve this based on the receiving environment, public input and financial considerations. The MSR stipulates universal discharge limits for BOD_5 (or $CBOD_5$), TSS, total phosphorus, ortho-phosphorus, fecal coliforms, total residual chlorine and pH within categories based on receiver type (streams/rivers, lakes, marine) and available effluent dilution (Table 3.1). Secondary treatment is a requirement for discharge to all environments under the MSR, although primary treatment is permitted when wet weather flows exceed two times the average dry weather flow at facilities having an effluent dilution ratio of more than 40:1 (Government of British Columbia 1999, BCMELP 2001a,b). However, the MSR requires that a LWMP be prepared to reduce inflow and infiltration so that wet weather flows will not reached this threshold.

As noted above, the generic guidelines take into account the type of receiving environment, addressing one aspect of site-specific environmental protection. In addition, ammonia-nitrogen limits are established based on a back calculation from water quality guidelines applied at the edge of the initial dilution zone, accounting for receiving environment pH and temperature. More stringent requirements than the generic ones may be applied based on site-specific considerations. Environmental impact studies are also required under the MSR and are conducted following provincial guidelines (BC Ministry of Environment, Lands and Parks 2000). These outline the approach and content for an Environmental Impact Study (EIS), including establishing background conditions, comparison of existing/predicted conditions to provincial water quality guidelines, and assessment of the type and severity of impacts based on flow and mixing characteristics. However, most dischargers registered under the MSR do not routinely conduct receiving environment monitoring. LWMP are typically not as stringent as the MSR with respect to some or all requirements specified in the MSR.

3.1.3 Manitoba

Most municipal wastewater treatment systems in Manitoba are owned and operated by the municipalities with a few facilities owned privately, by the government or by another party. Effluent discharge limits, terms and conditions are implemented on a site-specific basis through licenses issued by Manitoba Conservation under *The Environment Act* (1987) of Manitoba taking into consideration the Manitoba Water Quality Standards, Objectives and Guidelines (Manitoba Conservation 2002). Generic limits for BOD_5 and microbiological parameters apply at all facilities, while new and/or expanded facilities may also have limits for TSS, residual chlorine, toxicity, ammonia and other nutrients, which may vary within a specific range depending on season (Table 3.1). Limits for ammonia are back calculated from receiving water quality objectives that take into account pH, temperature, season, and receiving water classification (cool versus cold water). Discharge limits are rarely stipulated for metals based on the assumption that they are concentrated in the biomass (sewage solids) and that most small systems do not have significant sources of metals.

For existing facilities, environmental risk is taken into account primarily only with respect to setting effluent limits for ammonia. Simple mass balance modelling is used to evaluate the potential water quality impacts of large, new municipal and industrial wastewater projects. This involves the determination of receiving water quality parameters to protect uses/quality of the water and determination of discharge requirements to achieve the water quality standards for protection of those uses. Both water quality and biological monitoring are employed to monitor the success of this approach. Proponents of small projects are allowed more latitude; while not required to provide as much detail, they are expected to address environmental impacts based on available information.

3.1.4 New Brunswick

Most wastewater treatment facilities are owned and operated by municipalities. Some systems are privately owned (e.g., mobile home parks), or owned by local residents (commissions). The Department of the Environment regulates MWWE under the Water Classification Regulation of the provincial *Clean Water Act* (2002).

New Brunswick does not formally use an environmental risk-based approach for regulating municipal wastewater discharge, although the receiver is implicitly considered in the requirement for all facilities to have a minimum 8:1 dilution. Generic limits have been established for BOD_5 and fecal coliforms (Table 3.1) and generic limits for other

parameters may be included site-specifically. Aerated or facultative lagoons constructed before 1986 have slightly less stringent effluent limits for BOD_5 and TSS, but most other facilities (~90%) follow the specified criteria, except for some facilities undergoing upgrades/expansion or having design issues. Disinfection is required for recreational areas, shellfish areas or if there are drinking water source risks. Discharges are permitted for some tidal waters, but only during high or ebbing tides, and there are no discharges permitted into lakes.

3.1.5 Newfoundland and Labrador

The majority of wastewater facilities are owned and operated by the municipalities, with a few being institutional, commercial, industrial or private facilities. Federal reserves and federal properties are owned and operated under federal jurisdiction provided areas outside of federal boundaries are not being impacted. MWWE is chiefly regulated under the Environmental Control Water & Sewage Regulations (2003) of the *Water Resources Act*.

The provincial regulations specify generic limits for numerous parameters including BOD_5, suspended & dissolved solids, total & fecal coliforms, total phosphorus and phosphates, ammonia, total residual chlorine, pH, oil and grease, and several metals (Table 3.1), although these are not universally required, especially for smaller discharges to the open ocean.

Newfoundland and Labrador does not use an environmental risk-based approach for monitoring municipal or industrial wastewater discharge. The ministry inspects facilities annually and requires that sewage dischargers conduct annual effluent analysis for the constituents mentioned in these regulations. Monitoring of major inland freshwater systems is undertaken through federal-provincial agreement. Other areas are monitored on an as needed basis due to resource conflicts or public health issues.

3.1.6 Northwest Territories

The Northwest Territories (NWT) is sparsely populated with predominantly small communities having limited technical and financial resources. Most communities have no sewer infrastructure; instead sewage vacuum trucks pump effluent from holding tanks at individual residences and transport waste to a local municipal facility for disposal (lagoons only).

Six tax-based communities own and operate their MWW facilities. Others (non-taxed based) are owned by the Government of Northwest Territories, but operated or

contracted out by the community. Only lagoon systems are used for treatment of municipal wastewater. Effluent discharges are managed under the NWT *Waters Act* (1992) and the *Mackenzie Valley Resource Management Act* (1998) by independent land and water boards that are responsible to the Ministry of Indian and Northern Affairs Canada (INAC).

There are no universal discharge limits for MWW treatment facilities, but guidelines have been developed (NWT Water Board 1992; Table 3.2). Effluent limits are imposed on a site-specific basis and generally allow for realistic performance expectations (e.g. technology based). Parameters may include BOD_5, coliforms, oil and grease, TSS, pH and/or toxicity. There is no process for setting site-specific, environmental risk-based municipal wastewater effluent discharge limits.

Industries in the NWT are more stringently managed because the majority of industrial developments occur in remote locations where receiving waters have never been previously impacted. Therefore, discharge limits are set very low to protect the receiver from impact. The Water Board considers environmental risk in finalizing end-of-pipe limits for industrial developments. Major mining projects often use Best Available Treatment Technology to predict what limits they can achieve for water quality parameters of concern on a site-specific basis. The Board then uses these predictions when setting end-of-pipe limits that are most protective to aquatic life.

3.1.7 Nova Scotia

MWW systems are primarily owned and operated by the municipalities; however there are a number operated by private companies (e.g. mobile home parks) and government agencies (e.g. Parks Canada, Department of National Defence, Public Works). The province typically regulated the effluent discharge requirements through operating approvals according to the Water Activities Designation Regulations under the Nova Scotia *Environment Act* (1995). Effluent discharge criteria in the approvals reference the Atlantic Canada Standards and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage (Environment Canada 2000), which were adopted in 2003 superceding Nova Scotia guidelines of the same name established in 1992..

There are no universal limits in place for existing facilities. The oldest facilities would be required to achieve an 80-95% reduction in BOD_5 and TSS depending on the receiver. Newer facilities permitted prior to the 2000 guidelines would be expected to achieve generic objectives established for different receiving water classes; specifically, open ocean discharges must meet a 30/30 (BOD_5/TSS) criterion (mg/L), brackish water or

Table 3.2: Domestic Wastewater Effluent Quality Guidelines for Northwest Territories (NWT Water Board 1992)

Wastewater Flow Litres/Capita Day (Lcd) & Season	Parameter	Unit	Stream, River or Estuary (a)				Lake (a)		Marine (d)	
			Dilution (b)				Residence Time or Dilution (c)		Mixing Condition	
			> 10:1 < 100:1	> 100:1 < 1000:1	> 1,000:1 < 10,000:1	> 10,000:1	Tr > 5 yr	Tr < 5 yr	Open Coastline	Bay or Fjord
< 150 Lcd Summer	BOD_5	mg/l	30	80	100	360	30	80	360	100
	TSS	mg/l	35	100	120	300	35	100	300	120
	P (e)	mg/l	10	-	-	-	-	-	-	-
	F. Coli	CFU/dL	1,000 (f)	10,000 (f)	100,000 (f)	1,000,000 (f)	1,000 (f)	10,000 (f)	(g)	(g)
< 150 Lcd Winter	BOD_5	mg/l	No discharge	special permit	100	260	30	80	360	100
	TSS	mg/l			100	240	35	100	300	120
	P (e)	mg/l			-	-	-	-	-	-
	F. Coli	CFU/dL			1,000,000 (f)	1,000,000 (f)	1,000 (f)	10,000 (f)	(g)	(g)
150 to 600 Lcd Summer	BOD_5	mg/l	30	40	120	120	30	40	120	120
	TSS	mg/l	35	60	180	180	35	60	180	180
	P (e)	mg/l	9	-	-	-	-	-	-	-
	F. Coli	CFU/dL	10,000 (f)	10,000 (f)	100,000 (f)	1,000,000 (f)	1,000 (f)	10,000 (f)	(g)	(g)
150 to 600 Lcd Winter	BOD_5	mg/l	No discharge	special permit	100	120	30	40	120	120
	TSS	mg/l			100	180	35	60	180	180
	P (e)	mg/l			-	-	-	-	-	-
	F. Coli	CFU/dL			1,000,000 (f)	10,000,000 (f)	1,000 (f)	10,000 (f)	(g)	(g)
> 600 Lcd Summer	BOD_5	mg/l	25	30	80	80	25	30	80	80
	TSS	mg/l	30	30	70	70	30	30	70	70
	P (e)	mg/l	2	-	-	-	2	-	-	-
	F. Coli	CFU/dL	1,000 (f)	10,000 (f)	100,000 (f)	100,000 (f)	1,000 (f)	10,000 (f)	(g)	(g)
> 600 Lcd Winter	BOD_5	mg/l	No discharge	70	70	70	25	30	80	80
	TSS	mg/l		70	70	70	30	30	70	70
	P (e)	mg/l		-	-	-	-	-	-	-
	F. Coli	CFU/dL		10,000 (f)	1,000,000 (f)	10,000,000 (f)	1,000 (f)	10,000 (f)	(g)	(g)

[a] - untreated wastewater discharges are not permitted to any inland waters, except where specified by the Water Board

[b] - dilution = minimum average monthly stream flow/average daily wastewater flow

[c] - residence time = volume of lake (m^3)/annual outflow from lake (m^3/yr)

[d] - marine outfalls are to meet the design specifications of Appendix A in the NWT Water Board Guideline for the Discharge of Treated Municipal Wastewater

[e] - guidelines for phosphorus concentrations are flexible, site specific

[f] - guidelines for fecal coliform levels are intended to limit concentrations everywhere outside initial mixing zone to < 100 CFU/dL

[g] - bacteriological standards are a concern in this environment only where discharge might affect a fishery or recreation

restricted bays a 20/20 criterion, and rivers and lakes a 10/10 or 5/5, depending on the size and dilution available. Subsequently, site-specific effluent guidelines have been established based on assessment of assimilative capacity (below).

As described above, environmental risk is somewhat considered in the BOD_5 and TSS criteria applied to new MWW treatment facilities. A receiving water assessment is recommended in the case of all new MWW treatment facilities and mandatory in the case of facilities discharging over 50,000 US gal/day (189 m^3/day). Receiving water studies are conducted by a consultant for the proponent to establish discharge limits that will not create an adverse affect. These focus on assessment of water quality and factors affecting mixing (Environment Canada 2000) to determine waste assimilation capacity, although sampling of indigenous aquatic biota may also be required. Limits are based on the assimilative capacity of the specific receiving water, taking into account water uses. For example, freshwaters used for irrigation will affect volume and quality requirements during low flow periods. Water quality models may range from simple mass balance calculations, as described in Section 3.1.1 or may be more complex; guidance is available to assist in model selection (Environment Canada 2000). Rarely, permits require monitoring of the receiving water for parameters such as dissolved oxygen. Also, discharges to tidal estuaries are sometimes limited to high or ebbing tides. Some large cities on the coast of N.S. have been allowed to continue to discharge untreated sewage to the ocean, due to the high cost of providing collection and treatment.

3.1.8 Nunavut

Municipal wastewater in Nunavut is managed through multiple Acts and responsible parties including: Institutes of Public Governance (IPG) derived from the Nunavut Land Claims Agreement (particularly the Nunavut Water Board who issues the water licenses), the Hamlets (municipalities) who are usually the water licensees, Indian and Northern Affairs Canada (INAC) who regulate and enforce wastewater through the *Nunavut Water & Surface Rights Tribunal Act*, the federal Department of Fisheries and Oceans (DFO) who administers the *Fisheries Act*, the Nunavut Department of the Environment (DOE) who administer the *Nunavut Environmental Protection Act*, and the Department of Community & Government Services (CGS) who are responsible for wastewater infrastructure in the Territory.

Facilities discharging more than 50 m^3/d are licensed as well as some smaller facilities. Generic guidelines exist for BOD_5, TSS, pH, oil and grease, and fecal coliforms based on categories that consider water use (volumes) per capita served, as well as receiver

type and mixing characteristics (Table 3.3; Nunavut Water Board 2000). The Nunavut criteria are very similar to those used by the Northwest Territories (Table 3.2). In addition to the criteria presented in Table 3.3, effluent pH must be maintained between 6 and 9, and oil and grease should not exceed 5 mg/L or produce a visible sheen. However, these guidelines are applied site-specifically through water licences for each facility and may thus be altered to accommodate site-specific considerations. Other than the categories taking into account receiver type and dilution, mixing and/or retention time characteristics, there are no environmental risk-based guidelines for MWWE management in Nunavut.

3.1.9 Ontario

All (460) municipal sewage treatment plants in Ontario are owned by the municipalities and operated by either the municipality, the Ontario Clean Water Agency (OCWA) or a privately contracted company. All discharges are regulated under the Ontario Water Resources Act (1990), which is administered by Ontario's Ministry of Environment. When warranted, other legal requirements that are relevant with respect to discharges such as the Fisheries Act can be enforced where there are deleterious effects to water.

Minimum level end-of-pipe limits have been established for CBOD5, TSS and total phosphorus (phosphorus does not apply to lagoons), with limits for total ammonia nitrogen, E. coli and total residual chlorine included on a case-by-case basis (Table 3.1; OMOEE 1994b). These limits are being updated as per MOE commitments under the 2002 Canada/Ontario Agreement Respecting the Great Lakes Basin Ecosystem to develop a management framework for municipal sewage treatment plants. The generic limits, which reflect the performance of the best available technology, are applied to new and expanding facilities when approval is sought under the Ontario Water Resources Act. More stringent requirements may be required based on an assessment of the receiving water quality. Older approvals may reflect less stringent performance expectations.

Provincial policy outlines the goal of ensuring that surface water quality is satisfactory for aquatic life and recreation and that water uses that require more stringent water quality be protected on a site-specific basis (OMOEE 1994c). Applications for, or amendments of, approvals to discharge typically must assess potential impacts on receiving waters by evaluating whether provincial water quality criteria will be exceeded as a result of the discharge. This is typically done using simple mass balance modelling that takes into account the background concentrations and flow/dilution as well as the effluent concentration and flow under typical and worst case conditions (OMOEE 1994a). The

Table 3.3: Domestic Wastewater Effluent Quality Guidelines for Nunavut Territory, 2000

Wastewater Flow Litres/Capita Day (Lcd) & Season	Parameter	Unit	Stream, River or Estuary (a)				Lake (a)		Marine (d)	
			Dilution (b)				Residence Time or Dilution (c)		Mixing Condition	
			> 10:1 < 100:1	> 100:1 < 1000:1	> 1,000:1 < 10,000:1	> 10,000:1	Tr > 5 yr	Tr < 5 yr	Open Coastline	Bay or Fjord
< 150 Lcd Summer	BOD_5	mg/l	30	80	100	360	30	80	360	100
	TSS	mg/l	35	100	120	300	35	100	300	120
	F. Coli	CFU/dL	1,000 (e)	10,000 (e)	100,000 (e)	1,000,000 (e)	1,000 (e)	10,000 (e)	(f)	(f)
< 150 Lcd Winter	BOD_5	mg/l	No discharge	special permit	100	260	30	80	360	100
	TSS	mg/l			100	240	35	100	300	120
	F. Coli	CFU/dL			1,000,000 (e)	1,000,000 (e)	1,000 (e)	10,000 (e)	(f)	(f)
150 to 500 Lcd Summer	BOD_5	mg/l	30	40	120	120	30	40	120	120
	TSS	mg/l	35	60	180	180	35	60	180	180
	F. Coli	CFU/dL	10,000 (e)	10,000 (e)	100,000 (e)	1,000,000 (e)	1,000 (e)	10,000 (e)	(f)	(f)
150 to 500 Lcd Winter	BOD_5	mg/l	No discharge	special permit	100	120	30	40	120	120
	TSS	mg/l			100	180	35	60	180	180
	F. Coli	CFU/dL			1,000,000 (e)	10,000,000 (e)	1,000 (e)	10,000 (e)	(f)	(f)
> 500 Lcd Summer	BOD_5	mg/l	25	30	80	80	25	30	80	80
	TSS	mg/l	30	30	70	70	30	30	70	70
	F. Coli	CFU/dL	1,000 (e)	10,000 (e)	100,000 (e)	100,000 (e)	1,000 (e)	10,000 (e)	(f)	(f)
> 500 Lcd Winter	BOD_5	mg/l	No discharge	70	70	70	25	30	80	80
	TSS	mg/l		70	70	70	30	30	70	70
	F. Coli	CFU/dL		10,000 (e)	1,000,000 (e)	10,000,000 (e)	1,000 (e)	10,000 (e)	(f)	(f)

Note: Footnotes were not defined in orginal document.

process is somewhat similar to that previously described for Alberta (Section 3.1.1), but is not documented in such detail. The specific parameters and limits to be included in each facility's permit are assessed site-specifically at the discretion of the Ministry of Environment.

3.1.10 Prince Edward Island

Treatment systems in Prince Edward Island may be municipally, privately, government or industrial-owned and operated. MWWE is managed under the Prince Edward Island Environmental Protection Act. Current policy is that all new or upgraded systems must satisfy a minimum secondary treatment and it is expected that, by 2007, all treatment systems will be meet this level. Generic limits for BOD, TSS and fecal coliforms are applied to all new and upgraded facilities (Table 3.1) and receiving environment assessments are used to determine if more advanced wastewater treatment is required Practises related to setting MWWE effluent limits and determining requirements for receiving water assessments are not specifically documented in any provincial regulations or guidelines.

3.1.11 Quebec

Municipal wastewater treatment facilities in Quebec are owned by municipalities and are operated either by the municipality or a private company. The Ministry of the Environment authorizes any expansion/construction and sets effluent quality limits through the *Environment Quality Act* (Loi sur la qualité de l'environnement). A mechanism for enforcing effluent compliance is presently under development; current compliance is based on voluntary cooperation by individual facilities.

There are no generic end-of-pipe limits for MWWE in Quebec, but limits are based on performance guidelines established for different treatment technologies (Ministry of Municipal Affairs internal, unpublished documents). Limits may be set for BOD_5, TSS, total phosphorus and fecal coliforms. Secondary treatment facilities are also required to measure COD and ammonia. Chlorination of effluent is prohibited.

Similar to the Water Quality Based Effluent Limits Procedures developed by Alberta Environmental Protection (Section 3.1.1), the Quebec approach is modeled after the one developed by the U.S. Environmental Protection Agency (USEPA 1991, Section 3.2). It involves a simple mass balance model approach to compute an effluent discharge objective that takes into account background levels (concentration x flow) and the discharge load such that the applicable water quality criterion (for the most stringent water use) will not be exceeded at the end of mixing zones (additional details in Section

3.7). Effluent discharge objectives are applied for facilities on a site-specific basis to protect and recover aquatic life and downstream uses. If discharge impact is determined to be low, only fine screening may be necessary. To date, objectives have only been set for BOD_5, TSS, total phosphorus, fecal coliforms, ammonia, H_2S, and acute toxicity, but the same approach could be used for any other contaminant following published guidance (MEF 1996). Some objectives may not be adopted as stringently as is indicated by the environmental risk model, due to technological limitations; for example, BOD_5 limits will not be set lower than 15 mg/L.

3.1.12 Saskatchewan

The municipalities own the majority of the wastewater treatment facilities in the province and the Saskatchewan Water Corporation owns two facilities. Saskatchewan Environment regulates all the wastewater effluent discharges according to The Water Regulations (2002) under the *Environmental Management and Protection Act* (EMPA; 2002). The Water Regulations state that, unless otherwise set out in a permittee's permit, secondary sewage treatment facilities must discharge effluent with no more than 30 mg/L of $CBOD_5$ or BOD_5, and not more than 30 mg/L TSS. A companion, non-regulatory document identifies typical effluent levels of BOD_5, TSS, total phosphorus, total nitrogen and total coliforms for different types of facilities (Table 3.4), which may be used as guidance for establishing limits on a site-specific basis (see below). Effluent disinfection is sometimes required.

Effluent discharge limits are most often technology-based, but site-specific limits are sometimes established that take into account the nature and volume of the effluent, climate, assimilative capacity of the receiver and effluent mixing characteristics, natural quality and character of the receiving water, and expected uses of the receiving water. Compliance monitoring of wastewater facilities by municipalities may include water quality monitoring of the receiving stream. Provincial Surface Water Quality Objectives outline the general quality objectives applicable to all Saskatchewan waters receiving effluents including mixing zone criteria for receiving waters adjacent to effluent outfalls. These are not legislated standards, but can be incorporated into the permitting process for wastewater effluents.

3.1.13 Yukon Territory

The Yukon Water Board issues licenses for municipal wastewater treatment facilities under the *Yukon Waters Act* (1992). The Water Resources Division of the Yukon Department of Environment administers and audits the performance of each facility

Table 3.4: Typical Effluent Quality from Various Sewage Treatment Processes (Saskatchewan Environment 2002)

Process	BOD_5 mg/L	TSS mg/L	Total P mg/L	Total N mg/L	Total Coliforms/ 100mL
Primary					
(including anaerobic lagoons)	75-150	50-110	5-7	25-45	$>2x10^6$
with phosphorus removal	45-85	25-50	1-2	20-40	$>2x10^5$
Secondary					
biological (mechanical)	10-25	10-25	3.5-6.5	15-35	$2x10^4$-$2x10^5$
aerated lagoons	15-30	20-35	4-7	20-40	$2x10^3$-$2x10^5$
facultative lagoons - spring	25-70	20-60	3.5-7	20-35	$<2x10^3$-$2x10^5$
- fall	10-30	10-40	2-5	5-20	$2x10^2$-$2x10^4$
Advanced secondary with chemical treatment (phosphorus control)	5-15	10-30	0.5-1.5	15-35	$2x10^2$-$2x10^4$

under the license, except with respect to any effluent toxicity tests, which Environment Canada administers under the *Fisheries Act*. Guidelines for Municipal Wastewater Discharges in the Yukon were published in 1983 and are presently being updated. Licenses are issued for municipal waste on a site-specific basis and may include limits for BOD_5, TSS, phosphorus and fecal coliforms.

The Yukon Territory does not formally follow any environmental risk-based approach for managing MWWE but environmental considerations may be taken into account during the licensing process. Specifically, secondary facilities (there are only 2 in the territory) and lagoons must proceed through an environmental assessment process followed by a full review by a series of territorial and federal agencies before obtaining a water license. The Water Board acts independently from regulators and sets the final standards and monitoring conditions. When municipalities apply for a license, they are subject to the effluent standards set by other agencies.

The territory uses environmental risk-based decision processes to set end-of-pipe limits for industries. There is a comprehensive system of reviewing project descriptions and subjecting them to a thorough environmental assessment. Federal and territorial agencies and other stakeholders make recommendations and interventions to the applicant and the Water Board. Performance standards such as the federal Metal Mining Effluent Regulation limits and the CCME guidelines for protection of aquatic life are used as a starting point, while site conditions will often dictate modifications to limits.

3.1.14 Federal Facilities

There is no centralized management of wastewater facilities owned and operated by the federal government of Canada or First Nations. Effluent limits at such facilities are established by the federal department responsible for the facility, typically in accordance with the "Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments" (Environment Canada 1976), or according to requirements of the province in which the facility operates, whichever is more stringent. In some cases, notably the Department of National Defence, more stringent requirements have been developed. The federal guidelines specify that "generally, secondary treatment or equivalent should be the minimum acceptable treatment". Environmental risk-based criteria are generally not applied, except where a facility is required to meet provincial requirements.

3.2 United States

Authorized by the Clean Water Act (CWA), point source discharges to surface waters (including MWWE) are regulated under the National Pollutant Discharge Elimination System (NPDES) permit program. In most cases, the USEPA has delegated the responsibility for NPDES permits (and therefore, regulation of MWWE) to each state while retaining oversight of the program. Minimum water quality standards are set by the EPA, but states with delegated authority can set more stringent requirements. NPDES permits are typically issued at five-year intervals on a site-specific basis, taking into consideration the impact of the proposed discharge on the quality of the receiving water relative to the state Water Quality Standards (WQS). Effluent limits are specified in the NPDES permit to ensure that receiving water discharges do not exceed the state WQS criteria.

3.2.1 Water Quality Standards

The CWA requires that every state develop WQS applicable to all water bodies within the state. Guidance for WQS is provided in the USEPA (1994b) *Water Quality Standards Handbook*. The WQS, which must be reviewed/revised on a three year basis, must be approved by the USEPA and should a) include provisions for restoring and maintaining the chemical, physical and biological integrity of state waters, b) provide, wherever attainable, water quality for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water ('fishable/swimmable'), and c) consider the use and value of state waters for public water supplies, propagation of fish and wildlife, recreation, agriculture, industrial purposes and navigation. The WQS are composed of three key parts.

The first part of the WQS involves use designations for water bodies based on an assessment of beneficial uses of those water bodies. The CWA describes various 'desirable' uses for water bodies that should be protected, including public water supply, recreation and propagation of fish and wildlife. More specific uses (e.g., cold water aquatic life, agricultural and other sub-classifications) or uses not indicated in the CWA may be designated according to state values, as long as they support the defined 'fishable/ swimmable' goals.

The second part of the WQS includes numerical and/or narrative water quality criteria sufficient to protect each of the designated uses assigned to the specific receiving water body. Numerical criteria define the magnitude (the allowable concentration of a specific parameter), duration (the period of time over which the in-stream concentration is

averaged for comparison with criteria concentrations) and frequency (how often criteria may be exceeded) for each of up to 126 priority parameters as summarized in the USEPA *Gold Book* (i.e., *Quality Criteria for Water*, USEPA 1986; 2002) and other site-specific parameters, as required. States may establish numeric criteria using EPA guidance (e.g., USEPA 1991) modified to reflect site-specific conditions or other scientifically defensible methods, or use EPA derived limits. The WQS numerical water quality criteria may be values expressed as levels (e.g., pH), constituent concentrations or mass loadings (e.g., metals, organic compounds), toxicity units (e.g., whole effluent toxicity) or numbers deemed necessary to protect designated uses (e.g., biological indices). The EPA criteria for the protection of aquatic life address both short-term (acute) and long-term (chronic) effects on both freshwater and saltwater species. Human health criteria are designed to protect people from exposure resulting from consumption of water or fish/shellfish. The WQS narrative criteria may supplement numeric criteria or provide the basis for limiting discharge of specific parameters where the state has no numeric criteria for the parameter or to limit toxicity where the toxicity cannot be traced to a specific pollutant. In general, the narrative criteria are statements that describe the desired water quality goal (e.g., requiring that discharges be “free from toxics in toxic amounts” or “free of objectionable colour, odour, taste and turbidity”). The use of toxicity testing and whole effluent toxicity (WET) limits is generally based upon narrative water quality criteria and/or in some cases a numeric criterion for toxicity (either expressed as a threshold toxic effluent concentration or as toxic units-TU) may by incorporated into the WQS. The WQS criteria may vary from jurisdiction to jurisdiction, but derivation of the water quality-based effluent limits (WQBEL) has generally followed guidance outlined in the *Technical Support Document for Water Quality-based Toxics Control* (USEPA 1991). Inclusion of additional biological, sediment and wildlife criteria is currently encouraged by the USEPA and these criteria are likely to be incorporated as part of the NPDES permitting program in the future.

The third part of the WQS includes adoption of an antidegradation policy that includes the methods used to implement the policy. Antidegradation policies generally provide three tiers of protection from degradation of water quality. Tier 1 includes protection of water uses in existence as of November 28, 1975, the date of the EPA’s first Water Quality Standards Regulation. Tier 2 includes protection of water quality necessary to support propagation of fish, shellfish, wildlife and recreation in waters that currently meet the applicable criteria. Before water quality in Tier 2 waters can be lowered there must be an antidegradation review to ensure adequate management, technology, and controls have been applied and to ascertain the degradation is justified and in the public best

interest based on economic or social considerations. In these cases, site-specific alternative criteria may be established for the receiving water body. Tier 3 antidegradation protects the quality of outstanding national resources (e.g., waters of national or state parks, wildlife refuges, water of exceptional recreational or ecological significance). With the exception of short-term and temporary changes in water quality, no new or increased discharges are permitted to Tier 3 waters or their tributaries.

3.2.2 Effluent Limits

Section 301 of the U.S. *Clean Water Act* required all publically owned treatment works (POTW) to achieve effluent limits based on secondary treatment by July 1st, 1977 and additional requirements based on Best Practicable Wastewater Treatment had to be met by July 1st, 1983.

Effluent limits specified in the NPDES permit consider both the technology available to treat the effluent (i.e., technology-based effluent limits) and protection of designated uses of the receiving water (water quality-based effluent limits). Technology-based regulations apply to all MWWE treatment plants and represent the minimum level of effluent quality attainable by secondary treatment. If, after technology-based limits are applied, the permit writer projects that a point source discharge may exceed any WQS criterion in the receiver, a water quality-based effluent limit (WQBEL) must be imposed. WQBELs involve a site-specific evaluation/characterization of the MWWE itself and its effect on the receiving water.

The technology-based regulations provide secondary treatment standards as well as provisions for special considerations regarding combined sewers, less concentrated influent wastewater for combined and separate sewers, industrial wastes, trickling filters, waste stabilization ponds and discharges to marine environments. Secondary treatment standards include limitations for BOD_5, TSS and pH (Table 3.5). Where nitrification is occurring in a treatment process (e.g., facilities with high retention times or underloaded volumes), carbonaceous BOD_5 ($CBOD_5$) may be substituted for BOD_5 to minimize false indications of poor facility performance. In addition, chemical oxygen demand (COD) and total organic carbon (TOC) may be substituted for BOD_5 when a long-term BOD:COD or BOD:TOC correlation has been established. Equivalent-to-secondary treatment limits, which are greater than the secondary treatment standards, may be applied to facilities with trickling filters or waste stabilization ponds (in part, to prevent costly treatment plant upgrades) and secondary treatment plants under various geographical, climatic or seasonal conditions that cannot meet secondary treatment efficiencies. However, receiving water quality must not be adversely affected by the

Table 3.5: Comparison of MWWE Universal Discharge Criteria for International Jurisdictions

				BOD_5				$CBOD_5$				COD		TSS				Total Nitogen		Total Phosphorus		Ammonia			Dissolved Oxygen	pH	Oil and Grease		Fecal Coliforms		Chlorine Produced Oxidants	Total Residual Chlorine
Jurisdiction	**Sub-jurisdiction**	**Applicable Legislation[a]**	**Category**	General	Monthly	Weekly	% Removal	General	Monthly	Weekly	% Removal	General	% Removal	General	Monthly	Weekly	% Removal	General	% Removal	General	% Removal	General	Monthly	Weekly	General	General	Monthly	Weekly	Monthly	Weekly	General	General
				mg/L	mg/L	mg/L		mg/L	mg/L	mg/L		mg/L		mg/L	mg/L	mg/L		mg/L		mg/L		mg/L	mg/L	mg/L	mg/L	Units	mg/L	mg/L	Org/100 mL	Org/100 mL	ug/L	mg/L
United States	General	CWA Section 301(b)(1)(B), 40 CFR Part 133	Secondary Treatment	-	30	45	85	-	-	-	-	-	-	-	30	45	85	-	-	-	-	-	-	-	-	Range from 6.0 to 9.0	-	-	-	-	-	-
			Equivalent-to-Secondary Treatment	-	30	45	-	-	-	-	-	-	-	-	45	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Alternative State Requirements	-	-	-	-	-	-	-	-	-	-	-	37 - 120[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Florida	FAC Rule 62-600, FS Section 403.086	Freshwater Outfalls	-	-	-	-	20	-	-	90	-	-	20	-	-	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Marine/Estuarine Outfalls	-	-	-	-	25	-	-	85	-	-	30	-	-	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Advance Waste Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	New Jersey	NJAC 7:14A-12	Secondary Treatment	-	30	45	85	-	-	-	-	-	-	-	30	45	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			All Facilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.0 minimum	Range from 6.0 to 9.0	10	15	200	400	0.1	-
	Ohio	OAC 3745-1-05	All Facilities (BADCT) - Yearly	-	-	-	-	-	10	15	-	-	-	-	12	18	-	-	-	-	-	-	1.0	1.5	-	-	-	-	126	235	-	0.038 (Max.)
			All Facilities (BADCT) - Summer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	4.5	-	-	-	-	-	-	-	-
			All Facilities (BADCT) - Winter	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Washington	WAC Chapter 173-221	All Facilities	-	30	45	85	-	-	-	-	-	-	-	30	45	85	-	-	-	-	-	-	-	-	Range from 6.0 to 9.0	-	-	200	400	-	-
Europe	Finland, Sweden, United Kingdom	EU UWWTD 91/271/EEC	Standard EU Directive	25	-	-	70 - 90	-	-	-	-	125	75	35	-	-	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Finland EPA 86/2000, EPD 169/2000	High Elevations - 2,000 to 10,000 PE	-	-	-	40	-	-	-	-	-	-	60	-	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Swedish Environmental Code	High Elevations - more than 10,000 PE	-	-	-	40	-	-	-	-	-	-	35	-	-	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		UWWT Regulations SI 1994 No. 2841 (England and Wales), SI 1994 No. 2842 (S.144)(Scotland) and SR 1995 No. 12 (Northern Ireland)	Sensitive Areas - 10,000 to 100,000 PE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	70 - 80	2	80	-	-	-	-	-	-	-	-	-	-	-
			Sensitive Areas - more than 100,000 PE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	70 - 80	1	80	-	-	-	-	-	-	-	-	-	-	-
	Germany	Waste Water Ordinance June 2004 (Federal Law Gazette I p. 1106)	Size Category 1 Less than 60 kg/d BOD_5 (raw)	40	-	-	-	-	-	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Size Category 2 60 to 300 kg/d BOD_5 (raw)	25	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Size Category 3 300 to 600 kg/d BOD_5 (raw)	20	-	-	-	-	-	-	-	90	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-
			Size Category 4 600 to 6,000 kg/d BOD_5 (raw)	20	-	-	-	-	-	-	-	90	-	-	-	-	-	18	-	2	-	10	-	-	-	-	-	-	-	-	-	-
			Size Category 5 Greater than 6,000 kg/d BOD_5 (raw)	15	-	-	-	-	-	-	-	75	-	-	-	-	-	13	-	1	-	10	-	-	-	-	-	-	-	-	-	-

[a] - CWA = Clean Water Act, CFR = Code of Federal Regulations, FAC = Florida Administrative Code, FS = Florida Statutes, NJAC = New Jersey Administrative Code, OAC = Ohio Administrative Code, WAC = Washington Administrative Code, EU UWWTD = European Union Urban Waste Water Treatment Directive, EPA = Environmental Protection Act, EPD = Environmental Protection Decree, UWWT = Urban Waste Water Treatment, SI = Statutory Instrument, SR = Sta

[b] - Alternative secondary regulation varies from state to state

discharge. In some cases, alternative state requirements (ASRs) may be established (based on climatic or geographic location, the type of technology used, or any other supportable criteria) allowing higher limits than either the secondary treatment standards or the equivalent-to-secondary limits.

The general process for determining whether technology-based regulations are sufficient or whether WQBEL are required is described in the Technical Support Document for Water Quality-based Toxics Control (USEPA 1991) and the NPDES Permit Writers' Manual (USEPA 1996) and summarized briefly here. The need for determining WQBEL permit limits for the protection of aquatic life or human health may not require facility-specific effluent monitoring data. In these cases, dilution ratios, type of treatment facility, existing data (either historical data applicable to the specific facility or other similar treatment facility data may be used), compliance problem or toxic impact history and the type of receiving water body and its designated uses must be taken into consideration to determine whether the discharge will exceed, has the reasonable potential to exceed, or contributes to an exceedence of an ambient (WQS) criterion. In cases in which effluent characterization is utilized, pollutants of concern are identified (based on historical effluent monitoring data and reports, knowledge of industry discharges to the facility, etc.) and analytical effluent monitoring data (eight to 12 samples analyzed for *Gold Book* parameters is recommended minimum) are collected. The state WQS may require that chemical-specific, whole effluent toxicity (WET) and biological criteria be utilized. Based on the effluent concentration of each pollutant of concern and the effluent dilution at the edge of the mixing zone, models are used to produce estimates of the receiving environment parameter concentration under various flow regimes (e.g., low flow 7Q10, annual average). Generally, the applicant is responsible for providing the characteristics of the discharge (e.g., effluent flows, effluent characterization data, mixing zone details, WET values) to the appropriate regulatory authority in determining WQBEL. The regulatory authority then determines the expected concentration of each effluent parameter in the receiver. Each resulting parameter concentration is then compared to the numerical and/or narrative WQS based on the most restrictive human health (reference ambient concentration) and/or aquatic life (acute and chronic toxicity) criteria. If this evaluation projects that a criterion (or criteria) exceeds or has reasonable potential to cause or contribute to an exceedence of the WQS criterion, WQBEL permits are required. If no reasonable potential for exceeding the WQS criteria exists, no WQBEL are required for the NPDES permit period. However, technology-based effluent limits must still be applied. For those parameters requiring WQBEL, wasteload allocations

(WLA) or total maximum daily loads (TMDL) are determined and permit limits are developed for the facility.

3.2.3 Compliance Monitoring

NPDES compliance is verified through self-monitoring programs, discharge monitoring reports and site inspections. The NPDES permit generally specifies the effluent limitations, schedules of compliance and reporting requirements. In addition, self-monitoring procedures including frequency of analysis, sampling location and procedures, acceptable or required analytical techniques and frequency of reporting are normally stipulated in the permit. Self-monitoring reports generally include any information relevant to the conditions outlined in the NPDES permit for compliance as well as progress with scheduling milestones. These data must be entered into the Permit Compliance System (PCS) database, which will automatically 'flag' violations of permit limitations, compliance schedules and reporting requirements. These 'progress' reports are generally required on a monthly basis. The Discharge Monitoring Report (DMR) program evaluates the permitee's ability to analyze and report accurate data and is intended to improve overall laboratory analytical performance for self-monitoring data. DMR/Quality Assurance (QA) performance results are compiled annually. Inspections are conducted by the regulatory authority to address specific violations/problems and to verify compliance with permit conditions. Inspections may include reviewing records, inspecting treatment facilities, assessing progress with compliance schedules, evaluating laboratory facilities and performance and collecting samples for analysis or 'splitting' samples for concurrent analysis. Inspections are carried out as stipulated in the NPDES Compliance Inspection Manual on at least an annual basis.

Most states (or designated municipal authorities) issue permits for sewer users that are considered "significant" based on the criteria of the responsible authority. Such permits may require pretreatment prior to discharge to municipal sewers as well as compliance monitoring. Non-compliance (i.e., exceedence of an effluent discharge limit for a specific substance or for whole effluent toxicity) will typically trigger regulatory action, such as a charge and/or a requirement to initiate an investigation of cause. When a charge is laid upon a municipal treatment facility and it is suspected that the cause is/was a sewer discharge, the facility may initiate a sampling program within the sewer grid to identify the source. If identified, the municipal treatment facility may launch legal action against the source discharger to recover the associated costs.

3.2.4 State Specific Approaches

Within the framework described above, individual states typically develop their own regulatory framework. Examples from different parts of the country illustrate how the implementation can vary from state to state.

Florida

The NPDES permitting program is administered through the Florida Department of Environmental Protection (FDEP) on behalf of the USEPA. Florida has adopted five designated uses, including Potable Water Supplies (Class I), Shellfish Propagation/Harvesting (Class II), Recreation/Ecology (Class III), Agricultural Water Supplies (Class IV) and Navigation, Utility and Industrial (Class V) classifications. The system does not include any sub-categorizations as observed in many other states. The water quality classifications are arranged in order of the degree of protection required; with Class I water generally having the most stringent water quality criteria and Class V the least. The water quality criteria include 106 narrative and/or numeric values. Some criteria may be water hardness dependent (e.g., certain metals) or water pH dependent (e.g., pentachlorophenol). Biological criteria for each water use designation include bacteriological counts and biological integrity (i.e., relative difference of Shannon-Wiener Diversity Index scores for benthic invertebrate communities upstream and downstream of the discharge). The water quality criteria apply to areas outside of mixing zones under average annual flow conditions.

The Florida WQBEL process generally follows standard EPA protocols (USEPA 1991). Specifically, WQBELs are based on a review of water quality data applicable to the portion of the water body potentially impacted by the discharge. These data may be found in previous permit applications and/or through existing data on ambient water quality in the FDEP files. Without sufficient historical data, the available assimilative capacity of the receiver is determined through computer model procedures (approved by the FDEP or USEPA). The FDEP is responsible for determining the WQBEL based on information provided by the applicant (e.g., effluent characteristics and volume, technology utilized, etc.) and existing FDEP files (e.g., ambient water quality). In addition, minimum monitoring frequency requirements based on the permitted capacity of the facility are stipulated in the NPDES permit. Compliance monitoring and reporting conform to the procedures discussed above.

New Jersey

In New Jersey, the NPDES permitting program is administered through the New Jersey Department of Environmental Protection (NJDEP) on behalf of the USEPA. The WQS in New Jersey assign designated uses to each of seven water body categorizations (including two freshwater, three estuarine, one coastal and one special categories) and a separate Delaware River and Delaware Bay categorization. Freshwater classes may have sub-categories based on whether the waters are deemed suitable for trout. The water quality criteria include 136 narrative and/or numeric values. Specific water quality criteria are applied to the water body classes (or sub-categories) rather than the designated use as in some other states. The numeric values generally do not incorporate water hardness- or pH-dependent equations. With the exception of bacteriological criteria, no other *in situ* biological criteria have been established in New Jersey. The water quality criteria apply to areas outside of mixing zones. Depending on the effluent parameter, the design flow in the establishment of the state WQS ranges from the minimum average one-day flow with a statistical recurrence interval of 10 years (MA1CD10; acute aquatic life) to a minimum average 30 consecutive day flow with a statistical recurrence interval of 10 years (MA30CD10).

For any parameters that are found to exceed, or have the reasonable potential to exceed the state WQS, WQBEL must be determined according to the standard EPA protocols (USEPA 1991). The process is very similar to that described above for Florida, with the issuance of the NJPDES permit specifying discharge limits, monitoring requirements and reporting requirements for the facility.

Ohio

In Ohio, the NPDES permitting program is administered through the Ohio Environmental Protection Agency (OEPA) on behalf of the USEPA. Aquatic life habitat (seven sub-categorizations generally based on annual ambient water temperature of the water body), water supply (three sub-categories including potable, agricultural and industrial), aesthetics and recreation (three sub-categories including bathing waters, primary and secondary contact) constitute the four use designations for state waters. The most stringent water quality criteria associated with any one of the use designations for a particular water body will apply. Water quality criteria applicable to aquatic life habitat, water supply, aesthetic and recreation designations include 21, 13, 6 and 3 narrative and/or numeric values, respectively. Additional and/or separate water quality criteria are applicable within the Lake Erie drainage basin and Ohio River drainage basin.

For the purpose of setting WQBEL, chemical-specific (versus biological) criteria in Ohio apply as either 'Outside Mixing Zone' (receiving water in which the effluent is reasonably well mixed as defined in administrative documents) or 'Inside Mixing Zone' (end-of-pipe maximum effluent limits or criteria to be met a short distance from the effluent pipe). Some aquatic life habitat criteria may be water hardness dependent (e.g., certain metals) or pH dependent (e.g., pentachlorophenol). Biological indices are used, in part, to define various warmwater habitats in the aquatic life habitat use designation. The same indices (i.e., Index of Biotic Integrity and Modified Index of Well-being and the Invertebrate Community Index) are also utilized as the basis for state biological criteria. The biological criteria are numerical values assigned according to organism group, biological index, site type, eco-region and/or aquatic life use designation. Biological surveys must be completed on an annual basis according to state protocols (Ohio EPA 1988). Any failure to attain the biological criteria must be investigated to determine potential cause (e.g., toxicity, natural variability) and may result in reassignment of use designations and/or WQBEL, depending on the outcome. WQBEL are based on 7Q10 and 1Q10 stream design flows for chronic and acute aquatic life criteria, respectively, and HMQ (Harmonic Mean Flow) for agricultural, human health and aesthetic criteria.

For any parameters that are found to exceed, or have the reasonable potential to exceed the state WQS, WQBEL must be determined according to the standard EPA protocols (USEPA 1991). In Ohio, the determination of reasonable potential is based on the ratio of the projected effluent quality to the wasteload allocation. This comparison results in the assignment of the specific parameter to one of five groups, each of which has an associated water quality-based permit condition recommendation that may range from establishing a chemical-specific limit, final effluent monitoring or determination that the specific parameter is not likely to pose a risk to designated uses. In waters of the Lake Erie basin, additional conditions may be applied based on findings of elevated concentrations of specific parameters in fish tissues. Compliance monitoring and reporting frequency for a facility typically follows standard timelines (as discussed above).

Washington

The NPDES permitting program is administered through the Washington State Department of Ecology on behalf of the USEPA. Washington has separate use designations based on whether the environments are freshwater or marine. Freshwater use designations contain four primary categories including aquatic life (contains six sub-categorizations generally based on fish usage characteristics of the water body),

recreation (contains three sub-categories including extraordinary primary, primary and secondary contact), water supply (four sub-categories including domestic, agricultural, industrial and stock water supplies) and miscellaneous (contains five sub-categories including fish harvesting, boating, navigation, wildlife habitat and aesthetics) uses. Marine use designations contain four primary categories including aquatic life (contains four sub-categories ranging from 'fair' to 'extraordinary'), shellfish harvesting, recreation (contains two sub-categories including primary and secondary contact) and miscellaneous (contains the same five freshwater sub-categories). As in other jurisdictions, the most stringent water quality criteria associated with any one of the use designations for a particular water body will apply. The water quality criteria include those outlined in the current National Recommended Water Quality Criteria (USEPA 2002) and include narrative and/or numeric values. Some criteria may be water hardness (e.g., certain metals), temperature or pH dependent (e.g., pentachlorophenol). Biological criteria for water use designation include bacteriological counts only. The water quality criteria apply to areas outside of mixing zones and may have duration periods specified as instantaneous, 1-hour averages, 24-hour averages or 4-day averages.

For any parameters that are found to exceed, or have the reasonable potential to exceed the state WQS, WQBEL must be determined according to the standard EPA protocols (USEPA 1991; Washington State Department of Ecology 2002). Therefore, the process is similar to that described above for Florida/New Jersey, with the issuance of the NPDES permit specifying discharge limits, monitoring requirements and reporting requirements for the facility.

3.3 Europe

3.3.1 Summary of the European Directive

EU Directives must be implemented in each EU Member State by the respective national authority in accordance with EU law. EU Member States are required to achieve the conditions set out in the EU Urban Waste Water Treatment Directive (91/271/EEC), which include installation of at least secondary treatment or an equivalent treatment, by December 31, 2000 at the latest, for discharges greater than 15,000 Population Equivalent (PE; 1 population equivalent equals the organic biodegradable load having a BOD_5 of 60 g O_2 / day measured on pre-treated effluent) or by December 31, 2005 at the latest for discharges from 2,000 to 15,000 PE.

The EU Urban Waste Water Treatment Directive concerns the collection, treatment and discharge of urban wastewater from certain industrial sectors. This EU Directive outlines universal standards for end-of-pipe compliance at all secondary treatment facilities. The standards are expressed as either numerical limits or percentage reduction values for COD, BOD_5 and TSS parameters. Alternate/additional end-of-pipe limits are also applied to facilities that discharge into waters at high elevation and/or into waters classified as 'sensitive areas' and 'less sensitive areas'. For these areas, PE provisions for each parameter may be implemented. 'Sensitive areas' include water bodies that are eutrophic or are susceptible to eutrophication, as well as water bodies from which potable water is collected. In addition to the aforementioned parameters, total nitrogen (TN) and total phosphorus (TP) limits that take PE into account are applied to treatment facilities that discharge to sensitive areas. Less stringent limits (including no limits) may apply to large water bodies (i.e., estuaries, coastal areas) that exhibit high water exchange and are not susceptible to eutrophication (or likely to become eutrophic) or experience oxygen depletion due to the discharge of urban wastewater. These areas are referred to as 'less sensitive'. Apart from identification of 'sensitive' and 'less sensitive' water bodies, the end-of-pipe limits do not take receiving environment conditions and/or dilution ratios into account for derivation of the limits. In addition, no biological criteria are stipulated in the EU Urban Waste Water Treatment Directive.

Compliance monitoring must be conducted on pre-treated influent and treated effluent at a frequency dependent upon the facility PE (may range from four to 24 samples per year dependent upon treatment plant size and whether effluent complies with provisions of directive). A certain percentage of 'failure-to-comply' events are allowable, but no repercussions are identified for those that fail to meet the directives consistently. On a bi-annual basis, Member States are required to provide the EU Commission with information concerning the program. Therefore, the EU Commission review and assess the information every two years and publish a summary report thereon.

3.3.2 Finland

Environmental Permit Authorities (of which there are three) administer MWWE environmental permits in adherence with Finland's Water Act (1961) and more recently, the Environmental Protection Act (86/2000; EPA)/Environmental Protection Decree (169/2000). The latter documents implement the EU Urban Waste Water Treatment Directive and other Directives. The Finnish Environment Institute (SYKE) reports nationally on the effectiveness of the environmental permits system, but is not involved with permit issuance.

The Finland EPA is a general act on the prevention of pollution, including various industry with no special provisions for MWWE treatment. Permits are issued on a site-specific basis. In general, permit applications involving discharges to surface water must include a report of the nature of the activity/process, a general description of the outfall waters including background water quality, flow, fisheries resources etc., any perceived or real environmental impacts (including aesthetic, fisheries etc.), and any other relevant material. The application is then publicized to allow for any input from interested stakeholders before final issuance of the permit. In general, permits issued in Finland stipulate that BOD_5, COD, TP, TN and TSS always be measured in MWWE. Limits must be at least equivalent to EU Directive values, but more stringent limits may be applied on a case-by-case basis. In addition, site-specific (narrative/numeric) limits may be applied for a number of additional parameters (listed in Finland's Environmental Protection Decree) if the substances are found to be present in the discharge. No rationale for utilizing more stringent limits or utilizing/selecting additional parameters and assigning respective limits for these parameters are identified in policy documents.

Compliance must meet the objectives set in the EU Urban Waste Water Treatment Directive. Treatment plants perform daily monitoring or monitor on a frequency stipulated in the discharge permit conditions. The Environmental Authority may also carry out inspections 'as often as necessary'. In Finland, any permit details (including accounts of environmental impacts, protection measures, public comments, etc.) are stored in an environmental protection database for future reference.

3.3.3 Germany

Jurisdictions (referred to as Bundeslander, of which there are 16) administer MWWE environmental permits in accordance with Germany's Waste Water Ordinance (2004; AbwV) and Federal Water Act (2002). The former document implemented several Council Directives including the EU Urban Waste Water Treatment Directive and other Directives. The Federal Office for Environmental Protection (Umweltbundesamt) provides the framework from which the Bundeslander issue permits.

The AbwV specifies the minimum requirements to be stipulated when granting a permit to discharge wastewater to surface waters for several industries. Permits are issued on a site-specific basis using technology-based effluent limits only (i.e., no risk-based approach employed). Limits for COD, BOD_5, ammonia-nitrogen, total nitrogen and total phosphorus are based on Best Available Technology (BAT). Limits are categorized according to size of the wastewater treatment facility (based on influent BOD_5 load). In addition, the Federal Water Act has a number of narrative criteria that may be included

in the permit terms. Chemical-specific characterization (apart from the BOD_5 determination) of the MWWE and receiving environment assessments are not conducted as part of the permitting process.

Compliance with the Waste Water Ordinance for any parameter is satisfied if approved government monitoring and analysis methods result in 80% of the sampling events meeting the stipulated limit and provided no result exceeds the limit by more than 100 percent.

3.3.4 Sweden

MWWE is subject to Swedish Environmental Code licensing rules, which succeeded the Environmental Act in 1999. The Code is a framework covering most of the legislation relevant to a wide range of environmental issues and falls under the auspices of the Swedish Ministry of the Environment. However, the Swedish Environmental Protection Agency oversees environmental practices in general and the Swedish Water and Wastewater Association is involved with technical and regulatory aspects of MWWE and other water treatment issues. Permits to discharge treated MWWE may be issued through Regional Environmental Courts and/or County Administrative Boards depending on the size of the facility. MWWE discharge in Sweden must meet the standards set out in the EU Urban Waste Water Treatment Directive.

The permitting process in Sweden is similar to that of Finland. Permits are issued on a site-specific basis. Permit applications may require an environmental assessment of the receiver prior to issuing the license. In addition, the application may be publicized to allow for any input from interested stakeholders. However, unlike Finland, the required effluent monitoring parameters for Swedish facilities generally only include those parameters outlined in the EU Waste Water Treatment Directive. In general, the resulting limits are more stringent than outlined in the EU Waste Water Treatment Directive. This is especially true for nitrogen since many of the treatment facilities in Sweden employ technologies to remove nitrogenous compounds.

3.3.5 United Kingdom

Environmental regulators responsible for MWWE (and industrial) discharges in the United Kingdom include the Environment Agency, the Scottish Environment Protection Agency and the Environment and Heritage Service of the Department of the Environment for Northern Ireland. Discharges from wastewater treatment works and combined sewer overflows are subject to conditional Discharge Consents (or Registered

Standards in Northern Ireland). The EU Urban Waste Water Treatment Directive was transposed into legislation across the United Kingdom in January 1995.

3.4 Australia (State of Victoria)

Under the Australian Environment Protection Act (1970), point source (including MWWE) discharge licenses and regulations are issued through the State/Territory Environmental Protection Agency (EPA) or equivalent. Policies pertaining specifically to MWWE discharge licensing requirements or setting of discharge limits are not available, although general environmental policies pertaining to wastewater discharges are outlined in the respective State Environment Protection Policy (SEPP). Discharge licenses are typically issued on a site-specific basis, taking into consideration the impact of the proposed discharge on the quality of the receiving water relative to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000). The ANZECC guidelines provide the basis for risk-based approaches to protect environmental values of waters. However, adherence to the guidelines is not mandatory nor do the guidelines have any formal legal status.

3.4.1 Environmental Quality Objectives and Indicators

The SEPP provides the framework to set beneficial uses and environmental values of surface waters that reflect environmental, social and economic benefits to the community. Under the SEPP, surface waters are categorized into segments according to geographical location and/or type of water body (aquatic reserves, estuarine/marine, river/stream and wetlands/lakes). Eleven beneficial uses to be protected are identified in the SEPP, including aquatic habitat, primary and secondary recreational contact, aesthetic values, indigenous cultural values, agriculture/irrigation water supply, aquaculture, industrial/commercial water supply, domestic water supply and fish/ shellfish harvesting. Aquatic habitat designations and the associated Environmental Quality Objectives and Indicators may be further subdivided depending on the degree of environmental modification (urbanization) to the receiving water body.

Environmental Quality Objectives and Indicators (the 'Objectives') for the beneficial uses are outlined in the SEPP. The Objectives include approximately 99 numerical/narrative water quality chemical-specific and five biological-specific 'trigger-values'. In addition, no acute lethality at the point of discharge and no chronic toxicity outside of the declared mixing zone are generally permitted (unless demonstrated that the toxicant is non-persistent and breaks down in the mixing zone). The Objectives also include provisions for sediment quality. The median and $75^{th}/25^{th}$ percentiles must be calculated from a

minimum of eleven data points collected from monthly monitoring over one year in order to determine compliance for chemical-specific criteria. Biological criteria require calculation of various benthic diversity/proportional indices through spring and autumn benthic sampling from riffle and pool habitats using standard rapid bio-assessment approaches.

3.4.2 Compliance Monitoring

The non-attainment of an objective triggers further investigation to assess risks to beneficial uses, from which mitigating actions may need to be implemented. This occurs "as soon as is practicable" using best management practices through implementation of an Attainment Program (which is a 10 year framework for mitigation).

3.5 New Zealand

Under the New Zealand Resource Management Act (1991), point source (including MWWE) discharge consents are issued through Regional Councils, of which there are 17. The Regional Councils are independent statutory authorities that make decisions independent of the New Zealand Ministry for the Environment (MfE), which acts purely as a policy unit of the Central Government. Applicants for resource consents generally require the submission of a site-specific receiving environment assessment (EA). Following review of the EA by the Regional Council, resource consents may be issued stipulating the environmental monitoring, compliance and reporting requirements for the consent holder. Chemical-specific limits may or may not be imposed, depending on the outcome of the risk assessment. Recently, guidance for the development of limits for MWWE and other discharges to New Zealand waters has been based on a risk-based approach as outlined in the New Zealand Municipal Wastewater Monitoring Guidelines (NZWERF 2002). The general principle of the Guidelines is that the higher the risk to the environment from the discharge, the greater the required scale of monitoring.

3.5.1 Risk-Based Approach

The process utilized in development of a risk-based monitoring program for MWWE in New Zealand is based on the 'HIAMP' process (Hazard Identification, Analysis, and Monitoring Plan). In this process, characterization of the MWWE discharge (the untreated waste stream and treatment process performance), the receiving environment and community values is completed. The MWWE discharge characterization involves rating at least ten parameters (or parameter groups) to produce a 'low', 'medium' and 'high' hazard rating for each of the constituents of the discharge. The number of parameters included in the characterization is partly dependent on the nature of the

influent (e.g., whether industrial sources feed into the system) or on specific parameters deemed important through the local community/Regional Council. The receiving environment characterization also utilizes a hazard rating system. Receiving waters are first characterized by type (e.g., lake/reservoir, stream/river, estuary, coastal marine, offshore marine, etc.). Once the receiving environment type has been identified, hazard ratings are subsequently applied according to the assimilative capacity/sensitivity of the receiver in relation to the discharge based on dilution, substrate, enrichment status, ecological values, aesthetics, contact recreation, water supply, fish/shellfish harvesting and presence of other inputs for each of the parameters (or parameter groups) identified earlier. The rating system is partly subjective, although categories are defined in the guidelines. Mixing zones are generally accepted, and if no modelling has been completed, are generally confined to 100 m from the source. Finally, community values are taken into consideration.

Once the characterization is complete, the risks of the discharge are analyzed. Each constituent-of-concern of the wastewater is assessed according to the type of impact (e.g., public health, ecological, social, economic, aesthetics and odour, etc.) that it may impose. This process integrates all components of the characterization and the likelihood of any impacts is assessed. The level of impact and the risk associated with the impact are combined to rank the appropriate level of monitoring resources to be applied to each constituent of the wastewater on a scale of 1 to 3 with a further option of 'none'. From this analysis, monitoring objectives/programs may be established (and may also become incorporated into the resource consent conditions) which define the parameters to be measured and the frequency of monitoring. Biological surveys and compliance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) may be recommended, but not required under the objectives program.

3.5.2 Compliance Monitoring

The conditions of the discharge consent stipulate that the holder must report compliance to the regulatory authority, which has the right to audit the statements. The wastewater treatment facilities, which are self-monitored, must bear all the costs associated with the sampling, analysis and assessment of effects. Non-compliance may result in the rescinding of the consent if corrective actions are not implemented in a reasonable time.

3.6 Combined Sewer Overflows

Combined sewer systems (CSSs) are wastewater collection systems designed to transport sanitary sewage (consisting of domestic, commercial and industrial wastewater) and storm water in a single pipe to a treatment facility. During wet weather periods, flows may exceed the capacity of a CSS and/or treatment facility resulting in direct discharges of untreated wastewater to receiving environments. The CSS discharge points, referred to as combined sewer overflows (CSOs), may represent a major contributor to use impairment and aesthetic degradation in receiving waters.

CSOs are recognized as point source discharges by the USEPA and are subject to NPDES permit requirements including both technology-based and water quality-based provisions of the CWA (USEPA 1995a). A National CSO Control Strategy (EPA 1989) and CSO Control Policy (EPA 1994a) were utilized as the basis for the establishment of a consistent national approach for addressing CSO discharges in the United States through the NPDES permit program. The CSO Control Strategy outlined objectives to reduce, eliminate or control CSOs and/or ensure that CSO discharges occur only as a result of wet weather, to bring CSO discharge points into compliance with technology-based and water quality-based requirements of the Clean Water Act (CWA), and to minimize impacts of CSOs to designated uses.

The CSO Control Policy outlined provisions for developing appropriate, site-specific NPDES requirements (i.e., respective of Water Quality Standards-WQS) for all CSSs that overflow due to wet weather events and established enforcement initiatives that included elimination of dry weather CSO discharges and CSO compliance with CWA WQS and other requirements. The CSO Control Policy took into consideration and allowed program flexibility with respect to determining and implementing cost-effective means of reducing pollutants and meeting CWA objectives based on the community's financial capabilities. In addition, the CSO Control Policy defined expectations for permittees, State WQS authorities and NPDES permitting and enforcement authorities. The expectations for permittees included mandatory implementation of nine technology-based controls (referred to as NMC) to reduce CSOs and their effects to water quality by January 1st 1997 and development of long-term control plans (LTCPs) for CSOs. WQS authority expectations included provisions for review and revision of State WQS to reflect CSO. The CSO Control Policy also outlined expectations in consideration of the financial capability of permittees when reviewing CSO plans by the NPDES permitting authority. Several guidance documents were developed by the USEPA to assist

permittees, WQS authorities and NPDES permitting authorities with implementation of the CSO Control Policy (USEPA 1995a-h).

In most cases, the USEPA has delegated the responsibility for CSO discharges to each State under the NPDES permit program. The permits are typically issued at five-year intervals on a site-specific basis, taking into consideration the impact of the proposed discharge on the quality of the receiving water relative to pre-established State WQS. The resulting CSO limits and/or conditions specified in the NPDES permit ensure that receiving water discharges do not exceed the State WQS criteria based on the NMC technology-based approach.

None of the other Canadian or international jurisdictions have established environmental risk-based approaches for managing combined sewer overflows. Current practices for managing CSOs in Canada include preventing construction of new combined sewers and expansion of existing combined sewers, separating sanitary and storm sewers as soon as is technically and financially feasible, and taking steps to reduce the frequency and volume of CSOs (Table 3.6).

3.7 Summary and Assessment of Approaches

3.7.1 Canada

A variety of approaches for management of MWWE are presently utilized in Canada, ranging from a strictly technology-based (generic limit) approach (Newfoundland) to an environmental risk-based approach involving derivation of site-specific discharge limits for protecting specific water uses (Quebec; Table 3.7). The majority of Canadian jurisdictions have adopted a hybrid approach, with generic guidelines or regulatory limits for a limited suite of conventional parameters (e.g., BOD_5/$CBOD_5$, TSS, fecal coliforms) and mechanisms for imposing more stringent limits or more parameters on a site-specific basis at the discretion of the regulatory authority. In some cases, environmental risk is considered in a limited way, such as in British Columbia, Nova Scotia, Northwest Territories, and Nunavut, where generic discharge criteria have been established within broad categories based on receiving environment type and/or dilution/mixing characteristics. Several provinces have policies, guidelines, and/or formalized procedures for deriving site-specific effluent limits for multiple parameters (e.g., Alberta, Ontario, Quebec) or primarily just for ammonia (British Columbia, Manitoba), but they are not necessarily universally applied among treatment facilities.

Where utilized, site-specific discharge criteria are typically developed by back calculation from water quality standards, objectives or guidelines for protecting uses of the receiving

Table 3.6: Summary of Combined Sewer Overflow Management Practises in Canada

Jurisdiction	CSOs Exist?	Performance Requirements
Alberta	Yes (Edmonton)	Practises to minimize releases. Striving for 85% equivalent separation of combined sewers by 2012.
British Columbia	Yes	No new construction or expansion of CSOs. Separation of sewers when feasible. Minimize frequency and volume of releases.
Manitoba	Yes	Separate sewers when feasible. Objective to reduce discharges to maximum of 4 per year.
New Brunswick	Yes	No new construction or expansion of CSOs. Approvals to Operate specify that efforts be taken to reduce infiltration and ultimately separate sewers.
Newfoundland and Labrador	Yes	Same requirements apply as for MWWE, but not universally required/enforced.
Northwest Territories	No	
Nova Scotia	Yes	Discharges greater than 100 L must be reported.
Nunavut	No	
Ontario	Yes	Policy stipulates minimum primary treatment, 30% BOD removal and 50% TSS removal, and other requirements to minimize discharge volumes.
Prince Edward Island	Yes	CSOs being eliminated over next four years
Quebec	Yes	Remove floating debris. No dry weather discharge. Sometimes maximum discharge frequency specified. No CSO discharge in fish spawning areas or within 1 km of drinking water intake or shellfish harvesting.
Saskatchewan	No	
Yukon	No	

Table 3.7: Summary of Basis for MWWE Discharge Criteria in Canada

Jurisdiction	Universal Regulations or Guidelines (R/G) and Date of Implementation	Parameters for which Generic Criteria are Established	Applied to New/Expanded (N) and/or Existing (E) Facilities or Discretionary (D)*	Environmental Risk-Based Approach(es): Yes (Y), No (N), Partial (P)*	Basis for Environmental Risk-Based Approach(es)	New and/or Existing Facilities (N/E)	Comment
Alberta	G (1997)	CBOD, TSS, and fecal coliforms for all except seasonally discharging wastewater (facultative) lagoons. Also total phosphorus, total coliforms, fecal coliforms at larger facilities.	N	Y	Back calculation from receiving water quality criteria, taking into account variability in flow and concentration of both effluent and receiving environment.	N, E	More stringent of generic or risk-based approach used to derive limits. Similar approach employed in Quebec.
British Columbia	R (1999)	BOD_5, TSS. Also phosphorus, total coliforms, residual chlorine, pH and/or toxicity at some facilities.	D	P	Generic limits are categorized by receiver type. Effluent limits for ammonia must be back calculated from edge of initial dilution zone accounting for pH and temperature.	N, E	Liquid waste management plans allow time for a facility to work toward achieving regulations.
Canada (federal facilities)	G(1976)	BOD, TSS, fecal coliforms, pH. Also phosphorus and residual chlorine at some facilities	N, E	N	-	-	-
Manitoba	G (2002)	BOD_5 and fecal coliforms; possible also TSS, total phosphorus, total nitrogen, ammonia, total residual chlorine, toxicity.	N, E	P	Back calculate ammonia discharge limits from receiving water quality objectives, taking into account pH, temperature, season and receiving water classification (cool vs. cold water). Similar modelling required for other parameters for new, large projects.	mostly N	-
New Brunswick	R (2002)	BOD_5 and fecal coliforms. Also CBOD and residual chlorine at some facilities.	N, E	P	Minimum 8:1 dilution, no discharges to lakes or to tidal areas on low or rising tides. No other formalized approaches.	N,E	-
Newfoundland and Labrador	R (2003)	BOD_5, fecal coliforms, total coliforms, TSS, TDS, oils, floating debris, grease, chlorine, metals, cyanide, nitrates, ammonia, pH, phenol, phosphorus, radionuclides, selenium, sulfides, temperature.	N, E	N	-	-	-
Northwest Territories	G (1992)	BOD_5, TSS, fecal coliforms, phosphorus.	N, E	P	Generic discharge criteria established for categories of discharges involving water use per capita, receiver type, dilution, mixing characteristics and retention time.	N, E	-
Nova Scotia	G (prior to 2000)	BOD, TSS (generic limits prior to 2000).	E	P	Generic limits for BOD and TSS for new facilities (pre 2002) were based on type of receiver. Post 2002, site-specific limits are established based on assimilative capacity.	N	-
Nunavut	G (2000)	BOD_5, TSS, fecal coliforms, pH, oil and grease.	N, E	P	Generic discharge guidance for categories of discharges based on site-specific water use per capita, receiver type, dilution, mixing characteristics and retention time.	N, E	-
Ontario	G (1994)	BOD, TSS. Also, total phosphorus, *E. coli.*, pH, residual chlorine at some facilities	N, E	P	Back calculation from receiving water quality objectives used to develop more stringent effluent requirements as deemed necessary. Requirements for non-acutely lethal effluent at end of pipe may be included as a result of the assessment. Applied mostly to new facilities or those undergoing upgrades or expansions.	N, E	-
Prince Edward Island	No	BOD, TSS, & fecal coliform limits based on new policy (not documented)	N	P	New systems and those undergoing upgrades may be required to conduct receiving environment assessment	N	-
Quebec	No	-	-	Y	Both technological performance and environmental protection are considered in deriving site-specific effluent limits for MWWE. Environmental approach involves back calculation from receiving environment criteria.	N	Approach is similar to Alberta's.
Saskatchewan	G (2002)	CBOD, BOD_5, TSS, total phosphorus, total nitrogen, ammonia, total coliforms.	N, E	P	Nature and volume of pollutants, season, receiver characteristics and expected receiver uses taken into consideration.	N, E	-
Yukon	G (1983)	COD, BOD_5, TSS, total phosphorus, fecal coliforms, total residual chlorine, pH, phenols, oil, grease, temperature.	N, E	P	Environmental conditions may be considered when licenses issued.	N, E	-

*P - Partial. Environmental risk-based approach applies to only some parameters or is applied at the discretion of the regulatory agency for some or all parameters.
*D - Regulatory agency has discretion to apply requirements (e.g., BC - allowances made under Liquid Waste Management Plans). See text.

water. In Quebec, this has been adopted as the preferred approach for derivation of effluent limits, although it has been relying to date on voluntary compliance because it lacks a regulatory mechanism for enforcement. Alberta and Ontario may apply either a site-specific or a generic criterion, typically whichever is more stringent. Other Canadian jurisdictions have only rarely derived site-specific limits for municipal facilities, most often for newer and larger facilities than for older, smaller facilities.

Water quality criteria employed by different jurisdictions include those developed by the CCME, the jurisdiction itself, and/or the U.S. EPA (Table 3.8) and pertain to a variety of water uses (protection of aquatic life, drinking water, agriculture, wildlife, recreation). However, unlike the U.S. model (Sections 3.2 and 3.7.1), none of the provinces formally assigns one or more water use designations to water bodies, or portions thereof, for the purpose of managing municipal and industrial inputs to that receiver. Therefore, decisions as to which water quality criteria should be taken into account at any given site rest mainly with the proponent of the facility seeking regulatory approval and the individuals representing the regulatory agency. Alberta and Quebec are the only Canadian jurisdictions that prescribe the formula by which effluent limits should be calculated based on water quality criteria (Tables 3.8 and 3.9). The other jurisdictions make decisions based on approaches proposed by the proponents seeking regulatory approval.

Frameworks also exist in some parts of Canada to establish site-specific water quality criteria for protection of aquatic life that take into account the manner in which receiving water characteristics may site-specifically alter the expression of toxicity of some parameters (e.g., Ontario, Quebec, British Columbia). In such cases, site-specific water quality criteria may be developed and then used to develop site-specific effluent criteria.

Most Canadian jurisdictions, except Newfoundland, New Brunswick, and the Yukon allow for mixing zones in the receiving environment in regulatory policy or guidelines respecting MWWE discharges. Available effluent dilution is taken into account in considering mixing zones or is otherwise incorporated into the regulatory approach by all provinces and territories except Newfoundland. Mixing zones are not consistently defined, but are generally required to be as small as possible so as to minimize impacts on receiving water uses (Table 3.8). Mixing zones are usually assessed for a “worst-case” dilution scenario (e.g., 7Q10 or 7Q20 etc. for rivers).

Effluent limits may also be established based on whole effluent toxicity, but this is not presently practiced in Canada for MWWE. In such cases, a facility may be required to ensure that effluent toxicity never occurs at effluent concentrations lower than those

Table 3.8: Comparison of Approaches Used in Canada for Back-Calculation of Effluent Limits from Water Quality Criteria for Protection of Designated Uses

Jurisdiction	References	Water Quality Criteria			Effluent Mixing Characteristics		Derivation of Effluent Limits
		CCME	Jurisdictional	U.S. EPA	Receiver conditions that must be defined[a]	Mixing Zone Definition	
Alberta	Water Quality Based Effluent Procedures Manual (Alberta Environmental Protection 1995)		X	X	· for acute criteria - 1Q10 · for chronic criteria - 7Q10 · for human health (non-carcinogen) – 30Q5 · for human health (carcinogen) – harmonic mean flow	Limited mixing zones are allowed within which instream guidelines may be exceeded, the area should be small enough to not interfere with beneficial uses, should ensure protection of waterbody as a whole (chronic) and limit acute lethality to organisms passing through plume (acute).	see Table 3.9
British Columbia	Waste Management Act Municipal Sewage Regulation, British Columbia, 2002		X		Define "initial dilution zone" which is the 3-dimensional zone around the point of discharge where mixing of effluent and receiving water occurs.	dilution zone height = bed to surface distance; radius/width = lesser of 100 m or 25% water body width; for stream/river/estuary also define length = lesser of 100 m or distance downstream at which width is as stated above.	-
Manitoba	Manitoba Water Quality Standards, Objectives and Guidelines (Manitoba Conservation 2002)		X	X	· avoid chronic effects – 7Q10 · avoid chronic effects (ammonia) – 30Q10 · avoid acute effects – 1Q10	Mixing zone should be as small as practicable, not acutely lethal, allow for passage of all life stages of aquatic life, and should not cause or contribute to impairment of water uses outside of mixing zone. Also, in lakes the mixing zone must be the lesser of ≤ 10% of available volume or 100 m radius.	-
New Brunswick	Atlantic Canada Standards and Guidelines Manual (Environment Canada 2000)	X			7Q20	Small as possible, no impairment of existing or likely water uses; streams: <25% cross sectional area or volume of flow, <1/3 river width, lakes: < 10% receiving water volume available for mixing, ≤100m radius of outfall	There is general guidance respecting the process for deriving waste load allocations, but no specific calculation or model is prescribed (proponent's discretion).
Northwest Territories	Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories (NWT Water Board 1992)	X			10:1 dilution required unless effluent quality equals or betters that of the receiving environment	Maximum 100 m downstream (stream) or diameter (lake), maximum 1/3 width of stream or 1/3 cross sectional area of lake, in all cases extends from water bed to surface.	-
Nova Scotia	Atlantic Canada Standards and Guidelines Manual (Environment Canada 2000)	X			7Q20	Small as possible, no impairment of existing or likely water uses; streams: <25% cross sectional area or volume of flow, <1/3 river width, lakes: < 10% receiving water volume available for mixing, ≤100m radius of outfall	There is general guidance respecting the process for deriving waste load allocations, but no specific calculation or model is prescribed (proponent's discretion).
Nunavut	Guidelines for the Discharge of Domestic Wastewater in Nunavut (Nunavut Water Board 2000)	X			10:1 dilution required unless effluent quality equals or betters that of the receiving environment	Maximum 100m downstream (stream) or diameter (lake), maximum 1/3 width of stream or 1/3 cross sectional area of lake, in all cases extends from water bed to surface.	-
Ontario	Deriving Receiving-Water Based, Point Source Effluent Requirements for Ontario Waters (MOEE 1994)		X		· continuous discharge – 7Q20 · Great Lakes – 20:1 dilution · all others – site specific	An area of water contiguous to a point source or definable diffuse source where the water quality does not comply with one or more of the Provincial Water Quality Objectives	-
Quebec	Method for Calculating Water Quality-Based Effluent Objectives for Aquatic Pollutants (MENVIQ 1996)	X	X	X	Conventional Pollutants: Aquatic life, recreation - 7Q2 Toxic Pollutants: Chronic criteria - 7Q10 Human health (water and/or fish consumption) - 30Q5	Maximum 300m long, less than half width of watercourse (maximum 50m), maximal dilution: 100, limits can be modified depending on water uses.	Calculation of environmental effluent objectives: tolerable load = maximum load - upstream load pollutant load[b] = $(Q_{am}+Q_e)C_c - Q_{am}C_{am}$ tolerable effluent concentration[b] = $[(Q_{am}+Q_e)C_c - Q_{am}C_{am}]/Q_e$
Saskatchewan	Surface Water Quality Objectives (MB #110) (Saskatchewan Environment 1997)		X		7Q10	Streams: no more than 25 percent of the cross-sectional area or volume of flow, nor more than one-third of the river width; lakes: < 100m radius from outfall and not exceed 10% of that part of the receiving waters available for mixing.	-
Yukon	Yukon Water Act (Yukon Water Board 1992)	X			-	-	-

[a] - measures designated as xQy (i.e., 7Q10) represent the average minimum flow for "x" consecutive days that has a probable recurrence interval of once in "y" years

[b] - Q_{am} = upstream flow, Q_e = effluent flow, C_c = concentration corresponding to the water quality criterion for a given pollutant, C_{am} = upstream pollutant concentration

Table 3.9: Limits Setting Equations to Use for Wasteload Allocation in Alberta

Long Term Average (LTA) (acute n=1, chronic n=4)	Average Monthly Limit (AML) (1<n<30)	Maximum Daily Limit (MDL)
$LTA = WLA*e^{[0.5\delta^2_n - z\delta_n]}$	$AML = LTA*e^{[z\delta_n - 0.5\delta_n^2]}$	$MDL = LTA*e^{[z\delta - 0.5\delta^2]}$
where $\delta_n^2 = \ln((CV_2/n)+1)$	where $\delta_n^2 = \ln((CV^2/n+1)$	where $\delta^2 = \ln((CV^2+1)$
z = 2.236(99^{th} percentile)	z = 1.642(95^{th} percentile)	z = 2.236 (99^{th} percentile)

LTA = long term average (mean)
WLA = waste allocation
δ = standard deviation
z = z score for normal distribution, z=1.64 for 95th percentile
n = number of samples

occurring in the receiving environment based on available dilution. For example, if a minimum 5:1 receiving water to effluent dilution is consistently available, an effluent toxicity limit may be specified at 17%, meaning toxicity in laboratory tests of effluent should not occur at concentrations less than 17%. This approach is used to protect against the effects of non-regulated substances in effluents that may exert individual or combined toxic effects in the receiver.

None of the Canadian jurisdictions consistently requires assessments of indigenous receiving environment biota. Such an approach allows for verification as to whether the biological communities in the receiver are being adequately protected by existing effluent management practices. Biological monitoring has been successfully incorporated into federal regulations for effluents discharged by mines and pulp and paper mills in Canada (i.e. Environmental Effects Monitoring as specified by the Pulp and Paper Effluent Regulations and Metal Mining Effluent Regulations under the *Fisheries Act*). The detailed requirements of the mining and pulp and paper EEM programs result in costs that would be prohibitively expensive for many/most municipal treatment facilities, but simplified approaches could potentially be developed such as those used by some U.S. jurisdictions (e.g., Ohio). The "Reference Condition Approach" presently being evaluated for application in the industrial EEM programs in Canada (Reynoldson et al. 2005) may also provide a basis for cost-effective sampling designs based on pooling of resources to generate regional reference data sets.

Population size (Alberta, Nunavut and Northwest Territories) and water use per capita (Nunavut and Northwest Territories) have also been incorporated into some Canadian approaches for regulating MWWE.

In British Columbia, where the desired quality goals for all MWWE are stipulated in Municipal Sewage Regulations, and some facilities are regulated accordingly, an alternative mechanism exists under the provincial *Environment Act* to provide other facilities with more time to implement the necessary changes for achieving such quality (i.e., through a Liquid Waste Management Plan). This is a formal approach for phasing in upgrades across the province that acknowledges the associated financial constraints.

None of the jurisdictions surveyed employs an environmental risk-based approach for managing combined sewer overflows.

3.7.2 International

Internationally, the United States is the only jurisdiction of those surveyed that formally regulates MWWE using an environmental risk-based approach (Table 3.10). There,

Table 3.10: Comparison of Basis for MWWE Discharge Criteria for International Jurisdictions

Jurisdiction	Sub-jurisdiction	Universal Discharge Criteria (Y/N)	Parameters for which Universal Criteria are Established	New or Existing Facilities (N/E)	Environmental Risk-Based Approach(es) (Y/N)[a]	Basis for Environmental Risk-Based Approach(es)	New or Existing Facilities (N/E)
United States	Florida	Y	$CBOD_5$, TSS, total phosphorus, total nitrogen.	N, E	Y^R	Receiving water quality must meet state/regional Water Quality Standards at all times outside of the mixing zone. In general, the Water Quality Standards take into account and/or are based on a combination of approaches (including whole effluent toxicity assessment, physico-chemical water quality based effluent limit modeling (e.g., total maximum daily load / waste-load allocation models) and/or biological assessments) to protect previously assigned beneficial uses for the receiving water body.	N, E
	New Jersey	Y	BOD_5, TSS, Oil and Grease, total coliforms, pH, Chlorine Produced Oxidants.	N, E	Y^R		N, E
	Ohio	Y	$CBOD_5$, TSS, ammonia, E. coli, total residual chlorine, dissolved oxygen.	N, E	Y^R		N, E
	Washington	Y	BOD_5, TSS, fecal coliforms, pH.	N, E	Y^R		N, E
Europe	Finland	Y	BOD_5, COD, TSS, Total Nitrogen (TN) and Total Phosphorus (TP).	N, E	N^{SS}	-	-
	Germany	Y	BOD_5, COD and/or TSS at all facilities; Total Nitrogen (TN) and Total Phosphorus (TP) for 'sensitive' areas.	N, E	N	-	-
	Sweden	Y	BOD_5, COD, TSS, Total Nitrogen (TN) and Total Phosphorus (TP).	N, E	N	-	-
	United Kingdom	Y	BOD_5, COD and/or TSS at all facilities; Total Nitrogen (TN) and Total Phosphorus (TP) for 'sensitive' areas.	N, E	N	-	-
Australasia	Australia	N	-	-	Y^G	Dischargers must strive to meet Environmental Quality Objectives and Indicators (i.e., Australian and New Zealand Guidelines for Fresh and Marine Water Quality) or background receiving water conditions (typically whichever is most stringent) to minimize / avoid risks to and protect beneficial uses of the receiver. The risk management approach involves identification of environmental values (either locally or site-specific), selecting relevant water quality guidelines and setting water quality objectives based on previously determined environmental values for the receiving water body. Through the results of monitoring of the receiving water body and utilization of statistical decision criteria, determination of whether the water quality objectives have been exceeded is assessed.	N, E
	New Zealand	N	-	-	Y^G	A risk-based process (HIAMP - Hazard Identification, Analysis and Monitoring Program) utilizing influent chemistry characteristics, (expected) wastewater treatment system performance, receiving water body features (physico-chemical, biological characterization), receiving water dilution ratios and community values are used to identify the potential risk and actual level of impact of MWWE to the receiving water body. From this analysis, an appropriate level of monitoring resources for each constituent in the wastewater is defined. No 'trigger' concentrations exist for a specific parameter, as the regional council must determine the 'appropriate' level of impact based on community values.	N, E

[a] - G = indicates that limits are guidelines only, R = indicates that limits are regulatory, SS = regulatory site-specific limits may be imposed, although no formal risk-based approach utilized in their derivation.

most receiving waters, or portions thereof, are formally designated as having one or more beneficial uses (aquatic life, recreation, drinking water, etc.), although the use designations (categories) vary from state to state. The most stringent of the applicable quality criteria (from the various applicable beneficial uses) is then applied to each receiver (or portion of receiver) and effluent limits are back-calculated from the criteria to ensure the criteria can be consistently met.

Some states also impose site-specific effluent toxicity criteria for facilities based on the available dilution. Generic criteria for BOD_5/$CBOD_5$, TSS and sometimes other parameters also exist in all the states surveyed and the most stringent of the generic versus risk-based limits are typically applied. Biological assessments of receiving environments are also required in some states (e.g., Ohio).

While several Canadian jurisdictions have adopted environmental risk-based approaches for MWWE that are similar to those used in the U.S., the U.S. approaches are nationally more widely and consistently applied, and more extensively documented (e.g., more formal procedures and specific guidance). This reflects the fact that MWWE have been actively regulated in most states for decades, and all facilities have been expected to comply.

None of the European countries surveyed formally employ environmental risk-based approaches for MWWE regulation. Finland has the flexibility to impose site-specific limits but there is no formalized policy or approach for doing so.

Environmental risk-based guidelines exist in Australia and New Zealand but these are not consistently applied. The basis for establishing limits is left to the discretion of the responsible regulatory authorities. Like the approach used by the U.S. and some Canadian provinces, the guidelines generally involve back calculation to achieve criteria that protect beneficial uses of the receiving environments.

3.7.3 Summary

The majority of jurisdictions in Canada and internationally presently emphasize a technology-based approach for managing MWWE, with some jurisdictions (e.g., U.S., Alberta) also using environmental risk-based approaches to establish more stringent limits or set effluent limits for non-conventional parameters. Each of the various technology-based and environmental risk-based approaches are associated with advantages and disadvantages which will need to be taken into account during the development of a national strategy for Canada (Table 3.11). The technology-based approaches employed in Canada generally accept varying degrees of treatment, with

Table 3.11: Comparison of Potential Approaches for Managing Municipal Wastewater Effluents

Approaches		Cost Implications	Effectiveness	
			Advantages	Disadvantages
Technology-Based [1]	Effluent limits established based on existing technology.	Little to no cost except that associated with system optimization, if necessary, to achieve expected levels of performance.	Recognizes that different types of treatment systems can be expected to provide different levels of environmental performance. Easiest option to implement because of low cost.	Offers limited improvement to environmental protection relative to existing conditions.
	Effluent limits established based on best-available technology (for conventional parameters such as BOD, TSS).	Very costly to municipalities currently using simple, low-cost systems.	Maximizes environmental protection, respecting BOD and TSS and typically achieves ancillary removal of other substances.	The measurable improvement in protection of receiving environment uses may be much less than the cost associated with technology upgrades at some sites with large dilution capacity.
Environmental Risk-Based [2]	Effluent limits established to achieve water quality standards, objectives or guidelines in receiver (mixing zone may or may not be tolerated).	Very costly to municipalities where upgraded technologies may be necessary to achieve chemical-specific criteria for protection of water uses.	Discharge objectives achieve a high level of environmental protection with respect to the specific substances measured.	May not be adequately protective unless all the substances currently impacting the receiving environment can be identified and measured (e.g., potential impacts of non-conventional chemicals on biota).
	Effluent limits established to ensure that whole effluent toxicity does not occur at concentrations less than the effluent concentrations achieved in the receiver.	Very costly to municipalities where upgraded technologies may be necessary to achieve toxicity-based criteria.	Discharge objectives achieve a high level of environmental protection with respect to toxicity.	May not be adequately protective unless the toxicity test conditions and endpoints are relevant to mechanisms of impact occurring in receiving environment.
	Effluent limits established to achieve desired concentrations of both chemicals and toxicity.	Very costly to municipalities where upgraded technologies may be necessary to achieve chemical- and toxicity-based criteria.	Discharge objectives achieve a higher level of environmental protection than either the chemical or toxicity approach alone.	May not be adequately protective unless the suite of analyses addresses all the substances and mechanisms of impact occurring in the receiver. May be overprotective unless protection of receiving environment biota is the water use priority.
	Adequacy of effluent limits for protecting health of receiving environment biota assessed through biological assessments of receiving environment.	Can be costly to conduct studies. Very costly to municipalities where studies indicate upgraded technologies may be necessary to protect receiving environment biota.	The only relevant approach for verifying the "success" of effluent management practises with respect to protecting receiving environment biota. Approach is consistent with that used for pulp and paper and mining industries in Canada to provide feedback to effectiveness of generic (sector-wide) effluent limits.	May be overprotective unless protection of receiving environment biota is the water use priority (e.g., agricultural drainage).

[1] Effluent limits are usually universally applied to facilities using similar treatment technology.
[2] Effluent limits are usually developed site-specifically, taking into account receiving environment characteristics and/or uses of the receiving environment.

limits established based on the level of performance that can be expected from such treatment technologies. In contrast, the U.S. has established secondary treatment as the minimum acceptable standard, reflecting a value judgement that it is unacceptable to pollute when there is adequate technology to reduce pollutant loadings. The main advantage to an environmental risk-based approach is that MWWE treatment is geared specifically toward site-specific conditions and costs are thus proportionally allocated to sites that will likely demonstrate the greatest measurable improvement.

There is no national list of MWWE facilities, so it is not currently possible to accurately predict the cost implications associated with regulatory options such as implementation of generic discharge objectives across or within categories of treatment type. There is also no national list of available receiving environment dilution at municipal wastewater facilities, so it is not currently possible to predict the cost implications of other regulatory options, such as implementation of site-specific objectives to achieve CCME water quality criteria.

With respect to environmental risk-based approaches, there are three general approaches that have been adopted among the various jurisdictions surveyed:

1. Derivation of site-specific effluent limits based on back calculation from water quality criteria developed to protect specific beneficial uses of the receiver (e.g., protection of aquatic life, recreation, drinking water etc.).
2. Deriviation of site-specific effluent limits based on protection against whole effluent toxicity (i.e., toxicity must not occur at concentrations exceeding the available dilution).
3. Surveys of receiving water biota to assess the efficacy of the established MWWE limits in terms of protecting such biota.

Each of these has its own benefits and limitations (Table 3.12).

Table 3.12: Comparison of Water or Effluent Quality Assessment Tools, (modified from U.S. EPA 1991)

Tool	Capabilities	Limitations
Contaminant - specific quality criteria	· Protect aquatic life, human health and piscivorous wildlife · Cover a wide range of species and effects for a given contaminant · Integrate the contaminant's fate (bioaccumulation, sedimentation) · Define the pollution source · Direct treatment technologies by identifying a substance · Not very costly if limited number of contaminants are analyzed · Are preventative	· Take into account only those contaminants that are known and that were analyzed · Do not take contaminant bioavailability into account · Do not take possible interactions in mixtures into account · Do not directly measure biotic effects; the cause-effect relation is uncertain · May involve considerable costs if there are many contaminants to analyze
Whole Effluent (or ambient water) toxicity tests	· Integrate the toxic effects of several substances at a time · Also measure the effects of unknown contaminants · Take contaminant bioavailability into account · Limit toxicity measurement to a single analysis · Measure the exact toxicity of effluent or ambient waters · Are preventative	· Do not protect human health or piscivorous wildlife · Represent incomplete toxicology (only test some species and some effects) · Ignore persistency (bioaccumulation) and sedimentation · Are not always representative of actual receiving water conditions when used solely on effluent · Provide incomplete data on the causative contaminant · Do not orient treatment technologies since no substance is identified
Bioassessments (surveys of receiving water biota)	· Measure receiving water effects · Integrate effects over time and defines historical trends · Integrate the effects of all sources including unknown ones · Integrate the effects of all other possible stresses (degradation of the physical environment, parasitism) in addition to those linked to toxics	· Do not protect human health or piscivorous wildlife · Do not assess effects during critical flow periods · Do not isolate a single cause for an observed effect · Do not differentiate between sources · Measure existing effects (is not preventive) · Are costly if a high degree of discrimination is sought

4.0 OPTIONS FOR FUTURE CONSIDERATION

1. Environmental risk-based approaches for managing MWWE used in Canada and internationally generally involve back calculating effluent limits from water quality criteria developed to protect site-specific water uses. Of all the jurisdictions surveyed, this approach has been most widely applied in the U.S. and thus is the best documented. If Canada elects to adopt a similar approach, it should undertake a more detailed review of the U.S. system with respect to how limits are set and compliance is enforced, how states manage their own programs within the federal framework, and how the municipalities have responded to the regulations both technically and financially. This will assist in understanding how differences in regulatory frameworks among federal, provincial/state and municipal jurisdictions in both countries may affect implementation in Canadian jurisdictions. Of Canadian jurisdictions, the approach adopted by Alberta appears to be most similar to the U.S. model and representatives of that province would likely be useful as resources for evaluation of potential implementation across Canada.

2. If a U.S. EPA-type approach is considered for implementation across Canada, consideration should be given to requiring both chemical-specific and whole effluent toxicity-based limits, since the process for derivation of effluent limits is similar and the combine approach provides greater environmental protection than either approach alone.

3. Consideration should be given to developing a cost-effective approach for receiving environment monitoring for municipalities to demonstrate whether receiving environment biota are adequately protected. This represents the only means of assessing the “success” of a regulatory strategy for protecting receiving environment biota.

4. A national list of municipal wastewater treatment facilities should be developed, specifying, as a minimum, the type of treatment employed, the population size served, and the minimum and average available dilution for each facility. This will allow for assessment of the implications of making specific changes to existing regulations.

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APPENDIX A

Canadian and International MWWE Survey Responses

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Alberta**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	owned and operated by the municipality
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	Yes Alberta Environment is the only agency that issues approval for wastewater discharges to the environment.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes
3.2	Are the generic limits universally applied to all facilities? If not, why not?	There are generic limits for facilities within each category. Categories are based on population size (≤ or ≥ 20,000) and treatment technology (secondary, aerated lagoon). Wastewater lagoons are excepted (i.e., no limits).
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	For populations <20,000: CBOD≤25 mg/L; also TSS≤25 mg/L for secondary treatment facilities For populations >20,000: CBOD≤20mg/L, total P≤1mg/L, total coliform ≤1,000/100mL, fecal coliform ≤ 200/100mL, and ammonia established on a site-specific basis based on receiving water to meet the WQ and aquatic life needs (**how**?); also TSS ≤ 20 mg/L for secondary treatment facilities Exceptions: wastewater lagoons – have no defined limits
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems **Are these guidelines referred to in any regulations? Yes the Standards and Guideline document is refered to in the regulations Which regulations? Wastewater and Storm Drainage Regulation**
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Approval to operate? (**correct term?**) “Approval” is the correct term

3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	The operator must report non-compliance or violation of their approvals as soon as it takes place. This is one of the requirements of the approval. Also Alberta Environment inspects the facilities occasionally.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Previous CCME survey indicates additional parameters or tighter limits may be established on a site-specific basis. **Is this actually practised? If so, please fill Section 4.0 Yes it s practiced**
4.2	Please briefly describe the approach(es) used.	Models are used to determine water quality outside mixing zone and compared to Canadian Surface Water Quality Guidelines and the receiving stream needs/requirements. Then using the model and considering mixing zone, end of pipe limits are determined. End of pipe numbers are applied if it is more stringent than technology based numbers.
4.3	What were the rationales behind the derivation of the selected approach(es)?	Protection of receiving stream while considering a reasonable mixing zone
4.4	If not previously explained, are other uses of the waterbody (e.g.,	Yes – This is done on site specific and through stream

	water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	water quality needs and down stream water use. The size of the mixing zones can vary considering down stream water use.
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes – receiving stream needs/requirements are different for each receiving stream
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	This is measured both through water quality measurement and measuring the aquatic plant biomass Who takes these measurements? The approval holder carries out Day t day monitoring. Alberta Environment does ambient water quality measurement and reports on the state of the stream/environment.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	No universally applied process for deriving site-specific effluent limits.
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	No it is specified in the standards and guidelines document which referred to in the regulations
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Through Approval that are issued for each facility or Code of Practice that is a generic approval for wastewater lagoons
4.11	Is the success of the discharge limits in achieving environmental	Yes see 4.7

	protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes only in the city of Edmonton
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Yes There have been several methods that Alberta Environmnet and the City of Edmonton have come up with over the years to remediate CSO effects and reach the goal of 85% **equivalent separation** of combined storm sewers by 2012, including the following: • Eary Action Control Plan-utilizing the existing sewer system better and remedial measures • Gold Bar STP upgrades-ability to handle higher wet weather flows • Underground storage facilities for capture of CSO flows for later release to STP • Sewer separation • Tunnel Conveyance upgrades • modification of existing weirs in CSO's to retain more volume in the sewer therefore less release into the river

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	Same as municipal wastewater see section 4.1
6.3	What were the rationales behind its/their derivation?	See section 4 same as municipal wastewater
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	See section 4 same as municipal wastewater
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	See section 4 same as municipal wastewater
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	See section 4 same as municipal wastewater
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**British Columbia**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	All of these.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	Yes, through the Environmental Management Act.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes, some limits are based on treatment technology and what can be expected to be achieved (eg: BOD &SS), other limits are based on type of receiving environment (eg: ammonia, phosphorus, coliforms). Question: Are/were environmental impact studies universally required at every facility to establish other monitoring/compliance requirements? i.e. for existing discharges, what steps were followed to decide what to measure and how often? Were similar types of studies done at each facility to make such decisions? e.g. full chemical screen of actual effluent or predictions of effluent quality, biological studies of receiver etc. Answer: Environmental impact studies are universally required at every facility under the MSR. Waste Management Permits and Operational Certificates (OC) under a LWMP have technical assessment reports that establish the individual facility monitoring/compliance requirements. These are written into the Permit or OC requirements. Similar types of studies are used to make the decisions on what type of monitoring is required at each facility. Guidelines or Objectives have generally been available to Ministry staff writing the Permit or OC requirements in the past. At present, the MSR requirements are used as a guideline to establish specific requirements. Professional knowledge is necessary to set these requirements in most cases.
3.2	Are the generic limits universally applied to all facilities within	Yes, except that time may be allowed to upgrade facilities

	the same category? If not, why not?	through a Liquid Waste Management Plan.
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	BOD – 45 mg/l, SS – 45mg/l for secondary treatment; BOD – 10 mg/l, SS – 10 mg/l for advanced wastewater treatment; BOD – 130 mg/l, SS – 130 mg/l for primary treatment; pH 6.0 to 9.0
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Municipal Sewage Regulation. Question: Are there guidelines in place for studies mentioned in section 3.1? Answer: Yes. The Environmental Impact Study Guideline – A Companion Document to the Municipal Sewage Regulation (December 2000). The Compliance Guideline – Meeting the Intent and Requirements of the Municipal Sewage Regulation (January 2001). Code of Practice for the Use of Reclaimed Water (May 2001). Pollution Control Objectives for Municipal Type Waste Discharges in British Columbia (September 1975).
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Both through the Municipal Sewage Regulation or through existing permits or operating certificates under a Liquid Waste Management Plan (LWMP). Question: Any idea how many facilities are regulated under MSR vs LWMP vs Waste Mgnt Permits (or proportions)? Answer: Most major municipalities have developed LWMPs and all

		are encouraged to do so. Most smaller municipalities and subdivisions still have Waste Management Permits. New discharges are regulated under the MSR. All dischargers are encouraged to meet the MSR requirements and are required to when they need an amendment to their Waste Management Permits.
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Monthly or Annual reporting by the discharger and site inspections & audits by Ministry staff. Question: Any idea how long it might take to phase our waste management permits and/or LWMPs? Answer: LWMPs will not be phased out but will gradually over time meet the MSR requirements (this may take considerable time). Waste management permit holders are constantly being encouraged to switch to the MSR but are only required to do so when they need a major amendment.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in	Yes, for nutrients, coliforms, toxicity and for operating certificates issued under a LWMP. Question: Can you give specific examples of the limits? Answer: Ammonia – Chronic limits (Maximum 30 day average) are set out in a table in accordance with variable pH and temperature. Back calculations are made using the pH and temperature in the receiving environment during the

	the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	low flow period (7 day average low flow for rivers) to ensure that the chronic limits are not exceeded at the edge of the initial dilution zone (note: the allowable dilution zone is 25% of the stream width or less). The phosphorus requirement may be waived by the manager if it is not necessary otherwise it is less than 1 mg/l total or 0.5 mg/l ortho unless there are more restrictive limits required either as a concentration in the effluent or as a total load during a certain period of the year as determine by the manager. Coliforms are often required to meet receiving water standards (eg: 200 MPN / 100mls for discharge to recreation water). Toxicity is the 96hour LC 50 test for rainbow trout in the effluent but this may be waived if the discharger demonstrates to the manager that the discharge does not adversely affect the receiving environment. Environmental Impact Studies are required to determine other requirements and to ensure that BC Water Quality Guidelines & Objectives are met.
4.2	Please briefly describe the approach(es) used.	Through an environmental impact study (EIS) under the Municipal Sewage Regulation (MSR) taking into account water quality guidelines, flow, and mixing characteristics. Requirements may be less stringent under a Liquid Waste Management Plan.
4.3	What were the rationales behind the derivation of the selected approach(es)?	The MSR sets the long term goal of achieving secondary treatment for all discharges in the Province. LWMPs allow time to achieve this goal based on receiving environment conditions, public input and financial considerations. Permits are being phased out

		and replaced by criteria under the MSR or LWMPs.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes. All uses of the water body are taken into consideration in setting the discharge limits as a result of the Environmental Impact Study. Depending on the use of the receiving environment, treatment and disinfection requirements can be much more stringent than ordinary to the point that water is reusable under almost all conditions except as a potable water source.
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes. Through the Environmental Impact Studies required.
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	Both water quality and biological monitoring are carried out in the receiving environment on a site specific basis by the discharger and Ministry staff. Question: How often? Answer: Effluent monitoring is done on a consistent basis by both small and large dischargers and according to the applicable requirements of either a Permit, OC or under the MSR. For receiving environment monitoring, most dischargers authorized by a permit and OC comply with the monitoring program, which can vary from quarterly to once every 2 years. For discharges registered under

		the MSR most of the registrants do not conduct receiving environment monitoring, although it is a requirement under the MSR and a program is usually included in their Operating Plan or EIS. The Ministry is presently doing very little receiving environment monitoring associated with authorized discharges.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Yes, but exceptions are permitted over the short term under the Liquid Waste Management Plan process.
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Municipal Sewage Regulation under the *Waste Management Act (now Environmental Management Act)*, except for discharges approved prior to the regulations coming into force in 1999, or discharges otherwise authorized by the minister (e.g. a Liquid Waste Management Plan) or an order under the *Environmental Management Act* .
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	The discharge limits are administered through the MSR, the LWMP or through existing Waste Management Permits.
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	Yes. Ministry staff check the receiving environment from time to time. The MSR and LWMPs require the discharger to carry out certain monitoring of the receiving environment by appropriate professionals with the results interpreted and submitted to the Ministry for review.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	No universal limits. No person can construct or expand a combined sewer system. Sewer separation is required if possible when repairs are necessary. Existing CSOs dischargers must estimate flows, frequency, number of overflows and total annual volume at each location. CSOs are not allowable with less than a 5 year return period unless a LWMP is prepared that assesses the potential impact on the receiving environment at all locations and takes steps to reduce the quantity, frequency and number of overflows and includes measures to eventually eliminate the overflows. The LWMP environmental impact study may show a need for interim treatment at any or all CSO locations in order to meet BC Water Quality Objectives.

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	Similar to Municipal Waste Water Effluent (MWWE). Site specific permits are used for the larger discharges.

		Regulations are used for smaller discharges.
6.3	What were the rationales behind its/their derivation?	Similar to MWWE.
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Generally Yes.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	In Regulations, Water Quality Guidelines & Objectives, Industry Pollution Control Objectives Environmental Management Act
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Regulations and site specific Permits.
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

Management of Municipal Wastewater Effluent (MWWE) Survey
Expected Return Date (Jan 7, 2005)

Section 1: Contact Details

Jurisdiction:	**Manitoba**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	Majority are owned and operated by the municipality, but the other three categories exist.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	From a regulatory perspective, yes.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	See Appendix A Do these limits apply to new AND existing facilities? If they only apply to new facilities, what are the requirements for existing facilities? All facilities would have BOD and microbiological limits. New and upgraded facilities would have ammonia limits or in the case of sewage lagoon, longer holding requirements to ensure that ammonia levels have been reduced prior to discharge. Some recent upgrades would have nutrient limits and more facilities will be required to meet nutrient limits as the province address nutrient reduction for Lake Winnipeg.
3.2	Are the generic limits universally applied to all facilities? If not, why not?	The effluent discharge limits, terms and conditions are implemented on a site specific basis through licences issued under *The Environment Act of Manitoba*
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	See Appendix A
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	- *The Environment Act*, Chapter E125, Province of Manitoba - Licences issued under The Environment Act - *Manitoba Water Quality Standards, Objectives and Guidelines*
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Site specific Environment Act Licences

3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Monitoring and reporting by the licencee. Audit and spot checks by the department. What is involved with spot checks by the dept? Visual? Samples taken? If so who takes them and who analyzes them? For what? I could vary from checks on data from the licencee to independent sampling of effluent by departmental staff.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Do you use an ERMM, a risk-based decision-making process, to determine what pollutants need to be controlled and/or to determine discharge limits, based on the characteristics of the site specific receiving environment? If so, could you give a brief description of the model (use of water quality criteria, mixing zone, etc.) and the process? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Basic modelling is used in the application of water quality limits such as limits for ammonia. Proponents are required to evaluate impacts for large projects. Proponents of small projects are allowed more latitude and are not required to provide as much detail however they must address environmental impacts based on the information available. Can you provide a brief description of the model and the process? The model is a mass balance static model
4.2	Please briefly describe the approach(es) used.	Determination of receiving water quality parameters to protect uses of that water; then determination of discharge requirements to protect those parameters/uses.
4.3	What were the rationales behind the derivation of the selected approach(es)?	To protect quality of receiving waters. How were parameters determined? The parameters are determined by provincial water quality standards staff and vetted through a public consultation process.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes As above
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**.	Yes, as above.

	If yes, please explain how this is done and how such uses are prioritized.	
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	**Yes**
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	Both water quality and biological monitoring is used. Who specifically does the monitoring? The proponent is normally responsible to have the monitoring done with analysis being done at certified labs.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Proponents are required to evaluate impacts for large projects. Proponents of small projects are allowed more latitude and are not required to provide as much detail however they must address environmental impacts based on the information available.
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Guideline documents and Information Bulletins. Such as? Where can we find these? The main reference would be the Manitoba Water Standards, Objectives and Guidelines document. A hard copy was provided to Claude Fortin, Env. Canada. It should also be available on the MB Water stewardship website.
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Site specific Environment Act Licences
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	Yes. Loadings tracking, monitoring, surveys are used. Who conducts the assessment? The proponent is normally required to do this work as part of the licence.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	CSO are present but Manitoba does not have CSO standards.The objective of reducing the number of discharges to 4 per year has been endorsed as a reasonable target if the CSO cannot be eliminated entirely through sewer separation. No limits have been applied to CSO's in Manitoba at this time; the first licence on CSO's is expected to be issued in early 2005 to the City of Winnipeg.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Site specific limits can be applied in a licence issued under *The Environment Act* as an extension to the licence for the wastewater treatment facility. Proponents are required to evaluate impacts. Evaluating impacts is problematic due to increased flows in rivers following large precipitation events. A variety of methods are being investigated to reduce CSO's. It should be noted that discharge limits do nothing to eliminate CSO's; it is the combination of limits and system improvements that brings about a reduction.

Section 6: Industrial Effluent discharges directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	The same approach as used for Municipal discharges detailed above
6.3	What were the rationales behind its/their derivation?	As above
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	As above
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	As above
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	**As above**
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	**As above**

APPENDIX A: MUNICIPAL WASTEWATER TREATMENT PLANT EFFLUENT PERFORMANCE STANDARDS

Jurisdiction	Pollutant	Category 1	Category 2	Category 3
Manitoba	Parameters	-BOD less than 30 mg/l at any time -CBOD less that 25 mg/l at any time provide ammonia limits are in force -TSS less than 30 mg/l at any time -Total P less than 1 mg/l on an annual average and/or 1mg/l for June – October based on a 30 day rolling average and 2 mg/l for Nov – May based on a 30 day rolling average -Total N less than 10 mg/l on an annual average and/or 10 mg/l for June – October based on a 30 day rolling average and 20 mg/l for Nov – May based on a 30 day rolling average -Ammonia is limited based on a variety of formulas e.g. cool water aquatic and cold water aquatic life; 30Q10, 7Q10, 1Q10 (refer to *Manitoba Water Quality Standards, Objectives and Guidelines*) -Fecal coliforms less than 200 per 100 ml by MPN method based on geometric mean -Total chlorine residual would be based on the water quality criteria if required. Most treatment facilities in Manitoba do not use chlorine or are in the process of switching to UV disinfection systems.	Are these the only parameters analyzed for? For example, do you look for metal concentrations? Metals concentrations are normally not analyzed because they are concentrated in the biomass. Most small systems do not have a significant source of metals.	
	Whole effluent toxicity	Our current effluent toxicity test requirement requires the use of whole effluent based on Environment Canada's "Biological Test Method" using rainbow trout.		

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**New Brunswick**
Name of Contact:	**Timothy R. LeBlanc**
Agency/Affiliation:	**Environmental Management Division, Department of the Environment and Local Government**
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Phone:	**506-453-7945**
E-mail:	**Timothy.Leblanc@gnb.ca**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	A) No. Not municipal systems. Some community systems are privately owned however. (Ie: mobile home parks.) B) Yes C) No. D) Yes. Commissions –owned and operated by local residents
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	Yes. The department is responsible for the regulatory compliance of municipal wastewater effluents.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	See Appendix A Other pollutants or more stringent limits than the standard limits can be added, based on the characteristics of the site specific receiving environment. Certificate of Approval required to Operate
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Site specifically (individual Approval to Operate) Depends on receiving environment - 8:1 dilution required, or tertiary treatment necessary - disinfection required if recreational area, shellfish area or drinking water source risks - tidal waters – some discharges only discharge during high tide. No discharges to lakes
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	See Appendix
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Certificate of Approval to Operate Wastewater Works *Water Classification Regulation – Clean Water Act* (2002)
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Do you use an ERMM, a risk-based decision-making process, to determine what pollutants need to be controlled and/or to determine discharge limits, based on the characteristics of the site specific receiving environment? If so, could you give a brief description of the model (use of water quality criteria, mixing zone, etc.) and the process? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	No
4.2	Please briefly describe the approach(es) used.	
4.3	What were the rationales behind the derivation of the selected approach(es)?	
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**.	

	If yes, please explain how this is done and how such uses are prioritized.	
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	No.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	We can add CSO limits to Approvals to Operate. Combined sewers are not permitted in new constructions, including expansions to collection systems Certificate of Approval to Construct. Approvals to Operate conditions include: The Owner shall undertake efforts to replace combined storm/sanitary sewers with separate storm and sanitary sewers, and shall undertake all reasonable efforts to correct other existing infiltration/inflow to the system.

Section 6: Industrial Effluent discharges directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes (somewhat – case by case)
6.2	Please briefly describe the approach(es) used.	Some industries (pulp & paper) have regulations to follow
6.3	What were the rationales behind its/their derivation?	Available regulations to follow
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Not always, case by case depending on industry, receiving water, facility size, etc.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Pulp & Paper – DFO Pulp & Paper Regulations CCME Guidelines for some parameters
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	**Discharge limits are administered through an approval process (similar to municipal wwtps)**
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	**No specific regulations**

APPENDIX A: MUNICIPAL WASTEWATER TREATMENT PLANT EFFLUENT PERFORMANCE STANDARDS

Jurisdiction	Pollutant	Category 1	Category 2	Category 3
Ontario	New Brunswick	Class I in ACWWVCP Classification System – generally an aerated or facultative lagoon - discharge water body must have an 8:1 dilution, no lakes: BOD_5 – daily max, ≥ 20 mg/l (once a month, Apr-Nov) (TSS) – daily max, ≥ 20 mg/l (once a month, Apr –Nov), UV treatment – (once a week) the geometric mean faecal coliform density of four consecutive samples does not exceed 200 MPN/100 ml throughout the year. Chlorine treatment – daily max (2/week) chlorine residual of between 0.3 mg/l and 0.7 mg/l is maintained after a retention time of 30 minutes based on the average daily effluent flow.	Class II in ACWWVCP Classification System – complex lagoon or smaller mechanical plant - discharge water body must have an 8:1 dilution, no lakes: BOD_5 – 8 hour composite (twice monthly) TSS – 8 hour composite (twice monthly) UV Treatment – (twice a week) the geometric mean faecal coliform density of four consecutive samples does not exceed 200 MPN/100 ml throughout the year. Chlorine treatment – daily max (3/week) chlorine residual of between 0.3 mg/l and 0.7 mg/l is maintained after a retention time of 30 minutes based on the average daily effluent flow.	III in ACWWVCP Classification System – larger, more complex mechanical Plant - discharge water body must have an 8:1 dilution, no lakes: BOD_5 – 24 hour composite (twice weekly) TSS – 24 hour composite (twice weekly) UV Treatment – (daily) the geometric mean faecal coliform density of four consecutive samples does not exceed 200 MPN/100 ml throughout the year. Chlorine Treatment – daily max (daily) chlorine residual of between 0.3 mg/l and 0.7 mg/l is maintained after a retention time of 30 minutes based on the average daily effluent flow.

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Newfoundland and Labrador**
Name of Contact:	**Haseen Khan**
Agency/Affiliation:	**Water Resources Management Division, Department of Environment and Conservation**
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Phone:	**709-729-2535**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	Most are municipally owned and operated. We do have some institutional, commercial, industrial, and private plants. I don't know of any owned and operated by a government agency. We can provide additional information such as numbers, locations, types, capacities, etc. if required.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	No. Federal reserves and federal properties are owned and operated under federal jurisdiction. We do have jurisdiction if activities within those areas are impaction on areas outside their boundaries. The Water Resources Act and Environmental Control Water & Sewage Regulations apply provincially while the federal Fisheries Act and Federal Environmental Legislation also apply in some cases.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Yes
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	See separate table
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Yes. Newfoundland and Labrador Regulation 65/03, "Environmental Control Water and Sewage Regulations, 2003" under the *Water Resources Act*.
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Permit to Operate
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Through annual inspections and monitoring

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	No
4.2	Please briefly describe the approach(es) used.	NA
4.3	What were the rationales behind the derivation of the selected approach(es)?	
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	

4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Same performance standards as specified for MWWE from treatment facilities (**how is this monitored and enforced?**). Monitoring of major inland freshwater systems are undertaken through our federal-provincial agreement. Other areas are monitored on an as need basis due to resource conflicts or public health issues. Enforcement is usually undertaken in a co-operative mode while non-compliance may be pursued at the discretion of the Minister including Ministerial orders and prosecution.

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	No
6.2	Please briefly describe the approach(es) used.	
6.3	What were the rationales behind its/their derivation?	
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Northwest Territories**
Name of Contact:	**Peter Lennie-Misgeld** **Senior Regulatory Officer**
Agency/Affiliation:	**Mackenzie Valley Land and Water Board**
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E-mail:	**peter@mvlwb.com**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	All six tax based communities owned and operated by the municipality and the infrastructure of others (non-tax-based) are owned by the Government of the Northwest Territories but operated by the communities or contracted out by the community.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	The GNWT does not have any regulatory jurisdiction for the management of MWWE. This is done by independent land and water boards in the NWT who are ultimately responsible to the Minister of INAC. The GNWT manages certification and training and assists communities with funding (Department of Municipal and Community Affairs) and generally ensures adequate infrastructure is in place, primarily through contractors, and inspects operations (Department of Public Works and Services.)

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) NO **If NO, please proceed with SECTION 4. If yes, please continue below.**	The meaning of end-of-pipe limits is not clear. Most of our communities have trucked system and not piped system. . Primarily parameters are imposed on a case-by-case basis depending on treatment strategies and location. No our jurisdiction does not have generic end of pile limits for municipal wastewater effluent. What is meant by trucked in? If waste is hauled, where is it disposed? Trucked in means that a sewage vacuum truck pumps out the effluent from a holding tank within the residence and then hauls it to the local municipal facility for disposal. This is done due since many smaller communities do not have municipal infrastructure in place i.e. buried water and sewer lines. In these communities each house also has its drinking water hauled via truck to each house, where it is stored in holding tank for use. Can we get some examples of specific discharging criteria? Examples are attached.
3.2	Are the generic limits universally applied to all facilities? If not, why not?	No, limits are assessed on a case by case basis.
3.3	What are the parameters measured, their respective generic limits	BOD, Coliforms, Oil and Grease, TSS, pH, toxicity tests for

	and the rationales behind their derivation (e.g., best achievable performance for that technology)?	some municipalities
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	The Mackenzie Valley Resource Management Act and the NWT Waters Act (both federal legislation) and associated regulations are the governing legislation. Water licences are developed for each community. Generic limits are specified in the legislation or regulations. Limits are developed on a case by case basis.
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Site specific water licences. What do site specific licenses govern? Water License are issued for use of water and/or deposits of waste. The license sets the discharge criteria that have to be met to operate. If criteria are exceeded then Water License Inspectors take the appropriate enforcement/compliance action. Criteria for what triggers a water license is outlined in the Northwest Territories Waters Act and the Northwest Territories Water Regulations.
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Monitoring is required and all monitoring data are presented in monthly and annual reports. These reports are required for all water licenses issued for deposits of waste. Indian and Northern Affairs inspectors check for compliance and conduct enforcement.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Do you use an ERMM, a risk-based decision-making process, to determine what pollutants need to be controlled and/or to determine discharge limits, based on the characteristics of the site specific receiving environment? If so, could you give a brief description of the model (use of water quality criteria, mixing zone, etc.) and the process? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	No, we do not use risk assessment processes in determining end of pipe limits for industrial or municipal activities.
4.2	Please briefly describe the approach(es) used.	
4.3	What were the rationales behind the derivation of the selected approach(es)?	
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**.	

	If yes, please explain how this is done and how such uses are prioritized.	
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	No
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	

Section 6: Industrial Effluent discharges directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No** Yes	No, our Board does itself use risk-assessment to finalize end of pipe limits for industrial developments. However, all water license applications for industrial developments are stakeholder reviewed and stakeholders as well as applicants do sometimes use environmental risk processes to develop their recommended effluent quality criteria to our Board. For the major mining projects Best Available Treatment Technology has often been used by applicants to predict what end of pipe limits they can achieve for water quality parameters of concern. Our Board then considers these predictions in setting the final end of pipe limits.
6.2	Please briefly describe the approach(es) used.	
6.3	What were the rationales behind its/their derivation?	
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	
6.5	Is the process for deriving the effluent limits specified in legislation	No, it is done on a case by case basis. The NWT Waters Act

	or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	only outlines the Boards authority to set water quality standards in accordance with applicable federal regulations or in the absence of such regulations, standards the Board sees as acceptable.
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	**Site specific water licenses are developed for industrial activities e.g. mining. Each industrial water license contains it's own specific discharge criteria which are often set by using** Best Available Treatment Technology and Board setting limits that are most protective of aquatic life. It is also important to note that in the north the majority of industrial developments are located in remote conditions where receiving water bodies have not be previously impacted by industrial activities. Therefore, discharge limits are set at very low limits to protect the receiving water body from adverse impact. CCME water quality guidelines are used by applicants as well as the Board to guide in the development of protective discharge criteria.
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	**No, there are no municipalities in the NWT that use any treatment outside of a lagoon system. Municipal discharge limits in the north are not as stringent as industrial discharge criteria**

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Nova Scotia**
Name of Contact:	**Robert Rowe**
Agency/Affiliation:	**Water and Wastewater Branch, Nova Scotia Dept. of Environment and Labour**
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E-mail:	**rowerj@gov.ns.ca**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	Wastewater systems are mostly owned and operated by the municipalities, however there are a number which are operated by private companies in Mobile home parks, campgrounds, pulp mills, and other businesses. A few would be run by government agencies such as Parks Canada, DND, Public Works, etc.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	Mainly this falls to the provinces, however the Federal Government has regulations under the Fisheries Act which would also be applicable. They usually work with the province on these matters.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	**Are generic limits in place for existing facilities? Regardless, how were limits established? Can you provide examples of effluent limits that demonstrate the range of permit requirements in existence?** **See email following this survey**
3.2	Are the generic limits universally applied to all facilities? If not, why not?	
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes. Limits for BOD, TSS, fecal coliforms are established for new facilities based on receiving water studies. **Please also describe how effluent limits were established for existing facilities throughout Section 4 (and Section 3 and 6, if applicable).**
4.2	Please briefly describe the approach(es) used.	Receiving water studies are conducted by the Consultant for the proponent to establish discharge limits that will not create an Adverse Affect. They follow the procedures as outlined in the Atlantic Canada Stds and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage. (Available on our Provincial Website)
4.3	What were the rationales behind the derivation of the selected approach(es)?	It is based on the assimilative capacity of the specific receiving water.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes, in freshwaters where water is also used for irrigation this is taken into account as this will affect volume requirements in the low flow time of year and water quality requirements. ie. If flows are reduced by irrigation requirements there will be less capacity to assimilate the waste and less water for aquatic life.
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes. See above.

4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes.
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	Some permits, but most don't require monitoring of the receiving water for parameters such as DO. Also in tidal esturaries we sometimes require discharges to be limited to times when the tide is high or flowing out.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	It applies to all new applications, with a few exceptions. Some large cities on the coast of N.S. have been allowed to continue to discharge untreated sewage to the ocean, due to the high cost of providing collection and treatment.
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	**For new facilities**: Limits are incorporated into operating permits following Atlantic Canada Standards and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage. The permitting process is regulated according to Water and Wastewater Regulations, NS. Reg. 140/2000 and Activities Designation Regulations, NS. Reg. 47/95, under the *Nova Scotia Environment Ac*t
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Site specific permits and operating approvals is the tool to administer the regulations.
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	No, not by the Department, however some environmental groups and concerned citizen groups do monitoring of specific lakes, rivers and estuaries that they have an interest in. Only by reviewing the results of effluent monitoring by the owners of the sewage treatment plants do we get some idea of the effectiveness of the program.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Regulated under Emergency Spills Regulations NS Reg. 59/95 which specify that spills of sewage greater than 100 L must be reported. **No requirement to analyze spill composition or assess receiver impact?**

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes, same process as for municipal sewage.
6.2	Please briefly describe the approach(es) used.	
6.3	What were the rationales behind its/their derivation?	
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	No some industries such as fish plants discharging to salt water only require coarse screening. (0.5 inch)
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	No. It is in the Guidelines. (Atlantic Canada Standards and Guidelines Manual for the Collection Treatment and Disposal of Sanitary Sewage 2000).
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Site specific permits are used, however some industries are exempted such as fish plants in salt water and pulp mills are covered under Federal Legislation.
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	As mentioned above some cities such as Halifax and Sydney don't have sewage treatment. This is changing as facilities are presently under construction. The main barrier has been financial, and political will to enforce compliance.

From: Bob J Rowe [rowerj@gov.ns.ca]
Sent: Tuesday, January 25, 2005 4:16 PM
To: rjohnson@minnow-environmental.com
Subject: Re: CCME Survey follow up

Reagan:
Ok I will answer for existing facilities.
3.1 Yes generic limits are in place for some facilities. Really old permits would require a % reduction in BOD and SS depending on the receiving waters this could be 80-95% reduction required. This isn't good though as facilities expand they can exceed the assimilative capacity of the receiving waters and still meet permit requirements. After that permits had generic limits depending on the receiving water body. ie open ocean required a 30/30 effluent. (BOD and SS) Brackish water or restricted bays required 20/20 effluent and rivers and lakes got limits of 10/10 or 5/5 depending on the size and dilution available. Fecal coliforms were generally always specified to be less than 200/100ml. Older permits used total coliforms and the limit was 1000/100ml.
The limits were outlined in guidelines, and policies.
Permits were site specific, and older permits had no reporting requirements. Compliance was verified by monthly visits by inspectors. newer permits have reporting requirements and visits are made much less frequently to all facilities generally 1 inspection every 2 years for low risk facilities and 2 times per year for high risk facilities.
Effluent limits for existing facilities generally vary depending on when the permit was drawn up or if it was revised due to alterations or improvements to the sewage treatment plants.ie we still have some plants operating on the % reduction type of permits.
We don't normally require the analysis of CSO's and very few are reported as required. When this is done it is usually in conjunction with studies on treatment needs for upgrading plants and collection system infrastructure. When spills are reported it is usually accompanied by public health advisories on the use of the receiving water, and efforts are made to contain or limit the extent of the spill.
I hope this answers your questions, but if you have more please contact me.
Bob

Robert Rowe MPH., P. Eng.
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B3J 2T8

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>>> "Reagan Johnson" <rjohnson@minnow-environmental.com> 2005-01-21 10:53:51 AM >>>
Hi Bob,

We have been reviewing survey responses and I have a follow up question for you. The responses that you provided in the survey were quite good, however, they seemed to focus entirely on new facilities. We do require information on existing facilities, their limits etc. I have attached your response survey and ask if you would be willing to complete the survey again, this time focussing only on existing facilities. Please feel free to get in touch if you have any questions or concerns.

Thank you,

Reagan

Reagan Johnson, M.Sc.
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Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Nunavut**
Name of Contact:	**Gladis Lemus**
Agency/Affiliation:	**Pollution Control and Air Quality, Department of Environment**
Address:	**Brown Building, Stn 1360 P.O. Box 1000 Iqaluit, NU X0A 0H0**
Phone:	**867-975-5907**
E-mail:	**glemus@gov.nu.ca**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	b) Owned & operated by Municipality (92%, 23 out of 25) c) owned and operated by a *territorial* government agency (8%, 2 out of 25, Rankin Inlet & Resolute Bay)
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	No, Management of Municipal WW Effluent consist of different levels: 1. IPG: Institutes of Public Governance derived from the Nunavut Land Claims Agreement, particularly the NWB-*Nunavut Water Board*, who issues water licenses. NWB has a 'Guideline for the Discharge of Domestic Wastewater in Nunavut' 2. The *Hamlets* (Municipalities) who are the water licensees (in most cases).

		3. Federal: *INAC* who regulates & enforces wastewater through the 'Nunavut Water & Surface Rights Tribunal Act', and *DFO*, pertinent to Fisheries Act (Sc 36(3) – deleterious substances) 4. Territorial: Mainly from Department of Environment (*DOE*), who administer the 'Nunavut Environmental Protection Act' (who prohibits the discharge of contaminants), and through the Department of Community & Government Services (*CGS*), who are responsible for wastewater infrastructure in the Territory.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes, as stated in the NWB's 'Guideline for the Discharge of Domestic Wastewater in Nunavut'
3.2	Are the generic limits universally applied to all facilities? If not, why not?	The Guideline is applicable to all NWB 'licensed' facilities
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	BOD5, TSS, pH, Oil & grease, F. Coli, & heavy metals (See attached Guideline)
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	No, limits are specified in the NWB Guideline
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Site-specific permits/licenses

3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Through reporting to NWB (See Guideline for details) & site-specific audits by the Regulatory agency (INAC – Water Enforcement)

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Do you use an ERMM, a risk-based decision-making process, to determine what pollutants need to be controlled and/or to determine discharge limits, based on the characteristics of the site specific receiving environment? If so, could you give a brief description of the model (use of water quality criteria, mixing zone, etc.) and the process? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes, See Table 6.1 of Guideline for details.
4.2	Please briefly describe the approach(es) used.	Depending on body of water receiving the effluent, different parameters are taken into consideration, like season, mixing conditions, dilution & residence time. (See Table 6.1 of Guideline)
4.3	What were the rationales behind the derivation of the selected approach(es)?	Factors & environmental conditions typical of the North
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes, case-specific & receiving water body specific.

4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes, more importantly for the North is seasonal variability
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes, see Section 3.2 of the Guideline
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	Water quality or biological monitoring of the receiver
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Applied to all Municipal wastewater systems
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Not in the legislation or regulations. Documented in the NWB's Guideline
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Site-specific permits/licenses to operate
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does	No, success is judge by reports and public concerns

	your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	No
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	

Section 6: Industrial Effluent discharges directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	Environmental-risk based on site specific condition, northern conditions, and applicable Canadian Environmental Quality Guidelines (Canadian Council of Ministers of the Environment)
6.3	What were the rationales behind its/their derivation?	To maintain the quality of the receiving water within reasonable & acceptable limits
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Yes

6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Not in the legislation or regulation, but on NWB's guideline & applicable Canadian Environmental Quality Guidelines (Canadian Council of Ministers of the Environment)
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Site-specific permits/licenses to operate
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	--

APPENDIX A: MUNICIPAL WASTEWATER TREATMENT PLANT EFFLUENT PERFORMANCE STANDARDS

Jurisdiction	Pollutant	Category 1	Category 2	Category 3
Nunavut	*See Table 6.1 & 6.2 of Guideline for details*			

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Ontario**
Name of Contact:	**Stephen Carty**
Agency/Affiliation:	**Ontario Ministry of the Environment Land Use Policy Branch**
Address:	**135 St. Clair Avenue West, 6th floor Toronto, Ont M4V 1P5**
Phone:	**416-314-7201**
E-mail:	**Stephen.carty@env.gov.on.ca**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	All municipal sewage treatment plants (460) are owned by the municipalities. There are approximately 200 municipal sewage treatment plants operated by the Ontario Clean Water Agency (OCWA), which is an arms-length agency of the provincial government. Most of the remaining plants are operated by the municipality, while a few municipalities have contracted operations to private companies.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	All discharges to the natural environment are regulated under the *Ontario Water Resources Act* (OWRA). The OWRA is the responsibility of the Ministry of the Environment. There are other legal requirements that are relevant with respect to discharges, eg. the federal *Fisheries Act*, that can be invoked where there are deleterious effects to water. Wastewater effluent is potentially subject to these requirements.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	(See Appendix A) Yes. These end–of–pipe performances are currently being updated as per MOE commitments under the 2002 Canada/Ontario Agreement Respecting the Great Lakes Basin Ecosystem to develop a management framework for municipal sewage treatment plants. These end-of-pipe performances represent minimum effluent quality requirements. More stringent requirements may be required based on an assessment of the receiving water quality.
3.2	Are the generic limits universally applied to all facilities? If not, why not?	The generic limits which reflect the performance of best available technology are applied to new/expanding facilities at the time approval is sought under the *Ontario Water Resources Act*. Older approvals may not include all of these requirements. More stringent limits may also be applied in an approval based on receiving water conditions at the time of an application for renewal/expansion/new plant.
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	See Appendix A
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Limits are included in *Ontario Water Resources Act*, Section 53 approvals (ie. "Certificates of Approval", for discharges to the natural environment). Municipal effluent limits are derived from the following guideline documents: - *Water Management Policies, Guidelines, Provincial Water Quality Objectives* ("Blue Book") - *Deriving Receiving Water Based, Point Source Effluent Requirements for*

3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	See 3.2 Effluent limits are included in approvals issued under Section 53 of the *Ontario Water Resources Act*.
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Each facility must submit monthly reports to the Ministry for parameters included in approvals issued under the *Ontario Water Resources Act*. Any non-compliance with an approval requirement must be reported to the Ministry within 7 days. Municipal sewage treatment plants are also inspected by ministry staff, at which time audit sampling is carried out.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Do you use an ERMM, a risk-based decision-making process, to determine what pollutants need to be controlled and/or to determine discharge limits, based on the characteristics of the site specific receiving environment? If so, could you give a brief description of the model (use of water quality criteria, mixing zone, etc.) and the process? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Provincial Water Quality Objectives (PWQO) set the maximum acceptable concentrations for chemicals and other pollutants. PWQOs are an integral part of Water Management in Ontario. PWQOs are developed according to "Ontario's Water Quality Objective Development Process (1992)". The PWQO were established in collaboration with the science division of the ministry as well as our federal counterparts and the Canadian Water Quality Guidelines. The standard setting process includes a risk assessment and risk management process. The Ministry water management policies and guidelines (*Water Management Policies, Guidelines, Provincial Water Quality Objectives* (“Blue Book”) are based on principles such as the protection, preservation, and sustainability of the province's water resources for future generations. In

		order to effectively implement these principles, ecosystems and watershed management, how pollutant s are controlled, and the inter-relationship of air, water and land management are all important considerations. The water management policies and guidelines supporting PWQO's are the basis for establishing acceptable limits for water quality and quantity, consistent with the protection of the aquatic ecosystem and ground-water. They are equally applicable to local site specific situations, an entire watershed, or the Great Lakes. They establish the limit or the extent to which a water resource can be used without interfering with other uses. In setting the limits or requirements for the protection of the water resource, the protection of other media such as land and air must be considered and are taken into account in the Approvals and Environmental Assessment processes. A project may have to be altered or scaled down to achieve the appropriate protection of all media. Multi-media considerations may lead to more stringent limits compared to those needed to protect the water resource alone. MOE's environmental protection strategy places priority on preventing, then minimizing the creation of pollutants. When the creation of pollutants cannot be avoided, the Ministry's priority is to prevent their release to the environment and second, to minimize their release. As part of the approvals process for municipal discharges, the above policy requires that an assessment of receiving water quality be undertaken. As a result of receiving water assessments, more stringent than normal limits may be included in an approval, and other contaminants, limits and monitoring requirements may also be included an approval. General policies are contained in ministry policy

		for ensuring that surface waters are of a quality which is satisfactory for aquatic life and recreation. Policies are split into two categories, Areas with Water Quality Better than the Provincial Water Quality Objectives and Areas with Water Quality not meeting the Provincial Water Quality Objectives. The policies outline requirements for evaluation of existing surface water conditions as part of an application for approval of a discharge.
4.2	Please briefly describe the approach(es) used.	See 4.1
4.3	What were the rationales behind the derivation of the selected approach(es)?	With respect to surface water quality, the goal is to ensure that the water quality is satisfactory for aquatic life and recreation and that water uses that require more stringent water quality be protected on a site specific basis. Ground water quality is to be preserved to protect the greatest number of users.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes, on a case by case basis depending on the receiving water.
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes, (mainly temperature). For setting un-ionized ammonia level
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	**Yes, according to MOE** *Water Management Policies, Guidelines, Provincial Water Quality Objectives* ("Blue Book")
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	MOE has established set of monitoring stations across the province to assess long term effect of discharges

4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Yes, with varying degree depending on the receiving water conditions.
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	*Policy Manual: Deriving Receiving Water Based, Point Source Effluent Requirements for Ontario Waters*
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Through approvals issues under section 53 of *Ontario Water Resources Act*
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	See 4.7

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	An updated policy, completed in 1997, stipulates the following for Minimum CSO Controls: ➢ No Dry Weather Overflows ➢ Operation and Maintenance Program ➢ Pollution Prevention Program ➢ Control of Floatables ➢ Maximize use of Collection System ➢ Maximize use of STP for Wet Weather ➢ 90% volumetric control of flows from wet weather ➢ Minimum level of treatment during wet weather is primary treatment ➢ As a minimum, achieving an average of 30% BOD removal and 50% total suspended solids removal. Treatment facilities can either be located centrally (at STP) or at distributed locations (satellite treatment) Procedure F-5-5 (Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems)
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Yes, according to MOE Policy F-5-5, minimum treatment is primary (As a minimum, achieving an average of 30% BOD removal and 50% total suspended solids removal followed by disinfection, especially where discharges take place in the vicinity of beaches).

Section 6: Industrial Effluent discharges directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	MOE promulgated nine industrial sector regulations under the Municipal/Industrial Strategy for Abatement program for industrial sectors that discharge directly to surface water. The nine sectors are: organic chemical manufacturing, inorganic chemical manufacturing, iron and steel manufacturing, electric power generation, petroleum sector, metal mining, industrial minerals, metal casting, pulp and paper. In developing the effluent limits for each industrial sector, sampling at each plant was conducted to determine the parameters contained in industrial effluent. Effluent limits are based on best available technology approach and complemented that with an evaluation of the impact of discharges on the receiving waters. - Technology based effluent discharge (BATEA) limits are incorporated in the regulations. These BATEA limits represent the minimum pollution control requirement for each discharger. Industry is free to choose any method to achieve the limits; - More stringent limits, if required to protect water uses of the receiving stream are incorporated in Certificates of Approvals. Approvals under the *Ontario Water Resources* Act

		Approvals can include more stringent requirements than those in regulations.
6.3	What were the rationales behind its/their derivation?	See 6.2
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	This approach is applied to the large dischargers that discharge directly to surface water, included in the nine industrial sectors noted in section 6.2. These companies comprise the largest direct dischargers with known chemical and/or harmful pollutants in effluent. There are a number of small direct dischargers not included in these regulations. However, these companies require an approval under the *Ontario Water Resources Act*, which can include effluent limits.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Effluent limits for the nine industrial sectors noted in section 6.2 are set out in regulations under the *Environmental Protection Act*. An approval is also required under the *Ontario Water Resources* Act for all direct dischargers. Effluent limits are established in accordance with policy , ie. *Policy Manual: Deriving Receiving Water Based, Point Source Effluent Requirements for Ontario Waters*
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	**Through a combination of regulations, approvals under the *Ontario Water Resources Act* and policy/guidelines.**
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	**The policy intent in the past has been to develop a similar approach for municipal discharges. Currently there is no regulation for municipal sewage treatment plant discharges. MOE is in the process of developing a management frame work for municipal waster water discharges**

APPENDIX A: MUNICIPAL WASTEWATER TREATMENT PLANT EFFLUENT PERFORMANCE STANDARDS

Jurisdiction	Pollutant	Category 1	Category 2	Category 3
Ontario	Parameters	$CBOD_5$ = 25 annual average COD = not applicable TSS = 25 annual average TP = 1 annual average Case by case standards: Total Ammonia Nitrogen E. coli = monthly geometric mean of 200 *E .coli* per 100 mL Total Chlorine Residual = 0.5 mg/L annual average pH = 6 – 9.5	Seasonal Lagoons with TP removal by batch chemical dosage: $CBOD_5$ = 25 TSS = 25 All Other Lagoons: $CBOD_5$ = 30 TSS = 40	
	Whole effluent toxicity	Acute - May be required through the Certificate of Approval on a case by case basis. Currently under review and will be a requirement for periodic testing (monthly, quarterly). Chronic - Not applicable	Acute - May be required through the Certificate of Approval on a case by case basis. Currently under review and will be a requirement for periodic testing (monthly, quarterly). Chronic - Not applicable	

Management of Municipal Wastewater Effluent (MWWE) Survey
Expected Return Date (ASAP)

Section 1: Contact Details

Jurisdiction:	**Prince Edward Island**
Name of Contact:	**Jim Young, P.Eng** **Director, Water Management**
Agency/Affiliation:	**Department of Environment, Energy and Forestry.**
Address:	**11Kent St, PO Box 2000, Charlottetown, PE, C1A 7N8**
Phone:	**902-368-5034**
E-mail:	**jjyoung@gov.pe.ca**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	Systems are municipally, privately, government and industrial owned & operated in PEI.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	MWWE construction, operation, maintenance and discharges are approved under the EPA for PEI.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	**Yes** New WWTP are approved to satisfy secondary wastewater treatment level BOD – 25mg/l TSS – 25 mg/l F.C. avg. – 200 mpn
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Yes to all new plants
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	As described above
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	No, Thru standards and guidelines
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Administered thru the approval process for wastewater treatment facilities. Section 13 of EPA requires approval for all new systems or modification or upgrades to existing systems.
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Reporting thru new water and wastewater system operating regulations. Report annually with monthly summaries.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	**Yes** **Impact and risk assessment of the receiving water. This would include assimulative capacity assessment and all existing uses of the resource.**
4.2	Please briefly describe the approach(es) used.	As above
4.3	What were the rationales behind the derivation of the selected approach(es)?	Shared resource and accumulative impact assessments
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes

4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	All of the above
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Yes all new wwtp's and upgrades or modifications to existing wwtp's
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	No. Thru the approval process. Approvals are issued as orders under the EPA. This includes a specific order to operate the wwtp with discharge limits.
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	As above
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	Yes. Thru environmental effects monitoring. All dependent on the receiving water.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes we have CSO's. These are older and we no longer approve this type of system. All CSO's will be eliminated over the next four years.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	**No we do not.**

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes same as described earlier for municipal wwtp's.
6.2	Please briefly describe the approach(es) used.	As above
6.3	What were the rationales behind its/their derivation?	As above
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	As above
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	As above
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	As above
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

From: Jim Young [Jjyoung@gov.pe.ca]
Sent: Friday, April 22, 2005 8:39 AM
To: porr@minnow-environmental.com
Subject: RE: TR : Comments on the Report

Patti

See attached response to your questions below

1. Is the legislation governing MWWE management officially called the "Environmental Protection Act" (or the Environmental Protection Act of Prince Edward Island or ...)? Are there regulations published under this act and, if so, how are they properly referred to? Either way, are you able to send me the relevant regulatory regulatory passages so I can see how specific the requirements are in the legislation itself?

Act is called " Prince Edward Island Environmental Protection Act" . Yes the regulations are published under this Act, specifically Section 25 of the Act. Effluent limits are policy only not in the Act or regulations. Section 13 of the Act under a Certificate of Approval gives the Minister Authority to put conditions on wastewater systems.

2. Are the BOD/TSS/Fecal limits you mentioned outlined in the EPA or elsewhere? If elsewhere, would you please provide the title of the document if one exists?

Policy only.

3. What effluent limits have been applied to older facilities that have not had to undergo upgrading?

All treatment systems in PEI by next year will be minimum full secondary treatment. The only limit the older systems can't satisfy without upgrading is the fecal.

4. Are facilities required to have an operating permit? Is this administered under the EPA?

Under Section 16 of the Act they must operate and maintain system as ordered by the minister. Also the new regs require owners to report annually on the systems performance to their customers (water quality, effluent quality).

5. Are impacts and risk assessments of receiving waters required only in the case of new facilities and upgrades? Does this mean older facilities have not likely been required to do such assessments? What do such assessments involve (water, sediment, benthic invertebrate, fish sampling)? Do they always follow a similar type of approach (explain)? Are such requirements outlined in a document we can reference? Who is responsible for conducting the assessments (e.g., Would the municipality that owns the facility be responsible for hiring a consultant to complete the work?)

Older systems are grandfathered. New or upgrades depending on the receiving water. An assessment must be conducted at the owners expense. Full assessment of accumulative impacts on the receiving environment including water, sediment, fin fish, shellfish, invertebrates is required. I will have our surface water assessment section respond specifically to this.

6. If there is little in the way of formally documented guidance for setting limits and/or receiving water assessments, who makes the decisions on a facility by

facility basis?

The Minister has the final decision. The beginning point is minimum effluent quality standard of secondary treatment would be assessed for the specific receiving water. If the assessment determines a higher standard tertiary (some nutrient removal requirements) then that is what would be approved.

Any further questions please let me know.

Jim

-----Original Message-----
From: Jim Young [mailto:Jjyoung@gov.pe.ca]
Sent: Monday, April 18, 2005 3:16 PM
To: porr@minnow-environmental.com
Subject: Re: TR : Comments on the Report

Patti

Attached find your report for PEI filled in. If you have any follow up questions please let me know.

Thanks
Jim

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Quebec**
Name of Contact:	**Didier Bicchi**
Agency/Affiliation:	**Service de l'expertise technique en eau** **Ministère de l'environnement du Québec**
Address:	**675 Rene Levesque Boulevard East, 8th Floor** **Quebec, QC G1R 5V7**
Phone:	**418-521-3885 ext 4852**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	Owned by municipalities and operated either by the municipalities themselves or by private companies.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	Municipalities have the responsibility of managing their wastewater effluents. Through our environmental quality act (*Loi sur la qualité de l'environnement*), the Ministry of the Environment authorises any sewer expansion and wastewater treatment plant construction or expansion. It also sets discharge limits.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	There are no generic end-of-pipe limits applicable to everyone. End-of-pipe objectives are first determined on a site-specific basis, according to the uses downstream and associated guidelines, and an ERMM. Wastewater treatment technology is determined based on the set objectives. If the discharge is considered as having very limited impact, only fine screening can be required to remove debris. End-of-pipe limits are set according to the performance standards of the technology installed. See Appendix A.
3.2	Are the generic limits universally applied to all facilities? If not, why not?	There are no generic end-of-pipe limits applicable to all. Performance standards are applied by type of technology installed.
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	COD, BOD_5, TSS and ammonia are measured at all secondary treatment plants. Others, such as P_t and faecal coliforms are added when limits for these are set. End-of-pipe limits are set according to the achievable performance of the technology installed. See Appendix A.
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	No. Technology performance standards appear in guidance documents produced by the Ministry of Municipal Affairs. Ambient Water quality criteria are published on the web site of the Ministry. And the “Method for calculating water quality-based effluent objectives for aquatic pollutant” (1991-2001) was sent to 500 persons or industries; the up-dated version (in preparation) will be on the web site of the Ministry in 2005.
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	

3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Monitoring results are sent to a centralized data compilation system administered by the Ministry of Municipal Affairs. Compliance is verified by the Ministry of the Environment by having access to this data.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Do you use an ERMM, a risk-based decision-making process, to determine what pollutants need to be controlled and/or to determine discharge limits, based on the characteristics of the site specific receiving environment? If so, could you give a brief description of the model (use of water quality criteria, mixing zone, etc.) and the process? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes, an ERMM is used. The ERMM is based on real or potential uses downstream, water quality criteria to be met after a mixing zone, background levels and low water conditions. Effluent discharge objectives are set for BOD_5, TSS, total phosphorus, faecal coliforms, ammonia, H_2S and whole effluent acute toxicity. These objectives are then translated into effluent discharge limits, based on technology limits. Up to now, discharge limits have only been set for BOD_5, TSS, total phosphorus and faecal coliforms. The potential adverse effects of the discharge are evaluated by the Ministry of the Environment. (Eventually, the ERMM will be used for all pollutants, like it's now the case for the industrial sector. For the industrial sector, chronic guidelines and chronic whole effluent toxicity have to be met at the end of a mixing zone (described below). Starting from there, a back-calculation is done with stream flow and effluent flow to derive an end-of-pipe "ideal" objective. This is called a water quality-based effluent objective (WQBEO). The end-of-pipe discharge has to be non-acutely toxic. Sometimes, for short term discharges or when acute toxicity is well documented and is a fast-acting pollutant (like ammonia, chlorine), acute values (final acute values) are also used as a limit at the end-of-pipe. All of these are WQBEOs).
4.2	Please briefly describe the approach(es) used.	The approach is a simple mass balance, based on loads. What is already in the water body (concentration x flow) plus the discharge load should not exceed the ideal condition at the end of the mixing zone, i.e. the chronic guideline and the chronic whole effluent toxicity. So what you intend to meet at the end of the mixing zone, minus the stream load, gives you the discharger's allocated load and concentration. The allocated mixing zones are not the same for each use and for each substance. The "risk" approach is well

		described in the document cited above.
4.3	What were the rationales behind the derivation of the selected approach(es)?	An environmental model was needed to identify which parameters needed to be reduced and to what level, in order to maximize environmental benefits with the available money.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes. Some uses are always considered as they are supposed to be everywhere: aquatic life, fish consumption by humans (to prevent the contamination of fish flesh for current and future human consumption) and piscivorous wildlife. Some other uses are also considered but only at the site: drinking water supply, recreational activities, etc. See foot note.
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes. Water quality-based effluent objectives (or EDOs) are calculated for critical low flows as we want them to be met most of the time. Low flows differ from one use to another depending on the time needed for an effect to develop (aquatic life vs human health for example). Temperature could sometimes be used to define two EDOs, one for winter and one for summer for very few substances (ammonia for example). Tides are more difficult to take into account, but they are. A typical scenario is used that takes into account the inversion of the tide and the depth of the discharge. It is not the worse case scenario.
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes, but the mixing zones are not the same for BOD and TSS then for toxics (ammonia for example). It is expected that in the near future, no mixing zone will be tolerated for highly toxic, bioaccumulative and persistent chemicals. Specific physical limits are described in the WQBEO document. The principles of allocating a mixing zone are given in the same document and in the CCME, 1999, document, in the chapter on site-specific objectives.
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	The Ministry has a number of sampling sites across the province where water samples are taken and a few parameters are analysed. Sometimes the health of a whole river watershed is evaluated. But generally, these do not aim at determining the effectiveness of discharge limits at a specific site.

4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	It is universally applied, but some objectives might not be translated into discharge limits as stringent because of technological limitations (i.e. BOD objectives will not be translated into a discharge limit lower that 15 mg/l). The approach applies to new wastewater systems or their modifications.
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	No. Our environmental quality act (*Loi sur la qualité de l'environnement*) requires the Minister's authorization for wastewater treatment and waterworks. Applicants have to follow a guide and provide the necessary information to the Ministry, which then calculates specific effluent discharge objectives. These objectives are then used by applicants to design the treatment systems. The authorization process allows the Ministry to make sure the proposed treatment systems will meet the effluent discharge limits derived from the objectives. The above-mentioned guide (*Guide de présentation des demandes d'autorisation pour les systèmes de traitement des eaux usées d'origine domestique*) was published in July 1999 and is now online. The method for calculating effluent objectives (*Méthode de calcul des objectifs environnementaux de rejet pour les contaminants du milieu aquatique*) was first published in 1991, revised in 2001, and should soon be online.
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Through our environmental quality act (*Loi sur la qualité de l'environnement*), the Ministry of the Environment authorises any sewer expansion and wastewater treatment plant construction or expansion. It is through this authorisation process that discharge limits are set according to the selected treatment technology.
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	The Ministry has a number of sampling sites across the province where water samples are taken and a few parameters are analysed. Sometimes the health of a whole river watershed is evaluated. The results of these are reported in public documents.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes. Combined sewer overflow structures have to be authorized by the Ministry of the Environment. Overflows occurring during dry weather are not allowed. CSOs have to be monitored, either continuously for bigger systems or by periodic inspections for smaller systems. Some CSO reduction techniques are starting to be used in lager cities.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	No overflow during dry weather and minimal removal of floating debris are the minimum requirements. A set frequency of events can be allowed, based on uses downstream. The potential adverse effects of the discharge are evaluated by the Ministry of the Environment. CSO frequency limits are established based on set criteria related to the uses downstream (primary or secondary contact, scenery, public health, irrigation and livestock watering) and the flow of water (continuous or stagnant). No discharge is permitted within 1 km of a dinking water intake or a shellfish harvesting site, and no discharge is permitted in a fish spawning site. See *Grille d'évaluation pour le contrôle des débordements*.

Section 6: Industrial Effluent discharges directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes.
6.2	Please briefly describe the approach(es) used.	The ERMM is used for all pollutants. Chronic guidelines and chronic whole effluent toxicity have to be met at the end of a mixing zone. Starting from there, a back-calculation is done with stream flow and effluent flow to derive an end-of-pipe "ideal" objective. This is called a water quality-based effluent objective

		(WQBEO). The end-of-pipe discharge has to be non-acutely toxic. Sometimes, for short term discharges or when acute toxicity is well documented and is a fast-acting pollutant (like ammonia, chlorine), acute values (final acute values) are also used as a limit at the end-of-pipe. All of these are WQBEOs. This is the "risk" evaluation part. These WQBEOs do not take into account economical, social or technological constraints. They would never be directly written in a license or permit. They have to be translated into discharge limits or technological standards. This is the management part.
6.3	What were the rationales behind its/their derivation?	Mostly for toxics, particularly for those which are already in ambient waters naturally (like metals), it is not possible to define an end-of-pipe value for every dischargers without expecting these values to be to high or to low for the environment depending on the discharge load and the load already in the ambient water. So as dilution is not a treatment, minimum requirements are needed in regulations (like every car should have an anti-pollution system even in backcountry) but for sensitive water body, for low flows, or when multiple dischargers are at the same location, etc, these minimum requirements are not sufficient (like in the cities, anti-pollution systems on each car are not sufficient to prevent air pollution problems). So an environmental model was needed to rationalise the number of problematic contaminants to follow at each discharge and to identify which ones should be reduced, by treatment or best management practices or prevention programs. This approach was also useful to identify where research is needed, to get better or new analytical limits for examples, or to decide where site-specific guidelines would be needed for metals. Since there aren't a lot of industrial regulations in Quebec and as there aren't a lot of substances in regulations, this approach allows us to add EDOs and eventually performance limits for substances not covered in regulations.
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Yes.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations.	No.

	If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	All industrial activities must have a certificate of approval from the Ministry of the Environment (article 22 of the Environmental Quality Act) where specific discharge limits can be set. Some industrial sectors have regulations (pulp & paper, oil refineries) that describe minimum requirements. Some industrial sectors must have specific permits (*attestation d'assainissement*). These are described in the Act and in regulation.
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	It is used for municipal wastewaters, but only for a limited number of parameters and there is no universal minimum discharge limits. Québec plans to extend the municipal model to other parameters.

APPENDIX A: MUNICIPAL WASTEWATER TREATMENT PLANT EFFLUENT PERFORMANCE STANDARDS

Jurisdiction	Pollutant	Category 1	Category 2	Category 3
Quebec	Parameters	No minimum treatment requirement, since effluent discharge objectives are determined on a site-specific basis, using an ERMM. Wastewater treatment technology is determined based on the set objectives. End-of-pipe limits are set, usually for BOD_5 and TSS, according to the performance standards of the technology installed. Québec has a series of these performance standards per technology (three different ones just for aerated lagoons), with each one having yearly and periodic average discharge limits. P_t limits are added when required. Disinfection requirements (faecal coliforms) are based on the uses downstream and chlorination and chlorination/dechlorination is prohibited.		
	Whole effluent toxicity	No requirements.		

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Saskatchewan**
Name of Contact:	**Thon Phommavong**
Agency/Affiliation:	**Environmental Protection Branch, Saskatchewan Environment**
Address:	**3211 Albert Street, Room 224 Regina, SK S4S 5W6**
Phone:	**306-787-9986**
E-mail:	**tphommavong@serm.gov.sk.ca**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	Most municipal wastewater treatment systems in Saskatchewan are owned and operated by the municipality. However, the Saskatchewan Water Corporation operates two wastewater facilities in the province.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	No, while Saskatchewan Environment regulates all municipal MWWE discharges in the province, municipalities are responsible for the actual operation and compliance monitoring of these facilities. SaskWater is responsible for the management of the two facilities that they operate.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes – Saskatchewan requires a secondary sewage treatment process that produces effluent with no more than 30 milligrams/litre (mg/L) of CBOD5 or BOD5 and no more than 30 mg/L of total suspended solids. Effluent disinfection may also be required in the permittee's permit. Other elements applicable to end of pipe controls can be found in the *Guidelines to Sewage Works Design* EPB 203, November 2002, which have been adopted by *The Water Regulations*, 2002. Wastewater treatment facilities must be operated so as to produce effluent that meets the requirements set out in the permittee's permit, *The Water Regulations* 2002, and any other relevant regulation made pursuant to the *Environmental Management and Protection Act (EMPA)*, 2002. *EMPA* also allows the issuance of a Sewage Works Protection Order or Emergency Sewage Works Protection Order to a permittee or any owner of a sewage works should more stringent requirements or other requirements become necessary.
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Typically, these standards are implemented universally, however, more stringent requirements can be made part of the facility's Permit to Operate a Sewage Works.
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	See Appendix A
3.4	Are the generic limits specified in legislation or regulations?	Section 16 (2), (3) (i), (ii) of *The Water Regulations*, 2002.

	If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Section 18 (1) of *The Water Regulations*, 2002 Section 5 (1) (a) of *The Water Regulations*, 2002 adopts these guidelines for the purposes of the Regulations. Section 23 (1)(a) (i) of *EMPA, 2002* Section 31, *Environmental Management and Protection Act*, 2002.
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Generic limits are administered through the legislation shown in 3.4. Municipalities are issued a 'Permit to Operate a Sewage Works'.
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Conditions in the Permit to Operate a Sewage Works specify the compliance monitoring and reporting requirements. Environment Officers conduct annual compliance inspections at each wastewater works in the province to identify which systems represent a risk to source water quality.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Do you use an ERMM, a risk-based decision-making process, to determine what pollutants need to be controlled and/or to determine discharge limits, based on the characteristics of the site specific receiving environment? If so, could you give a brief description of the model (use of water quality criteria, mixing zone, etc.) and the process? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver	Yes. Saskatchewan has not set "across the board" effluent standards, but instead uses a risk-based approach to examine each case of waste disposal and determine pollution control discharge limits on a site-by-site basis. The factors that influence the pollutants that need to be controlled, and the degree of treatment required, include: the nature and volume of the polluting waste; the effects of pH, climate, assimilative capacity, natural quality and character of the receiving water; mixing, chemical and biological changes; velocity of flow; and specific requirements of the expected uses of the receiving stream.

	If NO, please proceed with SECTION 5. If yes, please continue below.	
4.2	Please briefly describe the approach(es) used.	See 4.1.
4.3	What were the rationales behind the derivation of the selected approach(es)?	See 4.1.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes - see 4.1.
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes – see 4.1.
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes, a portion of an effluent receiving waterbody may be utilized for the purpose of providing an initial dispersion of treated effluent.
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	Compliance monitoring of wastewater facilities by municipalities may include water quality monitoring of the receiving stream. The Department also conducts regular monitoring of surface water quality at a provincial network of monitoring stations.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Again, each case of waste disposal and water pollution is examined on a site-by-site basis.
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so,	*Surface Water Quality Objectives* MB#110 outlines general quality objectives applicable to all Saskatchewan waters

	please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	receiving effluents including mixing zone criteria for receiving waters adjacent to effluent outfalls. These are not legislated standards but can be incorporated into the permitting process for wastewater effluents
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Appropriate regulations are previously described. Site-specific permits to operate sewage works are required at each municipal discharge.
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place?	Yes – SE compiles inspection records and compliance monitoring data. Monitoring of wastewater discharges and receiving streams is carried out and resulting data are entered into SE's environmental database.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	CSOs are prohibited by regulation in as much as interconnection of sanitary sewage collection systems and storm water systems that would allow sanitary sewage to be discharged through a storm sewer is prohibited Section 14 of *The Water Regulations*, 2002
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	SE is developing storm water management guidelines at this time.

Section 6: Industrial Effluent discharges directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes, Saskatchewan uses a risk-based approach to determine pollution control discharge limits at each industrial discharge on a site-by-site basis depending on the volume and characteristics of the wastewater and receiving environment. Legislation used to regulate industrial wastewater discharges to surface water includes *EMPA, 2002* and *The Water Regulations, 2002*. Permitting requirements apply to industrial works as well in that the Department issues a 'Permit for Industrial Effluent Works'.
6.2	Please briefly describe the approach(es) used.	See Section 4
6.3	What were the rationales behind its/their derivation?	
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

APPENDIX A: MUNICIPAL WASTEWATER TREATMENT PLANT EFFLUENT PERFORMANCE STANDARDS

Jurisdiction	Pollutant	Category 1	Category 2	Category 3
Saskatchewan	Parameters	Municipal wastewater effluent performance limits are determined on a site-specific basis and are applied through the permitting process. CBOD5 or BOD5 = 30 mg/L and TSS 30mg/L max specified in regulation. More stringent values can be specified in permits.		
	Whole effluent toxicity	Municipal wastewater effluent performance limits are determined on a site-specific basis and are applied through the permitting process.		

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Yukon**
Name of Contact:	**Bob Truelson**
Agency/Affiliation:	**Water Resources Division, Yukon Department of Environment**
Address:	**10 Burns Road** **Whitehorse, YK Y1A 4Y9**
Phone:	**867-667-3217**
E-mail:	**bob.truelson@gov.yk.ca**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	a) Community Services (Yukon Gov.) in unincorporated towns b) all others
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	Water Resources administers and audits the performance of the water license for municipal uses and are a primary regulator, however Environment Canada administers the Fisheries act to ensure no toxicity in effluents (bioassays).

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes,
3.2	Are the generic limits universally applied to all facilities? If not, why not?	The guidelines are a 'start', but would have application to all facilities. It is understood that receiving waters differ in all cases, and licenses that are issued for municipal waste are seldom identical
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	See Appendix A for two examples. Note that some other licenses also require 'ammonia' and 'total organics' The limits would have been based on the best available information at the time and some variables in the guidelines (BOD, TSS, Phosphorus, Fecals)are based on the dilution ratio (3 categories) in the environment
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	No, Yukon has the 1983 **Guidelines for Municipal Wastewater Discharges in the Yukon Territory** (Note: these are considered out-of-date and are about to undergo updating)
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	The guidelines are used by the Yukon Water Board, which is a quasi-judicial, arms-length body under the auspices of the Yukon Waters Act. The Board issues licenses for municipal effluents and does this on a case by case basis.
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Licenses require that monthly reports be submitted as well as a year-end summary. Water Resources also conducts routine site audits depending on our level of interest in the

		site (past performance).

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Do you use an ERMM, a risk-based decision-making process, to determine what pollutants need to be controlled and/or to determine discharge limits, based on the characteristics of the site specific receiving environment? If so, could you give a brief description of the model (use of water quality criteria, mixing zone, etc.) and the process? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Partial. A facility (treatment plants – there are only two- and lagoons must go through a lengthy environmental assessment process, then they go to full review by a number of agencies (territorial, federal) as part of the water licensing process. The Water Board is an arms length quasi-judicial body that acts independently from regulators. They set the final standards and monitoring conditions. Municipalities would apply for a license and be subject to effluent standards set by other agencies.
4.2	Please briefly describe the approach(es) used.	N/A
4.3	What were the rationales behind the derivation of the selected approach(es)?	N/A
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	N/A
4.5	If not previously explained, is the variability in the receiving	N/A

	environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	**N/A**
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	N/A
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	N/A
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	N/A
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	N/A
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	N/A

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	No, systems are separate.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	N/A

Section 6: Industrial Effluent discharges directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	There is a comprehensive system of reviewing project descriptions and subjecting them to a multi-layered environmental assessment -both federal and territorial agencies and other stakeholders make recommendations and interventions to the applicant and the Water Board. Any significant industrial activity (mining, agriculture) would trigger the need for a water license and a mining license or agriculture permit. Some of the performance standards may be generically known, such as the federal Metal Mining Effluent Regulation limits to be met on a mine site and CCME guidelines in fish-bearing waters. These are a starting point, and site conditions will often dictate modifications.
6.3	What were the rationales behind its/their derivation?	Based on national EA type assessments (CEAA) originally, when the federal government were the main regulators. Now that the territory has assumed control of its natural resources, these

		statutes and EA processes have, and still are, undergoing some changes. The Water Board still retains its control of setting discharge limits based on the feedback process in place, and their own guidelines which exist for some undertakings (e.g. **Licensing Guidelines for Type A Quartz Mining Undertakings**)
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Yes, if the triggers contained in the Waters Act Regulation are activated.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Processes for Environmental Assessment dovetail with processes set out in the **Waters Act. Once a project is approved, it would proceed to obtain the relevant licenses (mining, water, land use). Effluent limits are primarily addressed in the Water License.** Yukon Environmental and Socio-economic Assessment Act **(comes into effect, fall 2005)** Yukon Waters Act and Regulations
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	**Site-specific water licenses and Quartz Mining Licenses,**
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	**Similar approach used, although the municipal wastewater guidelines will be more prescriptive up front.**

APPENDIX A: MUNICIPAL WASTEWATER TREATMENT PLANT EFFLUENT PERFORMANCE STANDARDS

Jurisdiction	Pollutant	Category 1	Category 2	Category 3
Yukon			45 mg/L [(20)] - 60 mg/L - - 100,000 0.05 mg/L 6 – 9 100% 5 mg/L Sampling is done monthly and based on one grab	150 mg/L (45) [(21)] - 150 mg/L (60) 5.0 - 1,600,000 (20,000 MPN/L) - 6-9 at 100 % concentration, non-toxic 5 mg/L (5) Monthly grab sample
		BOD_5 (or $CBOD_5$) TSS Tot. phosphorus Faecal coliforms Tot. res. Chlorine pH phenols oil & grease temperature		

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**United States, Florida**
Name of Contact:	**Mr. Aaron Van Smith**
Agency/Affiliation:	**Florida Department of Environmental Protection**
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Phone:	**(850) 245-8607**
E-mail:	**Aaron.VanSmith@dep.state.fl.us**

Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	Wastewater treatment systems can be either Owned/Operated by the Authority, Publicly Owned/Operated, Privately Owned/Operated, Both Publicly and Privately Owned/Operated, Owned/Operated by the City, Owned/Operated by the County, Owned/Operated by the State, or Federally Owned/Operated.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	We share regulatory responsibility (permitting, compliance and enforcement) with EPA. The NPDES program has been delegated to Florida.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes, Florida has technology-based effluent limitations (TBELs) specified for minimum criteria for domestic wastewater. "Technology-based effluent limitation (TBEL)" means a minimum waste treatment requirement, established by the Department, based on treatment technology. The minimum treatment requirements may be set at levels more stringent than that which is necessary to meet water quality standards of the receiving water body as set out specifically in other sections of Chapter 62-650, Florida Administrative Code (F.A.C.).
3.2	Are the generic limits universally applied to all facilities? If not, why not?	No, See #4.2 below
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	TBELs, for domestic wastewater facilities are: Non ocean outfalls: $CBOD_5$ & Total Suspended Solids (TSS), 20mg/L for both Ocean outfalls: $CBOD_5$ & TSS, 25mg/L & 30mg/L respectively. Facilities in certain part of the State have to meet Advance Waste Treatment (AWT): $CBOD_5$, TSS, Total Nitrogen, & Total Phosphorus; 5, 5, 3, 1 mg/L respectively.
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Yes, the limits may be found in rule 62-600.420, F.A.C. The AWT criteria may be found in Section 403.086, Florida Statutes (FS).
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Permits are issued to individual treatment facilities with end of pipe limits specified in the permit.
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Monitoring of limits and reporting of results is required by the permit. The Department also inspects the facility on a

		routine basis.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes
4.2	Please briefly describe the approach(es) used.	Water quality based effluent limitations (WQBELs) are developed when technology based effluent limitations (TBELs) are not sufficient to ensure that water quality standards and designated uses are protected and maintained. "Water quality-based effluent limitation (WQBEL)" means an effluent limitation, which may be more stringent than a technology-based effluent limitation, that has been determined necessary by the Department to ensure that water quality standards in a receiving body of water will not be violated. Total Maximum Daily Loads (TMDL's) are part of the determination of the wastewater effluent limits. A TMDL is the maximum amount of a given pollutant that a water body can absorb and still maintain its designated uses (e.g., drinking, fishing, swimming, shellfish harvesting). One water body may have several TMDLs, one for each pollutant that exceeds the water body's capacity to absorb it safely. TMDLs are required to be developed for all

		waters that are not meeting their designated uses and, consequently, are defined as “impaired waters.” Additionally, all applicants for new or expanded discharges to surface waters are required to comply with antidegradation requirements.
4.3	What were the rationales behind the derivation of the selected approach(es)?	WQBELs involve a comprehensive analysis of water quality and quantity data to determine potential environmental impacts. The antidegradation demonstration is a process to determine whether water quality degradation is necessary or desirable under federal standards and under circumstances which are clearly in the public interest.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	N/A
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes, items such as these are considered.
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	Monitoring and reporting of effluent limits is required by the permit. Also, a permit could require surface water monitoring if appropriate.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Yes
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so,	Yes, Chapter 62-650, FAC, discusses WQBELs & Section 303(d) of the federal Clean Water Act and the Florida

	please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Watershed Restoration Act, discusses TMDLs. The antidegradation requirements are based on Rules 62-302.300 and 62-4.242, F.A.C. The process for deriving effluent limits is outlined in FDEP's Wastewater Permit Writer's Manual.
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Permits are issued to individual treatment facilities with end of pipe limits specified in the permit.
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	Yes, a watershed-based management approach is used to address Florida's 52 major hydrologic basins. This includes the evaluation of water quality.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	No – There are no combined sewer systems in Florida.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	N/A

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	Water quality based effluent limitations (WQBELs) are developed when technology based effluent limitations (TBELs) are not sufficient to ensure that water quality standards and designated uses are protected and maintained. Total Maximum Daily Loads (TMDL's) are part of the determination of the wastewater effluent limits. A TMDL is the maximum amount of a given pollutant that a water body can absorb and still maintain its designated uses (e.g., drinking, fishing, swimming, shellfish harvesting). One water body may have several TMDLs, one for each pollutant that exceeds the water body's capacity to absorb it safely. TMDLs are required to be developed for all waters that are not meeting their designated uses and, consequently, are defined as "impaired waters." Additionally, all applicants for new or expanded discharges to surface waters are required to comply with antidegradation requirements.
6.3	What were the rationales behind its/their derivation?	WQBELs involve a comprehensive analysis of water quality and quantity data to determine potential environmental impacts. The antidegradation demonstration is a process to determine whether water quality degradation is necessary or desirable under federal standards and under circumstances which are clearly in the public interest.
6.4	Is this approach (are these approaches) universally applied to all	Yes

	facilities in the same industrial category? If not, why not?	
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Yes, Chapter 62-650, FAC, discusses WQBELs & Section 303(d) of the federal Clean Water Act and the Florida Watershed Restoration Act, discusses TMDLs. The antidegradation requirements are based on Rules 62-302.300 and 62-4.242, F.A.C. The process for deriving effluent limits is outlined in FDEP's Wastewater Permit Writer's Manual.
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Limits are established in facility-specific permits.
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	This approach is also used for municipal wastewater.

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**United States – New Jersey**
Name of Contact:	**Ms. Daveki Keymoore**
Agency/Affiliation:	**New Jersey Department of Environmental Protection (NJDEP) – Department of Water Quality (DWQ)**
Address:	**401 E. State Street – P.O. Box 029 Trenton, NJ 08625-0029**
Phone:	**(609) 633-3869**
E-mail:	**daveki.keymoore@dep.state.nj.us**

Section 2: General Information -Municipal

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	Most of the STPs are owned and operated by municipalities. Private companies under contract operate some POTWs. Some STPs are owned and operated by the State or Federal Agency; and a few are privately owned and operated;
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	Yes. Discharge of treated effluent from various municipal and industrial facilities directly into a river, stream, or the ocean is regulated under the authority of a NJPDES permit which limits the mass and/or concentration of pollutants discharged. The USEPA has delegated responsibility to the State, while retaining final oversight of the program.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes. There are some generic end-of-pipe-limits for certain parameters.
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Yes. They are applied to all facilities.
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	See attachment A
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	See attachment A
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	They are administered through individual NJPDES permits
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Compliance is verified through (i) self-monitoring, where the facility monitors its waste streams and reports to the Department using the discharge monitoring report (DMR) (ii) compliance monitoring, in which the NJDEP reviews the monthly report and inspects the site. (The NJPDES permit stipulates that self-monitoring requirements are the responsibility of the permittee. The permit sets forth the minimum frequency and type of

		sampling, analytical and data reporting requirements. All monitoring requirements for the permit are minimum requirements; however, additional monitoring is permissible and is encouraged as it promotes more representative data. The required information obtained by the permittee's self-monitoring program is reported to the Department through the submission of a DMR. The reported data are compared to the NJPDES permit effluent requirements to determine compliance with the permit.)

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes.
4.2	Please briefly describe the approach(es) used.	1. Water Quality based effluent limitations for conventional, non-conventional and toxic pollutants. 2. Imposition of criteria as end-of-pipe limits 3. Acute or chronic whole effluent toxicity limits (WET) 4. Effluent limits based on Total Maximum Daily Load (TMDL).
4.3	What were the rationales behind the derivation of the selected approach(es)?	1. The NJPDES permit program imposes water quality based effluent limits for conventional, non-conventional and toxic pollutants for discharges that cause a violation of the

		water quality standards. Through the permit process, an evaluation is made to determine the most stringent limit. This determination is based on the most stringent criterion (acute aquatic, chronic aquatic or human health). 2. The criterion end-of-pipe is imposed as the effluent limit, if the water quality of the receiving stream is impaired for a particular parameter and in the absence of a TMDL. 3. The water quality based effluent limitation for WET (acute or chronic, whichever is more stringent) is imposed using the numeric interpretation of the State's narrative criteria to protect the biological integrity of the receiving stream. 4. Waste load allocations are incorporated into the permits as they are expressed in the adopted TMDLs.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes. It is the policy of the State that all fresh waters be protected as potential sources of public water supply in order to provide adequate, clean supplies of potable water. Therefore, pollutants are regulated to attain compliance with the Surface Water quality Standards for human health criteria outside of regulatory mixing zones. (N.J.A.C. 7:9B) New Jersey has three levels of antidegradation protection in its Surface Water Quality Standards. The highest tier is fresh water 1 waters (FW1) or Outstanding National Resource Waters (ONRW). These waters shall be maintained in their natural state of quality (set aside for posterity) and are not subjected to any man-made wastewater discharges (N.J.A.C. 7:9B). The waters in the second tier of freshwater, category one (C1) are protected from measurable changes in water

		quality. The third tier of freshwater classification is Category two (C2). Water quality in these waters can be lowered to levels that still support all existing uses based upon a social and/or economic justification.
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes. The variability in the receiving waterbody is taken into consideration in the mixing zone analyses for dilution calculations. The dilution factor is used for calculating water quality based effluent limitations. For explanation regarding the procedures, please refer to Chapter 4 of the USEPA Technical Support Document For Water Quality-based Toxic Control, March 1991 (EPA/505/2-90-001)
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes.
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	The effectiveness of the established effluent limits are not determined or measured on a site-specific basis. However, subsequently if a facility requests additional pollutant loadings due to flow increase, the permittee is required to perform antibacksliding/antidegradation analysis. The data generated from the water quality study or monitoring conducted as part of this analysis are utilized to make an assessment of the water quality of the receiving stream on a site-specific basis.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Yes.

4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Legislation or regulations or Guidance Manual: (i) Section 301 of the Clean Water Act, (ii) 40 CFR 122, (iii) N.J.A.C. 7:14A (iv) N.J.A.C. 7:9B and (v) Technical Support Document For Water Quality-based Toxic Control, March 1991 (EPA/505/2-90-001)
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	The effluent limits for municipal discharge facilities are administered through individual/site-specific NJPDES permits.
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	Yes. 1. NJ has a statewide ambient water monitoring program which consists of chemical, physical and biological networks which covers the state's fresh, ground, marine and tidal waters. The waters are monitored for chemical parameters, biological health, aquatic-related habitat, sediment quality, sanitary quality, shellfish tissue contaminants and phytoplankton. The chemical /physical and biological data collected are used in assessments for NJ's Integrated Water Quality Monitoring and Assessment Report. 2. The Division of Water Quality has used pollutant-loading reductions as one of its environment indicators for the National Environmental Performance Partnerships System (NEPPS). In this process, EPA and State officials discuss environmental conditions and program needs, agree on goals and priorities, devise strategies for addressing priority needs, determine what the roles and responsibilities of each partner will be, and decide how they will measure progress.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Yes. Clauses contained in NJPDES permits issued to owners and operators of Combined Sewer Overflow Points. Intrusion of Surface Waters. 1. Applicability: This section is applicable to all permittees of Combined Sewer Overflow Control Facilities. 2. The permittee shall prevent the intrusion of the receiving waters into the combined sewer collection and conveyance system past the combined sewer overflow control facilities. Such protection shall be provided against the intrusion of all receiving waters below the flood elevation. For the purposes of this section the flood elevation shall be one-foot above the 100 year fluvial flood elevation or the 100 year tidal elevation, which ever is greater (See N.J.A.C. 7:13). 3. Long-term Solids/Floatables Control Measures a. Applicability: This section is applicable to all permittees of Combined Sewer Overflow Points. b. In accordance with the schedule provided in the permit, the permittee shall implement control measures which will capture and remove Solids/Floatables which cannot pass through a bar screen having a bar spacing of a 0.5 inches (13.0 mm) from all CSOs, unless the permittee can demonstrate, to the satisfaction of the Department, that an alternative control measure is more appropriate for a CSO Point.

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes.
6.2	Please briefly describe the approach(es) used.	1. Water Quality based effluent limitations. 2. Imposition of criteria as end-of-pipe limits 3. Acute or chronic whole effluent toxicity (WET) (4. Effluent limits based on Total Maximum Daily Load (TMDL) –yet to be used in industrial discharge permits).
6.3	What were the rationales behind its/their derivation?	1. The NJPDES permit program imposes water quality based effluent limits for conventional, non-conventional and toxic pollutants for discharges that cause a violation of the water quality standards. Through the permit process, an evaluation is made to determine the most stringent limit. This determination is based on the most stringent criterion (acute aquatic, chronic aquatic or human health). 2. The criterion end-of-pipe is imposed as the effluent limit, if the water quality of the receiving stream is impaired for a particular parameter and in the absence of a TMDL. 3. The water quality based effluent limitation for WET (acute or chronic, whichever is more stringent) is imposed using the numeric interpretation of the State's narrative criteria to protect the biological integrity of the receiving stream. (4. Waste load allocations will be incorporated into the permits as they are expressed in the adopted TMDLs.)
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Yes.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations.	Legislation or regulations or Guidance Manual: (i) Section 301 of the Clean Water Act, (ii) 40 CFR 122,

	If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	(iii) N.J.A.C. 7:14A (iv) N.J.A.C. 7:9B and (v) Technical Support Document For Water Quality-based Toxic Control, March 1991 (EPA/505/2-90-001)
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	The limits are administered through site-specific permits
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	N/A

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**United States – Ohio State**
Name of Contact:	**Paul Novak**
Agency/Affiliation:	**Ohio EPA**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	All municipal wwtps are owned and operated by municipality. We have one or two POTWs for county systems operated by private company under contract.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	yes

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	We follow federal secondary requirements plus must meet water quality standards. In addition, all new POTWs and the new flow for any expansion must meet 10 CBOD5, 12 TSS and 1 ammonia. See our antidegradation rule 3745-1-05
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Yes – although we can use different BADCT limits for non-standard technologies, eg wetlands
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	Best Achievable Demonstrated Control Technology BADCT, from lawsuit re: antideg in 1994.
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	See OAC 3745 – 1-05 see BADCT
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Ohio Adm Code and NPDES permits
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	NPDES self monitoring reports and state com[pliance inspections

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes – water quality based effluent limits
4.2	Please briefly describe the approach(es) used.	Modeling to protect chemical specific criteria as well as numeric biological criteria
4.3	What were the rationales behind the derivation of the selected approach(es)?	USEPA
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes – recreational use we have bacteria criteria, human health based chemical specific criteria
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes – use standard modeling protocols

4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	Biosurveys of downstream biota and chemical specific sampling. Fish tissue sampling in some cases.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Yes
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Regs – see wqs and modeling rules 3745-01 and 02
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Npdes permits
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	Yes – see previous responses

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	No

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	Same as for POTWs - except use federal regs – NSPS to define BADCT
6.3	What were the rationales behind its/their derivation?	Ditto
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Ditto
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Ditto
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	**Ditto**
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	**Ditto**

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**United States, Washington State**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	B or c
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	No. We are delegated to operate the federal NPDES program for municipal and industrial dischargers only. EPA Region 10 regulates discharges from federal facilities in Washington State.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Yes
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	See attached WAC 173-221
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	See attached WAC 173-221
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Individual wastewater discharge permits – See attached WAC 173-220
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Monthly self monitoring and report. Compliance inspection usually 1/year

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes
4.2	Please briefly describe the approach(es) used.	See Chapter VI of Permit Writers Manual – Ecology Publication 92-109 http://www.ecy.wa.gov/programs/wq/wastewater/index.html#permit%20manual
4.3	What were the rationales behind the derivation of the selected approach(es)?	Based on USEPA Technical Support Document EPA/505/2-90-001
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes. See Chapter VI of Permit Writers Manual – Ecology Publication 92-109

4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	Yes. See Chapter VI of Permit Writers Manual – Ecology Publication 92-109
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	Yes. See Chapter VI of Permit Writers Manual – Ecology Publication 92-109
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	Effluent monitoring and ambient physical/chemical monitoring
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Yes
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Not explicitly. See previous references
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Individual wastewater permits
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or	Ambient monitoring with data compared to Washington's Water Quality Standards WAC 173-201A attached.

	quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Meet water quality standards

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	See Chapter VI of Permit Writers Manual – Ecology Publication 92-109
6.3	What were the rationales behind its/their derivation?	
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Yes
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	No. See Chapter VI of Permit Writers Manual – Ecology Publication 92-109
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Same as municipal
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Finland**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	b) mainly d) only a few. Some are owned jointly by municipalities and industries, whose wastewaters are also treated in these plants. One is in public-private ownership,
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	No, SYKE has no responsibility for management. In Finland the Sewage Works need their own Permit for discharges to waters. Permits are given by environmental Permit Authorities. In these Permits are given among others the requirements for discharges (concentrations, reduction etc.) . The owners of the plants are liable for management of wastewater effluent, which are given in the Permit.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Minimum requirements are given in EEC:s Directive "Urban Waste Water Treatment Directive 91/271", but normally our requirements are tighter, especially regarding BOD and P. Requirements are set case-by-case, depending on receiving water bodies.
3.2	Are the generic limits universally applied to all facilities? If not, why not?	For smaller plants (< 100 PE) the maximum allowable discharge are set in a governmental decree since 2004. For larger plants see Annex.
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	BOD, COD, tot.P., tot. N, TSS always and case-by-case there can be others are monitored according to the permit, but other parameters are also measured.
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Only minimum limits set by legislation
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	They are given in Permits case-by-case
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Treatment plants have their own daily monitoring. The permits define requirements for so called loading monitoring (4-24 times/yr) that is done by "outsider" consultants, paid by the plant, but environmental authorities must approve the monitoring program. Results are delivered also to the authorities. In addition the authorities carry out also their own monitoring.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes. Already in the Water Act (1961) required a cost-benefit analysis with all risks taken into account. A prerequisite for the permit was that the benefits must be bigger than the adverse effects. The same principle was taken into the present Environent Protection Act, which came into force in 2000.
4.2	Please briefly describe the approach(es) used.	These must be included in the permit application and the permit authority considers their relevance.
4.3	What were the rationales behind the derivation of the selected approach(es)?	
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes This is a part of the permit process. It is not possible to get such a discharge permit that would endanger other important uses of the same water body. The cost-benefit analysis is meant to serve also this consideration.
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	

4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	We did not fully understand the meaning of mixing zones. The answer is more probably No than Yes. But in the future the harmful substances (defined in the water framework directive) may need to introduce some kind of mixing zones.
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	The state and sensitivity of the receiving water body (both chemical, physical and biological parameters are considered) affects the requirements in the periodic review process of the permits.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Applied to all municipal wastewater treatment plants.
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Environmental Protection Act (86/2000) and Decree (169/2000)
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Permits are always site specific. Local and regional environment authorities are responsible for supervision.
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	Yes, see above.

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Requirements are equal to those for municipal wastewater collected by separate system. There are combined sewer networks only in some bigger cities in downtown areas.

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	The legislation and the permit system is the same as for municipal wastewaters. However, other parameters may be included in the permit requirements and monitoring.
6.3	What were the rationales behind its/their derivation?	
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	Yes.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	See above
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	See above
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Deutschland (Germany)**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	a) and b)
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	No. Our Organisation and ministery and administration (Bund) are responsible for the frameworks (see: § 7a WHG, waste water ordinance and waste water charges act (files attatched). The sole responsibility for management is hold by the countries (Bundeslander)

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	yes
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Yes – but in respect to formal regulations they depend on type/class of discharger
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	BAT, see waste water ordinance
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Yes, see waste water ordinance and waste water charges act (attached)
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	In general by universal regulations (frame, minimum requirements/state), possibly specified by countries – at least minimum requirements
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Measurement of defined parameters in responsibility of countries (Bundesländer)

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	No (we may discuss about the reasons, if you are interested – a "basic principle" discussion about reasons and regulation within the last 30 years national regulations)
4.2	Please briefly describe the approach(es) used.	
4.3	What were the rationales behind the derivation of the selected approach(es)?	
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	

4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	No
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	yes
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	Not yet – respectively not until now. But we´re aware of that problem since many years and in actual discussion about strategies and solutions

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Not in respect of whole waste water effluent (see 4.1). If necessary (international regulations and requirements, e.g. EU - WFD), for single substances – "priority substances.
6.2	Please briefly describe the approach(es) used.	If so: NEC/PNEC
6.3	What were the rationales behind its/their derivation?	Precautionary principle
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	yes
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Yes waste water ordinance and waste water charges act
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	In general by universal regulations (frame, minimum requirements/state), possibly specified by countries – at least minimum requirements
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Sweden**
Name of Contact:	**Mr. Anders Lind**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	a) From one family up to about 100 persons b) In Sweden we have a proposal for a new act which says that a system municipal wastewater must be owned by the municipally. But they can operate by private companies.
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	Yes, the municipality got the licence. But a private firm can be contracted for the operation. See abive (Read about the Code for licence at http://www.regeringen.se/sb/d/108/a/1348)

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes
3.2	Are the generic limits universally applied to all facilities? If not, why not?	Not all facilities. The quality of the recipient (the surface water) classify the limits.
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	Mostly: BOD_7 10-15 mg BOD_7/litre Phosphate 0.3-0.5 mg tot-P/litre Nitrogen 10-15 mg tot-N/litre (Limits for nitrogen only from Stockholm and southwards up to Norweigen border in treatment plants for more than 10 000 pe. And mostly situated near the coast. But the European Union directive for municipal wastewater says that all plant for more than 10 000 pe must have limits for nitrogen. In Sweden about 75 % of all wastewater have nitrogen treatment because of mostly big plants have nitrogen treatment.)
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Regulations: Sweden must do as The European Union directive for municipal wastewater define.
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Each municipal wastewater plant got permits by a probation after the law.

3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Annual reporting. But if you got bad result you must explain it briefly. And with very bad results the responsible “boss” can be prosecuted. And if you got very bad result you have to do something about the problem so it will be OK.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Yes. See above
4.2	Please briefly describe the approach(es) used.	?
4.3	What were the rationales behind the derivation of the selected approach(es)?	?
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	Yes In EU we have a new legislation called (Water Framework Directive)
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**.	Yes for some paramets May be you will have sandfilter if the recipient have a low flow

	If yes, please explain how this is done and how such uses are prioritized.	Normally we don´t have biological treatment in regions with cold climate.
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	?
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	We (the treatments plants) works mostly with water quality. We also control heavy metals and organic materials in the sludge. Swedish EPA (www.naturvardsverket.se , change to English text) works mostly with water quality och biological and chemical monitoring in lakes, streams and in the sea.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	Yes
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Yes Europe Union EG- Direktive 91/271 EEG. And we have our Swedish directive also. But it must be harmonized with EG-directive above.
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Annual reporting to the authority for supervision
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes, in old towns etc. But all built-up areas since about 1957 shall have separate sewerage system. In some old towns for example Stockholm they have very big detention basins in the town centre
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	As a part of its work with sewer systems and their overflows, the Swedish Environmental Protection Agency (SEPA) has issued regulations covering discharges of wastewater from sewage treatment plants as well as monitoring of overflows of wastewater from the sewer system. The regulations provide that the overflow volume from sewer systems serving sewage plants designed for more than 500 pe (population equivalents) shall be monitored by means of measurement in overflows or calculations. By “calculations”, the Swedish Environmental Protection Agency means that it is suitable to use comuter-based calculation models, in combination with field measurements. Monitoring can alternatively be done by means of another method which satisfies the requirements set forth in regulations.

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Svenskt Vatten (Swedish Water & Wastewater Association) don´t work with problems as in Section 6. You may get help from Tor Borinder in Swedish EPA. But I am not sure. Tor.Borinder@naturvardsverket.se
6.2	Please briefly describe the approach(es) used.	
6.3	What were the rationales behind its/their derivation?	
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**United Kingdom (England & Wales)**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	d) Other – Urban waste water treatment plants are owned by municipality. However, the treatment plants are operated by privately owned water service companies who are the statutory sewerage undertakers
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	No. The regulation of urban wastewater is the sole responsibility of the sewerage undertakers. DEFRA is responsible for all aspects of water policy including regulatory systems. The Environment Agency (EA) manages water resources and enforces water quality standards. The water companies are required to undertake self-monitoring of compliance with the Directive, although the monitoring is audited by the EA.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Yes
3.2	Are the generic limits universally applied to all facilities? If not, why not?	No. Secondary treatment is the normal standard, but tertiary treatment is required where qualifying discharges affect sensitive areas as identified under the Directive. The Directive requires Member States to review designations of eutrophic sensitive areas every four years and allows the option of identifying less sensitive areas. Sewage treatment works greater than 10,000 pe discharging into sensitive areas are required to meet the Directive's treatment standards for nutrient removal, unless it can be demonstrated that the removal will have no effect on the level of nutrification. In inland sensitive areas, phosphorus is required to be removed whereas in coastal sensitive areas nitrogen must be removed (to control algal growth). Nitrate must also be removed prior to discharge into waters utilized for abstraction of drinking water. For less sensitive areas (coastal/estuarine waters), primary treatment is considered sufficient to protect these waters.
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	The monitored parameters for treatment plants providing secondary treatment are Chemical Oxygen Demand and Biochemical Oxygen Demand. Suspended Solids and Biochemical Oxygen Demand monitored for plants providing primary treatment. Standards for compliance are expressed in either concentration or percentage reduction terms. For those treatment plants that discharge to identified

		sensitive areas nitrogen and/or phosphorus loads are also measured. As set out in the EU Directives (See attached tables 1 and 2) In accordance with 'best technical knowledge not entailing excessive costs'.
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	Yes. The Urban Waste Water Treatment (England and Wales) (Amendment) Regulations 2003, ISBN 0110469283. In addition, the EU Urban Waste Water Treatment Directive 91/271/EEC
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	The Environment Agency issues discharge consents under the Water Resources Act, 1991 (as modified by the Environment Act 1995).
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	Discharge consent conditions allow self-monitoring (using automatic sampling apparatus) by the operator of the sewage treatment works under the presumption that if records have not been kept as required, then consent conditions will have been breached. Tripartite sampling is required in cases in which the Environment Agency takes samples (e.g., for audits). Results of water sampling analyses are sent to the Agency within 30 days of the sample being taken. Failure to report in accordance with the agreed procedures or within the time period specified is considered a breach of consent. Monitoring information is required to be made available to the Commission within six months of a request. This monitoring information is retained by the Environment Agency and is required to be made available to the Secretary of State on request, for the purpose of

		complying with this obligation. Situation reports issued to the EU are required at two year intervals.

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	No.
4.2	Please briefly describe the approach(es) used.	
4.3	What were the rationales behind the derivation of the selected approach(es)?	
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	
4.5	If not previously explained, is the variability in the receiving	

	environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes.
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	No. The Urban Waste Water Treatment Directive requires member states to take action to limit pollution from storm water overflows. This requires measures to be undertaken to improve unsatisfactory intermittent discharges, although no specific requirements are imposed. Criteria are to be used in deciding which CSOs are unsatisfactory and, therefore, subject to consent review to drive improvements. See **THE URBAN WASTE WATER TREATMENT(ENGLAND AND WALES) REGULATIONS (UWWT) 1994** Annex 8, Sections 7 and 8.

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes.
6.2	Please briefly describe the approach(es) used.	The Environment Agency considers each industrial discharge consent application on a case by case basis and sets discharge conditions accordingly such that the arrangements fulfil the requirements of Article 13 of the UWWT Directive (Regulation 8). Discharges of industrial waste water to collecting systems and urban waste water treatment plants are subject to prior regulations and specific authorisation by the water companies. In requiring the water

		companies to ensure that the requirements are met, the Regulations provide for water companies to require pre-treatment as necessary.
6.3	What were the rationales behind its/their derivation?	Variable, depending on industry.
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	No. See 6.2 above.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	Yes. The Water Industry Act 1991 (WIA).
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	See 6.2 above.
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	N/A – Industrial effluents eventually treated in waste water facilities

1. Table 1:

Requirements for discharges from urban waste water treatment plants subject to Articles 4 and 5 of the Directive. The values for concentration or for the percentage of reduction shall apply.

Parameters	Concentration	Minimum percentage of reduction (1)	Reference method of measurement
Biochemical oxygen demand (BOD5 at 20 °C) without nitrification (2)	25 mg/l O2	70-90 40 under Article 4 (2)	Homogenized, unfiltered, undecanted sample. Determination of dissolved oxygen before and after five-day incubation at 20 °C ± 1 °C, in complete darkness. Addition of a nitrification inhibitor
Chemical oxygen demand (COD)	125 mg/l O2	75	Homogenized, unfiltered, undecanted sample Potassium dichromate
Total suspended solids	35 mg/l 35 under Article 4 (2) (more than 10	90 (3) 90 under Article 4 (2) (more than 10	- Filtering of a representative sample through a 0,45 ìm filter membrane. Drying at 105 °C and weighing - Centrifuging of a representative sample (for at least five mins with mean acceleration of 2 800 to 3 200 g), drying at 105 °C and weighing

	000 p.e.) 60 under Article 4 (2) (2 000-10 000 p.e.)	000 p.e.) 70 under Article 4 (2) (2 000-10 000 p.e.)	

(1) Reduction in relation to the load of the influent.
(2) The parameter can be replaced by another parameter: total organic carbon (TOC) or total oxygen demand (TOD) if a relationship can be established between BOD5 and the substitute parameter.
(3) This requirement is optional.
Analyses concerning discharges from lagooning shall be carried out on filtered samples; however, the concentration of total suspended solids in unfiltered water samples shall not exceed 150 mg/l.

Table 2:

Requirements for discharges from urban waste water treatment plants to sensitive areas which are subject to eutrophication as identified in Annex II.A (a). One or both parameters may be applied depending on the local situation. The values for concentration or for the percentage of reduction shall apply.

Parameters	Concentration	Minimum percentage of reduction (1)	Reference method of measurement
Total phosphorus	2 mg/l P (10 000 - 100 000 p. e.) 1 mg/l P	80	Molecular absorption spectrophotometry

	(more than 100 000 p. e.)		
Total nitrogen (2)	15 mg/l N (10 000 - 100 000 p. e.) 10 mg/l N (more than 100 000 p. e.) (3)	70-80	Molecular absorption spectrophotometry

(1) Reduction in relation to the load of the influent.
(2) Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic N + NH3), nitrate (NO3)-nitrogen and nitrite (NO2)-nitrogen.
(3) Alternatively, the daily average must not exceed 20 mg/l N. This requirement refers to a water temperature of 12° C or more during the operation of the biological reactor of the waste water treatment plant. As a substitute for the condition concerning the temperature, it is possible to apply a limited time of operation, which takes into account the regional climatic conditions. This alternative applies if it can be shown that paragraph 1 of Annex I.D is fulfilled.

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**New Zealand**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	b) owned and operated by the municipality
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	No. The Ministry for the Environment is purely a policy unit of Central Government. It is not an Environmental Protection Agency and responsibility for the management of discharge permits has been devolved to Regional Councils, of which there are 17.

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	Not to my knowledge, but guidelines do exist.
3.2	Are the generic limits universally applied to all facilities? If not, why not?	
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	Not to my knowledge
4.2	Please briefly describe the approach(es) used.	
4.3	What were the rationales behind the derivation of the selected approach(es)?	
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	
4.5	If not previously explained, is the variability in the receiving environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	

4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	Yes
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	These processes are different for each of the regulatory authorities, in this case, the 17 regional councils.

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	Yes
6.2	Please briefly describe the approach(es) used.	Each discharge must apply for a discharge consent and each will need to show that the environmental effects of their activity is of minor effect to the environment
6.3	What were the rationales behind its/their derivation?	Each is theoretically from first priciples, but in reality each depends on case law.
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	No, each regulatory authority is at liberty to set its own limits.
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	The process for deriving the consent is specified in the Resource Management Act (1991)
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	The organisation granted a consent must generally report their compliance with the conditions off that consent. The regulatory authority has the right to audit this and may resort to rescinding the consent if compliance is not achieved in a reasonable time. Fines may also be imposed by the courts of up to $200,000 or 2 years in jail.
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	Generally it is, but there are a number of municipalities that seek understanding from the regulatory authority for leniency, and this is sometimes granted usually with a new compliance date being negotiated.

Management of Municipal Wastewater Effluent (MWWE) Survey

Section 1: Contact Details

Jurisdiction:	**Victoria, Australia**
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Section 2: General Information

	Question	Response
2.1	Are municipal wastewater treatment systems in your jurisdiction: a) privately owned and operated b) owned and operated by the municipality c) owned and operated by a government agency d) other (please explain)?	c) – municipal WTPs in Victoria are operated by state government owned authorities
2.2	Does your organization have sole responsibility for management of municipal wastewater effluent (MWWE) discharges to surface waters within your jurisdiction? Please explain.	YES – the regulation of MWWE discharges is the sole statutory responsibility of EPA Victoria. This is an independent statutory authority which makes decisions at its own discretion, independent of Ministerial direction

Section 3: Generic (Universal) End-of-Pipe Limits

	Questions	Response
3.1	Does your jurisdiction have any generic end-of-pipe limits for municipal wastewater effluent that is discharged to surface waters? (Answer yes if universal limits apply to all facilities within a category of treatment technology (e.g., primary, secondary, lagoons etc.)) **If NO, please proceed with SECTION 4. If yes, please continue below.**	NO
3.2	Are the generic limits universally applied to all facilities? If not, why not?	
3.3	What are the parameters measured, their respective generic limits and the rationales behind their derivation (e.g., best achievable performance for that technology)?	
3.4	Are the generic limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, are the generic limits specified elsewhere (e.g., guidelines, policy manual). Please explain.	
3.5	How are the generic limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	
3.6	How is compliance verified (e.g., centralized monthly/annual reporting, site-specific audits, other)?	

Section 4: Environmental Risk-Based Approaches

	Question	Response
4.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for municipal wastewater effluent that is discharged to surface water? **Yes or No** Examples might include (but are not limited to) derivation of effluent limits based on meeting water quality criteria or toxicity thresholds in the receiver, taking into account different uses of the receiver or variability in receiving environment conditions, or conducting impact/risk assessments based on protecting biota in the receiver **If NO, please proceed with SECTION 5. If yes, please continue below.**	YES
4.2	Please briefly describe the approach(es) used.	Defined values of surface waters in Victoria are set out in a 'State environment protection policy' eg ecosystem protection, potable water supply, recreational use. Discharges must be consistent with protecting these defined values - potential waste dischargers must demonstrate that discharges would not compromise these values.
4.3	What were the rationales behind the derivation of the selected approach(es)?	The approach described above is intended to give effect to the *Australian Water Quality Guidelines for Fresh and Marine Waters*, which introduced a risk-based approach to protecting the environmental values of waters.
4.4	If not previously explained, are other uses of the waterbody (e.g., water taking, other discharges, recreational uses etc.) taken into account in established discharge limits? **Yes or No**. If yes, please explain how this is done and how such variability is considered.	YES – see above
4.5	If not previously explained, is the variability in the receiving	YES – assessments of the impacts of discharges on waters

	environment (e.g., water elevations, flows, tides, temperature etc.) taken into account in establishing discharge limits. **Yes or No**. If yes, please explain how this is done and how such uses are prioritized.	should take such variability into account, on a case-by-case basis. This is particularly relevant for discharges to inland waterways, given the large variability of flows in Australian streams. Assessments are site specific, using the risk-based approach in the *Australian Water Quality Guidelines for Fresh and Marine Waters*
4.6	Are mixing zones tolerated in the environments receiving municipal wastewaters? **Yes or No.**	YES
4.7	How is the effectiveness of the established discharge limits determined on a site- specific basis (e.g., water quality or biological monitoring of the receiver or other approaches)?	EPA discharge licences for significant MWWE discharges require both physicochemical and biological monitoring of the receiving waters.
4.8	Is this approach (are these approaches) universally applied to all municipal wastewater systems or all systems within a specific category? If not, why not?	YES
4.9	Is the process for deriving risk-based municipal wastewater effluent limits described above specified in legislation or regulations? If so, please identify the applicable legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	The process is described in the *State environment protection policy (Waters of Victoria)*. This policy was adopted by government and gazetted under the *Environment Protection Act* 1970
4.10	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Via site specific discharge licences which MWWE discharges require, issued by EPA Victoria
4.11	Is the success of the discharge limits in achieving environmental protection formally assessed or quantified in any way? **Yes or No.** (Examples may include tracking reductions in loadings, measuring the health of receiving environment biota, conducting stakeholder satisfaction surveys). If yes, please describe the process for doing so. If no, how does your jurisdiction judge the success of the strategy that is in place.	YES: ➢ Load reductions ➢ Biological assessment of receiving environments ➢ Volume/load of MWWE diverted for beneficial reuse eg for irrigation of agricultural land

Section 5: Combined Sewer Overflow (CSOs)

	Question	Response
5.1	Does your jurisdiction have combined sewer overflows (CSOs)? **If NO, please proceed with SECTION 6. If yes, please continue below.**	NO – separate sewerage & stormwater systems are standard Australian practice
5.2	Does your jurisdiction specify any performance standards for the discharge of CSOs to surface waters? If yes, please explain how the process for establishing such limits, and the limits themselves, compare to those for municipal wastewater effluents.	

Section 6: Industrial Effluent Discharged Directly to Surface Waters

	Question	Response
6.1	Does your jurisdiction use any form of environmental risk-based decision process to derive end-of-pipe limits for industries that discharge wastewater to surface water? **Yes or No**	YES
6.2	Please briefly describe the approach(es) used.	Same risk-based approach, based on the *Australian Water Quality Guidelines for Fresh and Marine Waters described* for MWWE
6.3	What were the rationales behind its/their derivation?	See above
6.4	Is this approach (are these approaches) universally applied to all facilities in the same industrial category? If not, why not?	YES
6.5	Is the process for deriving the effluent limits specified in legislation or regulations? If so, please identify what legislation or regulations. If no, where is the process for deriving effluent limits documented (e.g., guidelines, policy manual)?	The process is described in the *State environment protection policy (Waters of Victoria)*. This policy was adopted by government and gazetted under the *Environment Protection Act* 1970
6.6	How are the discharge limits administered (e.g., through universal regulations, site-specific permits/licenses to operate, or other means)? Explain.	Via site specific discharge licences, which are issued by EPA Victoria
6.7	If this approach is not being used for management of municipal wastewaters, why not (e.g., planned but has not yet been phased in, political or financial barriers – please specify)?	