

North Saskatchewan Region Surface Water Quality Management Framework

A surface water quality management framework (framework) is being developed for the North Saskatchewan Region. The framework establishes an approach for monitoring and managing the cumulative impacts of human activities on water quality in the North Saskatchewan and Battle rivers. Cumulative effects management was first introduced in the North Saskatchewan Region with the Water Management Framework for the Industrial Heartland and Capital Region, which was developed in 2008 to address anticipated development in the Capital Region. At that time, government and stakeholders committed to maintaining or improving surface water quality in the stretch of the North Saskatchewan River from Devon to Pakan. Stakeholder and indigenous engagement on a Surface Water Quality Management Framework began in 2015 as a component of the North Saskatchewan Regional Plan, and continued in 2018. The current engagement will build on these initiatives and processes.

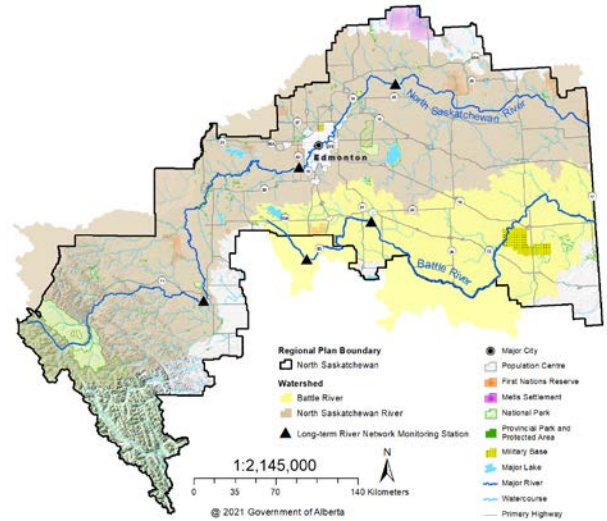


Figure 1: The North Saskatchewan and Battle River Watersheds

Surface Water Quality Pressures

Rivers in the North Saskatchewan Region are relied upon for source water for drinking, livestock watering, recreation, industry, providing healthy aquatic habitat and supporting traditional land use activities. However, pressure from different human activities can impact surface water quality in the region.

Population growth drives urban development, recreational growth, industrial growth and intensification of agricultural operations. All of these activities, individually and in combination, contribute to increased loadings of point source and non-point source pollutants. Nutrients are one type of pollutants from, for example, agricultural run-off or wastewater treatment facilities, which can lead to increased aquatic plant growth, causing changes in the flora and fauna of a river system.

Loss of native vegetation cover, wetlands and riparian areas reduces the natural capability of the landscape to filter contaminants, moderate flow and prevent erosion. This can lead to increased loadings of sediment and related pollutants.

Surface Water Quality Status

Many aspects of water quality in the North Saskatchewan Region have improved in recent decades due to improved management practices, especially wastewater treatment. Despite these advances, concerns for water quality in the North Saskatchewan and Battle rivers include low dissolved oxygen in the winter, nutrient enrichment, trace metals, and high sedimentation. Continuing efforts under the Water Management Framework for the Industrial Heartland and Capital Region are working to address these issues.

Low flow rates, a natural characteristic of the Battle River, may result in low pH, and high bacterial counts and nutrient concentrations. These sometimes exceed provincial water quality guidelines. This is a prairie-fed river system that relies on precipitation and groundwater to feed the river, so there is less dilution and flushing of human-made wastes.

Key Components of the Framework

Regional Objective

The proposed regional objective for the North Saskatchewan Region Surface Water Quality Management Framework is:

“Surface water quality in the North Saskatchewan and Battle rivers is managed so current and future water quality is maintained or improved.”

This objective reflects input from past engagements where participants indicated there was a strong local desire that surface water quality be maintained or improved, and managed to support human and ecosystem needs through shared stewardship

Once a regional objective is set, indicators are measured and used to understand whether that objective is being met.

Indicators and Management Thresholds

A list of proposed indicators for the North Saskatchewan and Battle rivers has been developed that considers the extensive collection of technical studies and analyses undertaken in the region. Key criteria considered in the selection of indicators includes:

- Availability of long term monitoring data
- Identified as contaminants of concern in previous studies or reports
- Increasing concentrations with time
- Exceedance of Environmental Quality Guidelines for Alberta Surface Waters
- Are influenced by human activity or land use pressures
- Ability to be influenced by management actions

A total of 19 and 21¹ indicators are being proposed for the Battle and North Saskatchewan rivers, respectively, including metals, ions, nutrients, biological indicators, and herbicides. A proposed indicator list and associated thresholds is provided in Tables 1 and 2 (see appendix).

Triggers

Triggers are established for the indicators based on historical monitoring data. There is a long data record that is suitable for characterizing historical water quality at five stations from the provincial Long Term Monitoring Network; three on the North Saskatchewan River and two on the Battle River (see Figure 1).

- North Saskatchewan River Upstream of Clearwater
- North Saskatchewan River at Devon
- North Saskatchewan River at Pakan
- Battle River at Highway 53
- Battle River at Driedmeat Lake

These station locations are located both upstream and downstream of sources of water quality pollutants.

Because concentrations of many of the indicators vary significantly throughout the year, separate triggers were set for the open water season (April to October) and the ice-covered season (November to March). The complete set of

¹ Includes one secondary indicator, which, due to data limitations, does not have triggers.

triggers for each station is provided in Tables 1 and 2 (see appendix).

Two types of triggers are set for each indicator. Median triggers use the middle value of the historical dataset and represent long term, chronic conditions; and peak triggers use one of the highest values in the dataset (90th percentile) and represent short term, acute conditions. Exceedance of a trigger signals that a potential change in water quality may be occurring, and prompts a management response under the framework.

Limits

Water quality limits are based on the most stringent water quality guidelines from the Environmental Quality Guidelines for Alberta Surface Waters, which identify the maximum concentrations allowable to support specific use (e.g. protection of aquatic life, recreation and aesthetics, and agriculture). Exceedance of a limit indicates that the risk of adverse effects on water quality is unacceptable.

It is important to note that the limits are not intended to be “pollute-up-to” numbers; the initiation of a management response when a trigger is exceeded is intended to prevent concentrations from reaching the limit.

Indicators without limits will be managed through the use of triggers. The framework will incorporate new or amended guidelines as limits, as they are adopted in Alberta.

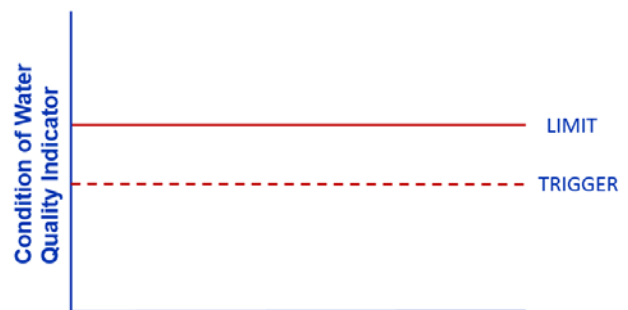


Figure 2: Management thresholds (triggers and limits)

Targets

Targets describe desired future conditions and can guide management direction and inform decisions about existing and future activities. Targets have not yet been set under the draft framework.

Management Response

In the North Saskatchewan Region, the management response will benefit from the numerous technical studies

completed in recent years, data from the ongoing monitoring of the tributary monitoring network, as well ongoing work in the Industrial Heartland.

Additional monitoring is occurring in tributaries of the North Saskatchewan River through the [WaterSHED Program](#), a collaborative partnership through Alberta Environment and Parks, City of Edmonton, EPCOR, and the North Saskatchewan Watershed Alliance. There are 19 monitoring stations from the headwaters of the North Saskatchewan River to the Saskatchewan Border.

Evaluation and Reporting

Annual *Status of Surface Water Quality* reporting will provide the public and decision-makers with information on indicator conditions and where they fall in relation to thresholds. A report on the *Status of Management Response* will be released every two years to provide information on any investigations and management actions undertaken by Alberta Environment and Parks.

Decision Making and Authority

Upon implementation of the framework, long-term planning and decision-making will be made in accordance with the defined objectives for management established under this Framework. The framework will be issued pursuant to Section 14 of the *Environmental Protection and Enhancement Act* until subsequent incorporation under a regional plan and the *Alberta Land Stewardship Act*.

Management of Surface Water Quality

Alberta is committed to the wise management of the province's water quantity and quality for the benefit of Albertans now and in the future. This is achieved through an adaptive management cycle that is responsive to new knowledge, collaboration and innovation. Provincial, municipal and indigenous governments, industry, Watershed Planning and Advisory Councils, and stewardship organizations all contribute to actions that support water quality management.

Plan: Develop the framework

Developing a framework incorporates feedback from multiple stakeholders, indigenous communities and the public. Once a regional objective is set, indicators are measured and used to understand whether the objective is being met. To learn more about the components of a framework, read the Surface Water Quality Management Framework fact sheet.

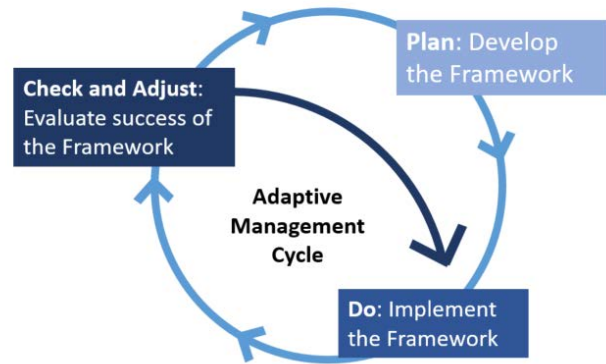


Figure 3: The Surface Water Quality Management Framework Adaptive Management Cycle

Do: Implement the framework

Data collected from monitoring is analyzed and compared to the triggers and limits set within the framework. Appropriate management response is taken if any indicators are above the triggers or limits in the framework.

Check and Adjust: Evaluate success of the framework

Any management actions that are taken are evaluated to ensure that they were effective and the desired state was achieved. Social, economic and environment needs are also evaluated to ensure the plan is still effective managing the water quality goals for the region.

Alberta Environment and Parks will review and update the framework to reflect changes in information, knowledge and continuing work on water quality indicators within five to ten years.

Next Steps

A Surface Water Quality Management Framework is being developed for the North Saskatchewan Region that applies to water quality on the mainstems of the North Saskatchewan and Battle rivers. Albertans are invited to provide input on the following key components of the framework:

- Identified regional pressures
- Regional objective
- Indicators and the approach for setting thresholds
- Management responses if thresholds are exceeded
- Monitoring, evaluation and reporting

A survey will be open until September 17, 2021. Your feedback will help contribute to the creation of a surface water quality management framework for the North Saskatchewan Region.

Appendix: Draft indicators, triggers and limits for the Battle and North Saskatchewan rivers

Table 1. Draft indicators, triggers and limits applied at the Battle River at Highway 53 and Driedmeat Lake monitoring stations

Indicator	Unit ^a	Season	Limit ^b	Median Trigger		Peak Trigger	
				Hwy 53	Driedmeat Lake	Hwy 53	Driedmeat Lake
BIOLOGICAL							
<i>Escherichia coli</i>	no/100ml	open	100	20	10	180	64
		winter	100	10	10	30	30
IONS							
Chloride	mg/L	open	100	8.1	32	13	72
		winter	100	9.0	75	16	200
Sodium	mg/L	open	-	48	72	78	120
		winter	-	82	160	140	280
Sulphate	mg/L	open	Equation	22	76	47	160
		winter	Equation	34	200	40	470
METALS							
Arsenic (total)	µg/L	open	5	2.31	3.12	5.70	7.42
		winter	5	1.20	2.56	7.26	4.81
Iron (dissolved)	µg/L	open	300	105	60.8	387	281
		winter	300	39.7	22.8	476	222
Lead (total)	µg/L	open	Equation	0.257	0.505	0.528	3.16
		winter	Equation	0.237	0.528	2.48	1.63
Mercury (total)	ng/L	open	5	2.21	3.09	6.59	15.5
		winter	5	0.985	1.60	14.5	4.15
Selenium (total)	µg/L	open	2	0.28	0.54	0.56	1.5
		winter	2	0.29	1.1	2.4	2.5
NUTRIENTS							
Total Organic Carbon (TOC)	mg/L	open	-	16	20	23	24
		winter	-	14	26	28	33
Ammonia	mg/L	open	Equation	0.050	0.13	0.15	2.0
		winter	Equation	0.27	2.0	1.2	11
Nitrite+nitrate	mg/L	open	100	0.0030	0.011	0.13	0.69
		winter	100	0.055	0.24	0.37	0.78
Phosphorus (total)	mg/L	open	c	0.18	0.26	0.46	0.63
		winter	c	0.079	0.27	1.1	0.99
Phosphorus (dissolved)	mg/L	open	c	0.11	0.14	0.36	0.41
		winter	c	0.029	0.067	0.11	0.35
ORGANICS							
MCPA (2-methyl-4-chlorophenoxyacetic acid)	µg/L	open	2.6	0.01	0.02	0.06	0.2
2,4-D (Dichlorophenoxyacetic acid)	µg/L	open	4	0.01	0.03	0.03	0.1

Indicator	Unit ^a	Season	Limit ^b	Median Trigger		Peak Trigger	
				Hwy 53	Driedmeat Lake	Hwy 53	Driedmeat Lake
GENERAL							
Total Dissolved Solids (TDS)	mg/L	open	500	320	410	370	610
		winter	-	480	880	720	1400
Total Suspended Solids (TSS)	mg/L	open	c	7.2	24	27	65
		winter	c	7.0	15	22	39
Sodium Adsorption Ration (SAR)	-	open	5	1.48	2.25	2.69	3.64
		winter	5	1.98	3.78	3.29	5.10

- a) Abbreviations include mg/L (milligram per litre), µg/L (microgram per litre), ng/L (nanogram per litre), and No/100mL (number per 100 millilitres).
- b) Limits have been adopted from the *Environmental Quality Guidelines for Alberta Surface Waters* (2018). The most stringent chronic guideline of either the Surface water quality guidelines for the protection of freshwater aquatic life (Table 1) or Water quality guidelines for the protection of agricultural water uses (Table 2) is listed, here.
- c) The guideline for this parameter is a narrative statement. It will be considered in the interpretation of water quality monitoring data, but cannot be directly applied as a Surface Water Quality Limit.

Table 2. Draft indicators, triggers and limits applied at the North Saskatchewan River upstream of Clearwater River, at Devon and at Pakan stations

Indicator	Unit ^a	Season	Limit ^c	Median Trigger			Peak Trigger		
				Clearwater	Devon	Pakan	Clearwater	Devon	Pakan
BIOLOGICAL									
<i>Escherichia coli</i>	no/ 100ml	open	100	10	10	30	40	30	280
		winter	100	10	10	10	20	10	87
IONS									
Chloride	mg/L	open	100	1.0	1.0	3.3	1.0	2.0	6.2
		winter	100	1.0	1.0	4.4	1.0	1.1	8.9
Fluoride	mg/L	open	1	0.11	0.12	0.14	0.14	0.15	0.16
		winter	1	0.11	0.12	0.15	0.12	0.14	0.17
Sodium	mg/L	open	-	2.1	4.0	7.4	2.8	5.7	11
		winter	-	1.4	3.7	8.0	2.4	4.6	12
Sulphate	mg/L	open	Equation	40	40	46	49	47	55
		winter	Equation	40	48	53	46	53	60
METALS									
Aluminum (dissolved)	µg/L	open	50	8.05	5.56	43.8	24.7	25.7	81.4
		winter	50	3.39	2.10	19.7	9.46	5.09	28.4
Arsenic (total)	µg/L	open	5	0.259	0.459	0.597	0.903	1.91	1.91
		winter	5	0.127	0.251	0.305	0.266	0.376	0.399
Cadmium (total)	µg/L	open	Equation	0.016	0.014	0.028	0.050	0.077	0.11
		winter	Equation	0.0070	0.0079	0.014	0.020	0.015	0.025
Cobalt (total)	µg/L	open	2.5	0.210	0.180	0.329	0.758	1.63	1.98
		winter	2.5	0.0601	0.0458	0.0885	0.308	0.133	0.207
Copper (total)	µg/L	open	7	0.912	1.13	1.60	2.62	4.99	6.39
		winter	7	0.491	0.666	0.903	0.980	1.03	1.67
Lead (total)	µg/L	open	Equation	0.326	0.286	0.611	1.21	2.66	3.71
		winter	Equation	0.114	0.122	0.183	0.470	0.416	0.852
Mercury (total)	ng/L	open	5	1.70	2.60	2.42	5.59	7.65	13.9
		winter	5	0.500	0.645	0.576	2.44	0.996	1.12
Selenium (total)	µg/L	open	2	0.21	0.25	0.33	0.33	0.37	0.56
		winter	2	0.20	0.25	0.36	0.24	0.38	0.47
Zinc (total)	µg/L	open	30	2.53	3.72	5.98	8.67	20.8	22.9
		winter	30	1.04	1.43	3.12	3.87	4.21	10.8
NUTRIENTS									
Ammonia	mg/L	open	Equation	0.050	0.050	0.050	0.058	0.062	0.11
		winter	Equation	0.050	0.050	0.10	0.051	0.050	0.19
Nitrate+nitrite	mg/L	open	100	0.051	0.0080	0.17	0.068	0.079	0.31
		winter	100	0.062	0.073	0.35	0.080	0.090	0.45
Phosphorus (total)	mg/L	open	b	0.016	0.011	0.031	0.065	0.12	0.13
		winter	b	0.0070	0.0060	0.013	0.036	0.010	0.027
Phosphorus (dissolved)	mg/L	open	b	0.0030	0.0040	0.0080	0.0098	0.013	0.024
		winter	b	0.0030	0.0030	0.0080	0.0062	0.0060	0.014
Total Organic Carbon (TOC)	mg/L	open	-	1.0	2.7	3.0	2.7	6.6	7.2
		winter	-	0.52	1.5	1.8	0.83	2.0	2.3
GENERAL									
Total Suspended Solids (TSS)	mg/L	open	c	21	19	23	160	142	220
		winter	c	4	3	4.4	42	10	22
SECONDARY									
Dichlorophenoxyacetic acid (2,4-D)	µg/L	both	4 ^d	-	-	-	-	-	-

- a) Abbreviations include mg/L (milligram per litre), µg/L (microgram per litre), ng/L (nanogram per litre), and No/100mL (number per 100 millilitres).
- b) Limits have been adopted from the *Environmental Quality Guidelines for Alberta Surface Waters* (2018). The most stringent chronic guideline of either the Surface water quality guidelines for the protection of freshwater aquatic life (Table 1) or Water quality guidelines for the protection of agricultural water uses (Table 2) is listed, here.
- c) The guideline for this parameter is a narrative statement. It will be considered in the interpretation of water quality monitoring data, but cannot be directly applied as a Surface Water Quality Limit.
- d) For secondary indicators, annual conditions will be compared against the guideline, but the guideline does not serve as a regulatory limit.