

State of Drinking Water in the Peace River Watershed

Prepared for:

Mighty Peace Watershed Alliance

March 2012

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1 Introduction

1.1 Peace River Watershed

The Peace River originates in the Rocky Mountains of British Columbia and flows northeast across northern Alberta, joining with the Athabasca River to form the Slave River below Peace Point (see **Figure 1**). The Slave River is a tributary of the Mackenzie River.



Figure 1: Peace River Watershed

Historically, the Peace River originated at the confluence of the Finlay and Parsnip Rivers in northeastern British Columbia. However, since the construction of the W.A.C. Bennett Dam in 1968 and the Peace Canyon Dam in 1980 by BC Hydro, the Peace River headwaters are now Williston Lake, located approximately 170 kilometers (km) upstream from the BC/Alberta border. With the construction of the WAC Bennett Dam, the Peace River flows have been modified with spring and summer flows detained and more water released during the winter.

Within Alberta, the Peace River Watershed includes several important tributaries representing six sub-basins: the Upper Peace, Smoky River (including the Little Smoky and Wapiti Rivers), the Central Peace, the Wabasca River, the Lower Peace and the Slave River, as shown in **Figure 2**. Technically, the Slave River is part of the Great Slave River basin, however it has been included by Alberta Environment and Water (AEW) in the Peace River Watershed Planning Advisory Council (WPAC). At Peace Point (within Wood Buffalo National Park), the Peace River has a drainage area of 293,000 km² and a mean annual flow of 68,200,000 m³ (AEW, 2011a).

Almost 160,000 people live within the Alberta portion of the Peace River Watershed (Alberta Municipal Affairs, 2010) as shown in **Table 1**. More than half of those people (88,000) live in urban centers, of which the City of Grande Prairie is the largest with a population of just over 50,000. Another 57,000 live in rural municipalities – including hamlets – which attest to the agricultural endeavours within the watershed. More than 12,000 First Nations people live on reserves, and another 2,200 Métis people live on Settlements within the watershed.

As the boundaries for the rural municipalities do not, necessarily, follow the sub-basin boundaries, they have been arbitrarily included in the sub-basin where their head office is located.

The Peace River watershed includes an extensive agricultural region that stretches from the City of Grande Prairie in the south to the Town of Fort Vermilion to the north. Cereal crops, oil seeds, peas, tame hay and forage (e.g., alfalfa, timothy and clover) are some of the primary crops grown. Livestock farming includes cattle, bison, elk and some sheep. Apiculture is also prominent in the Peace Region, with the Town of Falher claiming to be the ‘Honey Capital of Canada’ and boasting the world’s largest bee. Besides agriculture, oil and gas and forestry are major economic drivers within the Peace River Watershed.

1.2 The Importance of Healthy Drinking Water

People all over the world share a common need for clean drinking water supplies. In fact, a substantial part of the world’s population, in high-income, middle-income and low-income countries alike, rely on small community water supplies (WHO, 2011). Accessibility of clean or ‘healthy’ drinking water is an important factor in maintaining a healthy population. Contamination by infectious agents or chemicals can cause mild to severe illness and even death. Protecting water sources and minimizing exposure to contaminated water sources are important parts of environmental health.

In Canada, the responsibility for making sure drinking water supplies are safe is shared between the provincial, territorial, federal and municipal governments. The day-to-day responsibility of providing safe drinking water to the public generally rests with the provinces and territories, while municipalities

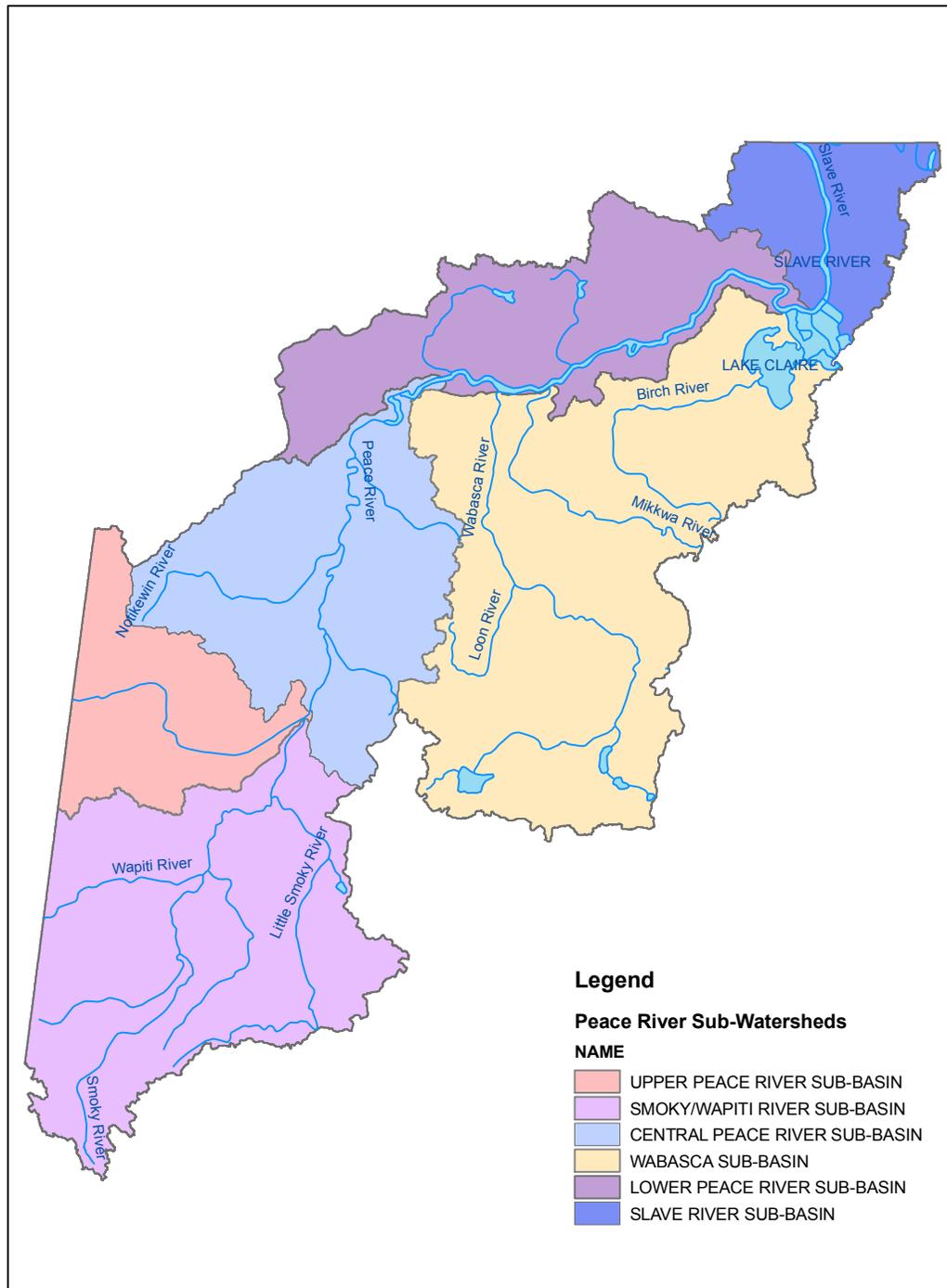


Figure 2: Peace River Sub Watersheds

Table 1: Population Statistics for the Peace River Watershed and Sub Watersheds

Sub Watershed	Urban		First Nations		Metis		Rural	
	Municipality	Population	Reserve	Population	Settlement	Population	Municipality	Population
Smoky/Wapiti	Grande Prairie	50,227	Horse Lake	436			MD of Greenview	5,464
	Beaverlodge	2,264	Sturgeon Lake	1,379			Grande Prairie County	17,989
	Falher	941					MD of Smoky River	2,442
	Fox Creek	2,278						
	Grande Cache	3,783						
	McLennan	824						
	Sexsmith	2,255						
	Valleyview	1,884						
	Wembley	1,443						
	Donnelly	374						
	Girouxville	282						
Hythe	821							
Sub-total	67,376		1,815		0		25,895	
Upper Peace	Fairview	3,297	Duncan's	132			MD of Spirit River	662
	Grimshaw	2,537					Saddle Hills County	2,478
	Spirit River	1,148					Birch Hills County	1,610
	Berwyn	561					MD of Fairview	1,856
	Rycroft	638					MD of Peace	1,487
	Hines Creek	396					Clear Hills County	3,293
	Sub-total	8,577		132		0		11,386
Central Peace	Manning	1,493	Lubicon Lake	44	Paddle Prairie	1,089	Northern Lights County	3,556
	Peace River	6,315	Woodland Cree	709			Northern Sunrise County	2,880
	Nampa	373						
	Sub-total	8,181		753		1,089		6,436
Wabasca			Bigstone*	2,712	Gift Lake	1,115	MD of Opportunity	3,259
	Sub-total	0	Loon River	395				3,259
Lower Peace	High Level	3,887	Beaver	415			Mackenzie County	10,002
			Dene Tha	1,934				
			Little Red River	3,558				
			Tall Cree	513				
Sub-total	3,887		6,420		0		10,002	
Slave River	0		0		0	ID No. 24 (Wood Buffalo)	422	
Total	88,021		12,227		2,204		57,400	

* The Bigstone First Nation includes the Peerless and Trout First Nations, which were recently established as their own separate First Nations.

usually oversee the day-to-day operations of the treatment facilities. Individuals who take their drinking water from groundwater (wells) or surface water capture (dugouts, ponds or lakes) may be responsible for ensuring the water quality. As users and consumers of water we all must take responsibility in protecting our water supply sources. Prevention of contamination is easier and cheaper than curing illness.

1.3 Purpose of the Report

The Mighty Peace Watershed Alliance Society (MPWA) is a Watershed Planning and Advisory Council (WPAC) established under Alberta's *Water for Life Strategy*, and is a not-for-profit organization. The MPWA is committed to achieving and implementing the 3 goals of the strategy:

1. Safe, secure drinking water supply;
2. Healthy aquatic ecosystems; and
3. Reliable quality water supplies for a sustainable economy.

In order to provide safe, secure drinking water supplies as stated under Goal 1 of the *Water for Life Strategy*, a thorough understanding of drinking water sources and their end-users is required. This is the first step in assessing risks to drinking water supply, both in terms of the factors affecting drinking water quantity and drinking water quality. Understanding current and future demands, risks, and protection measures is critical in formulating a strategy for drinking water management in the future.

Additionally, the MPWA intends to complete a state of the watershed (SoW) report for the Peace River watershed within Alberta, as is intended for all the major river basins in Alberta, under the *Water for Life Strategy*. Drinking water and the associated risks and management strategies form a key component of such reports, as these issues lie at the interface between the human and natural environments within a watershed.

The MPWA has engaged *Aquality Environmental Consulting Ltd.* to develop a report on the state of drinking water within the Peace River Watershed. The objectives of the report are to:

- Determine current drinking water sources within the watershed;
- Determine the type and level of drinking and wastewater treatment within the watershed;
- Determine the status of drinking water and wastewater infrastructure within the watershed, including current and future;
- Identify information and data gaps on the supply of drinking water in the watershed; and,
- Provide a document that may be of value to residents, various governmental agencies, and the Mighty Peace Watershed Alliance in managing drinking water supplies and quality, as well as related endeavors such as the preparation of a State of the Watershed report and Watershed Management Plan.

1.4 Scope of the Report

The scope of the report is limited to the Peace River Watershed within the Province of Alberta and includes the following information, as available:

- Geographic location (text and map format) and statistics on current drinking water sources for rural and urban municipalities, Métis Settlements, First Nation Reserves, industry (e.g. work camps) and private well-owners;
- Delivery systems, networks and water co-ops – current capacity, infrastructure gaps, future needs, funding mechanisms (government, user fees, full cost accounting, operation & capital cost planning);
- Type/level of treatment of drinking water and wastewater (including wastewater management practices of municipal, industry and private landowners);
- Regulatory agencies and programs, drinking water guidelines and standards, testing facilities;
- Drinking water issues (future growth and available supply including potential future sources of potable water, contaminants, treatment concerns, and other issues pertinent to the state of drinking water in the Peace Watershed);
- Information gaps;
- Conclusion – should identify where current or future drinking water stress points may occur or where data gaps should be filled and how. Emphasis should be on how this information is relevant to the board and its future work;
- List of key resources for further information; and
- Bibliography of all data sources.

2 Available Information and Contacts

This section describes the drinking water-related information sources that were acquired during a literature review, and the agencies that were contacted for drinking water information. The literature review describes the key reports which pertain to the scope of the project.

2.1 Literature Review

Grimshaw Gravels Aquifer Technical Report, Agriculture and Agri-Food Canada (1998)

In April 1998, the ‘Grimshaw Gravels Aquifer Technical Report’ was completed by the Earth Sciences Division of the Prairie Farm Rehabilitation Administration (PFRA) of Agriculture and Agri-Food Canada. The approximate extent of the Grimshaw Gravels Aquifer includes the Upper Peace and Central Peace Sub Watersheds. Subsequently, the Grimshaw Aquifer Management Advisory Committee (GAMAC) was incorporated in 2000, as a non-profit society, with representation from the following municipalities:

- Municipal District of Peace No. 135

- County of Northern Lights
- Clear Hills County
- Municipal District of Fairview No. 136
- Town of Grimshaw
- Village of Berwyn

The objective of the report was to assist the Committee to make informed decisions regarding the management and protection of the aquifer. The report included a general description of the aquifer, including the local geology and groundwater distribution; and the impacts of water withdrawals, overuse and contamination. Three major management issues were presented: municipal/irrigation water supply sites; potential point sources of contamination; and potential non-point sources of contamination. The report provided recommended actions and items for consideration in the development of an aquifer management plan.

Water Related Issues and Programs in Northwest Alberta, Northern Alberta Development Council (2003)

In March of 2003, the Northern Alberta Development Council (NADC) prepared a discussion paper on 'Water Related Issues and Programs in Northwest Alberta'. A copy of the discussion paper is included in **Appendix B**. For the Peace River Watershed State of Drinking Water report, the municipal contacts were provided an electronic copy of the discussion paper and were requested to confirm whether the information included in the paper, regarding their municipality, was still current and to provide updated information if not current.

Regional Groundwater Assessment, Hydrogeological Consultants Ltd. for the Northern Zone of the Alberta Association of Municipal Districts and Counties (2004)

In 2004, Hydrogeological Consultants Ltd., completed a regional groundwater assessment for the Northern Zone of the Alberta Association of Municipal Districts and Counties. The assessment study area included the Peace River Watershed within the Counties of Grande Prairie, Saddle Hills, Birch Hills, Northern Sunrise, Northern Lights and Mackenzie and the Municipal Districts of Spirit River, Peace and Fairview. The assessment:

- Identified the aquifers within the surficial deposits and the upper bedrock;
- Identified the aerial extent of the main aquifers;
- Described the quantity and quality of the groundwater associated with each aquifer;
- Identified the hydraulic relationship between aquifers; and
- Identified possible groundwater depletion areas associated with each upper bedrock aquifer.

The assessment did not include any water quality testing. No information was available regarding aquifer depletion or sustainable long-term water withdrawals. Therefore, there was no information in the report that could provide assurance (regarding the long-term reliability of their water source) to municipalities using groundwater for their municipal water supply.

Waterworks Facility Assessment Report, Associated Engineering for Alberta Environment (2004)

In October 2004, Associated Engineering completed the 'Waterworks Facility Assessment Report' for Alberta Environment, under the *Water for Life* Strategy. The purpose of the study was 'to identify short-term and long-term solutions to source, treatment and operational challenges in the supply of safe, secure drinking water in the Province of Alberta (Associated Engineering, 2004). One important consideration of the study was the potential for regionalizing drinking water treatment and supply, thereby reducing the number of facilities (and those at risk), and improving the level of service to the public. Although all treatment facilities were assessed, the report does not address each facility but, rather, establishes the overall state of water treatment in Alberta and then addresses short- and long-term solutions to the issues identified in the facility assessments, including the potential for regionalization. The report also presents source water, treatment, and operations and monitoring concerns identified during the field assessments of the treatment facilities.

Municipal Wastewater Facility Assessment, AECOM for Alberta Environment (2009)

In January 2009, AECOM completed the 'Municipal Wastewater Facility Assessment' phase I report, for Alberta Environment. The study was similar to the 2004 report completed by Associated Engineering, but focused on wastewater treatment facilities, rather than waterworks facilities. The study assessed the physical condition of the wastewater treatment facilities (WWTFs) and the risk of the treated effluent on the receiving waters. They developed 20 metrics to assess the WWTFs and the risk to their receiving waters on a watershed basis, including the Peace River Watershed. The treatment facilities were then assessed on a combined receiving environment/facility ranking category, ranging from LL to HH. AECOM then developed a database to manage the data and derive the metric results. The database was provided to AEW and will allow them to obtain a current assessment of the Province's wastewater systems. GIS maps were also developed to relate the effluent discharge outfalls to water quality and hydrometric stations.

Prairie Adaptation Research Collaborative

The Prairie Adaptation Research Collaborative (PARC) is a partnership of the governments of Canada, Alberta, Saskatchewan and Manitoba mandated to pursue climate change impacts and adaptation research in the Prairie Provinces. Their objective is to generate practical options to adapt to current and future climate change. They are also charged with fostering the development of new professionals in the emerging science of climate change impacts and adaptation.

Dr. D.J. (Dave) Sauchyn is the senior research scientist with PARC and has researched and co-authored several papers regarding drought and climate change and their impact on soil and water management, including:

- Aridity on the Canadian Plains: Future Trends and Past Variability. The Pre-Settlement record of Prairie Drought and Forecast of Future Aridity and What They Mean for the Management of Soil and Water Resources

- Modes and Forcing of Hydroclimatic Variability in the Upper North Saskatchewan River Basin Since 1063
- New reconstructions of streamflow variability in the South Saskatchewan River Basin from a network of tree ring chronologies, Alberta, Canada

These studies show that historic and prehistoric droughts on the prairies have been more extreme and have lasted longer than events experienced since the settlement of the prairies. With climate change we can anticipate more longer and more extreme droughts in the future, threatening the availability of water. Although these studies focus on the North and South Saskatchewan River Basins, the overall conclusion regarding water availability can be applied to the Peace River Watershed (Sauchyn, 2012).

2.2 Contacts

To gather the specific information regarding drinking water quality and treatment and wastewater treatment, AEW, Municipal Authorizations, was contacted for a listing of all authorized/registered drinking water and wastewater treatment facilities. Based on the lists provided, facility owners were contacted to provide the following information:

- The source of their drinking water supply;
- The legal land location of the water intake, water treatment plant and wastewater facilities, including the outfall, and the name of the waterbody/watercourse into which effluent is discharged;
- Statistics on current drinking water sources (and volumes) if available;
- Delivery systems, networks and water co-ops – current capacity, infrastructure gaps, future needs, funding mechanisms (government, user fees, full cost accounting, operation & capital cost planning);
- Type/level of treatment of drinking water and wastewater (including wastewater management practices);
- Drinking water issues (future growth and available supply including potential future sources of potable water, contaminants, treatment concerns, and other issues pertinent to the state of drinking water in the Peace Watershed); and
- Relevant testing data

The contacts were also requested to identify any other potential contacts that may have Peace River Watershed water-related information that may be of interest and benefit to the MPWA. They were also asked for any information, which they may have, that would be useful for completing a state of the watershed report.

For a complete listing of contacts, see **Table 4** in **Appendix A**.

2.2.1 Governments

2.2.1.1 *Federal*

Aboriginal Affairs and Northern Development Canada (AANDC) is responsible for meeting Canada's obligations and commitments to First Nations, Inuit and Métis, and for fulfilling the federal government's constitutional responsibilities in the North (AANDC, 2012). Lands and Environment (Social Programs and First Nations Relations – Treaty 8, Alberta Region) was contacted regarding drinking water and wastewater treatment facilities on the First Nations Reserves. They indicated that, although AANDC provides funding for the construction, operation and maintenance of the infrastructure, the First Nations are responsible for planning, developing and operating and maintaining their water and wastewater treatment facilities. Nevertheless, AANDC suggested that the First Nations (Alberta) Technical Services Advisory Group (TSAG) was the most appropriate agency to contact for drinking water and wastewater treatment on the First Nations Reserves. TSAG's Circuit Riders work directly with the First Nations in operating their drinking water treatment and wastewater treatment facilities.

Health Canada, in collaboration with Aboriginal Affairs and Northern Development Canada, assists First Nations in ensuring safe drinking water in their communities. Health Canada ensures that drinking water quality monitoring programs are in place on the First Nations Reserves. The 'Guidelines for Canadian Drinking Water Quality' are applied to the First Nations Reserves. First Nations and Inuit Health Branch (Alberta) was contacted regarding any drinking water or wastewater issues on the Treaty 8 First Nations reserves within the Peace River Watershed.

2.2.1.2 *Provincial*

AEW is responsible for drinking water and wastewater treatment, under the *Environmental Protection and Enhancement Act (EPEA)*. Thus, the Municipal Authorizations section of the Northern Region (Edmonton Office) was contacted for a listing of authorized/registered drinking water treatment facilities and wastewater treatment facilities within the Peace River Watershed.

The authorization/approval viewer available on AEW's website was used to obtain *EPEA* and *Water Act* approval information, particularly for those municipalities that did not respond to the request for information. Although most approvals were available on the viewer, not all the information needed was available, and the information that was provided was not always consistent between approvals. For instance, the *EPEA* approval for the construction, operation and reclamation of a waterworks system may or may not identify the raw water source or the location of the raw water intake. That information may be found in the *Water Act* approval. However, not all the *Water Act* approvals are available on the viewer, particularly if the approval was originally issued under the *Water Resources Act*, prior to 1999. Similarly, if a wastewater treatment facility falls under the *Water Act* Code of Practice for Wastewater System using a Wastewater Lagoon, the only information available on the authorization/approval viewer is a letter to the municipality stating that their wastewater facilities fall under the Code of Practice. The

location of the effluent discharge and/or the name of the receiving waterbody or watercourse are not provided. This information may or may not be found on the *Water Act* approval.

Alberta Health and Wellness (AHW), under their 'Environmental Public Health – Drinking Water' Program/Service inspect public water supplies, review water sample results and issue water advisories. They advise private landowners using wells, cisterns or dugouts for domestic water supplies, regarding the safety of their water and possible treatment options. The Health Protection Branch of AHW was contacted and they have some groundwater quality test results from private wells throughout the Province, which is available on a township basis.

Alberta Infrastructure was contacted for information regarding their drinking water and wastewater treatment facilities at the Peace River Correctional Centre. The information for the Correctional Centre was not available on the AEW authorization/approval viewer.

Alberta Tourism, Parks and Recreation was contacted regarding their wastewater treatment facilities at Young's Point and Moonshine Lake Provincial Parks. Those facilities come under the Code of Practice for Wastewater System using a Wastewater Lagoon and, thus, details on those systems were not available.

Alberta Sustainable Resource Development (Forestry) was contacted regarding their drinking water and wastewater treatment facilities at the Footner Lake Forest Site (camp). Drinking water for the Footner Lake Forest Site is now provided by the Town of High Level.

2.2.1.3 Municipal

All the urban (Villages, Towns, Cities) and rural (Municipal Districts, Counties) municipalities, included in the AEW list of authorized/registered drinking water and wastewater treatment facilities, were contacted for information regarding their facilities. The information provided by the municipalities that did respond, varied in content and detail. Thus, their information was complemented with the information garnered from the AEW authorization/approval viewer.

The 'Dunes', 'Silver Pointe Village' and Triple L Mobile Home are private subdivision developments, located near the City of Grande Prairie, and have their own municipal water supply systems and wastewater treatment systems. Aquatera Utilities Inc. provides the Dunes Subdivision with potable water up to the subdivision property line. Testing and other operations are conducted by the members of the subdivision (MPWA, 2012).

The contact information for the Dunes Subdivision was out of date, so they could not be contacted. Similarly, no contact information was available for Triple L Mobile Home, so they were not contacted. Silver Pointe Village was contacted by telephone and followed-up with an email request for information.

The Grandview Hutterite Colony near Grande Prairie and the Sandhills Colony near Eaglesham both have their own wastewater treatment facilities. No contact information was available for them.

2.2.2 First Nations

Upon the advice from AANDC, the Treaty 8 First Nations of Alberta, in Edmonton, was contacted unsuccessfully on several occasions to obtain contact information for the First Nations in the Peace River Watershed. The AANDC website and available First Nations websites were then searched for contact information. When a Band Manager was identified on the First Nations website, they were contacted first by telephone and then with a follow-up email with the request for information. Otherwise, a formal letter was faxed to the First Nations Chief and Council. All First Nations in the Peace River Watershed were contacted between November 7 and 8, 2011. No responses were received from any of the First Nations.

Upon recommendation from Aboriginal Affairs and Northern Development Canada, the First Nations (Alberta) Technical Services Advisory Group (TSAG) was contacted. Their Circuit Riders collaborate with the First Nations in the operation and maintenance of their drinking water and wastewater treatment facilities and, therefore, may be in a good position to provide information regarding those systems. No response was received from TSAG despite repeated attempts.

The Mighty Peace Watershed Alliance may wish to seek advice from Alberta Intergovernmental, International and Aboriginal Relations on an approach to obtain the desired information from our First Nations.

2.2.2.1 *Métis*

Two Métis Settlements are located within the Peace River Watershed: The Gift Lake Métis Settlement in the Wabasca Sub-basin; and the Paddle Prairie Métis Settlement in the Central Peace River Sub-basin. For the Paddle Prairie Métis Settlement an email was sent to their Superintendent of Public Works; for the Gift Lake Métis Settlement a formal letter was faxed to their Council. No response was received from either of the Métis Settlements.

2.2.3 Utilities

2.2.3.1 *Aquatera Utilities Inc.*

Aquatera Utilities Inc. (Aquatera) is located in Grande Prairie but provides a regional utilities service. Their waterworks system treats and distributes water to the City of Grande Prairie (including the airport) as well as the County of Grande Prairie No.1 (Hamlets of Clairmont and Wedgewood, as well as west and east rural subdivisions such as Taylor Estates), and the Town of Sexsmith. Their wastewater treatment system services the City of Grande Prairie as well as some of the County region. Clairmont, Sexsmith and the Grande Prairie Airport have separate wastewater treatment systems, which are owned and operated by Aquatera.

2.2.3.2 *NEW Water Ltd.*

NEW Water Ltd. is a collaborative partnership between Northern Sunrise County, the Village of Nampa, and Woodland Cree First Nation to meet their future drinking water needs on a regional basis. The

drinking water source is the Peace River, using the Shell Canada water intake, which is located on the Peace River just north of the Town of Peace River. The project includes a raw water transmission line, desilting pond, raw water reservoir, water treatment plant, and regional transmission line system. According to Northern Sunrise County, the water treatment plant went into service in September 2010.

No contact information was available for NEW Water Ltd., except Northern Sunrise County, which was contacted with the other municipalities. No response was received.

2.2.3.3 Smoky River Regional Water Management Commission

The Smoky River Regional Water Management Commission is a legal entity, legislated under a *Municipal Government Act* Regulation (Alberta Regulation 151/2003). The Commission is strictly a water utility treating and distributing drinking water to the Villages of Girouxville and Donnelly, the Town of Falher and the Municipal District of Smoky River (Hamlets of Guy and Jean Cote).

No contact information was available for the Commission, except the municipalities serviced by the Commission, as outlined in the Regulation. The municipalities were all contacted.

2.2.4 Industry

Aramark Remote Workplace Services (Encana Pelican Camp), Penn West Exploration and Bonavista Energy were all contacted regarding the wastewater treatment facilities at their respective remote camps. As their Peace River raw water intake is being used by NEW Water Ltd. for a municipal water supply, Shell Canada was contacted regarding any water treatment facilities they may be operating. The water that Shell withdraws from the Peace River is not used for drinking water; as such Shell has no drinking water treatment plant, wastewater facilities, or wastewater outfall.

3 Regulatory Requirements

3.1 Regulation and Legislation of Drinking Water in Alberta

Alberta's drinking water systems have been designated by AEW as either 'public' (provide potable drinking water to serve the general public) or 'private' (serve a single, privately-owned residence or building where the public has no interest in such a water supply). 'Bulk water hauling' is a third designation that applies to potable water intended for human consumption that is dispensed from an approved transport vehicle (water truck) to a storage facility (see **Figure 3**).

Most of Alberta's drinking water systems are regulated by Alberta Health and Wellness and AEW, with the exception of First Nations, and Federal Lands and Facilities which are under the jurisdiction of the Federal Government.

Private water systems are not provincially or federally regulated, and the onus is on the owner of the private system to test their water. Landowners using wells and/or dugouts for their domestic water supply can have their water tested by Alberta Health and Wellness to ensure potability.

Public water systems are regulated by Alberta Health and Wellness or AEW. Approved public systems are called ‘waterworks systems’ and require an approval under the *EPEA*; or a registration under the Code of Practice for a Waterworks System Consisting Solely of a Water Distribution System or the Code of Practice for Waterworks Systems using High Quality Groundwater. The *Activities Designation Regulation* describes the activities which require an approval, notification, or registration under the *EPEA*. A waterworks system refers to any system that provides potable water to the public, and includes water treatment plants and potable water storage facilities. Public systems not requiring an approval under *EPEA* are called ‘unapproved systems’. Public waterworks systems represent 10 % of all systems across the province but serve approximately 80% of the population of the province. Unapproved public water systems represent 90% of all systems across the province; however only serve approximately 20% of the population.

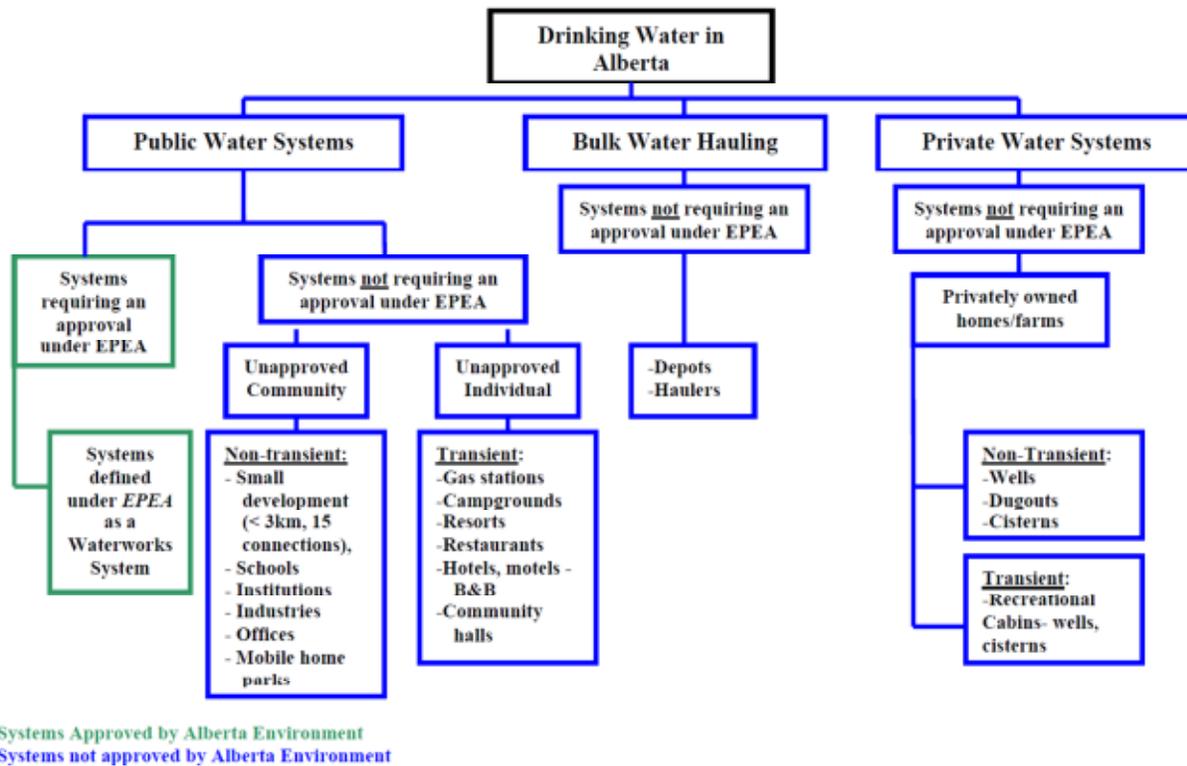


Figure 3: Alberta Environment and Water’s Classification of Approved and Unapproved Systems (adapted from the Environmental Public Health Manual for Safe Drinking Water 2007)

One of the goals of the Government of Alberta's *Water for Life* Strategy is to assure Albertans that their drinking water is safe and secure. To ensure this goal, AEW uses a 'Source to Tap Multi-Barrier Approach' or STMBA. One of the conceptual barriers of the STMBA approach is legislation.

Public approved waterworks systems are governed by: AEW, Alberta Health and Wellness, and the Provincial Public Health Laboratory (Microbiology). Unapproved water systems, including private systems and unapproved bulk water hauling, are governed by: Alberta Health Service Board, Alberta Health Services, Alberta Health and Wellness, and the Provincial Public Health Laboratory (Microbiology).

Table 2 describes the legislation that applies to each type of water system in Alberta.

Table 2: Alberta's Drinking Water Legislation

Type of Water System		Legislation	Regulating Department	Description of Legislation
Public Approved (Waterworks) Systems		<i>Guidelines for Canadian Drinking Water Quality</i>	Health Canada (Federal)	Outlines health-related parameters which are used by every jurisdiction in Canada and are the basis for establishing drinking water quality requirements for all Canadians.
		<i>EPEA - Activities Designation Regulation</i>	Alberta Environment and Water (Provincial)	Describes waterworks systems regulated by Alberta Environment and Water
		<i>EPEA - Potable Water Regulation</i>	Alberta Environment and Water (Provincial)	Details minimum design standards for approved surface and groundwater treatment and distribution systems in Alberta
		<i>EPEA - Approvals and Registration Procedure Regulation</i>	Alberta Environment and Water (Provincial)	Outlines the steps to be followed to acquire an approval or registration for a waterworks facility
		<i>EPEA - Environmental Appeal Board Regulation</i>	Alberta Environment and Water (Provincial)	Outlines the process in submitting an appeal
		<i>Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems</i>	Alberta Environment and Water (Provincial)	Provides design, performance, and monitoring standards for waterworks systems
		<i>Safety Codes Act</i>	Municipal Affairs (Provincial)	Governs treated water once it moves out of the waterworks distribution system, past the service connection for a residence
		<i>SCA - Plumbing Code Regulation</i>	Municipal Affairs (Provincial)	Portion of the <i>Safety Codes Act</i> that controls pollutants from contaminating the treated water by the materials used to build the service connection
		<i>Code of Practice for Waterworks Systems using High Quality Groundwater</i>	Alberta Environment and Water (Provincial)	The Code of Practice that applies to any person who constructs, operates or reclaims a waterworks system that uses high quality groundwater.
		<i>Code of Practice for a Waterworks System Consisting Solely of a Water Distribution System</i>	Alberta Environment and Water (Provincial)	The Code of Practice that applies to any person who constructs, operates or reclaims a waterworks system that consists solely of a water distribution system.
Unapproved Public, and Private Systems		<i>Guidelines for Canadian Drinking Water Quality</i>	Health Canada (Federal)	Outlines health-related parameters which are used by every jurisdiction in Canada and are the basis for establishing drinking water quality requirements for all Canadians.
		<i>Public Health Act - Nuisance and General</i>	Alberta Health and Wellness (Provincial)	Outlines various requirements associated with domestic water and sewage systems that are outside of the scope of <i>EPEA</i>

<i>Sanitation Regulation</i>	
<i>Environmental Public</i>	
<i>Health Manual for Safe</i>	Alberta Health
<i>Drinking Water</i>	and Wellness (Provincial)

The performance assurance for approved waterworks systems is a three-pronged approach consisting of: approvals and registrations (also referred to as Codes of Practice); compliance assistance; and enforcement. In these three areas, AEW undertake routine monitoring and inspection to ensure compliance of the approved drinking waterworks systems. The approvals and registrations provide explicit performance expectations, such as monitoring and reporting, which require facility owners to measure or monitor physical and chemical parameters and to submit bacteriological samples for testing. AEW's Regional Drinking Water Operations Specialists (DWOS) work closely with system owners and operators to ensure facility performance; provide technical advice; pursue better solutions; and respond to emergency situations. AEW Compliance Inspectors audit the operation of waterworks systems to ensure the legislated requirements are followed. Enforcement actions address instances where operators or owners have failed to fulfill their regulatory obligations.

For unapproved private systems, the onus is on the owner of the private system to ensure their drinking water complies with the 'Guidelines for Canadian Drinking Water Quality'. As a proactive method of drinking water management, AEW encourages owners to employ source water protection.

A copy of Health Canada's Guidelines for Canadian Drinking Water Quality is attached in **Appendix C**.

3.2 Regulation and Legislation of Wastewater in Alberta

AEW's Municipal Wastewater Program regulates wastewater treatment systems that are designed to treat more than 25 cubic meters of wastewater per day or systems that discharge off the site of development. Any wastewater systems that receive less than 25 cubic meters of wastewater per day, and that dispose of waste on private land, are deemed 'private systems'. Private systems include those for private residences and work camps, and are regulated by Municipal Affairs and the Federal Government (for First Nations).

AEW regulates the construction and operation of designated municipal wastewater systems, along with municipal waterworks and storm drainage systems under the authority of the *EPEA*. There are regulatory frameworks, standards and guidelines under *EPEA* that are designed to assure environmentally acceptable wastewater discharge and acceptable storm water management practices. The *EPEA* regulations outline design and construction standards for wastewater systems in Alberta; guidelines for land application of sludge; guidelines for usage of wastewater for irrigation; certification of operators of WWTPs, reporting for WWTP activities, sampling for WWTP compliance; and the process of *EPEA* approval application, review, and appeal.

The *Public Health Act and the Safety Codes Act (SCA)* outline several regulations regarding the design, construction, operation and maintenance of plumbing and private sewage disposal systems; and private sewage system objectives and the minimum requirements for safety, health and structural capability.

Figure 4 shows a flow diagram of the legislation that applies to domestic wastewater regulation in Alberta. **Table 3** describes the legislation that applies to municipal WWTPs and private wastewater treatment systems in Alberta.

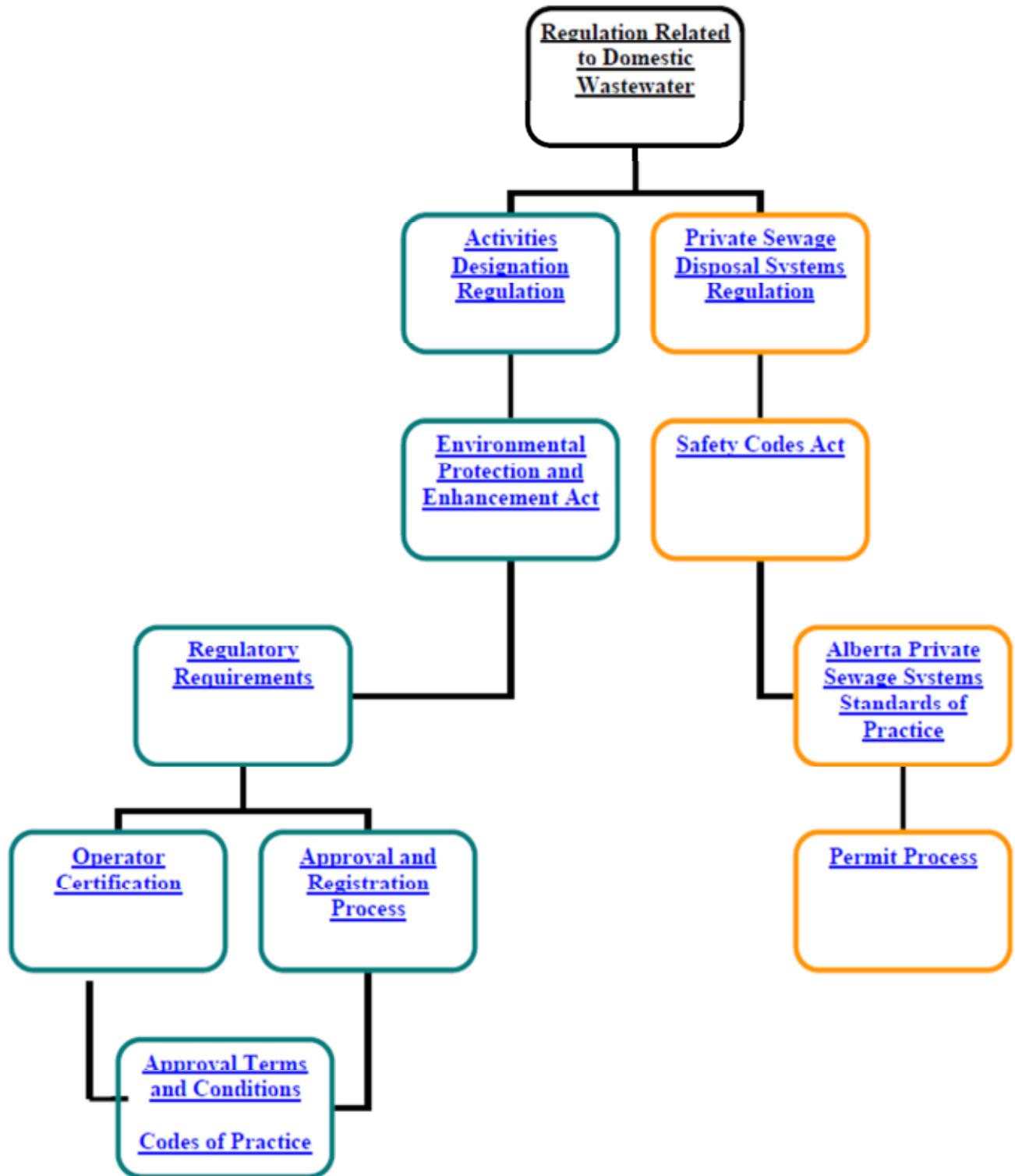


Figure 4: Alberta's Domestic Wastewater Regulation (adapted from the 2009 Guide to the Regulatory Requirements for Domestic Wastewater)

Table 3: Alberta's Wastewater Legislation

Type of Wastewater Facility	Legislation	Regulating Department	Description of Legislation
Municipal Wastewater Systems	<i>EPEA - Activities Designation Regulation</i>	Alberta Environment and Water (Provincial)	Describes wastewater systems regulated by Alberta Environment and Water
	<i>EPEA - Wastewater and Storm Drainage Regulation (AR 119/93)</i>	Alberta Environment and Water (Provincial)	Details design and construction standards for wastewater systems and storm drainage systems in Alberta; guidelines for land application of sludge; and guidelines for usage of wastewater for irrigation.
	<i>EPEA - Wastewater and Storm Drainage (Ministerial) Regulation (AR 120/93)</i>	Alberta Environment and Water (Provincial)	Outlines the certification of operators of WWTPs, reporting for WWTP activities, and sampling for WWTP compliance.
	<i>EPEA - Environmental Appeal Board Regulation</i>	Alberta Environment and Water (Provincial)	Outlines the process in submitting an appeal
	<i>Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems</i>	Alberta Environment and Water (Provincial)	Provides design standards and guidelines for wastewater treatment systems, including effluent quality guidelines.
	<i>EPEA - Approvals and Registration Procedure Regulation</i>	Alberta Environment and Water (Provincial)	Outlines the process of EPEA approval and registration application and review.
	<i>EPEA - Environmental Appeal Board Regulation</i>	Alberta Environment and Water (Provincial)	Outlines process of an appeal under the EPEA
	Private Sewage Disposal Systems	<i>Public Health Act - Nuisance and General Sanitation Regulation</i>	Alberta Health and Wellness (Provincial)
<i>Safety Codes Act</i>		Government of Alberta	Applies to the design, construction, operation and maintenance of plumbing and private sewage disposal systems
<i>SCA – Private Sewage Disposal Systems Regulation</i>		Government of Alberta	Requirements for equipment and operation of systems that dispose of sewage on private property
<i>Alberta Private Sewage Systems Standards of Practice</i>		Government of Alberta	Outlines the private sewage system objectives and the minimum requirements for safety, health and structural capability

3.3 Regulation and Legislation of Drinking Water and Wastewater for First Nations

The federal government currently has Protocols for Safe Drinking Water for First Nations Communities, which set out clear standards for the design, operation and maintenance of drinking water systems, as well as the Procedure Manual for Safe Drinking Water in First Nations Communities South of 60°, which is based on the Guidelines for Canadian Drinking Water Quality (GCDWQ). However, there are currently no legally enforceable protections for First Nations governing drinking water and wastewater on First Nation lands.

The Government of Canada has introduced a bill in the Senate to ensure the provision of safe and reliable drinking water for First Nations. The enabling bill would allow the Government, in collaboration with First Nations, to develop federal regulations for access to safe drinking water, and to ensure the effective treatment of wastewater and the protection of sources of drinking water on First Nation lands.

The bill lays out the areas that federal regulations could address, including:

- the quality of drinking water;
- the training and certification of water and wastewater system operators;
- the treatment of water and wastewater;
- the monitoring, testing, sampling and reporting; and,
- the protection of sources of drinking water located on reserve.

Federal regulations to protect the quality of water on First Nation lands have been recommended by the Office of the Auditor General, the Expert Panel on Safe Drinking Water for First Nations, and the Standing Senate Committee on Aboriginal Peoples.

In 2009, the Government launched the National Assessment of First Nations Water and Wastewater Systems in order to conduct a detailed assessment of existing public and private water and wastewater facilities operating on First Nation lands across the country. Recommendations from the National Assessment were released on July 14, 2011, and stated the need for a water and wastewater regulatory regime on First Nation lands.

Subject to the proposed legislation receiving Royal Assent, the Government of Canada plans to work in partnership with First Nations to develop federal regulations and standards, based on the needs of each region (AANDC, 2012).

Currently, wastewater treatment for First Nations is governed by Indian and Northern Affairs Canada (INAC), who has published a *Protocol for Centralised Wastewater Systems in First Nations Communities* (INAC, 2010) which contains standards for design, construction, operation, maintenance, and monitoring of centralised wastewater systems in First Nations communities; Health Canada; and the *Fisheries Act*, which limits the deposition of deleterious substances in waters.

3.4 Testing Facilities and Compliance

Under the *EPEA* Approvals and Codes of Practice for waterworks and wastewater systems, the Approval holder is responsible to undertake the necessary testing and report on their compliance with, or contravention of, the requirements of the approvals or Codes of Practice.

3.4.1 Testing Facilities

EPEA Approvals for waterworks systems, and the Code of Practice for Waterworks Systems, specify limits and monitoring requirements for various potable water quality parameters. The Approvals and Code of Practice also specify the analytical requirements, including an ISO 17025 accredited laboratory unless authorized otherwise in writing by the Director. Bacteriological samples are to be analyzed by the Alberta Provincial Laboratory for Public Health in Vegreville, unless otherwise authorized in writing by the Director.

Similarly, *EPEA* approvals for wastewater systems, and the Code of Practice for Wastewater Systems, specify limits and monitoring requirements for various wastewater effluent quality parameters. The Approvals and Code of Practice also specify the analytical requirements, including an ISO 17025 accredited laboratory unless authorized otherwise in writing by the Director.

AEW has an alternative laboratory policy that accepts in-house testing for the routine parameters (like chlorine, turbidity and pH) at water plants and (TSS, CBOD) at wastewater facilities, which does not require accreditation but, instead, requires standard operating procedures and regular equipment calibration. The semi-annual or annual chemical analyses are expected to be performed by certified labs (Curran, 2012).

3.4.2 Compliance

EPEA approvals for waterworks and wastewater systems, and the Codes of Practice for Waterworks Systems and Wastewater, specify reporting requirements for the various potable water quality and treated sewage effluent parameters monitored. The Operator of a waterworks system or wastewater system is responsible for meeting the monitoring requirements within the deadlines specified. Reporting is on a monthly and annual basis, as prescribed in the Approval and/or Code of Practice.

The AEW Compliance Assurance Program for *EPEA* and the *Water Act* begins with a foundation of sound regulatory requirements through statutes, regulations, authorizations, codes of practice and associated policies, standards and guidelines. Education, prevention, and enforcement are components of the program used to obtain compliance with the regulatory requirements.

Education is used to raise awareness of environmental protection and management, regulatory requirements, how to comply with those requirements, and the consequences of non-compliance. Education is also used to encourage continuous improvement and environmental stewardship.

Prevention supports compliance by building capacity and the willingness by the Approval Holder to comply with the regulatory requirements, and to identify and address potential problems before they

cause environmental damage. Prevention is a shared responsibility and includes the activities and actions of AEW, other regulatory authorities, the Approval Holder and the public.

Enforcement ensures consequences for non-compliance, ensures that an Approval Holder does not benefit economically from non-compliance, and assigns responsibility to address any damages. This includes actions that remedy, deter and punish where appropriate. An Approval Holder that is in non-compliance must remedy the problem(s) – to correct the non-compliance and to mitigate any damages. Deterrence and punishment are used to discourage future contraventions and/or repeat contraventions.

Instances of non-compliance frequently relate to the Approval Holder not reporting a contravention of an Approval condition immediately, because the Approval Holder may not be fully aware of their responsibilities under the Approval or related legislation. These unreported contraventions may be administrative or related to their monitoring and reporting obligations or both. These may include:

- Missed chlorine residual monitoring
- Missed turbidity monitoring
- Missed pH monitoring
- Missed biannual chemical parameter monitoring
- Missed bacteriological monitoring
- Exceeding the limit for any of the above
- Not meeting the Operator Certification requirements

When not reporting contraventions, the Approval Holder not only does not meet their reporting obligations, but they also do not allow AEW to collaborate with them to resolve issue.

Administrative contraventions are also incurred when "short term approval conditions" – typically timelines associated with facility upgrading and related report submission – are not met. Failure to compile and/or submit monthly and/or annual reports in accordance with the approval requirements (timelines, content) are also administrative contraventions.

For any contravention of the Approval or Code of Practice, the Approval Holder must immediately notify the Director by telephone, or other method specified in the Act and Regulations or authorized in writing by the Director. This notification must be followed-up with a written report, within 7 calendar days of the contravention, detailing how they are mitigating the issue and preventing it from reoccurring. AEW reviews the report and decides whether to:

- Close the incident based on acceptable corrective actions being taken by the approval holder;
- Refer it to a Drinking Water Specialist (DWOS) for follow-up/abatement; or
- Investigate the alleged offence(s) for potential enforcement action.

AEW maintains records of compliance by Operators of waterworks systems and wastewater systems. This information is very specific and is subject to FOIP requests. As the information identifies

communities with compliance problems, publishing it may create dissension amongst MPWA constituents where the Board is attempting to encourage collaboration and build consensus.

Information on a particular water treatment facility can be reviewed on AEW's website. The information provided appears to be limited to the presence or absence of coliform and *E. coli* bacteria, and is 3 months outdated. For example, on February 2012, we can only obtain the data up to and including November 2011. From AEW's homepage, choose 'drinking water quality' from the 'quick links' list, which takes one to the 'Regulated Drinking Water in Alberta' page. Enter the community of interest and the listing of summary reports is provided. Historical searches can also be done from that page.

4 Existing Drinking Water Sources and Delivery Systems

Table 4 outlines the municipal water supply systems within the Peace River Watershed currently authorized under the Alberta *EPEA*, their water supply sources and locations and the treatment provided. **Figure 5** shows the location of the drinking water sources within the sub-watersheds of the Peace River Watershed. Drinking water sources include primarily surface water from rivers and groundwater, including the Grimshaw Gravels Aquifer, a shallow surficial aquifer, and deeper bedrock aquifers.

4.1 First Nations Reserves and Métis Settlements in the Peace River Watershed

There are 13 First Nations within the Peace River Watershed: Bigstone Cree, Peerless Trout, Loon River, Whitefish Lake, Woodland Cree, Beaver, Dene Tha, Little Red River Cree, Lubicon Lake, Tallcree, Horse Lake, Duncan's, and Sturgeon Lake. Two Métis Settlements within the Peace River Watershed are the Paddle Prairie and Gift Lake Settlements. As written in Section 2.2.2, First Nations and Métis Settlement representatives did not respond to information requests. Therefore, this section relies heavily on the National Assessment of First Nations Water and Wastewater Systems Report (INAC, 2011), with emphasis on First Nations within Alberta.

There are 44 First Nations in Alberta, with 82 water systems (57 First Nation systems and 25 Municipal Type Agreements (MTA)). Twenty-five (25) of the 82 water systems receive their water supply through a MTA. Of the remaining 57 systems, 29 utilize groundwater, 5 utilize groundwater under the direct influence of surface water (GUDI) systems, and 23 utilize surface water systems. GUDI systems are classified as such based on their proximity to surface water, sensitive settings (i.e. wells in unconfined aquifers), improper well construction, or when groundwater quality characteristics suggest a link between groundwater and surface water (SaskH₂O, 2012).

There are 44 First Nations in Alberta, with 82 water systems (57 First Nation systems and 25 Municipal Type Agreements (MTA)). Ten (10) of the 82 water systems utilize distribution systems that are maintained through an MTA. The remaining 72 distribution systems are maintained by First Nations. Of the 72 distribution systems maintained by First Nations, piping is available for 38% of the homes. Eleven

percent (11%) of the homes require truck delivery; 31% of the homes are serviced by individual wells; and 13 of the homes reported no water service.

There are some water quality concerns for the surface water and GUDI water systems. The surface water systems draw their water from lakes or dugouts. On average, lake levels in Alberta appear to be dropping. Lower lake-water levels can affect the quality of the raw water, as well as having an impact on the water intake location. Some First Nations have had to extend their intake lines into deeper water (INAC, 2011). If raw water quality is poorer than it used to be, the cost of treatment will be higher, and will significantly impact future servicing costs.

GUDI systems exhibit water quality issues that are similar to untreated surface water. Any viruses, bacteria and protozoa that are present in the source surface water will be present in the water taken from the well. Illnesses may be caused by *E. coli.*, which was the organism responsible for the outbreak in Walkerton (2000); *Cryptosporidium*, which was the organism responsible for the sicknesses in North Battleford (2001); *Giardia spp.*; or other pathogens. Disease-causing organisms are a concern for all users but present a particular hazard for infants, young children and the elderly. Water that is considered to be potentially under the direct influence of surface water should not be used for any purpose where it may be ingested without first undergoing proper treatment (SaskH₂O, 2012).

In recent years, Health Canada has issued boil water advisories for several First Nations in the basin. Currently, there are boil-water advisories for: Dene Tha First Nation – Bush River (since October 22, 2010); Sturgeon Lake Cree Nation (since October 12, 2010); and Woodland Cree First Nation (since August 27, 2010) (Water Chronicles, 2012). All of these advisories are due to elevated total coliform levels detected in drinking water.

Of the 82 water systems servicing First Nations in Alberta, 21 of them were determined to be high-risk (INAC, 2011). Risk was determined by water source, design of water systems, operation, reporting and the operator. As classified by the groundwater source, MTA systems had the lowest risk, followed by groundwater under direct influence of surface water (GUDI) systems, then surface water systems, and, finally, groundwater systems.

The report recommended that communities that have a proven groundwater source continue to use groundwater to meet their needs for future growth. There are 25 First Nations currently serviced by Municipal Type Agreements. With the expansion of regional pipelines, Municipal Type Agreements may become available to other First Nations as a servicing option.

For more information about water systems risk, presented for individual first nations, see the National Assessment of First Nations Water and Wastewater Systems Report (INAC, 2011).

4.2 Upper Peace River Sub-Basin

As shown in **Table 1**, The Upper Peace River Sub-Basin includes the Municipal Districts of Spirit River, Fairview and Peace, Saddle Hills County, Birch Hills County and Clear Hills County; the Towns of Fairview,

Grimshaw and Spirit River; the Villages of Berwyn, Rycroft and Hines Creek; and the Duncan's First Nation. The sources of drinking water within the Upper Peace River Sub-basin include; the Peace River and its tributaries, and the Grimshaw Gravels Aquifer, as shown in **Table 5 in Appendix A**.

The Grimshaw Gravels Aquifer is a shallow surficial deposit aquifer, which provides a source of high quality groundwater. The Town of Grimshaw and the Village of Berwyn obtain their municipal water supply from the Grimshaw Gravels Aquifer. The Municipal District of Fairview No. 136 and the Municipal District of Peace No. 135 obtain a municipal water supply from the Grimshaw Gravels Aquifer for the Hamlets of Whitelaw and Brownvale, respectively. The Municipal District of Peace No. 135 holds groundwater licenses for the Griffin Creek Project (WR 21912), and the East Grimshaw Water Co-op (WR 16942). They hold 3 other licenses (WR 44824, 20836 and 19846) but these were not available on the AEW Authorization/Approval Viewer. No other information was found for the Griffin Creek, East Grimshaw, West Grimshaw, Golden Meadow and Shaftsbury Water Co-ops, located within the Municipal District of Peace No. 135.

The Town of Fairview obtains their municipal water supply directly from the Peace River. The Town of Spirit River obtains their municipal water supply from a coulee tributary to the Spirit River and the Village of Rycroft from the Spirit River. Saddle Hills County obtains a municipal water supply for the Hamlet of Woking from an unnamed watercourse. Birch Hills County obtains their municipal water supply for the Hamlets of Eaglesham, Wanham and Tangent from Fox Creek, using a regional water supply system.

Alberta Infrastructure obtains a municipal water supply from the Peace River for the Peace River Correctional Centre.

The Municipal District of Fairview No. 136 obtains treated water from the Town of Fairview for the Hamlet of Bluesky; as does the Fairview Rural Water Co-op.

The Village of Hines Creek obtains their municipal water supply from Jack Creek. Clear Hills County provides a municipal water supply to the Hamlets of Cleardale and Worsley from respective tributaries to the Eureka River.

There are currently no boil water advisories issued for the Upper Peace River Sub-Basin region regulated by the Government of Alberta at this time (A. Siad-Omar, pers. comm.)

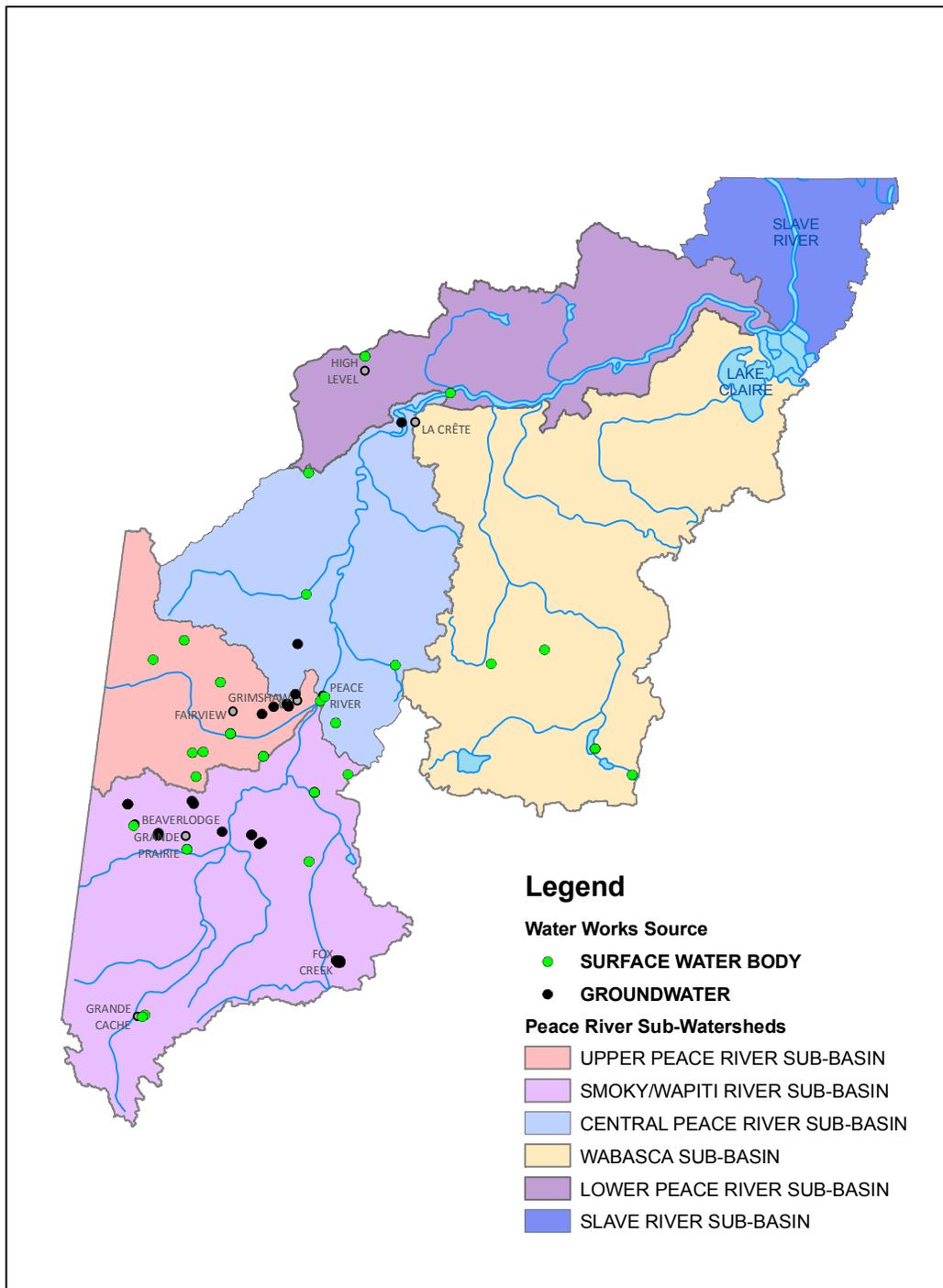


Figure 5: Locations of the Drinking Water Sources within the Sub-watersheds of the Peace River Watershed.

4.3 Smoky/Wapiti River Sub-Basin

As shown in **Table 1**, the Smoky/Wapiti River Sub-Basin includes the Municipal Districts of Greenview and Smoky River and the County of Grande Prairie; the City of Grande Prairie; the Towns of Beaverlodge, Falher, Fox Creek, Grande Cache, McLennan, Sexsmith, Valleyview and Wembley; the Villages of Donnelly, Girouxville and Hythe; and the Horse Lake and Sturgeon Lake First Nations Reserves. The sources of drinking water within the Smoky/Wapiti River Sub-Basin include: the Smoky and Wapiti Rivers and their tributaries, and bedrock aquifers, as shown in **Table 5** in **Appendix A**.

Aquatera Utilities Inc. provides a municipal water supply to the City of Grande Prairie, Grande Prairie County – for the Hamlet of Clairmont the Hamlet of Wedgewood as well as east and west rural subdivisions – and the Town of Sexsmith from the Wapiti River. The Smoky River Regional Water Management Commission provides a municipal water supply to the Town of Falher, the Villages of Donnelly and Girouxville and the Municipal District of Smoky River – for the Hamlets of Guy and Jean Cote – from the Little Smoky River, which is a tributary to the Smoky River. The Town of McLennan obtains a municipal water supply from the Winagami- Girouxville Canal, which is owned and operated by AEW, and uses Winagami Lake as the source. Winagami Lake is fed from the South Heart River, through AEW's South Heart River Dams. The South Heart River is located within the Athabasca River Watershed. The Town of Valleyview also obtains their municipal water supply from the Little Smoky River. The Town of Beaverlodge obtains their municipal water supply from the Beaverlodge River, which is a tributary to the Wapiti River. The Town of Grande Cache obtains their municipal water supply from Victor and Grande Cache Lakes. The Towns of Fox Creek and Wembley and the Village of Hythe obtain their municipal water supply from groundwater – the Town of Wembley from the Wapiti Formation, a bedrock aquifer. The County of Grande Prairie also provides a municipal water supply to the Hamlet of Bezanson from groundwater. Similarly, the Municipal District of Greenview provides a municipal water supply from groundwater to the Hamlets of Debolt and Ridgevalley.

There are currently no boil water advisories issued for the Smoky/Wapiti River Sub-Basin region regulated by the Government of Alberta at this time (A. Siad-Omar, pers. comm.)

4.4 Central Peace River Sub-Basin

As shown in **Table 1**, the Central Peace River Sub-Basin includes: Northern Lights County and Northern Sunrise County; the Towns of Manning and Peace River; the Village of Nampa; the Paddle Prairie Métis Settlement; and the Lubicon Lake and Woodland Cree First Nations Reserves. The sources of drinking water within the Central Peace River Sub-Basin include: the Peace River and its tributaries, and groundwater aquifers, as shown in **Table 5** in **Appendix A**.

The Town of Manning and Northern Lights County are collaborating to provide a municipal water supply to the Town of Manning and surrounding area, from the Notikewin River, which is a tributary to the Peace River. Northern Lights County also provides a municipal water supply to the Hamlet of Dixonville

from groundwater; and to the Hamlet of Keg River from the Keg River. The Town of Peace River obtains its municipal water supply from the Peace River. The Paddle Prairie Métis Settlement obtains its municipal water supply from the Boyer River and/or the Chinchaga River, the Peace River or other source when required.

NEW Water Ltd. is a collaborative partnership between Northern Sunrise County, the Village of Nampa and the Woodland Cree First Nation to provide a municipal water supply to their communities, on a regional basis. Their source is the Peace River, using the facilities of Shell Canada located just north of the Town of Peace River. Unfortunately, none of the partners provided any information on the details of the regional system, except that the new water treatment plant was to commence production on September 2, 2010. NEW Water Ltd. provides a municipal water supply to the Hamlets of Cadotte Lake and Little Buffalo, the Village of Nampa, and Northern Sunrise County for their East Peace Regional Water Supply System, including the Hamlet of Marie Reine.

There are currently no boil water advisories issued for the Central Peace River Sub-Basin region regulated by the Government of Alberta at this time (A. Siad-Omar, pers. comm.)

4.5 Lower Peace River Sub-Basin

As shown in **Table 1**, the Lower Peace River Sub-Basin includes: Mackenzie County; the Town of High Level; and the Beaver, Dene Tha, Little Red River Cree and Tall Cree First Nations Reserves. The sources of drinking water within the Lower Peace River Sub-Basin include: the Peace River and its tributaries, and groundwater aquifers, as shown in **Table 5** in **Appendix A**.

Mackenzie County operates a regional waterworks system to provide a municipal water supply to the Hamlets of Fort Vermilion and LaCrete. The source for Fort Vermilion's municipal water supply is the Peace River; and for LaCrete it is groundwater. The Town of High Level obtains their water supply from Footner Lake. The Town also provides a municipal water supply to the Footner Lake Forest Site.

There are currently no boil water advisories issued for the Lower Peace River Sub-Basin region regulated by the Government of Alberta at this time (A. Siad-Omar, pers. comm.)

4.6 Wabasca Sub-Basin

As shown in **Table 1**, the Wabasca River Sub-Basin includes: the Municipal District of Opportunity; the Gift lake Métis Settlement; and the Bigstone – including Peerless/Trout – and Loon River First Nations Reserves. The sources of drinking water within the Wabasca River Sub-Basin include: the Wabasca River and its tributaries, and groundwater aquifers, as shown in **Table 5** in **Appendix A**.

The Municipal District of Opportunity provides a municipal water supply to the Hamlets of Wabasca and Desmarais from North Wabasca Lake; to the Hamlet of Peerless Lake, which includes the Peerless/Trout First Nation, from Peerless Lake; to the Hamlet of Red Earth Creek from Red Earth Creek; to the Hamlet

of Sandy Lake from Sandy Lake; and to the Hamlet of Trout Lake, which includes the Peerless/Trout First Nation, from Trout Lake. The Gift Lake Métis Settlement obtains its municipal water supply from Gift Lake.

Northland School Division No. 61 owns and operates the Little Buffalo School at Little Buffalo (Lubicon Lake Nation). Although NEW Water Ltd. has constructed a treated water pipeline to the edge of Little Buffalo, the Lubicon Lake Nation has not allowed the Hamlet to be connected to the water supply. So, Northland School Division hauls water for the school and teacherage, on a daily basis, from Cadotte Lake.

The Loon River First Nation obtains their municipal water supply from the Municipal District of Opportunity's regional water supply system at Red Earth Creek.

There are currently no boil water advisories issued for the Wabasca Sub-Basin region regulated by the Government of Alberta at this time (A. Siad-Omar, pers. comm.)

4.7 Slave River Sub-Basin

As shown in **Table 1**, the Slave River Sub-Basin includes only Improvement District No. 24 (Wood Buffalo). No other organized municipalities exist within the Sub-basin.

AEW information does not identify any surface water or groundwater sources within the Slave River Sub-Basin that are used for municipal water supplies.

There are currently no boil water advisories issued for the Slave River Sub-Basin region regulated by the Government of Alberta at this time (A. Siad-Omar, pers. comm.)

5 Existing Drinking Water and Wastewater Treatment Systems

Table 5 in **Appendix A** outlines the drinking water treatment systems within the Peace River Watershed currently authorized under Alberta's *EPEA*. **Figure 5** shows the location of the drinking water sources. **Table 6** in **Appendix A** outlines the wastewater treatment systems within the Peace River Watershed currently authorized under *EPEA*, the locations of the treatment facilities and the effluent outfalls, and the name of the effluent receiving waterbody or watercourse. **Figure 6** shows the locations of the wastewater treatment effluent outfalls. The information provided was solicited from the municipalities. The *EPEA* and/or *Water Act* approvals were reviewed, using AEW's authorization/approval viewer, to fill in missing information.

AEW classifies water treatment and wastewater treatment facilities based upon a range of points as determined by the degree of difficulty of operating the treatment facility. The points system ranges from 1 to 76 and up, depending on maximum population served and the treatment requirements. A Class 1 water treatment facility is 30 points or less, but does not apply to surface water facilities; Class 2 is 31 to 55 points; Class 3 is 56 to 75 points; and Class 4 is 76 points and up. A groundwater supply with

only preventative chlorination is not considered a water treatment plant. The wastewater treatment facility classification uses the same point system.

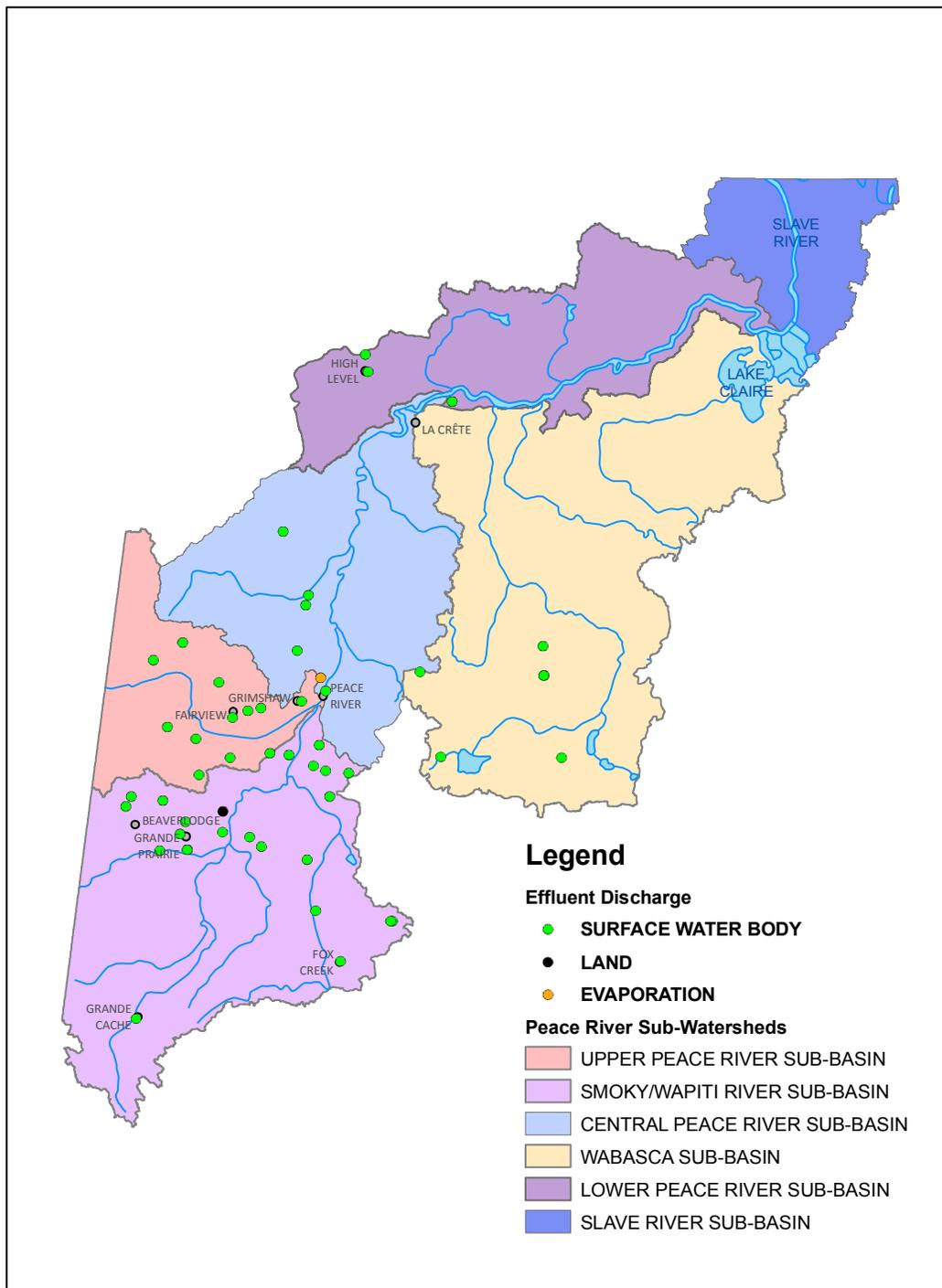


Figure 6: Locations of the Wastewater Treatment Effluent Outfalls within the Sub Watersheds of the Peace River Watershed.

5.1 First Nations Reserves and Métis Settlements in the Peace River Watershed

There are 13 First Nations within the Peace River Watershed: Bigstone Cree, Peerless Trout, Loon River, Whitefish Lake, Woodland Cree, Beaver, Dene Tha, Little Red River, Lubicon Lake, Tallcree, Duncan's, Horse Lake, and Sturgeon Lake. Two Métis Settlements within the Peace River Watershed include the Paddle Prairie and Gift Lake Settlements. As discussed in Section 2.2.2, First Nations and Métis representatives did not respond to requests for information. Therefore, this section relies heavily on the National Assessment of First Nations Water and Wastewater Systems Report (INAC, 2011), with emphasis on First Nations within Alberta.

5.1.1 Drinking Water Treatment

Of the 82 water systems servicing First Nations in Alberta, 7 are classified as small systems, 18 are Level I, 19 are Level II, 11 are Level III, 25 are MTA, and two of them have no classification. A small system is defined as having no treatment or disinfection only. The level I, II and III classifications are the same as those used by AEW. Municipal Type Agreement (MTA) indicates that the First Nations are supplied with treated water from or send their wastewater to a nearby municipality or neighboring First Nation or corporate entity, as outlined in a formal agreement between the two parties.

The water systems can also be classified by treatment type. Two systems are classified as 'none – direct use', 17 are classified as 'disinfection only', eight are 'greensand filtration', one is 'slow sand', 24 are 'conventional', six are 'membrane filtration', and 25 are 'MTA'.

Twenty-one of the 82 water systems were determined to be high-risk (INAC, 2011). Risk is determined by water source, design of water systems, operation, reporting and the operator. High risk systems have major deficiencies, which – individually or combined – pose a high degree of risk to the quality of water. These deficiencies may lead to potential health and safety or environmental concerns. They could also result in water quality advisories against drinking the water (such as, but not limited to, boil water advisories), repetitive non-compliance with guidelines, and inadequate water supplies. Once systems are classified under this category, regions and First Nations must take immediate corrective action to minimize or eliminate deficiencies.

As classified by drinking water treatment, Small and Level I systems have a medium and a high overall risk, whereas Level II and Level III systems have some low risk systems and some medium and high-risk systems. The high risk systems typically require system upgrades or improved operational procedures to meet the guidelines for treated water quality.

5.1.2 Wastewater Treatment Systems

Of the 44 First Nations in Alberta, thirty-nine (39) utilize 73 wastewater systems (60 First Nation systems and 13 Municipal Type Agreements (MTAs)). For the remaining five First Nations, three are serviced solely by individual septic systems, one is relying on privies and one has no members living on-site and has no system.

The 60 First Nation wastewater treatment systems consist of 54 systems using either facultative or aerated lagoons, 3 systems using a mechanical plant, 1 communal septic system and 2 other treatment type systems.

For wastewater collection, the 73 systems include 3 wastewater collection systems that are maintained through a MTA, and 70 wastewater collection systems that are maintained by the First Nations. Of the 70 First Nations collection systems, piping is available for 32% of the homes. Eleven percent (11%) of the homes are on truck haul; 57% of the homes are serviced by shootouts and individual septic tanks; and 79 homes reported to have no service. In terms of wastewater treatment capacity, it was reported that 37 of the 73 wastewater systems are under capacity, 2 are at capacity, and 25 are over capacity.

Of the 73 wastewater systems servicing First Nations in Alberta, 12 of them were determined to be high-risk (INAC, 2011). Risk is based on effluent receiver, design, operation, reporting and operators. The high risk systems typically require system upgrades or improved operational procedures to meet the guidelines for treated water quality or sewage effluent quality. Also, there were some environmental and health concerns associated with the use of shootouts, as they discharge raw sewage in close proximity to dwellings.

The report suggested that current Operation & Maintenance budgets are often insufficient to retain operators, to provide ongoing component replacement, and to perform all of the monitoring and recording requirements. Some measures identified by the report, that could be undertaken to reduce the overall risk, included: sampling, testing and recording the effluent quality prior to discharge would reduce the reporting risk; and providing ongoing training for operators to ensure that all systems are operated and maintained by trained/certified operators, and to ensure that operators complete monitoring and record keeping in accordance with INAC's Protocols. In most communities, Health Canada provides Community Health Representatives, who regularly sample the water quality of treated and distributed water. TSAG provides the Circuit Rider Training Program to train and certify operators.

For more information about water systems risk, presented for individual first nations, see the National Assessment of First Nations Water and Wastewater Systems Report (INAC, 2011).

5.2 Upper Peace River Sub-Basin

All the urban and rural municipalities and the Duncan's First Nation, as outlined in **Table 1**, were contacted for information regarding their water and wastewater treatment systems. Only Birch Hills County, the Town of Grimshaw and the Village of Berwyn responded to our requests. Information provided for the other municipalities was gleaned from their *EPEA* and/or *Water Act* approvals.

Birch Hills County owns and operates a water treatment plant in the Hamlet of Eaglesham, to treat surface water from Fox Creek. The plant uses a membrane for treatment and free chlorine for disinfection. The plant is currently operating at approximately 60% capacity but, in the future, more raw water capacity will be required. From the Eaglesham plant, Birch Hills County provides approximately

44,000 cubic meters (m³) of treated water to the Hamlets of Eaglesham, Tangent and Wanham. Free chlorine is then added again at Wanham and Tangent, for disinfection. The County treats the wastewater from the three hamlets using lagoon stabilization ponds located at each of the respective hamlets.

The Sandhills (Hutterite) Colony, near Eaglesham, uses a lagoon stabilization pond to treat the Colony's wastewater. As AEW only approves wastewater treatment systems for domestic wastewater, the Sandhills Colony lagoon should not be used to treat agricultural (livestock) wastewater. Those approvals are issued by the Natural Resources Conservation Board (NRCB). Since no information was available from the Colony, whether they have separate wastewater treatment facilities for agricultural wastewater is not known.

The Town of Grimshaw obtains their municipal water supply from the Grimshaw Gravels Aquifer. The aquifer is considered to be a source of high quality groundwater that does not require treatment, other than disinfection. The Town uses free chlorine for disinfection. The Town uses approximately 363,000 m³ of treated water and supplies another 12,000 m³ to potable water haulers and 111,000 m³ to the West Grimshaw Co-op, annually. The water treatment plant and infrastructure has up to 40% more available capacity for expansion. The Town treats their wastewater using lagoon stabilization ponds, and discharges their treated effluent into an unnamed watercourse, which drains into the Peace River.

The Village of Berwyn also obtains their municipal water supply from the Grimshaw Gravels Aquifer and uses free chlorine for disinfection. Approximately 89,000 m³ of water is used annually. The Village uses lagoon stabilization ponds to treat their wastewater.

The Municipal District of Peace supplies a municipal water supply to the Hamlet of Brownvale from the Grimshaw Gravels aquifer, which is considered to be a source of high quality groundwater. Therefore, no treatment is required other than disinfection, for which they use free chlorine. The Hamlet of Brownvale uses approximately 13,000 m³, annually. The Municipal District of Peace uses lagoon stabilization ponds for their wastewater treatment.

The Town of Fairview owns and operates a conventional, gravity, rapid sand water treatment plant to treat surface water from the Peace River for a municipal water supply. Free chlorine is used for disinfection. The Town also supplies treated water to the Fairview Rural Water Co-op and the Municipal District of Fairview for the Hamlet of Bluesky. The Town produces approximately 547,000 m³ of treated water annually. At Bluesky, the Municipal District adds supplementary free chlorine for disinfection. The Town and the Municipal District both use lagoon stabilization ponds for their wastewater treatment.

The Town of Spirit River owns and operates a conventional, gravity, rapid sand water treatment plant to treat surface water from a coulee tributary to the Spirit River for a municipal water supply. Free chlorine is used for disinfection. They treat their wastewater using lagoon stabilization ponds. Similarly, the Village of Rycroft owns and operates a conventional, gravity, rapid sand water treatment plant to

treat surface water from the Spirit River for a municipal water supply. Free chlorine is used for disinfection. They also treat their wastewater using lagoon stabilization ponds.

Saddle Hills County owns and operates a conventional, gravity, rapid sand water treatment plant to treat surface water from an unnamed watercourse for a municipal water supply for the Hamlet of Woking. Free chlorine is used for disinfection. They treat their wastewater using lagoon stabilization ponds.

Alberta Infrastructure owns and operates a conventional gravity, rapid sand water treatment plant to treat surface water from the Peace River for a municipal water supply for the Peace River Correctional Centre. Free chlorine is used for disinfection. They treat their wastewater using a mechanical activated sludge system. The treated effluent is discharged into the Peace River.

Alberta Tourism, Parks and Recreation trucks their drinking water in to Moonshine Lake Provincial Park. They use a lagoon stabilization pond to treat their wastewater. When necessary, wastewater effluent is discharged into Blueberry Creek. This is seldom required as evaporation usually equals or exceeds the annual volume of wastewater treated.

The Village of Hines Creek owns and operates a conventional, gravity rapid sand water treatment plant to treat surface water from Jack Creek. Free chlorine is added for disinfection. The Village treats their wastewater using a lagoon stabilization pond.

The County of Clear Hills owns and operates conventional, gravity, rapid sand water treatment plants at the Hamlets of Cleardale and Worsley to treat water from respective tributaries to the Eureka River. Free chlorine is added for disinfection. They use lagoon stabilization ponds to treat the wastewater from the two Hamlets.

5.3 Smoky/Wapiti River Sub-Basin

All the urban and rural municipalities and the Horse Lake and Sturgeon Lake First Nations, as outlined in **Table 1**, and Aquatera Utilities Inc. were contacted for information regarding their water and wastewater treatment systems. As no contact information was available for the Smoky River Regional Water Management Commission, they were not contacted per se, but their member municipalities were. Only Aquatera Utilities Inc. (for the City of Grande Prairie, Grande Prairie County and the Town of Sexsmith), Grande Prairie County, and the Towns of Falher, Valleyview and Wembley responded to the requests. Information provided for the other municipalities was gleaned from their *EPEA* and/or *Water Act* approvals.

Aquatera Utilities Inc., owns and operates a conventional, gravity, dual media water treatment plant in the City of Grande Prairie, to treat surface water from the Wapiti River. Free chlorine is used for disinfection. Approximately 7.3 million m³ of treated water is then provided to the City of Grande Prairie, including the Grande Prairie airport; 584,000 m³ to the County of Grande Prairie for the Hamlet of Clairmont; and 292,000 m³ to the Town of Sexsmith, on an annual basis. The County of Grande Prairie

at Clairmont and the Town of Sexsmith add calcium hypochlorite for maintaining free chlorine residual for disinfection, prior to distributing the water to their residents.

Aquatera also treats the City of Grande Prairie's and some of the County of Grande Prairie's wastewater using an activated sludge biological nutrient removal system. The treated effluent is discharged into the Wapiti River. The Grande Prairie airport, the Town of Sexsmith and the County of Grande Prairie at Clairmont all have their own lagoon stabilization ponds that treat their sewage. These lagoon stabilization ponds are owned and operated by Aquatera. The effluent from stabilization ponds from Clairmont and the Airport ultimately ends up into the Wapiti River via Bear Creek. The effluent from the stabilization ponds for Sexsmith ends up into the Smoky River via Kleskun Lake.

Aquatera is presently in the beginning stages of Phase II of its Wastewater Treatment Plant Upgrades. Improvements associated with the upgrades will be:

- Increased efficiency of the nutrient removal process. This will significantly decrease the nutrient levels in the effluent that is discharged to the Wapiti River and will ensure that future provincial regulations put forth by AEW are met.
- Improved treatment processes to handle future capacity requirements so that increased flow volumes due to expected population growth, as well as flows from major storm events can be handled.

The Dunes Subdivision, which is a private development located near the City of Grande Prairie, has a collection system consisting of 7 wastewater storage tanks located on the NE-25-070-06 W6M. From here, they have an AEW approval that allows them to haul their wastewater to the approved wastewater treatment facility located at the Aquatera Utilities Wastewater Treatment Plant.

The Smoky River Regional Water Management Commission owns and operates a conventional, gravity, rapid sand water treatment plant in the Town of Falher, to treat surface water from the Little Smoky River. Free chlorine is used for disinfection. Approximately 231,000 m³ of treated water is then provided to the Town of Falher, the Villages of Donnelly and Girouxville, and the Municipal District of Smoky River for the Hamlets of Guy and Jean Cote. Free chlorine for disinfection is still added at Donnelly, Girouxville, Guy and Jean Cote prior to distributing the water to their residents. Falher, Donnelly, Girouxville, Guy and Jean Cote all have their own lagoon stabilization ponds to treat their wastewater. Falher's treated effluent is discharged into Peavine Creek.

The Town of McLennan owns and operates the conventional, gravity, rapid sand water treatment plant to treat surface water from Winagami Lake, for a municipal water supply. Free chlorine is used for disinfection. The Town uses lagoon stabilization ponds to treat their wastewater. The treated effluent is discharged into Kimiwan Lake.

The Town of Valleyview owns and operates a conventional, gravity, rapid sand water treatment plant to treat surface water from the Little Smoky River for a municipal water supply. Free chlorine is used for disinfection. The plant was originally constructed in 2002 and has had some upgrades since then. It is

constructed for expansion, if required. The Town diverts approximately 400,000 m³ of water annually, from the Little Smoky River. Approximately 15% of their capacity is sold to a bulk water sales outlet or to a rural water system in the Municipal District of Greenview. The Town treats their wastewater using a mechanical aerated lagoon and the treated effluent is discharged to Sturgeon Creek, twice annually in the spring and fall.

The Town of Beaverlodge owns and operates a conventional, gravity, rapid sand water treatment plant to treat surface water from the Beaverlodge River for a municipal water supply. Free chlorine is used for disinfection. The Town uses approximately 7,800 m³ of treated water annually. AEW does not show an authorized wastewater treatment system for the Town of Beaverlodge.

The Town of Grande Cache owns and operates a pressure, rapid sand water treatment plant to treat surface water from Victor and Grande Cache Lakes for a municipal water supply. Free chlorine is used for disinfection. They treat their wastewater using a mechanical extended-aeration system. Their effluent is discharged to the Smoky River.

The Towns of Fox Creek and Wembley and the Village of Hythe all obtain their municipal water supply from aquifers, which are considered to be sources of high quality groundwater that do not require treatment, other than disinfection. However, the Town of Fox Creek uses a pressure water treatment system (greensand filtration) for aesthetic purposes and free chlorine for disinfection. The Town of Wembley and the Village of Hythe only use free chlorine for disinfection. The Town of Wembley uses approximately 136,000 m³ of treated water annually.

The Town of Fox Creek treats their wastewater using lagoon stabilization ponds, and discharges their treated effluent to Fox Creek, which drains into Iosegun Lake. The Town of Wembley also uses lagoon stabilization ponds to treat their wastewater and discharges their treated effluent into an unnamed creek which drains into Ringling Lake. The Village of Hythe treats their wastewater with lagoon stabilization ponds and discharges their treated effluent into the Beaverlodge River.

The County of Grande Prairie uses high quality groundwater to provide a municipal water supply to the Hamlet of Bezanson. Only free chlorine is added for disinfection. They treat the wastewater using lagoon stabilization ponds.

The Municipal District of Greenview uses high quality groundwater to provide a municipal water supply to the Hamlets of Debolt and Ridgevalley. Only free chlorine is added for disinfection. The wastewater is treated using lagoon stabilization ponds at each of the hamlets. The MD also treats the wastewater from the Hamlet of Little Smoky using lagoon stabilization ponds.

Alberta Tourism, Parks and Recreation uses high quality groundwater for their drinking water supply at Young's Point Provincial Park. Only free chlorine is added for disinfection. They use a lagoon stabilization pond to treat their wastewater. When necessary, wastewater effluent is discharged into Sturgeon Lake, via a large wetland area. This is seldom required as evaporation usually equals or exceeds the annual volume of wastewater treated (Johnson, 2012).

Penn West Exploration uses lagoon stabilization ponds to treat the wastewater from their Meekwap Camp and Meekwap Battery located on the LSD 05-17-066-15 W5M and LSD 15-18-066-15 W5M, respectively. Bottled drinking water is trucked into these sites (Watson, 2012).

The Grandview Hutterian Brethren, near the City of Grande Prairie, also use lagoon stabilization ponds to treat the Colony's wastewater. Unfortunately, no information is readily available from the Colony.

The Triple L Mobile Home Park, which is a private development located near Grande Prairie, also uses a lagoon stabilization pond for their wastewater treatment. No information was available from the Mobile Home Park.

5.4 Central Peace River Sub-Basin

All the urban and rural municipalities, the Paddle Prairie Métis Settlement and the Lubicon Lake and Woodland Cree First Nations, as outlined in **Table 1**, were contacted for information regarding their water and wastewater treatment systems. As no contact information was available for NEW Water Ltd., they were not contacted per se, but Northern Sunrise County was. Only Northern Lights County and the Town of Peace River responded to the requests. Information provided for the other municipalities was gleaned from their *EPEA* and/or *Water Act* approvals.

The Town of Manning and Northern Lights County own and operate the Northern Lights/Manning Regional Waterworks System (*EPEA* Approval No. 954-02-00, expires August 1, 2019). The Regional Waterworks System consists of two water treatment plants: one for the Town of Manning and one for the area surrounding the Town of Manning. Both are conventional, gravity, rapid sand water treatment plants to treat surface water from the Notikewin River. Free chlorine is added for disinfection. The Town of Manning uses approximately 242,000 m³ of treated water annually. They treat their wastewater and that from the adjacent region using a mechanical aerated lagoon. Their treated effluent is discharged into the Notikewin River.

Northern Lights County owns and operates a conventional gravity, rapid sand water treatment plant to treat surface water from the Keg River for a municipal water supply for the Hamlet of Keg River. Free chlorine is added for disinfection. AEW does not show an authorized wastewater treatment system for the Hamlet of Keg River. Northern Lights County also obtains a municipal water supply, for the Hamlet of Dixonville, from an aquifer, which is considered to be a source of high quality groundwater that does not require treatment, other than disinfection. Nevertheless, the County uses a pressure water treatment system (greensand filtration) for aesthetic purposes and free chlorine for disinfection. The County treats the Hamlet's wastewater using a lagoon stabilization pond. The County also treats the wastewater from the Hamlets of North Star and Weberville using lagoon stabilization ponds.

The Town of Peace River owns and operates two water treatment plants: one located at Shaftsbury and one located on 103rd Street. Both are conventional, gravity, rapid sand treatment plants to treat surface water from the Peace River. Free chlorine is added for disinfection. Approximately 1.7 million m³ of

treated water is used annually. The Town treats their wastewater using a mechanical activated sludge treatment plant. The treated effluent is discharged into the Peace River. The Town also treats the Peace River airport's wastewater using a lagoon stabilization pond and the treated effluent is discharged into an unnamed coulee, which drains into the Peace River. The Town of Peace River is upgrading their water treatment plant and is including an upgrade of their wastewater system in their long-term Capital Plan. Other issues will be addressed by their Capital Plan and will depend on growth.

Until recently, the Village of Nampa owned and operated a conventional gravity rapid sand water treatment plant to treat surface water from the Heart River. Free chlorine was added for disinfection. The Village treated approximately 175,000 m³ of water annually, of which almost 106,000 m³ was provided to Northern Sunrise County for their regional system. The Village now obtains its municipal water supply from the Peace River via the NEW Water Ltd. water treatment plant. The Village uses a lagoon stabilization pond to treat their wastewater, and discharges their treated effluent into an unnamed coulee, which drains into the Heart River.

Northern Sunrise County owns and operates the East Peace Regional Water Supply System, which includes the Hamlet of Marie Reine. They obtain their municipal water supply from the Peace River via the NEW Water Ltd. water treatment plant. Northern Sunrise County treats the Hamlets of Cadotte Lake's and Marie Reine's wastewater, using lagoon stabilization ponds.

Bonavista Energy uses lagoon stabilization ponds to treat the wastewater from their Vista Creek Camp, located on LSD 13-24-096-01 W6M. The treated effluent is discharged onto forested land.

5.5 Lower Peace River Sub-Basin

Mackenzie County, the Town of High Level and the Beaver, Dene Tha, Little Red River Cree and Tallcree First Nations, as outlined in **Table 1**, were contacted for information regarding their water and wastewater treatment systems. Only the Town of High Level responded to the requests. Information provided for the other municipalities was gleaned from their *EPEA* and/or *Water Act* approvals.

Mackenzie County owns the Mackenzie Regional Waterworks System that supplies a municipal water supply to the Hamlets of LaCrete and Fort Vermilion. At Fort Vermilion a conventional gravity, rapid sand water treatment plant is used to treat surface water from the Peace River. Free chlorine is added for disinfection. The County obtains a municipal water supply, for the Hamlet of LaCrete, from an aquifer, which is under the influence of surface water. The water is treated for aesthetics (greensand filtration), softening and disinfection, using free chlorine. The County treats both the Hamlets' wastewater using lagoon stabilization ponds, at their respective locations.

The Town of High Level owns and operates a conventional, gravity rapid sand water treatment plant to treat surface water from Footner Lake. Free chlorine is added for disinfection. The Town uses approximately 693,000 m³ of treated water annually. They also provide treated water to the Footner Lake Forest Site, where free chlorine is added for disinfection. The Town uses lagoon stabilization ponds

to treat their wastewater and discharges the treated effluent into the Bushe River, which drains into the Boyer River and then the Peace River. They are planning to upgrade their lagoon system to increase the capacity from 1450 m³/day to 6000 m³/day. The Town has also entered into mutual aid agreements with other municipalities for water and wastewater operator coverage. The Town's main issues related to water include: securing a viable long-term raw water supply; upgrading their wastewater treatment system; and securing sufficient funding to achieve these projects.

The Footner Lake Forest Site uses their own lagoon stabilization ponds to treat their wastewater, and discharges their treated effluent into Footner Lake.

5.6 Wabasca Sub-Basin

The Municipal District of Opportunity, the Gift Lake Métis Settlement and the Bigstone (including Peerless and Trout) and Loon River First Nations, as outlined in **Table 1**, were contacted for information regarding their water and wastewater treatment systems. No responses were received. Information provided was gleaned from their *EPEA* and/or *Water Act* approvals.

The Municipal District of Opportunity owns and operates the Wabasca-Desmarais Regional Waterworks System to provide a municipal water supply to the Hamlets of Wabasca and Desmarais. A conventional, gravity, rapid sand water treatment plant is used to treat surface water from North Wabasca Lake, and free chlorine is added for disinfection. Wastewater from Desmarais is collected using a collection system and is assumed to be pumped to Wabasca. At Wabasca it is treated with the Wabasca wastewater, using mechanical aerated lagoons and lagoon stabilization ponds.

The Municipal District of Opportunity owns and operates a conventional, gravity, rapid sand water treatment plant at the Hamlet of Red Earth Creek to treat surface water from Red Earth Creek, or Peerless Lake in case of emergency. Free chlorine is added for disinfection. Treated water is provided to the Loon River First Nation. The Red Earth Creek water supply system also provides bulk treated water to potable water haulers. The Municipal District also owns and operates conventional, gravity, rapid sand water treatment plants at the Hamlet of Peerless Lake, Sandy Lake and Trout Lake to treat surface water from Peerless Lake, Sandy Lake and Trout Lake, respectively. Free chlorine is added for disinfection. The Peerless Lake water supply system also provides bulk treated water to potable water haulers. The Municipal District uses lagoon stabilization ponds to treat the Hamlets' wastewater, at their respective locations.

Northland School Division No. 61 treats the wastewater from Little Buffalo School and the teacherage, using a lagoon stabilization pond.

The Gift Lake Métis Settlement treats the Settlement's wastewater using lagoon stabilization ponds.

Aramark Remote owns and operates a mechanical activated sludge wastewater treatment system at the Encana Pelican Work Camp, located on the NE 07-080-02 W5M. According to Aramark, that treatment

system has been closed down. Their approval to operate the system expired January 1, 2012. They discharged their treated wastewater effluent onto the forested land within the NE 07.

5.7 Slave River Sub-Basin

No water treatment or wastewater treatment facilities are known to be used in the Slave River Sub-basin.

6 Private Drinking Water Systems

As discussed in Section 3.1, private water systems serve a single, privately-owned residence or building where the public has no interest in such a water supply. Private systems which service small communities, work camps, or industrial facilities have been discussed in Sections 4 and 5. The remaining private water systems refer to individual groundwater wells and dugouts which service rural residents. There is difficulty in summarizing the location of, capacity of, and water quality of these private systems, as there is no publicly-available data source to summarize this information. There is, however, general regional groundwater quality information.

There are approximately 440,000 rural Albertans who depend on groundwater supplies along with an unknown number of Albertans that make use of surface water dugouts for their drinking water (CAESA, 1997). These residents do not enjoy the same level of drinking water quality assurance as recipients of municipal services do. Many residents within the Peace River watershed do not have access to quality supplies of groundwater, and therefore use surface water runoff into dug-outs for their drinking water. It has been clearly illustrated (Spilchen, 1991), that there is a high incidence of coliform bacteria (55%) in dugout drinking water from the northwestern Alberta region. Groundwater wells which are under the influence of surface water (GUDI) may also exhibit any water quality issues that are present in the source surface water, including any viruses, bacteria and protozoa. In areas that are heavily impacted by agriculture, both surface water dugouts and GUDI wells are at risk for contamination from pathogens (bacteria, viruses, and protozoa), as well as herbicides, and nitrates. In areas affected by industry, there may also be a risk for contamination from metals and other deleterious organic and inorganic substances. In areas where many residents use older septic tanks or shootouts for sewage management, or spray seepage on their fields, there is a risk of surface and groundwater contamination by pathogens. A study performed by the Canada-Alberta Environmentally Sustainable Agriculture Agreement (CAESA) in 1997 surveyed 824 water well sites in northwestern Alberta for water quality. They found that microbiological contamination was present in 14% of the wells surveyed; 27 sites had herbicide detections; 32% of the wells had guideline exceedances of herbicides, coliforms, nitrates, lead, zinc, chromium, or aluminum; and many of the wells had poor aesthetic quality due to the levels of total dissolved solids (TDS), sodium, iron, and sulphate. The majority of the microbiologically contaminated wells were less than 100 feet in depth.

Individuals relying on a private drinking water system should have their source tested regularly for water quality, and utilize some form of water treatment. Well/dugout owners are responsible for testing their own water, and working with their Regional Health Authority to submit the tests to a laboratory for results. The Regional Health Authority can provide information on proper sampling procedures, including where the sample should be taken, how long the well should be pumped prior to sampling, how long the sample can be stored, and the length of time allowed for delivery to the laboratory. A health inspector can assess test results and determine the water is safe to drink. The Guidelines for Canadian Drinking Water Quality, published by Health Canada will be used to establish whether any of the parameters tested exceed maximum acceptable concentrations.

In 2006, AEW in collaboration with Alberta Agriculture & Rural Development, Agriculture & Agri-Food Canada, the Alberta Water Well Drilling Association and Alberta Health Services established the 'Working Well' program. The Working Well program works to ensure safe and secure groundwater supplies for water well users in Alberta. The Program objectives include:

- Awareness - To help water well owners recognize that management of private wells is their responsibility, and to understand the potential impacts of human activities on groundwater.
- Knowledge - To help well owners gain a basic understanding of groundwater science, how a water well works, and how a well should be managed.
- Practice Change - To help well owners acquire the knowledge and skills to adopt recommended water well management practices.

7 Issues

7.1 Drinking Water

7.1.1 Surface Water

Based on the 2003 NADC Discussion Paper, the issues most common to municipalities included:

- An assured long-term supply of good quantity and quality raw water;
- Large capital and operational infrastructure costs;
- Meeting the province's enhanced standards, accelerating upgrade requirements with more complicated systems and further expenditures;
- Retaining skilled workers and keeping them current with training; and
- Early and increased demands in areas experiencing rapid growth

Similar concerns were expressed by Aquatera and municipalities, responding to our request for information. While retaining skilled workers is not as great an issue for Aquatera as it may be for the smaller municipalities, they too have to ensure that their workers are certified with the most current training.

The issues raised by the municipalities relating to surface water center primarily on the water treatment plants and the requirement for constant/continual upgrading. Rural residents wish to have the same quality drinking water as their urban neighbours, however, this may not always be possible. Although AEW regulates these facilities, whether rural or urban, funding is provided by Alberta Transportation and their priorities may not be the same as those of AEW. Insufficient funding is available to pay for all of the projects that are needed. The funding formulas used put some facilities at a disadvantage while striving to achieve a similar standard.

Birch Hills County, at their water treatment plant in Eaglesham, has found that treating and maintaining a safe water supply and reducing the amount of algae, trihalomethanes (thm), and manganese is a continuous concern. Attracting and keeping certified plant operators is a major issue for the County. They also anticipate an increase in raw water volume capacity in the future.

The Town of Valleyview's water allocation from the Little Smoky River is 668,400 m³ annually. However, they can only divert approximately 400,000 m³, in accordance with the instream flow requirements. On many occasions, the Town has had to apply for Temporary Diversion Licenses to meet their demand, as the flow in the Little Smoky River did not meet the 80% exceedance level. This situation may be exacerbated during drought conditions. The Town's water intake is restricted and they would have to change their diversion flow requirements to pump larger volumes. In addition, during the spring freshet when river flows are typically at their greatest, the water quality is very poor due to the high turbidities, which is difficult to treat. The Town's treatment plant is constructed for expansion, if required. However, any expansion will be dependent on the availability of water from the Little Smoky River.

The Town of Valleyview has two raw water reservoirs with a total capacity of 280,000 m³. AEW has encouraged the Town to build additional storage, however, as the Town is unable to fill their existing storage reservoirs, additional storage capacity would be redundant.

Aquatera and several municipalities have *Water Act* Licenses that include instream flow requirements. However, AEW has no instream flow needs studies completed within the Peace River Watershed. Instead they use an empirical method to determine instream flow requirements. As the Town of Valleyview has experienced, this method precludes them from securing their annual water demand, without obtaining a Temporary Diversion License. The issuing of a Temporary Diversion License to allow water withdrawals when the instream flow requirements prohibit withdrawals, defeats the purpose/intent of the instream flow requirements. Thus, the instream flow requirement on a *Water Act* License is an issue not only for the license holder, but also for AEW.

Although none of the municipalities raised the issue per se, water availability during extended periods of drought is a definite concern. Studies completed by Dr. David Sauchyn of the University of Regina and the Prairie Adaptation Research Collaborative suggest that future droughts in Alberta could be much longer and more severe than droughts recently experienced in the history of settlement.

7.1.2 Groundwater

The Town of Wembley currently obtains its water supply from three wells completed in a coarse-grained, fractured sandstone which is part of the Wapiti Formation. The three wells together produce an average of 400 m³/day. The Town requires another water well, to provide an additional 200 m³/day of water. In 2008, a ground water exploration program was carried out in the area west of the Town on the W½ 21-7-8-W6M. The Town intends to develop and connect the new test well to the current water supply system. A small treatment plant capable of treating the overall town's water supply would provide water more suitable for consumption than that which exists today. The approximate cost for the new well and water treatment plant is \$1.5 million. Funding for this project would come from provincial grants and Town reserves.

7.2 Wastewater

7.2.1 Effluent Quality

Treated wastewater effluent is an issue more for AEW if not the municipalities. As a condition of the approval for the construction, operation and reclamation of a wastewater treatment facility, the approval holder must monitor the untreated wastewater – where mechanical treatment is provided – and the treated effluent. The approval also stipulates monthly and/or annual reporting requirements. However, the impact of the effluent discharge on the receiving watercourse/waterbody, or the cumulative impact of several effluent discharges on the same watercourse/waterbody, is not known. The 2009 AECOM study may be a first step to addressing this issue.

Aquatera's *Water Act* License for the Grande Prairie Regional Water System included a requirement to conduct an Aquatic Assessment on the stretch of the Wapiti River between their raw water intake and wastewater effluent outfall, as well as upstream and downstream of their operations. The purpose of the Aquatic Assessment was to determine if increased water withdrawal and discharge would present a risk to the aquatic environment within the Wapiti River. The first cycle was conducted in 2007 and has been continued onwards since. Therefore, on a small scale, some studies are being conducted to determine if in fact, there is any impact on receiving watercourses/waterbodies.

Another provision of their *Water Act* License was to work in partnership with Weyerhaeuser to conduct a coordinated monitoring approach program. The purpose of this study was to determine the environmental effects of the discharge of the Aquatera Wastewater Treatment Plant and the Weyerhaeuser Pulp Mill on the Wapiti River. This study was conducted in 2011.

7.3 Funding

As of June 2009, funding for capital costs of installing the initial monitoring and control equipment for operational consortia is available for *Water for Life* funding at 90%. Introduced in 2006, the water

strategy initiative is only available for new regional water and wastewater systems or new extensions to existing regional water or wastewater systems.

Projects approved under *Water for Life* up to December 2011 include:

- Spirit River - \$75,000 – Rycroft and Spirit River Water Supply Feasibility Study;
- Birch Hills County - \$653,400 – Eaglesham Tangent Regional Water Supply Main;
- Clear Hills County - \$7,830,000 – Regional Water Transmission Pipeline Worsley/Cleardale;
- Northern Sunrise County - \$9,783,000 – Regional Water Phase 2A-Stage 1 WTP to St. Isidore/Nampa; and
- Peace River - \$3,969,391 – Peace River Regional Water Phase 2 – Feeder Main.

Alberta Transportation administers the Alberta Municipal Water/Wastewater Partnership (AMWWP), which applies to Cities (under 45,000 population), Towns, Villages, Summer Villages, Regional Commissions and eligible hamlets within Rural Municipalities. Financial assistance is provided for municipal water supply/treatment and wastewater treatment/disposal projects. Accepted projects receive grants as a percentage of project costs. For municipalities with a population of less than 1000 people, project costs are shared on a 75% government 25% municipality basis. Percentages are calculated with a population-based formula for municipalities with populations between 1000 and 45,000.

Projects approved under the AMWWP up to December 2011 include:

- Fairview - \$1,820,377 – Water Supply System Upgrade Phase 2;
- Hines Creek - \$2,940,000 – Water Supply System Upgrades Option 2;
- Municipal District of Opportunity - \$1,892,419 – Sandy Lake WTP Membrane Upgrade;
- Rycroft - \$1,950,000 – Rycroft WTP Upgrade Stage 1;
- Municipal District of Greenview - \$663,435 – Debolt Wastewater Infrastructure Upgrades;
- Smoky River Regional Water Management Commission - \$373,275 – SRRWMC WTP Phase I – on-line Turbidity Monitoring;
- Spirit River - \$3,913,087 – New Sewage Lagoon Construction; and
- Valleyview - \$392,371 – Water Treatment Improvements.

Most municipalities have taken advantage of the AMWWP program and other Federal and/or Provincial Programs that may be available from time to time. Although appreciative of the assistance, a common complaint is that insufficient funding is made available and municipalities still have to borrow extensively to upgrade/expand their water and wastewater treatment infrastructure.

Full cost accounting assists municipalities by providing a full cost reporting template, in accordance with established accounting standards, specific to drinking water operation. The objective is to ensure that municipalities have accurate information regarding the true cost of producing and supplying quality drinking water for municipalities seeking to improve or build drinking and wastewater facilities. None of

the municipalities that responded indicated that they used full cost accounting for their drinking water operations.

8 Information Gaps

8.1 Drinking Water

Several gaps exist on drinking water facilities in the Peace River watershed. Many of the operators we contacted did not respond to our survey. Of those that did respond, none addressed full cost accounting, electronic reporting or source water protection plans. We found no information of any water facility employing a multi-barrier approach that included a strategy for the protection of the aquatic environment or source water protection plans, with the exception of an approved watershed management plan on the Heart River. Alberta has been criticized in the past for not having legally defensible source water protection plans (Ecojustice, 2011). Northern Sunrise County completed a watershed management plan for the Heart River, which was the source for the Village of Nampa's municipal water supply system that addressed healthy aquatic ecosystems. However, now that the Village of Nampa and Northern Sunrise County obtain their municipal water supply from the Peace River through NEW Water Ltd., whether the recommended Implementation Strategy will continue to be executed is unknown.

Remarkably, Alberta and six other provinces lack requirements for public reporting (Sierra Legal Defense Fund, 2006), lack a central registry, have no searchable advisories online and do not report on trends (Ecojustice, 2011).¹ The new Alberta Health Services Board that has replaced Alberta's nine regional health authority board does not publish all boil water advisories online. While media advisories are the main source of information, the Regional Health Authority Officer has the discretion to issue a boil water advisory to the public.

Alberta Environment was concerned with providing specific non-compliance perspectives and other approval violations for water treatment and wastewater treatment systems on the Peace, and suggested the MPWA follow up with *Freedom of Information and Privacy Act* requests to obtain this information. This remains a data gap in this report. As records of compliance are very specific and subject to FOIP requests, only AEW knows which water treatment facilities are in compliance. Compliance data for water treatment facilities is available on the AEW website, however, the data is 3 months out of date and it only states the absence or presence of bacteria. Citing this lack of information, we are unable to answer the question "is drinking water good?" for each subbasin. However, there have

¹ All health advisories, including boil-water advisories, are posted on the Alberta Health Services website as they are received and can be viewed at: www.albertahealthservices.ca/1926.asp. Residents can also contact Health Link Alberta toll-free at 1-866-408-5465 if they have additional concerns.

been no reported human deaths related to the consumption of drinking water (i.e. fatalities from bacteria (*E. coli*) or intestinal parasites (*Cryptosporidium* or *Giardia*)) in the Peace River watershed. The number of boil water advisories within each basin may be the best surrogate for understanding drinking water safety. Every effort should be taken to ensure that there are no drinking water advisories within the basin. Another good indicator may be the number of operators in violation of their Approvals (Federal and Provincial). We recommend the Mighty Peace Watershed Alliance consider the above indicators for future reporting.

Any information available for the water treatment facilities on the First Nations Reserves was leaned from published INAC reports (INAC, 2011). None of the First Nations responded to the request for information. The First Nations (Alberta) Technical Services Advisory Group (TSAG), who collaborate with the First Nations in the operation and maintenance of their drinking water and wastewater treatment facilities, were also contacted with no success. Similarly, no information is available for the Gift Lake and Paddle Prairie Métis Settlements, other than what was obtained from the AEW website. This is another data gap for future study.

8.2 Surface Water

Several municipalities have *Water Act* Licenses that include instream flow requirements. However, AEW has no instream flow need studies completed within the Peace River Watershed. Instead, an empirical method to determine instream flow requirements is used, which may overestimate or underestimate the flow required to maintain the aquatic environment at any one time. Thus, instream flow requirement studies should be completed for the Peace River Watershed, particularly at the municipal water supply intakes.

For a municipality to determine whether the instream flow requirement of their license allows them to make water withdrawals, they need real-time flow data for the watercourse. AEW's website provides the data for those hydrometric stations that have real-time data. However, not all the watercourses have hydrometric stations and, for those that do, the stations may not have real-time capabilities. Thus, additional hydrometric stations may be required to support instream flow requirements.

Water availability studies are required to assist AEW and municipalities in planning for long-term sustainable (municipal) water supplies, while protecting the aquatic environment. Other than the Heart River Watershed Management Plan completed for Northern Sunrise County, based on the responses received, no other municipality within the Peace River Watershed is developing or contemplating a source protection plan.

The biggest risks to surface water are land use activities that increase pathogen, sediment and pesticide loadings to surface source waters, such as livestock operations, industrial activities, improper manure management and improper sewage disposal.

8.3 Groundwater

As the Grimshaw Gravels Aquifer is an unconfined aquifer located within surficial deposits, it is very susceptible to contamination. A management/source protection plan is required to protect the aquifer and the municipal and domestic users of this high quality groundwater source.

Although the 1998 Grimshaw Gravels Aquifer Technical Report and the 2004 Regional Groundwater Assessment completed by Hydrogeological Consultants Ltd. provide a good overview of available groundwater sources, no information appears to be available on the long-term sustainable pumping rates from these aquifers. Thus, more hydrogeological investigations of these aquifers are required to assist AEW and municipalities plan for long-term sustainable water supplies.

The biggest risks to ground water are land use activities that increase pathogen, sediment and pesticide loadings to surface source waters, such as livestock operations, industrial activities, improper manure management and improper sewage disposal in areas where ground water is under the influence of surface water.

8.4 Wastewater

Any information available for the wastewater treatment facilities on the First Nations Reserves was leaned from published INAC reports (INAC, 2011). None of the First Nations responded to the request for information. Similarly, no information is available for the Gift Lake and Paddle Prairie Métis Settlements, other than what was obtained from the AEW website.

Cumulative impacts of wastewater effluent discharges on the receiving watercourses/waterbodies should be assessed not only to protect the aquatic environment, but also to protect downstream municipal water sources.

9 Conclusions and Recommendations

9.1 Conclusions

Although few responses were received from municipalities and First Nations contacts, information was gathered from provincial government contacts and existing reports. AEW has commissioned some studies on groundwater quality and availability; municipal waterworks capacities, issues, and infrastructure needs; and an extensive provincial inventory of wastewater treatment systems. Based on the information provided in these reports, and the information we gathered from various municipal and provincial government departments, the following conclusions can be made regarding the state of drinking water in the Peace River Watershed:

- The drinking water-related issues most common to municipalities included:
 - An assured long-term good quantity and quality raw water;
 - Large capital and operational infrastructure costs;
 - Meeting the province’s enhanced standards, accelerating upgrade requirements with more complicated systems and further expenditures;
 - Retaining skilled workers and keeping them current with training; and
 - Early and increased demands in areas experiencing rapid growth.
- Birch Hills County, at their water treatment plant in Eaglesham, has found that treating and maintaining a safe water supply and reducing the amount of algae, trihalomethanes and manganese is a continuous concern. Attracting and keeping certified plant operators is a major issue for the County;
- The Town of Valleyview cannot withdraw their licensed water allocation from the Little Smoky River due to instream flow restrictions attached to their license and have had to apply for Temporary Diversion Licenses to meet their demand;
- Several municipalities within the Peace River Watershed have *Water Act* Licenses that include instream flow requirements. No instream flow needs studies have been completed for the Peace River in Alberta;
- Based on studies completed by the Prairie Adaptation Research Collaborative, water availability during periods of drought may be an issue;
- Wastewater treatment system effluent quality is monitored, however, few cumulative effects studies have been completed for receiving waters within the watershed;
- Aquatera is currently collaborating with Weyerhaeuser to undertake a cumulative effects study on the Wapiti River;
- A common complaint from municipalities is that insufficient funding is made available for upgrades/expansions of their water and wastewater treatment infrastructure;
- Although AEW regulates water and wastewater treatment facilities, Alberta Transportation funds them and their priorities do not always coincide with those of AEW.

- Insufficient funding is available to pay for all of the projects that are needed. The funding formulas used put some facilities at a disadvantage while striving to achieve a similar quality standard.
- Although the 1998 Grimshaw Gravels Aquifer Technical Report and the 2004 Regional Groundwater Assessment completed by Hydrogeological Consultants Ltd. provide a good overview of available groundwater sources, no information appears to be available on the long-term sustainable pumping rates from these aquifers.
- For the scope of this study, it was impossible to gather comprehensive information about private domestic drinking water wells.
- Other than the Heart River Watershed Management Plan, based on the responses received, no source protection plans are underway or being contemplated by municipalities within the Peace River Watershed.

9.2 Recommendations

This project has identified several issues, challenges and information gaps that will need to be addressed in the upcoming State of the Watershed report for the Peace River Watershed. While it was beyond the scope of this report to provide details and fill data gaps, it is essential to bring these issues and challenges forward for future considerations. The list of issues and data gaps presented below is not exhaustive and no effort was made to prioritize them. However, the list below highlights actions within the scope and the mandate of the Mighty Peace Watershed Alliance to fully explore and find solutions to these issues and challenges.

- **Source Water Protection Plans:** Promote and encourage local communities to develop a source-water protection for surface or groundwater supplies. In particular, for communities using shallow aquifers or located in areas of intensive growth and development. Source-water protection plans help safeguard public health and reduce challenges and costs involved in water treatment.
- **Promote collaborative effort:** Drinking water systems are regulated and managed by different governments including Alberta Environment and Water, Federal government (for First Nation communities), Alberta Health Services and Municipal governments. Encourage these organizations work together and deal efficiently emerging drinking water issues. Lack of collaboration between all governments and organizations involved in drinking water supply may lead to oversights and blurred responsibilities in the provision of safe drinking water. This was one of the main recommendations from Walkerton inquiry.
- **Promote Regional Drinking Water Supply:** As part of the Water for Life Strategy promote and encourage to Regional Drinking Water system to ensure safe, secure and reliable drinking

water. However, Regional Drinking Water supply may not be a feasible solution for all communities due to economics of scale. A comprehensive assessment is required to understand overall costs associated in with regional drinking water supply.

- **Sharing Knowledge and Resources:** Where regional supply is not feasible, promote and encourage opportunities to establish a joint consortium for local municipalities to serve as catalyst to strength collaboration, sharing resources, building capacity and reducing economics of scale. The consortium can also enhance protection of source of drinking water by developing contingency plan in case of emergency and lobbying for capital to replace and improve aging infrastructure, as well as insuring significant financial benefit without requiring communities to give up the control of their water and wastewater system. The funding needs expressed by municipalities should be addressed, taking into account the isolation of some communities and elevated rates of construction costs. To gather up-to-date information from municipalities, a meeting (similar to the 2003 NADC workshop) should be held somewhere within the watershed.
- **Water Supply Availability:** The Peace River basin is the largest watershed in Alberta and also the least allocated basin. However, there is tremendous variability locally in the availability of water. Groundwater is a source of water for large number of communities. However, it is unknown how much groundwater is available and long-term sustainable pumping rate. Further investigation is required to understand water availability during drought conditions and mitigation actions. A study should be completed for the Peace River mainstem and major tributaries in Alberta, as the water allocation to several municipalities depends on instream flow needs. AEW's hydrometric program should be expanded to include real-time hydrometric stations upstream of municipal water intakes. This would help support instream flow requirements. Hydrogeological investigations of heavily-used aquifers are undertaken to provide information about long-term sustainable pumping rates. This would assist AEW and municipalities plan for long-term sustainable water supplies.
- **Water Conservation:** Promote and encourage local municipalities to develop water conservation action plans in partnership with the Alberta Urban Municipalities Association. Water Conservation is one of the pillars of the *Water for Life* Strategy.
- **Rural Drinking Water:** A large number of the agriculture community/rural Albertans use unregulated individual system or small drinking water system. The numbers of these users are non-known and further action is required to understand issues and challenges facing these individual and small systems.

The list below highlights actions that may be outside within the scope and the mandate of the Mighty Peace Watershed Alliance, but should be fully supported.

- The Federal government require mandatory reporting of all Boil Water Advisories on First Nations on a major basin scale with location details in a central registry.
- The Province of Alberta require mandatory online reporting of all Boil Water Advisories on a major basin scale with location details in a central registry. As well, disinfection equipment failures and adverse water quality tests should be reported.
- The Province of Alberta mandate legally-defensible source water protection plans.
- The Mighty Peace Watershed Alliance should seek advice from Alberta Intergovernmental, International and Aboriginal Relations on an approach to obtain the desired collaboration and information from the First Nations.
- The Mighty Peace Watershed Alliance should promote mutual aid agreements between municipalities for water and wastewater operator coverage.

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Appendix A - Tables

Table 4: Listing of Contacts and Organizations for the Peace River Watershed State of Drinking Water Report

Organization Name	Department Contacted
Federal Government	
Aboriginal Affairs and Northern Development	First Nations Relations - Treaty 8
Health	First Nations and Inuit Health Branch (Alberta)
Provincial Government	
Alberta Environment and Water	Municipal Authorizations
Alberta Health and Wellness	Health Protection Branch
Alberta Infrastructure	Peace River Correctional Centre
Alberta Tourism, Parks and Recreation	Moonshine Provincial Park Young's Point provincial Park
Alberta Sustainable Resource Development	Forestry
Municipal Government	
Town of Beaverlodge	Administration
Village of Berwyn	Administration
Birch Hills County	Administration
Clear Hills County	Administration
Village of Donnelly	Administration
Municipal District of Fairview No. 136	Administration
Town of Fairview	Administration
Town of Falher	Administration
Town of Fox Creek	Administration
Village of Girouxville	Administration
Town of Grande Cache	Administration
City of Grande Prairie	Administration
County of Grande Prairie	Administration
Municipal District of Greenview No. 16	Administration
Town of Grimshaw	Administration
Mackenzie County	Administration
Northern Sunrise County	Administration
County of Northern Lights	Administration
Town of High Level	Administration
Village of Hines Creek	Administration
Village of Hythe	Administration
Town of Manning	Administration
Town of McLennan	Administration

Organization Name	Department Contacted
Village of Nampa	Administration
Northland School Division No. 61	Administration
Municipal District of Opportunity No. 17	Administration
Municipal District of Peace No. 135	Administration
Town of Peace River	Administration
Village of Rycroft	Administration
Town of Sexmith	Administration
Silver Pointe Village	Administration
Municipal District of Smoky River No. 130	Administration
Town of Spirit River	Administration
Town of Valleyview	Administration
Town of Wembley	Administration
First Nations and Métis	
First Nations (Alberta) Technical Services Advisory Group (TSAG)	Administration/Circuit Rider
Beaver First Nation	Public Works
Sturgeon Lake Cree First Nation	Band Manager
Lubicon Lake Nation	Administration
Horse Lake First Nation	Band Manager
Duncan's First Nation	Band Administrator
Little Red River Cree Nation	Band Manager/Public Works
Dene Tha First Nation	Band Manager
Woodland Cree First Nation	Administration
Bigstone Cree Nation	Public Works
Loon River Cree First Nation	Chief
Whitefish Lake First Nation	Public Works
Tallcree First Nation	Chief
Gift Lake Métis Settlement	Council Chairperson
Paddle Prairie Métis Settlement	Administration/Public Works
Utilities	
Aquatera Utilities Inc.	Environmental Coordinator
NEW Water Ltd.	Northern Sunrise County
Smoky River Regional Water Management Commission	Member Municipalities
Industry	
Aramark Remote Workplace Services (Encana Pelican)	Operations

Shell Canada
Penn West Exploration
Bonavista Energy

Environmental Coordinator
Operations Engineering
General email

Table 5: Municipal Water Supply Systems within the Peace River Watershed

Name of Facility	Facility Owner	Source Type	Sub-watershed	Water Body Drawn From	Filtration/Treatment	Primary Disinfection	Secondary Disinfection	Geographic Location of Water Withdrawal	Geographic Location of Facility	Type/Level of Treatment of Drinking Water
Beaverlodge	Town of Beaverlodge	Surface - River	Smoky/Wapiti	Beaverlodge River	Gravity - Rapid Sand - Conventional	Free Chlorine		SW 34-071-10 W6M	SW 02-072-10 W6M	
Berwyn	Village of Berwyn	Ground - Non-GUI	Upper Peace	Grimshaw Gravels Aquifer	n/a	Free Chlorine	n/a	LSD 02-31-082-24 W5M; LSD 13-29-082-24 W5M; LSD 01-31-082-24 W5M		
Bezanson	County of Grande Prairie	Ground - Non-GUI	Smoky/Wapiti	Unnamed Aquifer	n/a	Free Chlorine	n/a	LSD 15-10-072-03 W6M	NE 10-072-03 W6M	
Bluesky	MD of Fairview	Regional Supply	Upper Peace	Peace River	n/a	Free Chlorine	n/a	NE 04-080-03 W6M		
Brownvale	MD of Peace	Ground - Non-GUI	Upper Peace	Grimshaw Gravels Aquifer	n/a	Free Chlorine	n/a	LSD 16-19-082-25 W5M	LSD 16-19-082-25 W5M	Level 1
Cadotte Lake	Northern Sunrise County	Surface - Lake	Central Peace	Cadotte Lake	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	NE 27-086-16 W5M		
Clairmont	Aquatera Utilities Inc.	Surface - River	Smoky/Wapiti	Wapiti River	n/a	Free Chlorine	n/a	NW 24-070-06 W6M	SW 12-071-06 W6M; 5306 – 100 Street, Grande Prairie	Level 3
Cleardale	Clear Hills County	Surface - River	Central Peace	Tributary to Eureka River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a		SW 11-085-10 W6M	
Debolt	MD of Greenview	Ground - Non-GUI	Smoky/Wapiti		n/a	Free Chlorine	n/a	LSD 05-12-072-01 W6M; LSD 10-12-072-01 W6M		
Desmarais (Wabasca-Desmarais Regional Waterworks System)	MD of Opportunity	Surface - Lake	Wabasca	North Wabasca Lake	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SW 05-081-25 W4M		
Dixonville	Northern Lights County	Ground - Non-GUI	Central Peace	Unnamed Aquifer	Pressure - Aesthetic	Free Chlorine		NE 25-87-24 W5M	NE 12-87-24 W5M	Level 1
Donnelly	Smoky River Regional Water Management Commission	Regional Supply	Smoky/Wapiti	Little Smoky River	n/a	Free Chlorine	n/a	SE 02-076-22 W5M	SE 08-078-21 W5M	
Dunes	Private	Ground - Non-GUI	Smoky/Wapiti		n/a	Free Chlorine	n/a			
Eaglesham	Birch Hills County	Regional Supply	Upper Peace	Fox Creek	Membrane	Free Chlorine		SW 21-078-26 W5M		
Fairview	Town of Fairview	Surface - River	Upper Peace	Peace River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	NE 04-080-03 W6M		
Fairview Rural Water Co-Op	Fairview Rural Water Project Ltd.	Regional Supply	Upper Peace	Peace River	n/a		n/a	NE 04-080-03 W6M		
Falher	Smoky River Regional Water Management Commission	Regional Supply	Smoky/Wapiti	Little Smoky River	Gravity - Rapid Sand - Conventional	Free Chlorine		SE 02-076-22 W5M	SE 08-078-21 W5M	Level 2
Footner Lake Forest Site	Town of High Level	Regional Supply	Lower Peace	Footner Lake	n/a	Free Chlorine	n/a	S 05-111-19 W5M	NW 09-110-19 W5M	
Fort Vermillion (Under Mackenzie Region Approval)	Mackenzie County	Surface - River	Central Peace	Peace River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SE 30-108-12 W5M		
Fox Creek	Town of Fox Creek	Ground - Non-GUI	Smoky/Wapiti			Free Chlorine		LSD 01-32-062-19 W5M; LSD 15-29-062-19 W5M; LSD 07-30-062-19 W5M; LSD 12-31-062-19 W5M; LSD 16-36-062-20 W5M		
Gift Lake Metis Settlement	Gift Lake Metis Settlement	Surface - Lake	Wabasca	Gift Lake	Gravity - Rapid Sand - Direct Filtration	Free Chlorine		NW 28-079-12 W5M	NW 28-079-12 W5M	Level 2

Name of Facility	Facility Owner	Source Type	Sub-watershed	Water Body Drawn From	Filtration/Treatment	Primary Disinfection	Secondary Disinfection	Geographic Location of Water Withdrawal	Geographic Location of Facility	Type/Level of Treatment of Drinking Water
Girouxville	Smoky River Regional Water Management Commission	Regional Supply	Smoky/Wapiti	Little Smoky River	n/a	Free Chlorine	n/a	SE 02-076-22 W5M		
Grande Cache	Town of Grande Cache	Surface - Lake	Smoky/Wapiti	Victor Lake Grande Cache Lake	Pressure - Rapid Sand	Free Chlorine	n/a	NW 35-056-08 W6M; NW 01-057-08 W6M	NW 35-056-08 W6M; Lot U46, Block 7	
Grande Prairie	Aquatera Utilities Inc.	Surface - River	Smoky/Wapiti	Wapiti River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	NW 24-070-06 W6M	SW 12-071-06 W6M; 5306 – 100 Street, Grande Prairie	Level 3
Grande Prairie 'Regional'	Aquatera Utilities Inc.	Ground - Non-GUI	Smoky/Wapiti		No longer EPEA activity					
Grimshaw	Town of Grimshaw	Ground - Non-GUI	Upper Peace	Grimshaw Gravels Aquifer	n/a	Free Chlorine	n/a	LSD 08-25-083-24 W5M		
Guy	Smoky River Regional Water Management Commission	Regional Supply	Smoky/Wapiti	Little Smoky River	n/a	Free Chlorine	n/a	SE 02-076-22 W5M		
High Level	Town of High Level	Surface - Lake	Lower Peace	Footner Lake	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	S 05-111-19 W5M	NW 09-110-19 W5M	
Hines Creek	Village of Hines Creek	Surface - Lake	Upper Peace	Jack Creek	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	NW 05-084-04 W6M		
Hythe	Village of Hythe	Ground - Non-GUI	Smoky/Wapiti		n/a	Free Chlorine	n/a	LSD 03-24-073-11 W6M; LSD 04-24-073-11 W6M		
Jean Cote	Smoky River Regional Water Management Commission	Regional Supply	Smoky/Wapiti	Little Smoky River	n/a	Free Chlorine	n/a	SE 02-076-22 W5M		
Keg River	Northern Lights County	Surface - River	Central Peace	Keg River				NW 18-101-23 W5M	SW 19-101-23 W5M	Level 2
LA CRETE (Under Mackenzie Region Approval)	Mackenzie County	Ground - GUI	Central Peace	Unnamed Aquifer	n/a	Free Chlorine	n/a	LSD 01-05-106-16 W5M		
Loon River	Loon River First Nation	Regional Supply	Wabasca		n/a	Free Chlorine	n/a			
Manning	Town of Manning	Surface - River	Central Peace	Notikewin River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SE 28-091-23 W5M		
McLennan	Town of McLennan	Surface - Lake	Smoky/Wapiti	Winagami - Girouxville Canal	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	NW 29-077-19 W5M		
Nampa	Village of Nampa	Surface - River	Upper Peace	Heart River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SW 30-081-20 W5M		
Paddle Prairie Métis Settlement	Paddle Prairie Métis Settlement	Surface – River	Central Peace	Boyer River	Gravity – Rapid Sand – Conventional	Free Chlorine	n/a	SW 19-103-21 W5M	SW 19-103-21 W5M	Level 2
Peace River - Shaftesbury	Town of Peace River	Surface - River	Central Peace	Peace River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SE 13-083-22 W5M	SE 13-083-22 W5M	
Peace River - 103rd Street	Town of Peace River	Surface - River	Central Peace	Peace River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SW 29-083-21 W5M	SW 29-083-21 W5M	
Peace River Correctional Centre	Alberta Infrastructure	Surface - River	Upper Peace	Peace River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a			
Peerless Lake	MD of Opportunity	Surface - Lake	Wabasca	Peerless Lake	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	NW 28-088-04 W5M		
Red Earth Creek	MD of Opportunity	Surface - River	Wabasca	Red Earth Creek	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	NW 17-087-08 W5M		
Ridgevalley	MD of Greenview	Ground - Non-GUI	Smoky/Wapiti		n/a	Free Chlorine	n/a	LSD 10-26-071-26 W5M; LSD 01-22-071-26 W5M		

Name of Facility	Facility Owner	Source Type	Sub-watershed	Water Body Drawn From	Filtration/Treatment	Primary Disinfection	Secondary Disinfection	Geographic Location of Water Withdrawal	Geographic Location of Facility	Type/Level of Treatment of Drinking Water
Rycroft	Village of Rycroft	Surface - River	Upper Peace	Spirit River	Gravity - Rapid Sand - Conventional	Free Chlorine		NE 16-078-05 W6M		
Sandy Lake	MD of Opportunity	Surface - Lake	Wabasca	Sandy Lake	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SW 05-079-22 W4M		
Sexsmith	Aquatera Utilities Inc.	Ground - Non-GUI	Smoky/Wapiti		n/a	Free Chlorine	n/a	LSD 13-07-074-05 W6M; LSD 03-13-074-06 W6M		
Silver Pointe Village	Private	Ground - Non-GUI	Smoky/Wapiti		n/a	Free Chlorine	n/a			
Spirit River	Town of Spirit River	Surface - Dugout	Upper Peace	Tributary to Spirit River	Gravity - Rapid Sand - Conventional	Free Chlorine		NE 10-078-06 W6M	SE 22-078-06 W6M	
Tangent	Birch Hills County	Regional Supply	Upper Peace	Fox Creek	n/a	Free Chlorine	n/a	SW 21-078-26 W5M		
Trout Lake	MD of Opportunity	Surface - Lake	Wabasca		Gravity - Rapid Sand - Conventional	Free Chlorine	n/a			
Valleyview	Town of Valleyview	Surface - River	Smoky/Wapiti	Little Smoky River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SE 21-070-22 W5M		
Wabasca (Wabasca-Desmarais Regional Waterworks System)	MD of Opportunity	Surface - Lake	Wabasca	North Wabasca Lake	Gravity - Rapid Sand - Conv/Membr	Free Chlorine	n/a	SW 05-081-25 W4M		
Wanham	Birch Hills County	Regional Supply	Upper Peace	Fox Creek	n/a	Free Chlorine	n/a	SW 21-078-26 W5M		
Wembley	Town of Wembley	Ground - Non-GUI	Smoky/Wapiti	Wapiti Formation	n/a	Free Chlorine	n/a	LSD 04-22-071-08 W6M; LSD 13-15-071-08 W6M	N/A	
Whitelaw	MD of Fairview	Ground - Non-GUI	Upper Peace	Grimshaw Gravels Aquifer	n/a	Free Chlorine	n/a	LSD11-35-081-01 W6M		
Woking	Saddle Hills County	Surface - Impoundment	Smoky/Wapiti	Unnamed Creek	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	NW 18-076-05 W6M		
Worsley	Clear Hills County	Surface - Impoundment	Central Peace	Tributary to Eureka River	Gravity - Rapid Sand - Conventional	Free Chlorine	n/a	SW 06-087-07 W6M		

Table 6: Wastewater Treatment Systems within the Peace River Watershed

Name	Status	Sub-basin	Approval Number	Type of Treatment System	Treatment Processes	Sludge Management	Receiving Environment	Irrigation	Geographic Location (of effluent discharge)	Geographic Location of Facility	Name of Effluent-Receiving Waterbody/Watercourse
Aquatera	Region	Smoky/Wapiti	197502	Mechanical Activated Sludge	PC, SeC, RBC, BNR, UV, MF, SC	HT, MR-ATAD, DW, MCBF, LD	Stream/River	Yes	NW 24-070-06 W6M	SW 12-071-06 W6M	Wapiti River
Beaverlodge	Town	Smoky/Wapiti									
Berwyn	Village	Upper Peace	416	Lagoon Stabilization Pond	AC, FC, SC						
Bezanson (County of Grande Prairie)	Hamlet	Smoky/Wapiti	418	Lagoon Stabilization Pond	FC		Stream/River	No	NW 10-072-03 W6M	NW 10-072-03 W6M	
Bluesky (MD of Fairview)	Hamlet	Upper Peace	435	Lagoon Stabilization Pond	FC, SC		Stream/River	No	SW 3-82-2 W6M		
Cadotte Lake (Northern Sunrise County)	Hamlet	Central Peace	17883	Collection System							
Clairmont (County of Grande Prairie)	Hamlet	Smoky/Wapiti	518	Mechanical Aerated Lagoon	aerated multi compartment cell, aerated storage cell		Stream/River		SW 27-072-06 W6M	SW 27-072-06 W6M	
Cleardale (Clear Hills County)	Hamlet	Central Peace	525	Lagoon Stabilization Pond	FC, SC		Stream/River	No	NW 11-85-10 W6M		
Debolt (MD of Greenview)	Hamlet	Smoky/Wapiti	1441	Lagoon Stabilization Pond	FC		Stream/River	Yes	LSD 2-2-72-1 W6M		
Desmarais (MD of Opportunity)	Hamlet	Wabasca	599	Collection System							
Dixonville (Northern Lights County)	Hamlet	Central Peace	611	Lagoon Stabilization Pond	FC		Stream/River	No	SE 12-087-24 W5M	SE 12-087-24 W5M	Whitemud River
Donnelly	Village	Smoky/Wapiti	616	Lagoon Stabilization Pond	2x AC, FC, SC		Stream/River	No			
Dunes Subdivision	Private Development	Smoky/Wapiti	17654	Collection System			N/A		N/A	NE 25-070-06 W6M	
Eaglesham (Birch Hills County)	Hamlet	Upper Peace	629	Lagoon Stabilization Pond	FC		Land	No	SE 36-78-26-W5		
Encana Pelican	Camp	Wabasca	203302	Mechanical Activated Sludge	AET, AST, SeC, PLC SCADA, DT	LD, AD, Lagoon Disposal	Land	Yes	NE 07-080-02 W5M	NE 07-080-02 W5M	N/A
Fairview	Town	Upper Peace	658	Lagoon Stabilization Pond	4x AC, 2x FC, 2x SC	SDC	Stream/River	No	SE 16-81-3 W6M		
Falher	Town	Smoky/Wapiti	660	Lagoon Stabilization Pond	4x AC, FC, SC		Stream/River	No	NE 33-077-21 W5M	NE 33-077-21 W5M	Peavine Creek
Footner Lake Forest Site	Camp	Lower Peace	670	Lagoon Stabilization Pond	FC, SC		Lake	No	S 8-111-19 W5M		
Fort Vermilion (Mackenzie County)	Hamlet	Central Peace	693	Lagoon Stabilization Pond	4x AC, FC, SC		Stream/River	No	Plan 5999CL, Block A		
Fox Creek	Town	Smoky/Wapiti	695	Lagoon Stabilization Pond	4x AC, 2x FC, 4x SC		Lake	No	NE 32-062-19 W5M	NE 32-062-19 W5M	Fox Creek-Iosegun Lake
Gift Lake Metis Settlement	Settlement	Wabasca	11979	Lagoon Stabilization Pond	2x AC, 2x FC, 2x SC	SDC	Stream/River	No	SW 27-79-12 W5M		
Girouxville	Village	Smoky/Wapiti	707	Lagoon Stabilization Pond	2x AC, FC, SC		Stream/River	No	NE 9-78-22 W5M		
Grande Cache	Town	Smoky/Wapiti	718	Mechanical-Extended Aeration	GR, AB, SeC	AD, LD, ST, composting	Stream/River	No	W 29-056-08 W6M	W 29-056-08 W6M	Smoky River
Grande Prairie Airport	Airport	Smoky/Wapiti	18188	Lagoon Stabilization Pond	4x AC, FC, SC		Lake	No	SE 29-71-6 W6M		
Grande Prairie	City	Smoky/Wapiti	721	Mechanical Biofilm	ET, GR, PC, RBC, BNR, SeC, SC	HT, MR-ATAD, DW, AS	Stream/River	No	NW 24-70-6 W6M	SW 12-071-06 W6M	Wapiti River

Name	Status	Sub-basin	Approval Number	Type of Treatment System	Treatment Processes	Sludge Management	Receiving Environment	Irrigation	Geographic Location (of effluent discharge)	Geographic Location of Facility	Name of Effluent-Receiving Waterbody/Watercourse
Grimshaw	Town	Upper Peace	736	Lagoon Stabilization Pond	8x AC, 2x FC, 3x SC		Stream/River	No	NE 09-083-23 W5M	NE 09-083-23 W5M	unnamed watercourse
Grovedale (MD of Greenview)	Hamlet	Smoky/Wapiti	743	Lagoon Stabilization Pond	FC, SC (evaporation)		evaporation	No			
Guy (MD of Smoky River)	Hamlet	Smoky/Wapiti	749	Lagoon Stabilization Pond	FC, SC		Stream/River	No	NW 36-75-21 W5M		
High Level	Town	Lower Peace	771	Lagoon Stabilization Pond	4x AC, FC, SC	SDC	Stream/River	No	SE 33-109-19 W5M NE 6-84-4 W6M (Lot 5, Plan 8021860, Pt.)		
Hines Creek	Village	Upper Peace	782	Lagoon Stabilization Pond	4x AC, FC, SC		Stream/River	No			
Hutterian Brethern	Church	Smoky/Wapiti	17925	Lagoon Stabilization Pond	2x FC, SC		Lake	No			
Hythe	Village	Smoky/Wapiti		Lagoon Stabilization Pond	2x AC, FC, 2x SC		Stream/River	No	LSD 09-14-073-11 W5M		Beaverlodge River
Jean Cote (MD of Smoky River)	Hamlet	Smoky/Wapiti	818	Lagoon Stabilization Pond	FC, SC		Stream/River	No	NW 36-79-22 W5M		
La Crete (Mackenzie County)	Hamlet	Central Peace	16352	Lagoon Stabilization Pond	4x AC, FC, SC		Other	No			
La Glace (County of Grande Prairie)	Hamlet	Smoky/Wapiti	909	Lagoon Stabilization Pond	FC, 2x SC		Stream/River		NE 10-074-08 W6M	NE 10-074-08 W6M	
Little Buffalo School	School	Wabasca	932	Lagoon Stabilization Pond	FC		Lake	No	Little Buffalo 086-14 W5M	Little Buffalo 086-14 W5M	Little Buffalo Lake
Little Smoky (MD of Greenview)	Hamlet	Smoky/Wapiti	933	Lagoon Stabilization Pond	SC		Stream/River	No	LSD 06-30-066-21 W5M		
Loon River	First Nation	Wabasca	77853	Lagoon Stabilization Pond	FC, SC		Stream/River	No			
Manning	Town	Central Peace	953	Mechanical Aerated Lagoon	2x PMC	SDC	Stream/River	No	S 27-091-23 W5M	S 27-091-23 W5M	Notikewin River
Marie Reine (Northern Sunrise County)	Hamlet	Upper Peace	961	Lagoon Stabilization Pond	FC, SC		Stream/River	No			
McLennan	Town	Smoky/Wapiti	968	Lagoon Stabilization Pond	4x AC, FC, SC		Lake	No	SW 32-077-19 W5M		Kimiwan Lake
Meekwap Camp (Penn West)	Camp	Smoky/Wapiti	745	Lagoon Stabilization Pond	FC, SC		Stream/River	No	LSD 05-17-066-15 W5M	LSD 05-17-066-15 W5M	unnamed watercourse
Meekwap/Batt (Penn West)	Camp	Smoky/Wapiti	746	Lagoon Stabilization Pond	FC		Stream/River	No	LSD 15-18-066-15 W5M	LSD 15-18-066-15 W5M	unnamed watercourse
Moonshine Lake Prov. Park	Provincial Park	Upper Peace	992	Lagoon Stabilization Pond	FC, SC		Stream/River	No	NW 04-080-08 W6M	NW 04-080-08 W6M	Blueberry Creek
Nampa	Village	Upper Peace	1004	Lagoon Stabilization Pond	4x AC, FC, SC		Stream/River	No			
North Star (Northern Lights County)	Hamlet	Central Peace	1024	Lagoon Stabilization Pond	FC, SC		Stream/River	No	NW 32-090-23 W5M	NW 32-090-23 W5M	Buchanan Creek
Paddle Prairie Metis Settlement	Settlement	Central Peace	872	Lagoon Stabilization Pond							
Peace River Airport	Airport	Central Peace	18647	Lagoon Stabilization Pond	FC, SC, emergency cel		Stream/River	No			
Peace River Correctional Centre	Public Works	Upper Peace	16886	Mechanical Activated Sludge	OD, 2x SeC	2x SDC	Stream/River	No			

Name	Status	Sub-basin	Approval Number	Type of Treatment System	Treatment Processes	Sludge Management	Receiving Environment	Irrigation	Geographic Location (of effluent discharge)	Geographic Location of Facility	Name of Effluent-Receiving Waterbody/Watercourse
Peace River	Town	Central Peace	1051	Mechanical Activated Sludge	GR, AB, SeC	DW, ST, composting	Stream/River	Yes	SE 08-084-21 W5M	SE 08-084-21 W5M	Peace River
Peerless Lake (MD of Opportunity)	Hamlet	Wabasca	81890	Lagoon Stabilization Pond	2x AC, FC, SC		Land	No	NE 5-89-4 W5M		
Red Earth Creek (MD of Opportunity)	Hamlet	Wabasca	1094	Lagoon Stabilization Pond	FC, SC		Stream/River	No			
Ridgevalley (MD of Greenview)	Hamlet	Smoky/Wapiti	1102	Lagoon Stabilization Pond	FC, SC		Stream/River	No	NW 14-71-26 W5M		
Rycroft	Village	Upper Peace	1134	Lagoon Stabilization Pond	2x AC, FC, SC	Sludge drying bed at lagoon site	Stream/River	No			
Sandhills Colony		Upper Peace	209483	Lagoon Stabilization Pond							
Sandy Lake (MD of Opportunity)	Hamlet	Wabasca	1138	Lagoon Stabilization Pond	SC (evaporation)		Evaporation	No			
Sexsmith	Town	Smoky/Wapiti	857	Lagoon Stabilization Pond	4x AC, FC, SC		Stream/River	No			
Silver Pointe Village	Private Development	Smoky/Wapiti	68153	Lagoon Stabilization Pond	FC, SC		Lake	No			
Spirit River	Town	Upper Peace	1171	Lagoon Stabilization Pond	3x AC, 2x FC, SC	SDC	Stream/River	No	SE 14-079-06 W6M	SE 14-079-06 W6M	Howard Creek
St. Isidore (Northern Sunrise County)	Hamlet	Central Peace	1180	Lagoon Stabilization Pond	2x FC, 1 SC		Stream/River	No			
Sturgeon Heights (MD of Greenview)	Community	Smoky/Wapiti	1194	Lagoon Stabilization Pond	SC (evaporation)		evaporation	No			
Tangent (Birch Hills County)	Hamlet	Upper Peace	1211	Lagoon Stabilization Pond	FC, SC		Stream/River	No	SW 33-78-24 W5M		
Teepee Creek (County of Grande Prairie)	Hamlet	Smoky/Wapiti	18887	Lagoon Stabilization Pond	2x (FC, SC) different locations		Ditch	No	NW 33-073-03 W6M	NW 33-073-03 W6M	
Triple L Mobile Home	Private Development	Smoky/Wapiti	1235	Lagoon Stabilization Pond	FC		Stream/River	No			
Trout Lake (MD of Opportunity)	Hamlet	Wabasca	81891	Lagoon Stabilization Pond	FC, SC		Stream/River	No	28-86-4 W5M		
Valhalla (County of Grande Prairie)	Hamlet	Smoky/Wapiti	1246	Lagoon Stabilization Pond	FC, SC		Stream/River	No	NW 07-074-10 W6M	NW 07-074-10 W6M	
Valleyview	Town	Smoky/Wapiti	1247	Mechanical Aerated Lagoon	CMC, 2x PMC, SRC, SSC, 3x SC	LD	Stream/River	Yes	SE 29-070-22 W5M	SE 21-070-22 W5M	Sturgeon Creek
Vista Creek (Bonavista Energy)	Camp	Central Peace	158659	Lagoon Stabilization Pond	SC		Land	No	LSD 13-24-096-01 W6M	LSD 13-24-096-01 W6M	N/A
Wabasca (MD of Opportunity)	Hamlet	Wabasca	1276	Mechanical-Aerated Lagoon + Lagoon Stabilization Pond	CMC, PMC, CI + 4x AC, FC, SC		Lake	No	28-86-4 W5M		
Wanham (Birch Hills County)	Hamlet	Upper Peace	856	Lagoon Stabilization Pond	FC, SC		Stream/River	No	SW 10-78-3 W6M		
WatiNo (Birch Hills County)	Hamlet	Smoky/Wapiti	1291	Lagoon Stabilization Pond	FC		Stream/River	No			
Weberville (Northern Lights County)	Hamlet	Central Peace	10058	Lagoon Stabilization Pond	FC (evaporation)		Evaporation	No	NW 11-085-22 W5M	NW 11-085-22 W5M	N/A

Name	Status	Sub-basin	Approval Number	Type of Treatment System	Treatment Processes	Sludge Management	Receiving Environment	Irrigation	Geographic Location (of effluent discharge)	Geographic Location of Facility	Name of Effluent- Receiving Waterbody/ Watercourse
Wembley	Town	Smoky/Wapiti	1292	Lagoon Stabilization Pond	4x AC, FC, SC		Stream/River	No	Lot 1, Block 21, Plan 082448	Lot1, Block 21, Plan 082448	Unnamed Creek to Ringling Lake
Whitelaw (MD of Fairview)	Hamlet	Upper Peace	1305	Lagoon Stabilization Pond	FC		Stream/River	No	NW 15-82-1 W6M		
Woking	Hamlet	Smoky/Wapiti	1319	Lagoon Stabilization Pond	FC		Stream/River	No	SW 20-76-5 W6M		
Worsley (Clear Hills County)	Hamlet	Upper Peace	1321	Lagoon Stabilization Pond	FC		Stream/River	No	NW 36-86-8 W6M		
Young's Point Prov. Park	Provincial Park	Smoky/Wapiti	1325	Lagoon Stabilization Pond	FC, SC		Lake	No			

**Appendix B – Discussion Paper on Water Related Issues and Programs
in Northwestern Alberta**

Discussion Paper
on
Water Related Issues and Programs
in
Northwest Alberta



for the
Northern Alberta Development Council

March 2003

Prepared By:

*Jerry Nessman, P.Eng.
Peace River, Alberta*



Discussion Paper

on

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in

Northwest Alberta

***The following members of the Project Advisory Committee
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for the

Northern Alberta Development Council

March 2003

Prepared By:

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Executive Summary

In 2001 Federal and Provincial governments commissioned a study on the availability and accessibility for water information, assistance and programs in Northwest Alberta.

In 2003 they commissioned a results follow-up on the 2001 project and also an assessment of current water related issues, initiatives and programs relative to the concern about the sustainability of water supplies in the region.

A review of the 2001 study indicated most water users know where and how to access water data applicable to their needs. A central water website system, as was recommended, has not been established, but it is not obvious that this prevents water users from acquiring/sharing the water information they require. Funding formulas have not changed to offset hardships expressed by municipalities. Some municipalities have implemented regional water delivery systems and others have commissioned studies to research similar projects to minimize costs and maximize opportunities.

The 2003 study involved a water questionnaire sent to Northwest Alberta municipalities and gathering information from key provincial and federal departments and other organizations with principal water responsibilities.

The primary concern of all groups is the assurance for long time, adequate quantity and quality raw water for all water needs. Several other issues were expressed, including:

- recent dry years which accelerate supply depletion
- constrained economic opportunities due to water inadequacy
- potential contamination from livestock operations
- quality deterioration of stagnant rural sources
- the need for wetland conservation
- rushed infrastructure requirements for rapid growth areas
- loss of potable water for oil well injection
- the need for well planned regional water distribution systems
- changes to the province's drinking water standards add to municipal costs
- inadequate government funding for costly capital and operational infrastructure

Most municipalities reported a significant amount of surplus water is available for other uses, now and/or in the near future, with scheduled upgrades.

Federal and provincial governments and other agencies implement legislation, new studies, initiatives and programs to cope with current and future water issues to ensure there is an effective and sustainable way of conserving, managing and protecting water supplies and preserving the environment.

Recommendations are categorized in two groups:

- 1) Effective management and planning by all parties with water responsibilities to assure long time adequate quantity and quality raw water, and
- 2) A need for evaluation of funding programs for costly municipal water infrastructure.

Recommendations are detailed at the end of the 'Overview and Recommendations' section.

Overview and Recommendations

In early 2003, the Federal and Provincial governments and the Peace Regional Economic Development Alliance commissioned a water study for Northwest Alberta to provide:

- a follow-up on the previous research project called Discussion Paper: Water Information Base, Northwest Boreal Region: May 2001 (WIB)
- an assessment of water related issues, initiatives and programs, relative to the concern about the sustainability of water supplies in the region. This is a result of several consecutive years of below normal precipitation.

Follow-up To The 2001 WIB Report

With respect to the 2001 recommendations, the results from the 2003 process would indicate that for most part water users are satisfied with available information, know how/where to access it, are satisfied with technical assistance, advice and cooperation of water information providers and are satisfied with information updates. A central water website system has not been established, nor has there been any obvious moves toward doing so, but it is not obvious that this prevents water users from acquiring/sharing the water information they require.

Many municipalities have difficulties funding their share of water projects. Since 2001, program formulas have not addressed this issue.

Some municipalities have implemented regional water delivery systems and others have commissioned studies to research similar projects, which overlap common boundaries.

Assessment of Water Issues, Initiatives and Programs 2003

Objectives

To prepare a report to stimulate discussion on matters related to water availability, current and potential demand, and describe currently available water assistance programs. To provide an assessment of:

- Current water issues in Northwest Alberta such as depleted water supplies, use of potable water for industrial purposes, supply and contamination related to confined feeding operations, and constrained economic development opportunities resulting from inadequate water supplies
- The perceived water needs of municipalities and other water users
- Existing, new and proposed provincial and federal water related programs (within the last two years).
- An analysis of funding gaps to improve programs to address regional water supply issues.
- Alberta's Water For Life strategy and 'Framework for Water Management Planning'
- Current and proposed water basin planning initiatives, e.g. Lesser Slave Lake and River Basins
- New management tools such as the recently announced 'Land and Water Information Service'
- Prairie Farm Rehabilitation Administration's Regional Groundwater Assessment Initiative
- Municipal water cooperation arrangements for regional water distribution systems
- Primary water issues and specific issues such as livestock operations, potable water and legislation.

Predominant Concern

The most common concern of municipalities, governments and agencies is the assurance of perpetual adequate supply and good quality water.

Municipal Responses and Conclusions

Twenty-seven municipalities out of 43 replied to a questionnaire. Their responses are summarized as follows:

There appears to be significant water surpluses available, or with near future upgrades at several municipalities. Municipalities did not identify any 'large' non-municipal self-supplied water users who had surplus water.

The table and water availability map on pages 16 and 17 display the annual water consumption supplied by municipalities and their surplus water, the latter in some instances being dependent on future infrastructure upgrades.

Several communities are collectively moving towards regional water distribution systems and expanding those already operating. Some of these systems are in the planning stages. There are situations where municipal politics and insufficient funding hinder the advancement of these community water advantages. This is an area that needs to be worked on.

Municipal water infrastructure in most cases is in good condition or scheduled for upgrades. Upgrades seem to be continual with modern equipment and methods surfacing regularly. An additional concern is the Alberta Environment enhanced standards that will add to costs and complications. New water treatment plants tend to be designed to enable future expansion. Upgrades and/or new infrastructure become necessary when regional water distribution systems are implemented.

Alberta Transportation's Alberta Municipal Water/Wastewater Partnership Program (AMWWP) and Infrastructure Canada – Alberta Program (ICAP) were regularly utilized by several municipalities for their water system upgrades. These programs are currently committed to other scheduled similar municipal improvements. Most municipalities stressed that funding has been inadequate, creating hardships as other priority projects are postponed or eliminated. To compound the situation, the Province's increased standards can be expected to additionally heighten costs. It has been expressed that funding formulas should be based on a 'needs' assessment as well as population, and not just the latter.

Technical assistance, advice and information on water issues and programs required by municipalities are generally accessible to them.

Predominant water issues expressed by the municipalities are as follows:

- A need for assured long time adequate quantity and quality raw water
- Faced with large capital and operational infrastructure costs
- Enhanced provincial standards increase costs and bring about more complicated systems.
- Faced with early and increased demands in areas with rapid growth
- Difficult to keep water plant operators training current due to frequent system and standard changes.
- Potable surface and groundwater used for oil well injection, rather than utilizing sub-surface saline water, is considered wasting a valuable resource. The oil industry views this process as a continued economic benefit. The matter requires study.

Conclusions to Government and Agency Responses

The information gathered from government and other agency groups with key water responsibilities draw the following conclusions:

- The primary concern identified is the need for adequate good quality water. This parallels the main issue voiced by the municipalities.
- There are several technical and funding programs to assist with water acquisition, infrastructure and drought situations.
- Prairie Farm Rehabilitation Administration, Alberta Environment, Alberta Transportation, Alberta Agriculture, Food and Rural Development, Alberta Sustainable Resource Development, Health

Regions, Ducks Unlimited Canada and others have major water responsibilities. They implement legislation, new initiatives/programs and studies to cope with current and future water issues to ensure there is an effective and sustainable way of conserving, managing and protecting water supplies and preserving the environment.

- Alberta Economic Development's quest for economic development recognizes a primary need for adequate water.
- Drought continues to deplete water supplies adding a burden for all levels of government to offset these circumstances with funding, studies and other pursuits.
- Livestock operations are good for the economy. Initiatives encourage them, but management practices must comply with Alberta Sustainable Resource Development's legislation to safeguard water quality.
- Alberta Environment's Drinking Water Branch was created to give added attention to potable water issues. Government is similarly concerned, as are municipalities that new standards will further impact infrastructure costs. This is an area that needs to be investigated. The development of regional water delivery systems needs to be encouraged.

- Other significant water concerns:
 - reliable water supplies for municipalities with rapid growth.
 - many lakes are fairly to highly eutrophic resulting in low oxygen levels.
 - need for education, conservation, policies and regulations applied to wetlands.
 - Testing and action protocols need to be developed for blue-green algae contamination.

Recommendations

Assured long time adequate quality water:

1. Ensure that the programs and initiatives planned and managed by those with water responsibilities will effectively attend to this predominant issue. Modern research methods should be applied as they become available, like Alberta Agriculture, Food and Rural Development's drought science studies.
2. Promote programs that will encourage the acquisition of good water and also responsible conservation of water sources including wetlands.
3. Safeguard the water resource by consistent application of applicable legislation.
4. Regional water delivery systems should be advocated and well planned to maximize advantages within/amongst communities while also giving consideration to all potential future water uses, such as municipal expansions, commercial and industry. Municipalities should review the need of having a short-term facilitator to assist in planning these processes or possibly some other means to aid with coordination.
5. Provide additional assistance to communities experiencing rapid residential, industrial and commercial growth.
6. Drought intervals need to be given special attention with problems related to surface and groundwater depletion, as well as quality issues such as blue-green algae contamination, eutrophic lakes and stagnant rural sources.
7. The practice of using potable surface water and groundwater for oil well injection requires further evaluation.
8. Education and continued water information updates should be encouraged to promote adequate good quality water longevity. The Internet is the fashionable means of doing this, but it is not always up to date or user friendly. The 'paper' version is still very reliable and probably most accessible.
9. Education standards need to be enhanced and modernized for water system operators to keep them current with new technologies and proper operation and maintenance of water instrumentation and infrastructure.

Funding for municipal water systems:

1. Consideration should be given to a 'needs' based assessment in addition to the population criteria. Undue municipal hardships can occur due to outdated infrastructure, low tax base, unexpected changes such as the Province's new drinking water standards, emergency situations (change in source, rapid growth, major developments, groundwater depletion, etc.)
2. Municipalities need to discuss funding options, for example:
 - Review of cost sharing formulas
 - Is there a need for other funding programs
 - Interest free loans for the municipalities' share
 - Other

Acknowledgements

The municipalities, provincial and federal government, other organizations representatives and the project advisory committee provided much valued input and assistance leading to the preparation of this discussion paper. Their contributions are sincerely appreciated. Thank you.

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Assessment of Water Related Issues and Programs in Northwest Alberta

1.0 Introduction

1.1 Purpose of the Study

The project focused on rural and urban municipalities and aboriginal communities in Northwest Alberta. A map of the study area is appended at the end of the text. The purpose of this study is to provide a document in part to follow up on the previous research project called Discussion Paper: Water Information Base, Northwest Boreal Region: May 2001 (WIB). Secondly, this study is to provide information and an assessment of water related issues, initiatives and programs, relative to the considerable concern about the sustainability of water supplies in the Region. This is a result of several consecutive years of below normal precipitation. The research is to help improve awareness of issues, information and water programs, particularly over the last two years, from when the initial WIB study was processed. This research information will help authorities make better decisions about economic development, planning, land use and public health matters.

The Terms of Reference set the pace for the study. The following text, throughout sections 1.1 to 1.6, for most part, constitutes the Terms of Reference for the initiative.

1.2 Background

An expressed need for water information by water users resulted in an initiative in early 2001 to determine available sources of information and further information needs and accessing capabilities. The WIB report was the result of the project. In part the data collected went beyond information acquisition whereby municipalities expressed other concerns such as funding difficulties and the need for government to determine the best means of securing quality water for Northwest Alberta communities and their clients. At the time it was also identified that federal, provincial and municipal water users favored future surveys and forums to keep abreast of current ongoing water initiatives and programs.

In early 2003, several Northwest Alberta based agencies once again agreed in working together to identify ways of improving and assisting in the pursuit of water information and good quality water for northern communities. This is a cooperative initiative led by a Project Advisory Committee comprised of representatives from Northern Alberta Development Council (NADC), Prairie Farm Rehabilitation Administration (PRFA), Alberta Environment (AENV), Alberta Economic Development (AED) and the Peace Region Economic Development Alliance (PREDA). The Committee developed the Terms of Reference to identify key research objectives, expected results and project management.

The study process involved working with the Advisory Committee and preparing a discussion paper that includes: 1) a follow-up to the 2001 WIB study and 2) a water assessment update of key issues, initiatives and programs relative to the sustainability of regional water supplies and to address new water developments which evolved in the last 2 years.

1.3 Work Plan

The work plan approved by the Project Advisory Committee included the approach to:

- poll municipalities via survey questionnaires
- questionnaires and/or interviews with key government departments and agencies
- internet searches
- program and data analysis
- amalgamate/consolidate response data
- conclusions and recommendations
- final report
- symposium - presentation of information

1.4 Project Management

NADC managed the overall project. The advisory committee members provided advice to the consultant through random contacts and review of the draft report on March 5, 2003. PFRA, AENV, AT, AAFRD, and ASRD were key sources of information and contacts for the data-gathering segment of the study. The consultant contacted additional resource parties all of whom provided beneficial input to complete the analysis and develop the strategy.

1.5 Reporting

The initial research will be presented to the project advisory committee and management of their respective agencies. The study results were presented to municipalities and other interested water users at a symposium on March 21, 2003.

1.6 Project Objectives

To prepare a report to stimulate discussion on matters related to water availability, current and potential demand, and describe currently available water assistance programs. To provide an assessment of:

- Current water issues in Northwest Alberta such as depleted water supplies, use of potable water for industrial purposes, supply and contamination related to confined feeding operations, and constrained economic development opportunities resulting from inadequate water supplies.
- Survey findings regarding the perceived needs of water users.
- Existing, new and proposed provincial and federal water related programs (within the last two years). This report will also include an analysis of funding gaps to improve programs to address regional water supply issues.
- Alberta's Water For Life strategy and Framework for Water Management Planning.
- Current and proposed water basin planning initiatives, e.g. Lesser Slave Lake and River Basins Water Management Plan.
- New management tools such as the recently announced Land and Water Information Service.
- PFRA's Regional Groundwater Assessment Initiative.
- Municipal water cooperation arrangements for regional water distribution systems.
- Primary water issues and specific issues such as livestock operations, potable water and legislation.

1.7 Survey Process

The Advisory Committee met on January 22, 2003 to establish the terms of reference and work plan. Thereafter the consultant prepared a questionnaire, which was e-mailed on February 10th to all municipalities in Northwest Alberta. Other water questions were e-mailed to other levels of government and to various logical agencies and organizations with key water mandates. The process was furthered with interviews and telephone contacts. Responses were received from 63% of the municipalities polled.

2.0 Technical Report

In February 2003, Federal and Provincial government departments commissioned:

1. a follow-up to the May 2001 study, which examined the water supply information base (WIB) in Northwest Alberta.
2. an assessment of water related issues, initiatives and programs, reflecting what has transpired over the past 2 years within the Region.

2.1 Follow up of the 2001 Report

The primary process for the 2001 study involved survey questionnaires, one for municipalities and the other for Federal and Provincial governments and other organizations. Upon completion of the report, a one-day symposium/workshop took place to present the study findings and discuss the information.

Objectives of the 2001 Study Were to Determine the:

- roles and responsibilities of municipalities, government departments and other relevant organizations,
- description of all existing water information/data and their sources,
- available assistance programs,
- major water issues and gaps,
- recommendations to improve deficiencies, and
- suggestions to share research findings with stakeholders.

2001 Primary Findings Were:

- Municipalities are responsible to provide and/or assist in securing adequate and safe water for their clients.
- Federal and Provincial governments and non-government agencies are responsible for providing water information and assisting municipalities to secure adequate, good quality water supplies.
- Water supply deficiencies primarily affect residential and agricultural users. There are fewer industrial and commercial concerns.
- A number of municipalities experience financial hardships due to costly water supply infrastructure.
- There is a considerable amount of water information available. It appears much of it is unknown to water users. Most of it is available on publicly accessible websites.
- Other potential community initiated mechanisms are possible to inform water users.

2001 Recommendations Were:

- Municipalities, Federal and Provincial governments and other organizations should work together to coordinate water involvement activities and share information.
- Municipalities should optimize their electronic capabilities to access information.
- Municipalities should work together and with other stakeholders and resource proprietors to develop a compatible electronic water information system that would be accessible to the public with links to municipal and public sector websites.
- Federal and Provincial governments and other agencies should continue to assist by researching and offering new and improved water technologies, information and processes.
- Government programs need be evaluated to increase financial assistance where municipalities do not have the ability to pay based on funding formulas.
- Federal and Provincial governments need to research alternative water sources and modern procurement methods/techniques where municipalities are deficient of adequate water within a reasonable distance.

Review of 2001 Recommendations

With respect to the 2001 recommendations, the results from the 2003 process would indicate that most water information users are satisfied with available information, know how and where to access it, are satisfied with technical assistance, advice and cooperation of water information providers and are satisfied with information updates. A central water website system has not been established, nor has there been any obvious moves toward doing so, but it is not obvious that this prevents water users from acquiring/sharing what they require.

Most municipalities have difficulties funding their share of water projects. Since 2001, program formulas have not changed to help with this issue.

The last few years of dry conditions are a reminder that we can't be too lax in the pursuit of surplus water alternatives in readiness for continuing dry spells. Government research initiatives and new programs indicate their leadership towards methods of securing possibilities of sufficient, good quality raw water. In some instances, municipalities that share common boundaries have collectively commissioned studies to review such needs.

Follow up surveys and forums were recommended, which is represented by this current study.

Further review of the 2001 study will appear off and on through the following assessment of water related issues and programs, reflecting what has transpired over the past 2 years within Northwest Alberta.

2.2 Assessment of Water Related Issues, Initiatives and Programs / 2003

2.2.1 *Municipal Questionnaire, Responses and Conclusions*

The following 12 questions were asked of a total of 43 Northwest Alberta municipalities, 28 urban and 15 rural. A total of 27 replied. Their responses are categorized below and conclusions are summarized at the end of this section.

Questions 1 and 2

1. What is the total annual volume of water your municipality provides to clients?
2. Are your water systems operating at capacity? If not, how much more water could they supply? Please specify.

Rural Municipalities	Question 1 (x 1000m³)	Question 2 (x 1000m³)
Birch Hills County	45.0	Up to 22.5 more / 2005 upgrades / rural use
County of Gr. Pr.	163.8	163.8 more with upgrades
Northern Sunrise County	31.5 / Cadotte and Little Buffalo (105.9 distributed via Nampa / regional system)	7.9 (See Nampa Q1 & Q2)
MD of Big Lakes	283.9	more / Grouard 44.6, Faust 21.3, Joussard 18.0
MD of Greenview No. 16	35.3 (2 wells / Debolt, 1 well / Ridge Valley)	Maybe 10.6 more
MD of Northern Lights No. 22	22.7 (potable), 25.9 (non-potable)	~ capacity @ present (Dixonville and Keg River) 24.9 more @ Keg River / 2004
MD of Mackenzie No. 23	528.1 (Ft. Vermilion, La Crete and Zama)	453.1 more @Ft. Vermilion now, 610.6 more/2015 and 659.0 more / 2025 @ La Crete (As per Q 7)
MD of Lesser Slave River No. 124	263.0	129.0 more
MD of Smoky River No. 130	15.0	buy from Falher
MD of Spirit River No. 133	0	N/A
MD of Peace No. 135	1. Brownvale (from 2 wells, treated) 13.1 2. McInnis wells (3 wells, deregulated): MD 47.1, Co-op 62.9 3. Griffin well (deregulated) MD + Co-op (?)	28.1 more @ Brownvale; (Others ?)

Urban Municipalities	Question 1 (x 1000m ³)	Question 2 (x 1000m ³)
City of Grande Prairie	5,366.3	5,366.3 with upgrades (Aquatera Utilities Inc.)
Town of Beaverlodge	7.8	3.1
Town of Fairview	546.9	1,181.9 more / design
Town of Falher	231.3	700.0 (See Q 4)
Town of Grimshaw	486.5 (363.1 / Town, 12.0 / truck fill, 111.4 / West Grimshaw Co-op)	1,000.0 more providing wastewater system (lagoon) expanded & other upgrades
Town of High Level	550.0	1,450.0 more with WTP/2003
Town of High Prairie	591.0 (See Q 10)	730.0 more now and 1,195.7 more / design in 2010, both subject to adequate flow in the West Prairie River
Town of Manning	242.4	120.0 more with pump upgrade
Town of Peace River	1,715.1	Upgrades to enable licensed 2,050.6 more / 2 WTPs
Town of Rainbow Lake	254.2	@capacity in winter now; 254.2 more with WTP/2004-2005 – designed for expansion
Town of Sexsmith	233.4	58.4 more now. Additional surplus in future pending Aquatera Utilities Inc. (with City and County of Grande Prairie)
Town of Slave Lake	1,058.4	1,058.4 more with improvements and an additional 1,207.6 @ design with further upgrades
Town of Valleyview	365.0	635.0 more / design
Town of Wembley	136.4	None, near licensed limit (See Q 7)
Village of Berwyn	88.9	180.0 more now, (licensed for 378.1 total)
Village of Nampa	175.1 (of which 105.9 to Northern Sunrise County for regional system)	57.8

Questions 3, 4 and 5

3. Are there other existing self-supplied 'large' water users within or at close proximity to your municipality that could potentially provide water to others? (e.g. industry, agricultural)
4. Could your municipality provide water to a potential 'large' water user (e.g. industry)?
5. What is the present condition of your water system / life expectancy?

* Municipalities responded: either to system age (# years old) and/or life expectancy (# years life).

Rural Municipalities	Question 3	Question 4	Question 5 *
Birch Hills County	No	No	WTPs need replacing; distribution systems – 15 years life
County of Grande Prairie	Yes	with upgrades	5 – 7 years life
Northern Sunrise County	2 industrial – non potable	In future with upgrades	1. Cadotte WTP needs constant upgrades. Source direct from lake unreliable (See Q6) 2. Regional & hamlet systems, 40 years life
MD of Big Lakes	Town of High Prairie	Yes	25 years life
MD of Greenview No.16	No	No	20 years old, need upgrades
MD of Northern Lights No. 22	No	with upgrades and need water supplies	Dixonville distribution system, 20 years old
MD of Mackenzie No. 23	No	Yes @ Ft Vermilion, La Crete with upgrades (see Q 7), No @ Zama	Ft. Vermilion, 10 years life La Crete, 10-20 years / ~2005 upgrades Zama, depends on oil activities
MD of Lesser Slave River No. 124	Slave Lake Pulp and Chevron	Yes, annually supply 115,000m ³ to Mitsue Ind. Pk.	25 years life
MD of Smoky River No. 130	Not aware	Falher supply, MD distributes?	40 years life
MD of Spirit River No. 133	No	No	N/A
MD of Peace No. 135	No	Location?	Brownvale - 25 years life

Urban Municipalities	Question 3	Question 4	Question 5
City of Grande Prairie	No	Yes, Weyerhaeuser and Sexsmith and Sexsmith's Dynea glue plant	WTP reaching capacity
Town of Beaverlodge	No	Yes (3100m ³)	25 years life
Town of Fairview	No	Yes	100 years / continuous upgrades
Town of Falher	No	Not at present, but reviewing supply from Little Smoky River. Priority to supply neighboring municipalities with current source (Winagami Lake)	WTP 20 years old (upgraded in 2000), small upgrades as required
Town of Grimshaw	East water co-op in MD 135	Yes (1mil. m ³ with upgrades)	20-50 years life / dependant on population and AENV standards
Town of High Level	No	Yes with WTP / 2003	20 years life
Town of High Prairie	No	Yes	WTP/2002; infrastructure needs upgrades
Town of Manning	MD 22 in the future	Yes, with upgrades	20 years life
Town of Peace River	1. DMI Pulp Mill 2. PR Shell Insitu Plant 3. PR Correctional Center treats own water	included provision of water to other regional municipalities and industries in their planning	103 St. WTP needs major upgrades; Shaftesbury WTP needs some upgrades
Town of Rainbow Lake	No	No, only small industry as water source limited	WTP / 2004-2005 and designed for expansion
Town of Sexsmith	No	As per Q 2	New WTP / 2000, aquifer depletion?, limited size in transmission line
Town of Slave Lake	Slave Lake Pulp?	Yes, with upgrades	WTP upgrades to 2005; other components as funds permit
Town of Valleyview	No	Yes	30 years life; designed for expansion
Town of Wembley	No	No	Good, providing stable water tables
Village of Berwyn	Grimshaw and MD 135	Yes	Long term with maintenance
Village of Nampa	No	Yes	WTP updated in 1996, has 10 year horizon period for co-op expansion

Questions 6 and 7

- 6. Are upgrades scheduled for your system(s)? If so, when and what will they consist of?
- 7. Will the proposed upgrades result in more capacity? If yes, how much?

Rural Municipalities	Question 6	Question 7
Birch Hills County	Regional WTP / 2005	25-50% / rural use
County of Grande Prairie	New well, supply line, lagoon expansion	328,500m ³
Northern Sunrise County	Instrumentation/Cadotte WTP/2003, & study underway to draw from Peace & pipe to reservoir	No
MD of Big Lakes	WTPs to lower turbidity	No
MD of Greenview No.16	Debolt and Ridge Valley, more storage/2003	Yes 33m ³ / Debolt, 78m ³ / Ridge Valley (to enhance MD emergency services)
MD of Northern Lights No. 22	Keg River system scheduled for relocate and sizing in 2004	2004 raw water reservoir 54,553m ³ 24,900m ³ / (See Q2)
MD of Mackenzie No. 23	La Crete WTP / ~2005	La Crete - 610,580m ³ more to 2015 and then additional 659,016m ³ to 2025
MD of Lesser Slave River No. 124	3 WTPs, underway	129,000m ³
MD of Smoky River No. 130	In redistribution for expansion of co-ops (pumps, metering, disaffection)	Possibility of increasing storage.
MD of Spirit River No. 133	N/A	N/A
MD of Peace No. 135	On as needed basis	No

Urban Municipalities	Question 6	Question 7
City of Grande Prairie	Twin line to 2008, membrane technology to 2006	5,366,277m ³
Town of Beaverlodge	No	N/A
Town of Fairview	New Reservoir / 2003	386,363m ³ (total storage 977,272m ³); (See Q 2)
Town of Falher	Backwash disposal, monitoring / 2003	No
Town of Grimshaw	Chlorine system / 2003	No
Town of High Level	Treatment processes	1.450.0 with WTP / 2003
Town of High Prairie	Double reservoir capacity in 2010	591,000m ³
Town of Manning	River intake	No, but more dependable
Town of Peace River	Recent audit being reviewed by Council	Upgrades will result in overall capacity
Town of Rainbow Lake	WTP / 2004-2005	254,200m ³ with new WTP (See Q 2)
Town of Sexsmith	Potentially bring water from Grande Prairie / 2004	Yes (see Gr. Pr. Q10)
Town of Slave Lake	For treatment process / new guidelines	Only when raw water is poor
Town of Valleyview	Upgraded 2001	As per Q 2
Town of Wembley	New well	Yes, amount ?
Village of Berwyn	Chlorination / 2003	No
Village of Nampa	Future WTP expansion for rural users	Yes, amount unknown at present

Questions 8, 9 and 10

8. Has your municipality utilized any government water programs in the past 2 years (e.g. ICAP, AMWWP, other)? If so, please list which ones.
9. Did these programs provide an adequate level of funding?
10. Describe any cooperative efforts with other municipalities related to solving water problems that you may be involved with and any successes that have been achieved.

Rural Municipalities	Question 8	Question 9	Question 10
Birch Hills County	No	N/A	None
County of Grande Prairie	AMWWP	Yes	Regional water line and member of newly formed Aquatera Utilities Inc. with Grande Prairie and Sexsmith
Northern Sunrise County	ICAP & PFRA for water co-op.	More would be better. Too much bureaucracy.	1. work with Nampa's WTP to supply Nampa and County water co-op 2. Work with AENV, INAC, Woodland Cree – feasibility study / alternatives to low supply
MD of Big Lakes	AMWWP	Yes	Supply Kinuso, Kapawe'no First Nation & several water co-ops
MD of Greenview No. 16	No	-----	None
MD of Northern Lights No. 22	ICAP/2004 Keg River WTP with satellite potable water points for residents & industry.	ICAP, a huge benefit	No advantages for MD and Manning to link up.
MD of Mackenzie No. 23	ICAP, 64% of \$ 5.5 mil	Yes, ductile iron removal @ Ft. Vermilion (\$1mil) and est. 64% of \$5.5mil. for La Crete WTP	Determining water co-op interest?
MD of Lesser Slave River No. 124	AMWWP, ICAP	Yes for treatment; no funding for distribution systems	None
MD of Smoky River No. 130	1. PFRA/Co-op. 2. Working on EA for ICAP for Smoky River Co-op.	ICAP adequate compared to provincial formula.	MD, Falher, Girouxville, Donnelly & McLennan pursuing regional system. Falher now provides potable water to Girouxville, & MD (Smoky River Co-op, Guy and Jean Cote). Currently co-op has 65 connections and a request for 80 in 2003.
MD of Spirit River No. 133	ICAP-2003/2004 for rural distribution system	Yes	Treated water from Towns of Spirit River and Rycroft
MD of Peace No. 135	AMWWP	75%(?)	N/A

Urban Municipalities	Question 8	Question 9	Question 10
City of Grande Prairie	AMWWP	No, eligible for only 8%	City and County of Grande .Prairie. and Sexsmith intend to partner in Aquatera Utilities Inc. to provide regional services and industry
Town of Beaverlodge	ICAP, AMWWP	Yes	-----
Town of Fairview	AMWWP	No	Supply MD (Bluesky and co-op)
Town of Falher	AMWWP, 2000 WTP upgrade and new reservoir	No (28%). Debenturing still required.	Municipalities within MD 130 proposing regional water management commission. (See MD 130)
Town of Grimshaw	ICAP	No, insufficient for waterline replacements	Share parts, equipment
Town of High Level	AT	Funding shortage via grants. Used to cover 75%; now less. Other projects impacted. Costs skyrocketing.	20 years
Town of High Prairie	AMWWP	No, 58% on \$4mil.	High Prairie, MD Big lakes (for Enilda and rural residents accessing line+ truck fill @ Enilda and one @ High Prairie. Enilda truck fill provides Sucker Creek and East Prairie Metis Settlement occasionally.) Town provides to 6 MD water co-ops and one to be added in 2003.
Town of Manning	AMWWP	No	Share advice with other regional operators
Town of Peace River	AMWWP and ICAP	No, formula should be 'needs' assessment in addition to population driven	<ol style="list-style-type: none"> 1. GMEF funding not approved for PR / MD 135 / MD 22 for regional system. 2. Provide co-op in MD 135 along Shaftesbury Trail 3. Provides part of East Peace Co-op along Pat's Creek
Town of Rainbow Lake	AMWWP	72% of \$3-\$4mil.	-----
Town of Sexsmith	AMWWP	More would be welcome	(See Grande Prairie Q10)

Town of Slave Lake	AMWWP	No, since upgrades a condition of government approval	Considered an intake farther into Lesser Slave Lake, which in low levels would provide water down stream to agriculture and industry. Visualize opportunities in water and wastewater with adjacent MD.
Town of Valleyview	AMWWP - Water and wastewater upgrades at \$7million. Town grant 63%.	Wish it could be more for small town. (Appreciation expressed for assistance from AT at PR.)	Working with MD for co-op to supply residents and industry. Can't access sufficient funding to date.
Town of Wembley	ICAP	Yes	Discussions with City GP regarding connections in about 10 years.
Village of Berwyn	No	N/A	None
Village of Nampa	No	N/A	Supply Northern Sunrise County – water co-op to St Isidore, Marie Reine, Reno, Harmon Valley, Three Creeks and rural residents

Questions 11 and 12

11. Are you able to access information that you need to make decisions related to water supply?

12. In your opinion, what is the main issue (or issues) related to water that are facing your municipality?

Rural Municipalities	Question 11	Question 12
Birch Hills County	Yes	1. Quality and quantity of raw water 2. Funding to meet increased AENV standards
County of Grande Prairie	Yes	A rapidly growing area.
Northern Sunrise County	Yes	1. Lacking quality raw water at Cadotte Lake 2. Since AENV increases standards, province should increase funding.
MD of Big Lakes	Yes	Increase in AENV standards
MD of Greenview No. 16	Yes	Achieving new government standards
MD of Northern Lights No. 22	Yes	Ensured raw water supply (mainly rely on snow melt / run-off for storage)
MD of Mackenzie No. 23	Yes	Keeping reservoirs full at rural water points.
MD of Lesser Slave River No. 124	Yes	1. raw water quality 2. inadequate supply in Lesser Slave River
MD of Smoky River No. 130	Yes	1. Availability of raw water quality and quantity. 2. Increased provincial standards create financial hardships
MD of Spirit River No. 133	Yes	Raw water supply (study is underway)
MD of Peace No. 135	Yes	Province's chlorination requirements

Urban Municipalities	Question 11	Question 12
City of Grande Prairie	No, regulations for increasing diversion limits onerous, rationale unclear.	1. Huge costs to achieve stringent water quality standards 2. Demands of a growing region
Town of Beaverlodge	Yes	Feedlot operations upstream of intake on Beaverlodge River.
Town of Fairview	Yes	1. laboratory accreditation 2. regional systems 3. funding

Town of Falher	Yes, (AENV very helpful)	<ol style="list-style-type: none"> 1. Quantity and quality concerns from Winagami Lake source. (low levels and algae blooms) 2. Extreme cost for proposed raw water system. (municipal share in excess of \$2.5mil.)
Town of Grimshaw	Yes	<ol style="list-style-type: none"> 1. Water quantity and quality 2. Training (keeping operators updated)
Town of High Level	For the most part.	<ol style="list-style-type: none"> 1. Costs and complexities of systems 2. changing regulations 3. lack of skilled and/or available employees 4. strained politics between rural and urban
Town of High Prairie	Yes	Quantity of raw water from West Prairie River. Reservoir has 1 year storage (763,745m ³). Continuing drought would be a concern.
Town of Manning	Yes, via training, AENV and town engineers.	River intake often silts-in
Town of Peace River	-----	<ol style="list-style-type: none"> 1. Lack of funding. 2. Lack of co-ordination and long term vision. Regional systems as per Q10 should be encouraged and promoted.
Town of Rainbow Lake	-----	-----
Town of Sexsmith	Yes	<ol style="list-style-type: none"> 1. Supply. 2. To promote growth for residential and industry.
Town of Slave Lake	Yes	<ol style="list-style-type: none"> 1. capital and also operational funding. 2. next phase may include membrane filtration, which will have dramatic negative economic impact for users.
Town of Valleyview	Need accurate Little Smoky River instream flow data to comply with water license.	<ol style="list-style-type: none"> 1. intake diversion seriously hindered by AENV's instream flow needs 2. funding for a much needed potable system for rural neighbors
Town of Wembley	Yes	Aging infrastructure
Village of Berwyn	Yes	<ol style="list-style-type: none"> 1. water treatment 2. replacing old infrastructure
Village of Nampa	3 year study underway for the North Heart River Basin: (assist with water treatment methods, etc.)	<ol style="list-style-type: none"> 1. raw water quality 2. spraying season taxes system

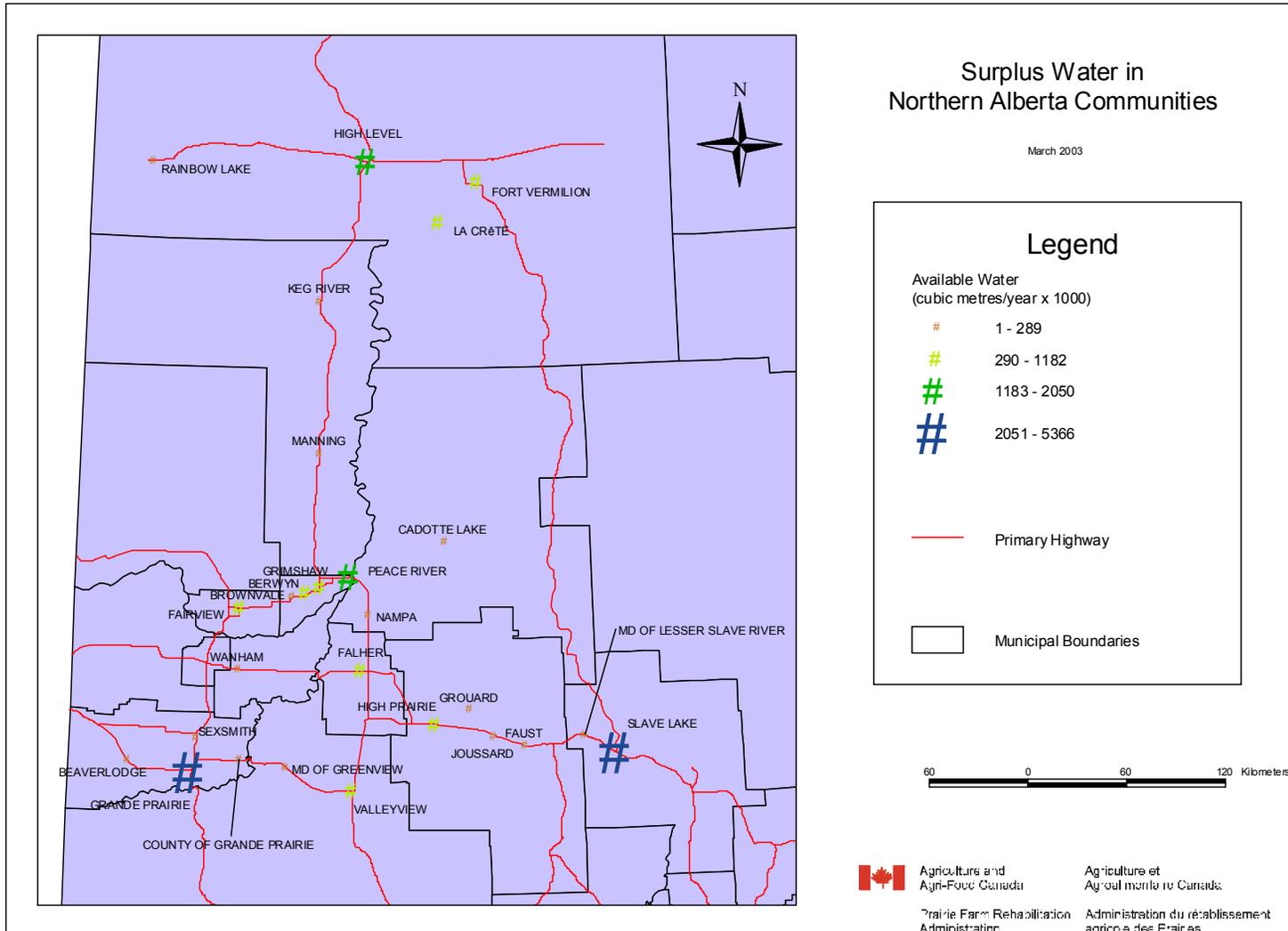
Conclusions to Municipal Responses:

There are significant water surpluses currently available, or with near future upgrades within several municipalities. Modern upgrades usually incorporate the potential for expansions of water treatment plants.

The following table and water availability map display municipalities' annual water consumption and their surplus water. They indicated that surplus water would be used for their future expansion requirements, including regional water distribution systems, with the bulk of it dedicated to other 'large' water users, such as industrial opportunities. The surpluses, in some instances, are dependent on upgrades within the next few years. Some surplus quantities are based on system design capacity and others on the licensed quantity. The latter is based on the assumption that the system could be upgraded to supply that quantity. The quantities shown in some cases depend on the continued security of the sources. Issues like contamination, drought and instream needs (INs) could create negative impacts. The tabled quantities could potentially be increased in other instances, depending upon the outcomes of studies/funding for regional water distribution systems, such as the pending Falher - river water line. Most of the delivery systems provide drinking water; a few others supply untreated (deregulated) raw water.

Municipalities	Annual Client Water (x 1000m ³)	Annual Surplus Water (x 1000m ³)
City of Grande Prairie	5,366.3	5,366.3
Town of Beaverlodge	7.8	3.1
Town of Fairview	546.9	1,181.9
Town of Falher	231.3	700.0
Town of Grimshaw	486.5	1,000.0
Town of High Level	550.0	1,450.0
Town of High Prairie	591.0	730.0 now, 1,195.7 / 2010
Town of Manning	242.4	120.0
Town of Peace River	1,715.1	2,050.6
Town of Rainbow Lake	254.2	254.2
Town of Sexsmith	233.4	58.4
Town of Slave Lake	1,058.4	2,116.8
Town of Valleyview	365.0	635.0
Town of Wembley	136.4	0
Village of Berwyn	88.9	378.1
Village of Nampa	175.1	57.8

Birch Hills County	45.0	22.5
County of Grande Prairie	163.8	163.8
Northern Sunrise County	31.5	Cadotte 7.9
MD of Big Lakes	283.9	Grouard 44.6, Jousard 18.0, Faust 21.3
MD of Greenview No. 16	35.3	(Debolt and Ridge Valley) 10.6
MD of Northern Lights No. 22	22.7 potable, 25.9 non potable	Keg River 24.9
MD of Mackenzie No. 23	528.1	Ft. Vermilion 453.1, La Crete 610.6
MD of Lesser Slave River No. 124	263.0	129.0
MD of Smoky River No. 130	15.0	Buy from Falher
MD of Peace No. 135	123.1	Brownvale 28.1



The municipal responses identified a few non-municipal self-supplied 'large' water users in the study area. It was not clear if they could provide surplus water.

For most part, municipalities in need of water system improvements are familiar with the process and where and with whom to contact in regards to accessing information/advise, technical assistance, and funding programs.

The Alberta Municipal Water/Wastewater Partnership Program (AMWWP) was predominantly utilized. The Infrastructure Canada – Alberta Program (ICAP) was utilized less frequently. There is no longer ICAP funding for these types of projects except for current commitments. Some municipalities indicated government funding was adequate. However, the majority expressed that costs usually result in the need for debenturing, creating municipal hardships as other priority projects are postponed or even eliminated, including much needed water and wastewater facilities/upgrades. To compound the situation, the Province's increased standards can be expected to additionally heighten costs and furthermore costs seem to be increasing exponentially.

Two years ago the municipalities strongly expressed their concern for high water/wastewater infrastructure costs. To date program formulas have not changed to help municipalities with their ability to pay. Eleven municipal responses, which were definite, indicated funding was inadequate; 9 said it was sufficient and the balance were not answered or vague. Municipalities need to review current funding formulas and programs and make recommendations to the Province for alterations to better enable them to secure timely adequate water facilities.

The 2001 WIB Study recommended that municipalities collectively work together to attain overlapping water systems where geographically / economically this was astute and where water sources are also conducive to such joint activities. It appears a number of these group endeavors are underway and others in the planning stages. However, there still are some instances where municipal politics and funding availability hinder community water advantages. This is an area that needs to be worked on.

There were a number of primary water issues expressed by the municipalities. Some were specific to their systems. The issues most common to municipalities overall are as follows:

- A need for assured long time good quantity and quality raw water
- Faced with large capital and operational infrastructure costs
- Meeting the province's enhanced standards, hastens upgrade timing with more complicated systems and further expenditures.
- Retaining skilled workers and keeping them current with training
- Faced with early and increased demands in areas with rapid growth
- Concerns were voiced about ground water and surface water being used for oil well injection rather than utilizing sub-surface saline water. It is felt that this is wasting a valuable resource. The oil industry views this process as a continued economic benefit. The matter requires study.

2.2.2 Other Government and Agency Inputs (including new initiatives, programs, water tools and websites)

Agriculture and Agri-Food Canada Prairie Farm Rehabilitation Administration (PFRA)

PFRA is a branch of Agriculture and Agri-Food Canada whose mission is to work with Prairie people to develop a viable agricultural industry and sustainable rural economy in Manitoba, Saskatchewan, Alberta and the Peace River Region of British Columbia.

Web site: <http://www.agr.gc.ca/pfra/>

As part of Agriculture and Agri-Food Canada, PFRA is guided by the principles of the Agricultural Policy Framework (APF), a federal-provincial-territorial initiative to develop an agricultural policy framework composed of five elements: food safety and food quality, environment, science and innovation, renewal, and business risk management. The framework, which is based on the setting of common goals for each element, entails important benefits for the sector and ultimately the general public. More details can be found at http://www.agr.gc.ca/puttingcanadafirst/index_e.php

Regional Groundwater Assessment (RGWA)

The Peace River regional groundwater assessment is well underway. The project encompasses all of Northwest Alberta municipalities in the White Zone as a whole, as opposed to individual municipalities as was done in Southern Alberta. Such an assessment is an overview of the groundwater resources in a region and identifies areas where aquifers may be more susceptible to contamination.

- regional aquifers (estimated well yield and water quality)
- areas with poor groundwater resources

The studies describe yield, quality, depth/cost and contamination risk.

Phase I is complete: well records, GIS data and maps.

Phase II is underway: report for each municipality, final maps, and internet sites and groundwater query program.

The study is useful when drilling a new well as it contains information on:

- groundwater yield
- water quality
- areas susceptible to contamination
- information can be searched per quarter section via website

Questions? Contact PFRA in Peace River at 624-3386 to obtain hard copies or visit <http://www.agr.ca/pfra/water/groundw.htm>

Rural Water Development Program (RWDP)

The RWDP, similar to 2 years ago, provides technical assistance to agricultural related and municipal clients to help solve water supply problems. Applicants may also be eligible for funding for up to one third of the cost of infrastructure. The program has changed making it available to individuals also. Based on the usual number of applicants, one can conclude the program is under funded.

National Water Supply Expansion Program (NWSEP)

NWSEP was announced in August of 2002. It is a program aimed at developing solutions to water supply issues across Canada considered a priority to agriculture. These may include projects such as large scale pipelines, schemes to improve management of existing water supplies or studies that will identify water supply solutions for areas that are currently experiencing shortfalls or are anticipated to experience water supply shortages in the near future. More information can be found at <http://www.agr.gc.ca/cb/news/2002/n20809ae.html>

National Land and Water Information Service (NLWIS)

The NLWIS, in partnership with others, will lead in providing the best available information, analysis and interpretation of land and water resources to all Canadians. This will result in improved land and water management decisions within a National framework. The NLWIS will measurably improve the environmental performance of the agriculture and agri-food sector to provide a quality of life Canadians deserve through improved stewardship of our land, water and air resources. <http://www.agr.gc.ca/nlwis/maine.htm>

Alberta Environment (AENV)

The AENV overview is on their home website: <http://www3.gov.ab.ca/env/water>. This site links to the status of Water For Life: Alberta's Strategy for Sustainability, which is due to be released this year: <http://www.WaterForLife.gov.ab.ca/>

Alberta must develop a strategy to ensure we have an effective and sustainable way of conserving, managing and protecting water supplies, which will preserve the environment while maintaining a high quality of life for Albertans.

The specific objectives of Water For Life are to ensure Alberta has:

- healthy, sustainable ecosystems
- a safe, secure drinking water supply
- reliable, quality water supplies for a sustainable economy
- the knowledge necessary to make effective water management decisions

Water For Life is a strategy aimed at addressing the following challenges:

Water Quantity

- There is a growing demand for water in the province, and a dwindling supply.
- There is increasing uncertainty about the ability to predict supply and demand. We can estimate the demand, but supply is difficult to predict due to unforeseeable environmental factors, including the effects of climate change.
- Alberta has a significant amount of groundwater, yet there is a lack of knowledge and understanding of its groundwater resources.
- Certain basins in some areas of the province are nearing the limits of water allocation, particularly during dry periods when less water is flowing in the rivers.
- Alberta must honor its commitments to Saskatchewan and Montana with regard to the amount of water that will flow into each jurisdiction.
- Economic opportunity is being lost in some areas of the province because of a lack of water supply.

Water Quality

- As Alberta's economy and population continue to grow, there may be increased potential for agricultural, industrial and municipal activities to affect Alberta's streams, lakes, rivers and groundwater.

- About 600,000 rural Albertans -- or 20 per cent of our population -- get their drinking water from private water systems, and do not have the same level of assurance as those who use approved waterworks systems.
- Recent events in Walkerton, Ontario and North Battleford, Saskatchewan have increased public awareness and concern about the safety and management of municipal water supplies.
- There are signs that water quality problems are putting increased stress on Alberta's rivers and lakes. This affects fish habitats, as well as the public's ability to enjoy water-related recreational activities, such as swimming.

The goal is to have an action-oriented water strategy, one that identifies specific activities and initiatives, in place by fall 2003.

Framework for Water Management Planning

<http://www3.gov.ab.ca/env/water/legislation/framework.pdf>

The government is committed, through the Water Act, to develop a guide for effective and efficient water management planning called the 'Framework for Water Management Planning'. The framework outlines the process for water management planning and the components required for water management plans in the province. It applies to all types of water bodies including streams, rivers, lakes, aquifers and wetlands, and takes a holistic approach. The framework is meant to provide general guidance for the planning process. The framework recognizes the linkages between water and the other resources such as forests, fish, wildlife, petroleum, minerals, and public and private lands.

A major component of the framework and a requirement of the Water Act is the Strategy for the Protection of the Aquatic Environment. The aquatic environment can be defined in terms of water quantity, water quality, habitat and aquatic species. The government's commitment is to maintain, restore or enhance the condition of the aquatic environment. The strategy will bring into play the Environmental Protection and Enhancement Act, the Fisheries Act, the Wildlife Act and a number of other necessary Acts and Codes.

Lesser Slave Lake and Lesser Slave River Basins Water Management Plan

Since Alberta Environment has a regulatory responsibility for controlling wastewater releases into the environment (Environmental Protection and Enhancement Act), the responsibilities for allocating water and protecting the aquatic environment (Water Act), and is responsible for water management in the Province (Alberta's Commitment to Sustainable Resource and Environmental Management), a water management plan is proposed for the Lesser Slave Lake and River Basins. The plan will strive to balance environmental, community, and economic issues with government policy for the protection and management of water resources.

The Terms of Reference for 'Lesser Slave Lake and Lesser Slave River Basins Water Management Plan - Phase I' is currently in draft stage. The objectives of the plan will be to:

- determine current water allocation, demand and supply in the planning area.
- estimate potential future water demand and supply within the planning area.
- recommend water conservation objectives for the Lesser Slave River
- establish conditions under which water flows in the Lesser Slave River may be supplemented.
- determine the impact of modifying the lake control weir on lake hydrology and surrounding lands.
- provide technical and water management information.

AENV Water Websites:

- The above websites have 'quicklinks' and 'advisories' that provide good sources of water information.
- AENV and others continue to add data to the **Forum For Community Watersheds Groups Website** at: <http://www.albertawatersheds.org/>

References are made to wetland and riparian areas (e.g. Cows and Fish Program):

- Water quality protection, environmental protection
 - Enhances fish habitat
 - Shoreline protection
 - Buffers water supply sources (recharge groundwater, reduce flood risk, offset drought)
 - Sustains biodiversity (wildlife habitat)
- Approvals issued under the Water Act and Environmental Protection and Enhancement Act are available on the 'Approval Viewer'.

Alberta Transportation

AMWWP and ICAP @: www.trans.gov.ab.ca, then click on 'municipal programs.'

Alberta Municipal Water Wastewater Partnership Program (AMWWP)

- The Alberta Municipal Water Wastewater Partnership Program (AMWWP) is available to cities, towns, villages and hamlets and was utilized by several of these municipalities in the Northwest Alberta. The program is committed to others for future works.
- Projects consist of water treatment plants, intakes, reservoirs (raw and treated water), transmission lines (raw and treated water), upgrades to facilities (treatment, pumphouses, etc.), instrumentation and engineering studies. Raw water projects for example consist of raw water transmission lines that lead to the treatment plant.
- Some municipalities undertook co-operative projects
- Costs are dependent upon the project scope. The funding formulas remain the same as those of 2 years ago. Funding is based on the municipality's population, up to 45,000. Maximum funding is 75% for populations under 1,000. This declines as the population increases after 1,000.
- There are some applications pending for one reason or another.
- There are municipalities who should be applying for upgrades but are reticent to do so due to funding concerns, consequently administration are not following through.
- There could be municipalities requiring upgrades which AT may not be aware of.
- AT has not initiated any new water programs in the last 2 years.
- The AT home website is new and improved; existing websites are regularly updated.
- AT has no other special water management tools to assist municipalities with water issues or information other than their website information.

Infrastructure Canada – Alberta Program (ICAP)

The ICAP Manager advised that the program was fully committed. It had been utilized by a number of NWB municipalities for various 'Green' projects (i.e. environmental enhancement) including water and wastewater systems. The program was a partnership between federal, provincial and municipal governments. ICAP and AMWWP Programs complimented each other (e.g. ICAP-WTP/AMWWP-feeder lines or ICAP-main lines/AMWWP-WTP). These programs could not be overlapped for greater funding opportunities for municipalities.

Over the last 2 years approximately \$7 million total funding went towards ICAP in the NWB involving all types of 'Green' projects. To date there is no further funding available for rural

municipal 'Green' projects under this part time program. It has primarily ended except for those already committed small community infrastructure works across Canada.

Alberta Agriculture, Food and Rural Development (AAFRD)

Changes to AAFRD's water related programs in the last 2 years:

The Alberta Environmentally Sustainable Agriculture (AESAs) Program, continues to monitor water quality in 23 small agriculture watersheds across the white zone of the province. <http://www.aesa.ca/>. The program is approaching the end of the first 5-year WQ trend analysis, and as such land cover and ag-census trend information is being up dated. Small items are added to the program as WQ issues arise. For example, glyphosate analysis has been added to a subset of watersheds, some additional watersheds are brought into the program for short periods to answer specific questions, a pilot-scale study is under way to look for correlation between shallow groundwater quality and ag-intensity.

In addition to the AESA program, AAFRD are near completing a couple of large research projects. Their investigation of sources of crypto and giardia in the North Saskatchewan basin wrapped up a year ago, and some beneficial management practices-evaluation work that they did near Lacombe is in the process of being assembled.

AAFRD anticipates the Province's 'Water for Life' strategy and the Federal-Provincial Agricultural Policy Framework (APF), once finalized, will generate some new departmental initiatives and programs. The APF is a safety net funding program with details yet to be finalized, but expected to be released in mid summer, 2003. It will provide cost sharing between the two levels of government and the benefactors. Funding will be available for drought relief and for an environmental component. The latter will involve environmental farm planning and incentives for environmentally sound beneficial farm management practices (BMPS).

Pharmaceutical residues in surface waters and antibiotic-resistant bacteria appear to be new upcoming issues.

Alberta Economic Development (AED)

AED has no legislation, policy or programs on water supply management but require water supply information as criteria for new development prospecting.

AED perceives a need to review all 2001 WIB recommendations.

They anticipate hiring a consultant on a short-term basis to determine which municipalities need assistance with water information, processes and information sharing, overlapping co-ordination and advantages between communities such as regional water distribution systems.

Upon conclusion of this research project AED wants a clear definition as to who, and which municipalities have how much water, including shortages and the locations where there are available surpluses for economic development purposes.

Health Regions

Keeweenaw Health Authority, as representative for Northwest Alberta Health Regions advised:

Their water related services and programs have not changed significantly in the last 2 years. There has been a provincial effort through the Technical Advisory Committee on Safe Drinking Water to (TACSDW) address several water related issues on a provincial level. One of the outcomes of this initiative has been the development of an 'Environmental Health Field Manual on Drinking Water'. This manual is now in use by all health authorities so that consistency in approach, advice and application can be attained across the province. One change of note is the upcoming change from faecal coliform as an indicator organism to Ecoli. The possibility of putting

the Environmental Health Field Manual on Drinking Water on the Alberta Health website is being discussed. It will probably go on later this year.

Ducks Unlimited Canada (DUC)

DUC programs have not changed significantly in the past two years. They tend to be more reactive than proactive in terms of the construction of significant water controls. They may try to use other securement techniques before building a control. Long-term management costs are an issue.

DUC pursues partnerships with non-government organizations such as the Alberta Conservation Association and the Nature Conservancy of Canada.

They are currently trying to develop a GIS based analysis tool that combines waterfowl data, wetland layers, perennial cover, etc. to identify key waterfowl areas.

DUC expressed a concern that this study was mostly about water supply and development. Wetland conservation, other societal benefits, and so on appeared to not be given much attention. AENV's Water For Life initiative will assist to overcome this concern.

2.2.3 Mutual Water Issues

Continued Drought Concerns

Alberta Environment

Ongoing concerns: reliable source of good quality water for municipalities (e.g. Valleyview, municipalities serviced by the Winagami-Girouxville Canal, others); reliable supply of water for industrial/commercial use (e.g. Ranger-Slave Lake Pulp).

Water For Life, Alberta's Strategy for Sustainability (preliminary) is addressing drought issues by way of pursuing good water conservation practices.

Alberta Agriculture Food and Rural Development

Concerns if drought trends continue:

- deteriorating quality of standing water supplies (dugouts, etc.)
e.g. eutrophication, cyanotoxins, etc.
- quality of 'alternative' water sources?

Alberta Drought Risk Management Plan (ADRMP)

The Drought Web Page lists a number of resources
<http://www.agric.gov.ab.ca/navigation/sustain/agdisaster/index.html>

The program involves the development of drought science/climate study and to replicate what the USA does. This is a proactive means to drought risk management planning and preparedness. A response to drought, for example, would be to enable comparison to affected areas in previous years. This would enable fairness by being able to respond similarly to future different drought stricken areas.

A partnership with AAFRD, AENV, Environment Canada, Agriculture and Agri-Food Canada and the University of Alberta will see the installation of 35 new Drought Net weather stations by March 31, 2003. These state-of-the-art weather monitoring stations will help to identify drought stricken areas of our province by providing real time, year round weather information.

The data gathered from these stations will be inputted into drought 'models' to provide drought severity, drought forecasting and drought impact scenarios to help our producers better respond to imminent or occurring drought.

In the mid to late '90s, recurring drought in our province prompted the Alberta government to look at a new approach to drought management in Alberta. A planned and coordinated policy and response plan was needed to help the agriculture industry and the Alberta government fiscally recover from drought. With an emphasis on preparedness and a coordinated response policy, the ADRMP was developed. Drought Net is a major initiative of the ADRMP.

With 2002 being the first year of implementation, the record dry conditions forced the ADRMP to go directly to drought response mode. Drought responses resulting from ADRMP implementation included an extended Alberta Farm Water Program, a Grasshopper Control Program and the \$324 million Farm Income Assistance Program.

The feasibility of a long-term farm water program, similar to the existing program, is now being considered as part of the drought preparedness function of the ADRMP. Again severe drought conditions in 2001/02 made only short-term programs possible at the time.

Over time, continued drought is going to have a large impact on Alberta's water tables. It is conceivable that more farmers will become interested in accessing surface water, through group pipelines, as the main source of household/livestock water on their farm versus the current trend to drill a well, or put a dugout on the farm.

From the environmental sustainability perspective, many farmers are encouraged to assess their on-farm water developments to ensure both quantity and quality. Environmental farm plans (EFP's) will be used in the future to assess environmental risks at the farm level. (Refer to: Federal- Provincial 'Agricultural Policy Framework' in the foregoing Section 2.2.2. / AAFRD / Page 23).

Alberta Farm Water Program (AFWP)

As an aid to drought situations, the current AFWP, which was implemented in 2001, reimburses producers for one-third of development costs, to a maximum payment of \$5,000. The program has been extended twice, with the current deadline being March 31, 2003 for completion of projects.

This program is for bona-fide farmers (active producers with greater than \$10,000 annual value of production). Its purpose is to provide assistance toward the cost of permanent on-farm water supply developments during the period January 1, 2001 to March 31, 2003, which are implemented as part of a long-term water supply plan. This supply can relate to agricultural or household usage. Payment may be provided for permanent on-farm water supply developments that reduce drought risk due to water supply or distribution problems. Eligible projects could include: wells, stock watering dams, spring development, cisterns, buried pipelines, dugouts, and remote watering system components, e.g. rural water co-ops.

Although the program is currently very well received by the farming industry in Alberta, we are helping to ensure that farmers are spending their money on the most effective water source for their farm. For example, producers putting dugouts in historically dry areas, or relying on water hauling for livestock watering may not be a long-term solution. The program encourages all producers to contact either an AAFRD water specialist, or those involved in PFRA to ensure that farmer funds are used most effectively.

Agriculture and Agri-Food Canada (AAFC)
Prairie Farm Rehabilitation Administration (PFRA)

PFRA's 'Drought Watch' Website for the Prairie Provinces

http://www.agr.gc.ca/pfra/drought/index_e.htm

The impact of climatic variability on the environment is of great importance to the agricultural sector on the Canadian Prairies. Monitoring the impacts on water supplies, soil degradation and agricultural production is essential to the preparedness of the region in dealing with possible drought conditions. The information about drought risk in Western Canada includes precipitation data, drought probabilities, water levels, forage conditions, climate, etc.

National Program for Drought Stricken Areas in Canada

As mentioned in Section 2.2.2, the four year \$60 million National Water Supply Expansion Program (NWSEP), was announced in 2002 to fund water supply expansion projects in the severest drought-affected areas across the country, particularly Saskatchewan and Alberta. Ten million dollars was made available in 2002 and the remaining \$50 million is dedicated over the subsequent three years to the development of solutions to water supply issues across Canada considered a priority to agriculture.

Ducks Unlimited Canada

With drought, the biggest concern is the increased opportunity for extending ditching into wetlands and the cultivation of wetland basins. Extended ditching actions were observed in the Peace country last year and this region was no means as dry as other parts of the Prairies. One benefit of a drought is the fact that landowners begin to appreciate permanent wetlands as they are sources for stock watering and water hauling.

Confined Feeding Operations (CFOs) and Intensive Livestock Operations (ILOs)

Alberta Sustainable Resource Development (ASRD)

A mandate of ASRD's Natural Resources Conservation Board (NRCB) is to regulate the Confined Feeding Operation (CFO) industry under the Agricultural Operation Practices Act.

The NRCB is concerned about ensuring the operations they work with do not adversely affect surface water and groundwater. To do that they need to be aware of the surface water and groundwater conditions in the area. Their focus is primarily quality of the water because Alberta Environment assesses the quantity issues as a part of the water licence. The NRCB acts as a 'one window' to government so that the water application goes through as part of the application process. Their objective is to ensure that all CFO's obtain a water licence if one is required under the Water Act.

The protocol of the Grimshaw Gravels Aquifer Management Advisory Association (GGAMAA) involves a broad involvement if an ILO is requested in the area, which is to avoid contamination to the aquifer. Joint representation from AENV, NRCB, PFRA make recommendations to GGAMAA regarding liquid manure injection on fields – timing, quantity and testing to ensure soils can cope with it, etc. This process is to ensure potable water is not jeopardized.

Alberta Agriculture Food Rural Development

Beneficial Management Practices (BMP), Environmental Manuals

AAFRD recently published 'Beneficial Management Practice, Environmental Manual for Feedlot Producers in Alberta' and 'Beneficial Management Practice, Environmental Manual for Hog Producers in Alberta; another 4, dairy, poultry, cow/calf, cropping will be available by March 31. The objectives of these manuals is to provide Alberta producers with information on environmental beneficial management practices to reduce impacts on soil, water, air and nuisance, and define for Alberta's industry reasonable, and acceptable environmental practices. The outcome is having producers use beneficial practices and nutrient management planning to reduce the impact of livestock production on soil, air and water. As well, the practices outlined in the manuals will serve to reduce nuisance effects of livestock production.

- Prohibited Releases: in accordance with the Environmental Protection and Enhancement Act, a feedlot cannot release or spread manure if the release or spreading of manure causes a significant adverse effect on the environment
- Deleterious Substance: The Federal Fisheries Act prohibits anyone from depositing a deleterious or harmful substance that may enter any water frequented by fish.
- Water Act: an approval is required for the undertaking of an activity which includes the construction, operation or maintenance of a structure that may:
 - alter the flow or level of water
 - change the location or direction of flow of water
 - cause the siltation of water
 - cause the erosion of any bed or shore of a water body
 - cause an effect on the aquatic environment

If it is necessary for the feedlot operator to divert more than 6,250m³ of surface water or groundwater per year, a water license is required.

Prairie Farm Rehabilitation Administration

PFRA becomes involved with livestock operations when requested for water assistance.

<http://www.albertabeefnorth.ca/>

This website is designed to consolidate and abbreviate the vast amount of information available on [Ropin' The Web](#) and within Alberta Agriculture, Food and Rural Development with respect to the Peace Region and the Boreal Transition Zone or "Northern Alberta". You will find agronomic information such as climate, water supply, soil zone and growing seasons, as well as market information such as regional services and what businesses are in these regions. The cost of production information that will be collected for several years will demonstrate that there are equal business opportunities (or better) for beef enterprises in the North as there are anywhere in North America.

This initiative may potentially lead to southern cattle farmers expanding to the north.

Ducks Unlimited Canada (DUC)

DUC are trying to promote a forage conversion program. They supply up front money for the establishment of forages for a 10 year period. This may be a useful program for flood prone lands or other marginal lands where there are water issues.

Potable Water

Alberta Environment (AENV)

A Drinking Water Branch has been created to focus on potable water issues. Drinking Water Guidelines will be upgraded.

Key Initiatives

- Will new standards, which determine increased treatment requirements, significantly impact on municipalities? AENV will assess smaller communities to determine system/cost impacts, determine level of investment and by whom, time frames for implementation by the government and/or the municipality to meet the new standards.
- The opportunity for promotion/development of regional water delivery systems will be encouraged. Epcore/Edmonton for example provides for 40 communities. The AENV Water For Life strategy will emphasize this approach for smaller areas and will assess what sort of joint endeavors show promise based on all factors. This is evolving with some of the Northwest Alberta urban centers providing for water co-ops and rural municipalities, and in other instances urban supplying urban.

For information about Canadian Drinking Water Guidelines connect to Health Canada's website at: <http://www.hc-sc.gc.ca>.

Health Regions

One issue of primary concern is blue-green algae (cyanobacteria) contamination. After the major problem experienced in Lesser Slave Lake in the fall of 2002 and after several other instances throughout the province, a sub-committee of the TACSDW has been formed to make recommendations regarding blue-green algae monitoring, action, etc. Hopes are to have at least interim testing and action protocols in place by summer, 2003.

2.2.4 Primary Water Concerns Identified

- AENV: raw water quality and quantity for municipalities
- AENV: reliable water supply for municipalities' rapid growth, AENV's standards are increasing which will require that municipalities upgrade
- AENV: number of lakes in Northern Alberta that are fairly to highly eutrophic - why?); lake aeration is necessary to keep an introduced fishery alive
- DUC: Effective and consistent implementation of the Water Act. Unauthorized drainage continues to be a problem. Hence, wetland loss and the possibilities of restoration are two key concerns. Implementation of watershed planning efforts, including wetland conservation and restoration, will likely be key over the near future. Education on the importance of wetlands and the policies and regulations governing those wetlands is key, at all levels from individuals to municipalities.

2.2.5 Conclusions to Government and Agency Inputs

The information gathered relative to the assessment of water related issues, initiatives and programs is an overview of what has transpired since the 2001 WIB study. There were many water related activities that were identified in 2001, which are still ongoing. However for most part, they are not repeated within this assessment, but can be reviewed in the WIB report.

The information gathered from government and other agency groups with key water responsibilities and needs draw the following conclusions:

- These parties overall are conscientious and sensitive to Northwest Alberta water issues, with particular emphasis on overcoming the depletion of good quality water sources.

- The primary concern identified is the need for adequate good quality water. This parallels the main issue voiced by the municipalities.
- There are several programs to assist with water acquisition and infrastructure such as Prairie Farm Rehabilitation Administration's Rural Water Development Program and Regional Ground Water Assessment Program, Alberta Transportation's Alberta Municipal Water Wastewater Partnership and Infrastructure Canada-Alberta Programs, Alberta Agriculture, Food and Rural Development's Alberta Farm Water Program. Some of these have been modified and others introduced by federal and provincial departments and other partners to mitigate depleting water supplies and safeguard water quality.
- Alberta Environment's Water For Life strategy is to take the direction to ensure there is an effective and sustainable way of conserving, managing and protecting water supplies, which will preserve the environment while maintaining a high quality of life for Albertans.
- The government is committed, through the Water Act, to develop a guide for effective and efficient water management planning called the Framework for Water Management Planning. The Lesser Slave Lake and River Basins plan is in draft form.
- Alberta Agriculture, Food and Rural development continually pursue research to maintain environmentally sustainable agriculture and to assist the rural communities in numerous ways.
- Alberta Economic Development in their quest for economic development opportunities, recognizes a primary need for adequate quality water.
- Health Regions welcome improved standards to enhance and promote health and wellness.
- Ducks Unlimited Canada programs are always in the best interest of conservation.

- Drought imposes extra strains on the water resource.
 - Specific concerns for municipalities and other water users with already constrained supplies.
 - Water For Life needs to give extra attention to conservation.
 - Concern within the rural community increases due to deteriorating standing water supplies.
 - Alberta Agriculture, Food and Rural Development and Prairie Farm Rehabilitation Administration have drought science/climate studies underway.
 - Ducks Unlimited Canada are concerned that wetlands are apt to have ditches extended into them for future drainage purposes.

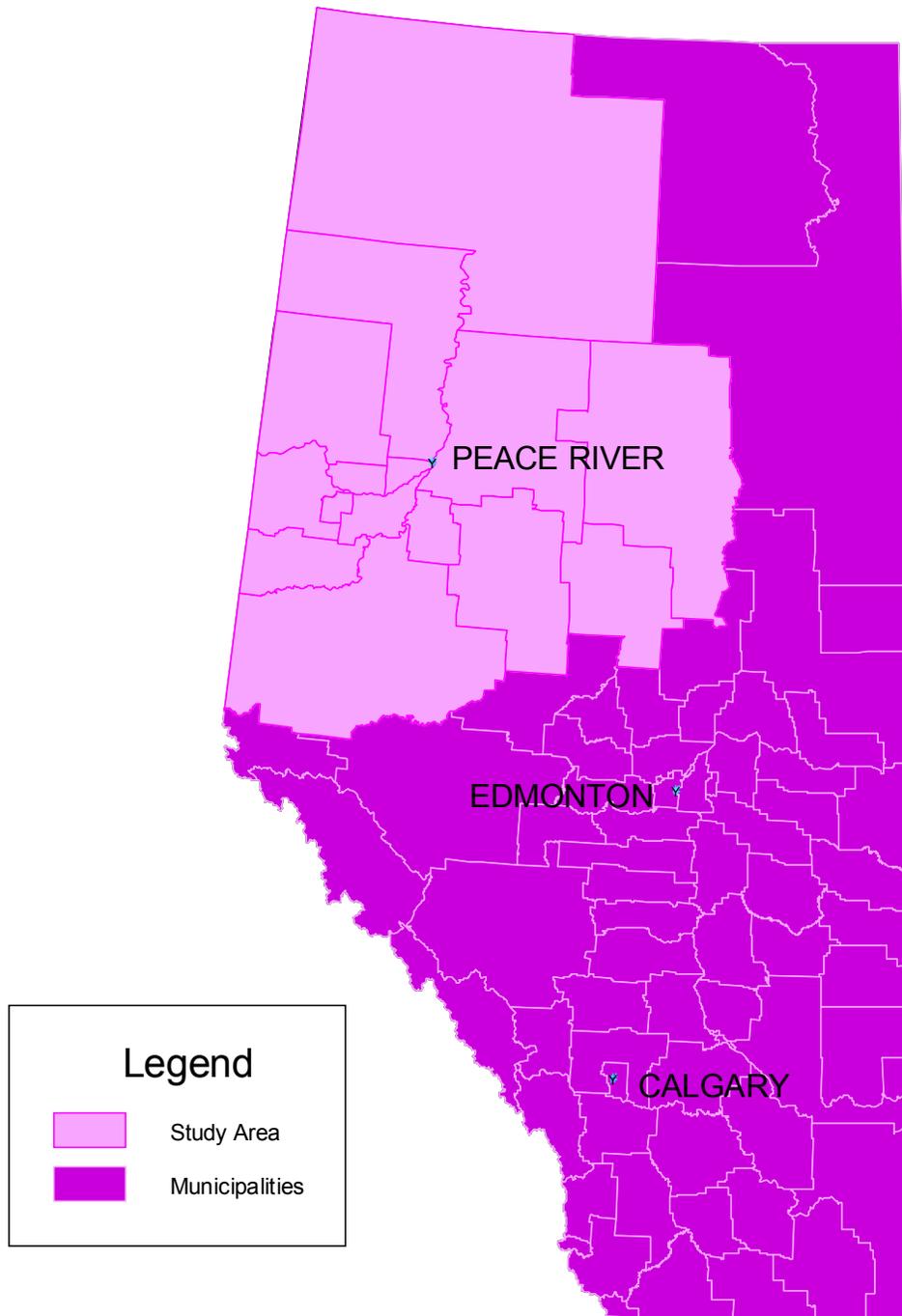
- Confined Feeding Operations
 - Alberta Sustainable Resource Development's legislation is to safeguard water quality from Confined Feedlot Operation processes.
 - Alberta Agriculture, Food and Rural Development has produced Beneficial Management Practices Manuals, which include the requirements of the Water Act, Environmental Protection and Enhancement Act and Federal Fisheries Act.
 - Alberta Agriculture, Food and Rural Development and Prairie Farm Rehabilitation Administration's AlbertaBeefNorth is an incentive for cattle producers to locate to Northwest Alberta.

- Potable Water Issues
 - Alberta Environment's new Drinking Water Branch was created to give added attention to the need to achieve and assure adequate water of good quality.
 - Government is similarly concerned, as are municipalities that new standards will further impact infrastructure costs. This is an area that needs to be investigated.
 - The development of regional water delivery systems needs to be encouraged.
 - A lack of fresh incoming water to several lakes in the region, causing blue-green algae contamination, is of concern to the Health Regions. Testing and action protocols need to be developed.

- Primary water issues (in addition to those mentioned above)
 - AENV: Rapid growth in some municipalities increases concern for reliable water supplies.
 - AENV: Many lakes in Northern Alberta are fairly to highly eutrophic resulting in low oxygen levels and affecting the fishery.
 - DUC: Expressed a need for consistency in applying the Water Act to offset problems of unauthorized ditching. Education, conservation, policies and regulations applied to wetlands are important.

Appended: Map of the study area.

Key Plan



Appendix C – Canadian Drinking Water Quality Guidelines



Guidelines for Canadian Drinking Water Quality

Summary Table

Prepared by the

Federal-Provincial-Territorial Committee on
Drinking Water
of the
Federal-Provincial-Territorial Committee on
Health and the Environment

December 2010

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Introduction

The *Guidelines for Canadian Drinking Water Quality* are published by Health Canada on behalf of the Federal-Provincial-Territorial Committee on Drinking Water (CDW). This summary table is updated regularly and published on Health Canada's website (www.healthcanada.gc.ca/waterquality). It supersedes all previous versions, as well as the published booklet of the *Sixth Edition of the Guidelines for Canadian Drinking Water Quality*.

These guidelines are based on current, published scientific research related to health effects, aesthetic effects, and operational considerations. Health-based guidelines are established on the basis of comprehensive review of the known health effects associated with each contaminant, on exposure levels and on the availability of treatment and analytical technologies. Aesthetic effects (e.g., taste, odour) are taken into account when these play a role in determining whether consumers will consider the water drinkable. Operational considerations are factored in when the presence of a substance may interfere with or impair a treatment process or technology (e.g., turbidity interfering with chlorination or UV disinfection) or adversely affect drinking water infrastructure (e.g., corrosion of pipes).

The Federal-Provincial-Territorial Committee on Drinking Water establishes the Guidelines for Canadian Drinking Water Quality specifically for contaminants that meet all of the following criteria:

1. exposure to the contaminant could lead to adverse health effects;
2. the contaminant is frequently detected or could be expected to be found in a large number of drinking water supplies throughout Canada; and
3. the contaminant is detected, or could be expected to be detected, at a level that is of possible health significance.

If a contaminant of interest does not meet all these criteria, the Federal-Provincial-Territorial Committee on Drinking Water may choose not to establish a numerical guideline or develop a Guideline Technical Document. In that case, a Guidance Document may be developed.

Guidance Documents undergo a process similar to Guideline Technical Documents, including public consultations through the Health Canada website. They are offered as information for drinking water authorities, and help provide guidance relating to contaminants, drinking water management issues or emergency situations. Consultation documents, Guideline Technical Documents and Guidance documents are available from the Health Canada website (www.healthcanada.gc.ca/waterquality).

In general, the highest priority guidelines are those dealing with microbiological contaminants, such as bacteria, protozoa and viruses. Any measure taken to reduce concentrations of chemical contaminants should not compromise the effectiveness of disinfection.

Inquiries can be directed to: water_eau@hc-sc.gc.ca

Membership of the Federal-Provincial-Territorial Committee on Drinking Water

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Alberta	Department of Environment	Dr. Donald Reid
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Manitoba	Department of Water Conservation	Ms. Kim Philip
New Brunswick	Department of Health and Wellness	Ms. Karen White
Newfoundland and Labrador	Department of Environment and Conservation	Mr. Haseen Khan
Northwest Territories	Stanton Territorial Health Authority	Mr. Duane Fleming
Nova Scotia	Department of Environment and Labour	Ms. Judy MacDonald
Nunavut Territory	Department of Health and Social Services	Mr. Peter Workman
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Prince Edward Island	Department of Environment, Energy and Forestry	Mr. George Somers
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Yukon Territory	Department of Health and Social Services	Ms. Patricia Brooks
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Environment Canada/Canadian Council of Ministers of the Environment	Dr. Doug Spry

Committee secretary

Health Canada (Water, Air and Climate Change Bureau, Safe Environments Directorate, Healthy Environments and Consumer Safety Branch)	Ms. Anne Vézina
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New, revised, reaffirmed and upcoming guidelines

Guidelines for several chemical, physical and microbiological parameters are new or have been revised since the publication of the *Sixth Edition of the Guidelines for Canadian Drinking Water Quality* in 1996. These new and revised guidelines are presented in Table 1.

Table 1. New and revised guidelines

Parameter	Guideline (mg/L)	Previous guideline (mg/L)	CHE approval
<i>Microbiological parameters</i>^a			
Bacteriological		0 coliforms/100 mL	
<i>E. coli</i>	0 per 100 mL		2006
Total coliforms	0 per 100 mL		2006
Heterotrophic plate count	No numerical guideline required		2006
Emerging pathogens	No numerical guideline required		2006
Protozoa	No numerical guideline required	None	2004
Enteric viruses	No numerical guideline required	None	2004
Turbidity	0.3/1.0/0.1 NTU ^b	1.0 NTU	2004
<i>Chemical and physical parameters</i>			
Aluminum	0.1/0.2 ^c	None	1999
Antimony	0.006	None	1997
Arsenic	0.01	0.025	2006
Benzene	0.005	0.005	2009
Bromate	0.01	None	1999
Chlorate	1	None	2008
Chlorine	No numerical guideline required	None	2009
Chlorite	1	None	2008
Cyanobacterial toxins—microcystin-LR	0.0015	None	2002
Fluoride	1.5	1.5	1996
Formaldehyde	No numerical guideline required	None	1998
Haloacetic Acids—Total (HAAs)	0.08	None	2008
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	0.1	None	2010
Methyl <i>tertiary</i> -butyl ether (MTBE)	0.015	None	2006
Trichloroethylene (TCE)	0.005	0.05	2005
Trihalomethanes—Total (THMs) ^d	0.1	0.1	2006

Guidelines for Canadian Drinking Water Quality—Summary Table

Parameter	Guideline (mg/L)	Previous guideline (mg/L)	CHE approval
Uranium	0.02	0.1	2000
<i>Radiological parameters</i>			
Cesium-137 (¹³⁷ Cs)	10 Bq/L	10 Bq/L	2009
Iodine-131 (¹³¹ I)	6 Bq/L	6 Bq/L	2009
Lead-210 (²¹⁰ Pb)	0.2 Bq/L	0.1 Bq/L	2009
Radium-226 (²²⁶ Ra)	0.5 Bq/L	0.6 Bq/L	2009
Strontium-90 (⁹⁰ Sr)	5 Bq/L	5 Bq/L	2009
Tritium (³ H)	7000 Bq/L	7000 Bq/L	2009

^aRefer to section on Guidelines for microbiological parameters.

^bBased on conventional treatment/slow sand or diatomaceous earth filtration/membrane filtration.

^cThis is an operational guidance value, designed to apply only to drinking water treatment plants using aluminum-based coagulants. The operational guidance values of 0.1 mg/L applies to conventional treatment plants, and 0.2 mg/L applies to other types of treatment systems.

^dThe separate guideline for BDCM was rescinded based on new science. See addendum to the THM document.

In certain situations, the Federal-Provincial-Territorial Committee on Drinking Water may choose to develop guidance documents: for contaminants that do not meet the criteria for guideline development, and for specific issues for which operational or management guidance is warranted.

Table 2. Guidance documents

Parameter or issue	CHE approval
Boil water advisories	2009
Chloral hydrate	2008
Corrosion Control	2009
Drinking water avoidance advisories	2009
Potassium from water softeners	2008

The Federal-Provincial-Territorial Committee on Drinking Water has established a science-based process to systematically review older guidelines to assess the need to update them. Table 3 provides the list of parameters whose guidelines remain appropriate and have been reaffirmed as a result of this review. Health Canada and the FPT Committee on Drinking Water will continue to monitor research on these parameters and recommend any revision(s) to the guidelines that is deemed necessary.

Table 3. Reaffirmed guidelines (2005)

Asbestos	Chloride	Diuron	Odour	2,3,4,6-
Azinphos-methyl	Colour	Ethylbenzene	Paraquat	Tetrachlorophenol
Bendiocarb	Cyanazine	Gasoline	Pentachlorophenol	Toluene
Benzo(a)pyrene	Diazinon	Glyphosate	Phorate	2,4,6-Trichlorophenol
Bromoxynil	Dicamba	Iron	Picloram	Trifluralin
Cadmium	2,4-Dichlorophenol	Magnesium	Silver	Xylenes
Calcium	Diclofop-methyl	Malathion	Taste	Zinc
Carbaryl	Dimethoate	Methoxychlor	Temperature	
Carbofuran	Diquat	Metribuzin	Terbufos	

Table 4 outlines documents which are being or have been developed and are awaiting approval through the Federal-Provincial-Territorial process.

Table 4. Upcoming documents (not yet finalized/approved)

Parameter or subject	Document type (GTD or guidance)	Current status
Ammonia	GTD	In preparation ^b
Carbon tetrachloride	GTD	In preparation ^a
Chromium	GTD	In preparation ^b
Dichloroethane, 1,2-	GTD	In preparation ^b
Dichloromethane	GTD	In preparation ^a
<i>E.coli</i>	GTD	In preparation ^b
Enteric viruses	GTD	In preparation ^a
Fluoride	GTD	In preparation ^a
Heterotrophic plate count	guidance	In preparation ^b
Nitrate/Nitrite	GTD	In preparation ^b
N-Nitrosodimethylamine (NDMA)	GTD	In preparation ^a
Protozoa	GTD	In preparation ^b
Selenium	GTD	In preparation ^b
Tetrachloroethylene	GTD	In preparation ^b
Total coliforms	GTD	In preparation ^b
Turbidity	GTD	In preparation ^b
Vinyl chloride	GTD	In preparation ^b

^aFinal guideline technical document or guidance document in preparation for final approval/posting.

^bGuideline technical document or guidance document being prepared for public consultation.

Guidelines for microbiological parameters

Currently available detection methods do not allow for the routine analysis of all microorganisms that could be present in inadequately treated drinking water. Instead, microbiological quality is determined by testing drinking water for *Escherichia coli*, a bacterium that is always present in the intestines of humans and other animals and whose presence in drinking water would indicate faecal contamination of the water.

Bacteriological guidelines

Escherichia coli

The maximum acceptable concentration (MAC) of *Escherichia coli* in public, semi-public, and private drinking water systems is none detectable per 100 mL.

Testing for *E. coli* should be carried out in all drinking water systems. The number, frequency, and location of samples for *E. coli* testing will vary according to the type and size of the system and jurisdictional requirements.

Total coliforms

The MAC of total coliforms in water leaving a treatment plant in a public system and throughout semi-public and private supply systems is none detectable per 100 mL.

For distribution systems in public supplies where fewer than 10 samples are collected in a given sampling period, no sample should contain total coliform bacteria. In distribution systems where greater than 10 samples are collected in a given sampling period, no consecutive samples from the same site or not more than 10% of samples should show the presence of total coliform bacteria.

Testing for total coliforms should be carried out in all drinking water systems. The number, frequency, and location of samples for total coliform testing will vary according to the type and size of the system and jurisdictional requirements.

Heterotrophic plate count

No MAC is specified for heterotrophic plate count (HPC) bacteria in water supplied by public, semi-public, or private drinking water systems. Instead, increases in HPC concentrations above baseline levels are considered undesirable.

Emerging pathogens

No MAC for current or emerging bacterial waterborne pathogens has been established. Current bacterial waterborne pathogens include those that have been previously linked to gastrointestinal illness in human populations. Emerging bacterial waterborne pathogens include, but are not limited to, *Legionella*, *Mycobacterium avium* complex, *Aeromonas hydrophila*, and *Helicobacter pylori*.

Protozoa

Although *Giardia* and *Cryptosporidium* can be responsible for severe and, in some cases, fatal gastrointestinal illness, it is not possible to establish MACs for these protozoa in drinking water at this time. Routine methods available for the detection of cysts and oocysts suffer from low recovery rates and do not provide any information on their viability or human infectivity. Nevertheless, until better monitoring data and information on the viability and infectivity of cysts and oocysts present in drinking water are available, measures should be implemented to reduce the risk of illness as much as possible. If the presence of viable, human-infectious cysts or oocysts is known or suspected in source waters, or if

Giardia or *Cryptosporidium* has been responsible for past waterborne outbreaks in a community, a treatment and distribution regime and a watershed or wellhead protection plan (where feasible) or other measures known to reduce the risk of illness should be implemented. Treatment technologies in place should achieve at least a 3-log reduction in and/or inactivation of cysts and oocysts, unless source water quality requires a greater log reduction and/or inactivation.

Viruses

Although enteric viruses can be responsible for severe and, in some cases, fatal illnesses, it is not possible to establish MACs for enteric viruses in drinking water at this time. Treatment technologies and watershed or wellhead protection measures known to reduce the risk of waterborne outbreaks should be implemented and maintained if source water is subject to faecal contamination or if enteric viruses have been responsible for past waterborne outbreaks. Where treatment is required, treatment technologies should achieve at least a 4-log reduction and/or inactivation of viruses.

Turbidity

Waterworks systems that use a surface water source or a groundwater source under the direct influence of surface water should filter the source water to meet the following health-based turbidity limits, as defined for specific treatment technologies. Where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times. Where this is not achievable, the treated water turbidity levels from individual filters:

1. For **chemically assisted filtration**, shall be less than or equal to **0.3 NTU** in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 1.0 NTU at any time.
2. For **slow sand or diatomaceous earth filtration**, shall be less than or equal to **1.0 NTU** in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 3.0 NTU at any time.
3. For **membrane filtration**, shall be less than or equal to **0.1 NTU** in at least 99% of the measurements made, or at least 99% of the time each calendar month, and shall not exceed 0.3 NTU at any time. If membrane filtration is the sole treatment technology employed, some form of virus inactivation* should follow the filtration process.

Guidelines for chemical and physical parameters

Table 5 provides the complete list of all current numerical Guidelines for chemical and physical parameters. Guidelines are either health-based and listed as Maximum Acceptable Concentrations (MAC), based on aesthetic considerations and listed as aesthetic objectives (AO) or established based on operational considerations and listed as Operational Guidance Values (OG). Parameters for which the health-based guideline was developed as an interim maximum acceptable concentration (IMAC) are identified with an asterisk (*) in the table below. The use of these 'interim' MACs was discontinued by the Federal-Provincial-Territorial Committee on Drinking Water in 2003. For more information on specific guidelines, please refer to the guideline technical document for the parameter of concern.

*Some form of virus inactivation is required for all technologies. The difference is that chemically assisted, slow sand and diatomaceous earth filters are credited with log virus reductions and membrane filters receive no credit.

Table 5. Health-based and aesthetic guidelines for chemical/physical parameters

Parameter	MAC (mg/L)	AO [or OG] (mg/L)	Year of approval (or reaffirmation)
Aldicarb	0.009		1994
Aldrin + dieldrin	0.0007		1994
Aluminum ^a		[0.1/0.2]	1998
*Antimony ^b	0.006		1997
Arsenic	0.01		2006
*Atrazine + metabolites	0.005		1993
Azinphos-methyl	0.02		1989 (2005)
Barium	1		1990
Bendiocarb	0.04		1990 (2005)
Benzene	0.005		2009
Benzo[a]pyrene	0.00001		1988 (2005)
*Boron	5		1990
*Bromate	0.01		1998
*Bromoxynil	0.005		1989 (2005)
Cadmium	0.005		1986 (2005)
Carbaryl	0.09		1991 (2005)
Carbofuran	0.09		1991 (2005)
Carbon tetrachloride	0.005		1986
Chloramines—total	3		1995
Chlorate	1		2008
Chloride		≤250	1979 (2005)
Chlorite	1		2008
Chlorpyrifos	0.09		1986
Chromium	0.05		1986
Colour ^d		≤15 TCU	1979 (2005)
Copper ^b		≤1.0	1992
*Cyanazine	0.01		1986 (2005)
Cyanide	0.2		1991
Cyanobacterial toxins—Microcystin-LR ^e	0.0015		2002
Diazinon	0.02		1986 (2005)
Dicamba	0.12		1987 (2005)
1,2-Dichlorobenzene ^e	0.2	≤0.003	1987
1,4-Dichlorobenzene ^e	0.005	≤0.001	1987
*1,2-Dichloroethane	0.005		1987

Guidelines for Canadian Drinking Water Quality—Summary Table

Parameter	MAC (mg/L)	AO [or OG] (mg/L)	Year of approval (or reaffirmation)
1,1-Dichloroethylene	0.014		1994
Dichloromethane	0.05		1987
2,4-Dichlorophenol,	0.9	≤0.0003	1987 (2005)
*2,4-Dichlorophenoxyacetic acid (2,4 -D)	0.1		1991
Diclofop-methyl	0.009		1987 (2005)
*Dimethoate	0.02		1986 (2005)
Dinoseb	0.01		1991
Diquat	0.07		1986 (2005)
Diuron	0.15		1987 (2005)
Ethylbenzene		≤0.0024	1986 (2005)
Fluoride	1.5		1996
*Glyphosate	0.28		1987 (2005)
Haloacetic Acids—Total (HAAs)	0.08		2008
Iron		≤0.3	1978 (2005)
Lead ^b	0.01		1992
Malathion	0.19		1986 (2005)
Manganese		≤0.05	1987
Mercury	0.001		1986
Methoxychlor	0.9		1986 (2005)
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	0.1		2010
Methyl tertiary-butyl ether (MTBE)		0.015	2006
*Metolachlor	0.05		1986
Metribuzin	0.08		1986 (2005)
Monochlorobenzene	0.08	≤0.03	1987
Nitrate ^f	45		1987
Nitritotriacetic acid (NTA)	0.4		1990
Odour		Inoffensive	1979 (2005)
*Paraquat (as dichloride) ^g	0.01		1986 (2005)
Parathion	0.05		1986
Pentachlorophenol	0.06	≤0.030	1987 (2005)
pH ^h		6.5–8.5	1995
Phorate	0.002		1986 (2005)
*Picloram	0.19		1988 (2005)
Selenium	0.01		1992
*Simazine	0.01		1986

Guidelines for Canadian Drinking Water Quality—Summary Table

Parameter	MAC (mg/L)	AO [or OG] (mg/L)	Year of approval (or reaffirmation)
Sodium ⁱ		≤200	1992
Sulphate ^j		≤500	1994
Sulphide (as H ₂ S)		≤0.05	1992
Taste		Inoffensive	1979 (2005)
Temperature		≤15°C	1979 (2005)
*Terbufos	0.001		1987 (2005)
Tetrachloroethylene	0.03		1995
2,3,4,6-Tetrachlorophenol	0.1	≤0.001	1987 (2005)
Toluene		≤0.024	1986 (2005)
Total dissolved solids (TDS)		≤500	1991
Trichloroethylene	0.005		2005
2,4,6-Trichlorophenol	0.005	≤0.002	1987 (2005)
*Trifluralin	0.045		1989 (2005)
Trihalomethanes-total (THMs) ^k	0.1		2006
Turbidity ^l			2004
*Uranium	0.02		1999
Vinyl chloride	0.002		1992
Xylenes—total		≤0.3	1986 (2005)
Zinc ^b		≤5.0	1979 (2005)

^aThis is an operational guidance value, designed to apply only to drinking water treatment plants using aluminum-based coagulants. The operational guidance values of 0.1 mg/L applies to conventional treatment plants, and 0.2 mg/L applies to other types of treatment systems.

^bFaucets should be thoroughly flushed before water is taken for consumption or analysis.

^cThe guideline is considered protective of human health against exposure to all microcystins that may be present.

^dTCU = true colour unit.

^eIn cases where total dichlorobenzenes are measured and concentrations exceed the most stringent value (0.005 mg/L), the concentrations of the individual isomers should be established.

^fEquivalent to 10 mg/L as nitrate–nitrogen. Where nitrate and nitrite are determined separately, levels of nitrite should not exceed 3.2 mg/L.

^gEquivalent to 0.007 mg/L for paraquat ion.

^hNo units.

ⁱIt is recommended that sodium be included in routine monitoring programmes, as levels may be of interest to authorities who wish to prescribe sodium-restricted diets for their patients.

^jThere may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.

^kExpressed as a running annual average. The guideline is based on the risk associated with chloroform, the trihalomethane most often present and in greatest concentration in drinking water.

^lRefer to section on Guidelines for microbiological parameters for information related to various treatment processes.

Parameters without guidelines

Some chemical and physical parameters for which a Guideline Technical Document is available have been identified as not requiring a numerical guideline, because currently available data indicate that it poses no health risk or aesthetic problem at the levels generally found in drinking water in Canada.

Table 6. Parameters without numerical guidelines

Ammonia	Asbestos
Calcium	Chlorine
Formaldehyde	Gasoline
Hardness ^a	Magnesium
Radon	Silver

^aPublic acceptance of hardness varies considerably. Generally, hardness levels between 80 and 100 mg/L (as CaCO₃) are considered acceptable; levels greater than 200 mg/L are considered poor but can be tolerated; those in excess of 500 mg/L are normally considered unacceptable. Where water is softened by sodium ion exchange, it is recommended that a separate, unsoftened supply be retained for culinary and drinking purposes.

Archived parameters

The Federal-Provincial-Territorial Committee on Drinking Water has established a science-based process to systematically review older guidelines and archive older guidelines which are no longer required. Guidelines are archived for parameters which are no longer found in Canadian drinking water supplies at levels that could pose a risk to human health, including pesticides which are no longer registered for use in Canada, and for mixtures of contaminants that are addressed individually. Table 7 provides the list of parameters whose guidelines have been archived as a result of this review.

Table 7. Parameters that have been archived^a

Chlordane (total isomers) ^b	Polychlorinated biphenyls (PCBs)
Dichlorodiphenyltrichloroethane (DDT) + metabolites ^b	Polycyclic aromatic hydrocarbons (PAH) ^c
Endrin ^b	Resin acids
Heptachlor + heptachlor epoxide ^b	Tannin
Lignin ^b	Temephos ^d
Lindane ^b	Total organic carbon (TOC)
Methyl-parathion ^b	Toxaphene ^b
Mirex	Triallate ^d
Pesticides (total)	2,4,5-Trichlorophenoxyacetic acid (2,4,5-T) ^d
Phenols (total)	2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) ^b
Phthalic acid esters (PAE)	

^aPublished in the 1978 version of the *Supporting Documentation* for these parameters (available upon request).

^bIn 1978 'Pesticides' Supporting Documentation.

^cOther than benzo[a]pyrene.

^dNo documentation available.

Guidelines for radiological parameters

Natural sources of radiation are responsible for the large majority of radiation exposure (>98%), excluding medical exposure. Guidelines for radiological parameters focus on routine operational conditions of existing and new water supplies and does not apply in the event of contamination during an emergency involving a large release of radionuclides into the environment. They have been developed taking into account new studies and approaches, including dosimetric information released by the International Commission on Radiological Protection (ICRP) in 1996 (ICRP, 1996). Maximum acceptable concentrations (MACs) in drinking water have been established for the natural and artificial radionuclides that are most commonly detected in Canadian water supplies, using internationally accepted equations and principles and based solely on health considerations. They are calculated using a reference dose level of 0.1 mSv for 1 year's consumption of drinking water, assuming a consumption of 2 L/day at the MAC.

To facilitate the monitoring of radionuclides in drinking water, the reference level of dose is expressed as an activity concentration, which can be derived for each radionuclide from published radiological data. The National Radiological Protection Board has calculated dose conversion factors (DCFs) for radionuclides based on metabolic and dosimetric models for adults and children. Each DCF provides an estimate of the 50-year committed effective dose resulting from a single intake of 1 Bq[†] of a given radionuclide.

The MACs of radionuclides in public water supplies are derived from adult DCFs, assuming a daily water intake of 2 L, or 730 L/year, and a maximum committed effective dose of 0.1 mSv, or 10% of the International Commission on Radiological Protection limit on public exposure:

$$\text{MAC (Bq/L)} = \frac{1 \times 10^{-4} \text{ (Sv/year)}}{730 \text{ (L/year)} \times \text{DCF (Sv/Bq)}}$$

The radiological effects of two or more radionuclides in the same drinking water source are assumed to be additive. Thus, the following summation formula should be satisfied in order to demonstrate compliance with the guidelines:

$$\sum_i \frac{C_i}{\text{MAC}_i} \leq 1$$

where C_i and MAC_i are the observed and maximum acceptable concentrations, respectively, for each contributing radionuclide. Only those radionuclides that are detected with at least 95% confidence should be included in the summation. Detection limits of undetected radionuclides should not be substituted for the concentrations C_i . Otherwise, a situation could arise where a sample fails the summation criterion even though no radionuclides are present.

Water samples may be initially analysed for the presence of radioactivity using techniques for gross alpha and gross beta determinations rather than measurements of individual radionuclides. Compliance with the guidelines may be inferred if the measurements are less than 0.5 Bq/L for gross alpha

[†]Becquerel (Bq) is the unit of activity of a radioactive substance, or the rate at which transformations occur in the substance. One becquerel is equal to one transformation per second and approximately equal to 27 picocuries (pCi).

activity and less than 1 Bq/L for gross beta activity. Alpha emissions are generally associated with naturally occurring radionuclides, whereas beta emissions are generally associated with artificial radionuclides. Although facilitating routine examination of large numbers of samples, these procedures do not allow for confirmation of the identities of the contributing radionuclides. These measurements are generally suitable either as a preliminary screening procedure to determine if further radioisotope-specific analysis is necessary or, if radionuclide analyses have been carried out previously, for detecting changes in the radiological characteristics of the drinking water source. The sampling and analyses for individual radionuclides should be carried out often enough to accurately characterize the annual exposure. If the source of the radioactivity is known or expected to be changing rapidly with time, then the sampling frequency should reflect this factor. If there is no reason to expect concentrations to vary with time, then sampling may be carried out seasonally, semi-annually or annually. If measured concentrations are consistent and well below the MACs, this would be an argument for reducing the sampling frequency. In contrast, the sampling frequency should be maintained, or even increased, if concentrations are approaching individual MACs or if the sum of ratios of the observed concentration to the MAC for each contributing radionuclide approaches 1.

Table 8. Health based guidelines for radiological parameters

<i>Radiological parameters</i>	
Cesium-137 (^{137}Cs)	10 Bq/L
Iodine-131 (^{131}I)	6 Bq/L
Lead-210 (^{210}Pb)	0.2 Bq/L
Radium-226 (^{226}Ra)	0.5 Bq/L
Strontium-90 (^{90}Sr)	5 Bq/L
Tritium (^3H)	7000 Bq/L