Alberta Environment's Drinking Water Program

A 'Source to Tap, Multi-Barrier' Approach

May 2009

Government of Alberta

Reproduction and Availability

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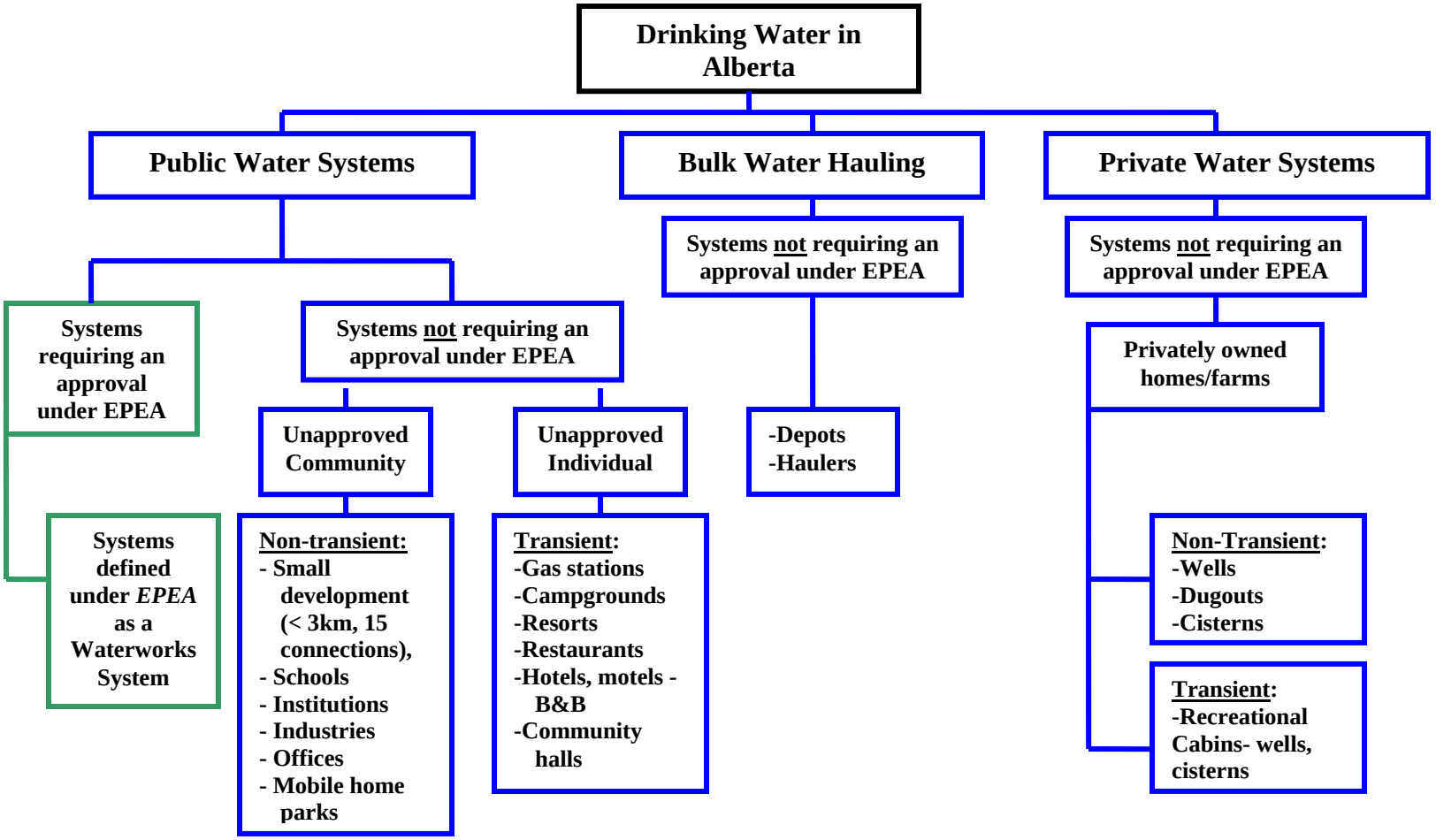
Introduction

Safe, secure drinking water is essential to Albertans and the Government of Alberta is committed to the wise management of water through *Water for Life: Alberta's Strategy for Sustainability*. One goal of the strategy is to assure Albertans that their drinking water is safe. Most of Alberta's drinking water systems are regulated by Alberta Health and Wellness and Alberta Environment. First Nations, Federal lands and facilities are under the jurisdiction of the Federal Government.

Alberta's drinking water systems are either private or public and serve a population of approximately three and a half million people. Private systems serve a single privately-owned residence or building where the public has no interest in such a water supply, and the onus is on the owner to test and treat their water. Public systems provide potable water to serve the general public. Potable water is water that will be used for drinking, cooking, bathing, dish washing or other domestic purposes requiring water suitable for human consumption. These public systems are subject to legislation from either Alberta Health and Wellness or Alberta Environment. Alberta Environment approved systems are referred to as waterworks systems and require an approval under the *Environmental Protection and Enhancement Act* (*EPEA*). A waterworks system refers to any system providing potable water; it can include infrastructure such as water treatment plants, potable water storage facilities and water distribution systems. Public waterworks systems that require health related treatment of their raw water before distribution are examples of approved systems and represent approximately 10 per cent of all systems across the province, but serve approximately 80 per cent of the population.

The raw water source, type of subdivision, and the size and type of the drinking water system determines whether or not the system requires an approval under *EPEA* from Alberta Environment. Unapproved public systems do not require an approval under *EPEA* and are regulated by Alberta Health and Wellness and Alberta Health Services (Figure 1). Public drinking water systems that do not require health related treatment of their raw water are examples of unapproved systems. They represent approximately 90 per cent of all systems across the province, however only serve approximately 20 per cent of the population.



Systems Approved by Alberta Environment
Systems not approved by Alberta Environment

Figure 1: Classification of Approved and Unapproved Systems (adapted from the *Environmental Public Health Manual for Safe Drinking Water 2007*)

The Multi-Barrier Approach

Alberta Environment uses a multi-barrier approach to ensure that safe, secure drinking water is provided to Albertans. This method is referred to as a 'Source to Tap, Multi-Barrier Approach' or STMBA and the term 'source to tap' refers to the continuum of environments water passes through – from a water body to the consumer's drinking water tap.

Barriers may be physical or administrative in nature. A physical barrier is a material object that impedes or separates; a filter is an example of a physical barrier. Physical barriers are quantitative in nature and allow for an assessment of tangible and measurable results. An administrative barrier is more conceptual and more difficult to quantify. For example, the cumulative effect that development (such as residential, commercial, industrial, forestry and agricultural activities) has on a watershed can dramatically impact water quality. Source protection planning is an example of an administrative barrier. It identifies risks and hazards impacting raw water supplies and allows for more informed decision-making with regard to activities and development in addition to lowering the risk of potential adverse impacts.

Alberta Environment's STMBA consists of legislation, drinking water systems, knowledge and awareness, performance assurance, and protection (Figure 2).

Appendix I provides an overview of Alberta Environment's Drinking Water Program as it relates to approved and unapproved waterworks systems.

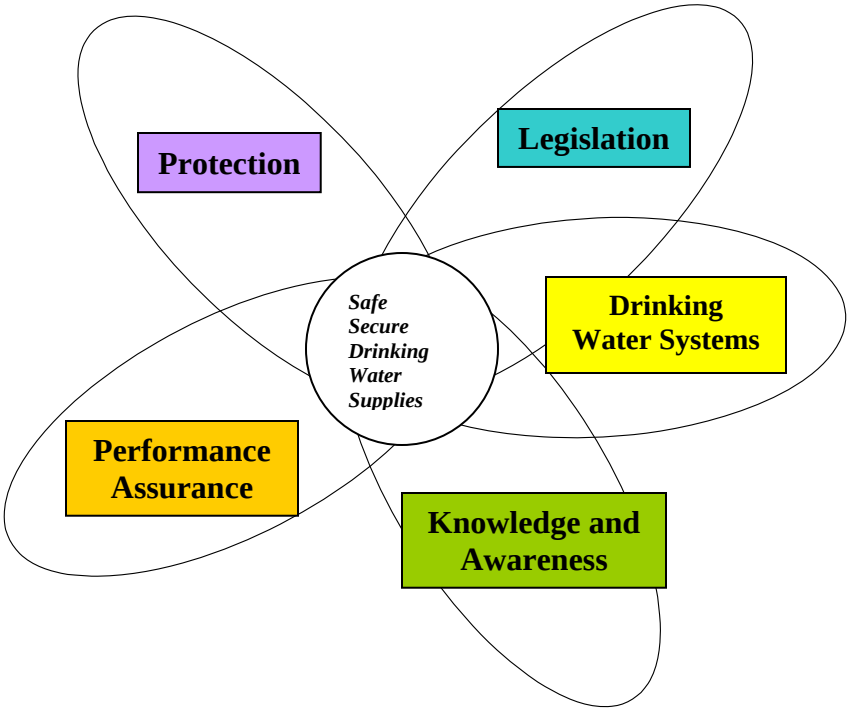


Figure 2: Alberta Environment's STMBA

Legislation

Effective and current legislation provides the legal foundation for the STMBA. Health Canada leads a Federal/Provincial/Territorial committee that develops the *Guidelines for Canadian Drinking Water Quality*. Under the *EPEA*, drinking water from Alberta Environment approved waterworks systems must meet the health related parameters of the *Guidelines for Canadian Drinking Water Quality*. Alberta Health and Wellness also utilizes the *Guidelines for Canadian Drinking Water Quality* for unapproved systems. The *Public Health Act* provides broad provisions to address health issues pertaining to any condition that may negatively impact public health including conditions that may give rise to unsafe drinking water.

A number of regulations under the *EPEA* and the *Public Health Act (PHA)* provide more detailed information on legislative requirements. Under the *EPEA*, the *Activities Designation Regulation* describes waterworks systems regulated by Alberta Environment; the *Potable Water Regulation* details minimum design standards for approved surface and groundwater treatment and distribution systems in Alberta; the *Approvals and Registration Procedure Regulation* outlines the steps to be followed to acquire an approval or registration for a waterworks facility; and the *Environmental Appeal Board Regulation* outlines the process in submitting an appeal. Design, performance and monitoring standards for these waterworks systems are provided in Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*. Under the *PHA*, the *Nuisance and General Sanitation Regulation* outlines various requirements associated with domestic water and sewage systems that are outside the scope of *EPEA*. Once treated water moves out of the waterworks distribution system past the service connection for a residence, Municipal Affairs governs under the *Safety Codes Act*, including the *Plumbing Code Regulation*. This prevents or controls pollutants from contaminating the treated water by the materials used to build the service connection.

The Government of Alberta is committed to working with stakeholders to make certain that the legislation and supporting documents are continuously updated to ensure that system design and operation accounts for current knowledge and emerging technologies.

Drinking Water Systems

This element of the STMBA includes the funding, design and upgrading process required to maintain sustainable state-of-the-art waterworks systems capable of producing water that will meet evolving standards.

The Government of Alberta provides grants to support the construction of, and upgrades to, waterworks systems. Alberta Transportation administers the Alberta Municipal Water/Wastewater Partnership (AMWWP) funding program for municipally-owned waterworks systems on behalf of the Province. The level of funding for municipally-owned water supply projects varies depending on factors such as community size and stand-alone versus regional systems. The Government of Alberta provides a higher level

of funding for regional systems in an effort to promote more sustainable drinking water systems in the province.

A facility assessments initiative was conducted across Alberta under *Water for Life: Alberta's Strategy for Sustainability*. This comprehensive review of all approved waterworks facilities acts as the baseline for future planning to ensure sustainable drinking water systems. The assessment information is updated and maintained annually. Alberta Environment's Drinking Water website provides a summary of these assessments called the *Waterworks Facility Assessment Report*.

Unapproved systems regulated by the Alberta Health Services must be properly sited, designed, constructed and managed to provide safe, secure supplies of drinking water. *The Environmental Public Health Manual for Safe Drinking Water* outlines processes to deliver safe drinking water from sources such as wells, dugouts and cisterns.

Knowledge and Awareness

Awareness of the issues facing drinking water systems now and in the future is vital to ensuring safe, secure drinking water for all Albertans. Alberta Health and Wellness, the Provincial Public Health Laboratory, Alberta Health Services and Alberta Environment all have roles to play in maintaining this awareness through education, technical assistance and knowledge transfer.

Accurate, up-to-date information and knowledge in the following areas ensures that decision-making is informed and evidence-based.

- Risk assessments;
- State-of-the-art waterworks systems;
- Management of unapproved systems regulated by health services;
- Operation;
- Waterborne disease surveillance and pathogen detection;
- Research and development;
- Reporting;
- Emergency response;
- Evaluation and audit of the overall effectiveness of the STMBA; and
- Watershed and source protection

Stakeholders that contribute to and benefit from such awareness include:

- Consumers;
- Operators;
- Owners;
- Watershed groups;
- Regulated Communities;
- All orders of Government; and
- Drinking water professionals

In addition, Alberta Environment has developed a Full Cost Accounting (FCA) initiative that promotes fiscal planning among municipal waterworks systems. FCA addresses system assets and operations and contributes to the sustainability of the waterworks system. This initiative assists municipalities by providing a FCA reporting template in accordance with established accounting standards specific to drinking water operations. The objective is to ensure that municipal and provincial governments have accurate information regarding the true cost of providing and supplying quality drinking water.

As one of *Water for Life's* goals is to ensure Albertans are knowledgeable and have access to on-line reporting of all approved drinking water facility test sample results, Alberta Environment is working with facilities to have all monthly reports available electronically. Reports not currently available on-line can be obtained by contacting the owner of the waterworks facility or an Alberta Environment Regional Office.

Performance Assurance

The Performance Assurance element for approved waterworks systems is a three-pronged approach consisting of (a) approvals and registrations (also referred to as Codes of Practice); (b) compliance assistance; and (c) enforcement. In these three areas staff undertake routine monitoring and inspections to ensure the compliance of the approved drinking waterworks systems.

(a) Approvals and registrations for the construction and operation of waterworks facilities specify both treatment processes and emergency response procedures. 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. Approvals provide a greater level of detail than the *EPEA* or regulations and are more responsive to site-specific conditions. For activities that are uniform across Alberta, registrations are used instead of site specific approvals. These registrations set out province-wide mandatory requirements for an activity or operation. For example, waterworks systems using high quality groundwater would receive a registration and must follow conditions stipulated in the *Code of Practice for Waterworks Systems Using High Quality Groundwater*. The other registration affecting drinking water is the *Code of Practice for a Waterworks System Consisting Solely of a Water Distribution System*.

(b) Compliance assistance ensures that legislative requirements are met and so is preventative in nature. Compliance assistance actions encourage continuous improvement and process optimization by owners of drinking water systems. Regional Drinking Water Operations Specialists (DWOS) work closely with system owners and operators to ensure facility performance; provide technical advice; pursue better solutions (such as upgrades and new technologies); and respond to emergency situations. The DWOS play an important role in the on-site education of operators, including provision of technical advice based on knowledge obtained from similar situations. Additionally, Compliance Inspectors audit the operation of waterworks systems to ensure the legislated requirements are followed.

(c) Enforcement actions address instances where operators or owners have failed to fulfill their regulatory obligations. Enforcement actions can include an enforcement order, civil remedy or penalty. Such enforcement actions can result from, for example, making no attempt to take corrective action on the failure to comply with regulatory requirements.

The Performance Assurance element for unapproved systems focuses on education and management. The Alberta Health Services provides technical assistance to systems owners regarding sampling protocols, results interpretation, treatment alternatives and overall management. The *Environmental Public Health Manual for Safe Drinking Water* is an extensive document that outlines these performance assurance components in detail.

Protection

Protection involves proactive measures and emergency response. Proactive measures reduce the risk to consumers and reduce the liability to the waterworks system owner. These measures anticipate events that may compromise the safety of drinking water and includes source protection, regardless of who regulates it, operator certification and data validation for approved systems. Emergency response involves plans or actions to deal with situations that arise from unforeseen events such as equipment failure or weather events.

Source water protection is used to control or minimize the potential of introducing chemicals or contaminants to raw water sources, including water used as a source for drinking. Raw sources (i.e. water that is not treated) of drinking water can come from the surface or from the ground so source protection means protecting all water resources. Source protection benefits human health, the environment and the economy as less stress is placed on the treatment plant. Drinking water source protection is the equivalent of, or a component of, a watershed management plan that focuses on water quality. Watershed management planning is the first barrier in the STMBA.

Alberta Environment recognizes that merely meeting drinking water design standards does not always provide assurance to Albertans that their water is safe. Poor operational performance may compromise the safety of the drinking water so the manner in which waterworks systems are operated to produce the expected drinking water quality is paramount. These waterworks systems are operated under the direction of well-trained and qualified operators who are certified under *EPEA.*

Good environmental management depends on validated environmental information. This information comes from drinking water testing in laboratories and Alberta Environment implements the *Laboratory Data Quality Assurance Policy* to ensure the submitted data is accurate and reliable.

The Provincial Public Health Laboratory (Microbiology) performs microbiological testing of drinking water samples taken by the system owner. If, for example, they detect the presence of coliforms or *E.coli* in drinking water samples, there is a notification

procedure that must be followed. For instances involving approved waterworks systems, the procedure is detailed in the *Communication and Action Protocol for Failed Bacteriological Results in Drinking Water for Waterworks Systems Authorized under the Environmental Protection and Enhancement Act*. This communication action protocol involves Alberta Environment, the owners and operators of the waterworks systems, the Provincial Public Health Laboratory, Alberta Health and Wellness, Alberta Health Services and the Federal Government (Health Canada).

A similar protocol exists for unapproved systems and is detailed in the *Environmental Public Health Manual for Safe Drinking Water*. In the event of an incident occurring, the Alberta Health Services deals directly with the system and the action protocol for these systems is the *Communication and Action Protocol for Failed Bacteriological Results in Drinking Water for Private and Communal Drinking Water Systems*.

The *Environmental Public Health Manual for Safe Drinking Water* provides guidance for investigation and inspection of unapproved systems. Use of this resource will lead to improved system performance and reduced challenges.

While there are some events that can be predicted or controlled, there are others that cannot; for these situations, an adaptive emergency response is required. Incident or emergency situations may arise from:

- non-conformance with health-related quality standards;
- accidents that increase levels of contaminants (i.e. spills, incorrect application of chemicals);
- human actions (i.e. human error, sabotage);
- interrupted service (i.e. equipment failure, extended power outages, lightning damage to electrical equipment); and,
- treatment challenges (i.e. seasonal variation, algae blooms, extreme weather events such as drought or heavy precipitation).

All affected parties must be kept informed during and after the occurrence of any incident. Boil Water Advisories or Water Usage Advisories can be issued to ensure quality and quantity of drinking water. Communication is essential to protect human health; the credibility of the waterworks system owner; and consumer confidence particularly in an emergency. Communicating the successful resolution of incidents or emergencies assures consumers that necessary corrective actions were undertaken.

Initiating strategies to protect the public, limit the extent of failures or decrease challenges to safe drinking water will lead to maintaining consumer confidence and provide a higher level of assurance in the overall quality of drinking water.

Summary

Safe, secure supplies of drinking water are vital to the health and well-being of Albertans and require the involvement of many organizations, departments and agencies. The Government of Alberta is committed to its role in the Source to Tap, Multi-Barrier Approach to meet this challenge and to ensure and maintain the sustainability of drinking water systems across the province.

Appendix II provides website addresses for organizations or programs associated with the delivery of safe and secure supplies of drinking water.

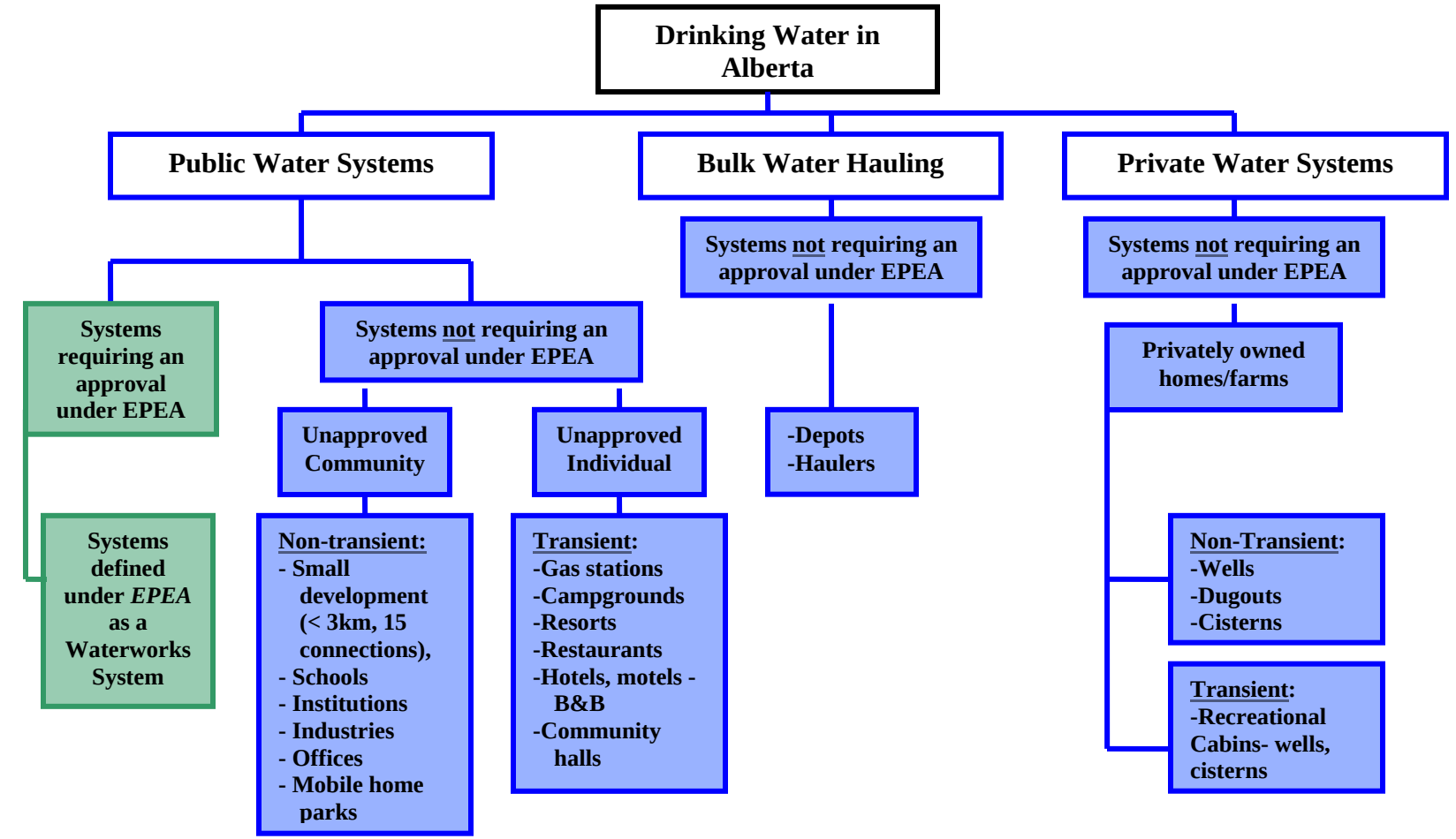
APPENDICES

APPENDIX I: Overview of Alberta Environment's Drinking Water Program

	Approved Waterworks Systems	Unapproved Systems
Government departments or agencies	• Alberta Environment • Alberta Health and Wellness • Provincial Public Health Laboratory (Microbiology) • Alberta Transportation	• Alberta Health Services Board • Alberta Health Services • Alberta Health and Wellness • Provincial Public Health Laboratory (Microbiology)

Types of Systems	• Systems serving a city, town, specialized municipality, village, summer village, hamlet, settlement area as defined in the *Metis Settlements Act*, municipal development, industrial development, privately owned development or private utility.	• Public systems that do not require treatment
		  • Schools, mobile home parks, campgrounds, resorts
		• Private Systems
		  • Acreage, farmstead, single family dwellings not connected to a municipal system

Legislative Tools	• *Environmental Protection and Enhancement Act* and associated regulations • *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* • *Guidelines for Canadian Drinking Water Quality*	• *Public Health Act* • *Nuisance and General Sanitation Regulation* • *Guidelines for Canadian Drinking Water Quality*
Drinking Water Systems	• Upgrades required under approvals or orders • Grant program for new or upgraded systems • Facility Assessments	• *Environmental Public Health Manual for Safe Drinking Water*
Knowledge and Awareness	• Publications • Public education via website • Education of Public Officials • Research	• Publications • Public education via website • Education of system owners • Research
Performance Assurance	• Approvals and Codes of Practice • Routine Reporting • Emergency Reporting • Electronic Reporting • Technical assistance • Compliance investigations	• Inspections by Public Health Inspectors • Technical assistance • Education
Protection	• Water Management Plans for source protection • Certified Operator Program • Accredited Labs • Emergency Response Plans • *Communication and Action Protocol for Failed Bacteriological Results* • Boil Water Advisories	• Accredited Labs • *Communication and Action Protocol for Failed Bacteriological Results* • Boil Water Advisories



Legend: - ***EPEA*** **and associated regulations*; Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems; Guidelines for Canadian Drinking Water Quality;* Approvals and Codes of Practice**

- Public Health Act; Nuisance and General Sanitation Regulation; Guidelines for Canadian Drinking Water Quality; Environmental Public Health Manual for Safe Drinking Water

APPENDIX II: Websites for organizations or programs associated with the delivery of safe, secure supplies of drinking water

Alberta Environment	http://environment.alberta.ca	
Alberta Environment's Drinking Water Program	http://environment.alberta.ca/1477.html	
Alberta Health and Wellness	http://www.health.alberta.ca/	
Alberta Health Services	http://www.health.alberta.ca/services/health-regions.html	
Alberta Transportation	http://www.transportation.alberta.ca/	
	Alberta Municipal Water/Wastewater Partnership	http://www.transportation.alberta.ca/2719.htm
	Alberta Municipal Infrastructure Program	http://www.transportation.alberta.ca/2708.htm
Alberta Water and Wastewater Operators Association	http://www.awwoa.ab.ca	
Environmental Public Health Manual for Safe Drinking Water	**For reprints of the 2007 version contact:** Debra Mooney Surveillance and Environmental Health Alberta Health and Wellness 10025 Jasper Ave 24th Floor, TELUS Plaza North Edmonton, Alberta Debra.Mooney@gov.ab.ca	
Guidelines for Canadian Drinking Water Quality	http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index_e.html	
Health Canada	http://www.hc-sc.gc.ca	
National Sanitation Foundation	http://www.nsf.org	
Provincial Laboratory of Public Health (Microbiology)	http://www.provlab.ab.ca/	
Source to Tap (National Guidance Document)	http://www.ccme.ca/sourcetotap	
Water Quality Testing for Private Systems	http://www.agric.gov.ab.ca/app21/infopage?cat1=Soil%2FWater%2FAir	