Public health guidelines for non-municipal drinking water

July 2021

Alberta

Statement of Responsibility

The Public Health Guidelines for Non-Municipal Drinking Water have been developed with input from experts in water safety management, microbiology, water engineering and environmental public health, representing Alberta Health, Alberta Health Services, Alberta Environment and Parks, Alberta Municipal Affairs, and have been reviewed by Dr. Steve E. Hrudey with the University of Alberta.

Legal Disclaimer

The Public Health Guidelines for Non-Municipal Drinking Water (Guidelines) are intended to support the requirements under the *Public Health Act* and Nuisance and General Sanitation Regulation.

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Terminology

Cistern	Any reservoir, tank, or container used for storing or holding drinking water and is intended to be used to supply a public drinking water system for a dwelling or building which is filled by a hauled-in, off-site water supply, piped in from an Alberta Environment and Parks approved system or is connected directly to a groundwater well**.**
Distribution system	A pipe network for delivery of potable water to consumers. A non-municipal system is considered to have a distribution system if there are: • five or more buildings or service connections which serve the public, • two or more buildings or service connections which serve the public and have more than 500 metres of distribution line, after the point of treatment or storage, or • risks which warrant additional barrier protection such as a system serving a large population (e.g. school) or vulnerable population (e.g. health care facility).
Exceedances of chemical or radiological health parameters	Any public drinking water system that is deemed to have a continual or intermittent risk related to an exceedance of one or more of the Maximum Acceptable Concentrations (MAC) for chemical or radiological parameters set out in the Guidelines for Canadian Drinking Water Quality.
Freshet	Spring runoff resulting from snowmelt or from combined rainfall and snowmelt runoff.
Groundwater under the direct influence of surface water (GUDI)	Groundwater having incomplete or unreliable subsurface filtration of surface water and/or infiltrating precipitation as deemed by a qualified hydrogeologist or groundwater engineer who is a member of the Association of Professional Engineers and Geoscientists of Alberta (APEGA) (based on Appendix 1-E Part 1 2012 *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*).
Potable water	Water that is safe for human consumption (Nuisance and General Sanitation Regulation A.R. 243/2003).
Protected groundwater	Water from a groundwater well that is considered at low risk of microbial contamination. The groundwater is assessed and classified by Alberta Health Services (AHS) using the Vulnerability Risk Assessment Tool For Wells (VRAW) or is classified as High Quality Groundwater under the Activities Designation Regulation by a qualified hydrogeologist or groundwater engineer who is licensed and in good standing with the APEGA.
Public non-municipal drinking water system	A public place providing or using potable water, which is not connected to a water system operating under the *Environmental Protection and Enhancement Act* or under other provincial or federal legislation.
Public place	Any place in which the public has an interest arising out of the need to safeguard the public health and includes, without limitation: (i) public conveyances and stations and terminals used in connection with them, (ii) places of business and places where business activity is carried on, (iii) learning institutions, (iv) institutions, (v) places of entertainment or amusement, (vi) places of assembly, (vii) dining facilities and licensed premises, (viii) accommodation facilities, including all rental accommodation, (ix) recreation facilities, (x) medical, health, personal and social care facilities, and

	(xi) any other building, structure or place visited by or accessible to the public (Public Health Act).
Secondary disinfection	A process used to ensure a disinfection residual is maintained in a distribution system to protect the water from microbiological regrowth and to control biofilm formation.
Truck-fill station or watering point	A bulk water station intended to provide potable water.
Vulnerable groundwater	Water from a groundwater well that is considered at risk for microbial contamination. The groundwater is assessed and classified by AHS using the Vulnerability Risk Assessment Tool for Wells (VRAW) or assessed by a qualified hydrogeologist or groundwater engineer who is licensed and in good standing with the APEGA.
Vulnerability risk assessment tool for wells (VRAW)	The risk assessment tool for wells used to help determine the microbial risk to the water. The tool aids in the determination of Protected or Vulnerable groundwater.
Water transport container	A water grade storage tank intended to transport only potable water, which has an interior finish composed of, or coated with, food grade contact material that is non-corrodible (e.g., stainless steel, fiberglass, plastic, aluminum, approved epoxy liner).

1.0 Introduction

Safe drinking water is critical to the protection of public health. Section 11 of the Nuisance and General Sanitation Regulation under the *Public Health Act* requires potable water in all public places in Alberta where water is provided for human consumption. These public places range from food facilities to campgrounds, camps, schools, rental housing and lodging, and other types of businesses which have their own drinking water supply. The water systems that serve these places are considered non-municipal drinking water systems.

The purpose of the Public Health Guidelines for Non-Municipal Drinking Water (Guidelines) is to provide clear direction and best practices for the management of drinking water, from the source of the water to the tap in Public Non-Municipal Drinking Water Systems (Systems), including transportation by water haulers. The goals are to reduce the risk from hazards that may compromise the safety of the drinking water, and provide potable water, as required under the Nuisance and General Sanitation Regulation. The Guidelines encompass:

- assessment of the risks of microbial and chemical contamination in water sources, including Protected groundwater, Vulnerable groundwater, stored water and in some cases, surface water;
- health-based targets for water quality;
- appropriate practices for protection of the water source, treatment of the water and operation of the system;
- verification of the system operation through monitoring, appropriate to the water source;
- the response to water system failures, malfunctions or operational changes; and
- operator knowledge.

The Guidelines describe how safe drinking water can consistently be achieved and delivered by protecting the source of the water, safely transporting and storing the water, treating the water, when needed, and maintaining and monitoring the water system. The Guidelines provide options and flexibility in reaching safe drinking water and are intended to be proportionate to the size and type of system. Tips to provide additional assurance of safety are provided in the Practice Notes in blue boxes.

1.1 Scope

The regulation of drinking water systems in Alberta is shared between two ministries: Alberta Environment and Parks and Alberta Health, and is based on the type of water source and the size of the system. Alberta Health Services (AHS) oversees systems regulated by Alberta Health. Systems on First Nations lands are overseen by the First Nation and Inuit Health Branch (FNIHB) of Indigenous Services Canada.

These Guidelines apply to systems regulated under the current Nuisance and General Sanitation Regulation, which are Systems that are not overseen by Alberta Environment and Parks under the *Environmental Protection and Enhancement Act* (EPEA), by Alberta Agriculture and Forestry or by the Government of Canada.

Specifically, these Guidelines apply to the following:

- a public place using water from a stand-alone cistern;
- a public place located on federal land with water from any source;
- a public place located on a farmstead, with water from any source (e.g. staff accommodation or food processing);
- a public place located entirely on a single parcel with a groundwater source;
- a truck-fill station, using a groundwater source, that is not connected to a municipal drinking water system; and
- water trucks/tanks used to transport potable water.

The Guidelines do not apply to the following types of drinking water systems; however, AHS will provide advice and support, consistent with these Guidelines, on water sampling, interpretation, and treatment:

- private community water systems (municipal developments such as water co-ops, where there is co-ownership) with fewer than 15 connections, or less than three kilometres of distribution line using either Protected or Vulnerable groundwater or a cistern; and
- private drinking water systems providing water for domestic purposes where the owner of the residential dwelling is also the owner of the water system, and no tenants access the water system.

The Guidelines do not apply to larger community systems such as villages, towns and cities or to most systems using surface water. Alberta Environment and Parks sets the requirements for these types of public drinking water systems.

Additionally, the Guidelines do not apply to non-potable water sources, including watering points which provide water for non-potable water purposes, such as fire fighting or irrigation, and which have signage indicating that water is 'non-potable'.

2.0 Providing potable water

Section 11 of the Nuisance and General Sanitation Regulation (AR 243/2003) states that 'where a person provides a source of water that the person intends to be used or realizes or ought to realize will be used by the public for human consumption, the person shall ensure that water is potable'.

For the purposes of Section 11, there are four ways for the operator of a System to ensure that the water being provided is potable:

a. Connecting to an existing water system/source approved or registered, or undergoing approval or registration under the EPEA;
b. Obtaining approval or registration under the EPEA and operating as a waterworks system;
c. Connecting to a system providing potable water in accordance with these Guidelines; or
d. Operating a drinking water system that provides potable water in accordance with these Guidelines.

If the owner of an existing System chooses to provide potable water as described under the Nuisance and General Sanitation Regulation (options c and d), AHS will gather information about the system, including any previous microbiological and chemical sampling results, to evaluate and classify the water source. Information about the water source will be collected using the AHS template called *Starting and Operating a Non-Municipal Public Drinking Water System*. Please contact your local public health inspector for more information.

Prior to any new System providing water to the public, the operator provides results of water sampling and records of system operation to AHS to confirm with AHS that the System is working effectively and meeting the operating conditions outlined in the Guidelines.

3.0 Cisterns

3.1 Potable water sources for cisterns

Cisterns are containers, generally fibreglass or cement, used to store a supply of potable water. The cistern should be filled by a water hauler (with AHS decal) which delivers water from an approved source, and regularly filled, cleaned and disinfected so that the water remains potable and safe to drink.

The practices below maintain the water so that it is safe for domestic uses, including drinking, cooking and bathing:

- The cistern is filled with water that is transported by an AHS approved water hauler from a potable water source. Approved water haulers have an AHS decal on the truck.
- The hauler needs to prevent contamination of the bulk water and the water in the cistern when the cistern is being filled. More information is provided in Section 4.4. The cistern should be clearly labelled on the fill port or hatch with the words 'Potable Water Only'. Cisterns previously used for non-potable uses may not be re-purposed to store potable drinking water, as per section 14 of the Nuisance and General Sanitation Regulation. However, groundwater, which is considered non-potable water, may be stored in a cistern, if the water is then treated as outlined in Part 6.0 prior to using the water for drinking, cooking or personal hygiene.

Practice note: Filling a cistern

To prevent stagnant cistern water, it is recommended that the cistern be filled at least once per month or often enough to maintain chlorine residual.

At a minimum, the total volume of the tank should be at least 3X the expected daily water use and no less than a 24 hour supply, depending on the use and costs of trucking in water. Although the sizing guidance does not incorporate water volumes required for fire suppression systems under the Fire Code, the expected daily water use may be calculated based on the wastewater volumes outlined in the latest Alberta Private Sewage Systems Standard of Practice Handbook (http://www.safetycodes.ab.ca/Public/Documents/PSSSOP_Handbook_Version_12_Online_Feb_21_2012b.pdf).

3.2 Protecting the water stored in the cistern

3.2.1 Cistern construction

- Cisterns should be made from a material that will not easily decay, deform, corrode, or diffuse any contaminants into the water that will degrade the potability or significantly impact the aesthetics or suitability of the water.[1]
- All flanges, gaskets, housing and other components of the cistern should be stamped to indicate that they conform to National Sanitation Foundation/American National Standards Institute NSF/ANSI 61-2016 Drinking Water System Components-Health Effects or the Alberta Plumbing Code.
- Coatings are often applied by manufacturers to the inside of the cistern to ensure potable water does not come in direct contact with the interior of the tank structure. Coatings should be certified as complying with NSF/ANSI Standard 61.
- Liners, if used, should be in good condition and have NSF or an United States Food and Drug Association (USFDA) approval/certification.
- Cisterns are meant to be watertight, and vermin and insect proof, and have no significant flaws or damage in order to protect water quality and enable proper cleaning and disinfection.
- The hatch cover and collar should be secure, insect proof, weather proof and designed in a manner to prevent water infiltration.
  - The operator should visually (at least twice per year) inspect the site, including the exterior of an above-ground tank, for flaws and damage. AHS can provide a template to help record the inspection results. The records should be maintained for at least three years following the inspection.
  - The cistern top surface should be free-draining, to prevent standing water collecting over top of the cistern.
  - Any joints, junctions or other access points into the cistern should be sealed to be water tight.
- Additional security measures may be needed in some situations to prevent unauthorized access and vandalism. Measures may include:
  - a padlock on the access hatch;
  - a protective box with padlock around the access hatch;
  - a chain link fence with lock around the cistern; and/or
  - any other effective means to prevent malicious or accidental contamination.

3.2.2 Cistern location and installation

- All cisterns should be set back from potential sources of contamination and in a location accessible for cleaning, servicing and filling, and located no less than:
  - 1.0 m from property lines;

[1] Currently, most cisterns are constructed of non-toxic concrete, polyethylene, fiberglass or similar material. The Canadian Standards Association-B126 Series-13 - WATER CISTERNS sets out construction requirements for cisterns.

- 1.5 m from drains, foundation walls and roadways;
- 10 m from a septic tank;
- 15 m from a sewage treatment field; and
- 15 m from other sources of contamination, and not down gradient from an open discharge or sewage lagoon or other source of contamination such as solvents, gasoline, animal manure, etc.[2]

- The cistern should be connected to the plumbing system by a licensed plumber.
- The cistern lid and collar should be elevated and the area landscaped to prevent rainwater, snowmelt or floodwater from entering the basin. Underground piping and the cistern water compartment should be protected from freezing.
- Bollards (steel pipes or posts filled with concrete) or other acceptable permanent barricades should be installed to protect the cistern and immediate area from vehicles or other risk of damage (e.g., located close to traffic).

Practice note: Cistern installation

Cisterns should be installed according to manufacturers' specifications including:

- Maximum burial depth (the depth limit should be specified regardless of manufacturing specifications to avoid any possibility of intersecting the groundwater table)
- Acceptable bedding and cover materials
- Placement in high groundwater tables
- Protection from permafrost, where applicable
- Appropriate sealant to prevent contaminants from migrating through collar segments, piping inlets and outlets, etc.

3.2.3 Cistern maintenance

Cisterns hold a potable water supply, which is considered a type of food, and should be maintained in a well-cleaned and sanitary condition as with any other food storage container.

- Cisterns should be inspected regularly to ensure the integrity of the cistern, the piping and other components.
- Procedures are needed to clean and disinfect the cistern and should be reviewed with the AHS public health inspector.
- Where truck-filled cisterns provide water to a system with a distribution system, chlorine may need to be added to the cistern to maintain a chlorine residual of 0.1 mg/L in the distribution line, depending on the source water and distribution system characteristics. The amount of chlorine would need to be calculated and verified on-site and added manually during the filling of the cistern.
- Whatever the source of water, chlorine should be added to water stored for more than 14 days in order to minimize microbial and algal growth. A total chlorine residual of 0.1 mg/L is recommended.

3.2.4 Cistern cleaning and disinfection

- All potable water cisterns should be cleaned:
  - before first use and commissioning;
  - whenever contamination has occurred or is suspected to have occurred (e.g., unsatisfactory water quality results, contaminated water infiltration or repairs when the cistern has been emptied);
  - after plumbing maintenance inside the tank;
  - when there is a change in the use of the premises or the supply;
  - maintenance after extended periods of non-use e.g., seasonal use in campgrounds; and
  - annually, as part of routine maintenance.
- The interior of the cistern may have low levels of oxygen and so any internal servicing of a cistern should be conducted by a person trained in confined space entry.

[2] Separation distances from a water source to a sewage system are prescribed in the Alberta Private Sewage Systems Standard of Practice 2009, adopted by regulation under the *Safety Codes Act*.

- All potable water cisterns should be disinfected:
  - after every cleaning;
  - before first use and commissioning;
  - after plumbing maintenance is done inside the tank;
  - when the source of the water has been deemed not safe to drink;
  - whenever microbial contamination has occurred or is suspected to have occurred (e.g., water is contaminated during filling or when undergoing maintenance or repairs);
  - on a frequency to sustain water quality; and
  - when recommended by the public health inspector.
- During disinfection, the chlorinated water should also be circulated through the distribution system. (The water should be disposed in accordance with local requirements and not discarded into an onsite wastewater treatment system or a communal wastewater treatment system, and not used as potable water).
- Further details on the process of cleaning and disinfection are available at How to Clean and Disinfect a Cistern.

3.2.5 Response to contamination

- If the cistern becomes contaminated, first identify the type of contamination (chemical or microbial). This may include inspecting the interior of the cistern to check for defects. Contact the local public health inspector to review the cleaning/disinfection steps needed.
- Where microbial contamination has occurred, the cistern and piping should be drained, cleaned, disinfected and refilled with a potable supply. The water should be sampled and tested to determine if cleaning and disinfection has been effective.
- Where chemical contamination has occurred, contact the local public health inspector to review steps to clean the cistern. The water should be sampled and tested for the chemical(s) of concern to determine if the cleaning has been effective and if the cistern and the distribution system may remain in use.
- Investigate the reason for the problem.
- Take steps to prevent a similar occurrence in the future.
- Where a cistern is determined to be ‘poorly constructed’ (e.g., cistern with physical defects, cracks, broken seal, or repeated, sporadic or seasonal presence of total coliform organisms) and deemed at risk of contamination from chemicals or direct sewage from humans or animals, the cistern should be replaced.

3.2.6 Cistern water sampling

Although the water used to fill the cistern will already have been treated and tested, the potable water in the cistern should be tested no less than quarterly for E. coli and coliforms, and prior to the opening of a cistern with seasonal use, to monitor the ongoing integrity of the water hauler’s tank, the filling process and the cistern.

4.0 Bulk water hauling

Water haulers transport bulk potable water from the water source to the customer and should take steps to protect the water and its source at the time of filling the truck tank, while in transport in the truck storage tank, and during delivery to the cistern. Since drinking water is a type of food, water haulers must take the steps necessary to protect the water from contamination and maintain potability, such as having the equipment necessary to operate safely and keeping equipment in good repair and in a clean and sanitary condition.

4.1 Water hauler documentation

- AHS will inspect the water-hauling vehicle and review operating procedures and responsibilities with the owner. AHS then issues a water hauler decal which is affixed, in a location visible to the public, on every water-hauling vehicle that meets the tank and operating requirements.
- Public health inspectors inspect water-hauling vehicles on a routine basis under the authority of the *Public Health Act*.

4.2 Water source

All water transported in bulk by means of a tank or receptacle, must be obtained from a water supply that is regulated by either Alberta Environment and Parks or Alberta Health as a potable water source.

4.3 Water transport tank

- The tank can be used only for the transport of potable water. Once approved, the tank and equipment must be exclusively used to haul and deliver potable water, as per section 13 of the Nuisance and General Sanitation Regulation. Transporting untreated, unapproved non-potable water, non-food products, such as petrochemicals or sewage, or any potentially contaminated materials is prohibited and will void the water tank approval.
- All water transport tanks must be made of food-grade material. Water transport tanks must be made of materials appropriate for the transport of potable water which has an interior finish composed of or coated with food-grade contact material that is non-corrodible (e.g., stainless steel, fiberglass, plastic, aluminum, NSF 61 certified epoxy liner) and is approved by AHS.
- Bulk water tanks or other receptacles and associated equipment, which have been approved for potable bulk water delivery, cannot be used for any other purposes (e.g. hauling non-potable water), unless AHS has reviewed the previous use, the impact on water quality and approved the tank for that use.
- Potable water tanks should be clearly and permanently labeled **'**FOR DRINKING WATER USE ONLY" or "POTABLE WATER ONLY" in a size and contrasting colour that is easily seen. (Recommend letters at least 15 cm (6 inches) tall.)
- Removable/transferable equipment such as hoses should also be clearly labeled "FOR DRINKING WATER USE ONLY" or "POTABLE WATER ONLY".

4.4 Maintaining bulk water potability

The following measures are important to protect the water, the cistern, the truck storage tank and other equipment from contamination during filling, storage, transportation and delivery:

- Tight-fitting covers/caps should be provided at filling/access outlets or any other locations where contamination of potable water may occur during storage/transportation;
- A backflow prevention device is required if water is pumped with a direct connection to potable water tanks or a plumbing system;
- Food grade hoses and nozzles should be used for water intake or discharge on the truck and protected to prevent contamination during transportation, and when not in use;
- Access/fill hatch seals must be in good repair and provide a waterproof seal;
- Access/fill hatches should be inspected visually to ensure they are in good repair and properly sealed;
- Water pumps that fill or empty the tank must use food-grade or potable water-grade lubricants (NSF 60);
- The tank should be routinely assessed for significant damage, including dents, that would affect the integrity of the tank interior;
- Tanks, hoses and/or nozzles should be cleaned and disinfected routinely. These water contact surfaces can become contaminated during transport, (e.g., cap missing on hose during transportation), and after long stagnation or periods of non-use;
- The end of nozzles and hoses should be cleaned and disinfected, at a minimum, every day; and
- Written procedures for emergency disinfection following a contamination incident (e.g. hose falling on the ground) should be developed and kept in each truck.

4.4.1 Recordkeeping

- The operator should maintain an activity logbook in the water-hauling vehicle to help with investigations of water quality issues, should they occur. This log should be available to a public health inspector upon request. Logbook records should include:
  - The date, time and location of each water fill;
  - The date, time and location of each water delivery;
  - The volume of water delivered to each site;
  - The date and time of equipment disinfection; and
  - Comments or observations regarding problems encountered with the water supply or water hauling vehicle and equipment (e.g., unusual water colour or odour) and actions taken, if any.
- The logbook should be retained for one year from the date of last entry.

5.0 Water wells: protection and maintenance[3]

Every source of water should be protected from microbial and chemical contamination. Contamination from many sources can be introduced into a well, including human and animal waste storage and handling areas, adjacent fuel, pesticide storage and handling areas, wastewater discharges, recreational facility discharges, vermin, wildlife and birds, and industrial activities.

There are several strategies that can be used to protect a well. Setbacks and location can separate the well from the contaminant and well maintenance prevents contaminants that are carried by rainfall, run-off, animals, etc., from entering the well.

Some wells are shallow, located in well pits, poorly constructed or connected to the surface, where protection and maintenance cannot adequately prevent the risk of contamination. For those wells, treatment is needed to ensure that the water is safe for consumption. Further information regarding water treatment is outlined in Section 6.0.

5.1 Well location

- Every water well should be located in a well-drained area, accessible for cleaning, treatment, sampling and repair, properly sloped to prevent run-off entering the well and protected from unauthorized entry or vehicular damage.
- Minimum setback distances for wells, established to reduce the risk of contaminants entering the well, are set out in Section 15(1) of the Nuisance and General Sanitation Regulation:

> *15(1) A person shall not locate a water well that supplies water that is intended or used for human consumption within*
>
> *(a) 10 metres of any watertight septic tank, pump out tank or other watertight compartment of a sewage or waste water system,*
>
> *(b) 15 metres of a weeping tile field, an evaporative treatment mound or an outdoor toilet facility with a pit,*
>
> *(c) 30 metres of a leaching cesspool,*
>
> *(d) 50 metres of sewage effluent on the ground surface,*
>
> *(e) 100 metres of a sewage lagoon, or*
>
> *(f) 450 metres of any area where waste is or may be disposed of at a landfill within the meaning of the Waste Control Regulation.*
>
> *(1.1) A person shall not change the use of a water well to a water well that supplies water that is to be used for human consumption from any other use if the water well is located within any of the distances above.*

5.2 Well maintenance

Routine maintenance of water wells helps to retain the integrity of the well structure, the productivity of the well, and protects the quality of the water in both the well and the aquifer.

- Every well should be maintained to prevent contaminants from entering the well as follows:
  - Maintain the well cap to minimize entrance of vermin and insects. A vermin-proof well cap provides the best protection. [4]
  - Check where backflow can occur and install an anti-backflow prevention device.
  - Protect all water lines and equipment from contamination during repair and disinfect any equipment being placed into the well.
  - Disinfect, using a shock chlorination procedure, as a microbiological control measure:
    - immediately after completing well installation;
    - whenever significant repair work is done on the well, pump or distribution system which may contaminate the water;
    - following contamination by flood water or any change in water clarity, colour or taste; and

[3] The Government of Alberta Water Wells and Ground Source Heat Exchange Systems Directive (2018) outlines the standards for well design and construction, disinfection, pumping and well closure (decommissioning), construction, flows, pumping, testing and reclamation.

[4] Information about vermin-proof well caps is available at Farm Water supply Program - Vermin Proof Well Caps.

- when lab tests indicate the presence of bacteria (fecal coliform) in the water.

- Any modification to a well should be conducted by a journeyperson certified under the Water Well Driller Trade Regulation (A.R. 94/2014).

Practice note: Well maintenance and shock chlorination

It is recommended that wells be disinfected, using a shock chlorination procedure, every year to prevent biofouling (gradual accumulation of microorganisms).

More information regarding well maintenance is available in Alberta's Water Wells...that last and further information regarding shock chlorination is available at Shock Chlorination Information for Private Water Wells.

A water well professional should be contacted if you need assistance with shock chlorinating your well.

6.0 Water treatment

As mentioned above, AHS will assess water wells, and surface water supplies on agricultural land that provide potable water to a public place, to determine the quality of the water, the risk of microbial and chemical contamination, and whether disinfection or treatment is needed.

- The first step is to contact your local public health inspector and complete AHS' *Starting and Operating a Non-Municipal Drinking Water System* document. During the assessment, the health inspector will visit the site, conduct a Vulnerability Risk Assessment, review any available engineering reports, well drilling logs, water quality information (bacteriological and chemical), and any designations from Alberta Environment and Parks.
- Based on the assessment, the water source will be categorized as one of the following:
  - Surface water
  - Protected groundwater, or
  - Vulnerable groundwater. [5]
- The treatment requirements for each type of source water are outlined in the sections below.
- Where the components of the treatment system are part of a pre-configured package, which complies with Section 2.2.10.17 of the National Plumbing Code of Canada, the owner's representative (such as a plumber) may install the required treatment components.
- Where a system's characteristics create treatment of operational complexities, the proposed treatment design may require authentication by a qualified Professional Engineer licensed by the APEGA.
- The treatment system should be adequately sized to ensure the production of adequately disinfected water, which meets the water demand.

[5] This includes groundwater sources where the Alberta Environment and Parks designation is incomplete or there is new evidence of contamination. For example, where a well was improperly constructed at the time of installation or where construction has failed and although the source is HQGW, the construction introduced contamination.

Practice note: Treatment components

Pre-engineered, certified treatment components are especially suited for small systems where site-specific engineered treatment plants may not be cost effective or necessary to achieve the treatment goals. Factors to be considered when selecting a pre-engineered water treatment component include timely availability of parts and service and estimated annual operating and maintenance costs. (Additional information on design components is available from the Ontario Ministry of the Environment, Conservation and Parks: Design Guidelines for Drinking Water Systems: https://www.ontario.ca/document/design-Guidelines-drinking-water-systems/treatment-and-chemical-application).

6.1 Disinfection to reduce microbiological risks

Protected groundwater has a low risk of microbial contamination while surface water and Vulnerable groundwater sources have a significant risk of microbial contamination and require disinfection to inactivate pathogenic microbes and achieve potable water, as required in Section 11 of the Nuisance and General Sanitation Regulation.

The goal of disinfection is to inactivate pathogens such as *Salmonella* or enteric viruses that are transmitted through water. Disinfection can substantially reduce the total number of viable microorganisms in the water[6] when the disinfectant concentration, contact time, water temperature, pH and other factors are considered.

6.1.1 Protected groundwater

Wells classified as Protected groundwater have a low risk of microbial contamination; however, enteric viruses have been detected in well-protected aquifers and can be transported significant distances. Any Protected groundwater supply should be protected from fecal waste. Information about disinfection options to provide additional protection is provided below.

Practice note: Disinfection of protected groundwater

Health Canada's Guideline Technical Document – *Enteric Viruses* recommends that Protected groundwater be disinfected to a minimum of a 4-log reduction of viruses (excluding more UV resistant viruses, Adenovirus 40 & 41) for sources vulnerable to virus contamination. The log reduction target may be achieved by installing:

- Pre-treatment filtration (as determined by manufacturers' specifications for the ultraviolet equipment) and NSF 55 Class A Ultraviolet equipment,
- A disinfection treatment system using free chlorine, or
- A treatment system deemed equivalent by AHS.

[6] Water Disinfection with Chlorine and Chloramine. Centers for Disease Control and Prevention. https://www.cdc.gov/healthywater/drinking/public/water_disinfection.html

6.1.2 Vulnerable groundwater

Wells classified as Vulnerable groundwater are vulnerable to microorganisms which can move through the soil into the groundwater. Consequently, Vulnerable groundwater requires continuous disinfection to inactivate both parasites (protozoa) and viruses.

- The treatment targets are a minimum of 3-log reduction (99.9%) of cryptosporidium and a 4-log (99.99%) reduction of viruses (excluding Adenovirus 40 & 41).
- The log reduction targets are achieved by installing one of the following combinations:
  - Pre-filtration (as determined by manufacturers' specifications) and disinfection with NSF 55 Class A Ultraviolet equipment;
  - Pre-filtration (as determined by manufacturers' specifications), filtration with absolute 1 micron filter or smaller (with NSF 53 or NSF 58 labelling stating 'cyst reduction'), and disinfection with free chlorine. (Note that nominal pore size rated filters are not adequate to meet the log reduction target for cryptosporidium cysts); or
  - A treatment system deemed equivalent by AHS.

6.1.3 Vulnerable groundwater with potential for fecal contamination

Some Vulnerable groundwater wells are at risk of viral contamination from human feces and may carry more UV resistant viruses, Adenovirus 40 & 41. These water wells will need continuous primary disinfection to achieve the 3 log reduction target for cryptosporidium and additional requirements to treat for the UV resistant viruses that are generally associated with human feces.

- The treatment targets are a 3-log reduction of cryptosporidium and 4-log reduction of the ultraviolet resistant viruses, Adenovirus 40 and 41.
- The log reduction targets are achieved by installing one of the following:
  - Pre-filtration (as determined by manufacturers' specifications), filtration with absolute 1 micron filter, and disinfection with free chlorine;
  - Pre-filtration (as determined by manufacturers' specifications), NSF 55 Class A Ultraviolet equipment disinfection and disinfection with free chlorine;
  - Pre-filtration (as determined by manufacturers' specifications), and ultraviolet disinfection validated for 4 log inactivation of Adenovirus 40 and 41; or
  - A treatment system deemed equivalent by AHS.

Practice note: Treatment

In some situations, a drinking water source may be at risk of human fecal contamination which carries the ultraviolet resistant viruses (Adenoviruses 40 and 41). Adenovirus is only present in water contaminated with human feces.

The standard NSF 55 Class A UV equipment using 40milliJoules/centimetre2 does not inactivate these viruses. NSF does not currently certify individual ultraviolet reactors to the 186 mJ/cm2 required to achieve 4-log reduction of adenovirus. Equipment with a qualified professional engineer-approved design and specifications for an ultraviolet system that can meet 4-log reduction of Adeno 40 and 41 could be deemed equivalent by AHS.

6.1.4 Surface water

Surface water is commonly contaminated with disease causing microorganisms and has highly variable turbidity (cloudiness) and water quality. It is directly affected by run-off containing contaminants from the surrounding area and consequently requires continuous disinfection to remove or inactivate all types of pathogens (parasites, bacteria and viruses) and achieve 3 log (99.9%) reduction of cryptosporidium and 4 log (99.99%) reduction of viruses including Adenovirus 40 and 41. Pre-filtration/polishing treatment is used to address the inconsistent water quality and make disinfection processes effective.

- The log reduction targets are achieved by installing one of the following:
  - pre-filtration (as determined by manufacturers' specifications), filtration with absolute 1 micron filtration or smaller, and disinfection with free chlorine;
  - pre-filtration (as determined by manufacturers' specifications), UV disinfection (NSF 55 A) and disinfection with free chlorine;
  - pre-filtration (as determined by manufacturers' specifications), and UV disinfection validated for 4-log inactivation of Adenovirus 40 and 41; or
  - a treatment system deemed equivalent by AHS.

Practice Note: Filtration

Effective pre-filtration/polishing accompanies any system that employs absolute 1 micron filtration or UV for protozoa treatment. Depending on source surface water quality, an effective pre-filtration step is required to ensure the source is able to be used without frequent disruptions of water service especially during high turbidity time periods (e.g., freshet).

6.1.5 Distribution system

Where a drinking water system has a distribution system, additional disinfection (sometimes called secondary disinfection) may be needed to ensure a minimal level of chlorine throughout the lines. The chlorine will prevent microbiological regrowth and reduce the formation of biofilm.

- The distribution system should be disinfected using adequate dosing and mixing to reach a minimum of 0.1 mg/L total chlorine at the end of the distribution system. This level of chlorine is difficult to measure and maintain and many operators aim for 0.3-0.5 ppm.
- For any system that is not using chlorine for primary disinfection and has a distribution system, a small in-line tank for mixing water and chlorine may provide consistent concentrations of chlorine in the water line from a chlorine metering pump.
- Where an operator of an existing system with Protected groundwater can demonstrate a satisfactory microbiological history throughout the system, based on multiple samples from representative locations, secondary disinfection may not be necessary.

6.2 Specifications for disinfection equipment

6.2.1 Chlorination

- Where chlorine equipment is installed to achieve continuous log reduction requirements:
  - Assess a wide variety of raw water quality parameters to determine the chlorine demand i.e., the amount of chlorine remaining after chlorine combines with other substances in the water. This would include an analysis of pH and ammonia and, in some cases, hydrogen sulfide, nitrite, organic nitrogen, iron, and total organic carbon, or other surrogates.
  - Calculate the chlorine dose for the system. (It will depend on the type of water source and its chlorine demand).
  - Calculate the Concentration-time (CT) value based on the maximum water flow rate of the system installed (designed) and operate the system to ensure that the required CT is met. Please refer to AHS' *Starting and Operating a Non-Municipal Public Drinking Water System* for further details.
  - Install chlorination treatment equipment that is certified to NSF 61: *Drinking Water System Components* or NSF 53 *Water Treatment Devices*.
  - Use chemicals in the water treatment system which are NSF/ANSI 60 certified.
  - Synchronize the chlorinator with the operation of the well water pump for proper chlorination. (i.e., chlorinator comes on when well pump turns on.) A continuous chlorine analyzer with alarms is recommended for optimum delivery and maintenance of chlorine residual (best located entering distribution system).
  - Provide an adequately sized baffled tank, sufficient to provide adequate contact time for chlorine at maximum flow rate.
  - Install ultraviolet treatment equipment, if used in conjunction with chlorine disinfection, upstream of any chlorine application in accordance with manufacturers' specifications.

- Do not hand dose, or use pellets, pucks or liquid chlorinators that directly chlorinate the well.
- Install a flow meter to monitor the water production flow rate, if needed.

6.2.2 Ultraviolet treatment

- Where ultraviolet treatment (UV) equipment is installed to achieve the log reduction targets:
  - Install UV treatment system certified to NSF/ANSI 55 Class A: *Ultraviolet Microbiological Water Treatment Systems* or an equivalent certification.
  - Install equipment which has:
    - Minimum 40 mJ/cm2 dosage;
    - A sensor to measure intensity;
    - An automatic shut-off valve, that will shut down the unit if the UV dosage drops below 40mJ/cm2; and
    - A flow restrictor or meter.
  - Prior to selecting the UV system, test the raw water quality to make sure the source water quality meets the minimum raw water quality targets set out by the manufacturer.
  - Ensure that the UV transmittance for source water exceeds 80% and is verified weekly, unless the UV unit is designed to compensate dosage for changes in transmittance.
  - Install an alarm which alerts the operator when validated lamp hours are reached, or if there is a lamp outage.
  - Adhere to the manufacturer's specifications for pre-treatment, intensity, flow rate, transmissivity and maintenance, including the frequency of UV lamp change outs.
  - Ensure that the manufacturer's maximum flow rate for the UV system is not exceeded.
  - Install a solenoid valve or automatic shut-off to prevent the flow of water when there is a UV alarm or a power failure. These alarms would indicate inadequate dosing and disinfection.
  - For UV installations in rental accommodations, such as long-term single family dwellings, an audible alarm may be used instead of a solenoid shut-off, if the alarm is in the audible range and residents are trained in the operation.
  - Install all equipment in accordance with the manufacturer's instructions to reach operating targets.

6.3 Treatment to reduce chemical constituents

The primary risk to human health from drinking water is microbial; however, in some cases, the chemical constituents, often naturally occurring, exceed the levels recommended by Health Canada (Maximum Acceptable Concentration) and can be a risk to health. These are of particular concern for systems where the water is used frequently, over longer periods or by vulnerable populations.

- AHS will assess all source water except for cisterns, to determine the potential for chemical risks. If recent water chemistry is not available, the water will be sampled and analyzed for routine and trace chemicals through the Alberta Centre for Toxicology. AHS will assist in the sampling, transport and interpretation of the results.
- Where the results from baseline water sampling indicate an exceedance of a chemical Maximum Acceptable Concentration (MAC), set by Health Canada, AHS will contact the operator to resample the source, confirm the concentration, and determine appropriate mitigation strategies, such as treatment.
- Appropriate treatment will be based on an assessment of:
  - Exposure (amount of water consumed over time, concentration of the chemical with respect to the MAC);
  - Likelihood of acute risk; and
  - Vulnerability of population (life stage and immunity status).
- Unsafe chemical concentrations may be reduced as follows:
  - Install a Point of Entry (POE) device, certified by NSF for the chemical of concern, such as a reverse osmosis or distillation unit at the point of entry into each building where water is used for consumption to remove the chemical(s) of concern. NSF certifications include NSF 53 for water treatment devices, NSF 58 for reverse osmosis and NSF 62 for distillation. More information on NSF certifications are available in Appendix A.
  - Install an NSF certified Point of Use (POU) device at fixtures where there is a reasonable likelihood that water will be used for human consumption (areas such as kitchens, drinking water fountains).
  - Modify operations to reduce the concentration of the chemical. For example, blending with another source, removal of lead plumbing, etc.
  - Use an alternative water supply for drinking (e.g., bottled water). This may be practical under limited circumstances where the water is provided at temporary facilities, occupational settings, and in situations where treatment is not possible.
- Where there is no certified NSF treatment device for a parameter, alternate and equivalent treatment devices can be considered.

6.4 General treatment equipment requirements

- For purposes of Section 12 of the Regulation, all drinking water treatment equipment shall be:
  - in operation whenever water is being supplied;
  - operated in accordance with manufacturers' instructions;
  - operated in a manner to achieve the design capabilities; and
  - maintained to ensure potable drinking water, including use of chemicals that are designated for use in the production of drinking water in ANSI/NSF 60.
- Where an existing water treatment system is evaluated and does not align with this Guideline, the treatment system may need to be repaired, modified or replaced in order to meet the water quality targets.

  All systems must meet any other applicable governing legislation including backflow prevention, treatment, operation, water allocation and material requirements under the Alberta Plumbing Code, the *Environmental Protection and Enhancement Act* and the *Water Act*.

7.0 Operations and maintenance

7.1 Operations plan

Every operator should develop and follow an Operations Plan that outlines the operating procedures, maintenance procedures, monitoring, responses to failed conditions, recordkeeping and reporting necessary for their system. (AHS can provide an operational template on request.)

- The owner should designate an operator to have primary responsibility for overseeing the system and meeting operational requirements.
- An operator should 'know the system', and be familiar with the system's normal operating conditions to be able to recognize unusual signs and situations.
- The Operations Plan should include:
  - the general schematic of the system components and general description of the system (source, type of distribution, type of treatment, population served);
  - a list of components, a description of related manufacturers' manuals, operational manuals;
  - operating and maintenance procedures specific to their system, including but not limited to:
    - surveys for possible signs of contamination of the source of water;
    - inspections of system components (intake/well, storage, treatment equipment and distribution);
    - start-up procedures for seasonal systems; and
    - a list of preventive maintenance of equipment, as needed.
  - description of the microbiological, chemical and operational parameters to be monitored; and
  - a response plan, including reporting, for water system failures such as unsatisfactory water quality results, system shutdown, lack of water, power failure. (See Appendix D for a response plan template.)
- The owner should record the following information and retain it for three years, to document trends and compliance with water quality and treatment targets:
  - name of the operator;
  - residuals and other operational indicators;
  - use of chemicals and concentrations;
  - maintenance of equipment;
  - water quality results;
  - complaints and water system failures;
  - unusual events, such as flood or fire; and
  - date and time of maintenance actions with full description including who performed the maintenance actions.

7.2 Operations

- The operator shall ensure the equipment and overall systems for treatment, transmission and storage are maintained in adequate operating condition as required under Section 12 of the Nuisance and General Sanitation Regulation to ensure that the equipment performs consistently and adequately to meet microbiological and chemical water quality objectives.
- The operator shall notify AHS of any major change to operation or treatment which might impact the water quality.

- The operator shall notify AHS of any changes to the name or ownership of the business.

7.3 Monitoring

Routine monitoring of microbiological and chemical constituents and equipment performance can detect changes in operation, track trends in water quality and confirm the efficacy of disinfection and other treatment processes in treated systems. The monitoring results confirm the characteristics of the source water, the water quality and system operation and provide the operator with evidence of what is normal. Any substantial change from that normal can then be investigated.

The sampling frequency, procedures and sampling locations applicable to each system will be based on the source water quality, operating conditions, the site-specific risks and developed in consultation with the public health inspector.

The Operations Plan should describe the microbial and chemical parameters to be monitored, the sampling frequency and location, the method of monitoring and the reporting process.

Practice note: Sampling procedures

Routine sample collection procedures should be conducted following the protocols from the designated public health laboratories (ProvLab and Alberta Centre for Toxicology) for microbial and chemical parameters.

7.3.1 Microbiological sampling

The operator should submit routine samples for testing E. coli and total coliforms to the local Community Health Centre of AHS (or directly to Alberta Precision Laboratories (ProvLab), if applicable). AHS will send the samples to ProvLab for analysis and AHS will provide the results back to the owner/operator. Unsatisfactory results will be shared as soon as available. The recommended frequency of sampling is outlined in Appendix B.

7.3.2 Chemical sampling

- The operator should submit samples for testing of routine and trace chemicals from the raw water source to the local Community Health Centre of AHS. AHS will transport the samples to the Alberta Centre for Toxicology (ACFT) for analysis and AHS will provide the results back to the owner/operator.
- All groundwater and surface water supplies should be tested to develop a baseline and then should be monitored at least every three years. Cistern supplies do not require chemical monitoring as the water quality is monitored at the source.
- ACFT analyzes the samples for a prescribed list of chemicals called Routine and Trace Elements (see Appendix C for a description of the chemicals analyzed) which includes physical properties and major and minor ions and metals. A number of the chemicals analyzed have an impact on health and have a MAC, set by Health Canada. Other chemicals are associated with taste, odour and usability of the water, and have Aesthetic Objectives, set by Health Canada.
- Additional chemicals may be analyzed, if they have been identified as a risk during a site-specific assessment, or if part of an investigation under the direction of the local public health inspector.

Practice note: Sampling

Water samples are shipped from the AHS Community Health Centres to the ProvLab and Alberta Centre for Toxicology for analysis of microbiology and chemistry. Samples are taken using the bottles, requisition form and instructions provided by AHS. Bacteriological samples must reach the ProvLab within 24 hours where they are analyzed for E. coli and total coliforms for accurate results. If the results are unsatisfactory from either lab, or the sample is rejected, the laboratory will notify AHS and the operator as quickly as possible for appropriate remedial action to be taken.

7.3.3 Equipment and operational monitoring

- Every operator should ensure that the system, including the treatment equipment, is working properly and should monitor the effectiveness of the equipment as outlined by the manufacturer.
- For those systems with chlorine disinfection, a minimum target of 0.1 mg/L total chlorine measured as the water enters the distribution system and at a point downstream of the treatment equipment confirms an adequate disinfection residual in all parts of the system. Other parameters, such as turbidity, may also be measured, where necessary for optimal disinfection.
- For ultraviolet treatment, the operator should follow the manufacturer's instructions for monitoring.
- Fail-safe systems should be tested for proper functioning at least semi-annually.

7.4 Response to water system failures

The operator should identify and document responses to critical water system changes and failures in the Operations Plan. Appendix D provides examples of system failures and responses.

- The first step is to notify the local public health inspector immediately when there is a system failure, a change in water quality, or unsatisfactory monitoring results. The public health inspector will consult with the operator to review the risks and appropriate response.
- Where there is evidence of a change in water quality or contamination in a well classified as Protected, AHS should be notified and the well will be re-evaluated. The well could be re-classified as Vulnerable groundwater, depending on the evidence of potential contamination.

Practice note: Water quality signals

A number of water quality indicators are commonly regarded as aesthetic concerns such as discolouration, odour and taste issues. But, these can be early indicators of health-related water quality such as when corrosion results in excessive levels of lead.

Unusual odour and taste has provided early consumer warning of sewage contamination and should never be dismissed without investigation to establish the cause. Groundwater in Alberta can experience problems with iron, manganese that causes discolouration, sulfides that cause odour and taste, and methane which can pose an explosion risk in confined spaces for furnaces and other devices with pilot lights.

8.0 Operator knowledge

Operators should have a comprehensive understanding of their system ranging from the source water and treatment processes to system risks, so that they are better able to assess and respond quickly and proactively to issues that could affect the potability of the water.

- Every operator should have knowledge and an understanding of:
  - health risks associated with drinking water;
  - drinking water system components and operations;
  - disinfection and treatment at their system;
  - storage and distribution; and monitoring procedures and response to water system failures.

Resources: Operator education

Operators may obtain further information from their local public health inspector and through the following organizations:

- Alberta Working Well Program (https://www.alberta.ca/working-well.aspx)
- British Columbia Small Systems Operators Course (available on line) https://eocp.ca/certified-operators/
- Alberta Water and Wastewater Operators Association (Small Water System Operations Course) https://awwoa.ca/courses/details/small-water-systems
- Training offered by equipment manufacturers or suppliers.

Appendix A: National Sanitation Foundation (NSF) certifications

The following NSF certifications are used in the drinking water industry. Note that the certification is based on a maximum concentration and may not be effective where the raw concentration is higher than manufacturers' specifications.

NSF 53 Drinking Water Treatment Units - Health Effects

> Certifies filters to reduce a contaminant which has a health effect. Contaminants with health effects are those regulated by the U.S. Environmental Protection Agency (EPA) and Health Canada. Both standards 42 and 53 cover adsorption/filtration which is a process that occurs when liquid, gas or dissolved/suspended matter adheres to the surface of, or in the pores of, an adsorbent media. Carbon filters are an example of this type of product.

NSF 58 Reverse Osmosis Drinking Water Treatment Systems

> Establishes minimum materials, design and construction, and performance requirements for point-of-use (POU) and point-of-entry (POE) drinking water reverse osmosis systems and the components used in these systems to reduce contaminants that are regulated by US EPA and Health Canada.

NSF 62 Drinking Water Distillation Systems

> Establishes minimum materials, design and construction, and performance requirements for point-of-use (POU) and point-of-entry (POE) drinking water distillation systems and the components used in these systems.

NSF 60 Drinking Water Treatment Chemicals

> Establishes limits for drinking water treatment chemicals that are directly added to water and are intended to be present in the finished water.

NSF 61-2017 Drinking Water System Components – Health Effects

> Establishes limits for the chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems. This Standard does not certify treatment performance, taste and odour, or microbial growth support requirements for drinking water system products, components, or materials.

Appendix B: Microbiological sampling frequency

Facility type[7]	Surface water[8], Vulnerable groundwater	Protected groundwater	Cistern
Institution[9] (daycares, nursery school, family day home, adult care)	W	M	Q
School[9]	W	M	Q
Mobile home park	W	M	Q
Food establishment	W	M	Q
Recreation area	W	M	Q
Work camp	W	M	Q
Personal services facility	W	M	Q
Housing[10] (single family rental)	M	S	S
Housing (multi-unit, hotels, foreign worker accommodation; bed and breakfast)	W	M	Q
Occasional/seasonal use public facilities (campground)	7 days prior to use and every week while in use	7 days prior to use and every month while in use	7 days prior to use and every month while in use
Truck-fill station/watering point	W	M	M

W=weekly; M=monthly; Q=quarterly; S=semi-annually; NA=Not applicable

[7] The sampling frequency for a multi-use system is based on the highest risk type of use. E.g., For a multi-use system with a restaurant and other public facilities, the highest risk would be the restaurant.

[8] Surface water systems should be sampled weekly, regardless of treatment, as the water quality at the source is highly variable and at greater risk of microbial contamination.

[9] Where practical, all drinking water systems serving high-risk or vulnerable populations should be sampled weekly. Over time, where effective operation of the treatment equipment for a vulnerable groundwater system can be confirmed, sampling frequency may be reduced from weekly to monthly.

[10] Sampling is recommended for housing but an operational plan would not be required.

Appendix C: Water chemistry

Routine chemistry

The following parameters are included in routine chemistry:

Parameter
Bicarbonate, carbonate and hydroxide
Calcium
Chloride
Conductivity
Fluoride
Iron (total)
Magnesium
Nitrate
Nitrite
pH
Potassium
Sodium
Sulfate
Total Alkalinity
Total Dissolved solids (TDS)
Total Hardness

(Further information is available at My Health Alberta - Understanding your drinking water chemical test results)

Trace elements

The following parameters are included in trace elements:

Parameter
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Chromium
Cobalt
Copper
Lead
Manganese (total)
Mercury (only screening)
Molybdenum
Nickel
Selenium
Silver
Strontium
Thallium
Titanium
Uranium
Vanadium
Zinc

(Further information is available at My Health Alberta - Understanding your trace metals analysis results)

Appendix D: Response to water system failures

(Adapted from the British Columbia Ministry of Health EMERGENCY RESPONSE AND CONTINGENCY PLANNING FOR SMALL WATER SYSTEMS June 2016) https://www2.gov.bc.ca/assets/gov/health/keeping-bc-healthy-safe/healthy-communities/ercp-sws-final-july-14-2016.pdf

This list provides examples of common water system failures. The list and/or the responses can be modified to suit the system. For example, the type of response, contact list, and order of response will vary, depending on the size of the system, the type of source water used and other factors. Please work with a public health inspector to complete the response plan.

Examples of possible water system failures

Sources(s)/intake(s)

- Contamination of source (chemical)
- Loss of source
- Flood conditions
- Turbidity

Distribution system

- Broken water line
- Backflow or back siphonage
- Blocked/faulty valve
- Contaminated reservoir/storage

Treatment/pump house

- Equipment failure such as pump failure
- Chlorinator failure
- Ultraviolet equipment failure
- Power failure

Other

- Fire

Examples of planned responses

Contact the local public health inspector.

Close emergency shut off valve to shut off water supply.

Modify or close facility and notify affected water users (as per advice of public health inspector or Boil Water Order).

Resample.

Coordinate repairs.

Arrange for alternate source of water, where possible.

Correct the problem.

Flush and disinfect the system prior to re-start.

Contact the public health inspector for approval to resume operation.