Small & Sustainable in North America

By Robin Keating

More than ever, sustainable surface and groundwater supplies are essential to communities across North America and around the world. The strains of industry and agriculture on groundwater are noticeable as pressures on water supplies intensify and supply patterns change. The increase in agriculture over vulnerable aquifers, climate change and hydrocarbon production are impacting water quality. Unregulated use or uncontrolled flow of groundwater can cause water quality degradation and conflict between water users. Reports have shown that groundwater use contributes to a decrease in base-flow to some streams and rivers, affecting surface water ecosystems.

Small drinking water systems opt for POE UV treatment

The North Boswell Water Users Community uses a Trojan UV Max Pro 10 system with 1-micron absolute filtration to meet drinking water standards.

Some jurisdictions in North America recognize that surface water and groundwater are connected. Considerations of the ecosystem and in-stream flow requirements are factored into the water use decision-making process. In Canada, British Columbia is the only province that does not regulate groundwater. The provinces of Alberta, Manitoba, Ontario and Nova Scotia, as well as the states of Washington and Idaho in the U.S., are recognized as leaders in North America for their groundwater allocation and permitting frameworks.

With the increased contamination of surface and groundwater, communities are looking for ways to protect and maintain water supplies to ensure safe drinking water for future generations. Some communities are incorporating as small drinking water systems (SDWS) and creating the infrastructure to govern and define how the SDWS will be maintained.

Incorporation of an SDWS allows these communities to negotiate with local provincial or state governing bodies. These organized, and now incorporated, user groups have the ability to elect a board of directors to represent the interests of the community.

Tough Questions

Federal governments, municipalities and organizations have no universal agreement on what constitutes an SDWS. The number of homes and individuals hooked up to the system, the amount of time it is used per year, the amount of water distributed, the complexity of operations and what is in the water vary with each jurisdiction. Every SDWS is unique, created by its membership.

According to a report from the Commissioner of Environment and Sustainable Development, Canada considers a very small drinking water system one that serves less than 500 individuals, and a small drinking water system one that serves fewer than 5,000. Per the U.S. Environmental Protection Agency (EPA), the U.S. considers a very small drinking water system one that serves between 25 and 500 individuals and a small drinking water system one that serves between 501 and 3,300. Local jurisdictions may have amendments or conditions on the number of homes or individuals served.

A scientific definition from Health Canada states that safe drinking water is free of microbiological contaminants and only contains chemical contaminants at levels that do not harm human health. In the U.S., EPA defines safe drinking water as not containing harmful bacteria, toxic materials or chemicals. It is considered safe if it meets these criteria, despite color, taste or odor issues.

Each SDWS must determine if the surface water or groundwater in its community is affected by external sources or changes in the environment surrounding the water supply. Whether it is a new community or the community has been instructed by a local regulator to treat its water due to aging infrastructure, the SDWS's membership must get professional help to work within jurisdictional guidelines.

Choosing a Treatment Method

These newly formed SDWS groups are looking for guidance on how to design and sustain a water treatment system within the framework of the jurisdiction. A qualified local water treatment specialist can work with regulators in the area to ensure the community is developing a system that meets or exceeds jurisdictional requirements. With larger communities, the SDWS administration also will have to retain the services of an engineer to design a water treatment system that complies with local health rules for safe drinking water.

Some communities are under permanent or seasonal boil water advisories and often are unable to agree on treatment methods. Community members may not want to treat the water at all, while others may have alternate treatment methods.

Water treatment often can cause dispute among members of an SDWS. Today, more people tend to oppose using chemicals such as chlorine to disinfect drinking water. Chlorine by itself is not effective against some parasites, such as *Cryptosporidium*, but can inactivate *Giardia*. The disinfection of both *Cryptosporidium* and *Giardia* is required by most jurisdictions in North America.

Giardia is often found in human, beaver, muskrat and dog feces. Cattle feces appear to be the primary source of *Cryptosporidium*, although these parasites also have been found in humans and other animals. Drinking water sources become contaminated when feces containing the parasites are deposited or flushed into water. If treatment is inadequate, drinking water may contain sufficient numbers of parasites to cause illness.

The North Boswell maintenance team keeps the system in top shape, which has helped the group earn recognition in its first 10 years.

Implementing UV Systems

An SDWS should have at least two barriers of protection against infection. If the water is pristine, filtration can be used as one barrier. If the source of the water is questionable, then chlorination may be required. A growing choice among small water system users is an ultraviolet (UV) microbiological water treatment system, used as the last treatment step for supplying clean, safe drinking water to the community.

Some communities cannot use a centralized treatment system but can now take advantage of advancements in water treatment technology. SDWS groups can use a point-of-entry (POE) UV system in each home. Attached to the water intake of the residence, the POE system uses filtration and/or chlorination as the first barrier of protection and UV microbiological disinfection as the primary barrier of protection.

In older municipalities, some chlorinated systems have seasonal events that overtax the system, resulting in boil water advisories. Smaller communities that feed off these older municipal systems now can create their own small systems using POE as an affordable way to upgrade an existing water system.

In some jurisdictions, it is necessary to install the POE system in a utility room or shed outside the residence for easier access and maintenance. Regulators are still establishing the framework for their regions. The SDWS group must prove that it is delivering the required dose for UV microbiological disinfection, and that it is complying with local regulations on water use. To achieve this, the water treatment specialist can install monitoring equipment that records the dosage information and alarm data during the lifetime of the SDWS.

The UV system should be validated to meet compliance within the industry and the jurisdiction. UV systems can be broad and varied; industry standards using NSF/ANSI Standard 55 - Class A POE Disinfection Treatment Devices are required to deliver a minimum UV dose of 38 milliJoules per sq cm, or 38,000 milliWatts per second per sq cm, at the failsafe point as determined by inactivation of *Bacillus subtilis* spores and using a sensitivity calibration curve. Class A qualification is available only to devices equipped with UV sensors for monitoring.

When a UV manufacturer makes a cyst reduction claim on a Class A device, it is required to have a prefilter that complies with NSF/ANSI Standard 53 for cyst reduction upstream of the UV device. Class A systems without a general cyst-reduction device for treatment of untreated surface waters must have a device in conformance with cyst reduction under Standard 53 installed ahead of the system.

Small System Success

The SDWS groups are growing in popularity throughout North America. Groups as small as three homes to as large as 220 homes are developing POE UV systems, sometimes winning awards for innovative work with local regulators.

Success Stories

Bowen Island. On Bowen Island in British Columbia, Canada, the small community of Honeymoon Creek was on a long-term boil water notice for using an untreated surface water source. The community was unable to build a centralized treatment system because the intake was on private property and the owner was unwilling to allow construction of any kind. Community members established an SDWS called the Honeymoon Creek Water Users Community and challenged Vancouver Coastal Health, the local jurisdiction, to prove that POE treatment was a good solution.

The Honeymoon Creek SDWS, its membership and the POE UV supplier entered into a contractual agreement on standards and maintenance for the treatment system. This method impressed regulators and has since expanded into surrounding communities. The Honeymoon Creek group has nine homes, earning recognition from the British Columbia Drinking Water Leadership Council and receiving the Small Water Systems Award from the British Columbia Water & Waste Assn. This award recognizes small water systems in British Columbia for initiatives that demonstrate outstanding effort in the delivery of safe drinking water.

Boswell. The town of Boswell, British Columbia, has been under various boil water advisories for more than a decade. In 2000, a small group of 14 homeowners formed a corporation called the North Boswell Water Users Community Inc. Residents were tired of the repeated boil water notices, so they set out to design a POE system using UV microbiological water treatment technology.

A decade later, Boswell has been recognized as one of the first communities in North America to incorporate and operate an SDWS using a POE UV microbiological water treatment system. The North Boswell SDWS recently celebrated a decade with no boil water advisories or notices, even though many surrounding communities are still under permanent boil water advisories. These communities are working with the North Boswell SDWS to help establish their own groups to manage and maintain small systems.

Communities are building small drinking water systems and working with regulators to help ensure sustainable safe drinking water for future generations. Whether you are an engineer, a water treatment specialist and installer or community member, take a look around your province or state for an SDWS or small water user group nearby to learn more about what you can do to ensure safe drinking water in every community. *wqp*

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