Operating a public drinking water system with industrial high water user demand:

Exploring the drinking water system in Old Perlican, NL

Introduction

The Town of Old Perlican is located near the tip of the Bay De Verde Peninsula, connected to the Avalon Peninsula, approximately 60 km north of Carbonear (Old Perlican, 2014a). In 2011 the population of Old Perlican was 661 (Old Perlican, 2014a). Given its active participation in the fishery and provision of necessary services such as a hospital, fire department, high school, and gas station, Old Perlican acts as a service centre for many smaller communities throughout Trinity and Conception Bays. The earliest European settlement of the town dates back to the 1500s, however, the municipality was only incorporated in 1971 (ibid).

Town of Old Perlican

The primary fish plant in Old Perlican processes crab and shrimp, employing close to 500 workers at peak production. A second fish plant focuses on harvesting ground fish such as lump, mackerel and capelin. Due to this diversification within the fishery, the community was somewhat protected from the economic effects of the Northern Cod moratorium that took place in 1992 (Old Perlican, 2014a). Currently, 90 percent of the residents in Old Perlican have access to municipally supplied water (Old Perlican, 2014b). The remaining residents use their own private wells for drinking water.

Source Water Quality and Quantity

Old Perlican has two surface water supplies: Bell Pond, which is used for resident consumption, and Cooks Cove Pond, which is primarily used for commercial water use but is available as a backup water supply for residential use if required (Old Perlican 2014c). Once Old Perlican incorporated in the early 1970s, Bell Pond was developed as the municipal water source. Cooks Cove Pond was developed 11 years ago to accommodate industrial high water users, particularly the fish processors located in the community.

> *Actually the quality of drinking water in Old Perlican is very good. As for domestic use I don't hear of many challenges, at least where we are with the small domestic use we use. As for quantity we use extreme amounts of water. We are a shellfish producer, shrimp processing uses a significant amount of water. Well I guess shrimp alone uses 100 gallons a minute. We peak out at maybe 1800-1900 gallons a minute when processing both shrimp and crab or shrimp and one other species.*
>
> - Business operator

While interviewee responses ranged on municipally supplied water, there is some consensus that chlorination has a negative effect on the taste and smell of drinking water. As surface water sources, these supplies are affected by seasonal weather changes such as

increased rain and runoff, resulting in discolouration in the water. Town and business officials indicate, however, that the water quality is very good, which is also confirmed in the Drinking Water Quality Index (DWQI) rating.

A boil water advisory (BWA) is issued when water samples are found to have higher than accepted amounts of e-coli or total coliforms (bacteria) detected or when there are deficiencies in disinfection or the distribution infrastructure in general. BWAs can be issued by the municipality or provincial drinking water officials, however, only the provincial government may lift the BWA. Two consecutive clean samples taken by Environmental Health Officers, or the Environmental Technician – both of whom work under Service NL (GS) – must occur at least a week apart before the BWA is lifted.

There has been one recorded BWA, dated March 6, 2010 on the DWQI summary for Old Perlican on the Water Resource Portal (DOEC, 2014). The reason stated for this is explained as "inadequately treated water was introduced into the system due to fireflows, flushing operations, minor power outage or other pressure loss"(Ibid.)

> *Well I've had one boil order since I've been here* [six years] *and we've put ourselves on that. And the one we did have was because we were changing the equipment so there wouldn't be any chlorine going into the water, so we put ourselves on a boil order.*
>
> - Water operator

The presence of disinfection by-products (DBPs) caused by the reaction between naturally occurring organic matter and chlorine, has been of increasing concern across the province with double the number of communities currently exceeding the acceptable levels, compared to the year 2000 (White, 2012). According to the *Guidelines for Canadian Drinking Water Quality*, Health Canada set the safety level of HAAs at 80 µg/L and 100 µg/L for THMs (Health Canada, 2012b). Research conducted through the University of Laval, along with reports published on the provincial DOEC Water Resources Portal, indicate that over the past number of years, the treated water in Old Perlican has consistently tested over the Health Canada recommended levels for Haloacetic acids (HAAs) from fall 2008 to spring 2013 (DOEC, 2014). However, reports show that Old Perlican has been in the acceptable range for DBPs.

The Langelier Index (LI) indicates the degree of saturation of calcium carbonate in water. A negative reading indicates that water will have a tendency to be corrosive in the distribution system; a positive reading means water will tend to deposit calcium carbonate in the distribution system; and a LI near zero means that the water will be neither corrosive nor calcium forming (DOEC, 2014). The results from the DOEC testing indicate that the LI in Old Perlican ranges from -3.74 to -7.92, which suggests that this could be having a potential corrosive effect on the waterlines.

Town of Old Perlican (Old Perlican, 2014d)

Infrastructure and Operations

Although there are two different water sources in Old Perlican, the municipal drinking water system functions as an integrated whole. The system is primarily gravity fed, with the exception of a booster pump at Long's Hill to

supply residents of that particular area (Old Perlican, 2014b). For over 40 years, Bell Pond has been the main residential water supply, and much of the in-ground infrastructure, particularly the service lines, are the same age. The degradation of the service lines over the years has resulted in leaks occurring throughout the town system. As previously mentioned, the Cooks Cove treatment plant and main line was installed 11 years ago, but other than the replacement lines, the entire system is outdated.

Old Perlican uses chlorine gas as a disinfectant for their source water supply. There is a back up generator in the water plant to ensure chlorine is pumped into the line in the event of a power outage. The plant is also equipped with a basic water screen, but only filters out larger debris from the system. Water from both Bell Pond and Cooks Cove Pond are treated with chlorination before entering the distribution system, however, the fish plants also use their own chlorination system as they must comply with the standards and protocols set by the Canadian Food Inspection Agency (CFIA) with respect to their treatment of water.

There are three paid staff that manage the town's water system: two full time employees as well as one part time employee. The full time employees consist of the town foreman and the water/heavy equipment operator, who are both certified as level 1 operators through the DOEC's Operator Education, Training, and Certification (OETC) Program. The part time employee is a general maintenance worker who is also knowledgeable about the water system. Having three staff members trained in water operations makes it easier for staff to schedule vacation time without comprising their duties for the town's water operations as well as helping to address succession planning. They also have physical records of their data infrastructure, such as as-builts and other maps, which provide a record of the changes that have taken place over the history of the system.

Bell Pond Water Plant (Old Perlican, 2014b)

There are a number of challenges Old Perlican's water system faces. One of the historical challenges has been meeting the volume demands of high water use industries in the community. Despite infrastructure upgrades in the past 12 years, there is concern among fish plant operators whether enough is being done to meet the industry standard for seafood processing. One particular informant suggested that there is a systematic problem within the provincial government, where they continue to put the onus on the municipality to manage the water systems. This becomes increasingly difficult for rural communities where, in many cases, they do not have the capacity to meet these needs.

Dead ends, leaks, and corrosion continue to be infrastructure issues for Old Perlican. The water operator describes that in some cases, such as dead ends, issues are unavoidable due to the layout of the pipes and where the homes are situated. One of the bigger issues is the amount of time required for employees to repair and replace damaged pipes. In a system that hasn't had a thorough upgrade in 40 years leaks are described as inevitable. Leak detection is by far the most expensive aspect of repairing leaks, and greater leak detection tools would be invaluable to the community.

> *We're up to 25 leaks this summer; we've done six this past month* [i.e.

January]. *Aging infrastructure, that's the problem.*

- Water operator

The town understands the need to address these issues, but have been unable to capitalize on any optimal solutions. One key informant suggested that the town must work with the provincial government to upgrade Old Perlican's water system. However, it was stated by another interviewee that Old Perlican has not applied to Capital Works funding through the Department of Municipal and Intergovernmental Affairs (MIGA) in the past five years. The respondent identified that more assistance is required from MIGA to provide direction in completing the application process.

Policy/Governance

In Canada, the responsibility for ensuring the safety of drinking water supplies is shared by the various levels of government. The principal responsibility of ensuring the safety of drinking water generally rests with the provinces and territories, while municipalities usually ensure the day-to-day operations of treatment facilities and distribution systems. Federally, Health Canada works in collaboration with the provinces and territories, through the Federal-Provincial-Territorial Committee on Drinking Water, to develop the Guidelines for Canadian Drinking Water Quality (GCDWQ). The GCDWQ are published by Health Canada and used by all Canadian jurisdictions (provinces, territories and the federal government) as a basis to establish their own enforceable requirements for drinking water quality.

In Newfoundland and Labrador the provincial government is the main body responsible for the delivery of safe drinking water to the public. In order to meet its own guidelines these operations must follow four acts: the Municipalities Act, the Municipal Affairs Act, the Environmental Protection Act, and the Water Resources Act, while abiding by the Canadian drinking water guidelines. Four provincial departments oversee the public water system through the Multi-Barrier Strategic Action Plan: DOEC, Department of Health and Community Services (DHCS), MIGA, and Service NL. Each department has specific roles in maintaining the drinking water systems in the province, such as providing chemical testing, workshops, financial support, or water quality reports.

Town of Old Perlican

The *Municipalities Act* governs the Town of Old Perlican. Under the Act it is the responsibility of the municipality to operate the public water system for its residents. Those who own property in the community pay taxes in order to contribute to the water services of Old Perlican. In 2013, the combined water and sewer rate per home was $260.00 per year. This rate has remained static for a number of years. High water users, such as the fish plants, pay $1.50/1000 gallons they use (Old Perlican, 2014e), an increase of 50% over the previous industrial rate as of 2012. One plant reports paying charges of over $100,000 yearly for more than 200 million gallons of water. The 2012 town budget included water system maintenance/operation costs of $144,000 (Mercer, 2012).

The community itself does not have a specific water management plan. Further, interviewees did not indicate that water was an integral part of other community planning documents. The

Town's Municipal Plan addresses the protection planning for the source water in the future, while the ICSP states overall improvements to the soda ash system and water-related infrastructure more generally as a goal (Old Perlican, n.d.). Part of the water operator's role is keeping daily log books of residuals, any maintenance performed on the system, tracking water quality reports, and recording any public complaints regarding the water system. Old Perlican also has a Public Works Committee that assists in overseeing the drinking water system.

Public Perception, Awareness, and Demand

There are two primary views residents hold regarding their drinking water quality, as described by key informants. A portion of the community believes the quality of the water is very good, especially in comparison to other rural communities in the province. Others are concerned by the discolouration of the municipal water and the taste of chlorine.

> *It is pretty poor. It's supposed to be good and safe to drink but the quality is not good as far as we're concerned. It smells when it comes out of the tap, it smells like chlorine.*
>
> - Community resident

Town representatives have stated that the water has a distinctive chlorine taste, although this is not a concern indicated in reports provided by the DOEC.

> *Some people get a taste of chlorine. Generally, it should be okay. It's not like well water. It's going to be different because of chlorinated water. Some people get the smell of bog. We're getting water out of a pond, from time to time you are going to get that.*
>
> - Water operator

Although some residents hold negative perceptions regarding the quality of the municipally supplied water, there appears to be a positive level of trust between residents and the town regarding the management of their drinking water systems. Representatives from the town have expressed the need for the municipality to do a better job explaining to the general public that the water is safe to consume by DOEC's standards.

It is evident based on key informant interviews that residents' perception of water quality is driven more by their personal aesthetic concerns than by the publicly available data provided by the DOEC. Further, several residents hold a general distrust of chlorine and chlorination as a water treatment method, believing it causes the water to be unsafe rather then acting as a mechanism for disinfection. There is a lack of understanding as to why chlorination is so broadly used as a common water treatment method used across the province.

Town of Old Perlican (Old Perlican, 2014d).

> *As far as we are concerned, it is unsafe. But it is always inspected and it's supposed to be safe by government regulation. But if you put a glass of water up to your face, you know it's not good...[the water] it's coming from a pond. So if it came straight from the pond it would be alright, but it goes through the system.*

- Community resident

The demand on the water supply has gotten more manageable in recent years. The addition of Cooks Cove Pond several years ago took significant pressure off the Bell Pond supply, allowing the community to shift the commercial demands to their new source. While at peak periods industrial high water users put pressure on the water supply, it is recognized by the community the positive economic impacts that fish plants bring to Old Perlican.

Conclusions and Future Directions

The Town of Old Perlican staff has a number of key assets at their disposal in terms of managing and developing their water system in the future. The three staff members that operate the town's drinking water system utilize two source water ponds of good water quality and ample supply. With the addition of Cooks Cove Pond in 2003, the community has been able to expand the capacity of their in-ground water delivery infrastructure while modernizing the water plant at Bell Pond.

In terms of improving on the system currently in place, the system needs to be upgraded based on the needs of all water users, including the fish plants. Through conversations with fish plant operators, the town is increasing its understanding of the current volumes of water used. It is clear that upgrades to the municipal water system are needed so that fish plants in Old Perlican remain economically competitive. This does present a potential challenge in terms of funding these upgrades. The town, in addition to using the tax revenue generated from the fish plants, will need to look to funding from MIGA and any other potential sources to meet these service requirements of these major employers.

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To see the full case study report please visit the *Exploring Solutions for Sustainable Rural Drinking Water Systems* website: http://nlwater.ruralresilience.ca/?page_id=17.

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