

PROTECTING OUR DRINKING WATER SUPPLY

EPCOR's Source-to-Tap Multi-Barrier Approach

1. Source Water Protection

EPCOR maintains a source water protection and monitoring program that identifies risks in the raw water supply (North Saskatchewan River). EPCOR's Source Water Protection Plan (SWPP) was first developed in 2008 to help mitigate potential risks to Edmonton's source water supplies by understanding the pressures on the watershed. We published an update to the plan earlier this year, which included enhanced land use maps, water quality assessment and incorporation of the Drinking Water Safety Plan Risk Assessment. Key SWPP risks were reviewed in 2015, 2016, 2017 and early 2018 as part of the annual Drinking Water Safety Plan review (see section on DWSP).

2. Treatment

Both Rosedale and E. L. Smith use conventional and direct filtration treatment methods. When raw water quality is good (typically in the fall and winter months), the plants will shift to direct filtration. This requires a substantially lower dose of alum and results in a significant reduction in the amount of waste discharged to the North Saskatchewan River. (See details in the Reducing Environmental Impacts section of this report). Both conventional and direct filtration treatments remove harmful bacteria, viruses and parasites (especially *Giardia* cysts and *Cryptosporidium* oocysts) that might be present in the untreated river water, as follows:

- EPCOR achieves at least 99.97% (3.5 log) physical removal credit for *Giardia* cysts and *Cryptosporidium* oocysts from the raw water during conventional operation by ensuring turbidity of the treated water produced by each filter in the water treatment plant is very low. Filter effluent turbidity is maintained at less than 0.1 NTU on individual filters at all times. The internal target is to be less than 0.08 NTU. This performance readily exceeds the AEP requirement of less than 0.3 NTU.
- During direct filtration operation, the individual filter effluent turbidity is still maintained at 0.1 NTU or less but the physical removal credit is reduced to 3.0 log removal. Although *Giardia* cyst and *Cryptosporidium* oocyst removal credit is slightly lower during direct filtration (99.9% versus 99.97% or 3 log versus 3.5 log), the concentration of these parasites in the river is much lower during this period. We monitor the concentration of the parasites in the river at least biweekly during direct filtration operation and at least monthly at other times.
- Ultraviolet light (UV) disinfection provides an additional 99.9% (3 log) inactivation credit of any *Giardia* cysts and *Cryptosporidium* oocysts remaining in the water after filtration.
- Primary disinfection provided by free chlorine provides an additional barrier against *Giardia* cysts, and is the primary barrier against bacteria and viruses.
- The overall removal credit of *Cryptosporidium* oocysts is 99.99997% (6.5 log) during conventional operation and 99.9999% (6.0 log) during direct filtration operation. This exceeds the minimum approval requirement of 99.9997% (5.5 log) that is based on the raw water quality and a health risk assessment. *Giardia* cyst removal is slightly higher due to chlorination.
- Bacteria and viruses are inactivated by chlorination but are also removed to some extent by filtration. Additional inactivation is achieved by UV disinfection.
- Ammonia is added to the water to form chloramines, which provide a lasting disinfectant residual through reservoir storage and throughout the distribution system within Edmonton and the regional waterworks systems.

3. Distribution System

EPCOR ensures the safety of water in the distribution system by confirming that the piping system is maintained and that there is adequate supply pressure. Ongoing programs that safeguard distribution system integrity and water quality include:

- distribution system pipe and appurtenance replacement
- main break repair
- valve exercising and replacement
- unidirectional flushing and hydrant servicing
- distribution system leak detection
- distribution system pressure monitoring

See details in the Industry Leadership section of this report.

A **Cross Connection Control (CCC)** program maintained by EPCOR provides an additional public health protection barrier. The goal of the CCC program is to minimize the potential for unintended backflow into the distribution system from moderate and severe risk customers in the multi-residential, commercial and industrial customer segments. This is done by ensuring Canadian Standards Association approved backflow prevention assemblies are in place for premise isolation and are tested annually as required by the National Plumbing Code of Canada, CSA B64.10 Standard, and the City of Edmonton Bylaw # 17698 EPCOR Water Services and Wastewater Treatment EPCOR Bylaw.

Every year, additional facilities are added to the program. In 2017, 764 facilities were added for a total of 11,071. In 2017, EPCOR staff inspected 1,090 facilities and issued 10,740 notices to customers and testers for installation requirements, annual testing, test-kit calibration and certification renewals. Overall compliance (tracking overdue tests and devices not installed), was at 70% at year-end, which is a 4% improvement relative to the end of 2016.

The **Lead Response** program reduces the potential for exposure to lead in tap water for approximately 3,000 homes in mature neighbourhoods of the city that are supplied through lead service lines. See details on this program in the Lead Response Program section of this report.

4. Monitoring

To ensure safety of the drinking water up to customer taps, EPCOR monitors raw water entering the Rossdale and E.L. Smith WTPs, as well as partially treated water and treated drinking water entering the distribution system. In addition, a routine monitoring program ensures water quality throughout the field reservoirs and distribution system. The water is also tested in response to valid customer complaints and following system depressurizations due to main breaks or planned maintenance work.

EPCOR exceeds the minimum amount of monitoring and testing required by the regulator. In a city the size of Edmonton, Health Canada recommends bacteriological testing on 178 samples collected from the distribution system each month. **In 2017, 2,814 samples were collected, or, an average of 235 per month.** In addition, EPCOR sent an average of 50 duplicate samples to the Provincial Laboratory for Public Health each month for an inter-lab quality check.

When samples collected after water quality and depressurizations are included, 3,737 samples were collected in the distribution system in 2016. In the last two years, EPCOR has been using our water meter reading team to collect truly random bacteriological samples from homes across Edmonton. This has allowed us to significantly increase the number of samples collected and get a more complete picture of water quality across the city.

In 2017, the EPCOR Water Laboratory carried out approximately 123,000 tests on 8,100 samples of raw water that entered the WTPs, partially treated water, treated water that entered the distribution system, water from the field reservoirs and from various points within the distribution system. EPCOR tested for 141 chemical, physical or microbial parameters. A further 3,100 tests were conducted on 1,300 samples and included another 252 additional parameters by external commercial laboratories. These figures don't include testing conducted for special projects or initiatives such as EPCOR's Home Sniffing program or the Lead Response program. Full details of all testing and monitoring that take place are published in monthly and annual Edmonton Waterworks reports that are posted on EPCOR's website.

In addition to laboratory testing, EPCOR also uses numerous online analyzers to continuously monitor critical treatment performance and water quality variables in the treatment plants, such as chlorine concentration and filtered water turbidity. Back-ups are provided for critical analyzers. There are 137 online analyzers at the E.L. Smith WTP and almost 80 at the Rossdale WTP with a quality assurance program in place to confirm they are reliable. Operators at the plants perform frequent bench tests to ensure the performance of these analyzers. **In 2017, operators performed approximately 40,000 and 30,000 tests at the E. L. Smith and Rossdale Water Treatment Plants respectively.**