

# Fort McMurray Wildfire Emergency Response And Water System Recovery



*Unwavering dedication to the community and engineering profession*

Fort McMurray, Alberta



**PRIME CONSULTANT:**  
ASSOCIATED ENGINEERING

**CLIENT:**  
REGIONAL MUNICIPALITY OF WOOD BUFFALO



## Executive Summary



### Wildfire reaching Fort McMurray

On May 3, 2016, a massive wildfire forced the evacuation of 88,000 residents from the urban area of Fort McMurray in the Regional Municipality of Wood Buffalo, in northeastern Alberta.

To assist with emergency response, the Municipality called upon long-time, trusted advisor Associated Engineering, drawing upon our knowledge of Fort McMurray's infrastructure and experience in emergency response.

With the wildfire threatening critical infrastructure and thousands of homes, protecting and optimizing the water treatment and distribution infrastructure to provide water for firefighting was paramount.

Drawing upon our knowledge of the water system, in particular, the water treatment plant upgrades that we designed three years ago, water process experts assisted plant operators with systems operations and making timely decisions to maximize plant throughput. Newly installed filters were fast-tracked into operation, helping to triple plant production from 30 to 86 million litres per day.

When plant operators were forced to evacuate the water treatment plant, with the wildfire looming at its fence line, our water process specialists operated and monitored the plant remotely from our Edmonton offices, making use of the remote operation facilities that we had implemented with the plant upgrades.

Our ability to operate the plant remotely allowed first responders to continue firefighting and reduced plant downtime, which, in turn, fast-tracked recovery efforts.

Working with the Municipality and government agencies, we developed and implemented a Water System Recovery Plan, cleaning and disinfecting Fort McMurray's complex water system, comprising 55 km of transmission main, eight reservoirs, many pump stations, and 350 km of distribution main.

The efficient execution of the recovery plan allowed Boil Water Advisories in the city to be lifted and the return of residents, confident that their drinking water was safe and secure.

### Highlights

- Largest wildfire evacuation in Alberta's history
- Flushed, cleaned, disinfected 10 water reservoir facilities
- Flushed over 55 km of transmission watermain, and over 350 km of distribution watermains

## Introduction



### Map of affected area

Located in northeastern Alberta, Fort McMurray has experienced a population boom over the last ten years, almost doubling in size to 88,000 residents.

On May 1, 2016, a fire started in a remote forested area in the Regional Municipality of Wood Buffalo, approximately 4 km southwest of the Fort McMurray during a stretch of unusually hot and dry weather.

On May 3, 2016, a wildfire triggered the evacuation of 88,000 people - the entire urban population of Fort McMurray, located in the Regional Municipality of Wood Buffalo, in northeastern Alberta. Over the days and weeks that followed, the fire decimated neighbourhoods, leaving many families homeless.

Having provided infrastructure planning and engineering services to the Regional Municipality of Wood Buffalo for 40 years, Associated Engineering offered our services for emergency response.

With the wildfire threatening thousands of homes, the Municipality's greatest need was to produce sufficient water for first responders to control the wildfire. The operators at the Municipality's water treatment plant were working day and night to keep the plant in operation.

Emergency operation of the water treatment plant was a consideration when Associated Engineering designed the plant expansion three years ago.

As the Municipality's water treatment plant consultant, we recommended installing systems to allow remote monitoring and operation of the plant. These systems played a crucial role during the emergency to maintain continuous operation of the plant for firefighting efforts.



**Wildfire as seen from Associated's office**



## Innovative Solution



**Interior of the water treatment plant**

Associated Engineering's background knowledge and experience with the design and construction of the water treatment plant and the water distribution master plan enabled our team to respond quickly to support operators during the emergency.

Our ability to remotely monitor the plant allowed us to analyze operations and offer advice to the operators to maximize water treated by the plant, greatly assisting operators to make timely decisions.

In particular, newly installed filters in the treatment plant were brought online to increase treated water production, even though filters were not fully commissioned. Bringing filters online almost tripled the output of the water treatment plant from 30 million litres of water per day to 86 million litres of water per day.

With the wildfire encroaching on the plant's fence line, operations staff had to evacuate the water treatment plant.

Associated Engineering's ability to remotely operate key elements of the water treatment and distribution system was called into action. Maintaining operation of the plant was critical to continued firefighting efforts.

After the wildfire was under control, our project team fast-tracked development of a Water System Recovery Plan and coordinated efforts for disinfecting and flushing the water distribution system so that evacuated residents could return home assured of safe drinking water.



**Operators working in the plant**

Ongoing operation of the plant limited downtime, which helped to expedite systems recovery once residents began returning home.

---

**Our ability to remotely monitor the plant from our Edmonton office ensured the ongoing treatment and distribution of firefighting water to save many homes and businesses at risk.**

---

## Complexities



**Worker inspecting a reservoir**

The Municipality's water treatment process uses ultraviolet light and chloramine for disinfection. During the fire, the ultraviolet disinfection units temporarily shut down. As a result, a Boil Water Advisory was established.

With the ultraviolet system offline and the high water demand, the team decided to change the disinfectant to chlorine - which is more effective than chloramine - to disinfect the distribution system.

The water system suffered significant water loss through the water distribution pipes serving destroyed and damaged homes and structures.

We worked to establish isolation plans at the neighbourhood level and once we were allowed to enter the city, we shut off individual home services to control water losses.

Our emergency response team also conducted a preliminary damage assessment of all major water facilities, to determine the operational status of the treatment plant, pump stations, and reservoirs.

We met with multiple levels of government to review the condition of the water system. Due in part to concerns of contaminants that may have entered the system during firefighting activities, the government identified strict requirements to be met before they would lift the Boil Water Advisory.



**Water samples for Boil Water Advisory testing**

Time was of the essence to develop and implement a systematic, efficient, and effective flushing program for Fort McMurray's complex, regional water system, which includes 55 kilometres of transmission pipes supplying 8 remote reservoirs and 350 kilometres of distribution pipes.

---

**Every reservoir had to be drained, cleaned, and disinfected. Every active watermain had to be flushed, to replace the firefighting water with treated, regulatory-compliant water.**

---

## Social & Economic Benefits



### Developing flushing plans

The Municipality's ability to use treated water for firefighting minimized impact on the water distribution system and reduced the effort for water system cleaning after the fire, allowing residents to return home quicker.

Notwithstanding, because of the potential contamination of the water system, the Alberta government required the Municipality to develop a Water System Recovery Plan to enable systematic recovery of the entire water system, and provide safe, potable water to the residents re-entering the community.

Associated Engineering played a key role in the Water System Recovery Plan, including engineering and inspecting the reservoir cleaning process, developing and executing the flushing plan, and coordinating and administering the contractor's services for flushing and repairing watermain breaks, and repairing hydrants and service connections.

We provided overall coordination of the Water System Recovery Effort, including project management, resource allocation

and planning, coordinating and communicating with other related response efforts, communicating with the Regional Emergency Operations Centre, reporting to Alberta Environment and Parks and Alberta Health Services, providing data management, and preparing safety plans.

While the evacuation order was still in effect, we mobilized rotating crews to provide a local presence and worked directly with operators and maintenance personnel.



### Water flushed from hydrant

Through the coordinated efforts of the Associated Engineering team, the Municipality's staff, and contractor's crews, the Boil Water Advisories for most of Fort McMurray were lifted by the end of June 2016.

---

Providing safe, potable water to the residents as part of their re-population and re-entry into the community was achieved through prudent planning and effective operational action.

---



## Environmental Benefits



### Operators inside the water treatment plant

The Fort McMurray wildfire is a reminder of climate change and the severity of its impacts. Climate change has increased the frequency and severity of weather-related disasters, and affirms the need for emergency preparedness.

The Fort McMurray wildfire highlighted the vulnerability of communities. Many communities will draw from lessons learned from the Fort McMurray wildfire.

Our team developed a comprehensive flushing program, which provided step-by-step instructions for field crews on operating valves, and flushing from hydrants to force water along the desired path.

Each flush was designed to achieve three-times turn-over of the volume of water in the pipe, replacing firefighting water with regulatory compliant water.

The staging and scheduling of this program was coordinated with the reservoir cleaning program, such that reservoirs deemed to be regulatory compliant were in

turn used to flush the mains serviced by that reservoir.

The flushing plans were provided to our field crews in Fort McMurray, who worked with local underground services crews and contractors to execute the plans, document progress, and monitor chlorine and turbidity levels in the water.

This was an extensive program of progressively flushing every single watermain in the entire distribution network.

We worked with other consultants and agencies in the region to monitor downstream impacts, prevent the release of chlorinated water to receiving bodies, and ensure that flushing operations did not cause erosion or flooding.



### Collecting water samples for testing

---

Future system planning and improvements will likely consider climate change adaptation measures to continue to improve the resiliency of the water system.

---

## Meeting Client's Needs



### Repairing damaged infrastructure

Associated Engineering and the Municipality demonstrated foresight in providing key elements of the Fort McMurray Water Treatment Plant and distribution system with remote monitoring and operations capabilities.

Associated Engineering's ability to remotely operate the plant helped operators make timely decisions to optimize plant operations, and enabled our staff to maintain operation and provide firefighting water when the Municipality's staff had to evacuate the Water Treatment Plant.

As a result, the plant's downtime was limited, enabling a quick recovery of the treatment plant once the operators returned to the plant.

The positive relationships that Associated Engineering has established with key stakeholders at the Regional Municipality of Wood Buffalo allowed our collective emergency response team to work together to develop rapid responses to protect homes and neighbourhoods, as well as critical water infrastructure, in the face of the fast-moving fire.

Associated Engineering's emergency response team was quick to respond,

develop, and execute recovery plans, and guide the Municipality through the logistic and regulatory obstacles to lift the Boil Water Advisory.

Our team helped to provide the availability and safety of critical infrastructure during firefighting efforts, and most importantly, for when residents returned to their homes.

---

With our experience providing emergency recovery for the Town of Slave Lake, Associated Engineering is now helping the Regional Municipality of Wood Buffalo to plan and re-build infrastructure that will be more resilient to climate change and future severe weather events.

---



**LETTER FROM REGIONAL MUNICIPALITY OF WOOD BUFFALO TO ASSOCIATED ENGINEERING**

*“During the Fort McMurray Wildfire, Water Treatment operations were pushed to their design limits that had previously been untested. When proximity of the wildfire prompted the total evacuation of the Fort McMurray Water Treatment Plant (WTP), operators were able to monitor and remotely operate key infrastructure. When key system processes failed, operators were able to make quick decisions on how to adjust treatment to minimize impacts to the distribution system while maintaining significant flow of firewater.*

*All of these actions: the increased capacity of the WTP; remote monitoring and operation of the WTP; and, the quick operational changes; were in full or part made possible by the actions of Associated Engineering. More specifically, through the support offered by [Associated Engineering’s] Steve Justus.*

*The Water Treatment Branch, the RMWB, and our residents owe a great deal to the dedication of Mr. Justus.*

*While this event shifts from response to recovery, many thank-yous will be shared between the public, our politicians, our firefighters, our volunteers, our first responders, and our municipal services.*

*Consultants generally provide thankless services, humbly completing stellar works of engineering that are silently and proudly shifted into the hands of their customers. On behalf of our team at the Water Treatment Plant, and, as a resident of Fort McMurray, I thank Associated Engineering and Mr. Justus for their unwavering dedication to our community and our profession”.*

*Travis Kendel, P.Eng.  
Manager, Sustainable Operations  
Regional Municipality of Wood Buffalo*



Water Recovery Phasing Map

