

# Lessons Learned: Recovering from a City-wide Boil Water Order

Presenter: Antoine Rempp and Graham Brown

Department: Environmental Services

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# Speakers' Introduction



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# Presentation Outline

- The 2020 ice jam flood event
- Contamination of the water distribution system
- Recovery of the water distribution system
- Lessons learned
- Questions





# The 2020 Ice Jam Flood Event

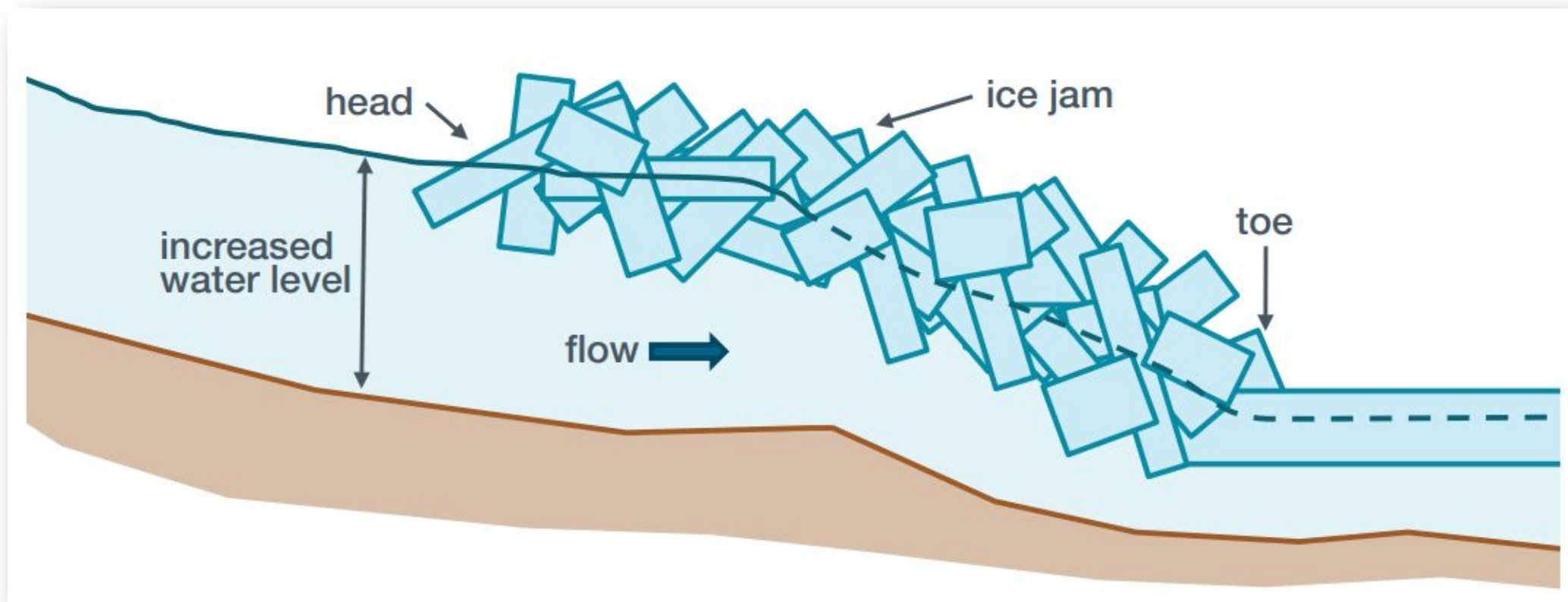
# Fort McMurray and Flooding

- Ice jam flood events extensively studied in Fort McMurray – down to a science
- 10 major flood events over the past 150 years
  - Largest on record – 1875
  - Recent floods in 1977, 1997, and 2020



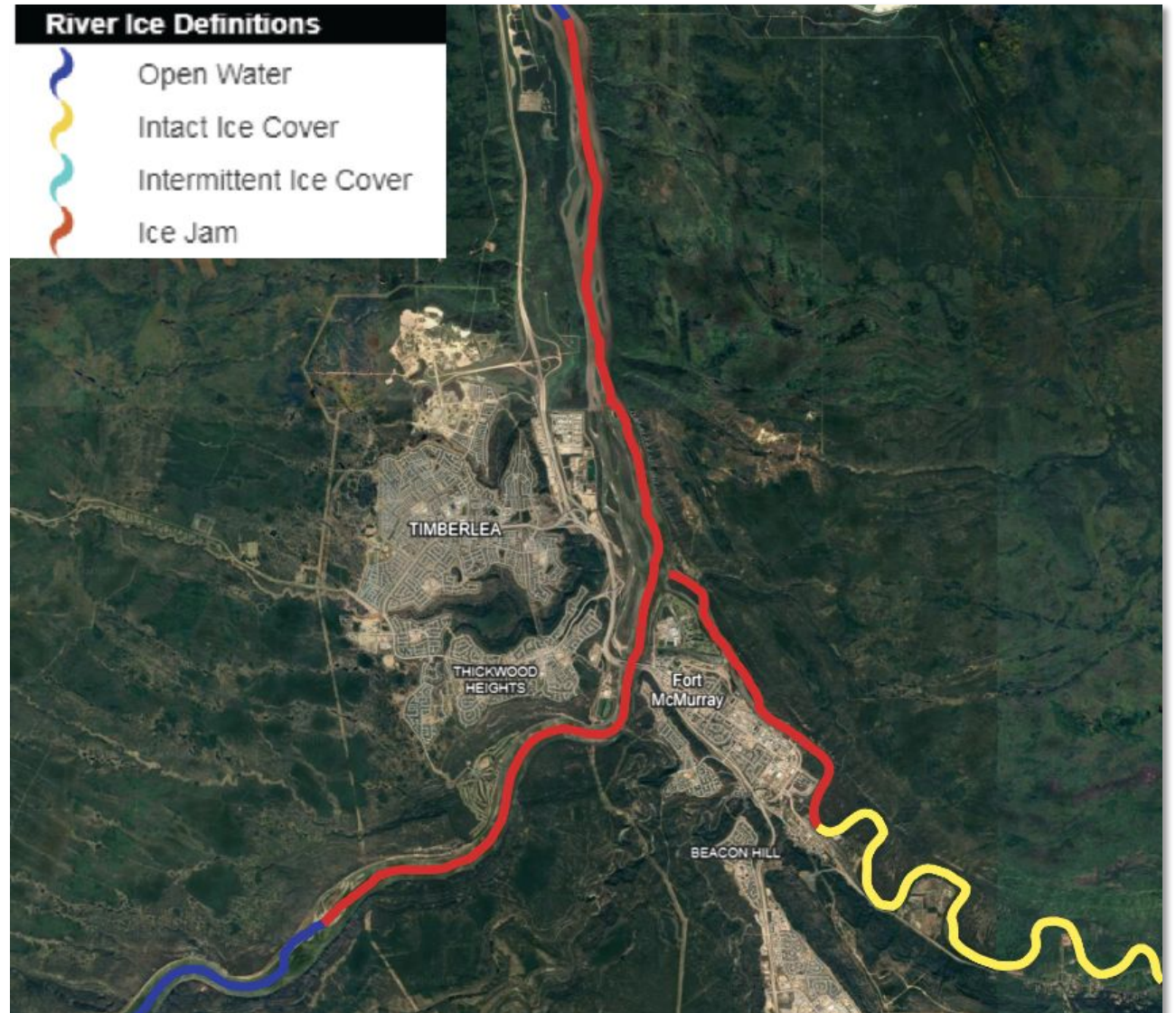
# What is an Ice Jam Flood?

- The result of ice buildup that blocks the rivers flow leading to high water levels



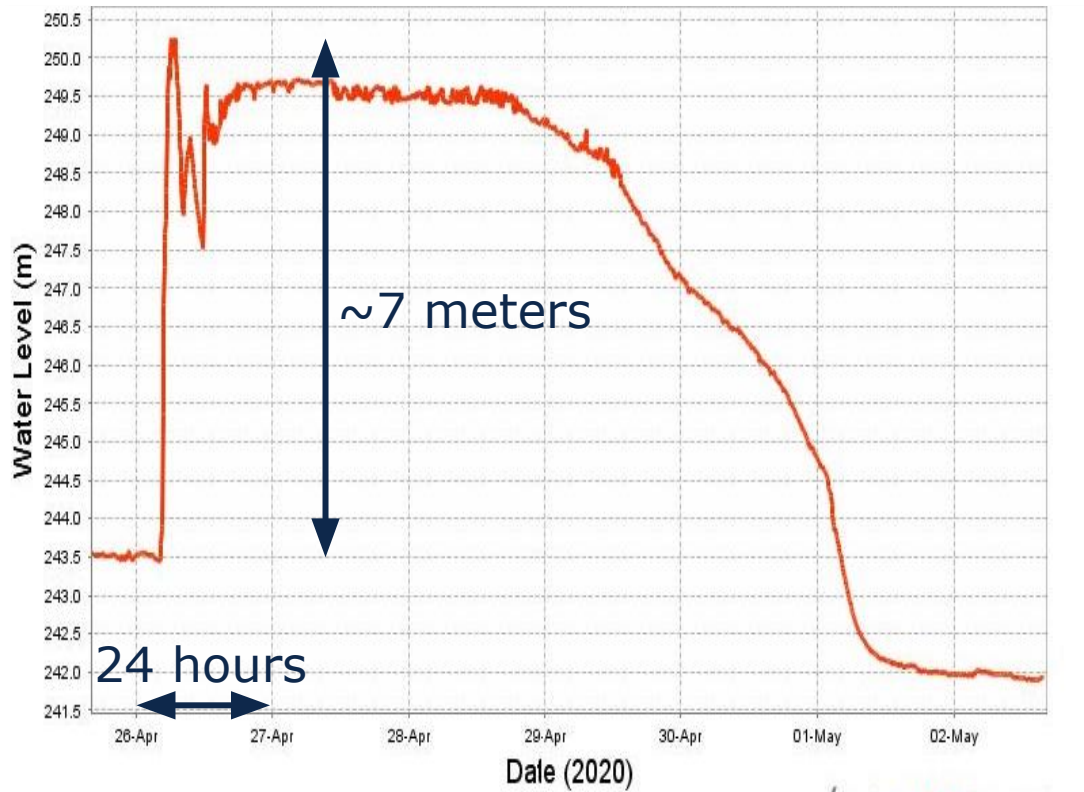
# Concerning Conditions

- April 26, 2023
- 25-kilometer-long ice jam on the Athabasca river



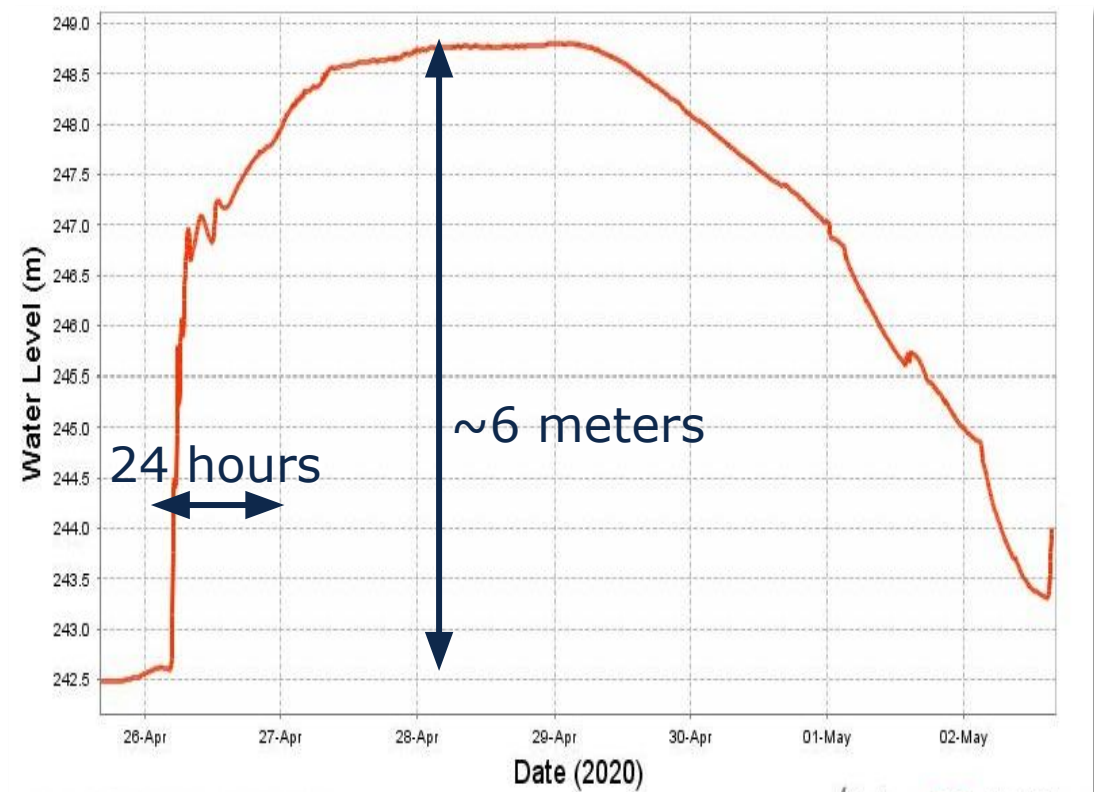
# Water Level Increase

## Athabasca River



Generated at: 2020-05-02 16:16:20

## Clearwater River



Generated at: 2020-05-02 16:16:20













# Contamination of the Water Distribution System

# The Water Treatment Plant

- Located upstream of the Athabasca-Clearwater confluence point
- Facility designed around 1:200 flood event +1 meter of freeboard
- Backflow prevention devices
- Annual river-breakup planning



# Flood vs. Plant



# Discovering the Contamination

- High turbidity alarms in the clearwell and distribution reservoirs – 180 NTU
- Inundated with nuisance alarms
- Reduction in chlorine residual leaving the clearwell
- Resident complaints of turbid water





# The Consequence

- Contamination of clearwell and distribution reservoirs and piping
- System-wide boil water order issued affecting 76,000+ people



*Environmental Public Health*

**ORDER OF AN EXECUTIVE OFFICER  
Boil Water Order**

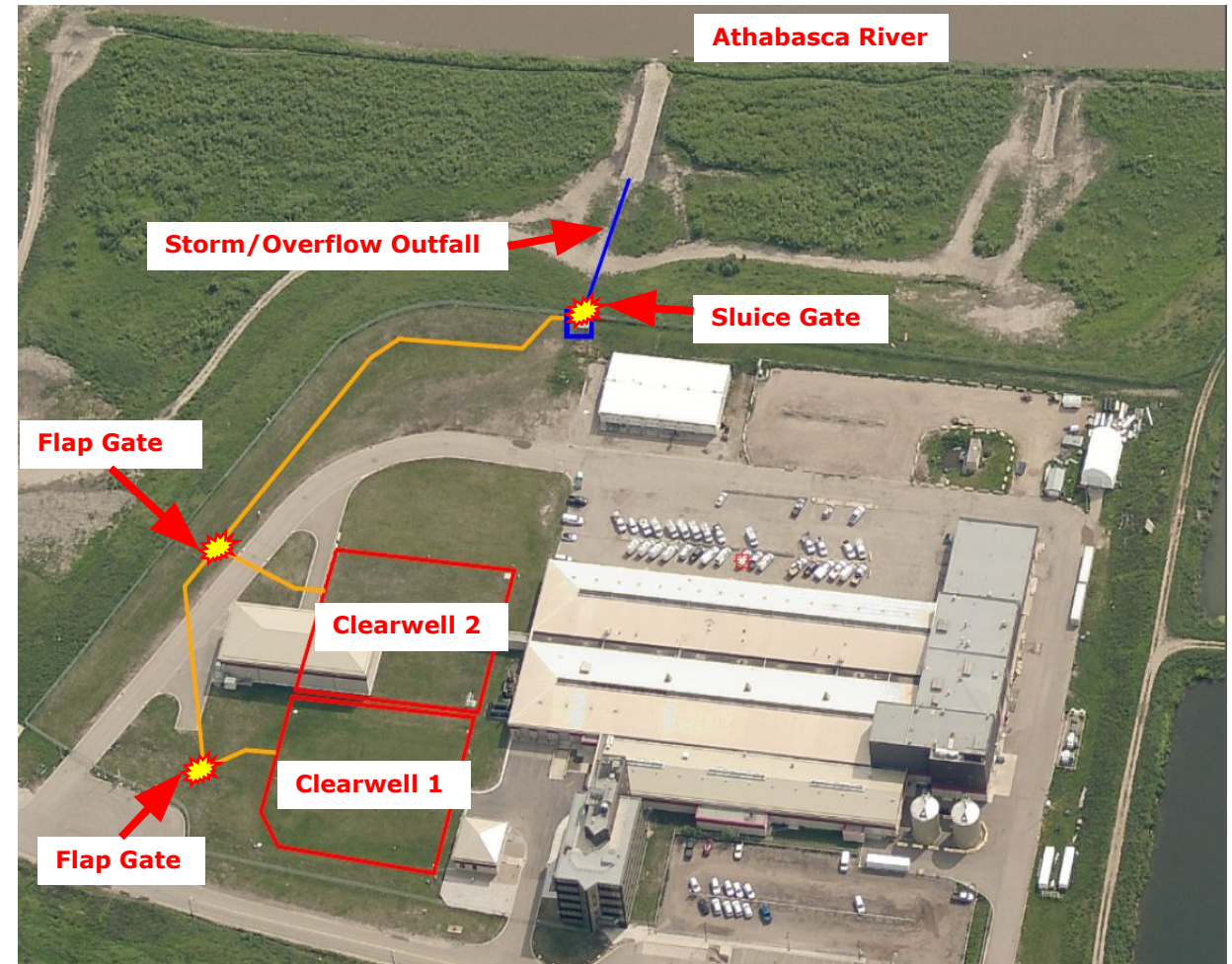


# What Happened?

- Sluice gate at storm outfall failed due to improper seating
- Storm system surcharged due to high flood level
- Flap gates on clearwell overflow bypassed due to construction defects

Which resulted in

- Raw water entering the clearwell



# Complications

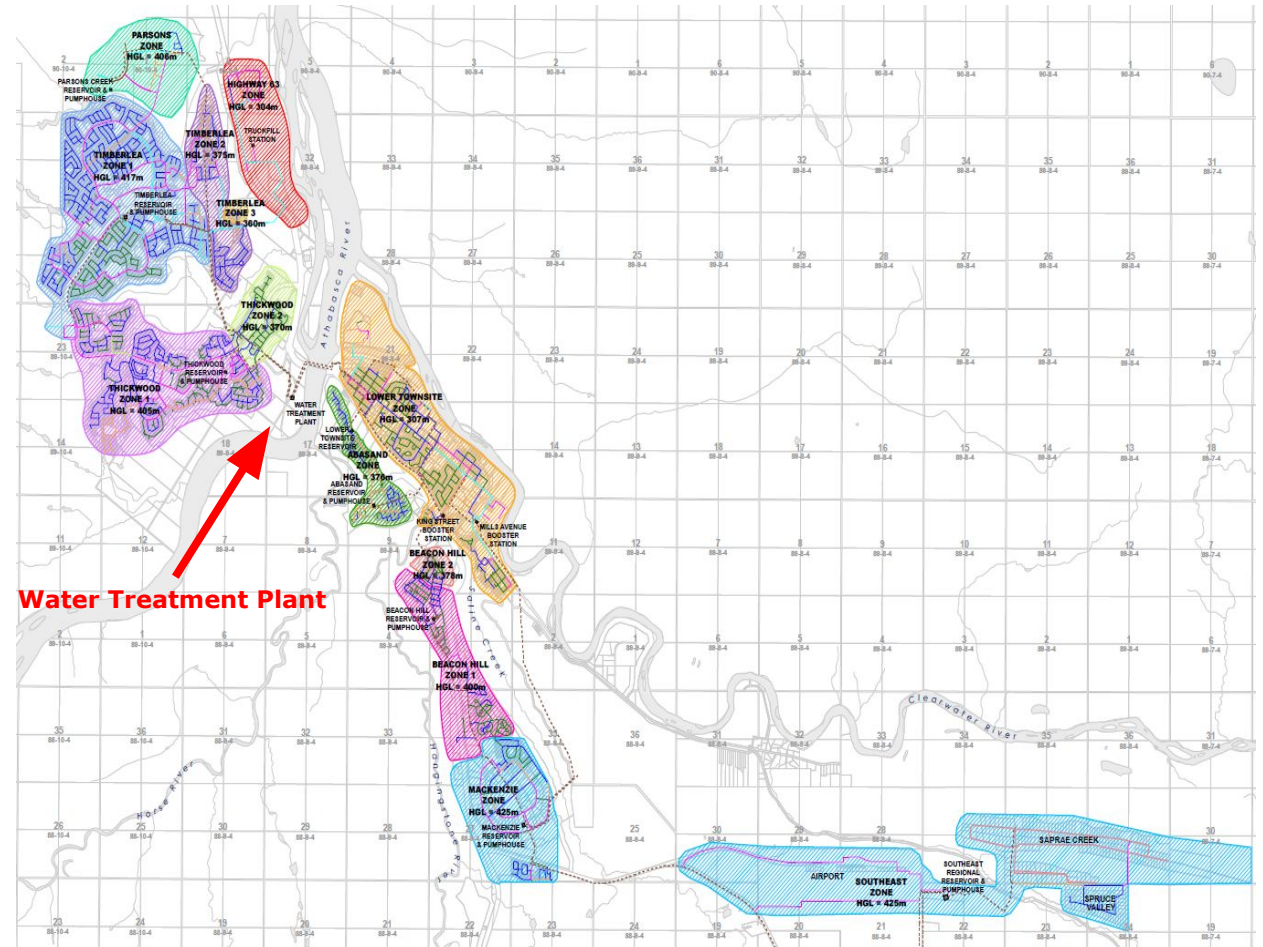
- Inability to operate clearwell valves to reduce impact of contamination



# Recovery of the Water Distribution System

# The Task at Hand

- Infrastructure requiring remediation:
  - ~ 400 km of watermains
  - 7 distribution reservoirs
  - 2 clearwell reservoirs
- 2016 Wildfire recovery strategy not viable
  - Different contaminants
  - Populated vs. unpopulated



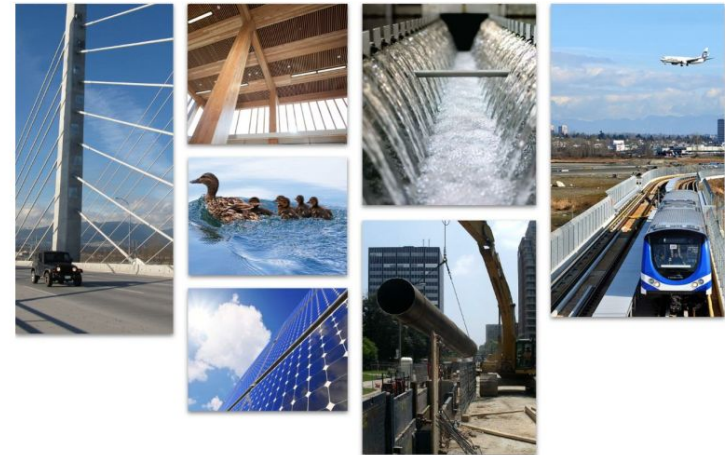
# Making the Plan

- Recovery strategy developed with direct regulator engagement
- Stakeholder buy-in before starting was key
- Initial strategy outlined in a single document
- Approach based on best management practices

## REPORT

Regional Municipality  
of Wood Buffalo

2020 River Break-Up  
Flood Contamination Incident  
Water System Recovery Plan



APRIL 2020



# The Approach

- Phased approach based on:
  - Geographic area
  - Degree of contamination
- Staggered lifting of the boil water advisory



# The Timeline

- Initial estimate: 120 days
- High level of uncertainty
- A frustrated public

CANADA

## Fort McMurray flood: Boil water advisory to remain in place until September



By **Breanna Karstens-Smith** & **Caley Gibson** • Global News

Posted May 4, 2020 2:37 pm • Updated November 3, 2022 11:18 am





# Optimizing the Effort

- Ask for help!
- Meet frequently
  - Daily at first and then adjust
- Work around the clock
- Document everything



# Distribution System: Recovered

- Boil Water Order issued on April 26, 2020
- Initial Estimate: 120 days
- First Boil Water Orders lifted on June 2, 2020 (37 days)
- All Boil Water Orders lifted by June 19, 2020 (53 days)

HEALTH

## Fort McMurray boil water advisory lifted in parts of city months ahead of schedule



By **Allison Bench** • Global News

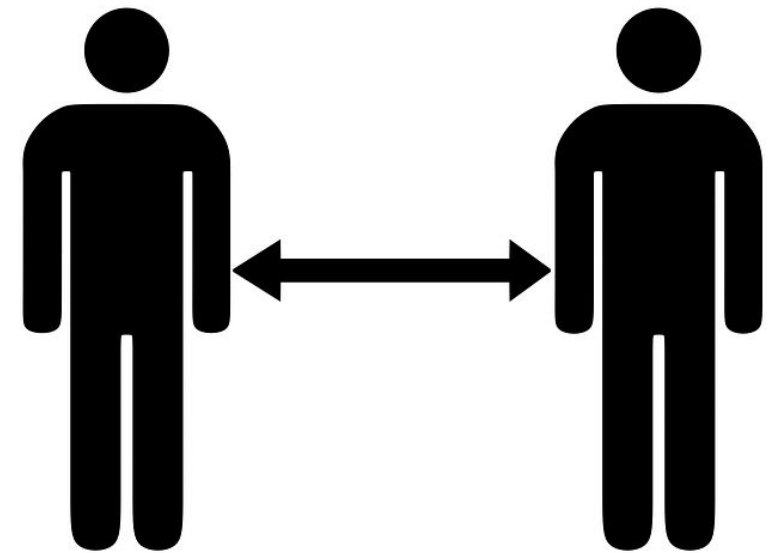
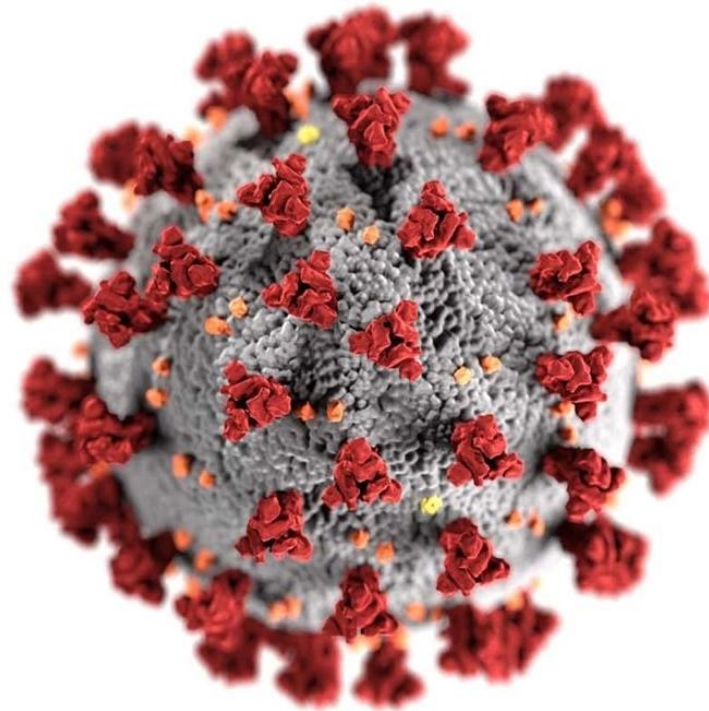
Posted June 2, 2020 6:23 pm · Updated June 2, 2020 6:28 pm



# Lessons Learned

# COVID-19

- Doesn't count during an emergency response effort!



# The Need for Flexibility

- Not everything goes accordingly to plan
- Adjust to the needs of the community
- Flexible, nimble, and adaptable



# Collaboration vs. Regulation

*“How do we all work within the framework we’ve set up to recover the system to its proper state, as quickly as possible, without risk to infrastructure and the public?”*



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Alberta Environment  
and Parks



# Alarm Rationalization

- Ensure SCADA alarm protocol is rational and justified
- Alarm clarity and priority is key
- Quality > Quantity

The screenshot displays a SCADA alarm management interface. At the top, there are navigation tabs: GUEST, Login, Process, Alarm Summary, Alarm History, Alarm Enables, Setpoints, Notifications, Trends, and Reports. Below the tabs, there are filter options for priority levels: High Priority, Medium Priority, and Low Priority. A 'CLEAR' button is also present. The interface shows 4 Unacknowledged Alarms and 176 Acknowledged Alarms. A table lists the following alarms:

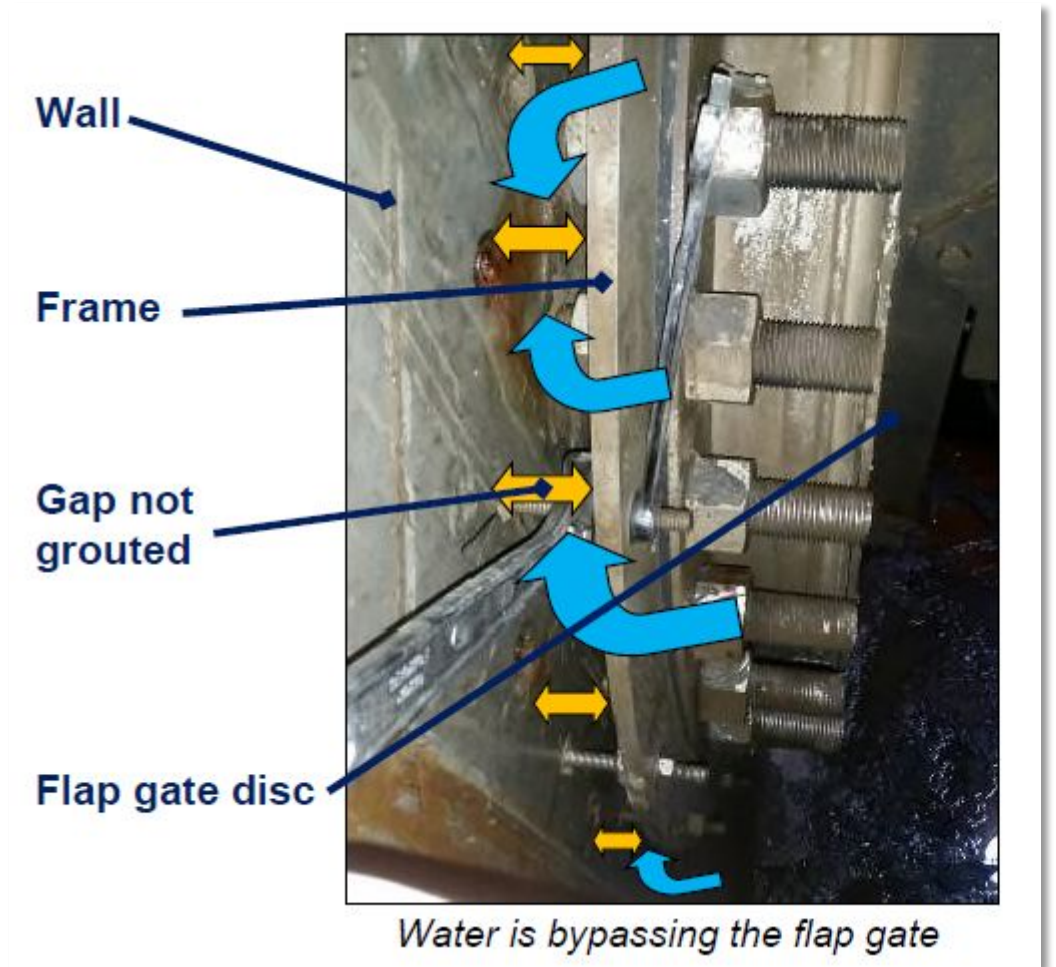
Date In	Priority	Area	Tagname	Description
11/6/2023	LOW	51LT3042,51LT3047,ALARM,CHEM,FM	FMICHEM_51TK3040_DIS_ALM	Coag Tank 4 Tx Level-Discrepancy Alm
11/6/2023	LOW	UWATER,881,ALARM	RS_881_FUEL_LO	881 Generator Fuel Tank Low
11/6/2023	LOW	UWATER,PARSONS,ALARM	RS_PCRK_INLETCL2HH	Parsons Inlet Cl2 high high
11/6/2023	LOW	51LT3012,51LT3017,ALARM,CHEM,FM	FMICHEM_51TK3010_DIS_ALM	Coag Tank 1 Tx Level-Discrepancy Alm
11/6/2023	LOW	UWATER,PARSONS,ALARM	RS_PCRK_INLETCL2H	Parsons Inlet Cl2 high
11/5/2023	LOW	51LT3017,CHEM,FM,WTP,ALARM	FMICHEM_51LT3017_LOLO_ALM	Coag Tank 1 LT3017 Low Low Alarm

Total Alarms: 6  
Filter: (Area In="ALARM" OR Area In="INLK") AND (Date In >= "11/5/2023" AND Time In >= "00:00:00") Sort: Time In, Descending



# Maintenance Programs

- More comprehensive maintenance program
- Visual inspections





# Pay Attention to Social Media

- The public will tell you if something is wrong... and you should listen!



# Risk Review

- Requires a holistic review of all systems
- Given a scenario, review:
  - What systems are exposed?
  - How could they be affected?
  - How do they affect each other?
  - What are the impacts?
  - How do you respond?



# There is More to the Story

- Wastewater Treatment
- Storm & Wastewater Collection
- Landfill
- Dechlorination
- Dewatering
- Downstream Impacts



# Questions?



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