

E.L. Smith High Lift Pump Event

January 29 to February 2, 2024

Presentation to Utility Committee – March 4, 2024

EPCOR Representatives

- Frank Mannarino, Senior Vice President, EPCOR Water Services
- Craig Bonneville, Director, Engineering & Technical Services
- Vicki Campbell, Director, Water Treatment Plants
- Martin Kennedy, Director, Sustainability & Public Affairs
- Susan Ancel, Director, One Water Planning
- Saqib Chaudhary, Director, Regulatory & Business Planning

Agenda

Overview of Water Treatment and Distribution

- Water Treatment Plants, Distribution and Reservoirs
- Water Storage
- Regional Customers

Incident Description and Response

- Event Timeline

Demand Management

- Demand Management Protocol
- Customer and Stakeholder Communications

Investigation and Follow-up

- Root Cause Analysis and Follow-Up Actions
- Increasing System Resiliency



Overview of Water Treatment and Distribution

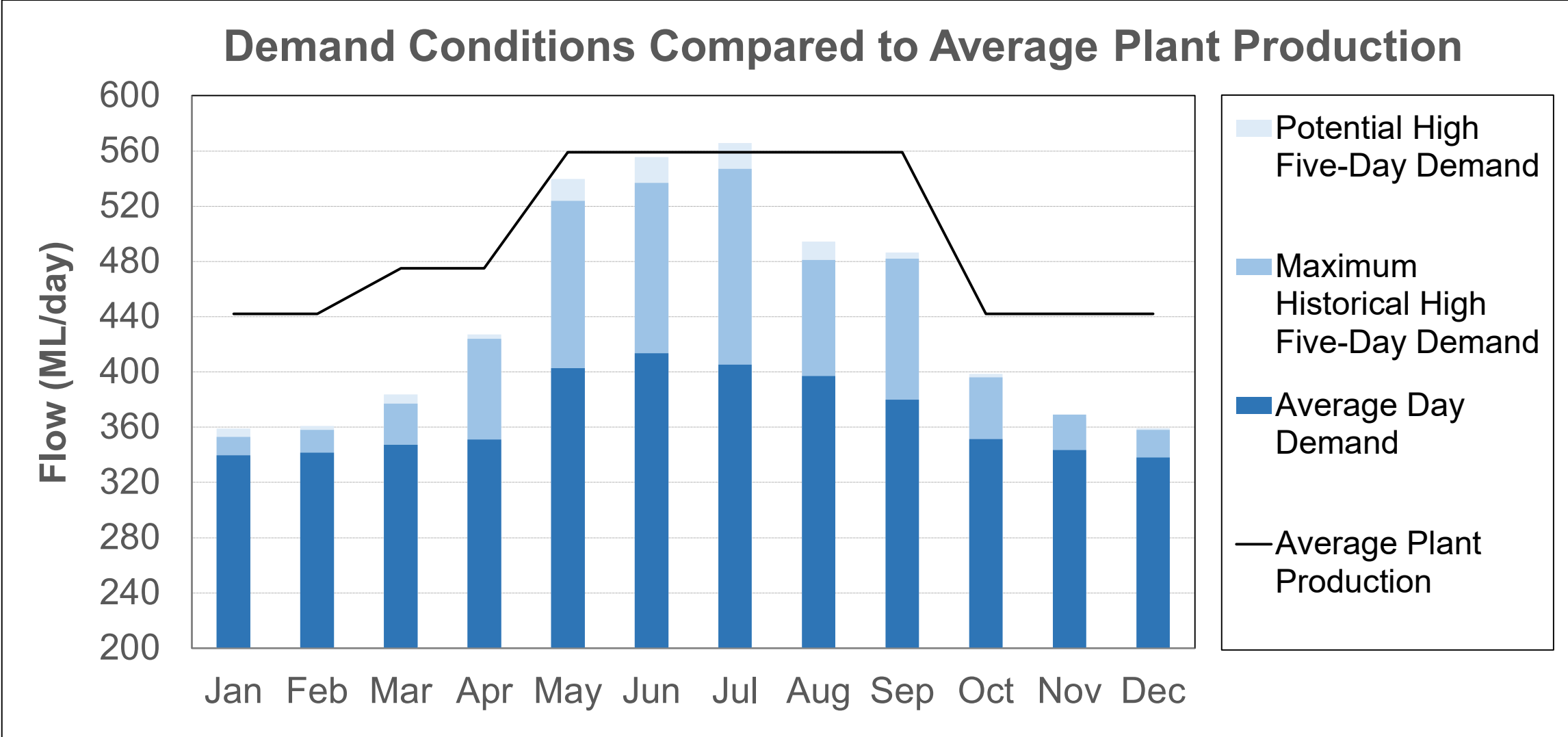
Water Treatment Plants

- Two water treatment plants near and drawing from the North Saskatchewan River
 - Rossdale 280 ML/day max
 - E.L. Smith 400 ML/day max
- Average Day Demand ~375 ML / day
- Max Average 5 Day Demand ~550 ML / day
- Supply of Average Daily Demand
 - Rossdale 35%, E.L. Smith 65%
- Water Consumption:

Residential	37%
Multi-residential	21%
Regional	28%
Commercial	21%

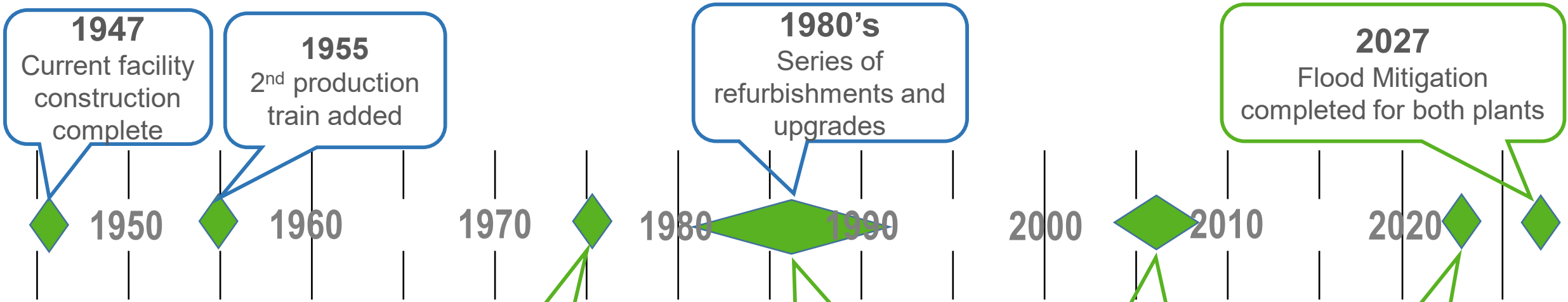


Water Treatment Plant Production and Demand



History of Major Water Treatment Plant Upgrades

Rossdale Water Treatment Plant



E.L. Smith Water Treatment Plant



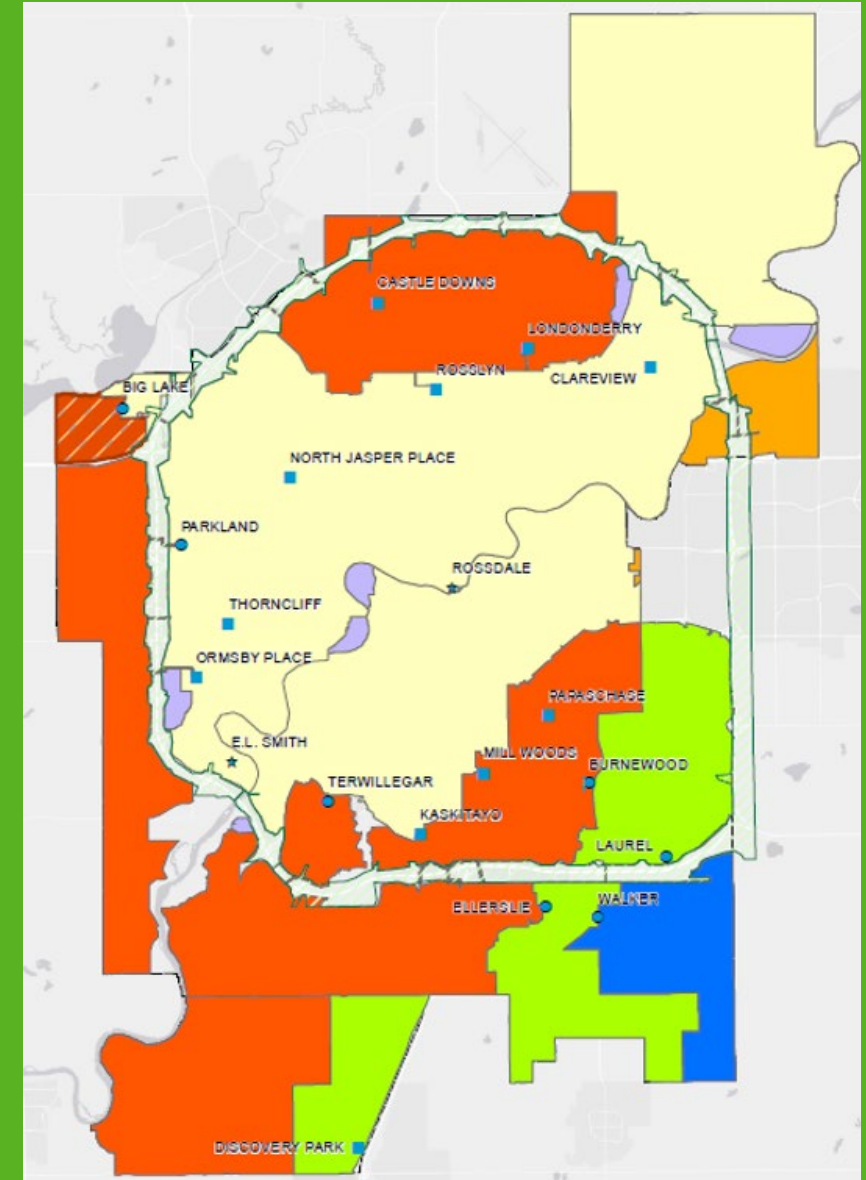
Water Distribution System

- Two primary functions
 - Deliver clean, safe, potable water
 - Fire protection
- 4,200 km of water mains, valves, hydrants
 - Includes 560 km of transmission mains sized 350 mm to 1350 mm
- Integrated network supplying Edmonton retail (residential, multi-residential and commercial) and wholesale (Regional) customers



Water Storage – Reservoirs

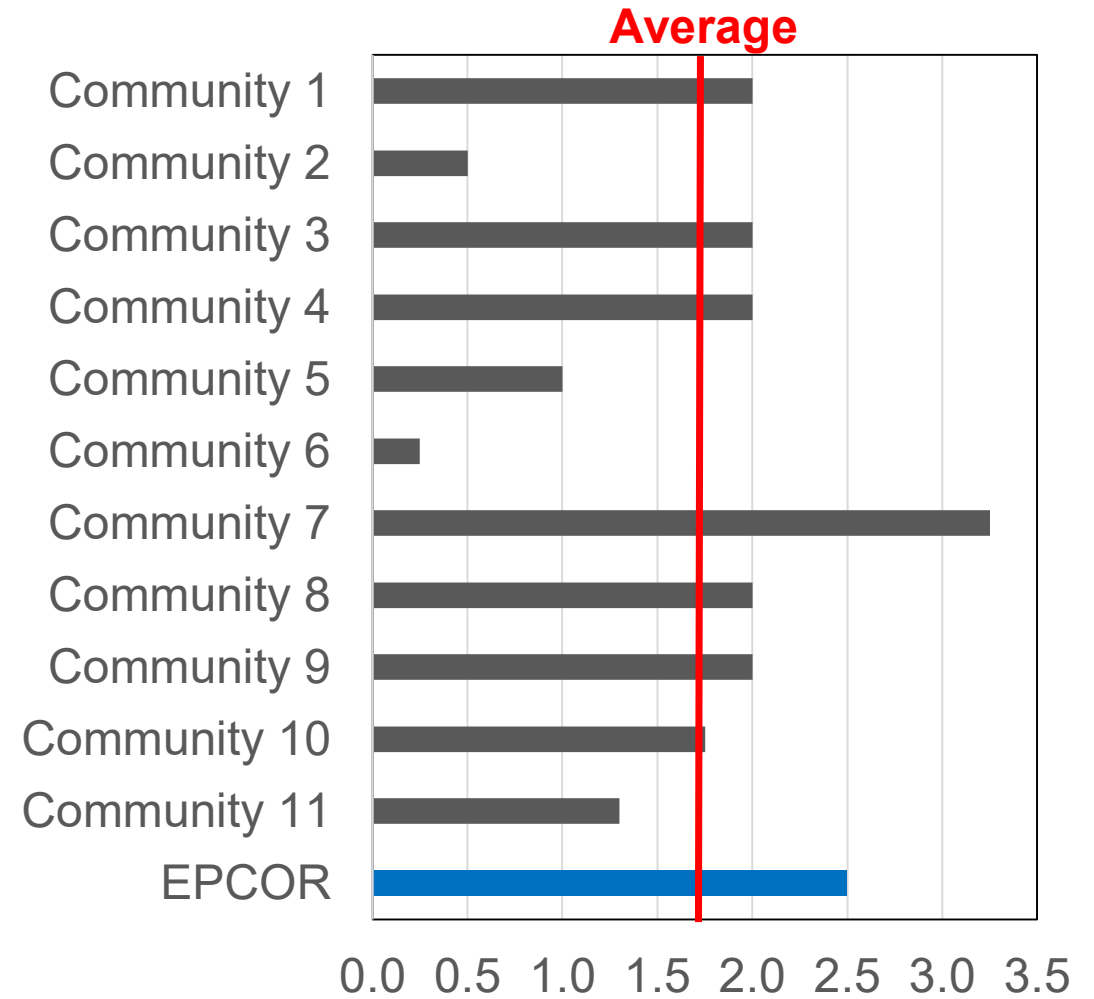
- Treated water storage consists of on-site reservoirs at plants and field reservoirs
 - 13 Reservoirs, 630 ML total available storage
 - 180 ML at Plants, 97 ML at E.L. Smith
- Field Reservoirs:
 - Supply water when demands > production
 - Storage for firefighting, operational issues
 - Provide flexibility and system reliability
- At average in-City day demand of 270 ML, about 2.5 days total available storage
- 7 pumping (booster) stations



Water Storage in Canadian Cities

- Water storage industry norms are generally two days or less
- Design guidelines, while varying province to province, generally require storage for fire protection, emergencies and portion of maximum daily flow
- Edmonton well exceeds the provincial guideline of less than one day

Days Treated Water Storage



Regional Customers

- Water supplied to 90 surrounding communities under contract through 7 water commissions representing 365,000 customers
- Approximately 37,000 ML/year reflecting 28% of EPCOR's water production
- Contracts outline maximum daily & annual volumes, minimum pressure levels
- EPCOR has contractual right to interrupt and curtail water supply due to unforeseen circumstances
- Strong collaboration with Regionals but limited day to day operations visibility
 - Regional commissions manage reservoirs levels independent of EPCOR
 - Separate demand management policies by municipality

Incident Description and Response



Event Timeline

<ul style="list-style-type: none">• A portion of Rossdale Water Treatment plant was offline for planned capital improvements	Q4 2023
<ul style="list-style-type: none">• Operators were alerted to an outage of distribution pumps• Maintenance support was dispatched to site to isolate the equipment and assess the situation, and concluded that:<ul style="list-style-type: none">• Water ingress into the underground vault containing the high voltage cables supplying power to the distribution pumps• Steam observed in the electrical room above, causing damage to the electrical equipment• E.L. Smith plant shutdown with no clear restoration timeline	Monday January 29 2:30 am

Event Timeline

- Maintenance, operations and engineering teams begin determining scope of the required repairs and activated emergency response protocol
- Return of Rossdale to higher production initiated, requiring the suspension of capital construction and restoration of the offline train to production status
- E.L. Smith pump electrical repair initiated, with equipment required identified and sourced, and resources organized
- Reservoir levels decreased from 70% to 60% overnight and in the morning daily demand started to increase
- **Mandatory non-essential water ban declared mid-day**

Monday
January 29
Morning

Event Timeline

- Customer engagement and communication to large commercial and regional customers initiated, with good cooperation
- Repair of electrical equipment by electrical contractor supported by EPCOR resources initiated
- In parallel, damaged equipment and cables were removed by EPCOR and contractor teams
- Comprehensive checks of electrical system performed to assess any damage to the treatment process – none found
- Electrical system repaired and 2000 hp pumps (with no cable damage) re-started at 10 PM

**Monday
January 29**
Afternoon &
Evening

Event Timeline

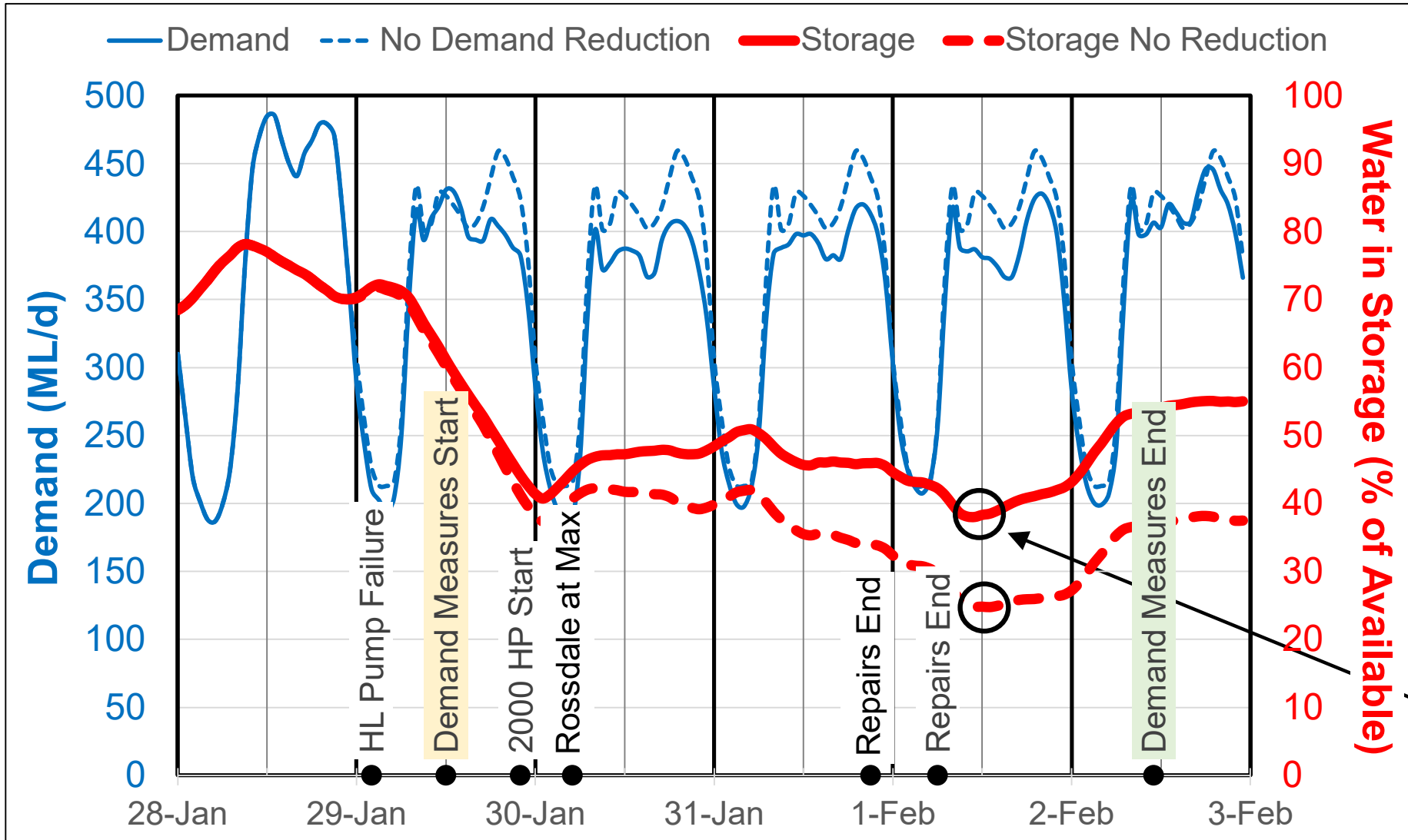
- Rosssdale production maximized, reservoir levels at 40%
- Sourced replacement cable material and equipment
- Restoration timeline of mid-day Sunday issued to public
- Planning and engineering for complex cable replacement
- Operations, Maintenance and Engineering support from Water Services and Electricity teams organized
- Review of electrical systems completed to ensure proper system settings and operation of the repaired system
- Rate of decline of reservoir volumes decelerated due to demand management measures

**Tuesday
January 30
&
Wednesday
January 31**

Event Timeline

<ul style="list-style-type: none">• E.L. Smith shutdown and cable replacement on 4000 hp Highlift Pumps initiated at 6 PM• Close monitoring of water distribution system performance to ensure no additional issues	Wednesday January 31 Evening - Overnight
<ul style="list-style-type: none">• Cable replacement completed at 6 AM• 4000 hp pumps started at 6:30 – 7 AM, reservoirs at 38%	Thursday February 1 Morning
<ul style="list-style-type: none">• Production and distribution system ran reliably and overnight production recovered reservoirs to minimum 50% storage requirement before lifting Demand Management Measures• Reservoirs at 53%, water ban lifted at 11 AM	Thursday February 1 Friday February 2

Demand Management and System Storage Results



Impact

- 100 ML saved in 3 days
- **Dotted Lines:** Forecast water demand (blue) & overall water storage (red) with no demand management
- **Solid Lines** Actual consumption (blue) & actual overall water storage (red)
- Overall water storage in the system was 10% points higher due to conservation efforts

Demand Management

Demand Management and Communications

Demand Management Protocols and Communication Procedures Overview

Customer Communications

- Direct Contact
- Public Appeal

Stakeholder Communications

Results

- Demand Management Response
- Public Survey

Water Demand Management Protocol

The three tiers of Demand Management measures are designed to achieve escalating levels of water conservation

Demand Measure C Mandatory

- All Measure A and B actions, plus mandatory restrictions on *non-essential* water use, with compliance measures
- Goal: Up to a 10% reduction in demand

Demand Measure B Voluntary

- All Measure A actions, plus voluntary restrictions on lawn watering and *non-essential* water use. No compliance measures
- Goal: Up to a 5% reduction in demand

Demand Measure A Operational

- EPCOR operational activities are adjusted to reduce water demand
- Goal: Up to a 2% reduction in demand

Essential and Non-Essential Water Use

Demand Management seeks to protect the integrity of the water system so that essential uses of water are maintained

Examples of Essential Water Use

- ✓ Human and animal consumption
- ✓ Sanitation
- ✓ Fire suppression services
- ✓ Businesses using water to deliver a product or service that is *life sustaining* for people, animals and plants
- ✓ Businesses that must use water to meet health code standards, such as hospitals and restaurants

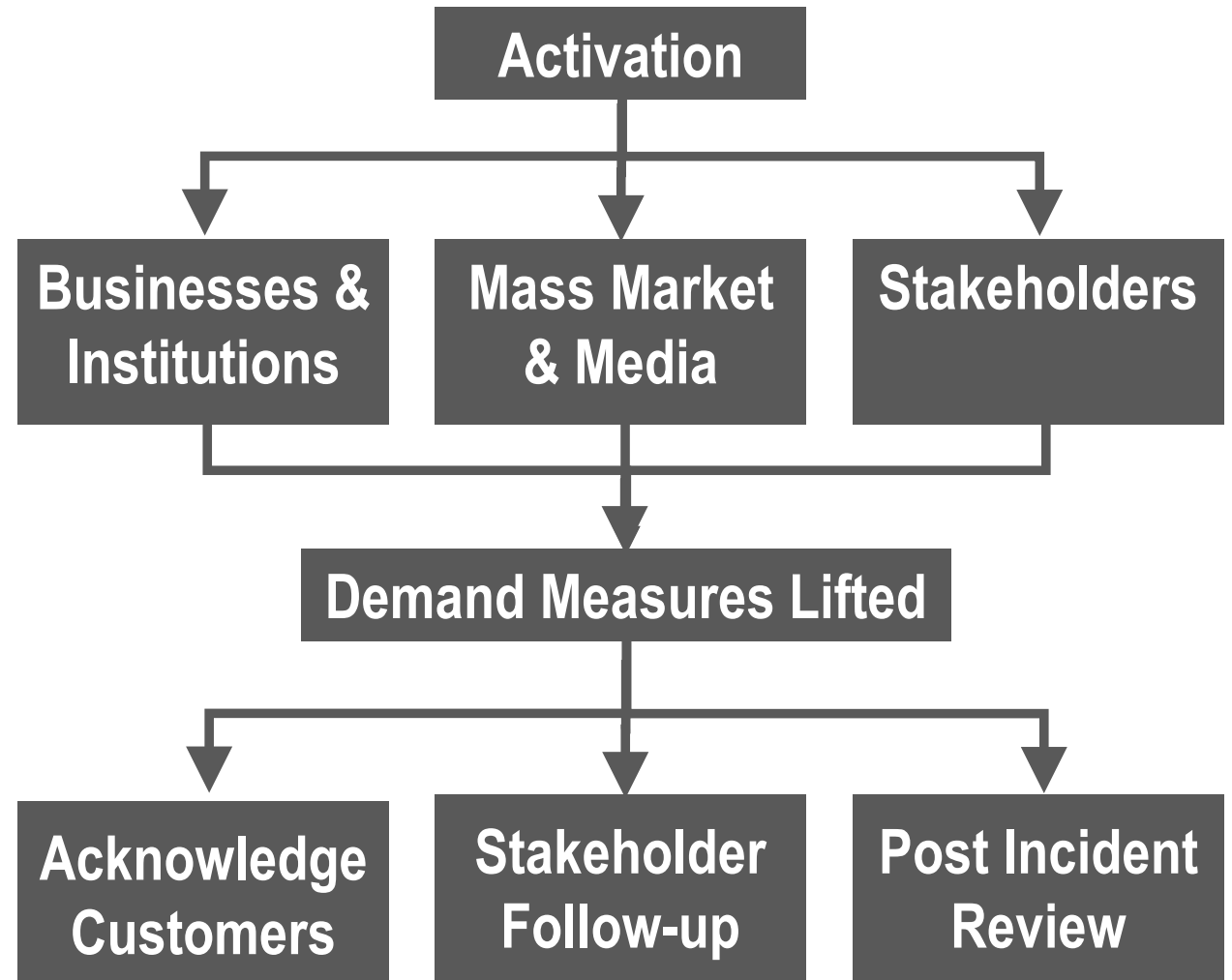
Examples of Non-Essential Water Use

- Businesses delivering a product or service that is *not* life sustaining for people, animals or plants
- Activities that can be deferred until the need for demand management has passed (e.g. vehicle washing, most laundry, pool filling, fire response training)
- Reducing water used for bathing, dishwashing and general use. In summer, restricting lawn watering and outdoor use

Communication Procedures Overview

The declaration of Demand Management Measure C activated communication procedures and teams across EPCOR

- Three concurrent tracks of activity
- Activities are aligned to announcements that initiate, update and then lift the non-essential water use ban



Communication Objectives

Primary Objective: Achieve targeted conservation results by communicating the water restrictions to customers

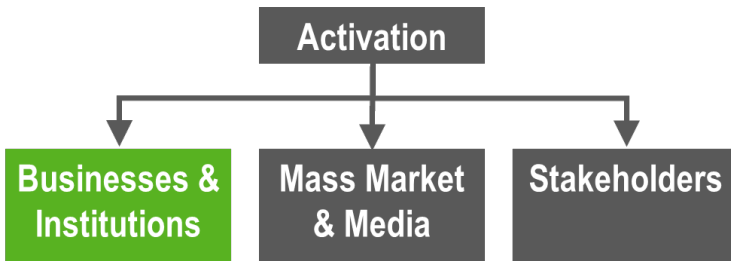
Additional objectives included:

1. Keeping media, customers and stakeholders informed as the event progressed
2. Addressing customer and stakeholder inquiries
3. Preparing for post-incident communications, reviews, and incorporation of lessons learned (continuous improvement)

Demand Measure C

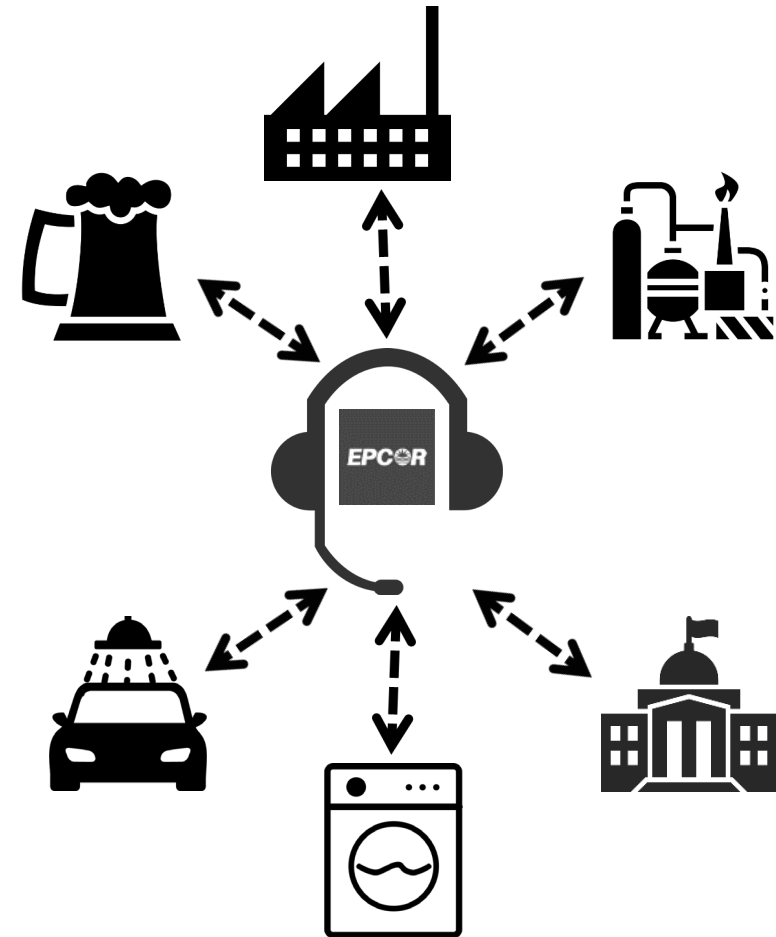
The conservation objective for Measure C is demand reduction of up to 10%, while continuing to serve all essential uses of water.

Businesses and Institutions Acted Quickly to Curtail Non-Essential Water Use



Business and Institutions

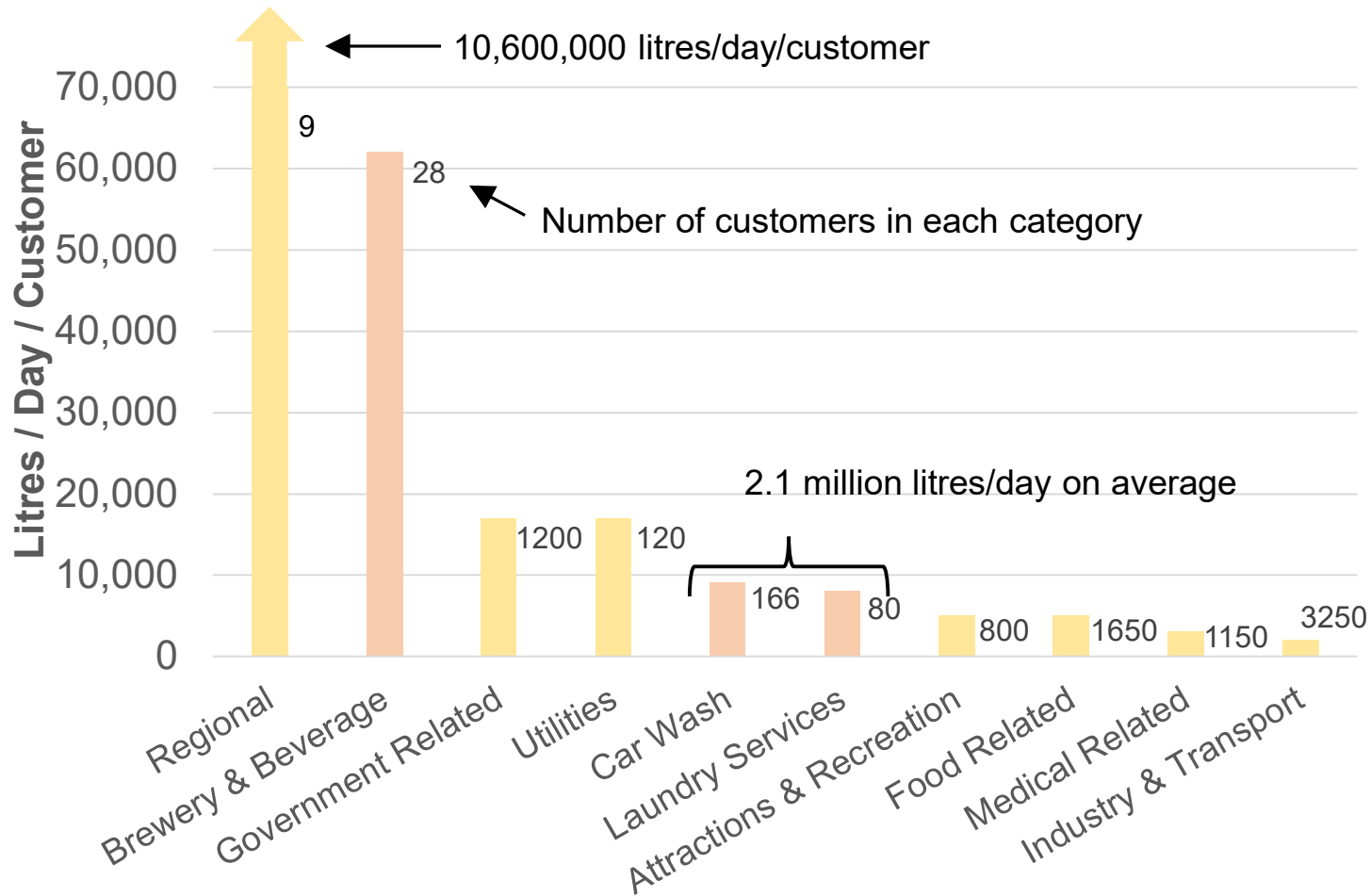
- Coordination with Regional Customers
- Direct communication (phone) to 260+ large customers within six hours of the ban being announced, and ongoing through the event
- Responded to 30 reports of non-compliance
- Truck fills limited to essential uses
- Positive response from large water users and community partners



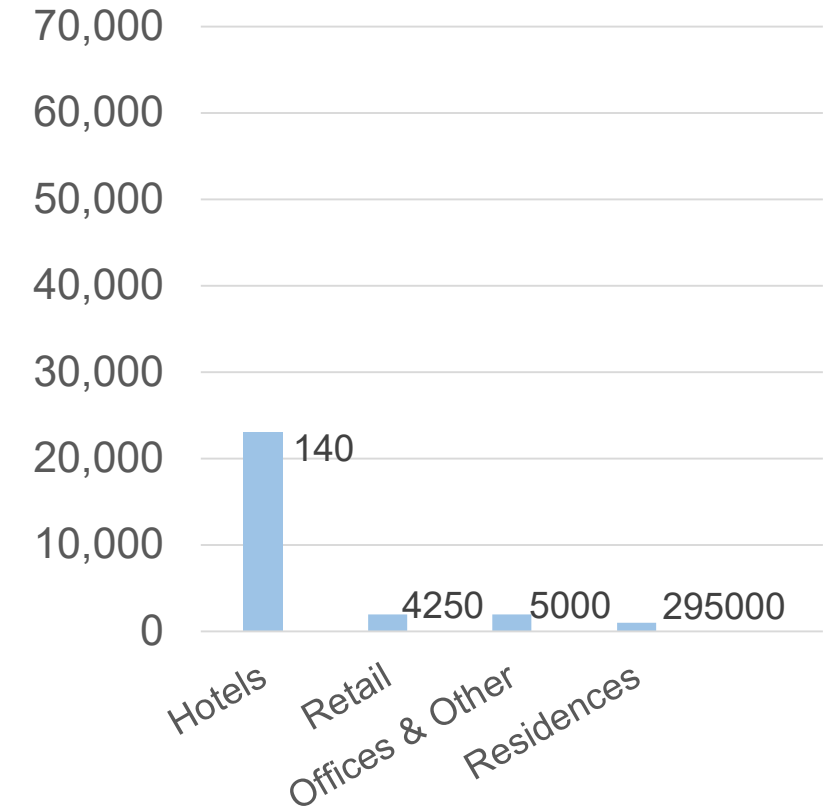
Demand Management Context and Use of Direct Communication vs Public Appeals

Shutdown / Curtailment
Mix of Essential Use (maintained) and Non-essential Water Use (curtailed)
Public Appeal

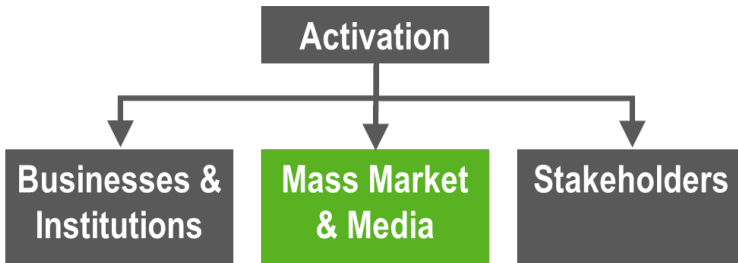
Direct contact focuses on groups with a small number of customers, and higher per customer water use



Public appeals focus on groups with a large numbers of customers and smaller per customer water use

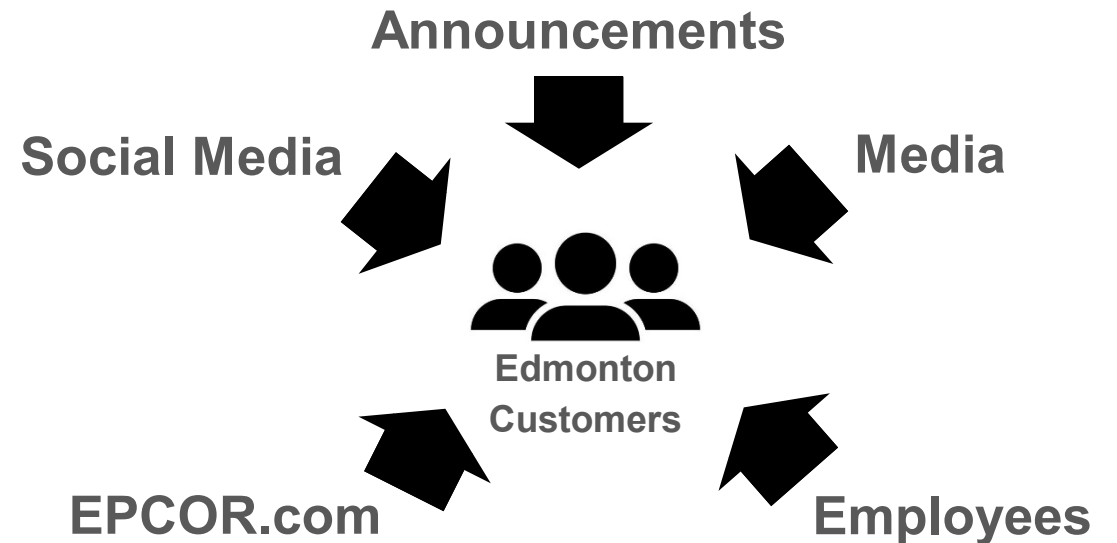


Multi-channel Approach to Mass Market Conservation Appeals

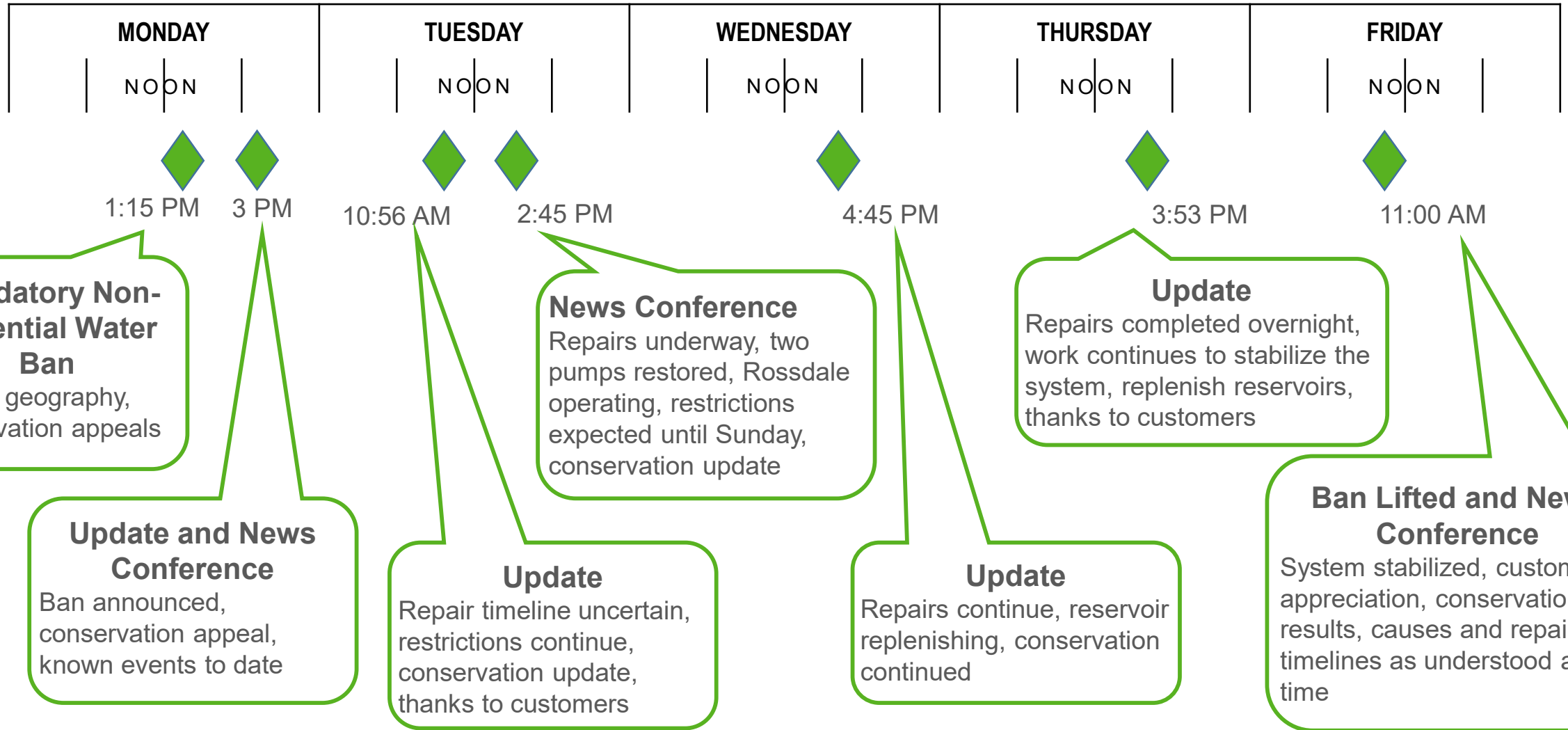


Mass Market and Media

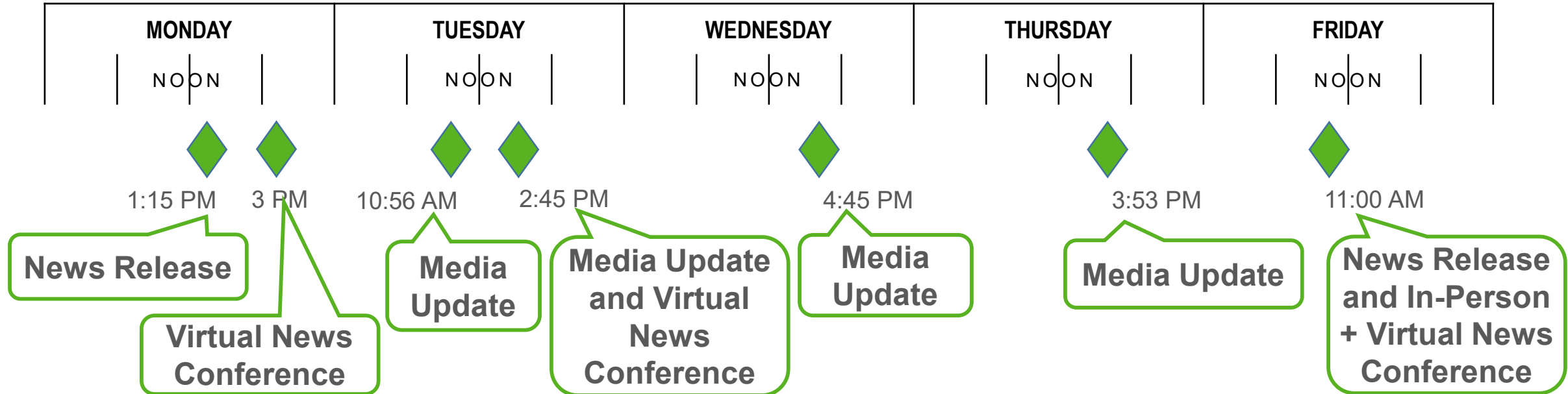
- Activities were aligned to announcements that initiated, updated and then lifted the non-essential water use ban
- Each wave of announcements was communicated through multiple channels
- Thank you radio ads following the event to express our gratitude to customers



Channel: Announcements and Updates

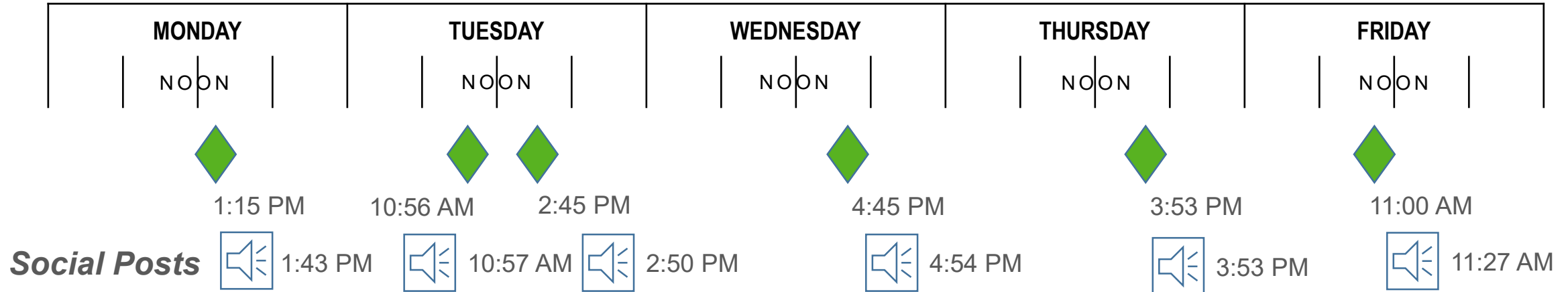


Channel: Media



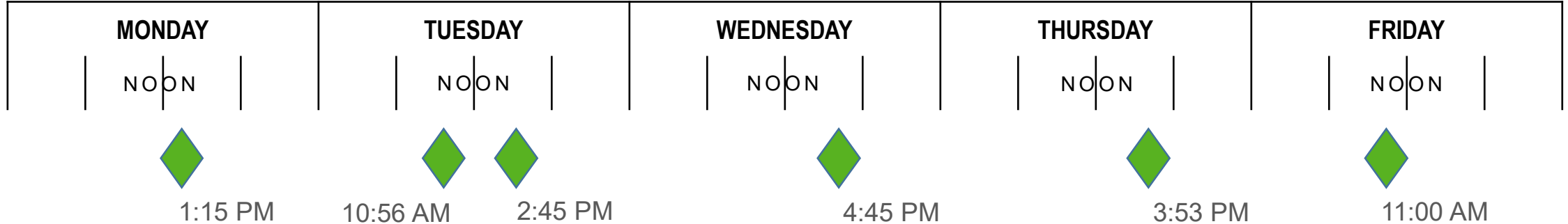
- Widespread coverage of the non-essential water ban and updates
- In-region coverage: CTV Edmonton, CBC Edmonton, Global Edmonton, City News, The Edmonton Journal, The Edmonton Sun, St. Albert Gazette, Devon Dispatch, Sherwood Park News, Lamont Leader, Stony Plain Reporter, Leduc Representative, Spruce Grove Examiner, Daily Hive Edmonton, ICI Radio Canada, BNN, Yahoo Finance, Alberta Politics, Urban Affairs
- Thank you radio ads ran Feb 5 – 7

Channel: Social Media Updates



- Updates through X, Facebook and Instagram following each announcement or update
- Rapid spread of message – 250 k views in the first 12 hours, 500 k total through the event
- Post amplified through sharing by governments, institutions and regional partners
- Additional channels monitored for activity and mentions

Channel: EPCOR.com



Web Banner and Updates

- EPCOR.com web banner live just after 1:15 Monday and updated with each announcement
- Visible on all pages viewed by Alberta-based users
- Alberta-based web traffic spiked to 4x normal levels on January 29 and remained elevated through February 2
- Web traffic returned to normal levels post-event

Stakeholder Updates

Updates were delivered to governments and stakeholders throughout the event

Mix of pre-release copies and post-announcement distribution

- Regional Water customers, to support their communication with their customers, and to help with system stabilization
- City of Edmonton Mayor and Council
- City of Edmonton Administration
- Government of Alberta
- Enoch Cree Nation
- Largest water customers prior to lifting the restrictions, to ensure system stabilization as they brought operations back online
- *Internal to EPCOR: Employees, Leadership*

Results: Water Conservation Achieved

WATER CONSERVATION

100

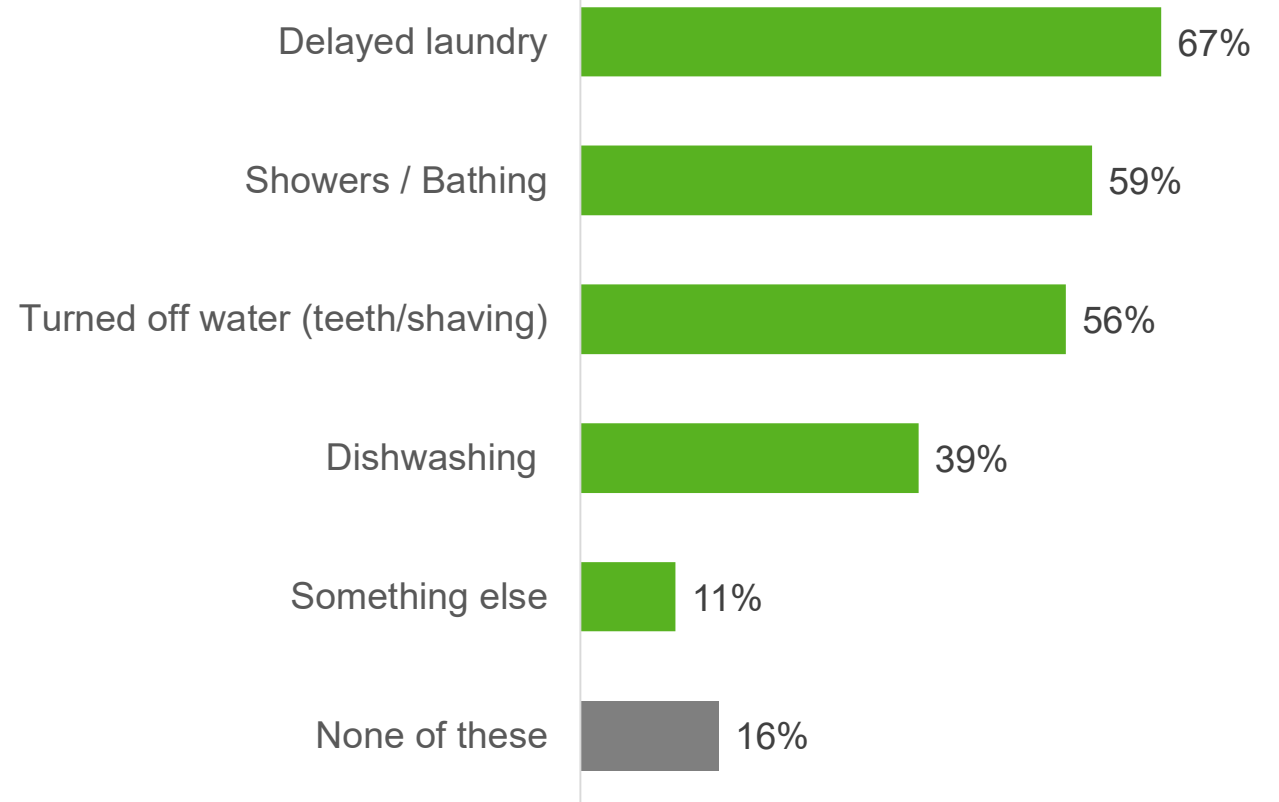
**Million Litres
saved over
four days**

10%

**Reduction in
water use**

Actions Taken During Non-Essential Water Ban

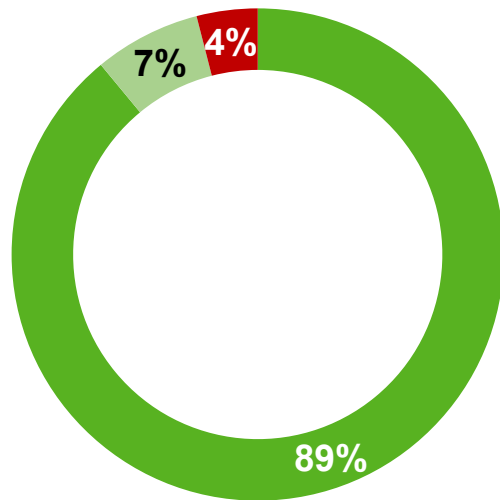
(residential customers, self-reported)



Survey: Adult Edmonton CMA residents, February 8-11, 2024, Base: Aware of water ban (n=502).

Results: Public Awareness Nearly Universal

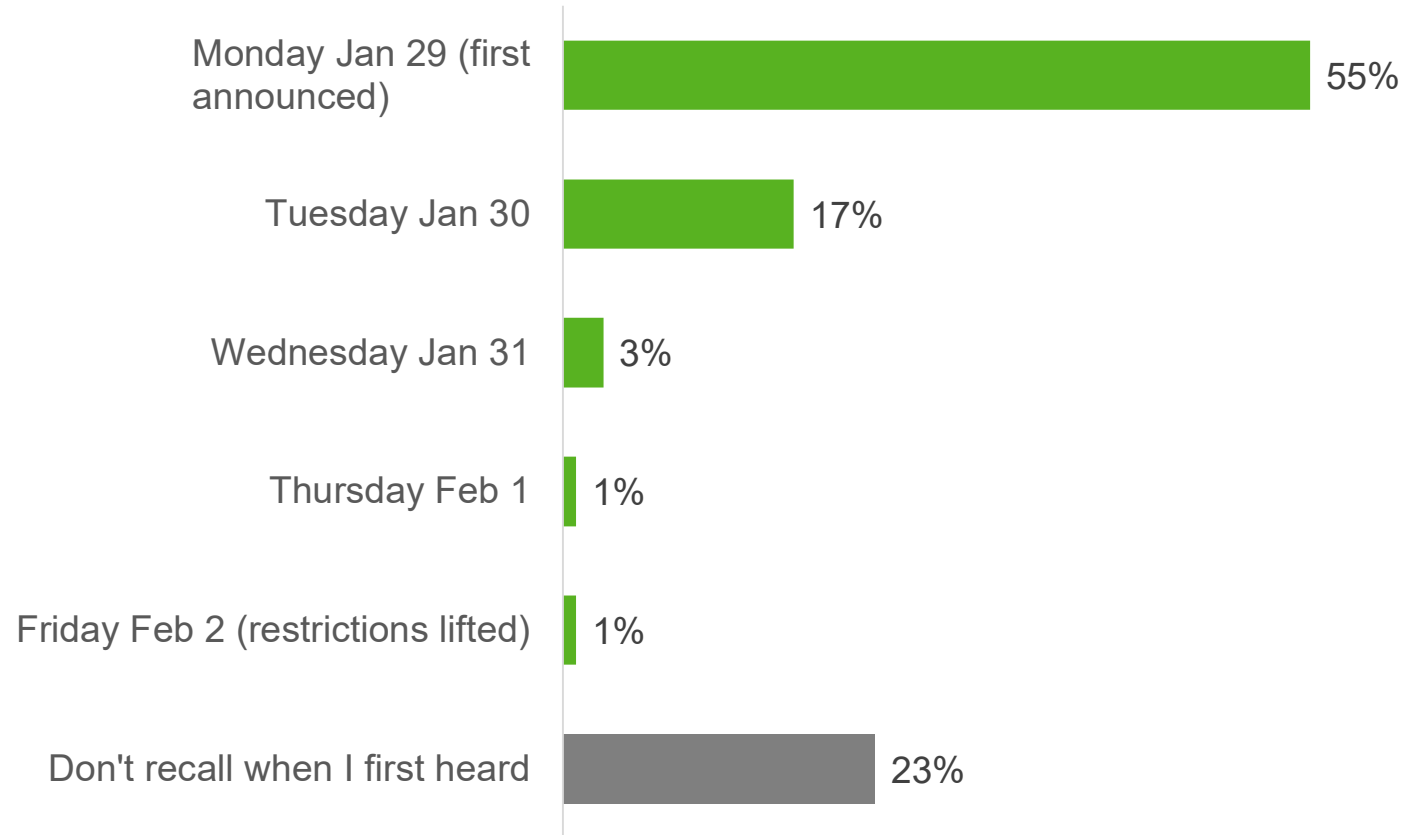
AWARENESS



- Yes, definitely aware
- Yes, heard about it
- No

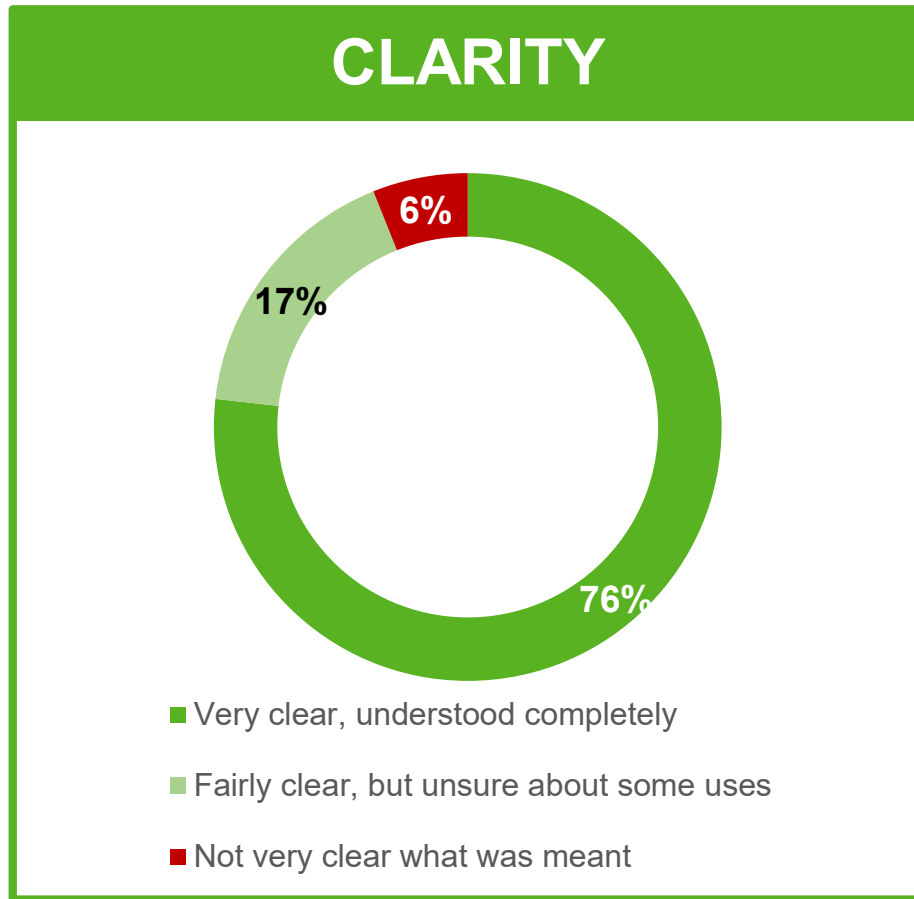
Survey: Adult Edmonton CMA residents, February 8-11, 2024, Base: All Edmonton respondents (n=521). "Before today, were you personally aware that this water ban had been in place between January 30th and February 2nd?"

Timeliness: Date First Aware of Water Ban



Survey: Adult Edmonton CMA residents, February 8-11, 2024, Base: Aware of water ban (n=502).

Results: Public Understanding Strong

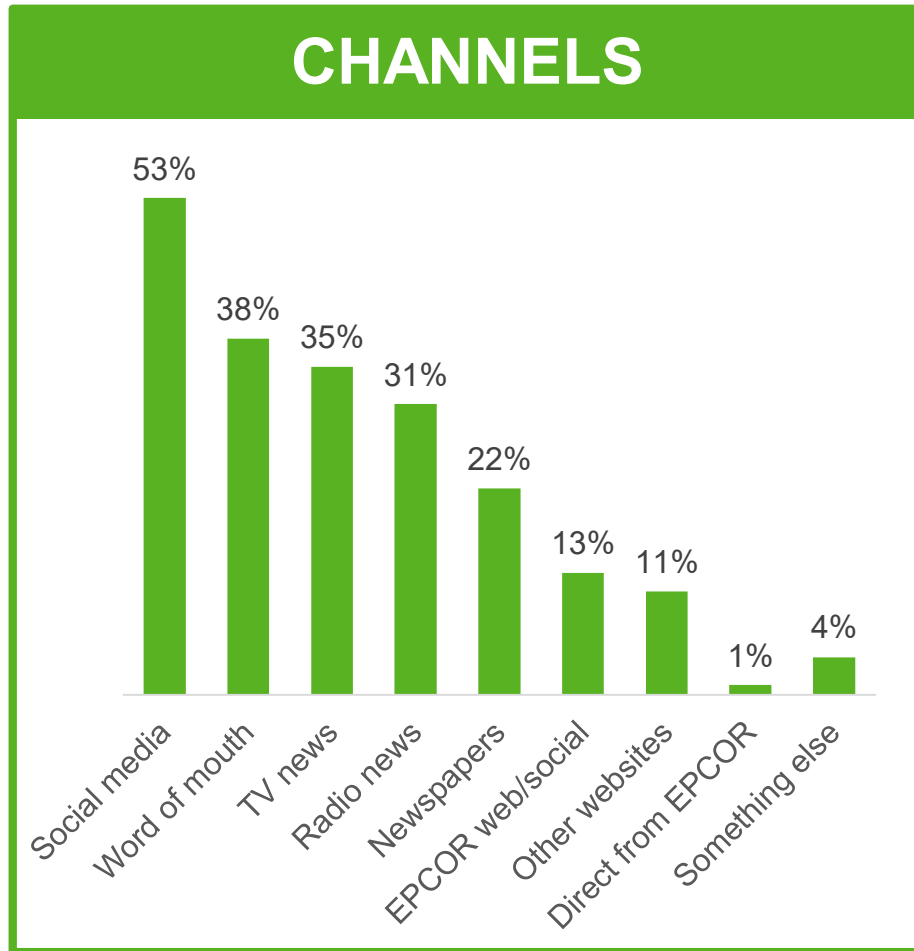


Most people understood “essential” vs “non-essential water use, but we found generational differences

- More than 80% of respondents >35 said they were very clear what was being asked of them
- 61% of respondents <35 said they were very clear what the term meant
- This is a finding we will address when updating our conservation messaging for Demand B and Demand C scenarios

Survey: Adult Edmonton CMA residents, February 8-11, 2024, Base: Aware of water ban (n=502). Q. How well did you personally understand what the word “non-essential” meant when you heard the phrase “Non-essential water ban”? That is, how clear was it to you what was “essential” vs. “nonessential” water use?

Results: Communication Channels



EPCOR used multiple channels to communicate, and audiences reported hearing about the ban multiple ways

- Significant demographic differences in television and radio news (high for 55+, very low for <35)
- Social media use high for all age groups
- Word of mouth as an information source high among <35, low among 55+
- Media's loss of reach to younger audiences will be addressed when updating our conservation communication plans

Survey: Adult Edmonton CMA residents, February 8-11, 2024, Base: Aware of water ban (n=502). Q. From which of the following sources did you get information about the non-essential water ban? [Multiple mentions allowed]

Communication Challenges

During the incident, a number of topics were confusing, controversial or sources of uncertainty

Essential vs Non-Essential Water Use

- While most customers were clear, some high profile 'uses' of water were confusing (e.g. swimming pools)

End-Use Regional Customers

- Periods of time where there were differences in application of Demand Measure C
- Public understanding on who holds customer relationships and accountabilities in the region

Desire to Understand the Cause

- Interest in the cause during a period of uncertainty and root cause assessment

Burden Sharing and Compensation

- The rationale for certain businesses being shut down or curtailed
- Assumptions about which businesses had been shut down or curtailed, and which hadn't
- Compliance enforcement advocacy from those who had curtailed their operations
- Competing views on compensation policy

Continuous Improvement Opportunities

As part of the post-incident review process, we assess results, seek and welcome feedback, and refine procedures

Demand Management Materials

- Increasing the volume of non-seasonal content
- How EPCOR helps customers understand essential vs non-essential water uses

Demand Management Procedures

- Additional communication channels that can be added, in particular for audiences not reached through media
- Internal processes and resourcing for customer call-outs and information flow

Large Water Users

- Discussion with Regional customers on coordinated implementation of Demand Management measures
- Feedback from car washes and laundromats on procedures to notify and opportunities for improvement
- Feedback from largest customers on the communication and support they received to implement operational changes

Demand Management Summary

Demand Management Measures Were Prudent and Necessary

- Forecast water storage levels
- Uncertainty of the repair timeline
- Need to restore reservoir levels post-repair
- *Essential uses of water were maintained throughout the incident*

Customer Conservation Achieved the Demand Measure C target

- Customers reduced water use by 100+ ML over four days (about 10% of forecast demand)

Communication Achieved Rapid and Widespread Awareness

- Public awareness levels at 97%
- 75% of public very clear on essential vs non-essential
- Large water users contacted within hours of restrictions

Thank You to Customers for their Strong Participation & Support of Conservation

- Major water customers shut down or substantially curtailed water consumption
- Car washes and laundromats shut down operations
- 84% of public reported taking a conservation action

We seek and welcome feedback to support our continuous improvement



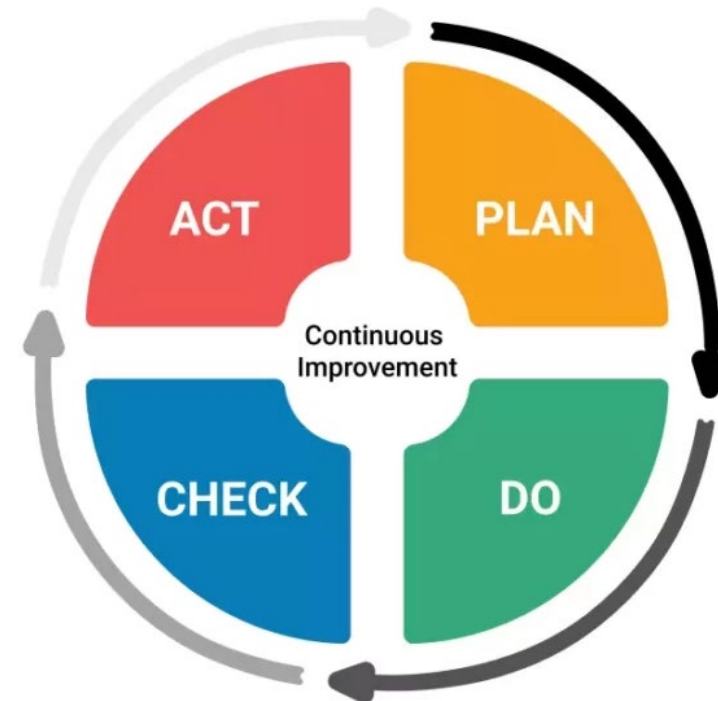
Investigation and Follow-up

Root Cause Investigation

1. Rapid water ingress into electrical vault
2. Water level increase to level of electrical cables
3. Electrical cables housed in covered tray contained uninsulated splice
4. Water contacting live electrical cables created steam
5. Electrical protection located inside transformer did not activate
6. Water heating continued, creating condensation in electrical equipment
7. Electrical fault occurred, resulting in damage to equipment

Additional Findings and Short Term Actions

- Review of maintenance practices related to incident found to be consistent with industry practices
- Review Demand Management Measures
- Review response and coordination with Regional Water Customer Group



Projects to Increase Short-term System Resiliency

New 5 kV Electrical Building – In-Service by Mid-2025

- High voltage electrical equipment feeding the highlift pumps had been identified for a life cycle replacement in 2022-26 PBR
- Project to upgrade equipment and relocate to a new standalone building was approved
- Equipment was ordered 2023
- New system will provide greater redundancy, monitoring capabilities and operational flexibility



Projects to Increase Mid-term System Resiliency

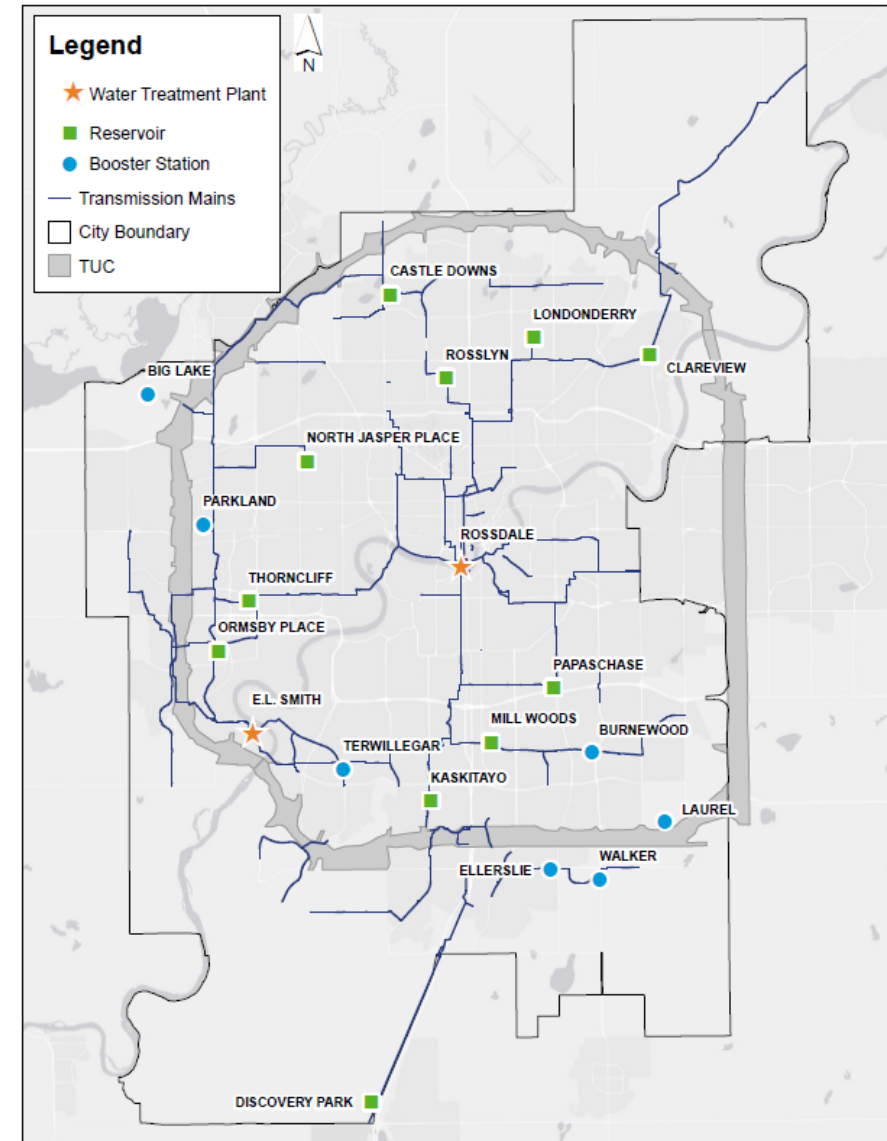
Additional E.L. Smith Highlift Pumphouse

- Water Integrated Resource Plan (2020) identified the need for a new highlift pumphouse at E.L. Smith WTP
- Will provide further redundancy and pumping capacity
- Concept design underway
- Will be included in next Water Services regulatory application

Projects to Increase Mid-term System Resiliency

System Interconnectivity - Conveyance of Water

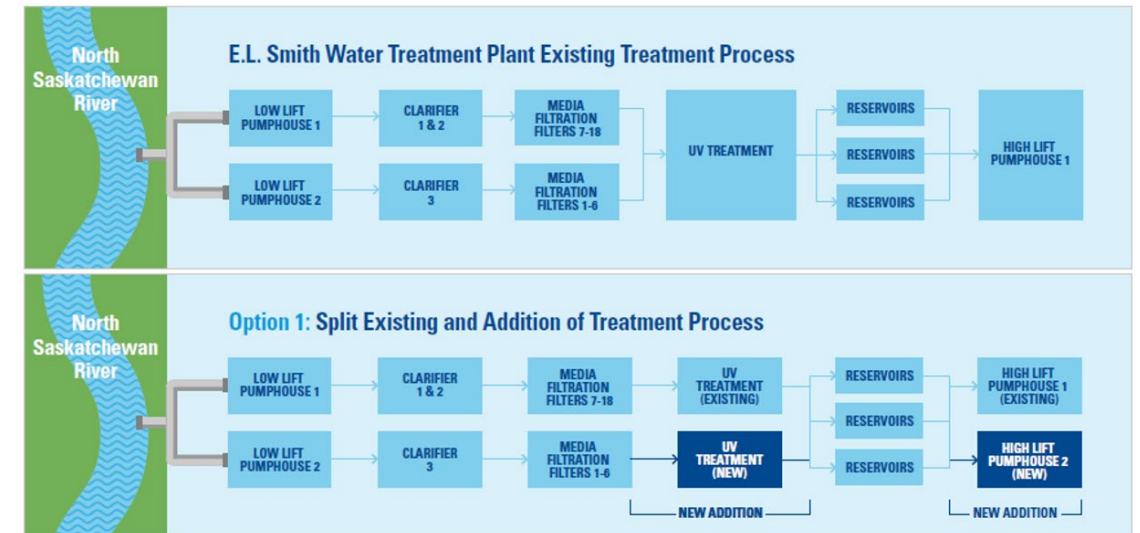
- WaterIRP (2020) identified potential new storage to be built in south Edmonton
- Hydraulic models will be utilized to further enhance strategies for conveyance of water between treatment plants and reservoirs
- Transmission system will be evaluated for areas where redundancy and further conveyance capacity can be enhanced



Projects to Increase Long-term System Resiliency

E.L. Smith Two Train Upgrade

- Water IRP (2020) identified series of projects to split E.L Smith into two independent treatment trains to increase redundancy
- Rossdale WTP is largely already split into two trains
- Upgrades at E.L. Smith started in 2005
- Planning will align with city planning



Additional Follow-up Actions

Review of Potential Significant Failure Conditions

- Water System is designed and operated with layers of redundancies and protection
- This event occurred due to the failure of cables obscured from view that were improperly installed decades ago
- As part of the Integrated Resource Planning (IRP) process, various scenarios are assessed to determine whether system can withstand significant events that could result in impacts to customers
- Additional reviews will be undertaken and completed as part of next IRP being prepared for 2026

Addressing Climate Change Resiliency

Flood Protection and Drought

- Flood Protection projects at both Water Treatment Plants are in progress
- Plans in place to protect plants if a flooding event were to occur prior to the flood barriers being completed
- EPCOR is supporting Province's drought resiliency planning
- The North Saskatchewan River basin is not at the same drought risk as Southern Alberta basins
- Drought mitigation is a part of our long term planning
- Summer heat waves have required demand management measures and will continue to be required to address climate impacts

Key Takeaways

- This was a rare event that necessitated the use of mandatory curtailment of discretionary water use
- EPCOR uses Integrated Resource Planning to continually review and update long term plans for all aspects of the One Water Cycle
- Feedback received will be incorporated into a review of the Demand Management Measures



Questions