Presentation

Sept. 13, 2022

Town of Aurora Climate Change Adaptation Plan

Summary Presentation



Objectives

Agenda

- Introductions and project context
- Climate change overview
- Risk assessment process
- Results
 - Top risks
 - Recommendations



Project overview

Town of Aurora Climate Change Adaptation Plan



Assess current and future climate risks to Town Assets

The climate risk assessment forms the basis for adaptation planning.



Adaptation measures

Identify adaptation actions to address the top vulnerabilities and risks to each asset type.



Adaptation Plan to improve the resilience of Town Assets

Create an Adaptation Plan to help coordinate and implement various actions and address climate risks through asset management.

Infrastructure considered in the assessment



Parks and Natural Heritage



Water and Wastewater Infrastructure



Linear Engineered Assets



Facilities.

Climate Change Overview

Climate Change Mitigation vs Adaptation



Two complementary approaches

Calgary's Climate Program (2018)

Past Events (What We Heard – Town Staff Interviews July 2021)



Stream erosion affecting roads



Heatwaves affecting people & buildings



Strong wind damage



Heavy rainfall, roof leakage



Challenges maintaining cooling for ice



Flooding affecting parking lots

Photos Oakland University, Athletica Sports Systems Inc., White House Roofing and Construction, the Weather Network, Clackamas Soil and Water Conservation District, YorkRegion.com

Climate Change Hazards



Higher average temperatures and extreme heat

Temperatures will be higher on average year round. The number of **hot days** (days over 30 degrees) will increase.



Freeze thaw cycles

Freeze thaw patterns will shift in frequency and timing. With warmer temperatures, **freeze thaw is likely to become more concentrated during winter months.**



Dry conditions and drought

Rising temperature and changes in precipitation and evapotranspirtation patterns may cause **more frequent and longer dry periods.**





Increase in average precipitation

More precipitation is expected to fall on an annual basis, particularly in spring, fall and winter.



Heavy precipitation and flooding

Rainfall will become **more frequent and intense.** More rain will fall on a typical rainy day and during storm events (e.g. 1-50 year storms).



Severe weather

Strong wind gusts and lightning impacts may increase as global temperatures continue to rise.

Risk Assessment Process

Applying the PIEVC Protocol

The PIEVC Protocol (Public Infrastructure Engineering Vulnerability Committee) is a tool that supports the systematic assessment of the risks posed by extreme weather and future climate to public infrastructure.

- Analyzes historical climate information and future probability and severity of climate risks.
- Assesses adaptive capacity of infrastructure systems as determined by design, operation and maintenance.
- Estimates severity of climate impacts on the infrastructure (e.g., deterioration, damage or destruction) to enable the identification of higher risk components.
- Results can be used to inform decisions on which assets require adaptation and how to adapt them (e.g. design adjustments, changes to operations or maintenance).



Town staff input

Risk Scores

	7	0	7	14	21	28	35	42	49
>	6	0	6	12	18	24	30	36	42
Ë	5	0	5	10	15	20	25	30	35
<u>.</u>	4	0	4	8	12	16	20	24	28
al	3	0	3	6	9	12	15	18	21
q	2	0	2	4	6	8	10	12	14
5	1	0	1	2	3	4	5	6	7
P	0	0	0	0	0	0	0	0	0
		0	1	2	3	4	5	6	7

Severity

Risk range	Threshold	Response
< 12	Low risk	No action necessary.
10 76	Low medium risk (12-25)	Action and/or an engineering
12 - 36	High medium risk (26-36)	analysis may be required.
> 36	High risk	Action required.

Town of Aurora Climate Adaptation Plan

Risk Summary

INFRASTRUCTURE CATEGORY		RELEVANT INTER- ACTIONS	OPPOR- TUNITIES	LOW RISKS	MEDIUM RISKS	HIGH RISKS
Linear Engineered Assets	Road Network	27	6	16	5	0
	Stormwater Network	47	11	24	12	0
Water	Water Network	19	4	12	3	0
Infrastructure	Sanitary Network	29	4	12	13	0
Park and Natural Heritage system		33	1	21	11	0
Facilities		31	3	12	16	0
Total		186	29	97	60	0

Town of Aurora Climate Adaptation Plan

Top Risks and Recommendations

Parks and Natural Heritage system

Highest Risks

- Playing fields become unusable during
 both extended periods of hot dry weather
 and extreme precipitation events (risk
 rating 20-25)
- Damage to landscaping and natural heritage from high temperatures, extreme precipitation, and severe thunderstorms (**risk rating 12-15**)
- Warmer wetter winters limiting the ability to make ice for outdoor rinks, (risk rating
 15)



Parks and Natural Heritage system

\$:<\$10,000 \$\$: \$10,000-\$100,000 \$\$\$: \$100,000-\$1M \$\$\$\$: \$1M+

Adaptation Actions - Short Term

Action ID	Action	Risk Rating	Cost Range	Lead
P-4	Adopt maintenance procedures to proactively identify hazardous trees and undertake preventative maintenance before damage occurs during extreme events.	12	\$	Operational Services
P-5	Continue maintenance procedures to inspect parks following extreme weather events to identify damaged landscaping and amenities to prioritize repairs and minimize service disruptions.	12	\$	Operational Services
P-6	Update 2013 study on natural capital in Aurora to reflect current assets and values for integration into AMP	-	\$\$	Finance, Engineering, Planning, Recreational Services

Parks and Natural Heritage system

\$:<\$10,000 \$\$: \$10,000-\$100,000 \$\$\$: \$100,000-\$1M \$\$\$\$: \$1M+

Adaptation Actions – Medium to Long term

Action ID	Action	Risk Rating	Cost Range	Lead
P-1	Conduct a study to investigate rainwater capture and storage needs and solutions for irrigation and drainage improvements for sports fields, parks, and municipal facilities.	25	\$\$	Recreation Services, Facilities Management
P-2	Plan for low maintenance landscaping with hardy species adapted to future climate conditions.	15	\$	Environment, Operational Services
P-3	Plan for changes to ice rink management in warmer winters.	15	\$\$	Community Services, Recreation Services, Operational Services

Linear Engineered Assets

Highest Risks

Road network

- flooding of roads and sidewalks (risk rating 15-20)
- damage to pedestrian paths from freeze-thaw cycles (risk rating 12),
- traffic hazards resulting from power outages and freezing rain during severe weather events (risk rating 12-24)

Stormwater Network

- Extreme precipitation overwhelming components of the stormwater management system, particularly bridges and culverts (risk rating 20-25)
- high temperatures and drought reduce the functionality of stormwater management ponds (**risk rating 16-20**)



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Linear Engineered Assets

\$:<\$10,000 \$\$: \$10,000-\$100,000 \$\$\$: \$100,000-\$1M \$\$\$\$: \$1M+

Action ID	Action	Risk Rating	Cost Range	Lead
L-1	Apply Low Impact Development (LID) and other "at- source" or "lot-level control" strategies aimed at reducing and delaying conveyance system loading.	25	\$\$	Development Planning, Policy Planning, Engineering
L-2	Review maintenance procedures to reduce storm and sanitary system blockages and improve levels of service.	25	\$	Operational Services
L-3	Increase the resilience of assets identified as vulnerable in the Tannery Creek Flood Study and maintain the asset management system to prioritize and track resilience actions. Consider expanding floodplain studies to include all Town infrastructure and future climate projections.	20	\$\$	Engineering
L-6	Increase stormwater management wet pond maintenance during drought and heatwaves.	16	\$	Operational Services

Adaptation Actions - Short Term

Linear Engineered Assets

\$:<\$10,000 \$\$: \$10,000-\$100,000 \$\$\$: \$100,000-\$1M \$\$\$\$: \$1M+

Adaptation Actions – Medium to Long Term

Action ID	Action	Risk Rating	Cost Range	Lead
L-4	Increase the resilience of erosion-prone areas of the stormwater network in association with the Stream Management Master Plan and LSRCA inspections.	20	\$\$	Operational Services
L-5	Enhance stormwater management wet pond protections for drought and heatwaves.	16	\$\$	Engineering
L-7	Increase the resilience of erosion-prone areas of the pedestrian paths and road network.	20	\$\$	Operational Services
L-8	Continue frost heave mitigation program.	12	\$\$	Operational Services
L-9	Conduct a high visibility signage replacement program.	12	\$\$\$	Operational Services

Water Infrastructure

Highest Risks

Water Network:

- Challenges maintaining water pressure for fire fighting during extended hot, dry weather (risk rating 20)
- Damage to bulk water filling station and booster station from flooding in extreme storm events (risk rating 15)

Sanitary Network

- Extreme precipitation leading to sewer backups (risk rating 25)
- increasing temperatures leading to more frequent occurrences of odour events (risk rating 12-15)



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Water Infrastructure

\$:<\$10,000 \$\$: \$10,000-\$100,000 \$\$\$: \$100,000-\$1M \$\$\$\$: \$1M+

Adaptation Actions - Short Term

Action ID	Action	Risk Rating	Cost Range	Lead
W-3	Continue to develop and practice emergency response plans as part of the Drinking Water Quality Management System to protect and restore critical water system infrastructure in the event of damage from severe storms or natural disasters.	15	\$\$	Operational Services
W-4	Implement flood monitoring systems at water booster stations and sanitary lift stations to identify issues early before damage to infrastructure or loss of power occurs.	15	\$\$	Operational Services

Water Infrastructure

Adaptation Actions – Medium to Long Term

\$:<\$10,000 \$\$: \$10,000-\$100,000 \$\$\$: \$100,000-\$1M \$\$\$\$: \$1M+

Action ID	Action	Risk Rating	Cost Range	Lead
W-1	Support landowners to protect their property from sanitary backups through education and incentive programs.	25	\$ per year, \$\$ over 5 years, \$\$\$ over 10 years	Development Planning, Policy Planning, Engineering, Building Services, Operational Services
W-2	Conduct a system-wide study to <mark>understand the age, conditions, and capacity of all storm and sanitary components</mark> .	25	\$\$\$	Engineering, GIS / IT
W-5	Review HVAC sufficiency at all pumping facilities to ensure the system is designed for increased temperatures. Review HVAC equipment connections to standby power in the event of power failures and maintenance practices in high-temperature conditions as needed.	15	\$\$	Engineering, Operational Services
W-6	Continue to inspect and maintain backup generators for the water booster station and consider installing backup power at the sanitary lift station.	15	\$\$	Engineering, Operational Services
W-7	Monitor for problematic sites for odour control issues in the sanitary system. Additive systems and/or air scrubbers may be used to respond to issues.	15	\$\$	Operational Services

Facilities

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Highest Risks

- Heatwaves may exceed the cooling capacity of Town facilities, leading to uncomfortable indoor temperatures and limiting use as cooling centres (**risk rating 15-25**)
- High temperatures may also accelerate the degradation of parking lots and walkways (**Risk Rating 15-16**)
- Damage to facility components from extreme precipitation and severe storm events (risk rating 12-20)



Facilities Adaptation Actions - Short Term

\$:<\$10,000 \$\$: \$10,000-\$100,000 \$\$\$: \$100,000-\$1M \$\$\$\$: \$1M+

Action ID	Action	Risk Rating	Cost Range	Lead
F-1	Monitor cooling demand at facilities to identify where exceeding maximum cooling capacities is possible with high summer temperatures. Upgrade HVAC systems to meet future cooling demands, prioritize key facilities that could be used as cooling centers.	25	\$\$\$	Community Services - Facilities Management
F-2	Consider both current and future cooling demands with increased temperatures during the planning and design of HVAC and electrical systems. Where cooling systems are being replaced, assess and upgrade the electrical system accordingly.	20	\$\$\$	Facilities Management
F-3	Provide access to backup power at all facilities critical to Town operations to maintain essential operations during power outages. Prioritize low-carbon sources of backup power where possible.	20	\$\$\$	Community Services – Facilities Management
F-5	Continue to inspect and maintain roof systems, paying particular attention to domed roofs at the Sports Dome and the JOC regularly and after extreme wind events. Proactively repair signs of material distress to avoid roof failure.	18	\$	Community Services – Facilities Management
F-8	Monitor internal drainage systems in facilities and prepare for a projected increase in precipitation events. Where facilities rely on sump pumps to manage inflow and roof drainage, review precipitation load calculations based on future climate projections, and incorporate the increased load when sump units are to be upgraded or replaced.	15	\$\$	Community Services – Facilities Management
F-9	Continue inspections of facilities structures regularly and after extreme wind events. Proactively repair damages as needed. An engineering study would be required to assess whether projected wind loads may surpass designed structural capacities at facilities, which could be initiated if regular inspections identify potential wind-related issues.	15	\$-\$\$	Community Services – Facilities Management, Engineering

Town of Aurora Climate Adaptation Plan

Facilities

Adaptation Actions - Long Term

\$:<\$10,000 \$\$: \$10,000-\$100,000 \$\$\$: \$100,000-\$1M \$\$\$\$: \$1M+

Action ID	Action	Risk Rating	Cost Range	Lead
F-4	Install lightning protection systems on tall or isolated buildings (such as Town Hall, the Aurora Community Centre), and those which are deemed critical for Town operations.	16	\$\$	Community Services, Facilities Management
F-6	Monitor air quality for key municipal facilities (e.g., those with many staff or public users) and consider upgrading HVAC systems to accommodate higher- rated filters such as MERV 13 equivalent filters as well as including space for the addition of MERV 8 pre-filters in case of a poor air quality event.	16	\$\$	Community Services, Facilities Management
F-7	Continue to inspect parking lots and hardscaping regularly to identify heat-related damage and implement small repairs where feasible to avoid further degradation in hot weather. Review the granular base structure and asphalt mix design during the next replacement cycle.	16	\$ - \$\$	Operational Services, Engineering

Wrap up

Conclusions



No high risks have been identified for the Town's infrastructure



The Town has already completed some studies and started taking actions to reduce its infrastructure risk.



The actions presented in the Adaptation Plan can further the resilience of the Town's infrastructure when integrated into asset management processes.



Thank you

Jay Maloney, MRM Analyst, Climate Risk & Resilience **Jay.Maloney@wsp.com**

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Questions?