Water Supply and Resiliency

Council Presentation
November 5, 2021

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Okotoks
Historic Past, Sustainable Future

Presentation Objective & Topic Overview

Topic Overview:

- Regulatory Overview
- Water Constraints & Risks
- Strategic Direction
- Implementation
- Water Security
- Timing/Next Steps

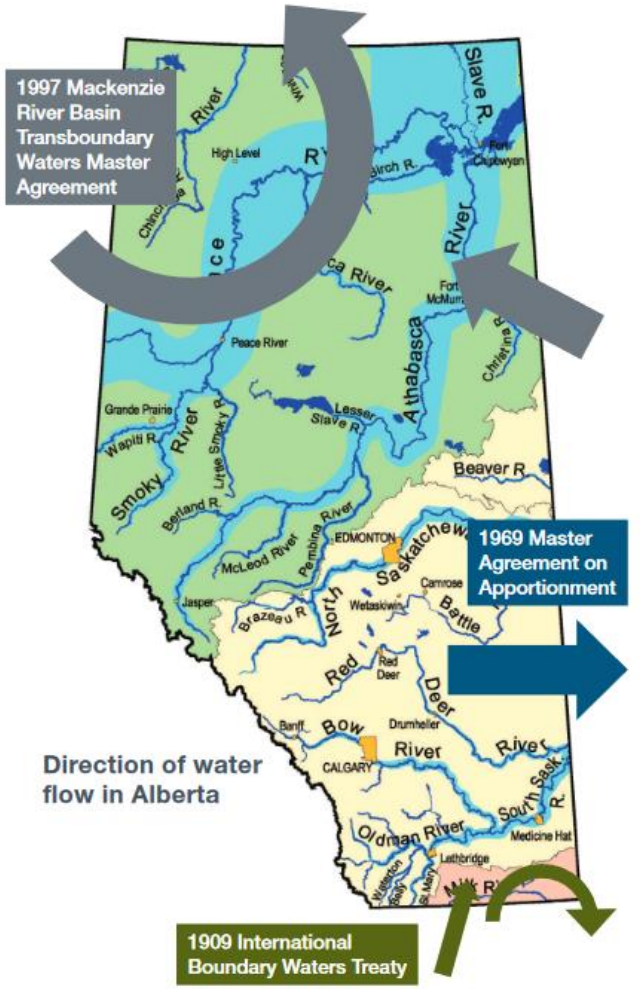
Regulatory Overview

Provincial Regulatory Framework - Overview

Provincial Trans-Boundary Water Agreements and Legislation

- Master Agreement on Apportionment
  - Generally ½ of the natural river flow must enter Saskatchewan

- Water Act
  - Provincial legislation promotes the conservation and management of water, through the use and allocation of water in Alberta.
  - Water usage rights are controlled through the issuance of water licences by the province:
    - ❖ “first in time, first in right” system
    - ❖ approval limits (annual volume and max diversion rate)
    - ❖ conditions/restrictions (seasonal, authorized usage, type, etc.)



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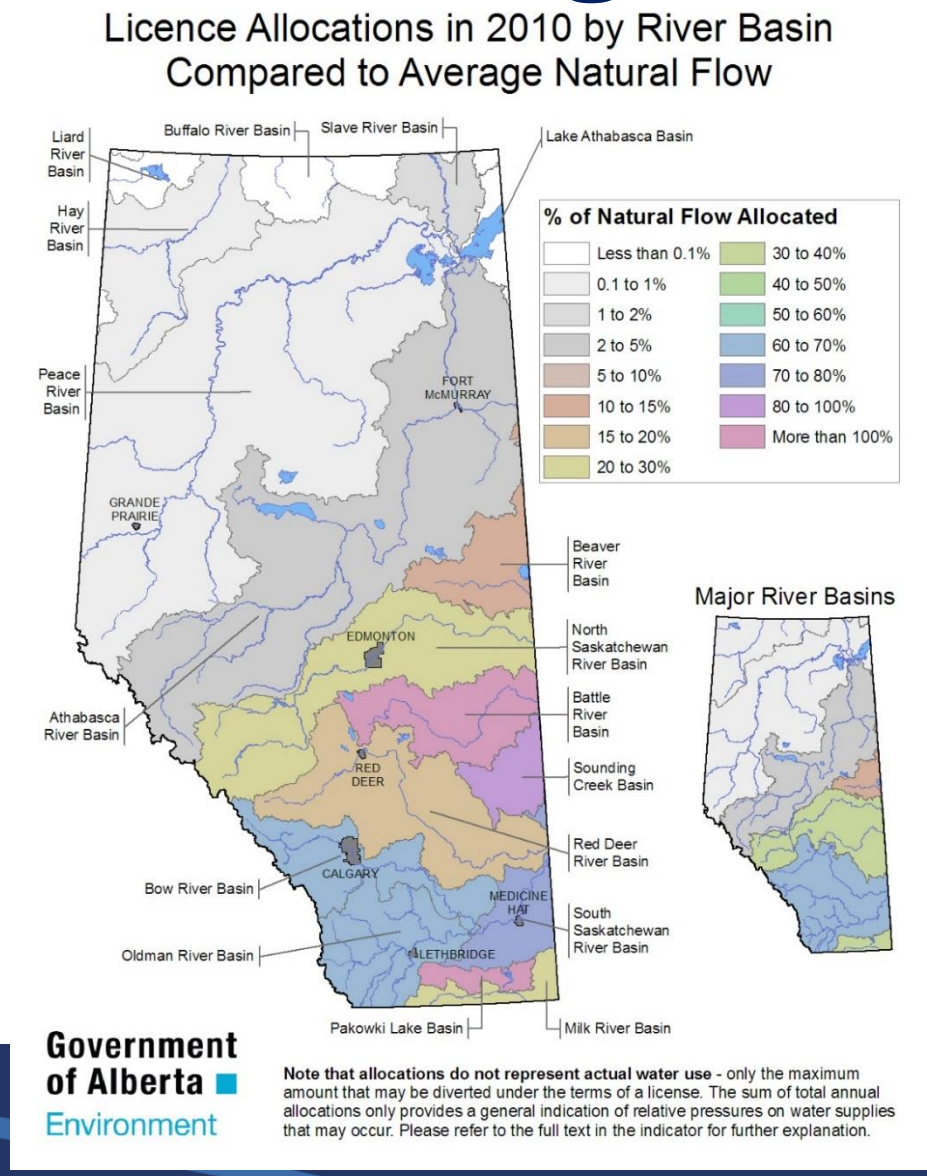
Provincial Regulatory Framework - Challenges

- **Increasing demand for water relative to supply**
  - limits for water allocations have been reached or exceeded in the South Saskatchewan River Basin

- **Water conservation and protection of the aquatic environment**
  - increased stress on the aquatic environment as use of existing licences increases
  - negatively affected riparian vegetation due to water diversion, storage, and land use management



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Provincial Regulatory Framework - Changes

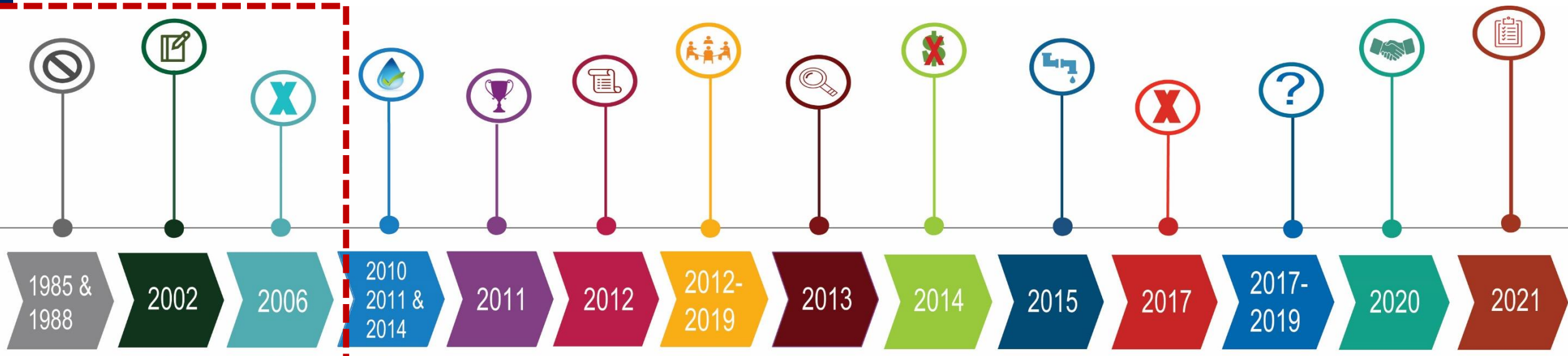
Moratorium on issuance of new water licences on the Sheep River and SSRB

- resulting creation of a “water licence economy” via water licence transfers
- Effectively created a “cap and trade” system
  - 10% environmental holdbacks on licence transfers.

Licence restrictions and conditions have been added to licences

- Low flow restrictions:
  - Instream Objectives (IO’s)
  - Water Conservation Objectives (WCO’s)

History Overview



Sheep River Moratorium implemented by Province

1998 30,000 population cap implemented

1999 Calgary Regional Partnership formed

Town's application for 25-year water license unsuccessful

Town's Water Management Plan implemented

Approved Water Management Plan for the South Saskatchewan River Basin closes water license application process

Population of Okotoks is ~11,644 in 2001

AEP approves water license transfers for the Town totaling 387,655 cubic metres

Town Water Management Plan awarded Willis Award for Innovation by the Canadian Association of Municipal Administrators

2012 Town appeals development along our borders

Town actively working with AEP to review Water Act regulations (specifically "return flows")

Population of Okotoks is ~24,511 in 2011, a 110% increase in 10 years.

2012 population cap lifted; annexation process begins

The Town has had 125+ meetings with the Province, neighbouring municipalities & other stakeholders to discuss critical water supply issue, gain support &/or ask for assistance to determine water supply options

Limited interest by other regional municipalities to participate in regional solution due to timing of

Town contracts BSEI to complete water-servicing review, identifying a pipeline from Calgary to Okotoks as the lowest cost option

Town's application for Water for Life funding unsuccessful, & again in 2015

Population of Okotoks is ~29,002 in 2019. Since 2011, growth has slowed significantly (<15% increase over 8 years) due to development restrictions resulting from lack of water

2017 annexation of 4,900 acres approved

Town creates Okotoks/Calgary water pipeline proposal

Town's water licenses placed on hold by Province (Town has 17 applications waiting during this time)

2018 Calgary Metropolitan Region Board formed

Town pursues other water supply options due to changes in provincial regulatory processes

Foothills Okotoks Regional Water Project (FORWP) MOU signed by Foothills County & Town

FORWP Water for Life funding application

FORWP approval submissions & tender readiness

Legend

AEP Decisions

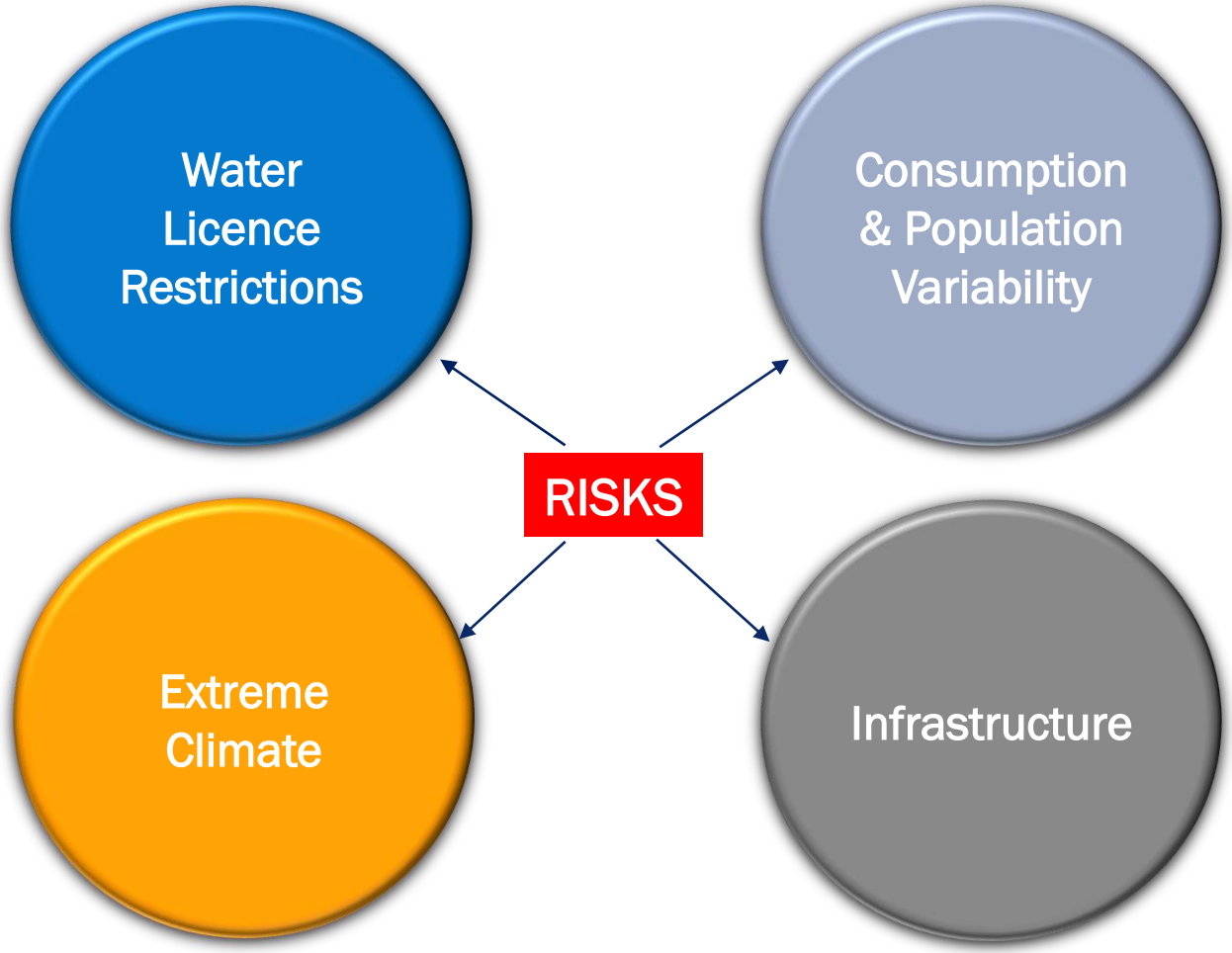
Population

Water Constraints & Risks

Constraints and Risk Overview

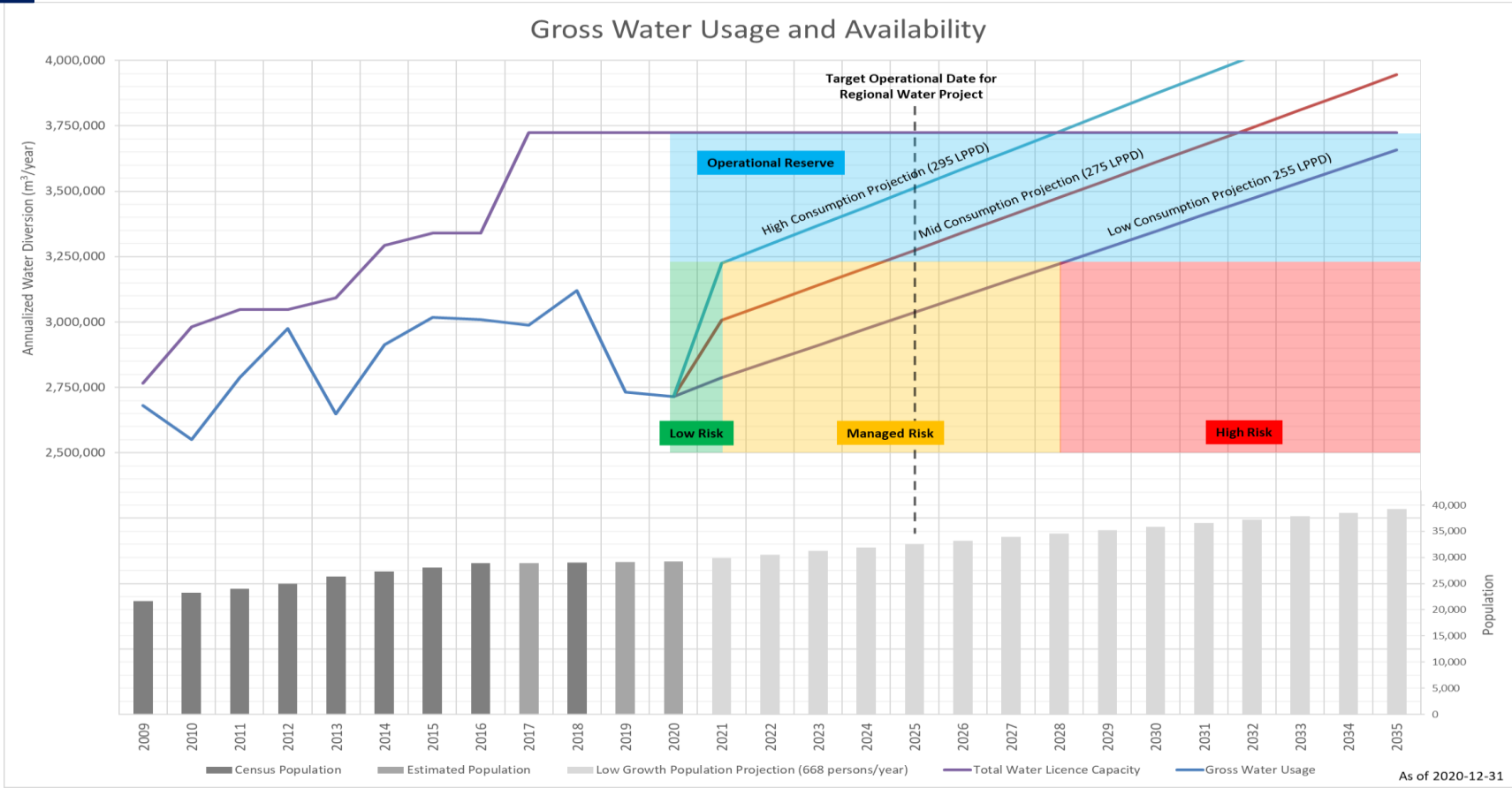
PRIMARY CONSTRAINTS

- Water Licence Capacity
- Well Production Capacity



Risk Factors will impact the likelihood of exceeding our Water License and/or Production Capacity

Total Licence Capacity & Exceedance Risk



Licence Capacity Exceedance Risk

- Risk can be “managed” until 2028
- Risk is “high” post 2028

Managed and/or High Risk

- See “Implementation” section of powerpoint for tools and strategies used to mitigate risks

*As of December 31, 2020

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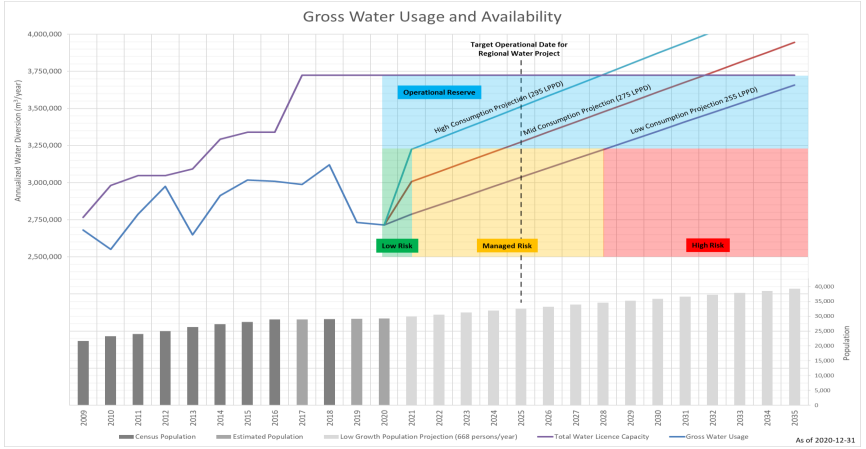
Total Licence Capacity & Risk Assumptions

Assumptions:

- **Unconstrained licensing**
- **Ability to utilize full license capacity**
- **Low growth scenario shown with variable consumption shown**
  - Growth - 668 persons/year
    (MDP and standard Master Plan Scenario based on current local market assumptions.)
  - Other growth rates possible but not shown for clearer visualization
- **Variable consumption shown**
  - Consumption - 255-295 LPPD
  - Although currently consumption is trending down, additional years of consistent data is required to confirm if this is trend is sustainable.
- **Monitoring and periodic updates will be required to confirm assumptions moving forward.**



*As of 2021-12-31
*2017 population estimate is interpolated
*2019 and 2020 population estimates are conservative at 100 persons/year
*Projections assume that growth is unconstrained by water licence capacity

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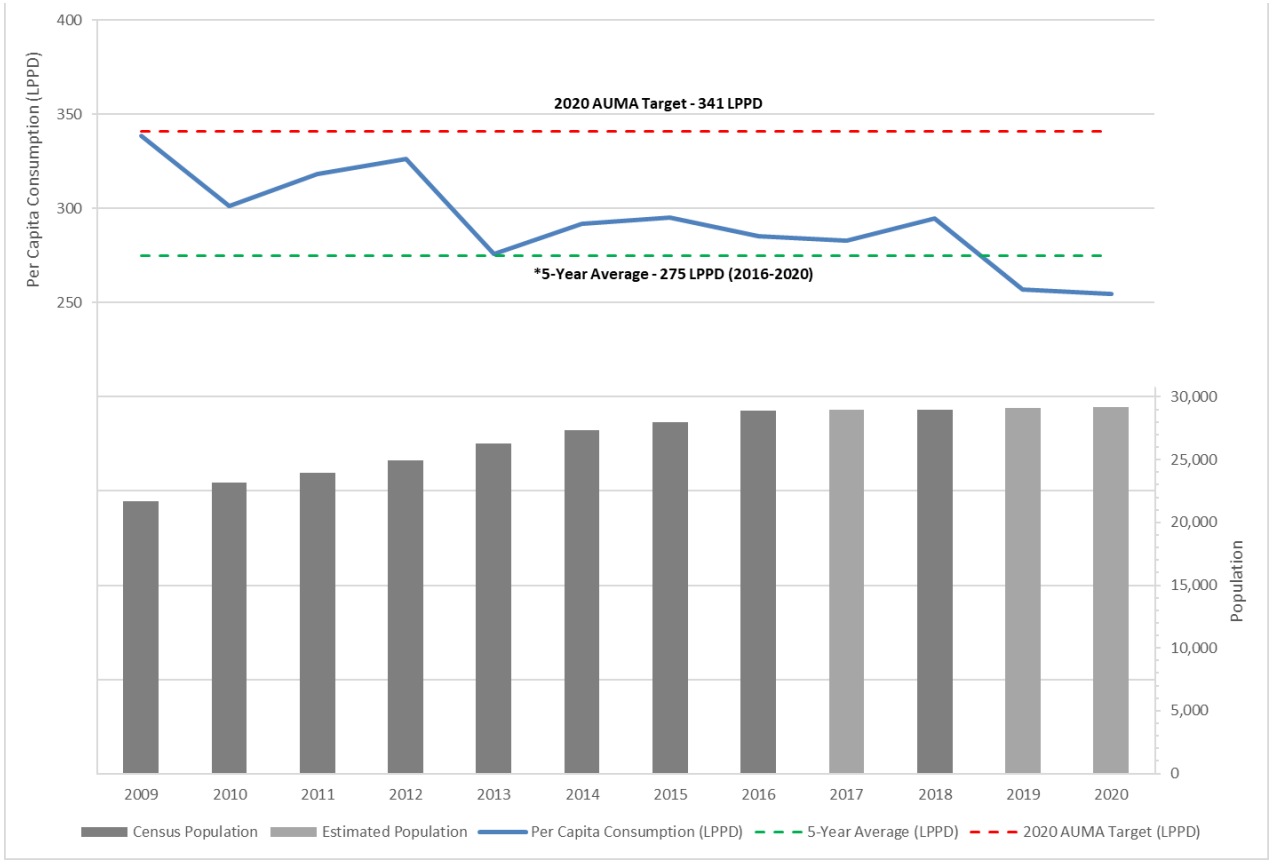
Consumption and Population Variability - Risks

Historical Gross Consumption and Population



*2017 population estimate is interpolated
*2019 and 2020 population estimates are conservative at 100 persons/year.
Needs to be confirmed (interpolated) when the 2021 federal census becomes available.

Consumption Risks

- If consumption or growth is higher than projected, Okotoks could reach licenced or production capacity earlier than expected

- Both Growth and Consumption are variable due to a variety of factors

- Consumption variability (255-295 LPPD in last 5 years)
  - Although currently consumption is trending down, additional years of consistent data is required to confirm if this is trend is sustainable.
  - Significant decrease in 2019/2020 due to identification and repair of significant line break.
  - Population estimates impact LPPD calculation*

- Growth Projection Risk
  - Historical growth rate ranged from 685 to 2851 persons/year between 2004 and 2016

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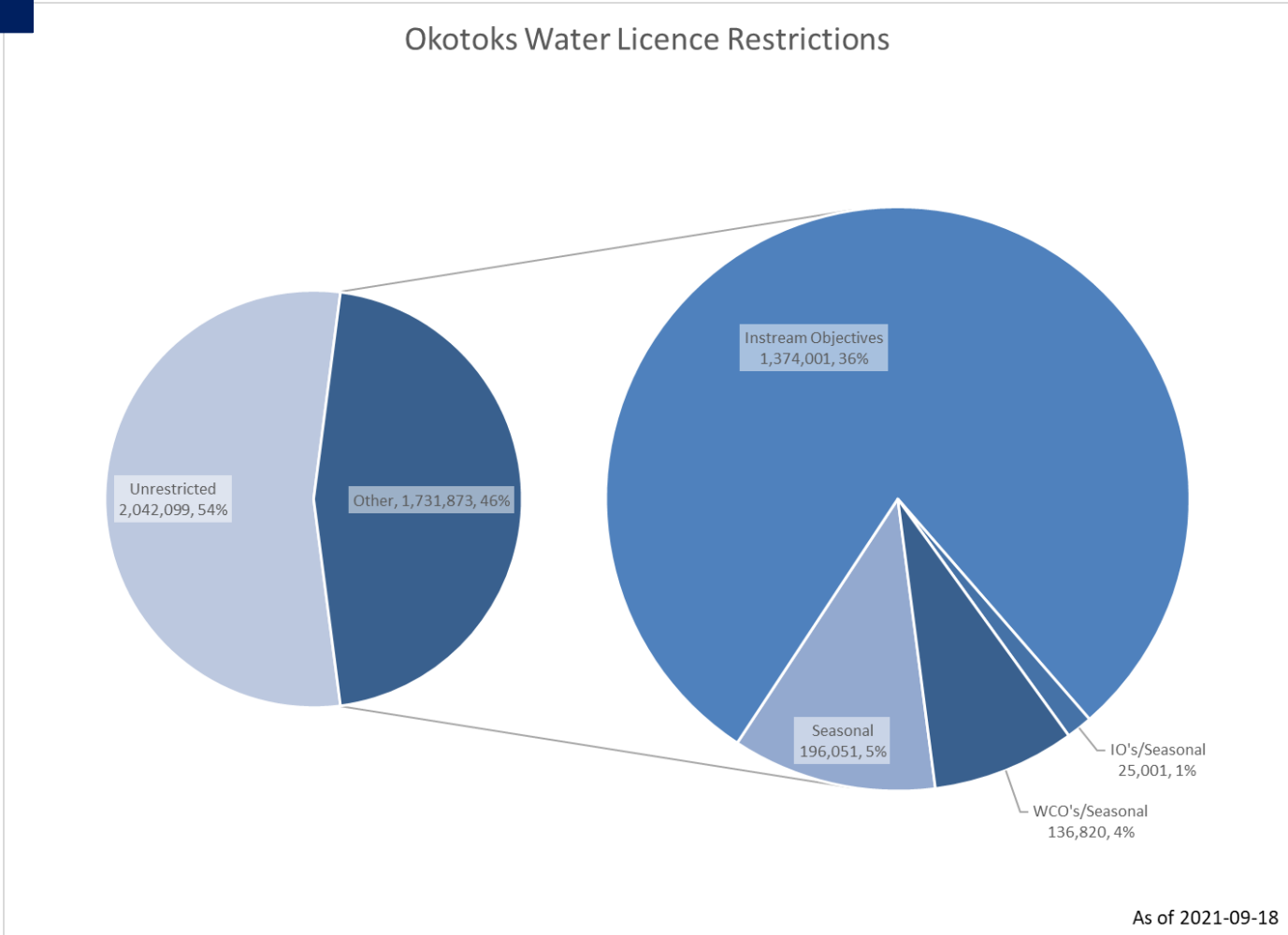
Water Licence Restriction - Risks



<u>Although we have licences, we may not be able to access our full allocation during restricted periods.</u>

- **Licence Restrictions**
  - Seasonal licences
  - IO/WCO restrictions
- **Operational Complexity**
  - Okotoks has 23 licenses, each with different conditions
  - Changes in interpretation of licences and Water Act could lead to non-compliance.
- **Seniority**
  - Older licenses have access to available water first in a shortage.

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Extreme Climate - Risks

- **Drought (increased demand, reduced supply)**
  - Climate change models predict increased frequency of multi-year droughts (and floods)
  - Historical water supply studies in the Bow River Basin show long periods of low flow as part of natural variability
  - Regardless of climate change projections, water management strategies need to be designed around significant, multi-year droughts
  - Increasing risk of natural droughts requires increased water supply system resiliency

- **Flood damage**
  - Both the Water Treatment Plant and the majority of the 13 wells are in the flood plain.
  - Infrastructure is armoured and a access bridge built to help mitigate flood risks.

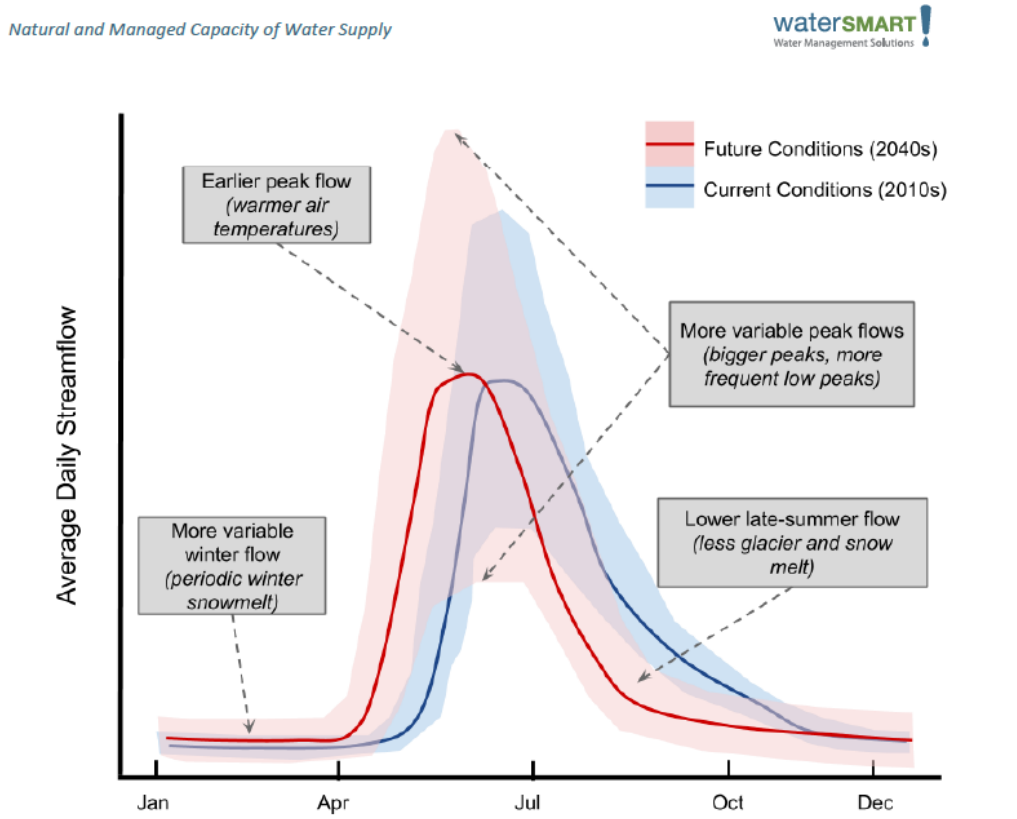
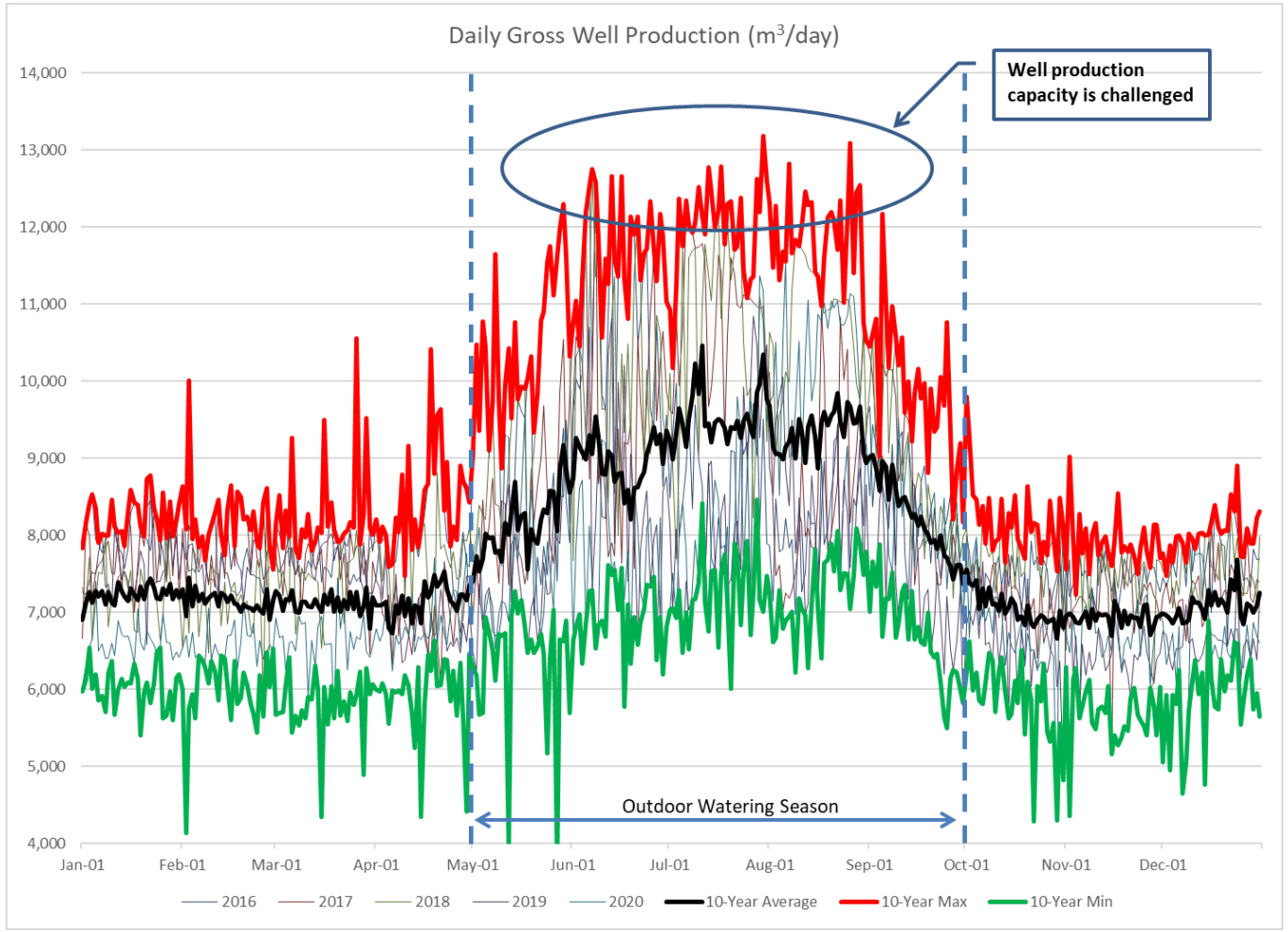


Figure 10. Conceptual diagram illustrating the changes to average daily naturalized streamflow expected to occur between now and the 2040s for a typical mountainous, snowmelt-dominated sub-basin in the Bow River watershed. The solid lines represent an "average" flow, while shaded areas correspond to an expected range of variability. The graph is not based on real data.

*2019 – WaterSmart - Natural and managed capacity of regional water supply in the Calgary Metropolitan Region

Production Capacity Risk (Peak Day)



Wells are challenged to produce peak day water demands

- The 13 Wells cannot produce consistently beyond (~12.5 ML/day)
- Wells production is further impacted by during certain river conditions such as low flow.
- Watering restrictions are required to manage peak day demands

Seasonal Peaking Factor

- During summer months, demand increases by 40-60% due to outdoor watering

Water Treatment Plant (WTP) has Significant Available Capacity

- Utilizing approximately 60% of WTP peak capacity at current level of service
- WTP design capacity is 21.7 mL/day (to be confirmed with full-scale hydraulic test)

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Infrastructure - Risks

- **Water Quality and Upstream Contamination**
  - Regionally, province-funded studies indicate water treatment plants show vulnerability to reduced raw water quality created by low flows
- **Limited Storage**
  - Limited potable water storage
  - No raw water storage
- **Major Watermain Breaks**
- **Power Failure**
  - Okotoks' 13 well raw water supply system has limited emergency power backup

Strategic Direction

Strategic Direction on Water

Municipal Development Plan

Goal = Sustainable Water

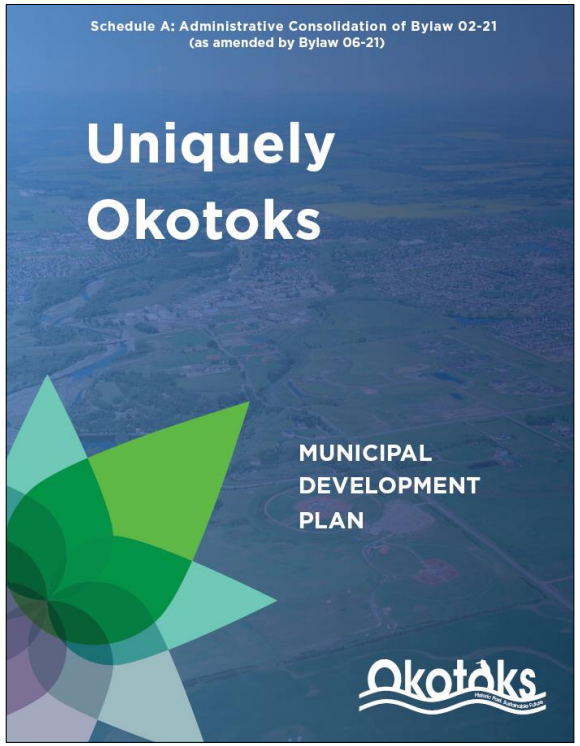
- Okotoks uses an end-to-end, watershed lens to protect and conserve our water while preparing for weather and climate change impacts.

Sample Policy

- 1.3.1 Align development approvals with the Town's water license capacity

  a) Ensure that approvals for development are granted in a fair and equitable manner in accordance with the Town's water allocation policy. (in LUB also)

- 4.2.1 a) Increase water conservation strategies,
- 4.2.1 f) Continue to design for non-irrigated landscapes and convert irrigated spaces to non-irrigated over time. Move to water re-use, non-potable water and stormwater use for irrigation of Town-owned public spaces.
- 4.2.1 g) Develop an aggressive peak water demand reduction program.
- 4.2.3 h) Implement an advanced water reuse strategy



*Complete details available in the Okotoks Municipal Development Plan

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Strategic Direction on Water

Environmental Master Plan

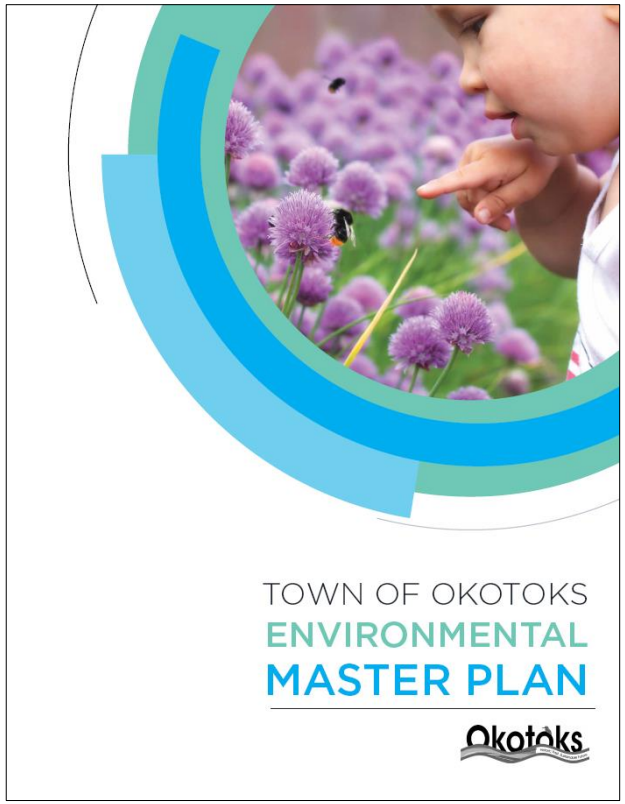
5 **Goal 5: Reduce water demand and consumption of drinking water and improve the water quality of our watershed**

GOALS

- Enhance the efficiency of the water system by increasing the capture and reuse of rainwater, stormwater, treated effluent and grey water
- Form regional partnerships to protect and manage the regional watershed
- Protect and improve water quality through riparian and wetland production and by reducing overland runoff and nutrient loads

TARGETS

- Achieve a 20% reduction in outdoor use of potable water (summer daily peak) by 2030
- Achieve & maintain lowest per capita gross water and residential potable water consumption rates in Canada
- Achieve and maintain an annual potable water system loss rate of less than 5%
- Meet or exceed Alberta's Potable Water Quality Guidelines in drinking water quality
- Meet or exceed Alberta's Environmental Quality Guidelines for Alberta surface waters



*Complete details available in the Okotoks Environmental Master Plan

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Strategic Direction on Water

Council has also Provided Direction and Funding to Pursue a Regional Water Solution

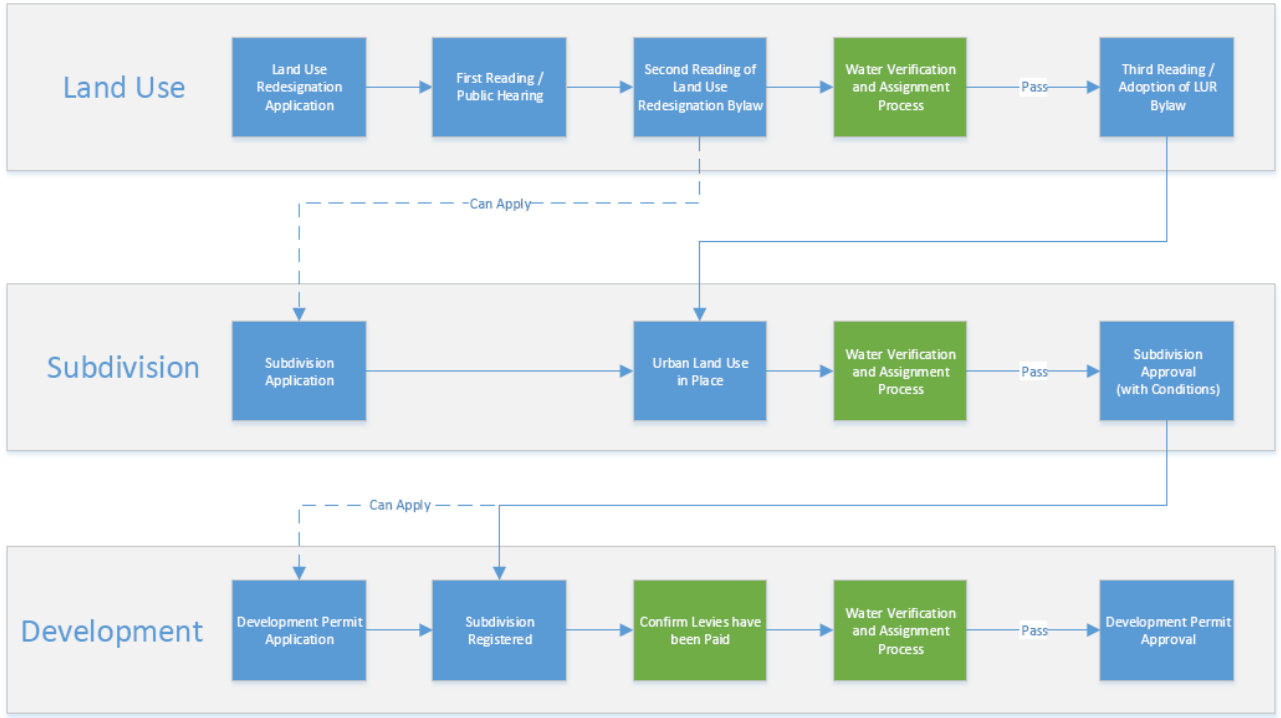
Why is Council's Strategic Direction important?

- Water Stewardship
- Sustainability
- Resilience
- Maximizing Value of Existing Infrastructure
- Energy Efficiency

*Complete details available in the Okotoks Municipal Development Plan

Implementation

Water Allocation System Overview



- **What is it?**
  - System to manage growth within the framework of the provincial water licence economy
  - Core principle is sustainability: Town only approves development within its water licence capacity
- **What is the process?**
  - Acquire water licences
  - Developers pay for Licence Capacity
  - Approve new development (growth) within water licence capacity
- **Okotoks is the first municipality in Alberta with this type of system**

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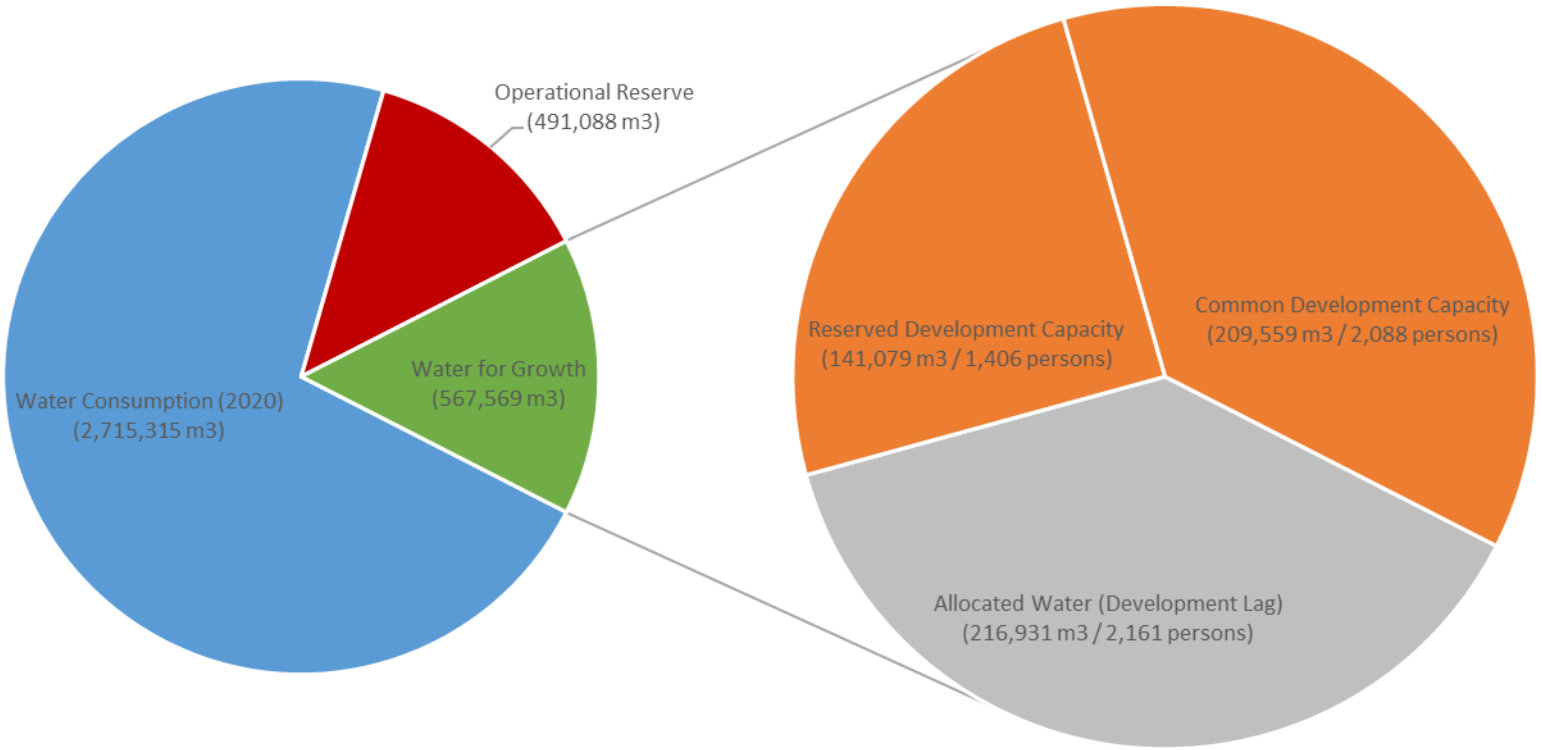
Water Allocation System



*Persons equivalent assumed at 275 LPPD
*As of 2020-12-31 assuming 2021 Water Allocation Transitional provisions and categorization used

- **Development Capacity**
  - Capacity for future development approvals
  - Explanation of common vs. reserved
- **Development Lag**
  - Capacity for growth in approved developments
  - Allocated to lands that are not yet consuming water
- **Operational Reserve**
  - Risk mitigation

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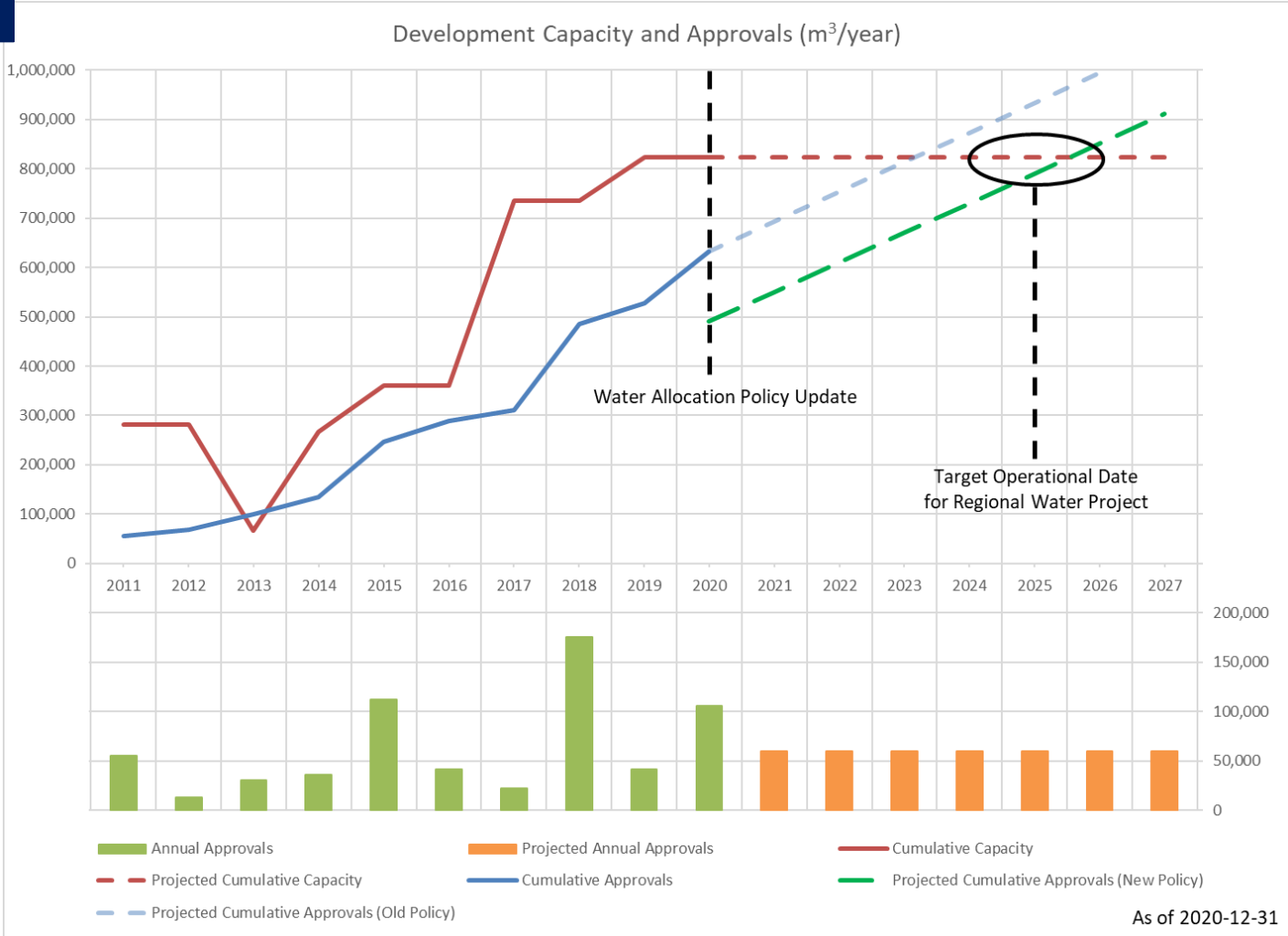
Water Allocation System – Approval Capacity



- Current remaining development capacity will likely be used by 2024-2025*
- 2021 Water Allocation update freed-up additional Approval Capacity
- Subject to many factors and can vary significantly year-to-year
  - Development approvals have exceeded 175,000 m3 in a single year

*Projected development capacity utilization rate assumes 60,000 m3/year
*Development Capacity refers to water licence capacity used to manage growth under the Water Allocation Policy since 2011.

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Water Conservation, Education and Programs

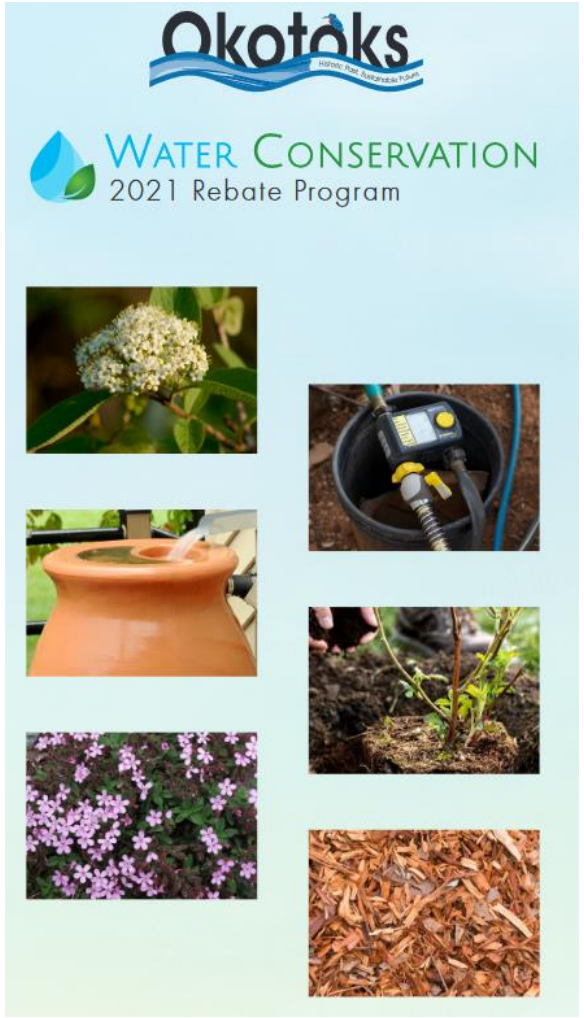

Table 8-3: Comparison of Water Conservation Measures

Municipality	Water Conservation Measures										
	Metering	Variable Water Rate Structure	Water Use Bylaws	Low-Flow Fixture Subsidy / Program*	Outdoor Watering Restrictions	Rain Barrell Subsidy	Non-Potable Water Use for Irrigation	Non-Potable Water Use/Re-Use for Municipal	Drought Tolerant Landscaping	Public Education Programs	Water Use Restrictions for ICI
Airdrie	✓	✓	✓	✓	✓		✓			✓	
Calgary	✓	✓	✓	✓		✓	✓	✓	✓	✓	
Chestermere	✓	✓					✓				
Cochrane	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Foothills	✓	✓	✓					✓			
High River	✓	✓	✓	✓		✓				✓	
Okotoks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Rocky View	✓	✓		✓			✓				✓
Strathmore	✓	✓	✓								✓
Wheatland	✓	✓	✓				✓	✓			

*2019 - Associated Engineering – CMRB - Water Use and Conservation in the Calgary Metropolitan Region Study

- Conservation
- Education
- Rebates
- Water Bylaw
- Development Standards
- Tiered Billing
- Projects
  - Non-Potable water Usage
  - Stormwater
  - Reuse

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Water Bylaw and Utility Rate Structure

		General Outdoor Use (except automated irrigation)	Automated Irrigation Only
SUN & THURS	ODD Numbered Addresses	6 AM-9 AM OR 7 PM-10 PM	2 AM-5 AM
WED & SAT	EVEN Numbered Addresses	6 AM-9 AM OR 7 PM-10 PM	2 AM-5 AM

Residential Utility Rates	Quantity	Rate
Water	Base Rate*	$20.50
Water Consumption - Tier 1	0-23 cubic metres	$1.55/$m^3$
Water Consumption - Tier 2	24-46 cubic metres*	$1.90/$m^3$
Water Consumption - Tier 3	46+ cubic metres* **new 2021 tier structure*	$3.17/$m^3$

Outdoor Watering Schedule

- Limit excessive watering to reduce seasonal peak demand / manage potable water reserves.

Block Utility Rate Structure

- Encourage conservation and disincentive heavy water usage

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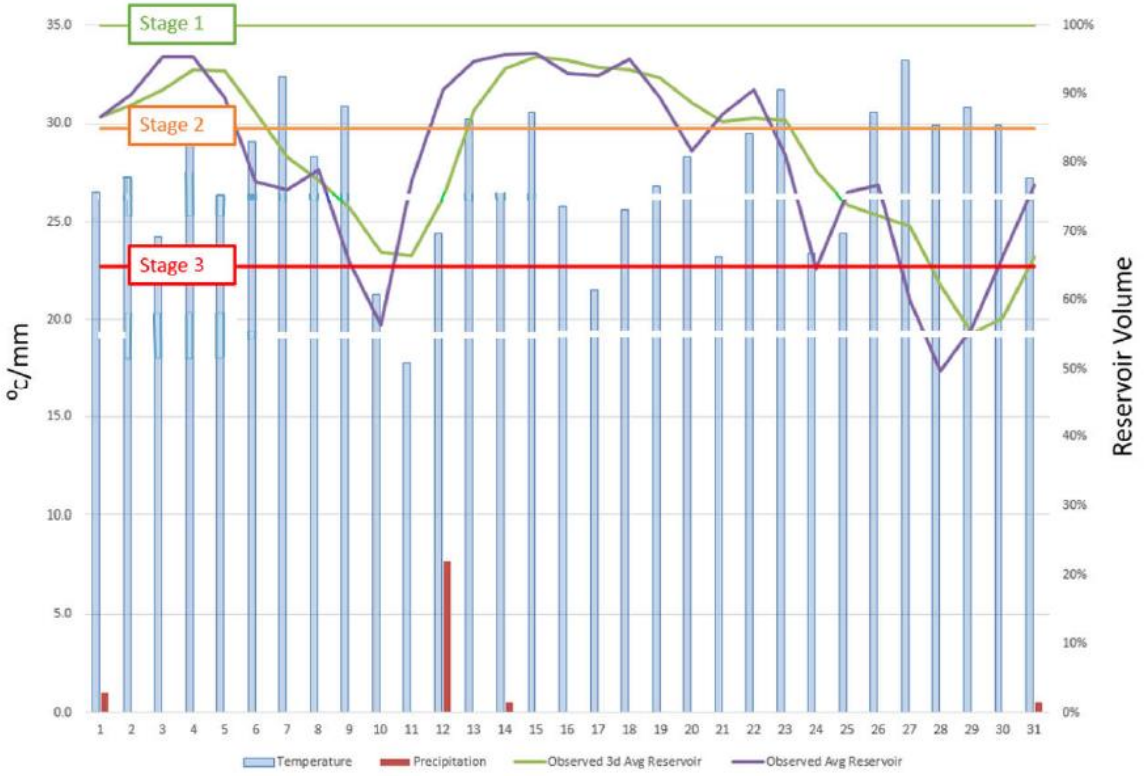
Water Shortage Response Plan – Water Restrictions

Chart 2: July 2017 Reservoir Volumes with Weather



Water Use Restrictions

- Different stages of water restrictions are triggered based on reservoir levels
- Minimizes or eliminates outdoor watering to preserve water supply for consumption and fire protection
- Typically occurs when demand exceeds production for a sustained period of time

Table 6: Water Shortage Response and Stage Triggers

Stage	Reservoir Volume	High Level Actions
1	85-100%	Normal operations; outdoor water use already restricted to 2days/week during May to October.
2	75-85%	Increased communication of existing water conservation initiatives.
	65-75%	Prohibit outdoor water use on weekends; increased enforcement.
3	<65%	Full outdoor water ban; close potable water bulk-fill station.
	<55%	Limit high water commercial customers; escalate enforcement for problem customers.

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Water Security

Why is an Ultimate Solution Required?

To provide long term sustainable water security in alignment with Council's Strategic Vision. The Ultimate Solution will address:

- Growth Impacts
- Supply Challenges
- Limited Remaining Development (License) Capacity
- Significantly mitigate the aforementioned risks

Why is an Ultimate Solution Required?

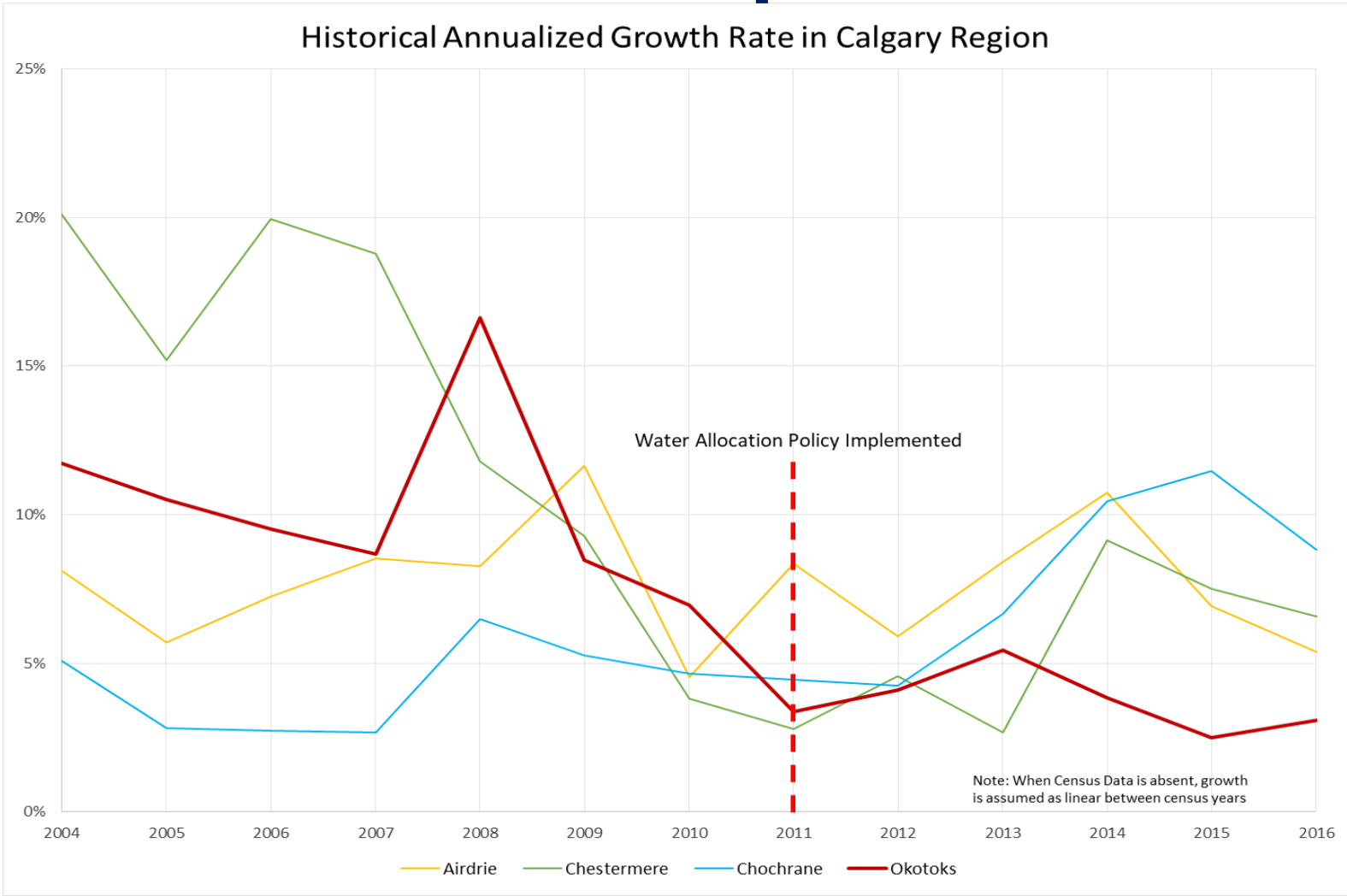
Growth Impacts:

Stigmatized Growth & Investment in Okotoks

- Okotoks went from one of the fastest growing communities in Canada to one of the slowest in the region

Developer Risk and Uncertainty

- Lack of secure water adds to developer uncertainty and leads to investment hesitation



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Why is an Ultimate Solution Required?

Supply Challenges

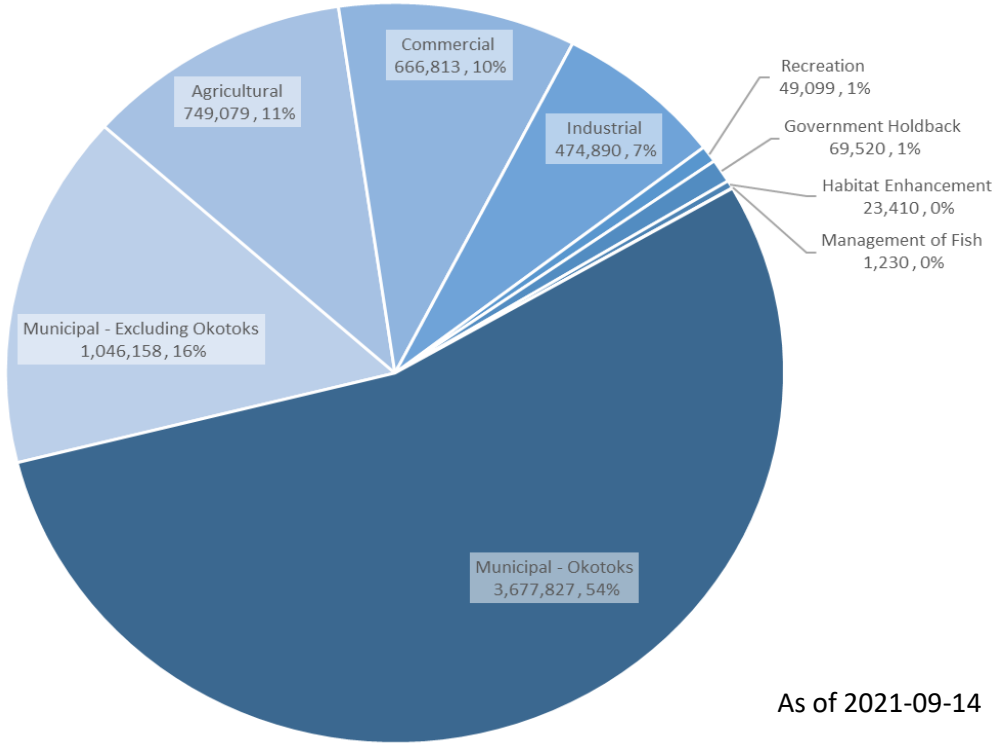
Sheep River is Small, Challenged and "Peaky"

- Sheep River cannot be viewed as the only source of water for sustainable growth

Limited licences available on Sheep River

- 70% of all surface water licences in the Sheep River WMA are for municipal use (54% Okotoks and 16% other municipalities)
- Lack of AEP support for licence transfers to the Sheep
- Significant Regulatory hurdles: Significant storage timeline, licence conditions (IO/WCO, holdbacks), transfer requirements (storage), etc.

Surface Water Diversion Licences
Sheep River Water Management Area



As of 2021-09-14

- Okotoks holds two groundwater licences for a total of 49,340 m^3 that are licenced for non-potable water supply.
- Okotoks holds an additional surface water licence for 36,908 m^3 in the "Bow Below Bassano Dam" WMA.
- AEP has not yet issued a water licence for 9,868 m^3 for the successful appeal of licence 00391311-00-00 in 2017.

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Why is an Ultimate Solution Required?

Limited Remaining Development (License) Capacity

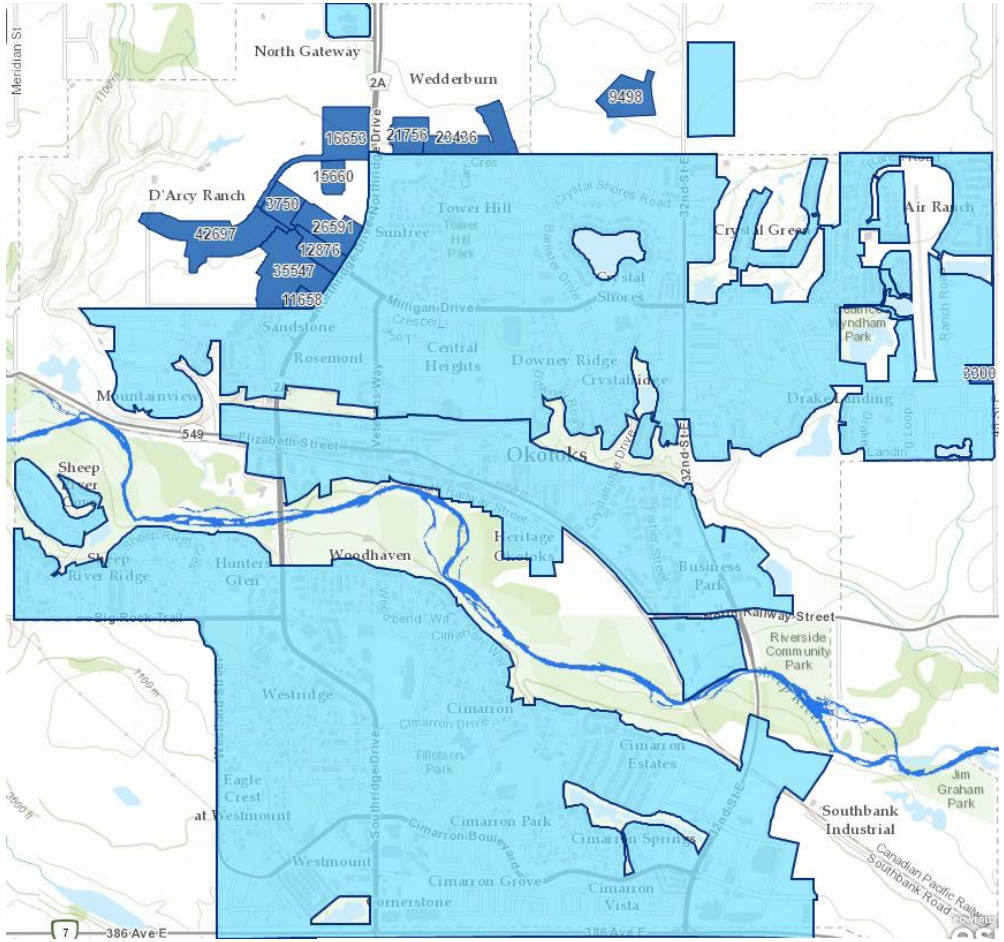
Limited Capacity in the Water Allocation system with minimal opportunity to add interim capacity

- Town forced to either stop approvals once unallocated development capacity is assigned or approve growth with increasing risk

Development Capacity	m^3	AF
Common Development Capacity	181,412	147.1
Anthem United Reserved Capacity	12,103	9.8
Burnswest Reserved Capacity	71,056	57.6
Okotoks Air Ranch Reserved Capacity	19,299	15.6
Tristar Reserved Capacity	13,522	11

*As of 2021-10-27

Water Allocation Map (blue = allocated)



*As of 2021-10-27

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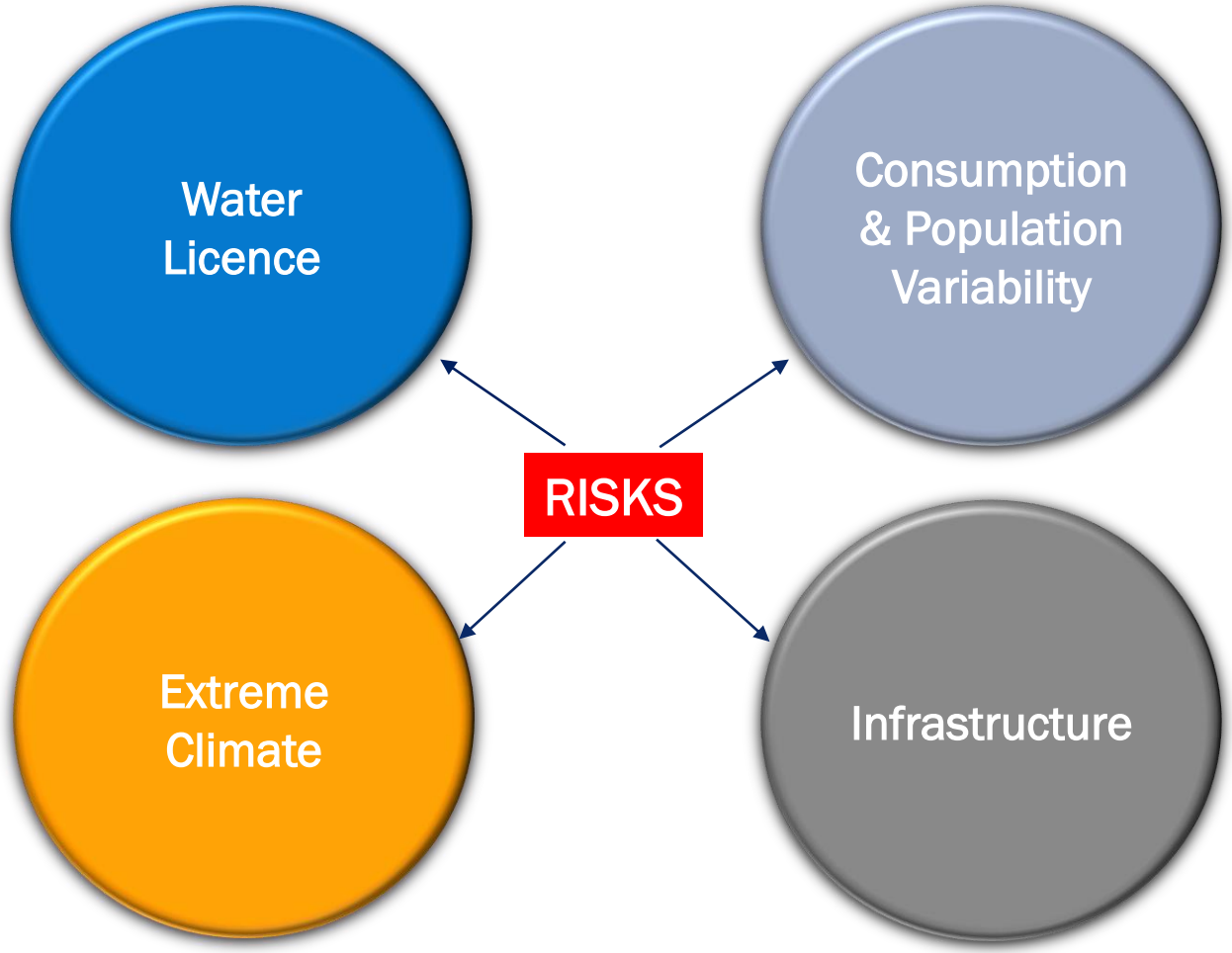
Why is an Ultimate Solution Required?

Risk Management

The ultimate solution will address constraints and risks by:

- Providing supplemental supply from the Bow River which is larger managed river with more available flow and licensed capacity
- Adding raw water storage
- Adding additional peak day capacity

Although constraints will be alleviated through implementation of the ultimate solution it will continue to be important to maintain our commitment to Council's strategic water objectives into the future.



What is the Ultimate Solution?

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