



November 4, 2024
The City of Calgary
P.O. Box 2100, Station M
Calgary, AB T2P 2M5

Attention: Sonya Sharp, Chair, Infrastructure and Planning Committee

Dear Infrastructure and Planning Committee Members,

**Re: Item 6.1 Update on Water Use and Water Loss Review
as an Input to the Off-site Levies (IP2024-1109)**

BILD is submitting this letter to the Infrastructure and Planning Committee (IPC) regarding item 6.1: Update on Water Use and Water Loss Review (Verbal), report IP2024-1109, to be presented on November 6, 2024.

While Administration has an action plan in response to Council's directives, BILD believes it lacks urgency in addressing the housing supply crisis. We are also concerned about inconsistent engagement, with materials often provided during meetings limiting our ability to prepare. The long gaps between engagements reduce opportunities for meaningful feedback.

BILD has continued to raise concerns about water demand metrics, especially Maximum Daily Demand (MDD), which impacts off-site levies. We also noted excessive water loss in Calgary's older infrastructure, contributing to higher development costs and inflated growth-related benefits.

Our concerns with the current MDD approach used by the City stem from its reliance on water usage data from treatment plants, which doesn't accurately reflect water demand where the benefits of the new infrastructure are received—at new homes. This results in oversized infrastructure and inflated costs, which unnecessarily increase cost recovery risk to industry and capital infrastructure project execution risks to the City and ultimately lead to unnecessary development barriers, hindering cost-effective additions to Calgary's housing supply.

The current method conflicts with the City's water efficiency goals outlined in a memo (copy attached) dated January 30, 2024, which emphasized affordability, sustainability, and resilience to drought. Additionally, Calgary's record immigration has accelerated land absorption, further straining the housing supply. Updated forecasts show the City's assessment of available land supply has decreased from 10-13 years in its 2023 report to 7-9 years in its 2024 report, heightening the urgency for new growth approvals.

BILD recommends that the IPC direct Administration to address these water-related infrastructure concerns in a fashion which better aligns with the urgency needed on the City's housing strategy and support for the growing demand for new homes. A list of relevant Council directions is attached.

To ensure that Council's directions to Administration are fulfilled in a manner that positively impacts housing supply and affordability, BILD respectfully requests that IPC recommend to Council that Administration be directed to address the following water-related infrastructure concerns:

1. **Re-evaluation of MDD:** Direct Administration to complete the Council-directed re-evaluation of the MDD and present its findings in report IPC 2024-1109 (Attachment 1) no later than March 31, 2025.

Item 6.1: Update on Water Use and Water Loss Review, IP2024-1109

2. **Update MDD Measurement Methodology:** Direct Administration to measure or estimate the MDD used for determining benefit allocation and benefiting areas for off-site levy calculations at the end-user consumption point, effective April 30, 2025.
3. **Unaccounted Water Allowance:** Direct Administration to set the maximum allowance for unaccounted-for water included in the MDD calculation at either 10% or the rolling average of the last 12 months of actual unaccounted-for water in Calgary's water network, whichever is lower, effective April 30, 2025. 10% is consistent with the Alberta Municipalities' targeted water loss resolution and other statutory and recommended water loss levels.
4. **Water Loss Strategy Disclosure:** Direct Administration to publicly disclose the accelerated Water Loss Strategy and provide it to BILD, other stakeholders and the public.
5. **Benefit Allocation and Benefit Area:** Direct Administration to use the re-evaluated MDD to recalculate the benefit allocation and benefiting areas for water-related infrastructure and levies no later than May 31, 2025.
6. **Off-Site Levy Bylaw Update:** Direct Administration to recommend an updated off-site levy bylaw, effective by June 30, 2025, if the recalculated benefit allocation and area for water-related infrastructure results in a levy rate change of more than annual inflations as reported by City of Calgary Corporate Economics.

BILD believes the above recommended actions and timelines better align with the urgency and commitment to housing affordability, reflecting the spirit and intent of Council's initial directions from September 16, 2023, as well as ongoing efforts to address the housing supply crisis.

We thank you for your consideration of the recommendations and look forward to continuing our collaboration with City building and addressing the housing supply crisis with Administration.

Yours truly,



Brian R. Hahn
CEO, BILD Calgary Region

Cc: David Duckworth, Chief Administrative Officer
Stuart Dagleish, Chief Operating Officer
Debra Hamilton, GM Planning and Development Services
BILD Calgary Region Board of Directors

Attachments

Chronology of directions

At its extraordinary Saturday, September 16, 2023, the Special Meeting of Council, called to deal with what Council labelled as Calgary's housing crisis and approve the Community Development Committee's recommendations and discussions on "Home is Here: The City of Calgary's Housing Strategy 2024-2030." The mayor stated that the council would take "swift action" to implement the recommendations.

At the **September 16, 2023, special meeting Council approved** amended recommendations. Included in Council's approval and **direction to Administration** were:

"1.C.13 Commit to infrastructure upgrades, services and amenities related to increased housing opportunities by:

*II. Using the data from the [existing] tracking systems to understand the additional funding needed for these communities **to have appropriate infrastructure**, services and amenities to accommodate housing and population growth;*

*III. Seeking opportunities to **equitably share the costs and benefits of housing-enabling infrastructure** (basic facilities, services, systems, and installations necessary or appropriate for the functioning of a housing community, including facilities, services, systems, and installations for **water**, sewage, power, communications, and transportation facilities such as roads, sidewalks, transit, and multi-modal transportation options), services and amenities amongst impacted groups, including the public, the private sector, and the Provincial and Federal governments*

4. Direct Administration to report to Community Development Committee annually, for the time duration of the current strategy that includes:

a. Updates on any new process costs or significant process changes for applicants resulting from the Housing Strategy's implementation across the planning continuum;

b. Recommendations to:

*i. **mitigate any additional costs to applicants and ultimately to housing consumers;***

ii. speed up approval processes as appropriate, in order to continue to support the construction of more housing;

*c. **Aggregated, third-party verified data points, sourced from both development industry and The City that demonstrate how savings are being passed onto consumers;**"*

At its **January 16, 2024**, Council meeting, Council directed Administration to:

*"... report back in 2024 Q2 to the Infrastructure & Planning Committee with a **detailed implementation plan**, including **specifics on deliverables, scope of work, by whom the work will be undertaken, resourcing, and timing**, with topics to be addressed to include:*

*a. An update to The City's Water Efficiency Plan including **new water efficiency targets**, policies, programs and tools for achieving targets.*

*b. Geographic **analysis for measuring water usage (including maximum daily demand) and leakage**, including new and established areas, and specifically progressing to a smart metering approach.*

*c. **Request data from the development industry that shows empirical evidence of which water saving measures** are being leveraged in new community development and home construction, to inform the work on maximum water demand.*

d. Reporting on RouteAhead strategies and actions relating to transit service introduction and adjustments, including On Demand, in new and actively developing communities.

Chronology of Council Directions Related to Item 6.1

e. Supplement annual off-site levy reporting for transit buses to include the new service implemented as buses are purchased using levy funds.

f. Infrastructure plans and inputs including scale and cost, including **rightsizing infrastructure** in the updated and consolidated Municipal Development Plan & Calgary Transportation Plan.

g. Identify risks and costs of operating and maintenance issues arising from under-utilized infrastructure due to slower pace of growth.

h. Alternative means, including developer-led and/or provincial government to fund new growth-related infrastructure in active Area Structure Plans outside currently Approved Area as opposed to passing the financial burden to the City of Calgary and existing taxpayers and utility rate payers.”

On **May 9, 2024**, BILD provided a response to item c. (attached), showing empirical evidence of water saving measures being leverage new community development and home construction.

At the **June 12, 2024**, Infrastructure and Planning Committee (IPC) meeting, with respect to Report IP2024-0573, IPC approved:

“That the Infrastructure and Planning Committee recommend that Council direct Administration to:

1. Engage a third-party engineering resource to:

*a. **Complete a review on water use trends and water loss (locally and in comparative jurisdictions); and;***

*b. **Complete an analysis of established areas, new communities and municipal customer water infrastructure design metrics** for the purpose of calculating greenfield and established area development levies.*

2. Report back to Council through the 2024 October 16 Infrastructure and Planning Committee with a progress update.

3. Amend Item G in the Growth Infrastructure Continuous Improvement Plan, Attachment 2, by deleting Item G in its entirety and replacing with the following:

*‘g. to **include work to identify risks and costs of operating and maintenance issues arising from both under and over-utilized infrastructure, considering both slow and accelerated paces of growth.**’”*

The June 12th recommendations of IPC were approved by Council on **June 30, 2024**.

On August 26, 2024, at a meeting convened by it, Administration provided a presentation of the approach it chose to take, independent from any further dialogue or consultation with BILD, in respect of the direction.

In response to the information presented, BILD provided a reply on September 6th, 2024, copy attached. Subsequent to BILD’s reply, a meeting has been scheduled between BILD, the City of Calgary and AECOM pertaining to the water use and water loss third party review.



May 9, 2024

Growth Funding & Investment
City & Regional Planning
The City of Calgary
PO Box 2100, Station M
Calgary, AB, T2P 2M5

Attention: Jennifer Black, A/Coordinator, Growth Financial Strategies

Re: Development Industry Feedback on Empirical Evidence Related to Water-Saving Measures to Inform Work on Maximum Water Demand - IP2023-1264

Dear Jennifer,

Thank you for your April 2, 2024, letter requesting data from BILD members showing empirical evidence of water-saving measures being leveraged in new community development and home construction. We understand this request is being made pursuant to the January 16, 2024, amendment related to [Report IP2023-1264](#), carried by City Council:

Direct Administration to report back in 2024 Q2 to the Infrastructure & Planning Committee with a detailed implementation plan, including specifics on deliverables, scope of work, by whom the work will be undertaken, resourcing, and timing, with topics to be addressed to include:

c. Request data from the development industry that shows empirical evidence of which water-saving measures are being leveraged in new community development and home construction, to inform the work on maximum water demand.

We appreciate the opportunity to share information about the measures the building and land development industry has implemented to reduce water demand to inform the work on maximum water demand. We provide the following feedback received from BILD members specifically related to:

- A. Water Use during Construction and Land Development
- B. Indoor Water Use
- C. Outdoor Water Use

Background

In terms of providing empirical data, The City of Calgary (the "City") should have the best information regarding empirical evidence of water-saving measures, as the City has metering data on substantially all residential dwellings' water usage since 2014. In addition, EPCOR Water Services Inc. (EWSI) issued a study in June 2021 titled [Water Use Trends and Guidelines Discussion Paper](#) (EWSI's Discussion Paper) which summarizes the changing water use trends of EWSI's residential, multi-residential, commercial, and regional customers. An important finding in the EWSI Discussion Paper was the consideration that "Per capita (person) residential consumption has been decreasing over time and will continue to decrease in the future."¹

Similar to the water use trends found in EWSI's Discussion Paper, the City of Calgary's consumption metrics have decreased from 2003 through 2021, illustrating the impact of water-saving measures – see [Drought Resiliency Plan](#). Due to a focus on installing water-saving measures in new community development and new homes, we understand the consumption per capita per day as measured at the City of Calgary's two water treatment plant outlets has decreased from approximately 525 litres/capita/day (l/c/d) to around 350 l/c/d which includes residential and commercial customers as well as system water losses. In terms of city-wide average end-user residential consumption only, we understand from City Administration's March 6, 2024, presentation to BILD, that the current usage is approximately 170 l/c/d.

We understand that the larger number (i.e., 350 l/c/d), as measured at the City of Calgary's two water treatment plant outlets includes water loss, which is reported in both Chris Tse's October 2023 email to BILD and in the noted March 6, 2024, presentation to be 285 l/connection/day, and equates to a system water loss of 22%. According to City data, 88% of the water lost is through system leaks. Given that each resident uses 170 litres of water per day, the system water loss due to leaks is akin to having an extra person and a half living in your home using water. In 2022, the water lost, specifically due to leaks, amounted to approximately 31.6 billion litres. Until these system water leaks are repaired, substantial improvements in water consumption per person are limited to improvements in end-user consumption.

In the City of Edmonton, which has system water losses of approximately 5%, metered residential water consumption is currently 140 l/capita/day. According to the above-referenced EWSI Discussion Paper, "These trends are projected to continue over the near term. [...] shows that developing neighbourhoods often have low per capita water consumption (175 L/capita/day and lower, with minimal exceptions). Low water consumption in developing neighbourhoods is attributed to a number of factors, including:

- Newer developments are installed with high-efficiency fixtures and appliances.
- In areas of high-density single- or multi-family development, smaller lot sizes lead to reduced irrigation requirements.

Research suggests that daily indoor per capita water use for new homes built with high-efficiency fixtures and appliances is currently 140 L/capita/day. Additional indoor reductions can be expected as future fixtures and appliances become more efficient than today's models and customer side leakage is reduced."²

¹ <https://www.epcor.com/products-services/new-connections/Documents/2021-Water-Use-Discussion-Paper.pdf> Page 52

² <https://www.epcor.com/products-services/new-connections/Documents/2021-Water-Use-Discussion-Paper.pdf> Page 27

In the building and land development industry, numerous water-saving measures have been introduced in new community development and home construction to mitigate water demand. Here are several examples:

A. Water Use during Construction and Land Development

1. Construction and Installation Works

- a. New development infrastructure must undergo vigorous tests and inspections to receive Construction Completion Certification and Final Acceptance Certification from the City. That infrastructure must adhere to numerous City of Calgary regulations, standards, and Waterworks Construction specifications during the installation and commissioning of water lines. These measures include that:
 - i. The City must provide prior written approval for all products that are to be incorporated into the water distribution system. The City reserves the right to withdraw the approval of any product if, in their opinion, the product does not perform satisfactorily.
 - ii. All newly installed water pipes are subject to hydrostatic pressure and leakage testing. During the pressure testing procedure, all exposed fittings valves and hydrants are also examined for leaks. Defective pipes are replaced with new pipes, and no repair clamps are to be used to rectify defective pipes.
 - iii. The volume of water flushed from the system during the commissioning inspection of new potable water mains must be measured and documented by a developer's contractor using a stopwatch and a pitot-style gauge, or an appropriate flow meter. This information is provided to the City to support improved auditing of non-revenue potable water. Moreover, effective backflow prevention measures, like a one-way check valve or vacuum breaker, are utilized to prevent any possible water supply contamination.
- b. During construction, industry efficiently utilizes captured surface-level stormwater to support construction activities. Before resorting to potable water, industry prioritizes the depletion of all accessible ponded areas.

2. Efficient land use

- a. Implementing zero lot line products in planning and development strategies to maximize space utilization and minimize water consumption.

3. Storm water Reuse and Parks

- a. Adoption of stormwater reuse for irrigation in new communities, contributing to water-saving efforts. Through industry consultation, BILD members advise that stormwater reuse for irrigation can lead to 3-5 million litres of water savings per irrigated hectare.
- b. Incorporation of low-maintenance and drought-resistant landscaping in parks and open spaces minimize the need for irrigation.

B. Indoor Water Use

1. **High-Efficiency Fixtures and Appliances:** Installing low-flush toilets, low-flow faucets and showerheads, high-efficiency dishwashers, and washing machines can significantly reduce water usage without impacting performance. Studies have shown that these fixtures can reduce water consumption by up to 50% compared to traditional fixtures.³ Industry meets or exceeds the City of Calgary's 40M2006 Water Utility Bylaw pertaining to low water use fixtures and installs the following:
 - a. **Low-Flush (or low-flow or high-efficiency) Toilets** that utilize no more than 4.8 litres of water per flush cycle. This is a significant amount as traditional high-flow toilets usually use between 13 and 25 litres per flush.⁴
 - b. **Low Flow Showerheads** which utilize no more than 7.6 litres per minute. For comparison, older showerheads can have flow rates as high as 20 litres per minute.⁵
 - c. **Low-Flow Faucets/WaterSense Faucet Aerators** utilize a maximum flow rate of 5.7 litres/minute.⁶ In comparison, the flow rate of a standard faucet is approximately 8.5 litres/minute.⁷
 - d. **Energy Star-certified Washing Machines** utilize approximately 53 litres per load. This contributes to approximately 33% less water usage compared to the 75 litres per load used by a standard washing machine.⁸
 - e. **Energy Star-certified Dishwashers** which utilize approximately 15 litres per load. This contributes to approximately 30% less usage when compared to a standard dishwasher.⁹ These appliances often incorporate innovative technologies like sensor-based water usage and optimized spray patterns to minimize water waste.
 - f. **On-Demand Hot Water Systems:** Installation of on-demand hot water tanks and hot water recirculation systems to reduce energy and reduce water typically wasted while waiting for water to heat up. This contributes to enhanced water conservation and overall environmental sustainability by reducing water wastage.
 - g. **Water Monitoring:** Provision of rough-in sleeves for water management systems like Moen Flo, enabling customers to monitor water use, including water flow rates, pressure, and temperature, to reduce water usage through weekly reports. Such systems can also detect leaks in the plumbing system and will shut off all water if a major leak is detected.

³ <https://www.nrel.gov/docs/gen/fy11/50133.pdf>

⁴ <https://www.crd.bc.ca/docs/default-source/water.pdf/>

⁵ <https://www.crd.bc.ca/education/water-conservation/at-home/indoor-water-use/bathrooms/showers>

⁶ <https://www.allianceforwaterefficiency.org/>

⁷ <https://nileedpha.com/blog/maximum-flow-rate-for-kitchen-faucets/>

⁸ <https://www.ohba.ca/whats-on-tap/>

⁹ <https://natural-resources.canada.ca/energy-efficiency/products/appliances-for-residential-use/dishwashers/13991>

C. Outdoor Water Use

1. **Xeriscaping and Drought-Resistant Landscaping:** Xeriscaping or drought-tolerant landscaping designs minimize the need for irrigation by using native plants and efficient irrigation systems such as drip irrigation. Research indicates that properly implemented xeriscaping can reduce outdoor water usage by up to 50-75%.¹⁰ Industry is minimizing outdoor water usage by:
 - a. The utilization of natural prairie-style landscapes with drought-resistant trees, shrubs, fescue sod, and naturalized channels and ponding areas for stormwater collection.
 - b. Increasing topsoil depth to 300mm leads to more rainwater retainment, requiring less hand/sprinkler watering for lawns.
 - c. The utilization of mulch conserves soil moisture by minimizing evaporation and stabilizing soil temperature, reducing water usage for irrigation.
2. **Rainwater Harvesting:** Collecting rainwater from rooftops and storing it for later use in irrigation or non-potable water applications can significantly reduce reliance on municipal water supplies. Studies have shown that rainwater harvesting systems can capture a substantial amount of water, supplementing a home's water supply when there is water scarcity due to drought or population growth that strains the existing water supply. Industry has been increasing use of rainwater for irrigation purposes, including rain barrels on individual lots.
3. **Smart irrigation systems:** Using weather-based or soil moisture-based irrigation controllers ensures that outdoor landscapes receive water only when needed, minimizing overwatering and water waste. Research has shown that smart irrigation systems can reduce outdoor water usage by up to 50%.¹¹ The industry has been utilizing the following measures to reduce outdoor water usage:
 - a. Installation of flow sensors, pressure regulating sprinklers, and smart irrigation systems to optimize water usage and detect irregularities. The systems may take longer to water an area but use water more efficiently and effectively resulting in less water being used.
 - b. Strict adherence to standards, specifications, and procedures for irrigation system design, installation, and monitoring, including pressure testing, water meter installations, and City approval processes as part of the Construction Completion Certificate and Final Acceptance Certificate.

Summary

Addressing the challenges of water demand and water conservation is crucial in ensuring affordable, vibrant, and prosperous residential communities in Calgary. Calgary must be competitive and affordable to attract and maintain investors, increase jobs, increase tourism, and maintain or increase standards of living for Calgarians.

The water-saving measures implemented by the building and land development industry, as illustrated above, demonstrate a concerted effort to reduce water demand. Backed by EWSI's Discussion Paper and bolstered by empirical evidence from the City of Calgary's residential

¹⁰ <https://education.nationalgeographic.org/resource/xeriscaping/>

¹¹ [What is Smart Irrigation? - HydroPoint](#)

metering data, these industry measures significantly contribute to lowering maximum water demand in new community development. This proactive approach fosters long-term sustainability and resilience in water resource management and design, ensuring a more efficient and responsible utilization of our vital water resources.

To aid in informing the work on maximum daily demand and right sizing the water infrastructure design parameters for new community developments, we believe it would be beneficial for us to jointly propose to Council engaging an industry expert to undertake a comprehensive third-party empirical analysis using the current measurement data similar to the EWSI Discussion Paper. This collaboration could ensure that infrastructure design parameters are finely tuned for efficiency and effective deployment of precious capital, showcasing empirical evidence of water-saving measures implemented in new community development and home construction. Such data would significantly contribute to our efforts in understanding and addressing maximum water demand design metrics.

We trust this information proves useful and look forward to continuing to work with the City of Calgary to promote and advance sustainable water resource management. Together we can maximize service from existing infrastructure to new homeowners and new home renters while also reducing the volume of water treated and distributed. In keeping with long-term efficiency, housing affordability and environmental stewardship goals we share, this will reduce operating costs and, as Chris Tse noted in his October 2023 email to BILD, delay or eliminate unnecessary capital investments for growth, all of which will reduce the costs included in new homes and lower bills to existing and future water utility ratepayers.

Best Regards,



Brian R. Hahn
CEO, BILD Calgary Region

cc: Tim Keane, GM Planning and Development Services
Debra Hamilton, Director, Community Planning
Matthew Sheldrake, A/Director, City and Regional Planning
Marcus Berzins, A/Manager, Growth Funding & Investment



September 5, 2024
 City of Calgary
 P.O. Box 2100, Station M, Mail Code 8062
 Calgary, Alberta T2P 2M5

Attention: Maggie Choi, P.Eng and Monica Bramley, P.Eng

RE: Continuous Improvement Workplan for Growth Infrastructure Planning: Third Party Review of Water Usage in Calgary

Thank you for sharing the workplan and schedule for the Council-directed Third-Party Review of Water Usage in Calgary (Report IP2024-0573) during the August 26, 2024, meeting between The City and industry. The meeting provided an update on The City's progress in response to Council's June 2024 direction, outlined the high-level workplan, clarified the process for future updates, and sought industry feedback.

In anticipation of the work ahead, it is essential that we establish a common understanding of the project workplan to avoid delays and ensure efficient use of resources. To facilitate this, we have provided a high-level summary and more detailed industry feedback, questions, and requests for further information. We kindly ask Administration to respond to BILD feedback, questions, information requests and involvement in upcoming meetings with the third-party consultant as soon as possible.

Summary

- The meeting reviewed Council's direction (Report IP2024-0573) for a third-party review of water usage trends and infrastructure design metrics, reporting back to IPC on October 16, 2024.
- Administration outlined a 3-part high-level workplan to address the Council directions. AECOM is the third-party consultant engaged by the City for Part 1 of the workplan.
- The Council directed understanding of over/under utilized infrastructure operation and maintenance risks is a separate internal project to be completed by The City.
- Administration proposed an industry Information Program which would discuss inputs in November 2024, Part 1 results in January 2025 and Part 2 results in March 2025.
- Administration indicated their intention to provide a verbal update only at the October 16th, 2024, IPC meeting.

BILD Feedback

At a high level, the presentation and information provided at the August 26th, 2024 online meeting addressed many of BILD concerns. The three-phase approach is acceptable although industry believes some of the work could proceed concurrently rather than sequentially. The current workplan timeline is slower than we would prefer and we would appreciate the opportunity to engage with the third-party consultant to discuss the scope of the review. Furthermore, while we prefer a written update for the October 16th IPC meeting, we understand your constraints and will work with the verbal update.

Regarding Part 3, although no timeline was provided, we encourage The City to engage with industry in the near future on several key off-site levy financial model inputs, in addition to the MDD, for the purpose of calculating Greenfield and Established Area development levies.

Thank you again for the August 26th meeting. We trust our feedback will assist in effectively completing this project and meeting Council's direction. We look forward to continuing our collaboration to enable needed housing supply in Calgary at the lowest reasonable cost and, as Sarah Huber and Monica Bramley so succinctly put it in their January 30th, 2024, memo to the Mayor and all Councillors, "... maximizing service from existing infrastructure and reducing the volume of water to treat and distribute, thereby reducing operating costs and delaying capital investments."

Best Regards,

J. Stewart

Jackie Stewart, P. Eng.
 Director, BILD Calgary Region

Cc: CICBA, NAIOP, BILD Calgary Region

BILD Feedback on Administration's August 26, 2024 Presentation

Re: Council Directions and City Workplan

A. Council Direction - Engage a third-party engineering resource to: Complete a review on water use trends and water loss (locally and in comparative jurisdictions)

City Workplan Part 1 – Water Use and Water Loss 3rd Party Review

The following is the scope of work provided by the City of Calgary to the third-party consultant, AECOM.

This review should include, but is not limited to, the following key factors for each jurisdiction or water utility over a period of ten years or length of available information:

- Water distribution system details, water use metrics and management practices
 - Length of in-service distribution network by pipe material
 - Population served
 - Average day demand (ADD) and maximum day demand (MDD) as well as calculation methods for historical and forecast values
 - Existence of production flow meter verification program, or similar,
 - Existence of district metered areas (DMAs) or permanent monitoring for water flow
 - Customer billing rates and type of billing practices used, specifically if Advanced Metering Infrastructure (AMI) is utilized
 - Itemization of all district meters in place in Calgary, including how long they have been in service, how they are read and how frequently they are read.
 - A list of all pumps between pressure zones in Calgary, the pumping capacity of each pump and how the operating hours of each pump are logged/recorded.
 - The maintenance frequency for all water network pumps—i.e., how often and at what point, for each type of pump used, is maintenance performed and what types of maintenance are performed.
 - Large customer demand forecasting as distinct from the new growth end-user residential demand (i.e., Regional or contracted capacity)
- Water loss metrics and management practices
 - AWWA-approved water loss metrics, including ILLI and litres per service connection per day
 - Historic break rate per km
 - Length of distribution system surveyed annually for leaks
 - Types of equipment used for leak survey
 - Other surveys done on the topic of water loss

Part 1 is also informed and connected to the Accelerated Water Loss Strategy, Distribution Flow Monitoring Strategy and the update of the Water Efficiency Plan.

BILD Feedback

1. Industry requests early and frequent engagement with the consultant (AECOM) and the importance of aligning the consultant's scope with industry expectations
2. Industry requests to attend the kick-off meeting with AECOM in September.
3. Request the City to provide a detailed schedule and scope for the consultant's work and to schedule a follow-up meeting in early October with The City and the consultant.
4. Industry stresses the importance of transparency and the need for industry to understand the data and methodologies used by the consultant.
5. *Average day demand (ADD) and maximum day demand (MDD) as well as calculation methods for historic and forecast values* – A simple average won't meet our hopefully aligned needs or the fundamental purpose for this exercise; this review needs to clearly differentiate between old and new end-use connections. Additionally, it's crucial to specify to the third-party consultant that they are focusing on end-user demand measured at the end-user connection to the water network, not

demand as measured at the treatment plant, as the benefit is realized where the end-user consumes the water. The current methodology of averaging the MDD, is not representative as it includes large users (e.g. Industrial, institutional, etc.) whose demand types are non-existent to less prevalent in most growth areas being serviced. This approach skews the results. This approach also dilutes the accuracy of the demand the third-party consultant should be trying to measure, making it harder to differentiate between old and new usage patterns. Differentiation of water usage between new residential, older homes, as well as ICI and regional users is required

6. *Historic break rate per km* - Industry respectfully requests the following be added:
 - a. the type of pipe material and age of pipe
 - b. the typical amount of water lost from the break and recommissioning of the repaired pipe.
 - c. the measure of the typical flow in the pipe/unit length

B. Council Direction - Engage a third-party engineering resource to: *Complete an analysis of established areas, new communities and municipal customer water infrastructure design metrics for the purpose of calculating Greenfield and Established Area development levies.*

City Workplan Part 2 - Cost Benefit Allocation for Growth

- Confirm/detail the method used in The City's approach to allocate growth related capital infrastructure costs for regional municipal customers and to calculate the off-site levies.
- Provide an analysis/comparison of how max day demand is applied in both methodologies to allocate costs related to growth related water infrastructure and provide a similar analysis for metrics used for wastewater.
- Conduct jurisdictional research to identify leading practices for cost allocation methods for both levies/development charges and regional municipal customers.
- Incorporate findings from Part 1 and identify recommendations for improvements.

BILD Feedback

1. We trust both the City and Industry want the review to focus on end-user consumption of new growth regardless if new housing product is in established area or new communities.
2. We trust both the City and Industry want to compare older home consumption to new home consumption as a means to explore and, as appropriate, reduce the MDD used for design and construction of water-related infrastructure and as Sarah Huber and Monica Bramley so appropriately put it in their January 30th, 2024, memo to the Mayor and all of Council, "*Keep water services affordable by maximizing service from existing infrastructure and reducing the volume of water to treat and distribute, thereby reducing operating costs and delaying capital investments.*"
3. We trust both the City and Industry want to determine and compare water loss in pipes in older communities to new communities with new pipe networks and, to the extent it is necessary differentiate water loss attributable to the different types of materials used in pipes and condition of pipes in new growth areas versus existing served areas.
4. How will the analysis of established areas, new communities and municipal customer water infrastructure design metrics be determined?

City Workplan Part 3 – Apply benefit allocation recommendations to capital project lists and use to inform the OSL bylaw update

BILD understands this work is yet to be scheduled and will intersect with New Project Identification (Growth Applications, Budget planning) and understanding operating and maintenance risks of over and underutilized infrastructure.

BILD Feedback

1. Although no timeline was provided, we encourage The City to engage with industry in the near future on several key OSL variables and factors, including:
 - a. Impact of a more appropriate MDD for new growth on size, timing and benefit allocation of projects in the OSL financial models
 - b. Reconciliation of 2023/2024 actual DA's that were signed

- c. New growth area on new business cases (will increase denominator)
- d. Use of ASP's as denominator for water infrastructure
- e. Most recent available information including reconciliation of project costs, interest rates etc.

C. Council Direction - Report back to Council through the 2024 October 16 Infrastructure and Planning Committee with a progress update

City Workplan

BILD understands that a verbal progress report, similar to the August 26th meeting presentation, will be provided to Council at the October 16 IPC.

BILD Feedback

1. We acknowledge Administration's desire to provide a verbal update at the October 16th, 2024, IPC meeting. While it is BILD's preference that a written report be provided, we also acknowledge staff vacations and accept the need for a verbal update at this time.

D. Council Direction - Amend Item G in the Growth Infrastructure Continuous Improvement Plan, Attachment 2, by deleting Item G in its entirety and replacing with the following: "*g. to include work to identify risks and costs of operating and maintenance issues arising from both under and over-utilized infrastructure, considering both slow and accelerated paces of growth.*"

City Workplan

BILD understands from the discussions during the August 26th meeting that this will be a separate internal City project. The City is currently exploring various growth scenarios, and this work will run concurrently with Parts 2 and 3 mentioned above.

BILD Feedback

1. As we understand this work will not be part of the third-party review, when and how will this be addressed and what are the plans to include and fully engage industry in a completely transparent fashion for this portion of the work?
2. What is the timeline for completion and what is currently being considered for the update to the Committee in October 2024?
3. From BILD's perspective, it seems as though the answer to this issue has already been somewhat framed by again, Sarah Huber's and Monica Bramley's January 30th, 2024, memo to the Mayor and all of Council, "*Keep water services affordable by maximizing service from existing infrastructure and reducing the volume of water to treat and distribute, thereby reducing operating costs and delaying capital investments.*" This seems to make clear that maximizing the use of existing infrastructure is best achieved by using the lowest reasonable MDD and taking into account the lowest reasonable water loss rate for new growth infrastructure. Please confirm that The City sees this on the same basis as industry.

BILD Information Requests:

1. Copy of the RFP sent to consultants (BILD received from Monica Bramley August 27, 2024)
2. AECOM response/scope of work
3. Detailed schedule/workplan for AECOM
4. List of other jurisdictions/survey participants
5. All City data sent to consultant (AECOM)
6. Survey results from all participants and list of those who declined to participate and why
7. Full and complete Accelerated Water Loss Strategy
8. Full and complete Distribution Flow Strategy including the AMI Strategy

BILD September 5, 2024, Correspondence

Schedule/Next Steps:

Item	Date	Details	BILD Response
1.	Sept.	Part 1-City kick-off meeting with AECOM	BILD requests industry attendance
2.	Sept. 6- Oct. 4	Part 1-City Background review – identification of appropriate/comparative participating jurisdictions/utilities	BILD requests industry attendance at this session and engagement on the selection of jurisdictions
3.	Sept/Oct	Part 1-BILD Meeting with Monica Bramley to review consultant's survey and ensuring alignment with industry expectations	Monica and BILD to coordinate date
4.	Oct 5-Nov.15	Part 1-Survey Preparation, Circulation and Compilation Part 2-Identify Consultant	BILD requests input on survey preparation.
5.	IPC - Oct.18	IPC – Verbal Report	
6.	Late Nov.	Industry Session - Inputs	
7.	Nov.15-Dec.20	Part 1-Consultant Final Report to City Project Part 2 -Kick-off and background review including inputs from Part 1	BILD requests input on Part 2 prior to commencement of work
8.	January	Industry Session - Part 1 results Part 2-Analyze benefit allocation for municipal regional customers and the OSL. Conduct jurisdiction research	
9.	March	Industry Session - Part 2 results Part 2- Identify recommendations and Compile report	
10.	March	IPC/Council Report	
11.	Q1 2025	Water Efficiency Plan Update	
12.	TBD	Part 3 – Apply benefit allocation	BILD requests input on Part 3 prior to commencement of work
13.	TBD	Meeting with City/BILD/EWSI	When does The City plan on scheduling the meeting between Calgary, BILD and EWSI as promised at the March 6 th , 2024 meeting on water loss?



Memo

January 30, 2024

To: Mayor and Members of Council

From: Sarah Huber, M.Eng., P.Eng.
 Manager, Utilities Project Development
 Capital Priorities & Investment

Monica Bramley, M.A.Sc., P.Eng.
 Leader, Water Project Development
 Capital Priorities & Investment

RE: Accelerated Water Loss Program

The City has a long history of Water Efficiency and water demand management. Careful management of Calgary's water supply and demand, investing in efficiencies, and managing the operations of Calgary's water treatment and distribution systems ensures there is a secure water supply for Calgary's customers now and in the near future. Continued efforts have enabled Calgary to:

- Keep water services affordable by maximizing service from existing infrastructure and reducing the volume of water to treat and distribute, thereby reducing operating costs and delaying capital investments,
- Ensure water is available for Calgary's growing population by reducing the per-customer amount of water withdrawn from our rivers,
- Make Calgary more resilient to drought by using water wisely and fostering a "culture of sustainability" among Calgarians to ensure we have enough to meet our future water needs and protect our rivers.

The City has been managing water loss over the last four decades through proactive leak detection to find and repair leaking infrastructure, proactive watermain replacement of aging infrastructure and the cathodic protection program to prevent deterioration of metallic pipes. In the 1990s the City began universal customer metering and conducting annual water audits to quantify water volumes from source to customer, and the amounts of both billed and lost water. These efforts and actions have driven down Calgary's water loss.

As identified in the Water Security Framework (2019), the City developed a Water Loss Strategy in 2019 to better understand the use of potable water within the Water Utility's infrastructure and the actions needed to minimize the volume of water loss. With the adoption of this strategy the City successfully reduced water loss from 337 L/conn/day in 2019 to 286 L/conn/day in 2022 with a target of 250 L/conn/day by 2030 (Figure 1).

Building on the learning and success of these reductions and in response to the increasing pressure on our water supply the City will further target and reduce water loss with an accelerated water loss program in 2024. An accelerated program will inform a more aggressive target beyond 2025 and an associated action plan that considers water loss reduction expenditures and benefits, as well as

external factors, such as pervasive drought conditions. In addition, The City is updating its overall water efficiency plan and will present the plan to council in 2025.

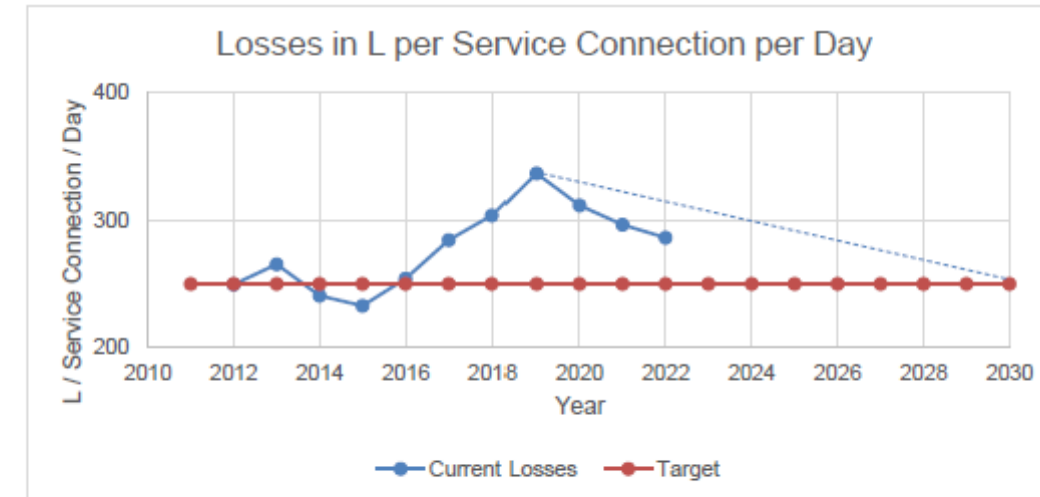


Figure 1: Losses Normalized by Service Connection

The Accelerated Water Loss Program for 2024 will include a balance of actions that improve the monitoring, identification, and detection of system leaks, as well as target infrastructure repair, replacement, and protection programs to reduce and prevent water loss. These actions are:

- Use advanced technology to support leak detection. Multiple pilots were conducted in 2023 to test and evaluate the effectiveness of new leak locating technologies including satellite imagery and semi-permanent acoustic sensors. Successful pilots have indicated that advanced acoustic sensors can effectively geolocate and target leaks within the system. The City will be utilizing the proven technologies internally for both proactive and reactive response to leakage events.
- Expand the leak detection program using a balance of internal and contracted resources.
- Evaluate and recommend a path towards enhanced distribution system monitoring, including additional flow meters to inform targeted areas for leak investigation.
- Prepare annual updates on water loss metrics and an update to the Water Loss Strategy, including a review of a more aggressive target beyond 2025 and associated action plan. Undertake a third-party audit of the City's water loss audit and strategy. Determining an appropriate longer-term target (2026-2030) will require continual evaluation of internal factors, such as water loss reduction expenditures and associated benefits, as well as external factors, such as pervasive drought conditions.
- Continue and evaluate ongoing programs for enhancement, such as annual watermain replacement, annual anode retrofit installation and replacement, feedermain inspections, meter testing, and smart metering implementation.



To achieve the actions set out in the Accelerated Water Loss Program, additional funding for both the operating and capital programs will be brought forward to council as part of the mid-cycle budget requests in the fall of 2024.

Sincerely,

Sarah Huber, M.Eng., P.Eng
Manager, Utilities Project Development
Capital Priorities & Investment, IS
T 403.861.4386

Monica Bramley, M.A.Sc., P.Eng
Leader, Water Project Development
Capital Priorities & Investment, IS
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Attachments:

- Attachment 1: Actions The City has taken to Reduce Water Loss
- Attachment 2: Calgary's Water Metering Program and Water Loss
- Attachment 3: Measurement of Calgary's Water Loss and Comparison to Other Municipalities

Cc: Michael Thompson, General Manager, Infrastructure Services
Doug Morgan, General Manager, Operational Services
Francois Bouchart, Director Capital Priorities and Investment, Infrastructure Services
Nancy Mackay, Director Water Services, Operational Services
Ryan Kidd, Deputy Director, Water Services, Operational Services

Actions The City has taken to Reduce Water Loss

Water supply and availability are essential to support a growing City and region. Ensuring customers continue to have an affordable service and reducing the amount we withdraw from our rivers will continue to make Calgary a sustainable and affordable place to live. The City of Calgary has over 5400 km of pressurized water pipe, and over 345,000 service connections that we operate maintain and upgrade to provide safe clean drinking water to Calgarians every day. The reduction of water loss through the identification of leaks and repair or renewal of our infrastructure will ensure water is available and reliable for our customers.

Water loss is the difference between the volume of water that is treated by the water treatment plant and the volume of water that is accounted and billed for at customer meters under the same time frame.

Current industry-standard terminology separates water loss into three categories: unbilled authorized consumption, apparent losses, and real losses (Figure 1). Unbilled authorized consumption includes water utilized for firefighting and municipal operations, such as flushing of watermains. Apparent losses are water that is being consumed, but not being paid for – an example would be meter installations lagging customer water use in new builds. Real losses are losses due to watermain breaks such as pinhole leaks or leaks at fittings or joints in pipes in the transmission and distribution system.

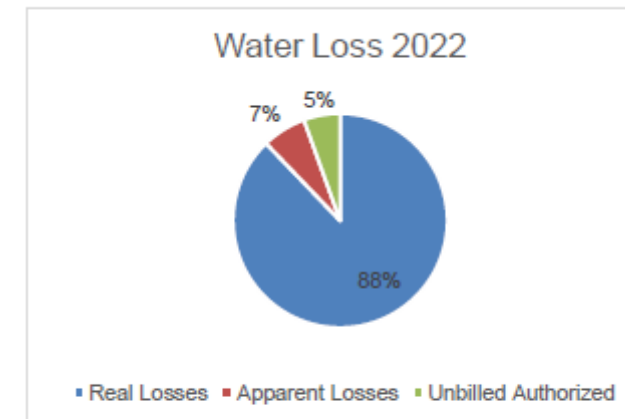


Figure 1: Breakdown of Water Loss from 2022 Water Audit

It is important to reduce the volume of water lost to leaks and breaks, and appropriately account for the water required for other authorized uses. Over the last four decades The City has proactively addressed water loss through a balance of actions that target real losses, through identification, repair and prevention of leaks, as well as apparent losses and unbilled authorized losses through actions that quantify the amount of water being treated and lost. These efforts and actions have had significant benefit in driving down Calgary's water loss.

Real Losses

Main replacement - The City runs a proactive water main replacement program that schedules timely replacement for aging water mains considering the material, geotechnical conditions, and break history, among other factors.

Cathodic protection - The City also has a robust cathodic protection program that connects almost all of the City's metallic distribution mains to sacrificial anodes to reduce corrosion that can result in pinhole leaks in metallic pipes.

Leak detection - Proactive leak detection is addressed in different ways, including pipe surveys in targeted areas using acoustic methods to listen to hydrants and valves for nearby leaks. The City uses district-metered areas in six targeted neighbourhoods for real-time water supply monitoring, allowing for the proactive identification of leaks/breaks in those areas. A district-metered area is an area of a water distribution network where there are strategically placed meters on the water pipes that supply water to the area. This provides data to understand exactly how much water is supplied to a certain area and is used to identify when the supply volume increases from typical demands, either indicating irregular usage or a leak.

The City is optimistic about using some of the new detection technologies successfully piloted in 2023 to provide a more efficient detection method. The new technologies have primarily been different offerings of acoustic sensors, which can be installed on a temporary (overnight or for a few days) or permanent basis on connection points to the system, such as hydrants and valves. Based on acoustic signatures, they can report to locations with a high likelihood of a leak.

Unbilled Authorized

Annual audits - Unbilled authorized consumption is tracked closely through an annual water audit process adhering to industry-standard practices using methodology recommended by the American Water Works Association.

Flow metering - Unbilled authorized consumption includes water used for municipal activities such as firefighting, flushing watermains for return to service or flushing during commissioning of new infrastructure, flushing of sanitary, and storm sewer mains to remove sediment, as well as water consumed during the annual Frozen Pipe Prevention (FPP) program, which requests targeted addresses run a small rate of flow through one tap to reduce the likelihood of frozen services during cold weather. The City annually audits the flushing and FPP programs to ensure compliance, track consumption, and confirm that the use of water is the most cost-effective and efficient solution.

Apparent Losses

Customer metering - Universal customer metering was initiated in 1991 to address high water consumption. These meters provide The City with an understanding of the volume of water that is accounted and billed for at customer meters.

Plant Meter Testing - Plant meter verification is regularly undertaken at the potable water plants to confirm the accuracy of the large production meters that report the volume of water leaving the plants.

Accelerated Water Loss Program Actions

The Accelerated Water Loss Program for 2024 will include a balance of actions that improve the monitoring, identification, and detection of system leaks, as well as target infrastructure repair, replacement, and protection programs to reduce and prevent water loss. These actions are:

- Use advanced technology to support leak detection. Multiple pilots were conducted in 2023 to test and evaluate the effectiveness of new leak locating technologies including satellite imagery and semi-permanent acoustic sensors. Successful pilots have indicated that advanced acoustic sensors can effectively geolocate and target leaks within the system. The City will be utilizing the proven technologies internally for both proactive and reactive response to leakage events.
- Expand the leak detection program, using a balance of internal and contracted resources, to include additional proactive support.
- Evaluate and recommend a path towards enhanced distribution system monitoring, including additional flow meters to inform targeted areas for leak investigation.
- Prepare annual updates on water loss metrics and an update to the Water Loss Strategy, including a review of a more aggressive target beyond 2025 and associated action plan. Undertake a third-party audit of The City's water loss audit and strategy. Determining an appropriate longer-term target (2026-2030) will require continual evaluation of internal factors, such as water loss reduction expenditures and associated benefits, as well as external factors, such as pervasive drought conditions.
- Continue and evaluate ongoing programs for enhancement, such as annual watermain replacement, annual anode retrofit installation and replacement, feedermain inspections, meter testing, and smart metering implementation.



Calgary's Water Metering Program and Water Loss

Understanding the amount of water produced at the water treatment plant and consumed by customers is fundamental in understanding the amount of water loss that is occurring in a system. Metering that provides timely and accurate consumption data has and will continue to play a key component in developing targeted water loss actions.

Customer Metering History

A customer water meter is a monitoring device placed on the water service to individual homes or businesses to measure consumption. Universal customer metering was initiated in 1991 with the Water Meter Incentive Program to address high water consumption, which was then followed by bylaw changes for new homes in 2002 that drove the percentage metered to 79% by 2006. By 2014, 97 per cent of customers had meters installed in their homes and businesses to measure consumption, primarily using metering and communication technology that provides a total consumption value with approximately a three-month delay from the usage time.

The City began developing a strategy in 2020 to transition metering to Advanced Metering Infrastructure (AMI), also known as "smart metering". AMI is industry-leading metering and communication technology which will allow for hourly customer consumption information rather than monthly aggregated data. This will allow for rapid awareness and response for customer-side leaks and improve data comparison abilities for customers across neighbourhoods. It is expected that completion of the full transition to an AMI system is estimated for the end of 2029.

System Metering to Support Geographical Analysis of Leakage

Additional distribution system metering is required to support geographic identification of system leakage, similar to metering for our existing District Metered Areas (DMA). A DMA is an area of a water distribution network where there are strategically placed meters on the water pipes that supply water to the area. This provides data to understand exactly how much water is supplied to a certain area and is used to identify when the supply volume increases from typical demands, either indicating irregular usage or a leak. So far, this has been done at the neighbourhood level for six targeted neighbourhoods. Understanding the requirements of enhanced distribution system monitoring, including additional flow metering, is advancing as part of the actions identified in the Accelerated Water Loss Program. This will support the most recent Council direction to report back on requirements for the geographic analysis for measuring water usage (including maximum daily demand) and leakage.

The implementation of AMI, coupled with additional distribution system metering will provide near real time information to help identify and prioritize geographical areas with leaks. While better data is key in identifying areas for investigation, more operational resources will also be required to find and repair specific leaks within an area, especially if a leak cannot be identified at the ground surface.

Measurement of Calgary's Water Loss and Comparison to Other Municipalities

Measurement of Water Loss

Water loss occurs in all distribution systems and it is important to be able to quantify the scale of the loss and then compare utility performance year-over-year and externally with other distribution systems. To do so, relevant performance indicators have been established by the American Water Works Association (AWWA) and the International Water Association (IWA) and have been standardized in the AWWA Water Auditing methodology, which is completed annually by The City.

Two preferred metrics from this methodology include the losses per service connection per day and the infrastructure leakage index (ILI). The losses per service connection per day is shown in Figure 1. Some of the benefits of this method of reporting are that it is easily understood and is normalized to the service connection to allow comparisons to be made on utility performance of water loss regardless of system size.

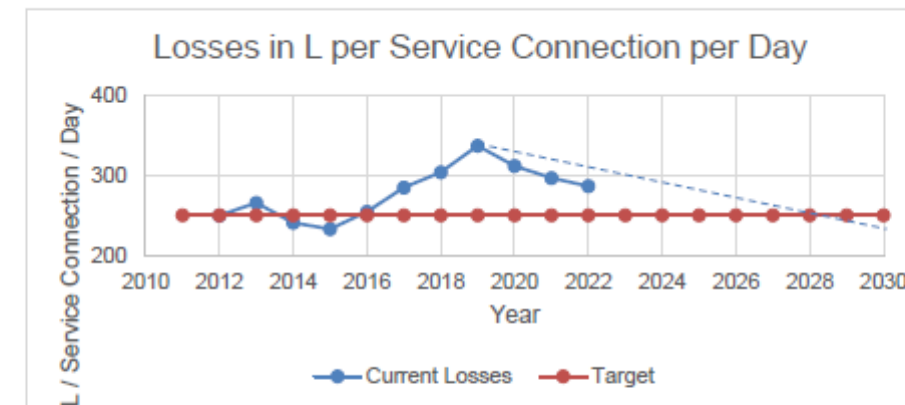


Figure 1: Losses Normalized by Service Connection

The ILI metric is a ratio of the current rate of water loss against a theoretical lower limit based on our system parameters such as kilometres of mains and the number of service connections. This metric takes into account the fact that all distribution systems leak, and larger, more complex systems leak more than smaller, simpler systems. This is a preferred benchmark internationally for utilities. Our ten years of history from 2012-2022, shown in Figure 2 and Figure 3, provides the International Leakage Performance Categories as developed and maintained by the IWA.

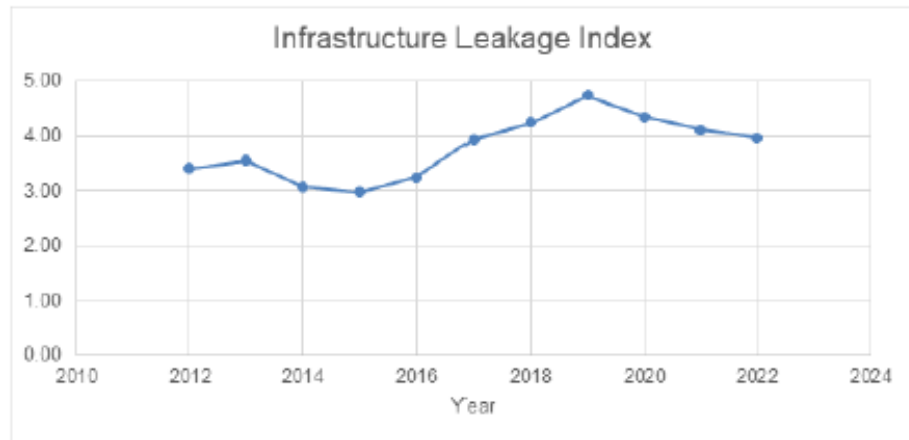


Figure 2: Calgary Infrastructure Leakage Index

Infrastructure Leakage Index	Level	International Leakage Performance Category
Lower than 2	Low	A
Between 2 and 4	Moderate	B
Between 4 and 8	High	C
Higher than 8	Very High	D

Figure 3: International Leakage Performance Categories

The Calgary Metropolitan Region Board "Water Use and Conservation in the Calgary Metropolitan Region Study" of October 2019 provided the information shown in Table 1, gathered through interviews with regional municipalities. The CMRB opted to report the water loss metric in % ranges to account for the lack of available data and consistent data for comparison of municipalities.

Table 1: Water Losses reported among Regional Municipalities in 2019

Municipality	Water Loss Metric
Airdrie	23%
Calgary	17 – 28%
Chestermere	17 – 27%
Cochrane	13 – 17%
Okotoks	23 – 35%
Strathmore	16 – 19%

Comparison with Other Utilities

The City of Calgary participates in the Canadian Infrastructure Benchmarking Initiative – other participants and their ILI values are shown in the following Figure 1.

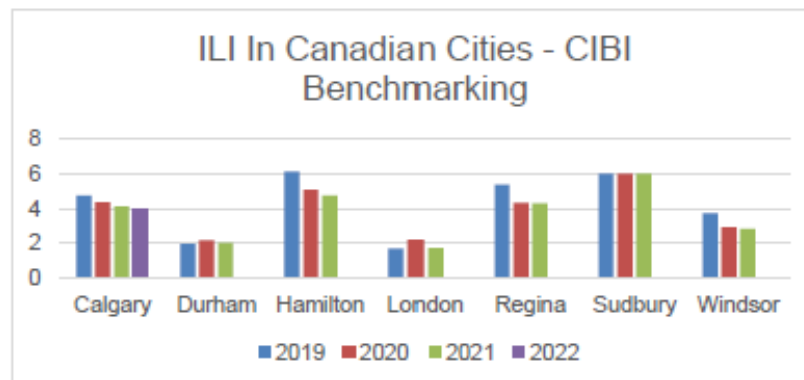


Figure 4: ILI in Canadian Cities - CIBI Benchmarking 2022

One-year Change in Years of Land Supply

Attachment = Land Supply Graphic



Years of Supply Comparison

Land Status	Years of Supply (SRG 2023 Report)	Years of Supply (SRG 2024 Report)
Planned Land	23-31	14-18
Not Yet Approved Land	6-9	4-5
Approved – Not Yet Serviced Land	7-9	3-4
Approved – Serviced Land	10-13	7-9