

The City of Calgary

Fibre Infrastructure Strategy

Annual Update

2021 May 13

Chief Financial Officer's Department - Information Technology

Executive Summary

On 2015 September 28, the Fibre Infrastructure Strategy was presented and unanimously approved by Council. This report serves as the 2020 annual update.

In 2020, the pandemic caused one of the most disruptive events in our lifetimes. Connectivity became a lifeline to many citizens and businesses. City fibre supplies and enables key pillars for recovery and our comeback.

By the end of 2020, over **782** facilities and assets (e.g. traffic controllers) have been fibre-connected while **avoiding** third-party communication costs estimated to be **\$8 million per year**.

In 2020, revenues saw a modest increase due to the effects of the pandemic and shifting priorities both internally and externally.

Corporate Analytics and Innovation (CAI), Roads and Information Technology continue to work with wireless service providers on **Master Agreements** for access to municipal assets for the installation of **5G**. CAI will be providing a report independently.

In 2020 January, The Legislative Review Expert Panel released their recommendations to the Federal Government for changes to the suite of legislation that governs Telecommunications, Broadcasting and Radio-communications. These recommendations are concerning and look to strip municipal authority from exercising full control over their assets.

The total capital budget approved for the 2019 to 2022 budget cycle is \$12 million. An additional \$6 million in capital infrastructure funding was obtained through the Government of Alberta Municipal Stimulus Program. This capital funding must be used in 2021 and will accelerate builds to City sites.

Background

The Fibre Infrastructure Strategy is critical to ensure The City of Calgary continues to provide fibre optic to deliver next-generation municipal services in a cost-effective manner.

Investment in City fibre is even more important today and into the next business cycle as The City's dependence on technology and data increases. City fibre is fundamental to delivering City services which contributes to **resiliency**, service **growth** and innovation and is the **foundation** of all connectivity which City business units rely on to excel as a smart, safe and prosperous city now and into the future.

2015 – 2020 Accomplishments

a. Connecting Assets

In 2020, over 782 facilities and assets (e.g. traffic controllers) are fibre-connected, increasing business-unit capabilities with unlimited bandwidth and avoiding third party communication costs estimated to be \$8 million per year.

Current trends indicate that devices like traffic controllers, sensors and antennae are connecting at a faster rate. The Internet of Things (IoT) is expected to increase demands for connectivity far into the future.

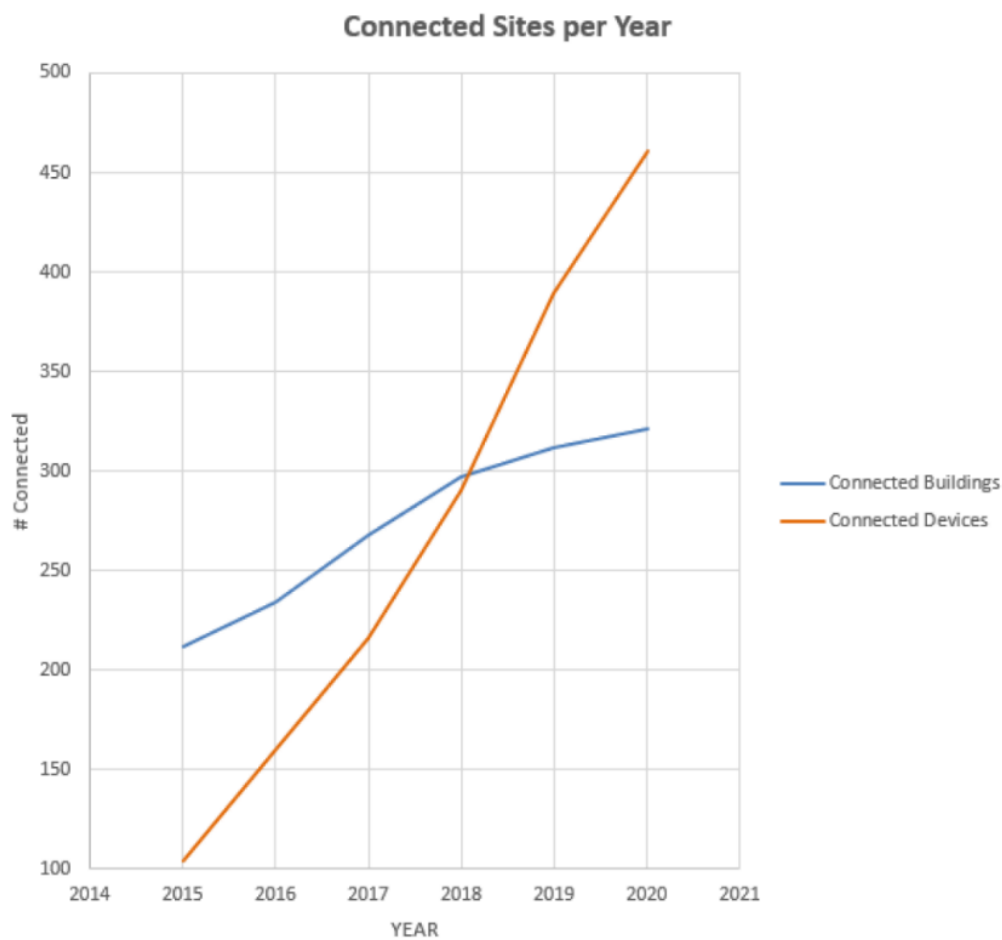


Table 1: 2020 Trends in Number of Assets Connected with City Fibre

b. Enabling Networks

City fibre enables numerous networks for City business units, civic partners, post-secondary institutions and external agencies. The City alone has more than 20 different networks specific to its applications. As an example, the network that operates the Light Rail Transit is much different than the network that ensures clean water, but both rely on City fibre.

City fibre allows business units to upgrade their networks quickly and easily to enable new types of services. For instance, Calgary Police Service was able to upgrade their network to facilitate body cameras and other new innovations due to the capacity that City fibre provides.

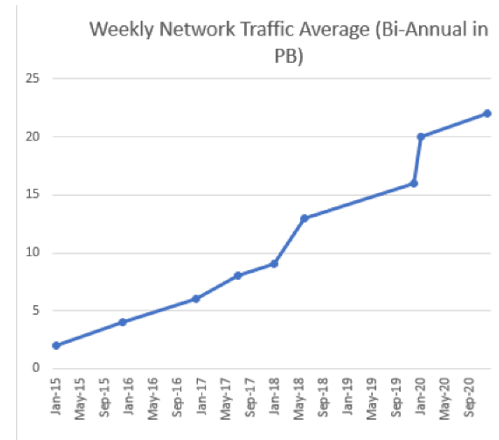


Figure 1: CCN: Bandwidth Consumption for City services [1 Petabyte (PB) = 1 million Gigabyte]

The Calgary City Net (CCN) is The City’s largest, most resilient network which provides high bandwidth, redundancy and security for business units. CCN’s success is represented by the rate of adoption by business units. During the last budget cycle, the CCN’s bandwidth demands have increased **1000%** (see Figure 1) as business units deploy connected devices to enrich and modernize their services.

c. Increasing Resiliency

City fibre increases the resiliency of City services which, in turn, enriches citizen confidence. When a city **owns** its fibre, it can respond with greater agility during extreme events. This was exemplified during the 2013 flood where a catastrophic loss in network resources was mitigated due to the control, agility and capacity afforded through City fibre. This could not have been achieved without full control of the fibre asset.

City fibre increases the resiliency of all services. As an example, the Roads department can monitor and control traffic signals remotely through their Management Information System for Transportation (MIST) network. The more reliable the network, the more reliable the service. Prior to The City launching its fibre strategy, the MIST network was only up 65% of the time. Currently, the MIST network is up 98% of the time. City fibre reaches over **370** traffic controllers, resulting in an **increase** of service uptime by **50%** (see Figure 2) and improving traffic flow through the city.

City fibre also enhances the resiliency of **mission-critical networks** operated by other agencies that offer **critical services** to citizens. Healthcare and power utility organizations license City fibre to strengthen the resilience of their services.

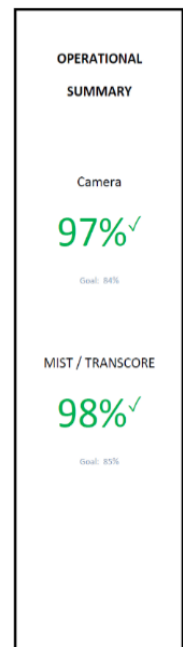


Figure 2: Traffic Network Uptime

d. Other Notable Accomplishments

- The University of Calgary research on City Fibre as a Sensor was published in the Journal of Applied Geophysics, December 2020.
- 2019 revenues broke through the \$1 million milestone.
- Calgary Police Service exclusively uses City fibre to build their core network and recently upgraded that network to accommodate body-camera technology.
- The new Calgary Remand Center is now fibre-connected.
- Shepard's Solar Project is now fibre-connected.
- New Southwest Bus Rapid Transit stations are connected to City fibre.
- Calgary 911 and Corporate Security are leveraging City fibre for enhanced services and increased resiliency.
- The Calgary Public Library uses City fibre as a preferred option.
- The City won the Minister's Award for Municipal Excellence for Municipally Owned Fibre Infrastructure (2016).
- University of Calgary research on Quantum Key Distribution published their findings in Nature Photonics in 2016. Access to City fibre was acknowledged in the research paper "Quantum teleportation across a metropolitan fibre network" for assisting in testing their research in a real-life environment.
- The City won the Ministers Award for Municipal Excellence for Municipally Owned Internet of Things Wireless Network (2018). This network is enabled by City fibre.
- The Calgary Internet Exchange is rapidly growing, in part, due to City fibre making Internet faster for everyone.
- Participated in a number of Canadian Radio-television and Telecommunications Commission consultations influencing policy to include municipal interests.
- Calgary Economic Development includes City fibre as a technology enabler to attract companies to Calgary.
- Participated in regional efforts to increase the importance of municipal fibre through speaking engagements, presentation to rural council and local meetings.
- Contributed and responded to provincial consultations like the Provincial Broadband Strategy.
- City fibre transports video from over 3,000 cameras used by Corporate Security, Transit, Roads and Calgary Parking Authority.
- Fibre infrastructure plays an important role in security by design.
- City fibre is a key element to delivering on business-friendly initiatives for Living Labs in conjunction with Calgary Economic Development.

Connectivity

5G Ready by 2020

Downtown Strategy

Future Focused Calgary

Resilient Calgary

Main Streets

Future of Transportation

Smart City

Rethink to Thrive

City Fibre Strategy Alignment

Connectivity plays an important role in all aspects of our society: economic, social, health, education, resilience and next-generation municipal services. Just as we move people, goods and services, fibre optics moves information – the digital version of people, goods and services.

Stranded Facilities

Connectivity demands for field computing, the Internet of Things, 5G and smart-city solutions are increasing every day, and this should be considered the new normal. These new demands emphasize the change in society and how cities need to adapt quickly.

Smart and resilient cities will be impacted by the rapid evolution and adoption of technology and reliance on data. What this means for The City is that connectivity through fibre and wireless will experience **sustained and continuous** demand inciting a greater integrated approach in the planning process for both public and private sectors. By incorporating digital infrastructure into an integrated solution, The City can mitigate new technology being “bolted on” to assets with a preferred, seamless and aesthetically attractive solution emerging.

Lesson Learned: *Stranded facilities are no longer finite as sustained and continuous demands for connectivity is the new normal.*

Cost Avoidance

Building infrastructure and self-provisioning services is always weighed against leasing infrastructure and services. Comparing the two scenarios is difficult to do with one metric or model; rather, a comparison on various models provide insights into how The City **avoids** third party service costs. The following are some cost-avoidance scenarios:

1. City fibre avoids leasing third party fibre at a cost of **\$28 million** per year.
2. The City’s Calgary City Net fibre network avoids approximately **\$8 million** per year in third-party network services.
3. City fibre-connected traffic controllers avoid operating costs of **\$1.8 million** per year.

Revenues

As part of the Fibre Infrastructure Strategy, The City operates as a dark-fibre-optic provider and licenses excess fibre-optic capacity to other public-sector organizations, businesses and/or carriers. This revenue is growing and serves to finance further construction activities. In 2020, revenues reached **\$1.1 million** and is anticipating steady growth going forward. Through Council support of the fibre strategy, a dramatic increase in revenue growth has been achieved (see *Figure 3*). Emerging markets, spurred by the trend to densify networks (5G/Small Cell, Internet of Things), will provide new revenue opportunities.



Figure 3: Current Revenues

Understanding that future demand will be continuous, and to mitigate risks arising from capital funding short falls, more emphasis on becoming **self-funded** is highly recommended. To achieve full self-funded status, revenues or alternate funding sources of \$3 million to \$4 million per year will be required.

2020 Status Update: In 2020, there was not as much engagement with outside agencies due to the pandemic and shifting priorities.

Future Opportunities

5G/Small Cell and the Evolution of Wireless Opportunities

5G/Small Cell is the next advancement in mobile and wireless technology important to connected, resilient and smart cities. It refers to wireless infrastructure that will enable many sectors and drive the digital economy by enabling automation, connected and autonomous vehicles, smart homes and field sensors. 5G/Small Cell represents a major uplift in infrastructure for wireless service providers. It's more than a small antenna on a pole, it also encompasses fibre optics, large cabinets, new power cables, power meters, networking equipment, etc.

The drive for advancing wireless infrastructure is both a risk and an opportunity for The City. Wireless service providers' successful deployment of 5G will depend on access to municipal assets like streetlight poles and facilities resulting in thousands of third-party assets integrating with City assets. New standards, processes and agreements will manage both operational and financial risks while preserving aesthetics and public safety.

Integrated planning can mitigate the operational and financial risks affiliated with wireless infrastructure deployment on City assets and presents opportunities for new sources of revenues. Wireless infrastructure requires fibre optic to transport data and some wireless service providers lack sufficient fibre optic to achieve this. Other potential sources of revenue can be found in attachment fees for antennas or co-location fees in City buildings.

2020 Status Update: The 5G opportunity is being led through Corporate Analytics and Innovation as part of the Wireless Infrastructure Deployment Program and is addressed through the collaboration of numerous business units and individuals throughout The City (Law & Legislative Services, Supply, Treasury, Information Technology and Roads). Updates are provided to the Gas, Power, and Telecommunications Committee by the Wireless Infrastructure Deployment 5G team.

Smart City, Economic Diversity, Digital Economy, Innovation, Collaboration

As The City of Calgary, in collaboration with community stakeholders, builds our communities' smart-city strategy, continued investment in digital infrastructure is key to success. A smart city invests in technology and data solutions to provide excellent services to citizens.

To support Council's Business-Friendly directive, and as part of the smart city focus of diversifying our economy, The City of Calgary is partnering with Calgary Economic Development to create the "Calgary as a Living Lab" initiative. As one of the largest owners of infrastructure in Calgary, The City is formalizing the process to open our infrastructure (where suitable) for companies and researchers to test, try and demo their products in real-world environments. The goal is to accelerate the commercialization of new products, services and research findings. It is not intended as a route for City solutions as there are avenues for those requests through existing procurement channels. For example, The City opened up Shepard Landfill for companies like Loughheed-Martin and NASA to test drone technologies. The Calgary Film Centre was used by an augmented reality software company to demo their products to potential clients.

2020 Status Update: The Living Labs program is achieving success with numerous projects assisting companies to advance their technology.

Miscellaneous Opportunities

From time to time, unique opportunities arise which can contribute to the expansion of City fibre. These opportunities can contribute in reducing construction costs, providing conduit (Greenline) and possible funding.

Regulatory, Legislation and Advocacy

Consistent with the 2015 Fibre Infrastructure Strategy, The City's participation as an **advocate** in the regulatory and legislative domain is still a priority to ensure that municipal interests are represented.

Of importance is the **legislative review** of the Telecommunications, Broadcasting and Radiocommunications Acts. This review was initiated to modernize the Acts in relation to how technology is evolving in our society. An expert panel was assembled and a call for comments was initiated in 2018 September.

Early indications suggest that some proposed legislative amendments will have significant ramifications to municipalities - impacts that could last for decades. The most significant risk municipalities face is **loss of jurisdictional control** over some components of municipal infrastructure and assets. This is mainly driven by the proliferation of wireless technologies like 5G/Small Cell whereby the wireless carriers want access to municipal assets (streetlight poles, buildings) to install antennas. Though advanced wireless networks are attractive to any modern city, a careful balance between municipal and industry interests are important considerations. By participating in the review, The City has helped shape and influence the legislative outcomes.

2020 Status Update: The Legislative review panel completed their final report "**Canada's communications future: Time to Act**" on 2020 January 20. The following recommendations raise concerns for regulatory oversight on municipal assets:

"34. The locations at which facilities must now be installed to pursue network deployment have broadened. We recommend that subject to any exclusions the CRTC may determine:

- **the CRTC's authority over passive infrastructure should clearly include access to all public property capable of supporting such facilities, such as street furniture;**
- the scope of access should include **radiocommunication facilities** and the **telecommunications facilities** necessary to operate them;
- the scope of access should also include non-discriminatory access to the support structures of **provincially regulated utilities;**
- the *Telecommunications Act* should be amended to authorize the **CRTC to mandate access to inside and in-building wire, support structures, and rooftops** within and on multi-dwelling unit buildings and be available to all providers of an electronic communications service; and
- the Minister of Industry should assign operational oversight of the radiocommunication and broadcasting antenna siting process to the CRTC, including **managing the interaction with municipalities and land-use authorities.**

36. We recommend that the *Telecommunications Act* be amended to require the CRTC to **consult with the relevant municipality** or other public authority prior to exercising its discretion to grant permission to construct telecommunications facilities. We further recommend that the Act be amended to empower the CRTC to **review and vary the terms and conditions of access** to the support structures of provincially regulated utilities, to ensure non-discriminatory arrangements.”

The above recommendations **impose on municipal authority and operations**. It is still not clear what the next steps are in the legislative review which was delayed due to the pandemic. It is expected to resume shortly, and The City will attempt to insert itself into the conversation to bring a municipal voice forward.

Advocacy and regulatory participation remain a high priority of the Fibre Infrastructure Strategy to protect municipal interests.

One Calgary (2019- 2022) Capital Budget

Due to reduced access to capital, the One Calgary (2019-2022) capital budget was significantly decreased compared to the Action Plan (2015-2018) budget.

Current and Future Operating Budget:

Current

The 2020 annual operating expenditure budget for the City Fibre Team is \$1.888 million.

Future

The 2021 to 2022 annual operating expenditures for the City Fibre Team remains at \$1.888 million.

Revenues derived from dark fibre licenses are applied to the operating budget. Modest increases in revenue are expected.

Current and Future Capital Budget:

Current

Total capital budget approved for 2019-2022 is \$12 million.

These funds are committed for new fibre projects such as intelligent intersections, stranded facilities and next-generation City infrastructure.

An additional \$6 million in capital infrastructure funding was obtained through the Government of Alberta Municipal Stimulus Program. This capital funding must be used in 2021.

Future

As network and fibre deployments continue to expand rapidly there may be future opportunities for partnerships and collaborations that provide funding to expand the fibre infrastructure.

In the 2019-2022 budget cycle, the Fibre Infrastructure Team will continue to focus on:

- a. Leveraging capital projects such as Greenline, Bus Rapid Transit's Airport Trail, etc.
- b. Collaborating with stakeholders such as Transportation, Water, Facility Management, Integrated Civic Facilities, Calgary Police Service, Calgary 911, Planning and Development, Real Estate & Development Services and ENMAX.
- c. Pursuing alternate funding sources such as grants or joint builds.
- d. Establishing partnerships to leverage opportunities to expand the fibre plant or generate additional revenues through technology advancements like 5G, automated meter reading, smart city applications, etc.
- e. Reducing deployment costs by leveraging ENMAX's utility pole infrastructure.
- f. Promoting and marketing dark fibre through speaking engagements.

Works Cited

Government of Canada Innovation, Science and Economic Development Canada and Canadian Heritage, "*Government of Canada launches review of Telecommunications and Broadcasting Acts*", <https://www.canada.ca/en/canadian-heritage/news/2018/06/government-of-canada-launches-review-of-telecommunications-and-broadcasting-acts.html> (June 5, 2018).

Government of Canada Innovation, Science and Economic Development Canada, Broadcasting and Telecommunications Legislative Review, "*What We Heard Report*", <https://www.ic.gc.ca/eic/site/110.nsf/eng/00011.html> (June 2019).

Government of Canada Innovation, Science and Economic Development Canada, Broadcasting and Telecommunications Legislative Review, "*Canada's communications future: Time to Act*", [https://www.ic.gc.ca/eic/site/110.nsf/vwapj/BTLR_Eng-V3.pdf/\\$file/BTLR_Eng-V3.pdf](https://www.ic.gc.ca/eic/site/110.nsf/vwapj/BTLR_Eng-V3.pdf/$file/BTLR_Eng-V3.pdf) (January 2020).