STUDY SESSION MEMORANDUM

TO: Mayor and Members of City Council

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DATE: January 12, 2023

SUBJECT: Update on Community Broadband

EXECUTIVE SUMMARY

The purpose of this study session is to update council members on the construction of the city's fiber backbone, to outline various approaches to using the city's fiber backbone to provide community-sponsored fiber-based internet services, and to outline the proposed next steps.

Community broadband is a topic that was initially discussed with council in 2016 and at that time a feasibility study was conducted. In 2018, council decided to fund the construction of a dark fiber backbone along main transportation corridors in the city. This decision was made as council recognized that there was substantial future value in this asset to enable broadband programs and that similar cities with successful programs generally owned some of their backbone infrastructure. As the construction of the backbone is completed in 2023, it is time to take the next steps in defining the city's community broadband program.

As staff embarks on this work, minor revisions to the objectives for community broadband are proposed to keep the objectives relevant for today's broadband market. Additionally, staff is seeking council's strategic direction on how to approach achieving the outcome of affordable, high-speed fiber-based broadband internet access for all in Boulder. The three general approaches include:

A. **"Provider of Last Resort"** - The low-risk, low-cost, but lower-likelihood of successfully achieving the desired outcome option of using the city-owned backbone for city's own purposes and as a "provider of last resort" to address

specific community challenges not addressed by private providers. In this approach the city would consider case by case fiber leases of backbone based on to-be-defined criteria, but it would not participate wholistically in the broadband market to retail residential or business customers.

B. **"Provider of Last Resort + Public Private Partnership"** - The medium-risk, low-cost, and likely to successfully achieve the desired outcome option of doing both Approach A and selecting a private-sector provider(s) who utilizes the city's backbone and implements privately owned infrastructure to achieve city-defined broadband policy objectives. In this approach the partner builds a new fiber-based, high-speed network connecting premises and the city negotiates on several parameters that could include retail price, prioritization of infrastructure investments, and access to lease city-owned fiber assets.

C. **"City operated service"** - The high-risk, very high-cost, and likely to successfully achieve the desired outcome option of funding the construction and operation of a fiber network to premise owned by the city. In this approach the city builds the entire fiber-to-premise network, operates the network, and is the service provider taking on all functions such as marketing, billing, and all technical services.

Regardless of approach, additional research and community engagement must be completed to define viable operating models before a final decision can be made. Staff is recommending that the "Provider of Last Resort + Public Private Partnership" (approach B, above) approach be explored further, with additional analysis and exploration of what types and levels of partnership could enable achieving the outcome and objectives for community broadband.

QUESTIONS FOR COUNCIL

1. Do councilmembers have any questions on work completed to date or on the current broadband ecosystem?
2. Do councilmembers agree with the proposed revisions to the outcome and objectives for the city's community broadband initiatives?
3. Do councilmembers agree with staff's recommendation to further explore approach B, "Provider of Last Resort + Public Private Partnership"?

BACKGROUND

Boulder, like many other similarly sized municipalities, has limited competition in the commercial broadband services market for residential and small/medium-sized business customers. Physical fiber infrastructure to premises is also very limited within the city with nearly all advertised broadband services being delivered via cable – a less 'future-proof' technology. As a result of this limited competition and infrastructure, pricing for services tends to be high with both innovation and customer service low.

In November 2014, the community approved a ballot measure (Item 2C) exempting the city from state limitations on telecommunication services. This measure established city

autonomy to invest in community broadband services, which had previously been limited by Colorado Senate Bill 05-152. Without a voter-approved exemption, this law significantly restricts the ability of municipal governments to provide broadband services, either independently or in partnership with private entities. A Broadband Working Group composed of community representatives was established in 2015 and continued to meet until early in 2017.

A formal, consultant-assisted broadband feasibility study was presented to council in a study session on July 12, 2016. The city then issued an RFP for potential partners, and on April 18, 2017, a public hearing was held to consider recommendations about how best to proceed. In the weeks leading up to the April council meeting, one company that the city had been negotiating with showed promise, and in the days prior to the meeting withdrew from negotiations. This change – along with an assessment that additional analysis was needed – led staff in May 2017 to recommend against pursuing a ballot issue in the election that was then just several months away. Council agreed.

Staff then stepped back, and reassessed the approach in late 2017, conducted additional community engagement, and in June 2018 presented council with various broadband operating model options (see also council materials from 1/9/18, 5/8/18, and 6/12/18).

Council voted to approve the design and construction of a city-owned "fiber backbone" in effort to work towards the goals of affordable and accessible high-speed internet services throughout the city and to preserve the city's future options for various broadband business models. Staff also recommended and council approved funding of high-priority network laterals (i.e., extensions from the backbone to specific sites) to connect key partner organizations to these services.

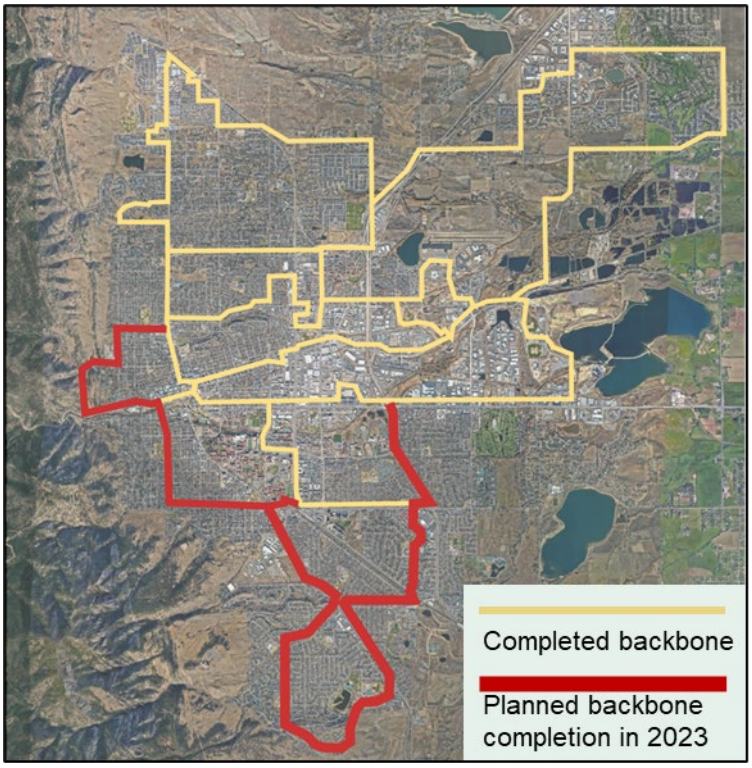

Figure 1 – "Backbone Construction Current State"

Five of the planned seven backbone rings will be complete by the end of 2022, see Figure 1, shown in light yellow. The remaining Canyon and Table Mesa areas (phases 5 and 6), shown in heavy red, have planned completion dates in autumn 2023. As rings are completed, they are available for service. This includes the Diagonal and Arapahoe rings that are already being used to deliver fiber for use by our public safety organizations and to traffic signal infrastructure. In parallel, city staff is developing

a multi-year 'smart city' plan that outlines how connected devices can further council priorities and department master plans while leveraging existing and planned city fiber assets.

Boulder is now in positioned to leverage its investment in the city-wide, fiber backbone infrastructure to spur delivery of fiber-based, high-speed, and competitively priced internet services. Furthermore, additional city investment will further close the digital divide that has seen improvement via private infrastructure investment since council approved backbone funding in 2018.

The city's work on community broadband also has a high degree of alignment with all attributes of the Sustainability, Equity, and Resilience Framework:

Sustainability, Equity & Resilience Framework	Community Broadband's Impact
Safe	• Directly enhances public safety communication • Enables more efficient / effective basic public health utilities
Healthy & Socially Thriving	• Enables digital connection and access to educational opportunities • Enables greater inclusion in the digital world
Livable	• Enables smart buildings and infrastructure
Accessible & Connected	• Directly bridges the digital divide • Enhances access to government services
Responsibly Governed	• Enhances customer experience, government transparency, and overall effectiveness
Economically Vital	• Enhances the attractiveness of Boulder as a place to do business • Promotes creativity, entrepreneurship, and social mobility for all

ANALYSIS

Boulder, having invested approximately $20M in core infrastructure (dark-fiber backbone), now must determine the best approach to achieve the city's desired outcome of community broadband. The fundamental question the city must now answer, is the level of control and financial/other risk it wishes to take on.

Community Broadband Outcome and Objectives

With grounding in the city's Sustainability, Equity, and Resilience, staff has drafted the intended outcome of community broadband initiatives: Affordable high-speed fiber-based broadband internet access for all.

To achieve this intended outcome staff also proposes 5 objectives on which future decisions will be framed. These objectives are:

- Citywide access
- Equitable & inclusive
- Future-oriented

- Competitive marketplace
- Consumer privacy

Two objectives that were defined when council last visited this topic in 2018, 'net neutrality' and 'open access' are proposed to be removed. By removing them the objectives are less redundant as 'open access' is captured as part of 'competitive marketplace' and 'net neutrality' as part of 'equitable & inclusive'. It also better reflects the current landscape around the broadband ecosystem and federal standards. 'Consumer privacy' is proposed as an addition given its criticality to deliver trusted and competitive services.

Operating Model Approaches

Figure 2, below, outlines the full range of operating models along a spectrum of risk and control.

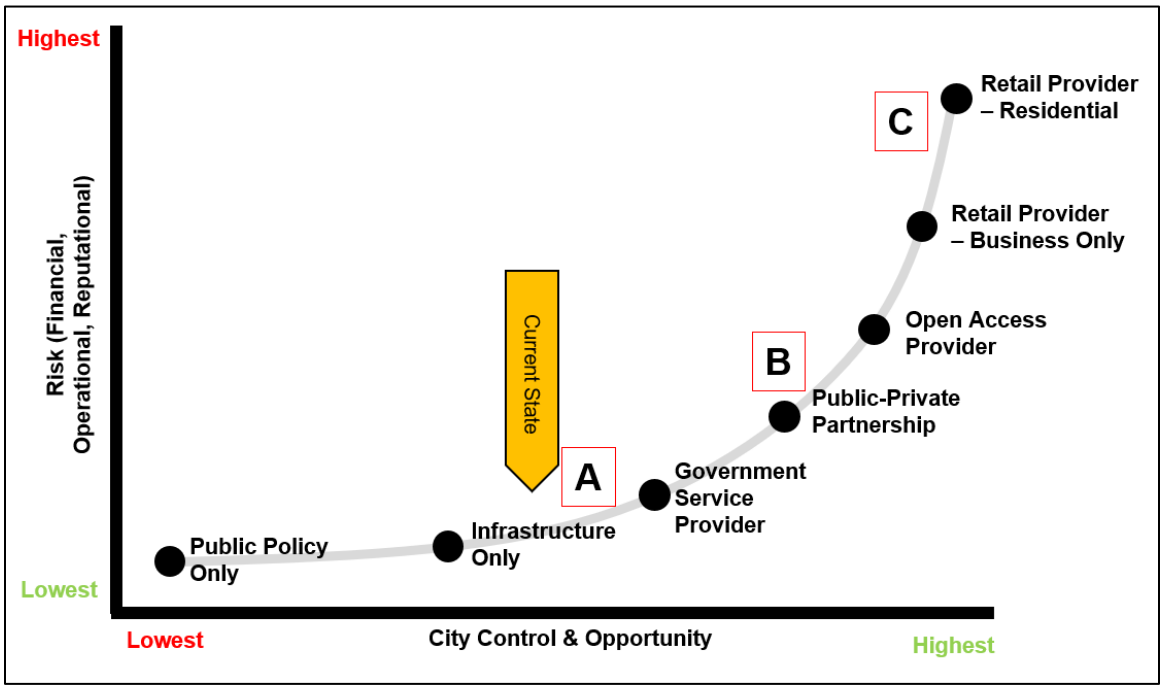

Figure 2 – "Fiber-based Municipal Internet Service Operating Models"

While the number of approaches is truly limitless along this spectrum of risk, to simplify decision making at this stage of the project, staff has summarized three core approaches to achieving the intended outcome of community broadband – A, B, and C (as indicated in Figure 2 and described below). Variations on each core approach are numerous and will be further outlined once there is alignment on the city's general direction.

From lowest risk and cost to highest:

> ***Approach A "Provider of Last Resort":*** This approach includes the city using the backbone infrastructure for its own purposes and as a "provider of last resort" (i.e., where private providers are not providing sufficient services) to

address community challenges (e.g. Boulder Rescue connection). The city considers case by case fiber leases of backbone based on to-be-defined criteria.

Approach B "Provider of Last Resort + Public Private Partnership": This approach includes Model A + the city partners with private-sector provider who utilizes the city backbone and implements defined broadband policy objectives. In this approach the partner builds new fiber-based, high-speed network connecting premises and operates associated services. The city leases backbone infrastructure and ensures ease of permitting / construction, and in return negotiates for items such as retail price locks and a say in the prioritization of geographies served.

Approach C "City Operated Service" This approach requires an estimated $+100M[1] of capital investment to build fiber city-wide to enable services to all city premises. Additionally, significant annual maintenance costs for all new fiber plant and electronics would be required. There are further complex operational requirements and costs associated with running a premise-based fiber network offering internet services. These include billing, ticketing, network operations, trouble shooting, customer care, and marketing of any new network and services. Given these complex and costly features staff does not believe these are feasible models to achieve the goals of affordable and accessible services in a timely or cost-effective manner.

Considering the balance of risk (financial, operational, and reputational) and control / opportunity, staff recommends approach B "Provider of Last Resort + Public Private Partnership". This partner would take on both the capital and operational risk of running a broadband network, and the market risk of competing and offering internet services in the local market.

[1] Estimate based on industry blended per premise installation estimate of $2,500/ premise at approximately 40,000 premises in Boulder

Additional details about a potential public-private partnership:

The city's fiber backbone has 432 individual fibers, each of which can be designated for a different use. Figure 3 outlines a high-level provisional allocation with several uses in mind reflecting some current and future use cases. Half of the backbone (216 fibers) have been provisionally allocated for the purpose of assisting with the deployment of community broadband solutions, shown in yellow, while others are intended for government services, shown in purple, and others, for city partnerships and being a "provider of last resort" for entities that cannot obtain services elsewhere, shown in blue.

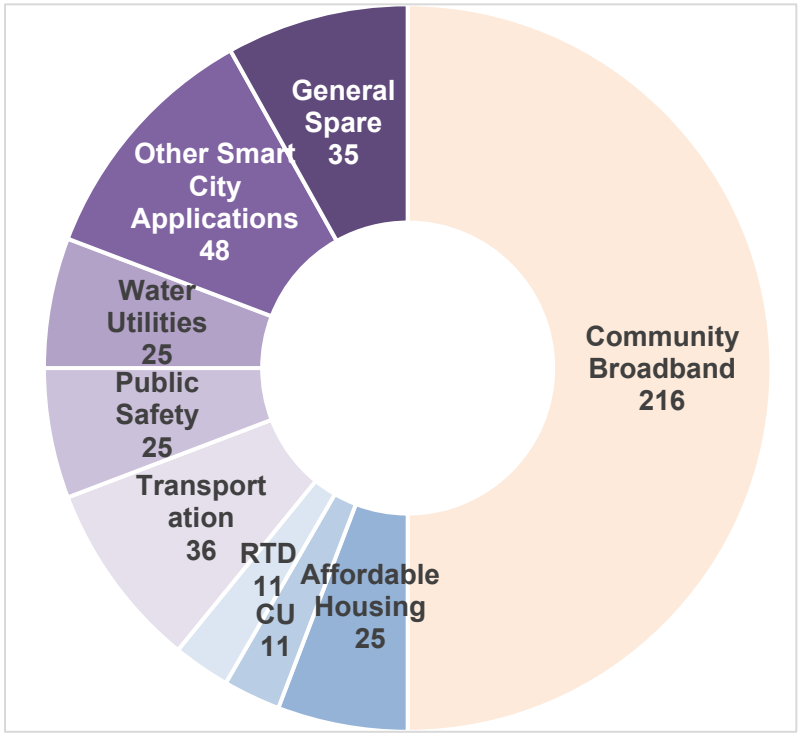

Figure 3 - "Provisional Cross Section of Fiber Backbone Uses"

Staff's recommendation is that the portion of fiber strands, in this provisional model there are 50%, be allocated to a private-sector partner who, in exchange, would extend fiber from the backbone to connect to premises across the city. The exact number of strands would primarily be driven by the technology choice that the potential private-sector partner utilizes to design and construct extensions from the backbone and connect fiber to city premises. These fibers are typically granted to the partner within the terms of the public-private-partnership agreement and are typically assigned by granting an Indefeasible Right to Use (IRU) for a term of 20 or 30 years.

Assuming a backbone allocation similar to the provisional model, the 216-fiber strand allocation offers an attractive starting point for a private sector partner to begin the process of marketing and ultimately securing fiber-based, internet customers in the city. The city's risk in this approach would be low as it would only commit a portion of the completed fiber backbone to a new partner to then leverage and create fiber expansion strategies to premises and offer new internet products and services. In return for providing use across the city's fiber backbone, the city could seek one or more of the following through contract negotiations to achieve affordability and accessibility goals:

A. A partner to fund and build fiber to all city premises. Everyone who desires a fiber-based service from this new partner should be served regardless of where they live or their property address

B. An expectation, at the city's discretion, to work with Boulder Housing Partners and other low/middle income housing communities prioritized by the city
C. Offer a true city-facilitated community broadband product available to all, a basic broadband service for everyone (e.g. $30 a month for a 100mbps service)
D. A partner to pay city a lease fee for using x fibers across the city's fiber backbone, or, city to share in of collected broadband revenues
E. As the partner builds their own fiber network from the city's dark fiber backbone, they also build city-owned fiber everywhere, effectively creating additional fiber assets across the rest of the city that could be used for "future proofing" and enabling more "provider of last resort" and "smart city" opportunities for the city

While the city would welcome a new partner to provide city-wide, fiber-based internet premise-based services, the city would continue to act as a "provider of last-resort" where if desired, it can extend fiber from its backbone and connect to community partners. The city is already completing work like this, such as with Boulder Rescue Squad which will be completed in 2023 providing them with fiber-based, critical, affordable, internet services. The "provider of last resort" would consider the following:

1. Extend lateral connections from the city's backbone where there is a need from a city partner that is not being served by the private sector
2. Typically these locations would be non-profit or some sort of governmental/institution location
3. The objective is not to compete with the private sector so for-profit organizations are not the focus unless the private sector is unable or unwilling to provide service

Increasingly, cities are looking towards private sectoring partnering to achieve true competition with their broadband offerings. Centennial is a good example of this, and more recently this is a direction that Colorado Springs has taken. Additionally, Huntsville, AL, Austin, TX, and also recently Mesa, AZ are all taking similar pathways but not all have an already completed fiber backbone in place that can offer a real incentive to the private partner.

Staff's recommendation is to seek a well-aligned private partner that understands the city's objectives as it relates to utilizing the current backbone, with the private partner ultimately, funding, designing, constructing and operating the required fiber extension loops and fiber drops that connect to city premises. All funding for the required effort to design, construct, and operate these fiber loops and premise extensions would be borne by the selected private sector partner. They would compete in the local Boulder market offering fiber based, broadband products and services taking on all the market risk and telecom incumbents. Whilst the city would not bring any direct funding to this partnership, the city would make its fiber backbone available for the partner to quickly have city-wide reach avoiding an estimated 3-years of costly design and construction enabling them to move much faster in a mid-sized metro market such as Boulder. Under this agreement the private partner is also responsible for maintenance of any fiber that

may be granted from the city. The city would remain responsible for maintenance of fibers not granted to partner from the backbone.

Additionally, Boulder, like most mid-sized cities across America, is not regarded as "unserved" or "underserved" per federal definitions as it relates to the opportunities to obtain broadband services. Therefore, staff do not see opportunities to obtain federal or state funds as capital for the purpose of directly building fiber and providing internet services. However, there are several areas of funding that potentially could assist community organizations bridge some of the challenges of broadband adoption such as cost, education, device availability etc. These programs will be further explored in early 2023.

MATRIX OF OPTIONS

	Approach A: Provider of Last Resort	Approach B: Provider of Last Resort + Public Private Partnership	Approach C: City Operated Service
Description	City completes fiber backbone in 2023, uses backbone for its own purposes and as a "provider of last resort" to address community challenges e.g. Boulder Rescue connection. City would consider case by case fiber leases of backbone on an opportunistic basis	City completes fiber backbone in 2023 and in parallel seeks private sector partner that would utilize city backbone and implement defined city broadband policy objectives. Partner builds new fiber-based, high-speed network connecting any premise within city boundaries	City completes fiber backbone in 2023 and in parallel seeks to fund the build out of a full fiber network that could connect fiber to every city premise. City would operate the network and be the service provider taking on all functions such as marketing, billing, and all technical services. These functions are typically performed by cities with existing electric utility departments
Infrastructure Owner	Backbone: **City** Distribution: **N/A** Electronics: **N/A** Operations**: N/A**	Backbone: **City** Distribution: **Private** Electronics: **Private** Operations: **Private**	Backbone: **City** Distribution: **City** Electronics: **City** Operations: **City**
Service Provider	**Private**	**Private**	**City**
Organizational Implications to City	**Low Risk** – Minor staffing implications during construction, no facility implications	**Low/Medium Risk** – City makes a portion of key fiber backbone asset available. Requires possible dedicated FTE to oversee asset allocation.	**High Risk** – as well as the full financial risk of funding a city-wide fiber network, city would have to stand up a new broadband department to perform all required ISP functions including facilities for administration and operations. A new department such as this is

			estimated to require 43FTEs
Financial Implications / Considerations	**Low** - $20m budget was secured in 2020 to complete the build of the city's fiber backbone. Some budget is likely to remain after completion of backbone at end of 2023 that could fund annual operational costs. Annual operational costs are relatively low <$50K.	**Low/Medium** - $20m budget was secured in 2020 to complete the build of city's fiber backbone. Private partner use of backbone and their plans to then fund and build out fiber across the city does not necessarily guarantee successful broadband outcomes. Annual operational costs are relatively low <$50K and may involve an additional FTE resource within IT	**High** – estimated to be $138m cost to construct, maintain, and operate network and customer service. Network costs estimated to be between $500k to $1m annually excluding all FTE costs. The model to pay back high expected capital costs is typically based on residential take rates and assumed revenue per premise.
Control	**Less Control** - Price: Set by provider - Speed: Set by provider - Minimal customer service requirements - Coverage may be dependent on market demand - No funding for backbone usage	**Some Control** - Price: May be negotiated with provider - Speed: May be negotiated with provider - Negotiated customer service requirements - Universal coverage across city - Payment to the city for use of fiber backbone	**High Control** - Price: Set by city - Speed: Set by city - Customer service requirements controlled - Universal coverage across city - No funding for backbone usage
Ability to Meet Objectives	**Low** - Citywide access: Not guaranteed - Equitable & Inclusive: Not guaranteed - Future-Oriented: somewhat - Competitive Marketplace: potentially better than status quo - Net Neutrality: ? - Open Access: Fiber backbone yes, other carriers remain on their own networks	**Mixed** - Citywide access: Possible - Equitable & Inclusive: Likely - Future-Oriented: Yes - Competitive Marketplace: somewhat – another competitor - Net Neutrality: Possible - Open Access: Possible, but most potential partners will desire to be sole service provider	**High** - Citywide access: Yes - Equitable & Inclusive: Yes - Future-Oriented: Yes - Competitive Marketplace: another competitor - Net Neutrality: Possible - Open Access: Not initially

Other Communities with this Approach	Holly Springs, NC Centennial, CO Urbana-Champaign, IL	Westminster, MD Huntsville, AL Colorado Springs CO Breckenridge, CO	Longmont, CO Wilson, NC Salisbury NC Ft. Collins, CO Loveland, CO

NEXT STEPS

Pending council feedback and general alignment with staff's recommendation to further research Approach B, next steps include:

- Continue backbone construction – planned completion in late 2023
- Backbone-use strategy analysis
- Public Private Partnership operating-model analysis (including more detailed cost analysis, resource analysis, and potential points for negotiation)
- Community engagement activities
- Prepare for a Q2 study session with additional detail around Approach B

ATTACHMENTS

- N/A