

Town of Johnstown Broadband Planning



Johnstown
Colorado

November 2023

Agenda

- ✓ Broadband FAQs and terminology
- ✓ Summary of provider availability
- ✓ Capital scope and cost
- ✓ Available Models
- ✓ Project Prioritization and Phasing Options
- ✓ Next Steps



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Terminology

Latency – Time taken for source to destination data transfer

Bandwidth – Historical term for the number of frequencies used to transmit data. These days, bandwidth is used as a term for “speed” and the rate (or amount) of data transferred over time

Broadband – Historical term for a faster data transmission technique. These days broadband is synonymous with “high speed internet”. Defined by the FCC as 25 Mbps download and 3 Mbps upload

Backhaul – Principal routes between strategically interconnected access points of the internet, covers long distances such as submarine cables, often made from optical fibers, internet backbone

Mbps – Megabit per second (Mb/s), one million bits per second

Municipal Fiber – Publicly owned Internet Service Provider classified as a utility, fully accountable to voters, “future proofed” with easily scalable world class bandwidth

Satellite

- GSO (Geostationary Orbit) Traditional
- NGSO (Non-Geostationary Orbit) Newer technology (Starlink)

Fixed Wireless

- Frequencies in electromagnetic spectrum partitioned into *Licensed*, *Unlicensed*, and *Licensed-by-Rule* bands
- “Fixed” wireless as opposed to “mobile” wireless (cellphones)

Copper Wire

- DSL is the incumbent broadband technology that operates on existing twisted pair copper phone lines

Coaxial Cable

- Coaxial cables can transmit data much faster than DSL due to the form of the cable but have similar drawbacks

Fiber to the Premise

- Optical Transmission technology transmit data with low power light pulses
- Fastest and most scalable by many orders of magnitude
- Fiber has connected the world together since 1980s
- *As good as it gets*



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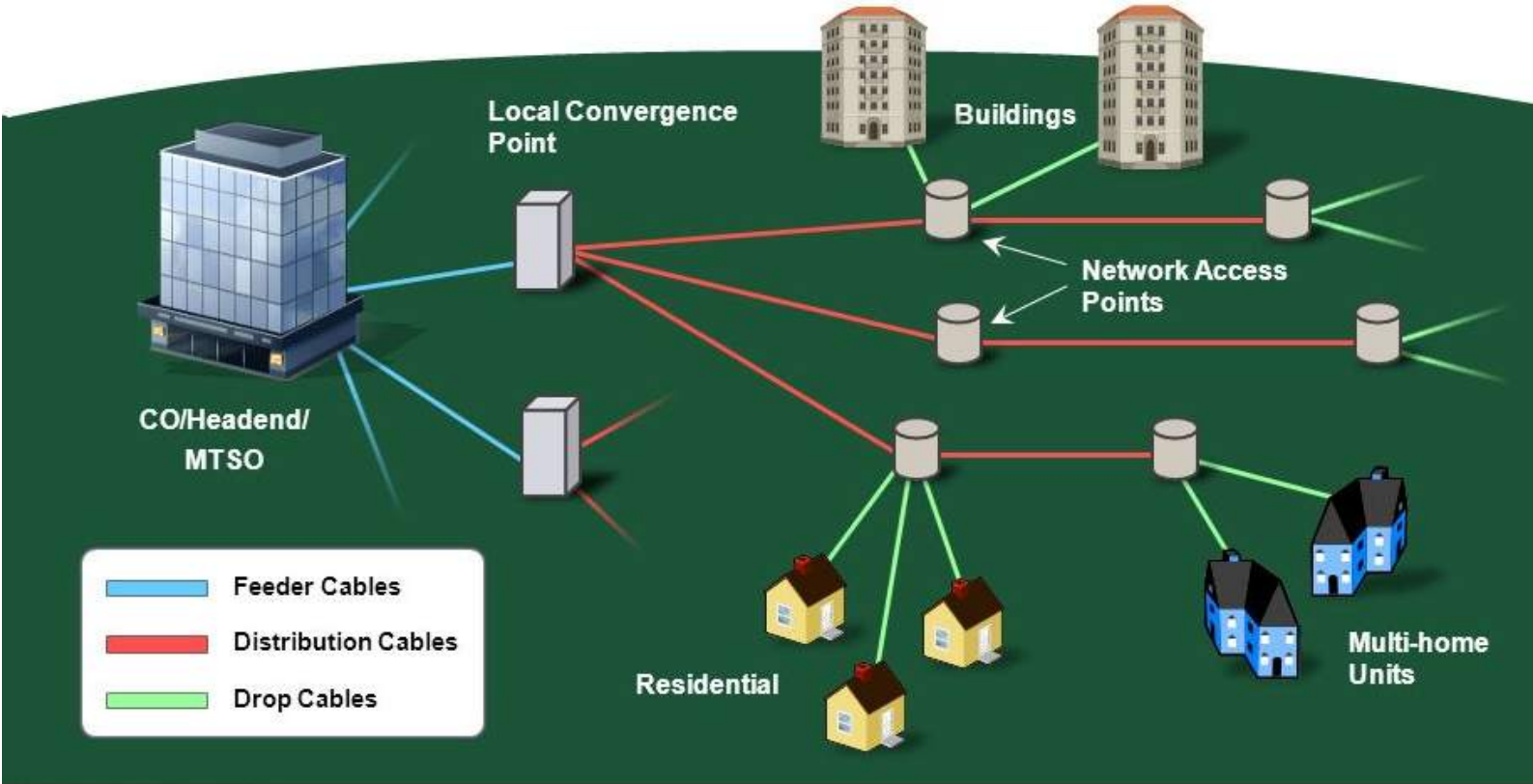
Availability Summary

Technology Type	Max Download Speeds	Max Upload Speeds	Latency	
Fiber	1,000 – 1,000,000+ Mbps	Symmetrical	10-100ms	Future Proof
Coax	10 - 1,000 Mbps	20-30 Mbps	10-100ms	Approaching limits of technology
Digital Subscriber Line (DSL)	1-100 Mbps	1-5 Mbps	10-100ms	Outdated
Cellular (4G, 5G)	1-55 Mbps	0.5-40 Mbps	10-100ms	Subject to interference, network congestion
Fixed Wireless	10-250 Mbps	10-50 Mbps	10-100ms	Subject to interference/ line of sight
Satellite	10-200 Mbps	5-20 Mbps	50-800ms	High latency, subject to interference, line of sight



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Fiber Networks



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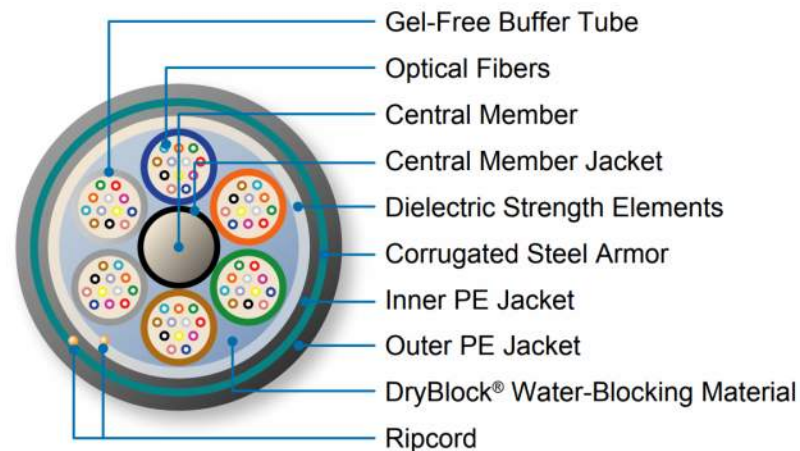
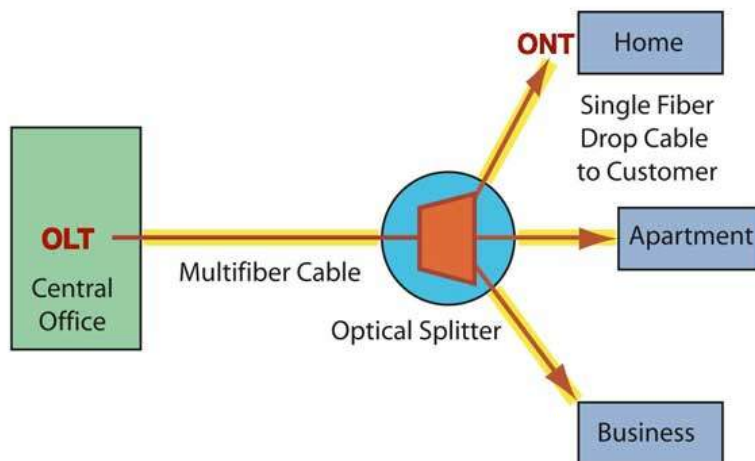


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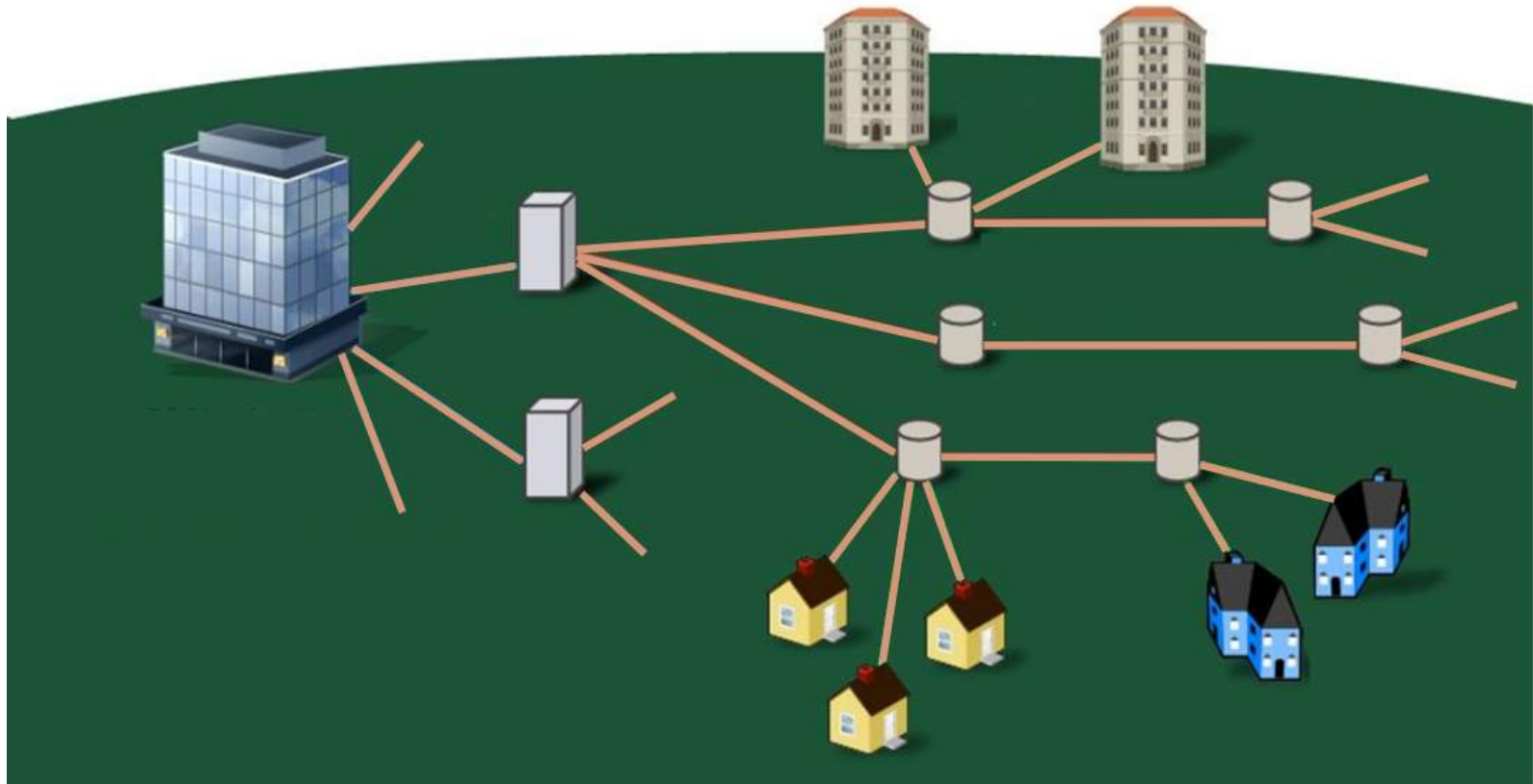
Passive Optical Network (PON) Fundamentals

- Internet connected to the Fiber Optic Network at Central Office
- “Feeder” optical fiber(s) runs to a location central to the served premises
- Optical splitter divides/multiplies the signal within each optical fiber 1:32
- Each of the 32 “distribution” fibers connect to a single premise



Early Internet: All Copper Infrastructure

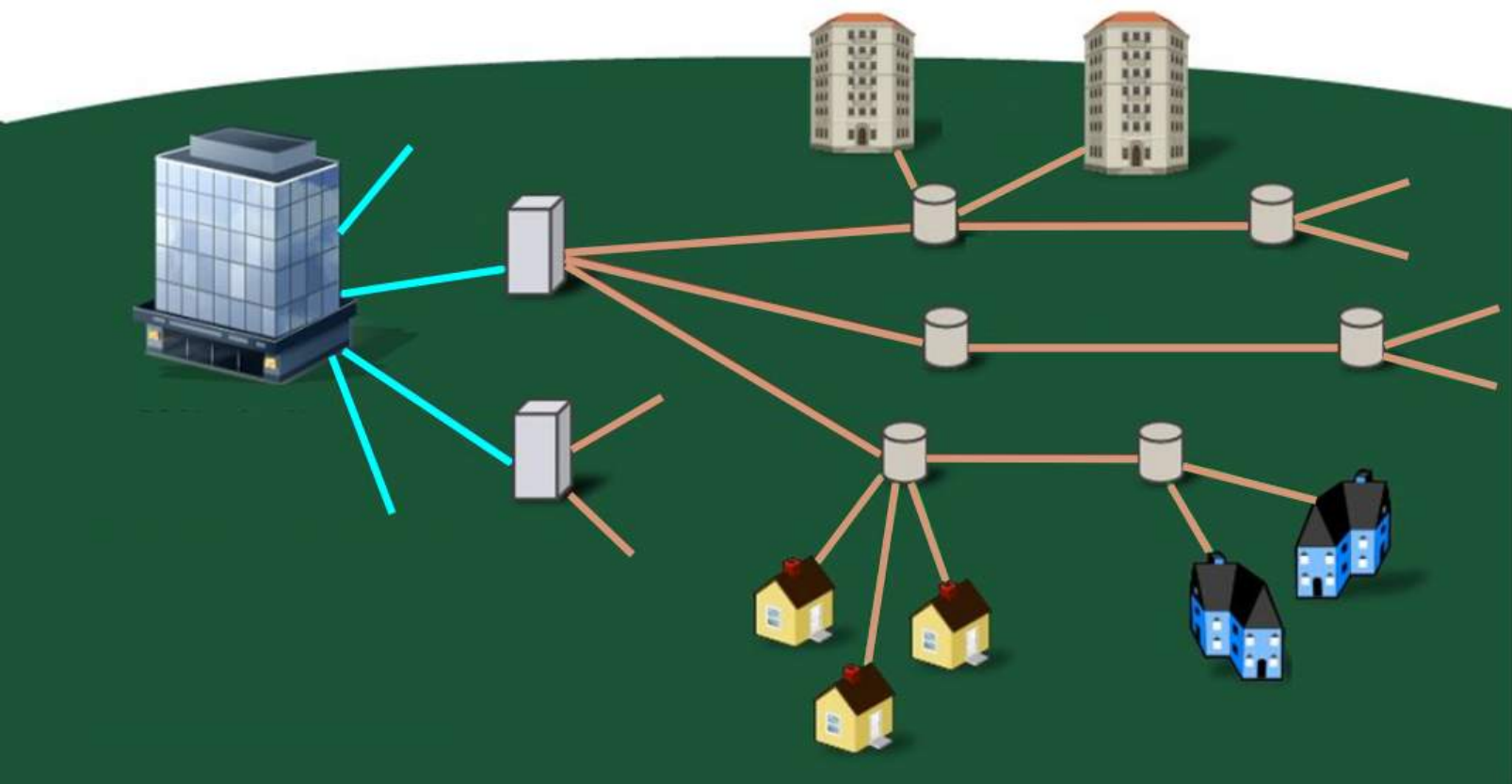
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~1980s to ~1990s: Fiber for Backhaul

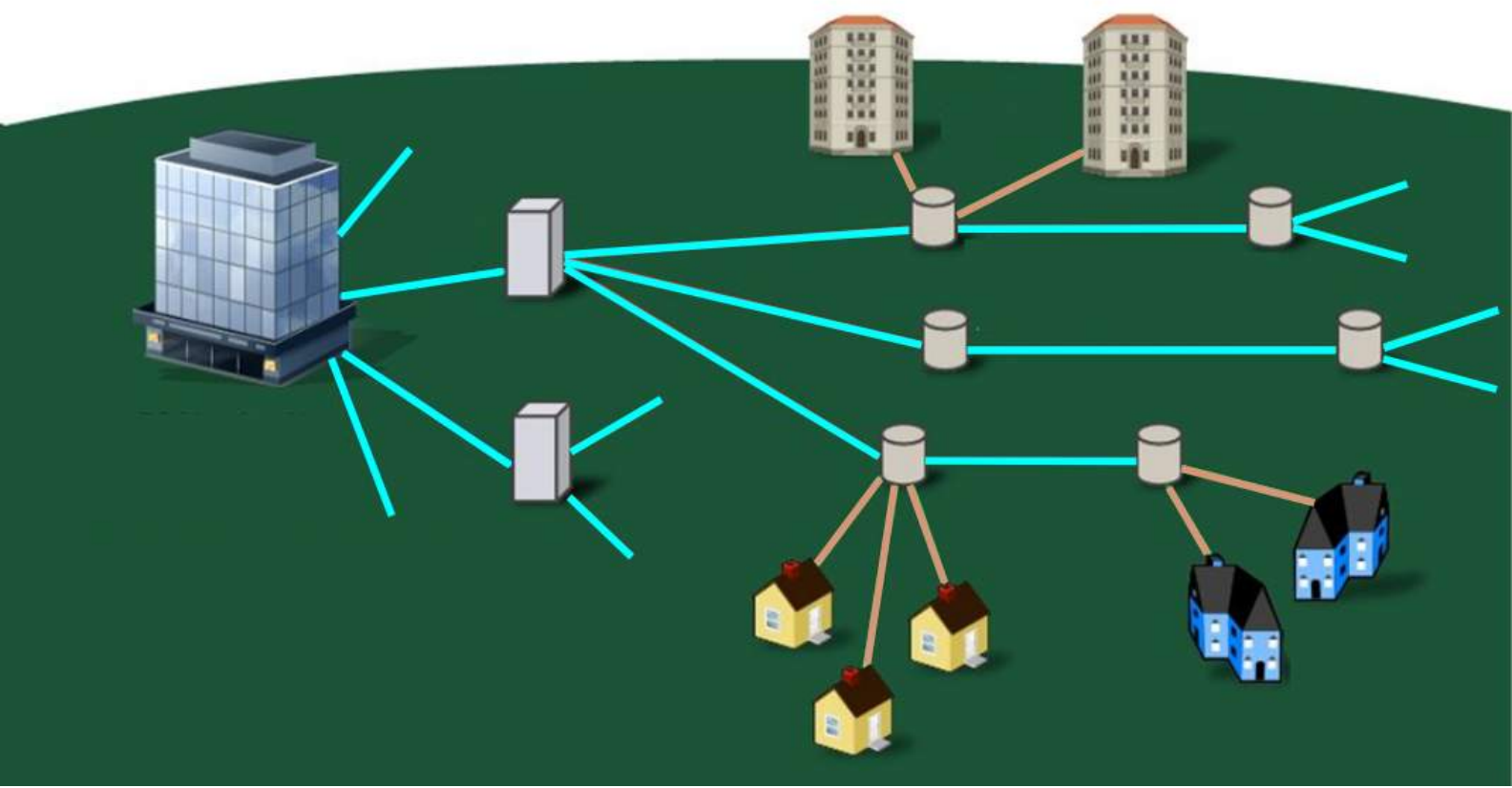
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~1990s to ~2000s: Fiber in more local networks

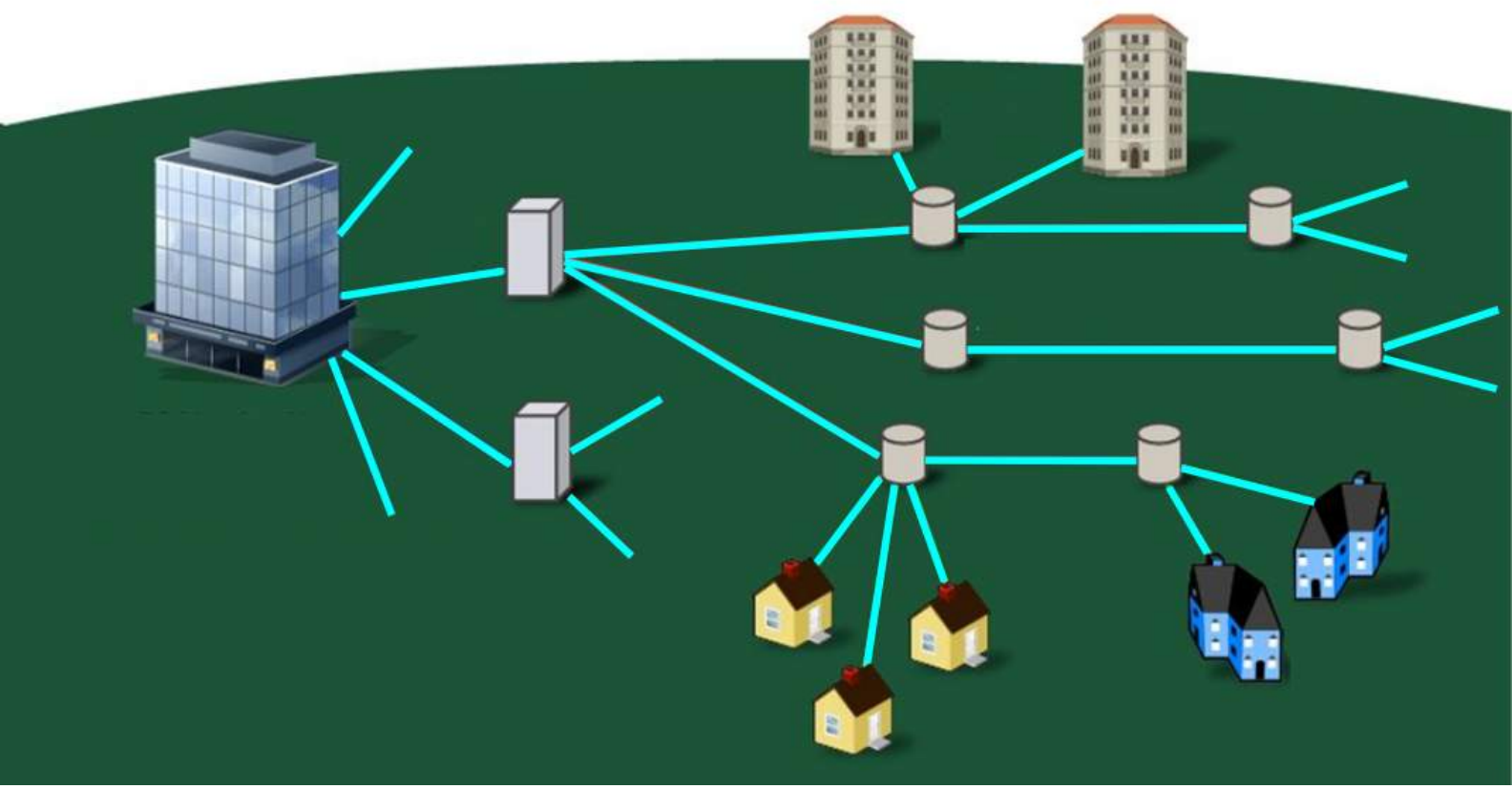
Fiber Networks



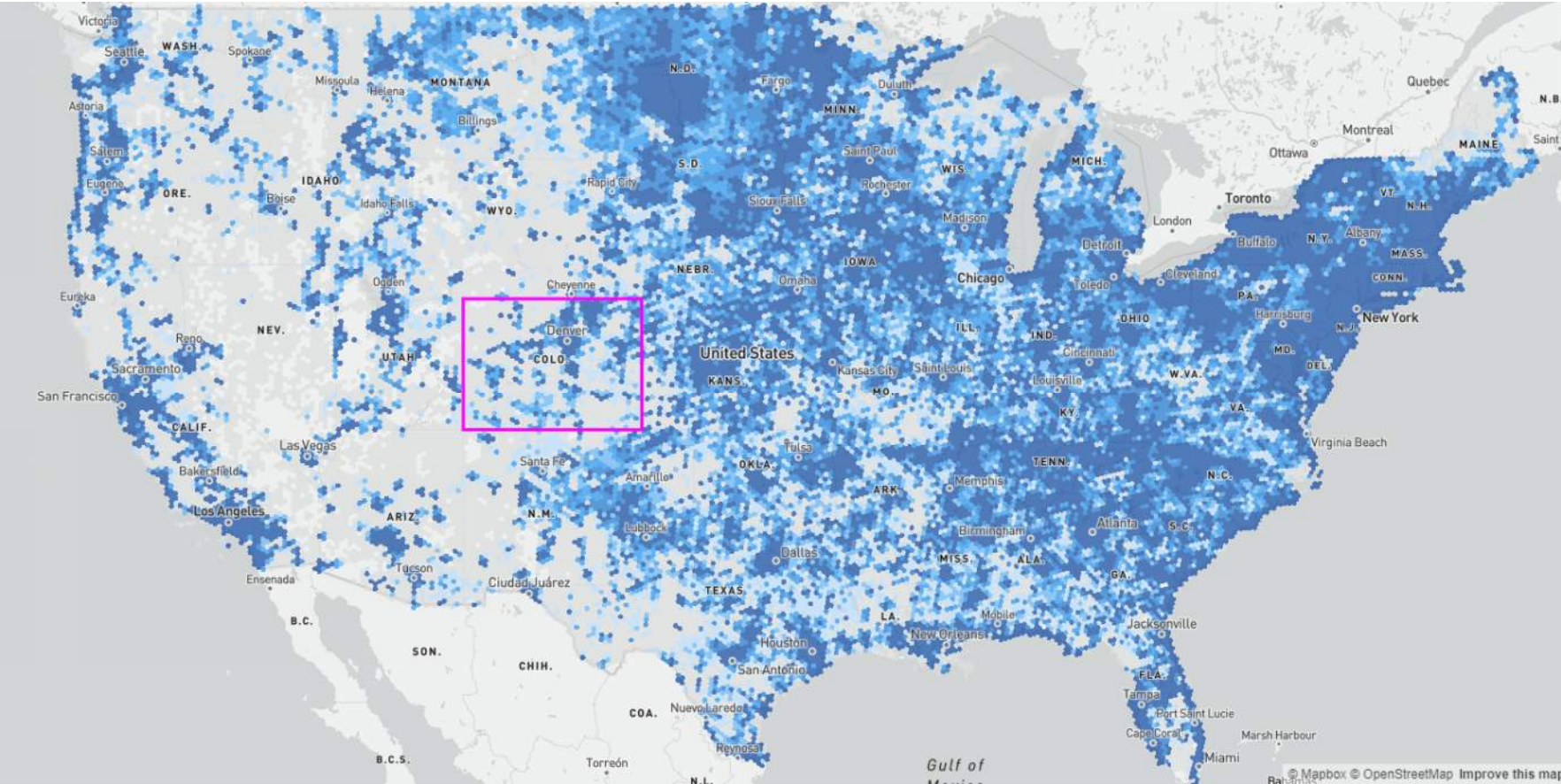
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~2000s to present: Fiber to the Premise

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Terminology

Broadband Serviceable Location (BSL): a business or residential location in which mass-market fixed broadband Internet access service is, or can be, installed.

- BSLs are not schools, libraries, community centers, and government buildings, barns, RVs, etc...

Unserved: BSLs lack access to Speeds of at least 25 Mbps downstream and 3 Mbps upstream with Latency levels low enough to support real-time applications.

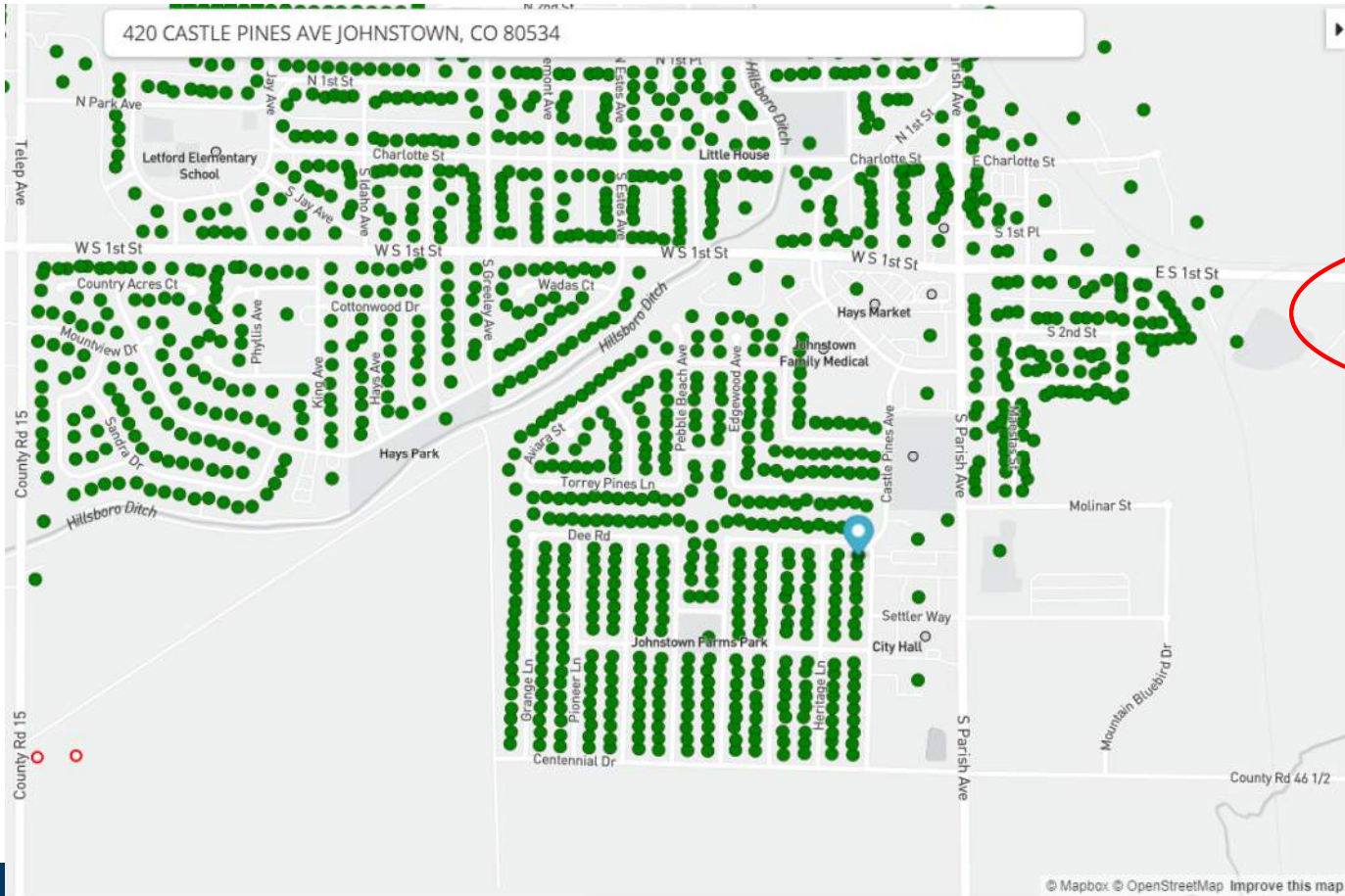
Underserved: BSLs lack access to Speeds of at least 100 Mbps downstream and 20 Mbps upstream with low latency

Served: BSLs have access to Speeds greater or equal to 100 Mbps downstream and 20 Mbps upstream with low latency



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FCC Fabric: Availability



Fixed Broadband | Mobile Broadband

Selected Location Location Challenge

420 CASTLE PINES AVE
JOHNSTOWN, CO 80534

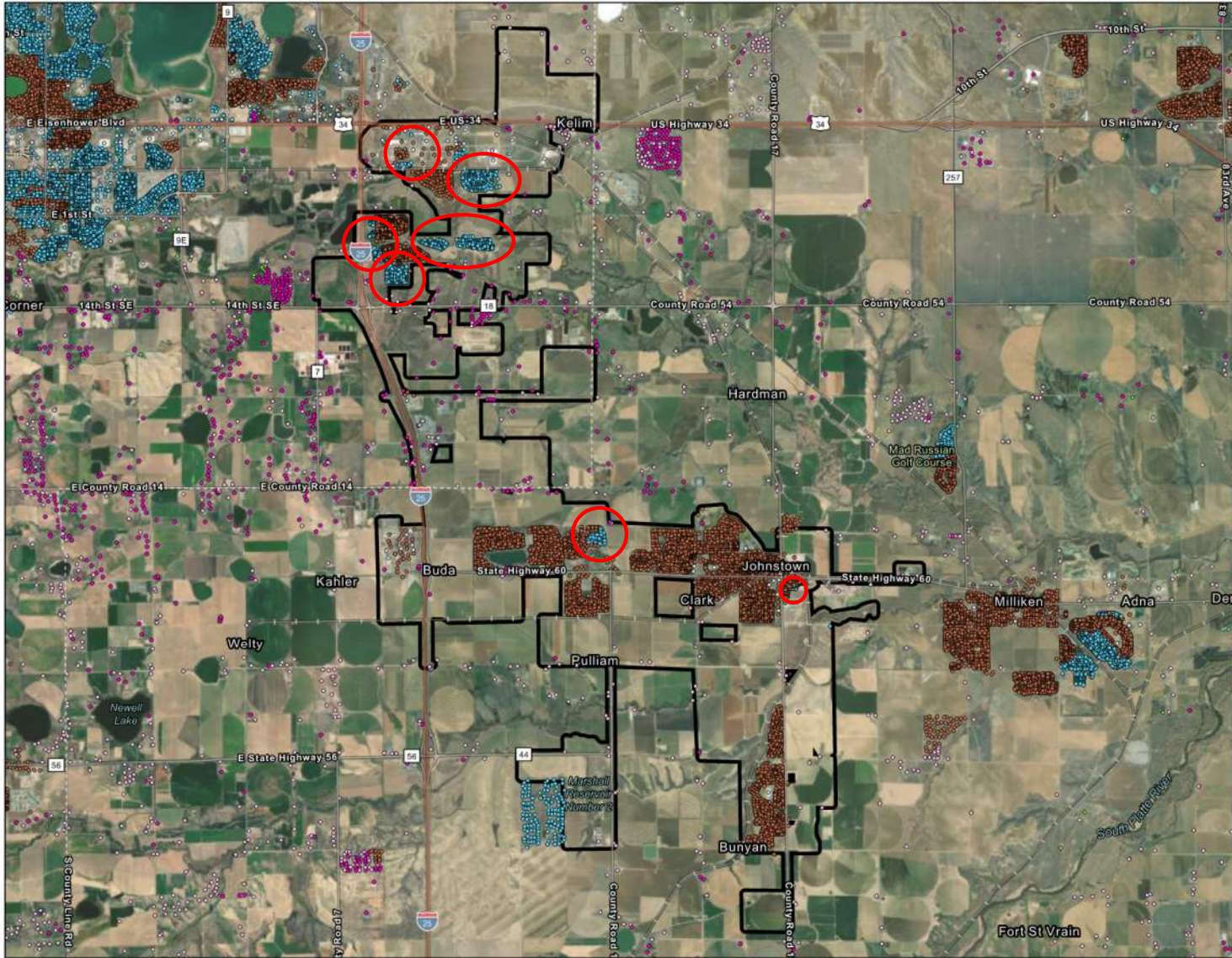
Status: **Served** | Residential | Unit Count: 1

Broadband ⚙️

Type	Residential
Technology	All Wired
Speed	100/20 Mbps or greater
Data As Of	Dec 31, 2022 (Last Updated: 11/7/23)

Grant Eligibility

- ✓ Based on FCC mapping
- ✓ Focused on areas lacking access to 25/3 Mbps or less



Terrestrial Service Technology

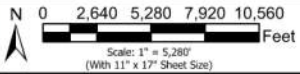
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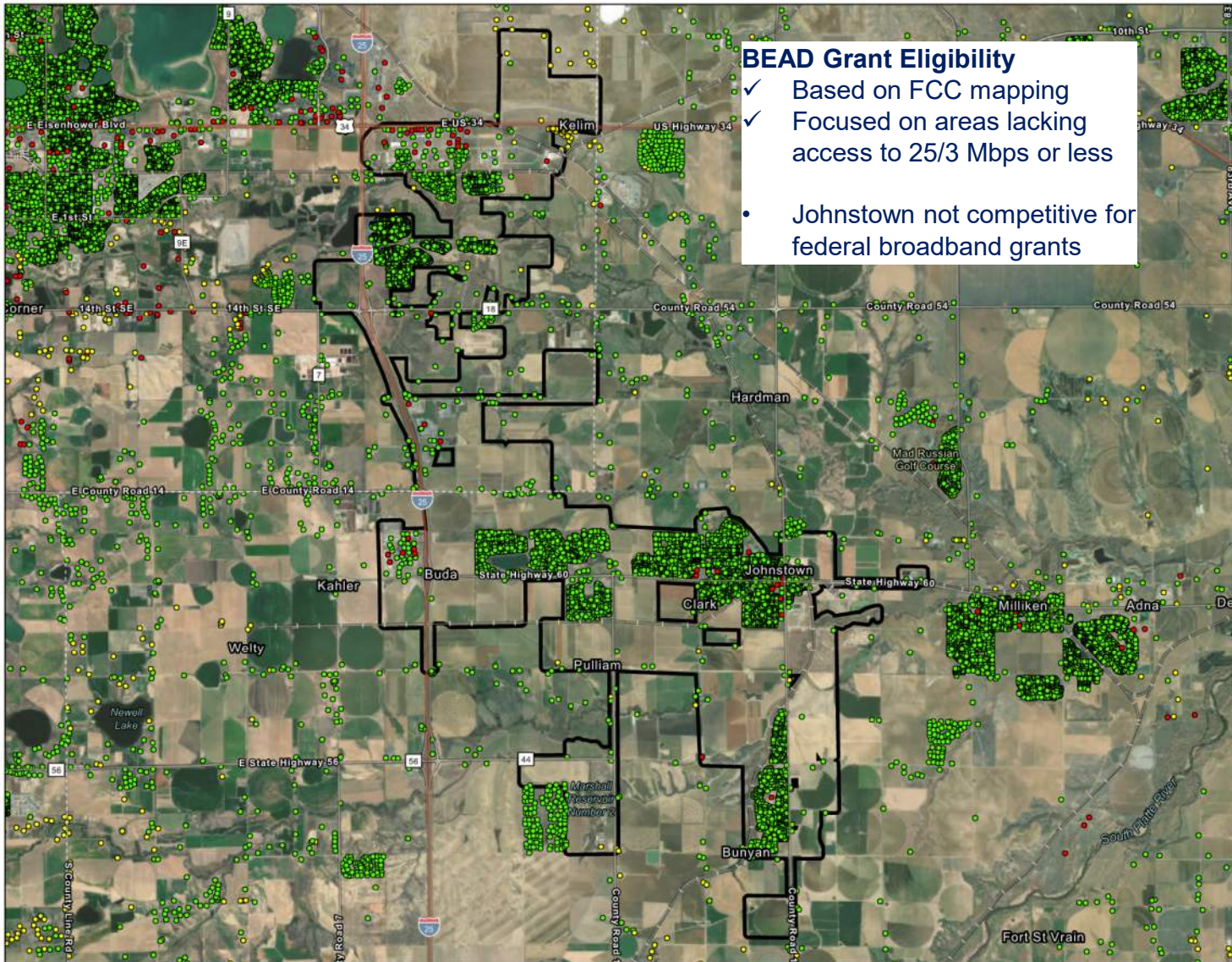


Fiber Broadband Services



-  Johnstown Municipal Boundary
-  No Reported Terrestrial Service
-  Copper Wire
-  Coaxial Cable / HFC
-  Fiber to the Premise
-  Unlicensed Terrestrial Fixed Wireless
-  Licensed Terrestrial Fixed Wireless
-  LBR Terrestrial Fixed Wireless

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BEAD Grant Eligibility


- ✓ Based on FCC mapping
- ✓ Focused on areas lacking access to 25/3 Mbps or less
- Johnstown not competitive for federal broadband grants

Broadband Availability





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N 0 2,640 5,280 7,920 10,560 Feet
Scale: 1" = 5,280'
(With 11" x 17" Sheet Size)

-  Johnstown Municipal Boundary
-  Speed < 25/3 Mbps
-  25/3 ≤ Speed < 100/20 Mbps
-  Speed ≥ 100/20 Mbps

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Availability Summary

	Fixed Terrestrial Broadband Provider	Technology Type	<u>Download</u> Max Advertised Speed (Mbps)	<u>Upload</u> Max Advertised Speed (Mbps)	Subscription Cost
Wireline	Century Link	Fiber	940	940	\$75 / month (no install fee)
	TDS	Fiber	1000	1000	\$90 – 120 / month
	TDS	Cable	1000	20	\$90 – 116 / month
	Century Link	DSL	10	1	\$74 / month + \$300 install
Wireless	Century Link	Wireless	0.2 to 140	0.1 to 40	\$70 / month + \$150 install
	Rise Broadband	Wireless	10 to 100	1 to 20	\$75 / month
	Vistabeam Internet	Wireless	100	20	\$88 per Month + \$200 Install
	Ascent Broadband	Wireless	100 to 150	5 to 38	\$90 – \$129+ / month
	T-Mobile	Wireless	0.2 to 25	0.1 to 3	\$55
Satellite	HughesNet	GSO	20 to 50	1 to 3	\$75 / month
	Viasat	GSO	100	Unspecified	\$215 / month
	Starlink	NSGO	56 to 169	9 to 17	\$120 / month + \$650 Install

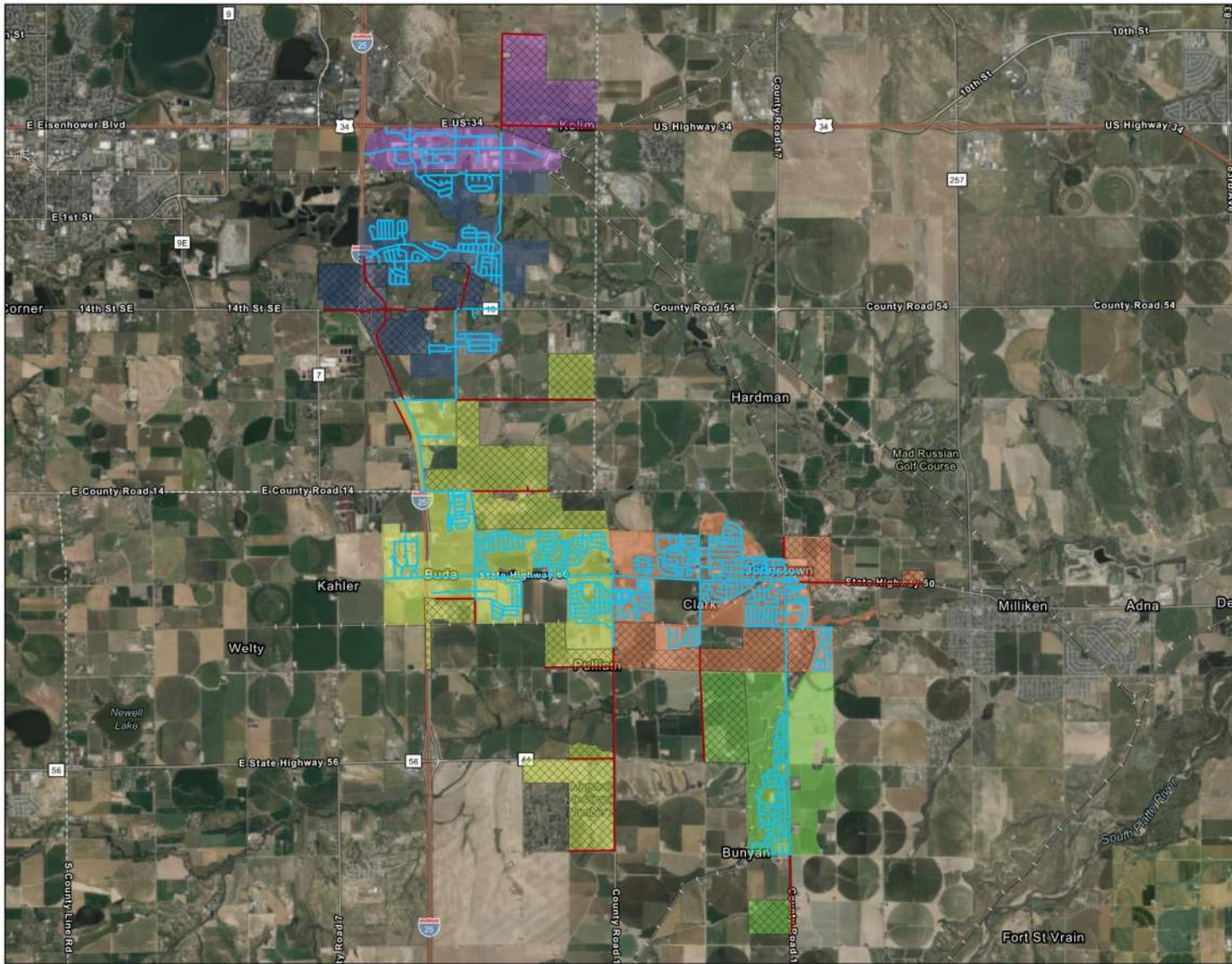
Public Broadband

Why have Municipalities/Public agencies pursued broadband?

- ✓ Broadband as a Utility
 - Consideration that broadband is no different than power, water, sewer – it is an essential utility
 - Create equity through bridging the “digital divide”
- ✓ Desire to “future proof” community through fiber
- ✓ Economic development/health
- ✓ Create a more reliable, resilient communication infrastructure
- ✓ Set the foundation for “Smart City”
 - Improve transportation, services, communication
 - Data to efficiently operate and manage assets




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High Level Network

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N 0 2,640 5,280 7,920 10,560
Feet
Scale: 1" = 5,280'
(With 11" x 17" Sheet Size)

• Address

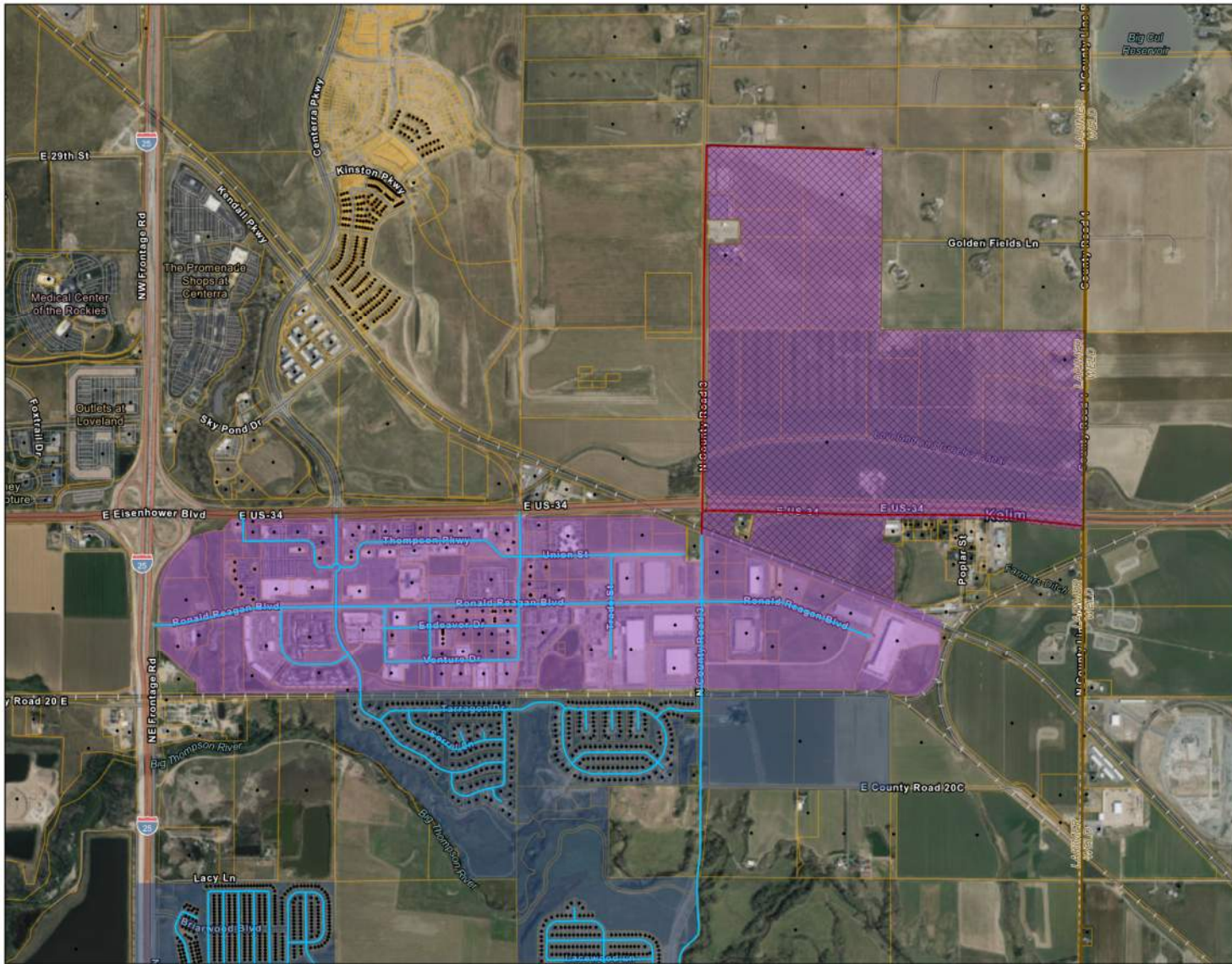
Area Name

- Centerra
- Downtown
- Johnstown West
- Stroh Farms
- Thompson River Ranch
- Rural Areas

Fiber Construction Phase

- Urban
- Rural

Date Exported: October 2023



High Level Network

Johnstown Broadband Planning

Johnstown Plaza Area Detail

Johnstown Colorado

N 0 660 1,320 1,980 2,640 Feet

Scale: 1" = 1,320'
(With 11" x 17" Sheet Size)

- County Boundary
- Parcel
- Address

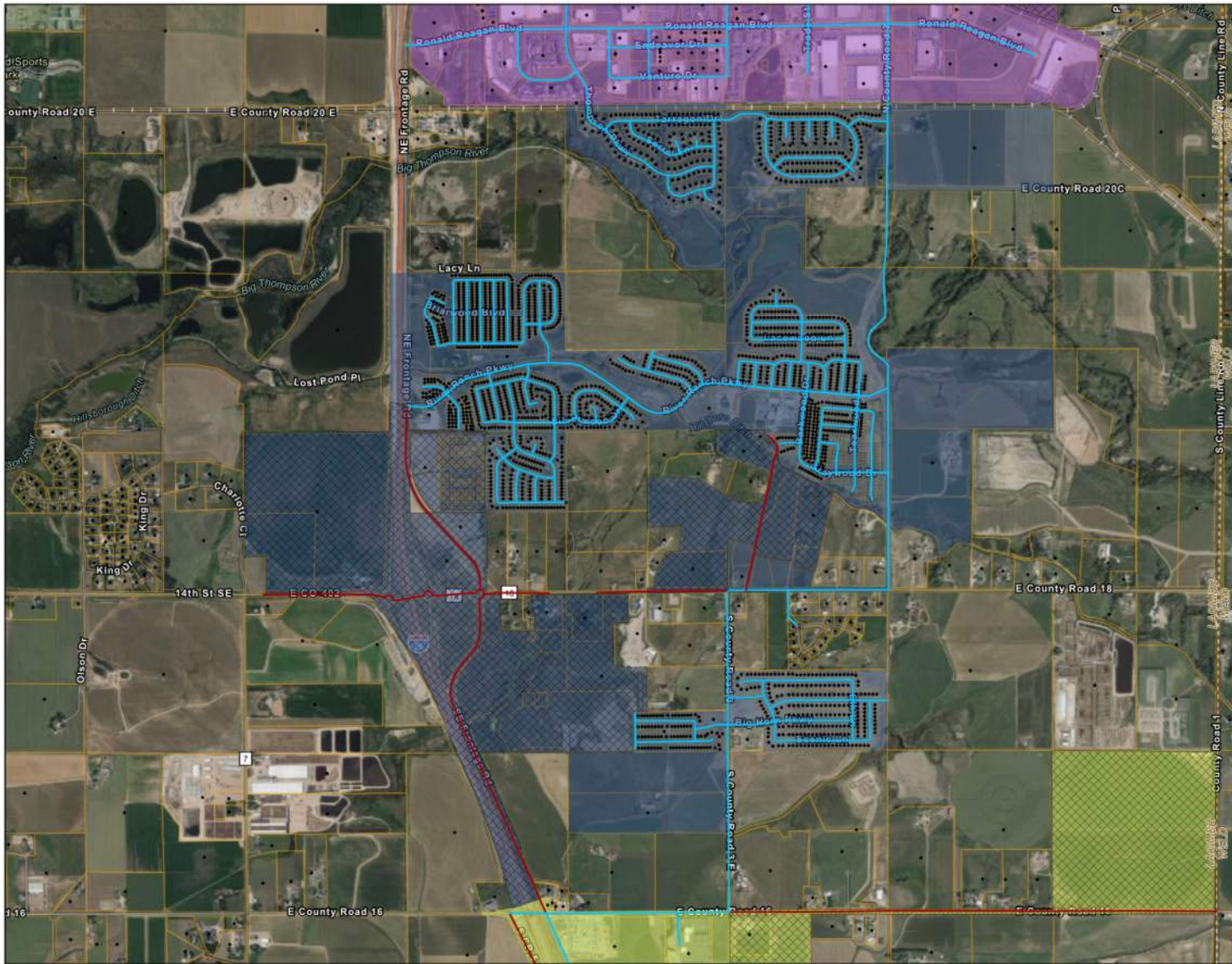
Area Name

- Johnstown Plaza
- Thompson River Ranch
- Rural Areas

Fiber Construction Phase


- Urban
- Rural

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Johnstown Broadband Planning
Thompson River Ranch Area Detail



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N 0 750 1,500 2,250 3,000 Feet

Scale: 1" = 1,500'
(With 11" x 17" Sheet Size)

- County Boundary
- Parcel
- Address

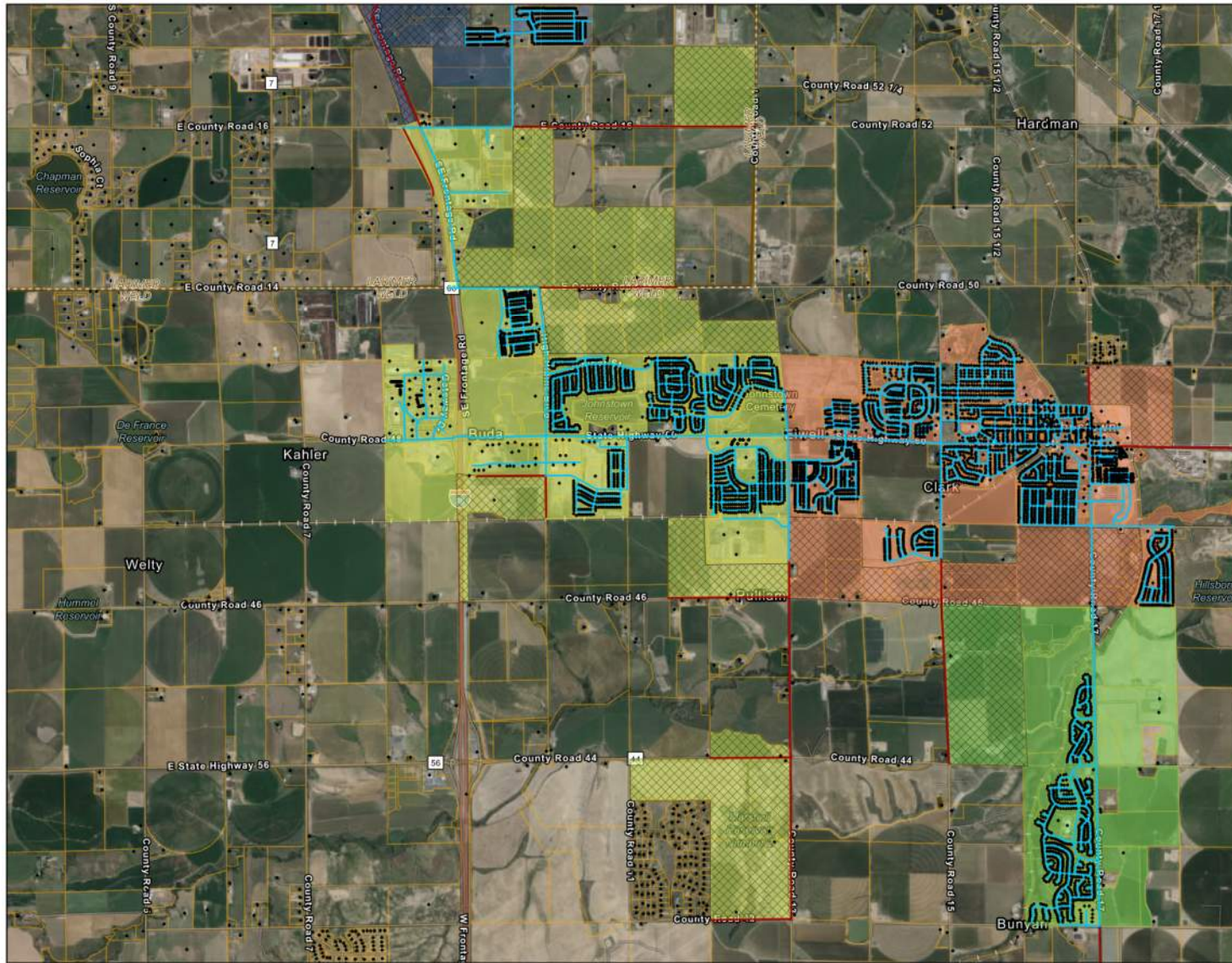
Area Name

- Johnstown Plaza
- Johnstown West
- Thompson River Ranch
- Rural Areas

Fiber Construction Phase

- Urban
- Rural


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Johnstown West Area Detail








Johnstown Colorado







-  County Boundary
-  Parcel
-  Address

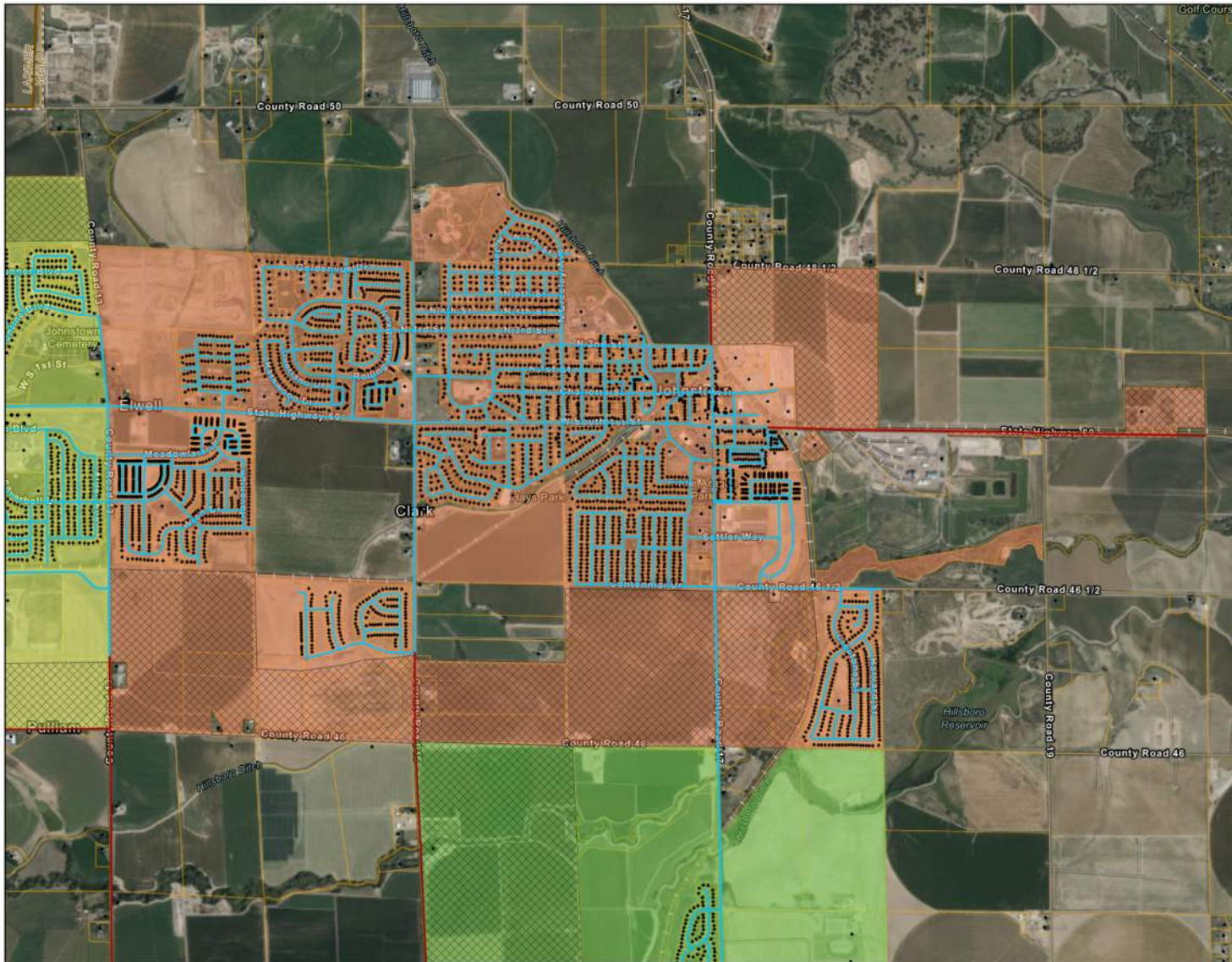
Area Name

-  Downtown
-  Johnstown West
-  Strohm Farms
-  Thompson River Ranch
-  Rural Areas

Fiber Construction Phase

-  Urban
-  Rural


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Downtown Area Detail



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N 0 750 1,500 2,250 3,000 Feet

Scale: 1" = 1,500'
(With 11" x 17" Sheet Size)

- County Boundary
- Parcel
- Address

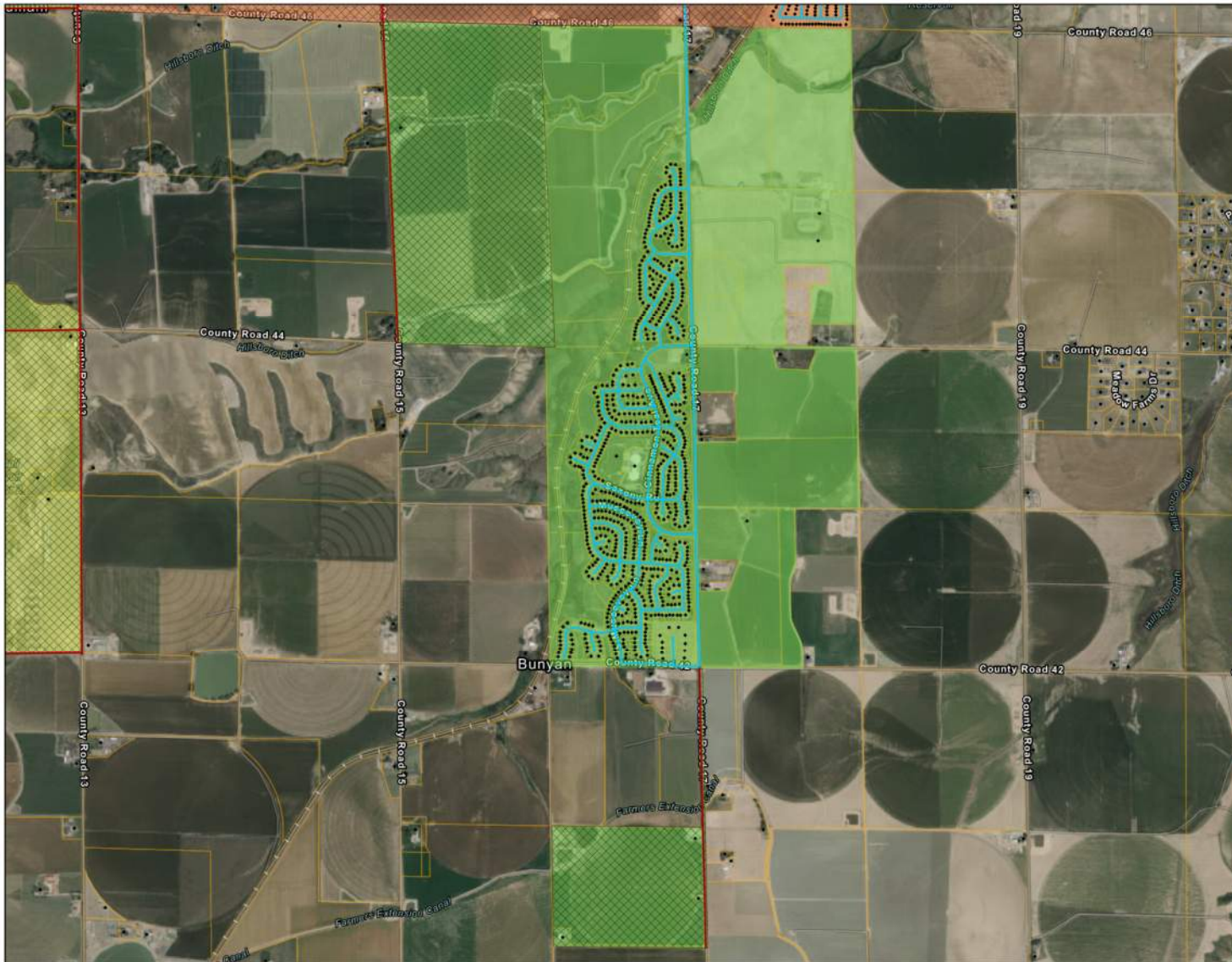
Area Name

- Downtown
- Johnstown West
- Stroh Farms
- Rural Areas

Fiber Construction Phase

- Urban
- Rural


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Stroh Farms Area Detail



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Fiber Broadband Services

N 0 750 1,500 2,250 3,000 Feet
Scale: 1" = 1,500'
(With 11" x 17" Sheet Size)

- County Boundary
- Parcel
- Address

Area Name

- Downtown
- Johnstown West
- Stroh Farms
- Rural Areas

Fiber Construction Phase

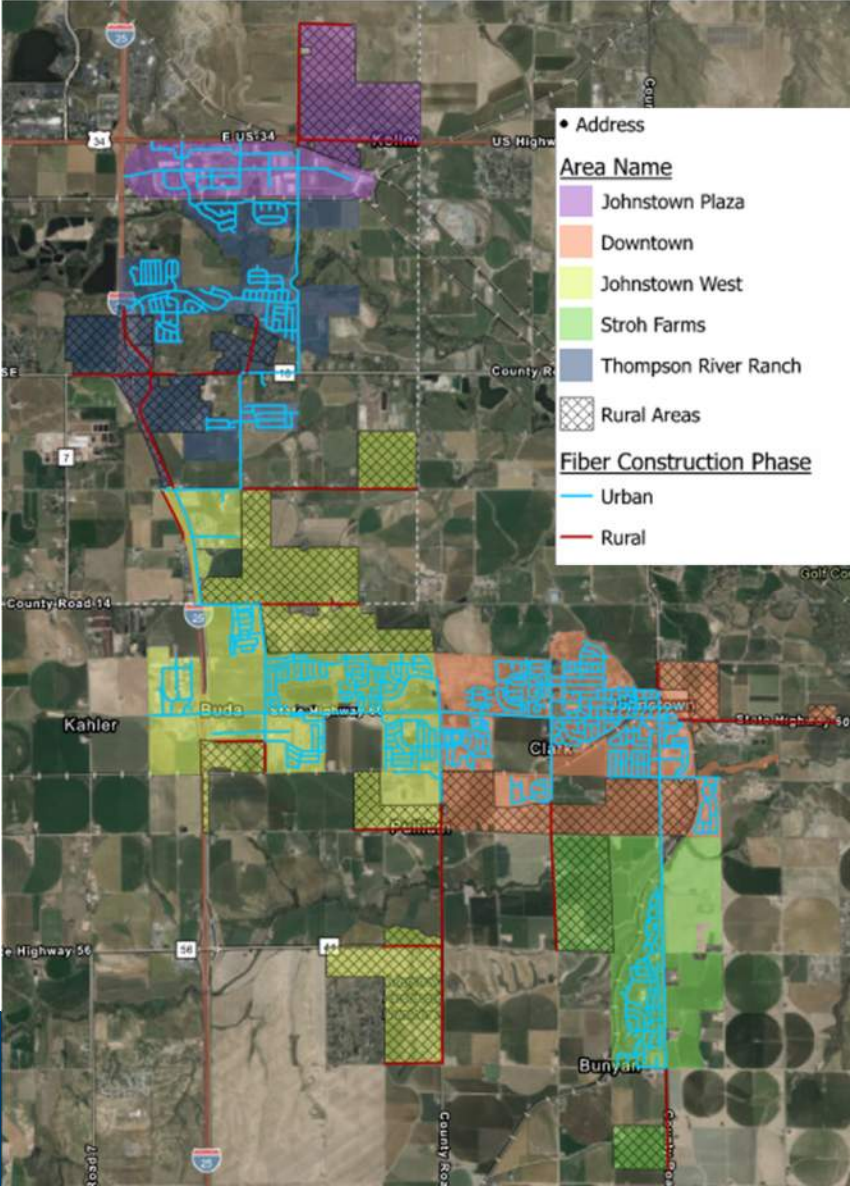
- Urban
- Rural

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Capital Project Cost

Total Cost Summary by Area

ITEM	TOTAL FOOTAGE	NUMBER OF ADDRESSES	COST PER ADDRESS	ESTIMATED COST
Johnstown Plaza	47,042	129	\$20,153	\$2,599,711
Downtown	214,329	3,311	\$3,670	\$12,152,638
Johnstown West	202,376	2,148	\$5,190	\$11,148,924
Stroh Farms	61,799	749	\$4,751	\$3,558,869
Thompson River Ranch	127,490	1,947	\$3,745	\$7,292,471
TOTAL	653,036	8,284		\$36,752,613
Average Cost per Address				\$4,437



Service Models

- ✓ Status Quo
 - Service by private industry
- ✓ Public-Private-Partnership
 - Private ISP, Private Equity, Private Contractor
 - Longer term relationship; lack of control over service
- ✓ Municipality as ISP
 - (i.e. Longmont, Fort Collins, Loveland, Estes Park)
- ✓ Connect to other Municipal Broadband providers
 - Service agreement/IGA
 - Possible revenue sharing/cost offsets
 - Level of control



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Johnstown Operated Utility

- ✓ Capital Expense: \$36.8 million
- ✓ Utility Start up Costs:
 - Minimum additional 2 years to setup utility prior to construction
 - 10-15 full time staff
 - Vehicles and Equipment
 - Enterprise Software Systems
 - Billing
 - Fiber Management
 - Sales/Marketing
 - Network Operations and Management
 - Professional Services, Marketing, Customer Service
 - Backhaul and IP addresses



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Johnstown Owned Utility

- ✓ Positive Cash Flow – ~8 years only \$95/month @ 50% take rate
 - ✓ Take rate vs cost can be sensitive and vary by region
 - ✓ Requires ~\$11M general fund transfer
 - ✓ Assumption: \$40M municipal bond, 30 year @ 4.4%
- ✓ Life of Asset – 25 to 50 years
- ✓ Schedule
 - Additional time to construction for utility setup (~2 years)
- ✓ Risk
 - Business model risk fully assumed by Johnstown
 - Staffing availability



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Municipal Partner - Business Model

- ✓ Capital Expense - \$36.8 million
- ✓ Income Shared to Town – As a % of Gross or Net Income
- ✓ Annualized Return on Investment – 2% to 6%
 - Funded through cash reserves
- ✓ Life of Asset – 25 to 50 years
- ✓ Schedule
 - More flexible phasing to match funding availability
- ✓ Risk
 - Some loss of control to outside entity
 - Operational and overhead costs borne by partner



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Cash Reserves

- ✓ In the case of Johnstown owned utility
 - Requires larger investment for increased start up and operational costs

- ✓ In the case of municipal broadband partner:
 - Flexible annual buildout based on available funding
 - Light up areas as funding is available
 - No additional overhead costs or debt payments
 - Paid back to Town through revenue share on subscriptions



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Municipal Bond

- ✓ In the case of Town Owned Facility
 - Secured by subscription revenue
 - Recommend approval through ballot measure vote to approve both enterprise utility creation and bond

- ✓ In the case of municipal broadband
 - Extends payback period
 - Difficult to secure bond against share of revenue and long payback



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Certificates of Participation

- ✓ Financing tool (acts similar to a bond)
- ✓ Collateralize Broadband assets to secure debt/issue COPs
- ✓ Secured by subscription revenue

- ✓ In the case of municipal broadband:
 - IGA would govern relationship
 - Town would initially own the assets
 - Assets would transfer to ISP over time
 - Debt would be paid by the Town, repayment from ISP subscription revenue



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Next Steps

- ✓ Questions?
- ✓ Further investigation/analysis



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Thanks!



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Capital Cost Breakdown

Johnstown Plaza

ITEM	UNIT	QUANTITY	UNIT COST	EXTENDED COST
Outside Plant Construction				
General Conditions	LS	8%		\$60,755
Mobilization	LS	10%		\$120,886
Outside Plant Construction - Labor	\$ / ft	33,663	\$22.56	\$759,437
Material Procurement	\$ / ft	33,663	\$8.34	\$280,615
Service Drop Construction				
	\$ / Address	37	\$857.00	\$31,880
Core Networking				
Network Equipment	\$ / ft	33,663	\$1.45	\$48,811
Hut Procurement and Fitout	LS	1	120,000	\$120,000
Subtotal	\$ / ft	33,663	\$42.25	\$1,422,385
Materials Cost Inflation	LS	8.0%		\$22,449
Estimating Contingency	LS	15.0%		\$213,358
Owner Contingency	LS	8.0%		\$113,791
Engineering and Network Design	LS	6.0%		\$85,343
Project Management	LS	4.5%		\$64,007
TOTAL				\$1,921,334
Cost per Address				\$15,495
Cost per linear foot				\$57.08



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Capital Cost Breakdown

Downtown Area

ITEM	UNIT	QUANTITY	UNIT COST	EXTENDED COST
Outside Plant Construction				
General Conditions	LS	8%		\$369,082
Mobilization	LS	10%		\$673,476
Outside Plant Construction - Labor	\$ / ft	204,500	\$22.56	\$4,613,520
Material Procurement	\$ / ft	204,500	\$8.34	\$1,704,713
Service Drop Construction	\$ / Address	992	\$857.00	\$849,973
Core Networking				
Network Equipment	\$ / ft	204,500	\$1.45	\$296,525
Hut Procurement and Fitout	LS	1	120,000	\$120,000
Subtotal	\$ / ft	204500	\$42.19	\$8,627,288
Materials Cost Inflation	LS	8.0%		\$136,377
Estimating Contingency	LS	15.0%		\$1,294,093
Owner Contingency	LS	8.0%		\$690,183
Engineering and Network Design	LS	6.0%		\$517,637
Project Management	LS	4.5%		\$388,228
TOTAL				\$11,653,807
Cost per Address				\$3,525
Cost per linear foot				\$56.99



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Capital Cost Breakdown

Johnstown West

ITEM	UNIT	QUANTITY	UNIT COST	EXTENDED COST
Outside Plant Construction				
General Conditions	LS	8%		\$293,054
Mobilization	LS	10%		\$537,218
Outside Plant Construction - Labor	\$ / ft	162,375	\$22.56	\$3,663,180
Material Procurement	\$ / ft	162,375	\$8.34	\$1,353,559
Service Drop Construction	\$ / Address	642	\$857.00	\$549,937
Core Networking				
Network Equipment	\$ / ft	162,375	\$1.45	\$235,444
Hut Procurement and Fitout	LS	1	120,000	\$120,000
Subtotal	\$ / ft	162,375	\$41.59	\$6,752,392
Materials Cost Inflation	LS	8.0%		\$108,285
Estimating Contingency	LS	15.0%		\$1,012,859
Owner Contingency	LS	8.0%		\$540,191
Engineering and Network Design	LS	6.0%		\$405,144
Project Management	LS	4.5%		\$303,858
TOTAL				\$9,122,728
Cost per Address				\$4,265
Cost per linear foot				\$56.18



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Capital Cost Breakdown

Stroh Farms

ITEM	UNIT	QUANTITY	UNIT COST	EXTENDED COST
Outside Plant Construction				
General Conditions	LS	8%		\$93,655
Mobilization	LS	10%		\$179,850
Outside Plant Construction – Labor	\$ / ft	51,892	\$22.56	\$1,170,684
Material Procurement	\$ / ft	51,892	\$8.34	\$432,572
Service Drop Construction	\$ / Address	224	\$857.00	\$191,540
Core Networking				
Network Equipment	\$ / ft	51,892	\$1.45	\$75,243
Hut Procurement and Fitout	LS	1	120,000	\$120,000
Subtotal	\$ / ft	51,892	\$43.62	\$2,263,543
Materials Cost Inflation	LS	8.0%		\$34,606
Estimating Contingency	LS	15.0%		\$339,531
Owner Contingency	LS	8.0%		\$181,083
Engineering and Network Design	LS	6.0%		\$135,813
Project Management	LS	4.5%		\$101,859
TOTAL				\$3,056,436
Cost per Address				\$4,103
Cost per Linear foot				\$58.90



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Capital Cost Breakdown

Thompson River Ranch

ITEM	UNIT	QUANTITY	UNIT COST	EXTENDED COST
Outside Plant Construction				
General Conditions	LS	8%		\$195,989
Mobilization	LS	10%		\$363,255
Outside Plant Construction - Labor	\$ / ft	108,593	\$22.56	\$2,449,858
Material Procurement	\$ / ft	108,593	\$8.34	\$905,232
Service Drop Construction	\$ / Address	581	\$857.00	\$497,489
Core Networking				
Network Equipment	\$ / ft	108,593	\$1.45	\$157,460
Hut Procurement and Fitout	LS	1	120,000	\$120,000
Subtotal	\$ / ft	108,593	\$43.18	\$4,689,282
Materials Cost Inflation	LS	8.0%		\$72,419
Estimating Contingency	LS	15.0%		\$703,392
Owner Contingency	LS	8.0%		\$375,143
Engineering and Network Design	LS	6.0%		\$281,357
Project Management	LS	4.5%		\$211,018
TOTAL				\$6,332,610
Cost per Address				\$3,273
Cost per Linear foot				\$58.32



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Connecting it all: Feeder and Rural Connections

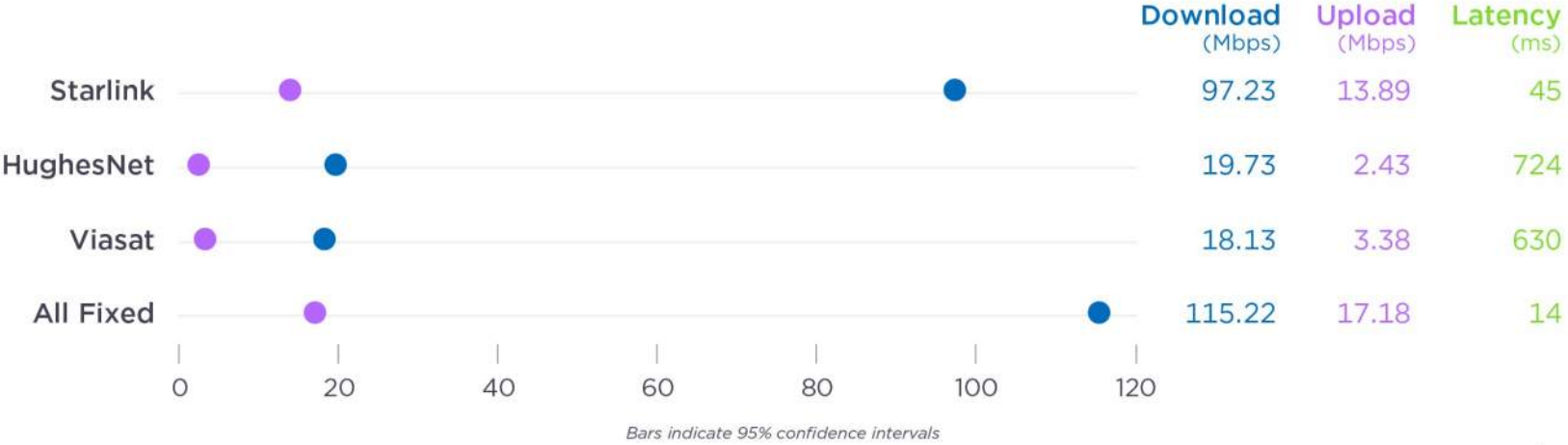
ITEM	UNIT	QUANTITY	UNIT COST	EXTENDED COST
Outside Plant Construction				
General Conditions	LS	8%		\$166,065
Mobilization	LS	10%		\$297,625
Outside Plant Construction - Labor	\$ / ft	92013	\$22.56	\$2,075,813
Material Procurement	\$ / ft	92013	\$8.34	\$767,021
Service Drop Construction	\$ / Address	11	\$857.00	\$8,999
Core Networking				
Network Equipment	\$ / ft	92013	\$1.45	\$133,419
Subtotal	\$ / ft	92013	\$37.48	\$3,448,942
Materials Cost Inflation	LS	8.0%		\$61,362
Estimating Contingency	LS	15.0%		\$517,341
Owner Contingency	LS	8.0%		\$275,915
Engineering and Network Design	LS	6.0%		\$206,937
Project Management	LS	4.5%		\$155,202
TOTAL				\$4,665,699
Cost per Address				\$133,306
Cost per linear foot				\$50.71



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Satellite Internet Performance vs. Fixed Broadband in the U.S. Speedtest Intelligence® | Q2 2021



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